



Envisioning State Regulatory Roles in the Provision of Energy Storage

NRRI Report No. 14-08

www.nrri.org

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July 2014

- Benefits of storage
 - Primary and Secondary Applications
- Technical, economic, and regulatory challenges
- Summary of ongoing state policies and implementation actions
- Ideas for state regulatory approaches

Benefits of Storage

- **Bulk energy services:**
Time shifting, arbitrage, capacity
- **Manage ramping requirements**
due to variable-output generation from wind & solar
- **Ancillary services:**
Frequency regulation, voltage support, reserves (spinning, non-spinning, supplemental), black start
- **Transmission & distribution infrastructure:**
Congestion relief, upgrade deferral, voltage support
- **Customer energy management:**
Power quality, reliability, demand-charge management, and retail time & price shifting

Technical Challenges

- **A cornucopia of technology choices:**
 - Different technologies meet different needs for quantity, quality, operations
 - Different options provide different benefits, value streams
- **Competing value streams:**
 - Maximizing multiple benefits requires complex planning and operations
- **So much depends on location:**
 - But, data on values by location is hard to find

Economic Challenges

- Some value propositions are self-limiting:
 - Increasing storage capabilities in the utility system means each increment creates less value
- Some value propositions compete, and are on widely different time frames
- Monetizing is not yet possible for all storage value-propositions
- Emerging technologies have higher costs and perceived risks
- Competition from low natural gas prices

Regulatory Challenges

- Whose resource is it and who controls it: Utility, IPP, Energy Service Company, Customer?
- How can projects capture value streams, especially values in multiple jurisdictions?
- Will smarter grid infrastructure fully enable storage integration?
- New tools and techniques are needed for comprehensive, locational IRP:
 - Storage is *somewhat* like and a complement to G, T, and D, distributed generation, demand response, load management, and energy efficiency.

Ongoing State Actions

- **Active dockets** (7 states)
- **Completed dockets** (4 states)
- **Demonstrations and pilot projects**
(39 states and about 350 projects, and growing)
- **IRP requirements** (6 states)
- **Proposed legislation** (5 states)
- **Microgrids policies, programs** (9 states)
- **Plug-in electric vehicles programs** (13 states)
- **Storage mandates** (California, Puerto Rico)
- **Tax Credits, Financial Incentives** (10 states)
- **Working groups or public workshops**
(8 states)



Recommendations (1)

- Learn from demonstration & pilot projects and share the lessons learned
- Review retail rates for customer-side storage
- Develop and deploy a full suite of IRP tools capable of analyzing and valuing storage, then use those tools to evaluate storage in IRP
- Identify the best few projects, for a “ready, fire, aim” approach



Recommendations (2)

- Invite non-transmission alternatives and G, T, and D deferment:
 - (1) analysis, and
 - (2) competitive bidding
- Consider and model whole new paradigms:
 - Will a market full of supply-following loads replace load-following supplies?
 - Will transactive energy be enabled, making possible continuous demand response?



Energy Storage Info Resources

- DOE Global Energy Storage Database:
www.energystorageexchange.org
- DOE Energy Storage Program:
energy.gov/oe/services/technology-development/energy-storage
- EISPC EZMAPPING Tool GIS for Storage (CAES, Pumped-Storage Hydro): eispctools.anl.gov/energy_resources/storage
- Energy Storage Association News:
energystorage.org/news/esa-news
- Energy Storage Technology Advancement Partnership, Clean Energy States Alliance:
www.cesa.org/projects/energy-storage-technology-advancement-partnership/
- Sandia Laboratories, Energy Storage Systems Program:
www.sandia.gov/ess/