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Status from the Northwest: Workshop, Dockets, & Analysis

REBECCA O'NEIL

Pacific Northwest National Laboratory

Presentation to Southwest PUC Workshop, Albuquerque NM
May 3, 2016

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PNNL at a glance

- 4,300 scientists, engineers, and non-technical staff
- $1.02 Billion operating budget

Laboratory Objectives

Institutional efforts that distinguish PNNL

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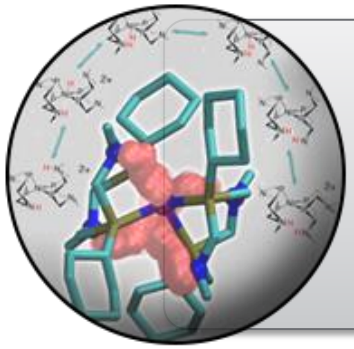

CHEMICAL CONVERSIONS FOR SUSTAINABLE ENERGY

Johannes Lercher, *Leader*
Doug Ray, *Steward*

CHEMICAL IMAGING OF DYNAMIC SYSTEMS

Lou Terminello, *Leader*
Allison Campbell, *Steward*

DISRUPTION OF ILLICIT NUCLEAR TRAFFICKING

Randy Hansen, *Leader*
Tony Peurrung, *Steward*

EFFICIENT AND SECURE POWER GRID

Carl Imhoff, *Leader*
Jud Virden, *Steward*

ENHANCE STAFF PRODUCTIVITY AND THE RESEARCH EXPERIENCE

Rich Davies, *Leader*
Marty Conger, *Steward*

PNNL's Electric Infrastructure Research Agenda

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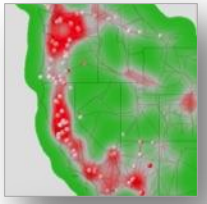

Grid Analytics - *Leveraging high-performance computing and new algorithms to provide real-time situational awareness and models for prediction and response*

Distribution Systems and Demand Response – *Making demand an active tool in managing grid efficiency and reliability.*

Transmission Reliability – *Seeing and operating the grid at the interconnection level in real-time*

Stationary Energy Storage – *Defining the location, technical performance, and required cost of storage; developing new materials and system fabrication approaches to meet requirements*

Cyber Security and Interoperability – *Developing tools and standards for secure, two-way communication and data exchange*

4

Developing new technologies bounded by cost and market drivers

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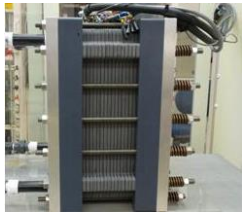
Competitive Technologies

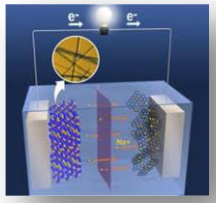
Mixed Acid VRB



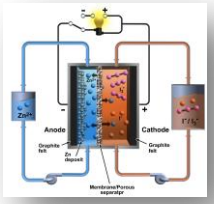
Na Metal Halide

Organic RFBs

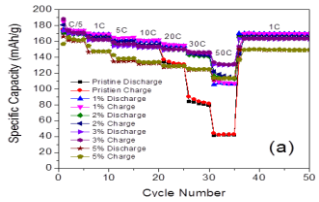
Na-ion



Zn-I RFB



Fast Response Li-ion



System Drivers

Technology

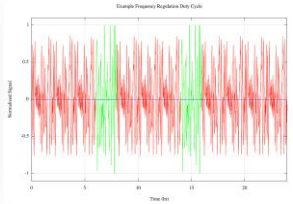
Cost Effective
Reliable
Safe

Cost Analysis

Market Acceptance

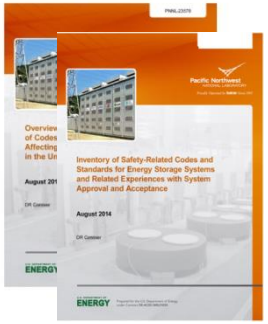
National Assessment

Performance Protocols

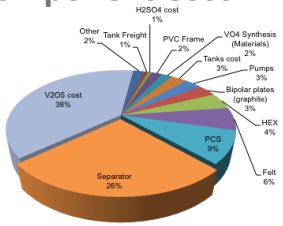


Bainbridge PSE Case

Safety Standards



Component Cost Analysis



WA CEF

Energy Storage: Federal Research Agenda

- **Cost competitive energy storage technology** - Achievement of this goal requires attention to factors such as life-cycle cost and performance (round-trip efficiency, energy density, cycle life, capacity fade, etc.) for energy storage technology as deployed.
- **Validated reliability and safety** - Validation of the safety, reliability, and performance of energy storage is essential for user confidence.
- **Equitable regulatory environment** – Value propositions for grid storage depend on reducing institutional and regulatory hurdles to levels comparable with those of other grid resources.
- **Industry acceptance** – Industry adoption requires that they have confidence storage will deploy as expected, and deliver as predicted and promised.

Grid Energy Storage, US DOE, December 2013.

http://energy.gov/sites/prod/files/2014/09/f18/Grid%20Energy%20Storage%20December%202013.pdf

What is the basis for regulatory investigation into energy storage?

Federal Energy Regulatory Commission –

To understand and possibly address "barriers to the participation of electric storage resources in the capacity, energy, and ancillary service markets in the RTOs and ISOs potentially leading to unjust and unreasonable wholesale rates"

- AD16-20, *Electric Storage Participation in Regions with Organized Wholesale Electric Markets*, April 11, 2016.
- Requests jurisdictional organized markets to respond with information regarding storage access to market participation, in particular specified eligibility, technical qualification and performance requirements, bid parameters, and charging for later use.

What regulatory outcomes could be achieved?

Washington Utilities and Transportation Commission – utilities should "account for the benefits of energy storage in their planning and procurement activities."

- UE-151069, *Modeling Energy Storage: Challenges and Opportunities for Washington Utilities*, May 2015.

Massachusetts Department of Public Utilities – among many services and benefits, **"**energy storage technologies have the potential to reduce electricity supply and distribution costs"

- D.P.U. 15-ESC-1, *Notice and Proposed Agenda for Conference on Energy Storage Resources*, June 2015.

Northwest Regulatory Workshop

Pacific Northwest Regulatory Workshop: Drivers

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US DOE and PNNL hosted Northwest utility regulatory commissioners and staff on July 22-23, 2015 at the Laboratory main campus in Richland, Washington.

DRIVERS

- Utility demonstration projects under the Washington Clean Energy Fund; and
- Unfulfilled direction from Washington Utilities and Transportation Commission (UTC) for utilities to improve energy storage analysis in integrated resource planning.

ROSTER

- Washington UTC – David Danner (chair), Ann Rendahl (commissioner), Philip Jones (commissioner), Staff (Yochi Zakai, Jeremy Twitchell, Deborah Reynolds, Lauren McCloy)
- Oregon PUC – Susan Ackerman (chair), Staff (Ruchi Sadhir, Elaine Prause)
- Idaho PUC – Paul Kjellander (chair)
- Montana PUC – Brad Johnson (chair)

Pacific Northwest Regulatory Workshop: Content

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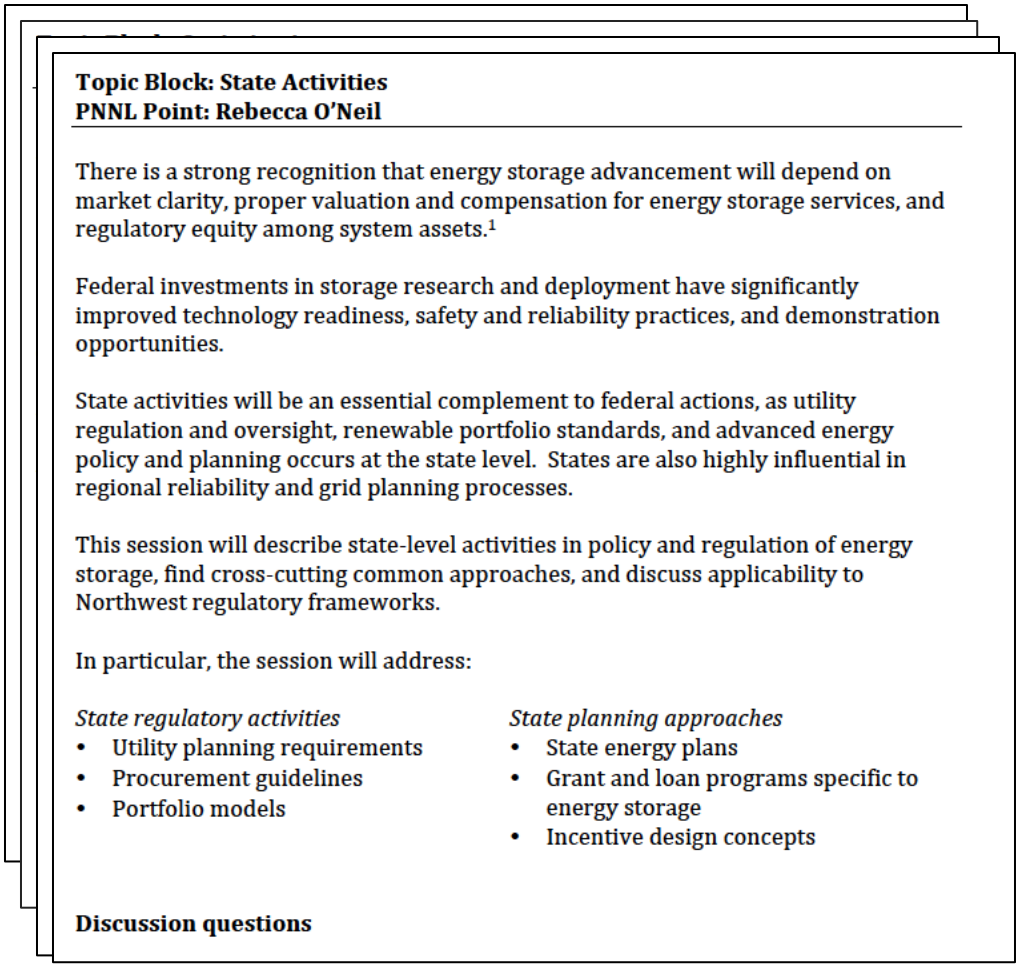
Workshop was organized into Topic Blocks with associated circulars.

Topic Block 1:
Trends in Storage Technologies

Topic Block 2:
Optimization

Topic Block 3:
FERC Policies and Market Models

Topic Block 4:
State Activities



Topic Block: State Activities
PNNL Point: Rebecca O'Neil

There is a strong recognition that energy storage advancement will depend on market clarity, proper valuation and compensation for energy storage services, and regulatory equity among system assets.[1]

Federal investments in storage research and deployment have significantly improved technology readiness, safety and reliability practices, and demonstration opportunities.

State activities will be an essential complement to federal actions, as utility regulation and oversight, renewable portfolio standards, and advanced energy policy and planning occurs at the state level. States are also highly influential in regional reliability and grid planning processes.

This session will describe state-level activities in policy and regulation of energy storage, find cross-cutting common approaches, and discuss applicability to Northwest regulatory frameworks.

In particular, the session will address:

State regulatory activities
- Utility planning requirements
- Procurement guidelines
- Portfolio models

State planning approaches
- State energy plans
- Grant and loan programs specific to energy storage
- Incentive design concepts

Discussion questions

Pacific Northwest Regulatory Workshop: Results

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Key presentations:

- How storage works: components, definitions, system type to services
- Siting and sizing systems, value stacking and optimized dispatch in the NW
- Battery chemistries: cost, performance, what we know and where we still need to conduct research

What we learned:

- *State-by-state engagement*: There is value in regional outreach, but regulatory actions are state- and market-specific.
- *New tools and methods needed:* Storage is not well-characterized in existing Commission processes.
- *Independent review:* There is a need for fair and independent arbiters of information about energy storage.

Washington

Washington State Regulatory Actions for Storage

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WASHINGTON UTC

- Washington Utility and Transportation Commission seeking better integration and evaluation of energy storage in utility integrated resource plans.
- Opened docket UE-151069. Workshop on August 25, 2015.
- Published and sought comment on Staff Paper titled *Modeling Energy Storage: Challenges and Opportunities for Washington Utilities.*
- Purposes of the docket are “even-handed modeling approach” and “level playing field” for storage.
- Outcome of the docket is a policy statement, planned for end of summer 2016.

Washington Clean Energy Fund (CEF)
Energy Storage Analytics Program Synopsis

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Objective

Provide a framework for evaluating the technical and financial benefits of energy storage, and exploring the value that energy storage can deliver to Washington utilities and the customers they serve.

Phases

Phase 1: **Data and Data Systems** → ***Phase 2:*** **Use Cases and Performance Monitoring** → ***Phase 3:*** **Evaluation**

1) Develop data requirements and data systems
2) Install energy storage systems, run use cases, and document technical performance
3) Evaluate technical and financial performance

Team

- **PNNL:** Brings expertise in energy/economics/environment system analysis and modeling
- **PSE, SnoPUD, and Avista:** Bring deep operational experience and utility data / test sites
- **Washington Department of Commerce**: Program management

Washington State Clean Energy Fund Energy Storage Projects

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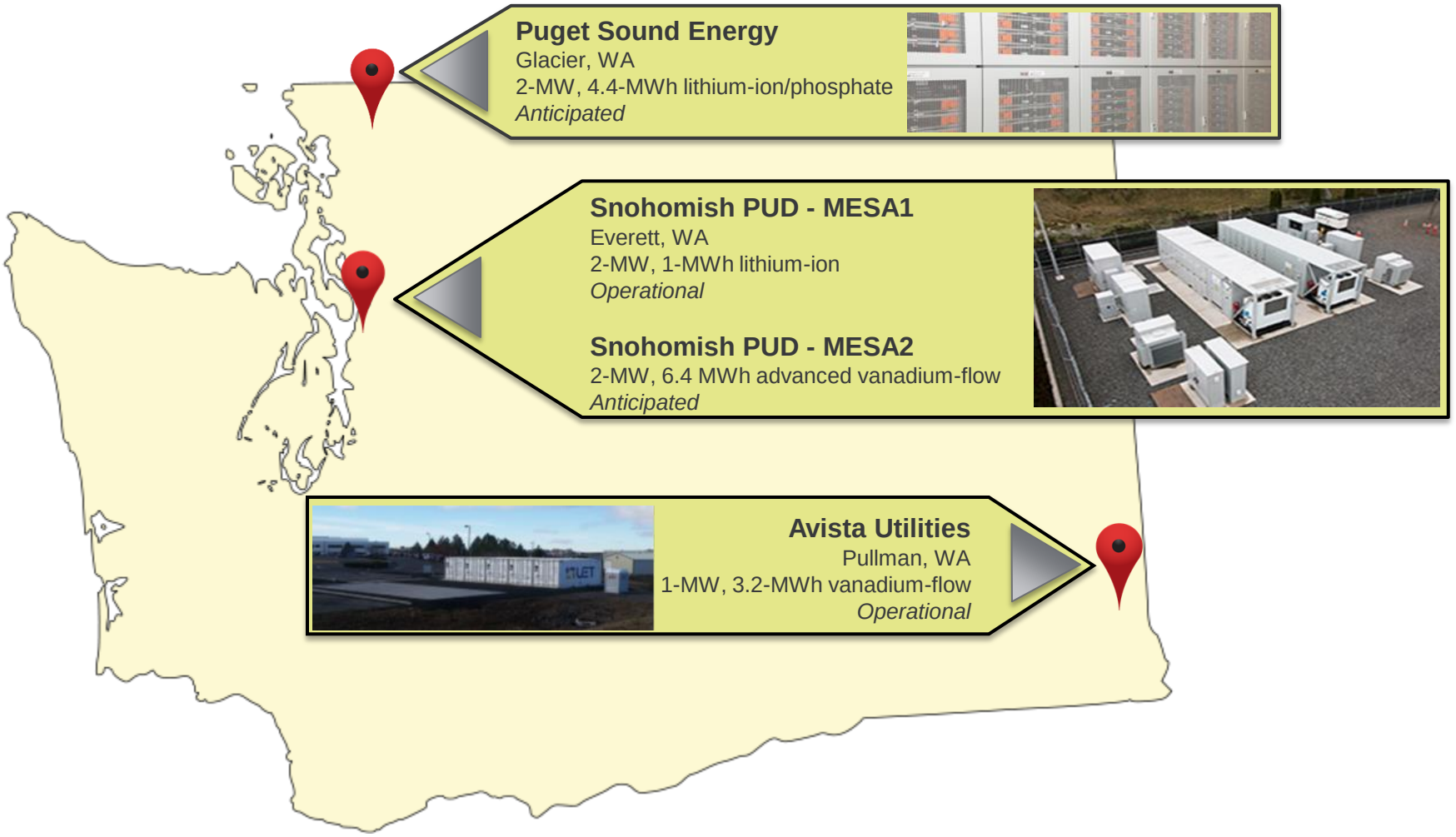

Oregon

Oregon State
Regulatory Actions for Storage

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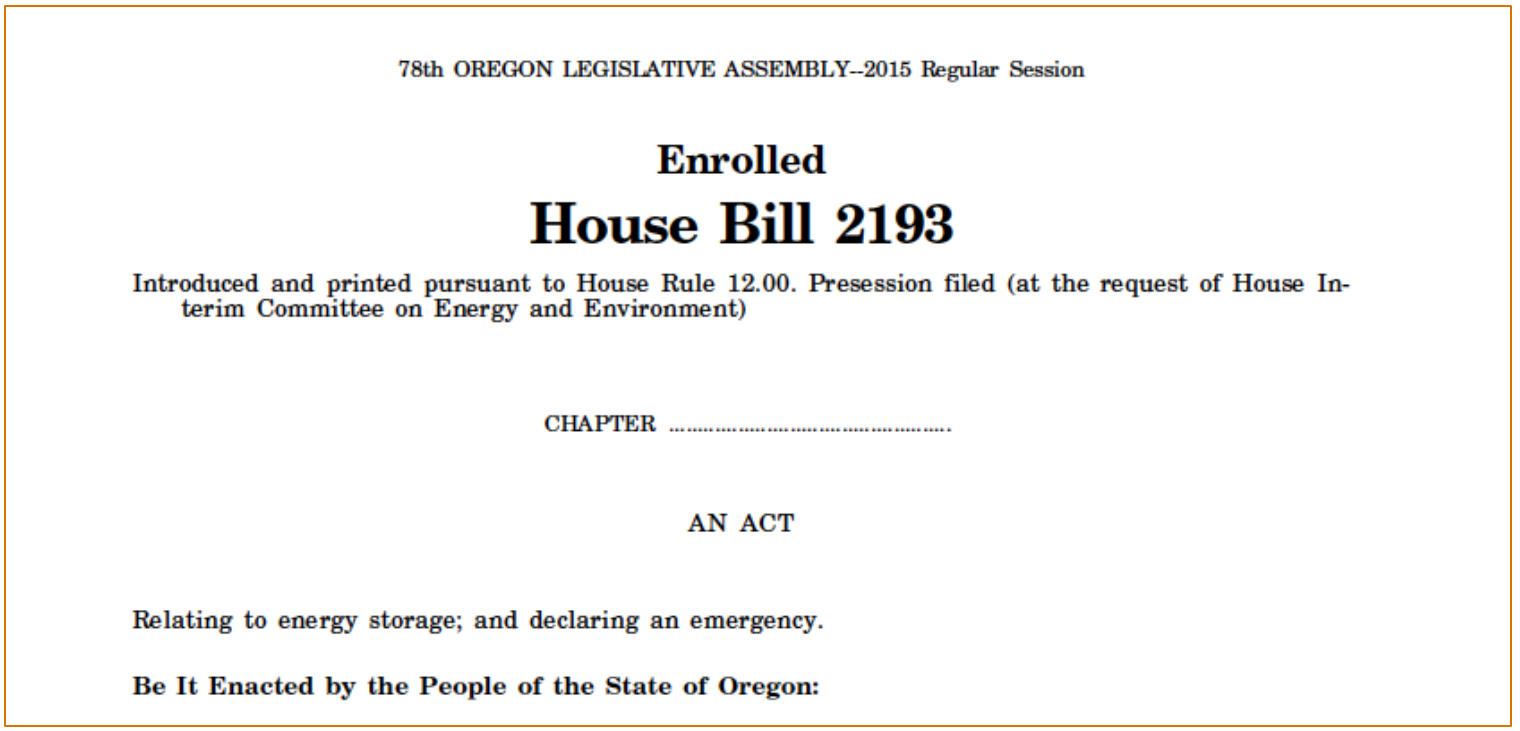
- Oregon legislature passed HB 2193 in 2015 session
- Directs Oregon PUC to create procurement guidelines for storage by 2017 and for jurisdictional utilities to propose projects that meet those guidelines.
- Capacity/energy terminology in law: projects should have “the capacity to store at least five megawatt-hours of energy” but constitute no greater than 1 percent of peak load (38 MW PGE; 26 MW PacifiCorp)



78th OREGON LEGISLATIVE ASSEMBLY--2015 Regular Session

Enrolled

House Bill 2193

Introduced and printed pursuant to House Rule 12.00. Presession filed (at the request of House Interim Committee on Energy and Environment)

CHAPTER .....

AN ACT

Relating to energy storage; and declaring an emergency.

Be It Enacted by the People of the State of Oregon:

Oregon State
Regulatory Actions for Storage

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Recap of HB 2193, UM 1751

Phase 1	Phase 2	Phase 3
PUC adopts guidelines <u>by 1/1/17</u> for proposals submitted in Phase 2 • Rule or Order, PUC staff prefer Order • Docket UM 1751 • Workshops started January 2016	Utilities submit one or more ES project proposals to the commission <u>by 1/1/18</u> • Data to identify potential system locations • Complements other planning efforts • Project details and cost-effectiveness evaluation • Treatment of confidential information	Commission may authorize projects • Capacity up to 1% peak 2014 load • Consistency with guidelines • Reasonable and in the public interest • May have above market cost
2016	2017	By 2020

Oregon State
Energy Storage Projects

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Regulatory Engagement Portfolio

Regulatory Engagement Agenda This Year

Analysis of resource planning applicability to energy storage

- Problem Statement: Traditional resource planning approaches do not provide visibility into energy storage system benefits. Resource plans evaluate the costs and risks of various resource portfolios in meeting forecasted load profiles with planning margins. The purpose of resource planning is primarily adequacy, with some accounting for flexibility.
  - Common practice for utilities to evaluate energy storage in resource planning on par with generating resources given an assigned cost rate ($/MW) with system portfolios generated at hourly intervals.
  - Resource plans are not designed to look at benefits that accrue to the transmission or distribution system; models are not intended to review sub-hourly services.
  - PacifiCorp: “Modeling tools that capture [all energy storage system] value streams are needed to evaluate potential incremental benefits (beyond what the traditional IRP models are capable of simulating).” Presentation at UM 1751 Oregon PUC Docket, February 29, 2016.

- Objective and Outcome: a report that provides state Commission staff with perspective on how well traditional resource planning tools evaluate energy storage opportunities and describes alternative methods to revealing energy storage system benefits within utility regulatory frameworks. If not IRPs, then how?

Regulatory Engagement Agenda This Year

Incentive design

- Problem Statement: Traditional energy efficiency and renewable energy programs provide incentives on energy saved or generated. This architecture does not fit a storage system, which provides frequency regulation or benefits through absorption of energy.
  - Currently federal incentives are only available for storage to the extent that the system is associated with and stores solar energy from a solar energy system. The IRS recently invited comment on these practices by February 2016 (Notice 2015-70).
  - Federal proposals such as the federal STORAGE Act (introduced 2011 and 2013) would offer investment tax credits for storage; Hawaii's SB 2738 would offer a 25% tax credit for behind-the-meter residential and commercial energy storage systems.

- Objective and Outcome: a report evaluating the suitability of existing incentive mechanisms to energy storage development for maximum impact, considering cost drivers for technology deployment including upstream supply chain and manufacturing limitations; and that provides policymakers with perspective on including energy storage as an eligible resource for incentive programs

Thank you!

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