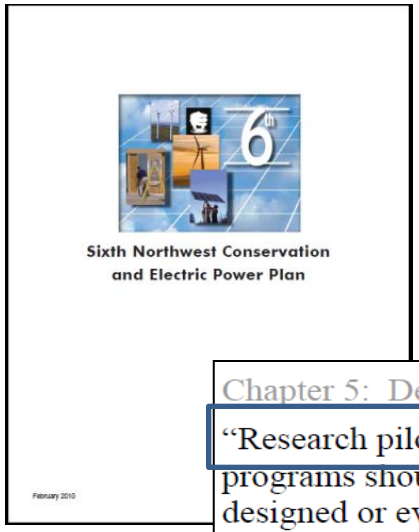
BPA Demand Response Program Overview

PNDRP February 25, 2015

Agenda

- A Look Back – the BPA Program: 2009 -2015
- Agency Drivers
- Demand Response Demonstration Portfolio
  - City of Port Angeles/NPIUSA Demonstration
  - Energy Northwest Aggregation Demonstration
  - Commercial Aggregation Demonstration
- Demand Response Management Systems
- Next Round of DR Pilots: DR Technology Roadmap
- Q & A

2010 Sixth Power Plan: Guidance for DR
This was an Important Driver for the new round of BPA R&D



Chapter 5: Demand Response — Sixth Power Plan

"Research pilot programs" should explore areas that have not been tried before. These pilot programs should be regarded as programs to buy essential information. They should not be designed or evaluated based on how cost-effective each pilot is on a stand-alone basis, but rather based on how much the information gained from each pilot will contribute to a long run demand-response strategy that is cost-effective overall. Ideally regional utilities and regulators will coordinate these research pilots to avoid duplication of effort. Regulators should allow cost recovery of pilots that contribute to such a strategy.

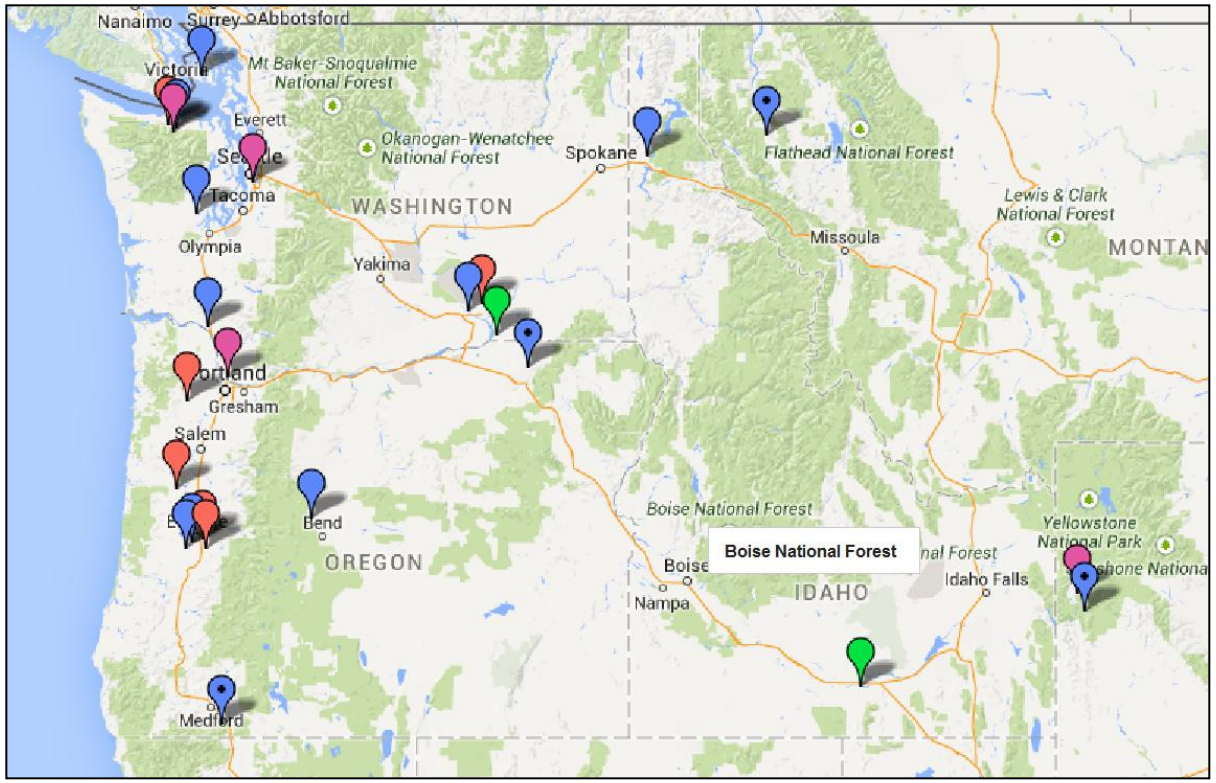
The region should also pursue "development and demonstration pilot programs" that are designed to test acquisition strategies and customers' reactions to demand-response programs that have been proven elsewhere. These pilots will allow the region to move to full-scale acquisition of some elements of demand response while the research pilots expand the potential by adding new elements. The development and demonstration pilots should be designed and evaluated with cost-effectiveness in mind, but with the recognition that the product of these pilots includes experience that can make the acquisition program more cost-effective.

Draft 6th Power Plan released in 2009…

In 2009 BPA Started Four Years of Pilots with Utility Partners

FAQ

- Pilots with **> 20 utilities**
- Tests in residential, public, commercial , industrial, and agriculture sectors.
- Technologies include **10 asset types**, e.g. 1000+ water heater controllers, HVAC controls, water pumping, thermal storage and building mgt. systems.
- Tests include not only peak shaving but innovative "**DR 2.0**" testing of new uses:
  - Load up (DECs)
  - Balancing Service
  - Load Shifting
- Many of these utilities have turned out to be **first movers** in DR demonstrations.



What is Driving the Increased Focus on Demand Response?

- **Wind Integration and Potential Increased PV**
- **Supply Constraints (Generation Capacity)**
- **Transmission Challenges**
- **Economic Benefits for Local Utilities**
  - Rate design with **demand charge** creates incentives for BPA load following customer utilities to invest in DR. DR may also help reduce the need for distribution investments.

State of the FCRPS & FCRTS

- BPA's generation and transmission systems have provided tremendous value to the region for a long time. However, both have started to approach their physical limits.
  - **Wind integration** – While most of the wind built in the northwest is sold outside of the region, BPA currently supplies within-hour balancing reserves for generation leaving its balancing authority (BA).
  - **FCRPS** – Providing balancing reserves requires taking advantage of the flexibility of the hydro system. However, due to an aging infrastructure and statutory constraints (e.g., enhanced Bi-op, Canadian Treaty, navigation, flood control, recreation, etc.), less hydro flexibility is available for this purpose.
  - **Transmission Service needs** – Due primarily to shifting loads, wind development, and load growth, the transmission system has become constrained during certain hours in a few specific locations.

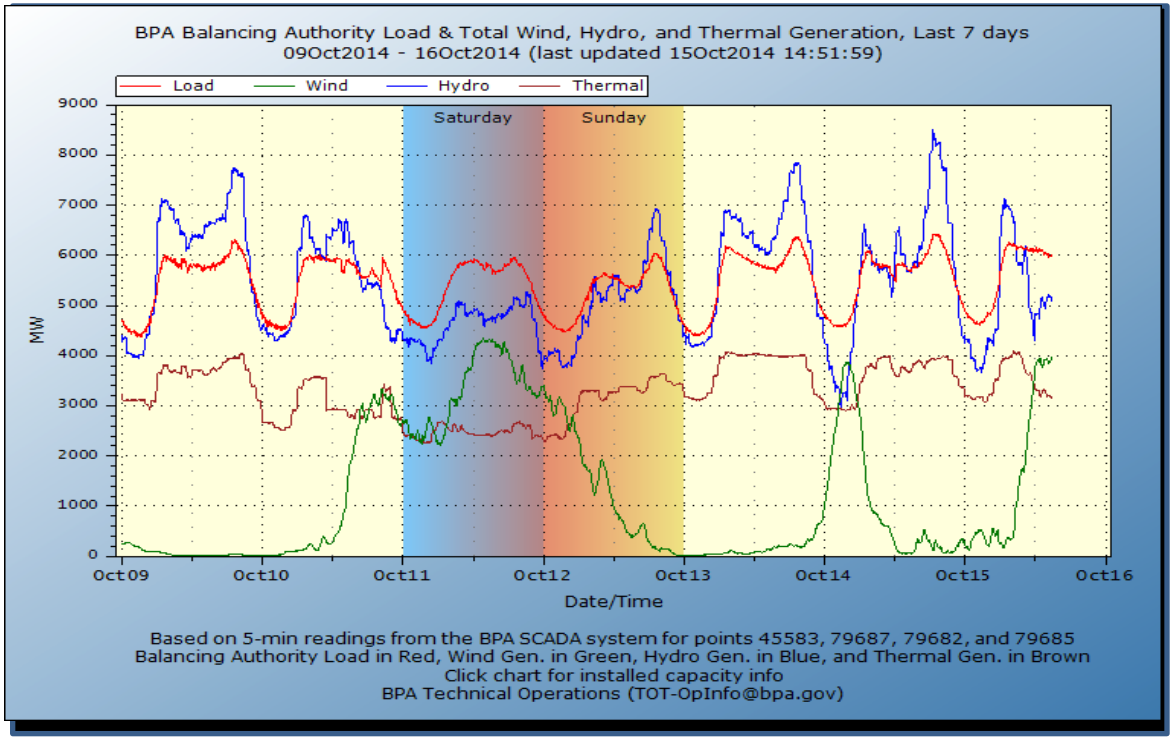
- DR can contribute to meeting these needs providing valued flexibility -

Wind Integration

BPA faces significant balancing reserve demands

- Actual wind generation can approach 50 percent of our load. There is currently 4782MW of installed wind capacity in the BPA BA.
- Wind variability (e.g. unexpected within hour ramps) increases the need for balancing capability.

Wind Variability: October 9 - 16, 2014



Update: FY16-17 Balancing Reserves Settlement

- Up to 500 MW of non-federal reserves needs in Spring
- Quarterly need for imbalance capacity is now 10 MW

Supply Constraints

BPA is soon running out of generation capacity…

and is at the limits of balancing reserves, but must ensure sufficient margin to meet multiple use requirements, including fish needs, increasing DR opportunities.

River Management: Types of Hydro Operations for Fish

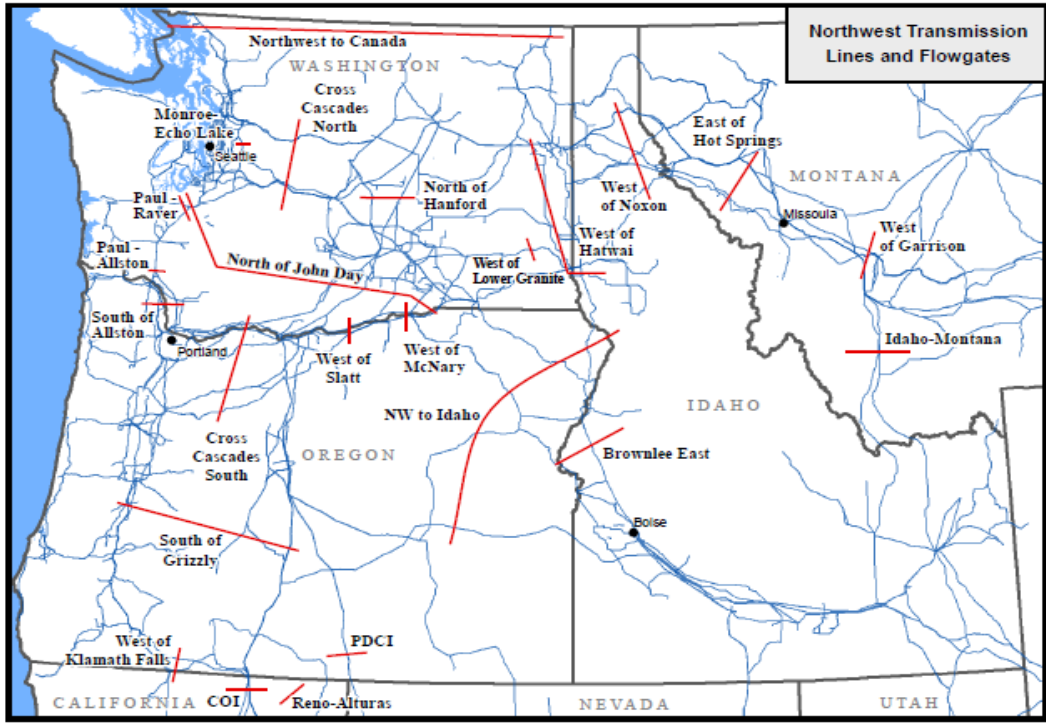
- **Minimum Flow Requirements:** Maintain flows during spawning and incubation periods to reduce risk of dewatering salmon spawning grounds and eggs (redds).
- **Flow Targets / Flow Augmentation:** Increase spring and summer river flows to enhance conditions for juvenile salmon and steelhead outmigrants.
- **Spill:** Provides a high-survival, non-turbine, and non-mechanical passage route for downstream migrants.
- **Storage Reservoir Elevation Constraints:** Ensure that water is available to help meet flow targets and provide flow augmentation.
- **Run-of-River Reservoir Elevation Constraints:** Lower pool elevation potentially increases the water velocity and fish migration speed through the lower mainstem reservoirs.
- **Turbine Efficiency Constraints:** During spring/summer outmigration period, turbines are operated within 1% of peak efficiency to minimize adverse conditions for fish passing through the turbines.

- DR can contribute to meeting these requirements and mitigating these constraints -

Transmission Challenges

BPA has more than 15,000 miles of high voltage transmission lines; DR may play in role in:

- **Congestion management** (at 18 flowgates and at other locations) for flowgates in times of stress,
- Being a **"Non-wires"** measure in areas where new transmission investment is proposed, and
- DR can help with **outage management**



In 2013, BPA Began Larger Scale DR Demonstrations, While Continuing Pilots through Technology Innovation

First prong: ***DR Advanced Demonstrations***

- Larger-scale DR projects to prove availability and reliability.
- A portfolio of 80-100MW of DR

1. City of Port Angeles
2. Energy Northwest Aggregation
3. Commercial Aggregation

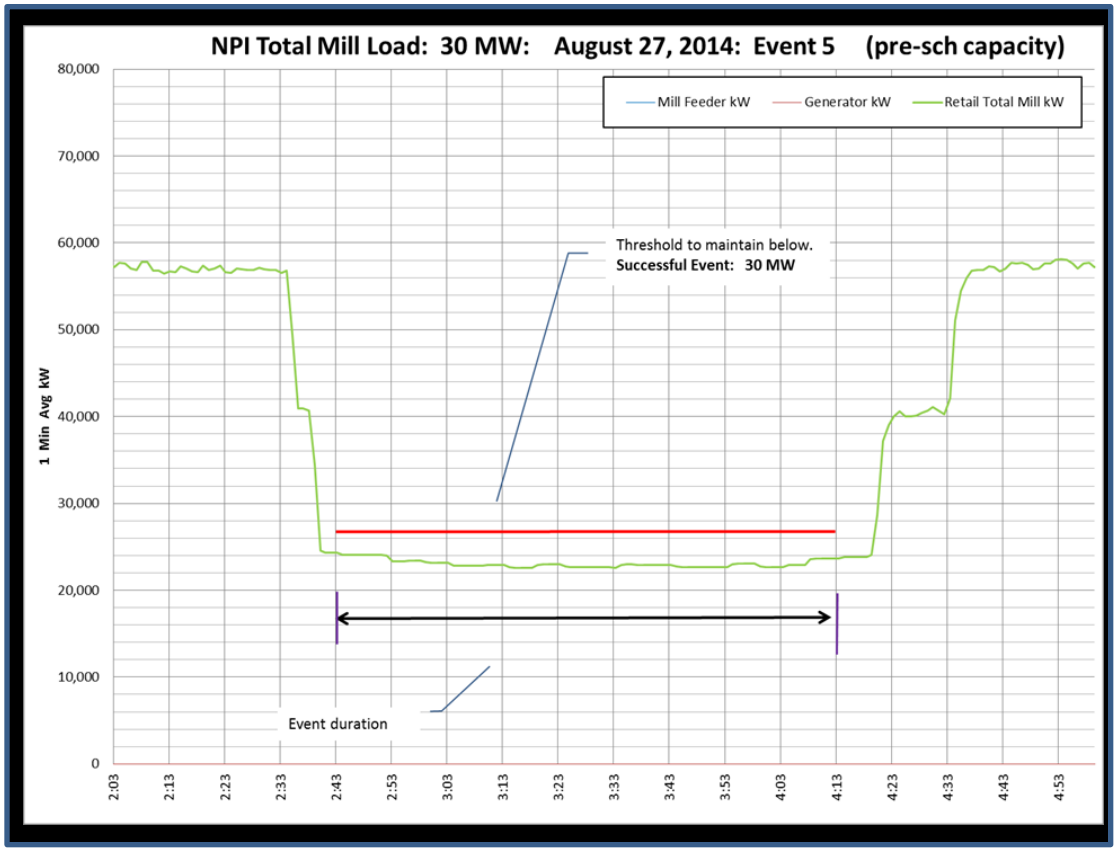
Second prong: ***Technology Pilots***

- Proof of concept research and development projects as part of BPA's ***Technology Innovation*** program

City of Port Angeles / Nippon Paper: First BPA Advanced DR Demonstration (Completed)

Summary

- Up to 30 MW
- 10 Minute advance notice INC (load reduction) for balancing product
- Event requests made through phone
- Events: Feb – Sept 2014



Learnings

- Industrial facilities will have downtime; need for communications around outages
- How to coordinate events across BPA operations
- Model Contract between BPA and the City

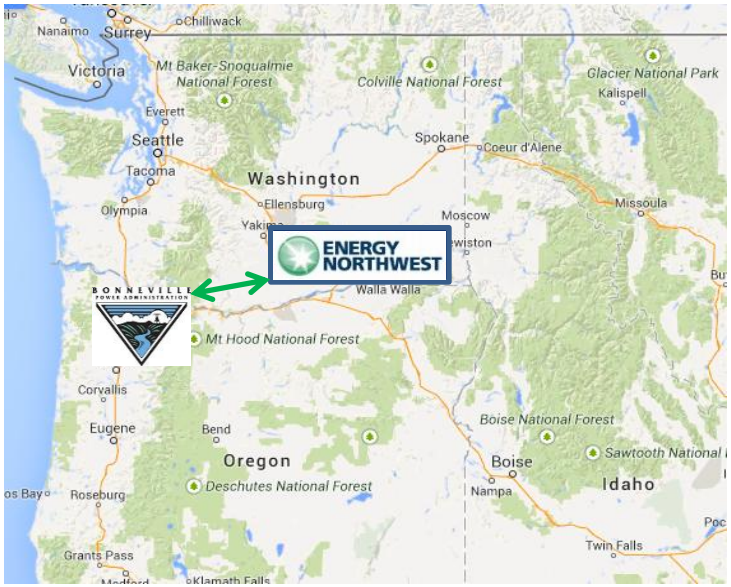
Energy Northwest Demonstration: Serving as a Demand Response Aggregator

Overview

- July 2013 - Energy Northwest responds to BPA call for public utility DR Demonstration proposals
- Product to be tested: within hour balancing capacity
- Demonstration went live Feb 9, 2015

Approach

1. New **non-commercial aggregation** approach: Public Aggregation for Public Loads
2. BPA's first **"system" to "system" test** of dispatching load from BPA through Aggregator to end-loads using Open ADR 2.0
3. **Asset types:** Tests not only load reduction, but battery storage and dispatchable voltage regulation

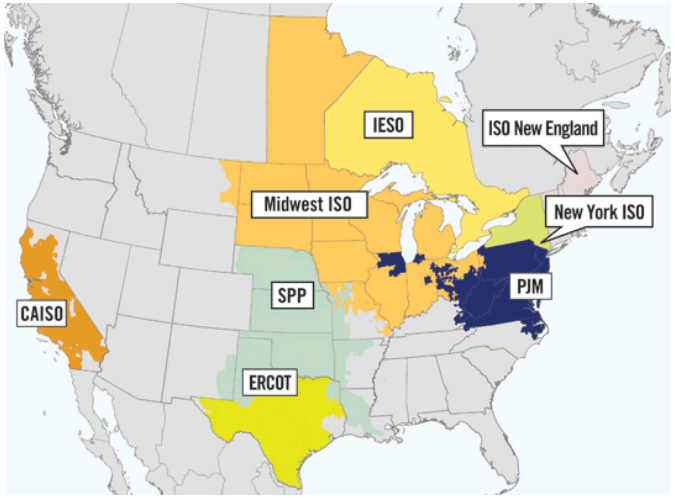


More details in EN presentation….

Commercial Aggregation Demonstration: Selection Made in July 2014; Utility Recruitment has Begun

Overview

- Test predominant model in the United States, Canada, Europe and Australia
- Review Commercial aggregators ability to bring specialized expertise – financing, recruitment, communications, metering and expertise not available to many utilities.
- BPA released RFP in May 2014; EnerNOC selected in July.



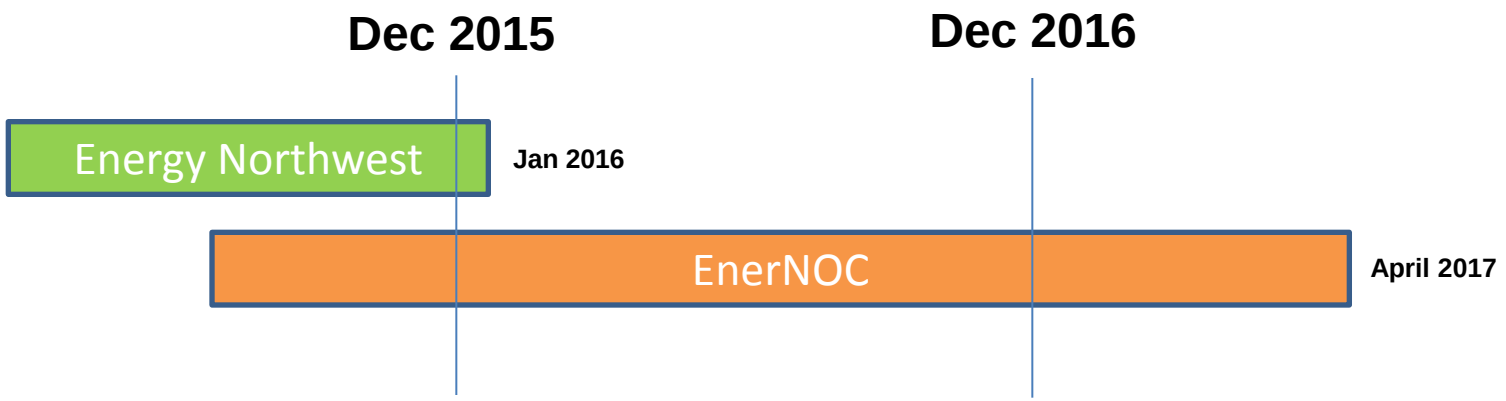
Approach

- Test set of new products for BPA
  - Peak Capacity (Winter – Cold snap)
  - Transmission Contingency (Summer – North/South flows for South of Allston substation)
- EnerNOC working closely with BPA customer utilities to introduce program and identify loads.

ENERNOC

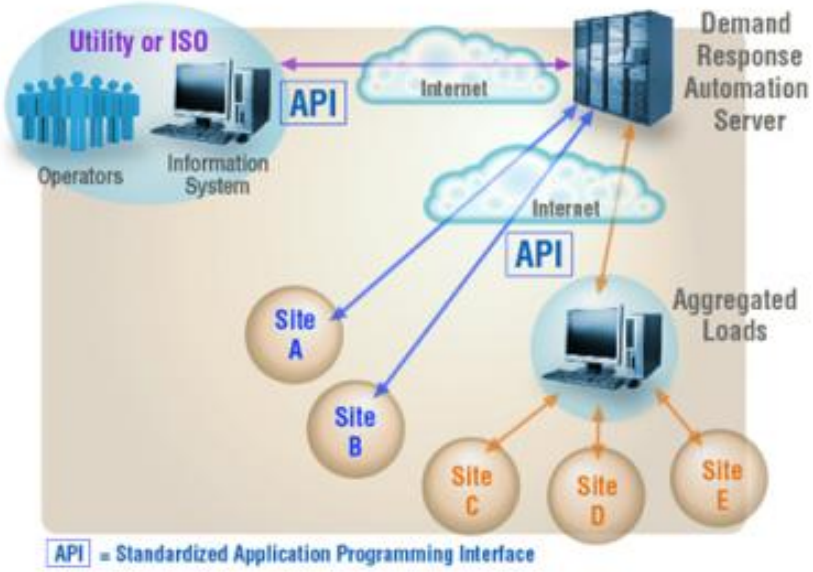
Aggregator Demonstration Summary

	Energy Northwest	EnerNOC
Aggregator Type	Public entity	Private company
BPA Need Being Tested	Within-hour Balancing (max 90 minute duration, 10 minute ramping)	1) Winter peak shaving 2) Transmission Relief for the South of Allston Substation
Eligible utilities	All BPA firm (Requirements) power customers	BPA balancing area with a preference for a specific set of utilities south of Cowlitz County, WA.



BPA Will Use a Demand Response Management System to Support the Demonstrations

A Demand Response Management System (DRMS) is software that lives on a server or in the cloud and communicates with multiple demand response sites or programs via internet or cellular. This software enables users to connect and manage multiple DR loads served by utilities, direct service loads, and/or aggregators .



Open Automated Demand Response (**OpenADR**) provides a non-proprietary, open standardized DR interface that allows electricity providers to communicate DR signals directly to existing customers using a common language and existing communications such as the Internet.

Technology Approach: Demand Response Management System

AutoGrid Demand Response Optimization Management System selected by BPA in June 2014.

AutoGrid

Approach

- Worked across the organization to define system requirements.
- Close collaboration with partners, Energy Northwest and RAI.
- Robust testing plans for User Interface and system integration points.

Successful go live on 2/9/2015

Lessons Learned

- OpenADR : Flexibility = Implementation Interpretation
  - Can't assume plug and play
- Requires collaboration and partnerships
- Involve end users from the beginning
  - Real time user feedback helped to define the dashboard to meet their needs.

BPA Autogrid System: In Action

Dashboard » Create Event from Available Event

Confirmation - 10min_24x7_DLC

Event Summary

Event Date: 02/20/2015

Start Time: 11:18

End Time: 12:48

Event Duration: 90 minutes

Event Notifications

Notification Date: 02/20/2015

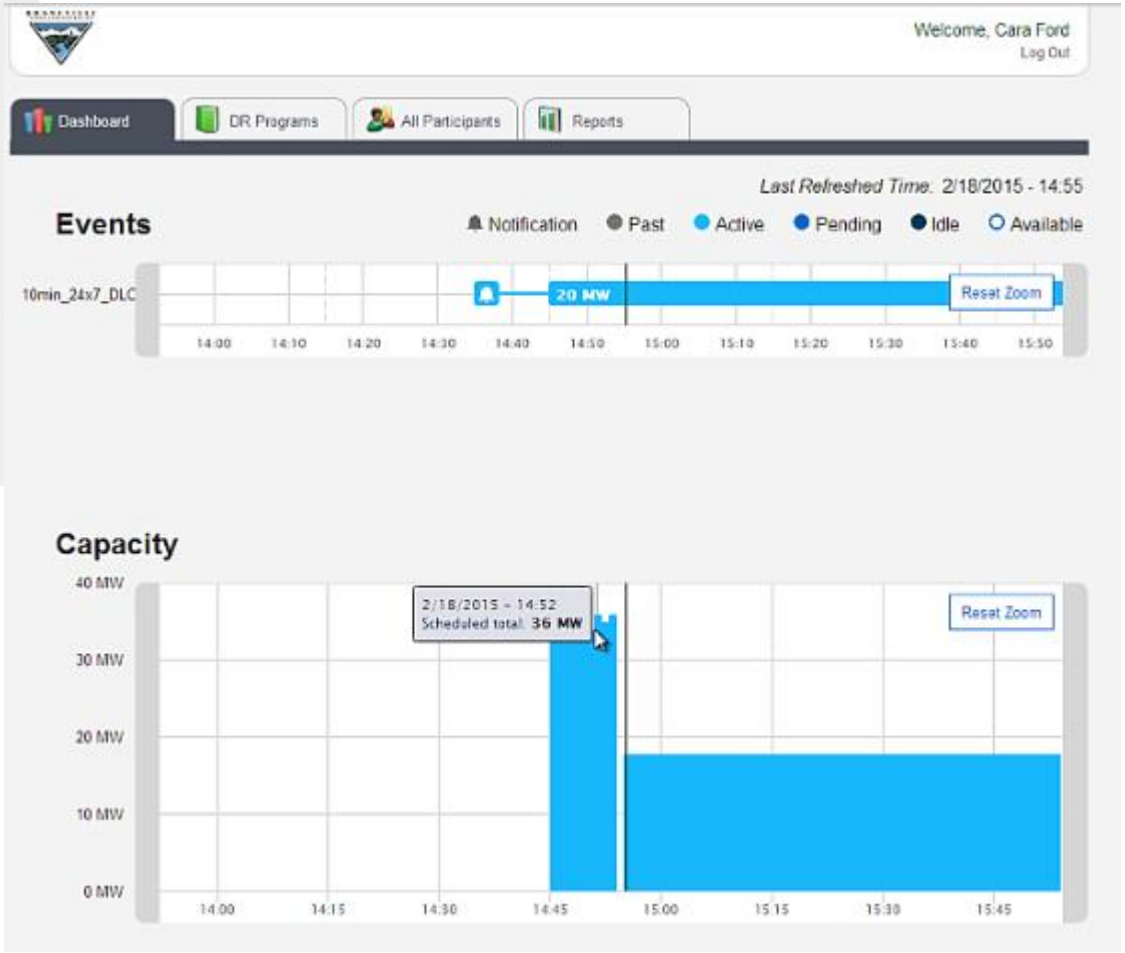
Notification Time: 11:08

Event Reason: **Internal Testing**

Event Details

Group(s): **All Enrolled**

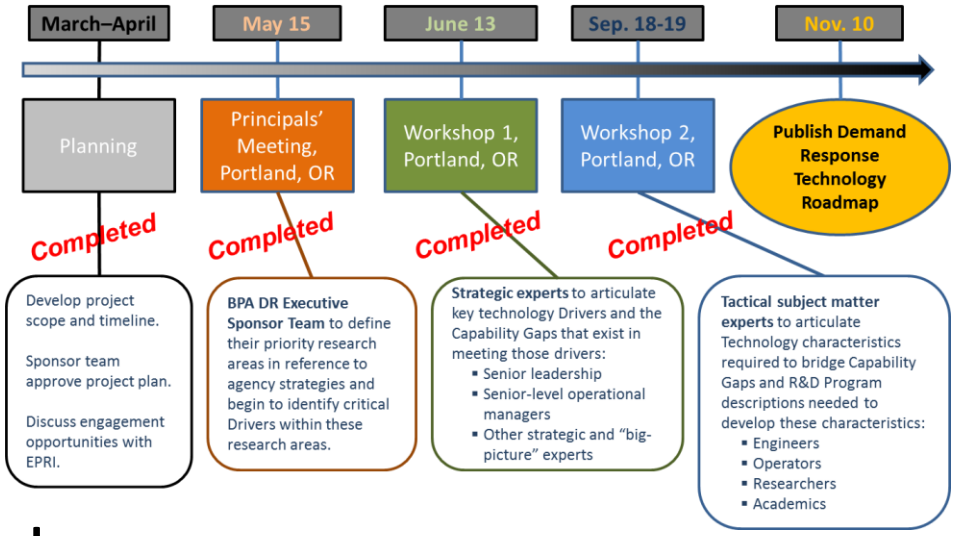
Number of Participants: 1



What's Ahead: Areas for the Next Round of DR R & D Pilots Defined by Local & National Experts

Focus Areas

- DR in Transmission & Generation Load Planning
- DR in Generation Capacity Planning
- DR in Grid Operations
- Integration of DR and EE



Solicitation Announcement in March

2014 Roadmapping

What's Ahead

- BPA will execute demonstrations….and potentially move **reliable, cost effective measures** that meet BPA needs into BPA operations

- BPA will continue to innovate in Demand Response through its Technology Innovation process (see 2015 solicitation)

- BPA is prioritizing "Integrated Demand Side Management" as a high priority area of strategic focus for the agency.

- BPA is prioritizing benchmarking of other DR / Demand-side programs in the coming year.

Q & A

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- Resources
  - BPA Technology Innovation page: http://www.bpa.gov/TI
    - Technology Innovation contact is Sheila Adel for TI solicitation: saadel@bpa.gov
  - BPA demand response page: http://www.bpa.gov/EE/Technology/demand-response