Northwest **Power** and **Conservation** Council



April 28, 2015

**MEMORANDUM**

**TO:** **Council Members**

**FROM:** **Council Staff**

**SUBJECT:** **Bonneville Power Demand Response Program Update**

## BACKGROUND:

Presenter: John Wellschlager, Bonneville Power Administration

Summary: Representing Integrated Demand Side Management for BPA, John Wellschlager, will present on BPA's recent experience with Demand Response and Smart Grid.

Relevance: Council staff preliminary findings suggest that Demand Response acquisition may be an important piece of the narrative during the action plan time period of the plan. The presentation of BPA's past and present experience may provide context for the proposed future state

Workplan: 1.B. Develop Seventh Power Plan

Background: BPA has recent experience with joint Demand Response (DR) pilot programs (e.g. Energy Northwest), Smart Grid and using DR as a capacity product in market operations.

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# BPA Demand Response Program Overview

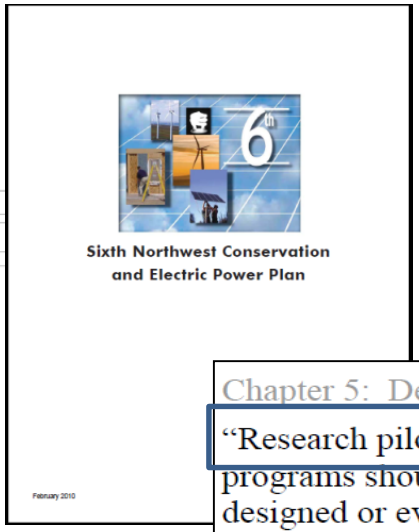
NW Power & Conservation Council
May 5, 2015

John Wellschlager & Tom Brim

# Objective today is to share where BPA's demand response program is and discuss where it is headed.

# 2010 Sixth Power Plan: Guidance for DR

## This was an Important Driver for the BPA R&D at that time




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.

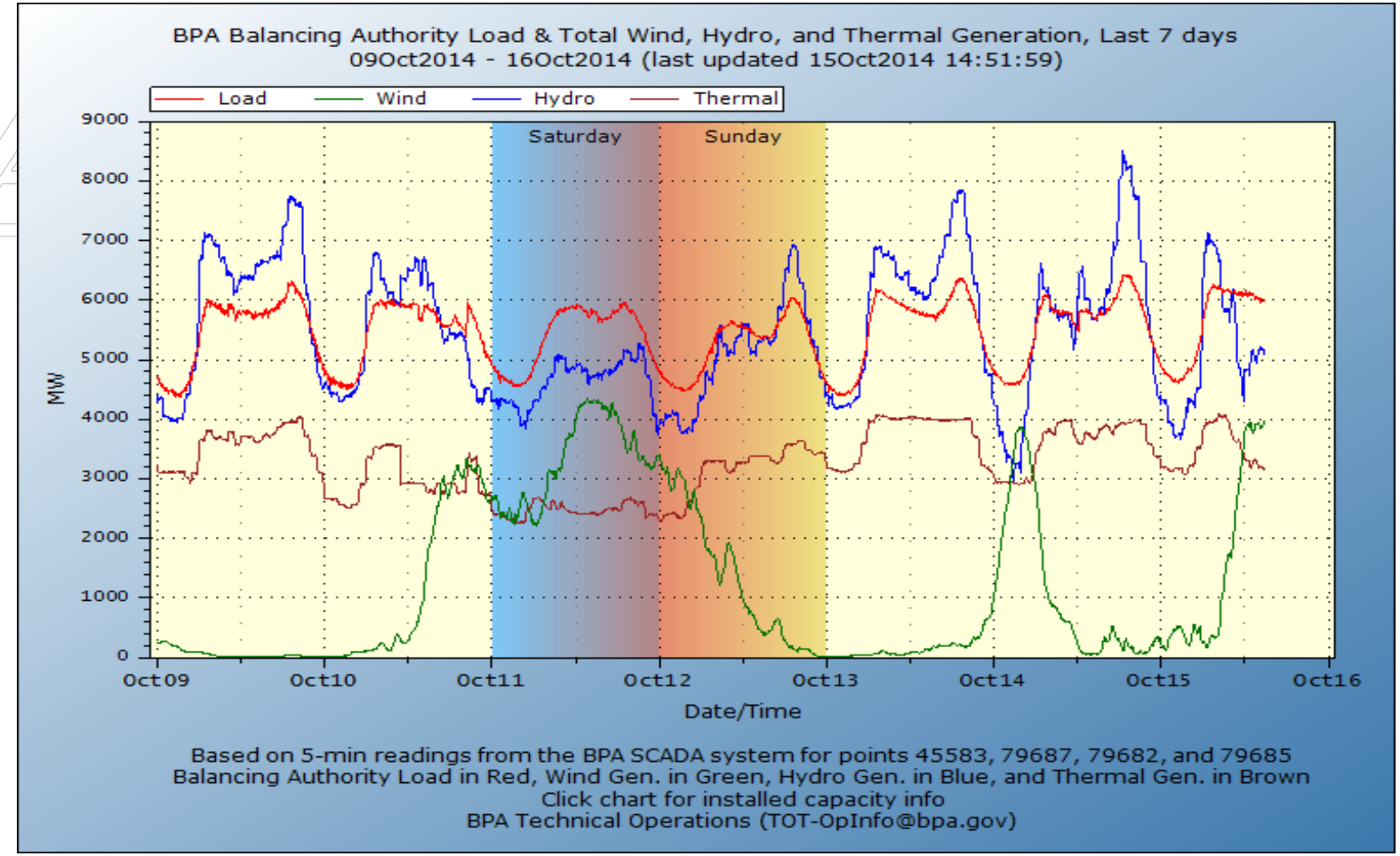
The region should also pursue "development and demonstration pilot programs" that are designed to test acquisition strategies and customers' reactions to demand-response programs that have been proven elsewhere. These pilots will allow the region to move to full-scale acquisition of some elements of 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…

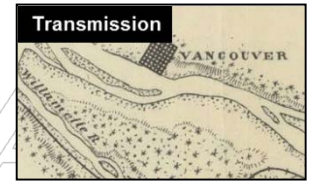
# Since 2010, Drivers for Demand Response in the Region Have Became More Pressing

- Wind Integration and Potential Increased PV
- Supply Constraints (Generation Capacity)
- Transmission Opportunities & Cost of Wires Projects
- Rate Signal to Local Utilities
  - Load following utilities becoming aware of challenge of managing demand charge portion of their bill.

# The Wind Challenge – October 14th 2014

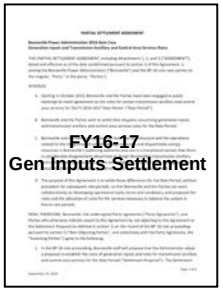


# Example of Needs at BPA That May Impact Future Acquisition of Demand Response….




## Transmission Contingency Planning

- First test with South of Allston flowgate with EnerNOC.
- Tx team lead by Sarah Arison, with Transmission planners and study engineers to review reliability and flow relief.




## Non-Federal Balancing Reserves

- In FY16 – 17 rate period, up to 500 MW of non-federal INC in Spring. Quarterly need for imbalance capacity reduced to 10 MW.
- Future rate periods are tbd.

2016 Resource Program

## Future Non-FCRPS Capacity Needs

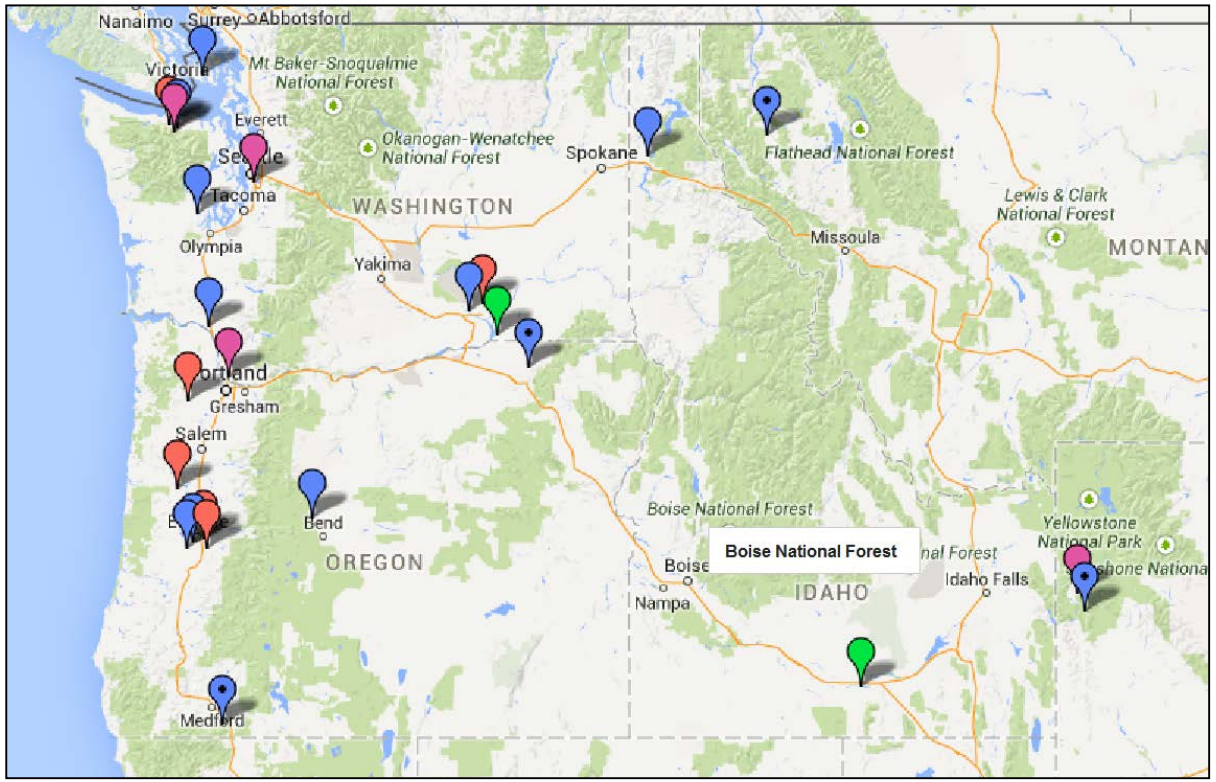
- 2019 and 2024 needs for 18 hour (extreme weather) and superpeak capacity.
- DR cost curves will be built in 2015 for those two products.

**… and other drivers may impact agency's use of DR (e.g. SCED and future constraints on hydro operations)**

# 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 included **10 asset types**, e.g. 1000+ water heater controllers, HVAC controls, water pumping, thermal storage and building mgt. systems.
- Tests included 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.



# Direction in November 2012


- **In 2012, we used ADF/ASF process to obtain a decision on continuing the DR Program**
  - 2009-2012, pilots were nearing completion
  - No DR funding for FY14 and FY15 (had not been in the IPR for those years)
- **Steve Wright decided to sustain a DR initiative but wanted scale increased and a focus on two things:**
  - First, determine if there were public utilities in the region which wanted to aggregate their loads, or aggregate across public utilities
  - Second, test the typical approach in North America for DR, private aggregation
- **And in December 2012, we acquired a program budget for FY13 -15 to enable those larger demonstrations.**

# In 2013-14 BPA Began the Larger Scale Demonstration Process

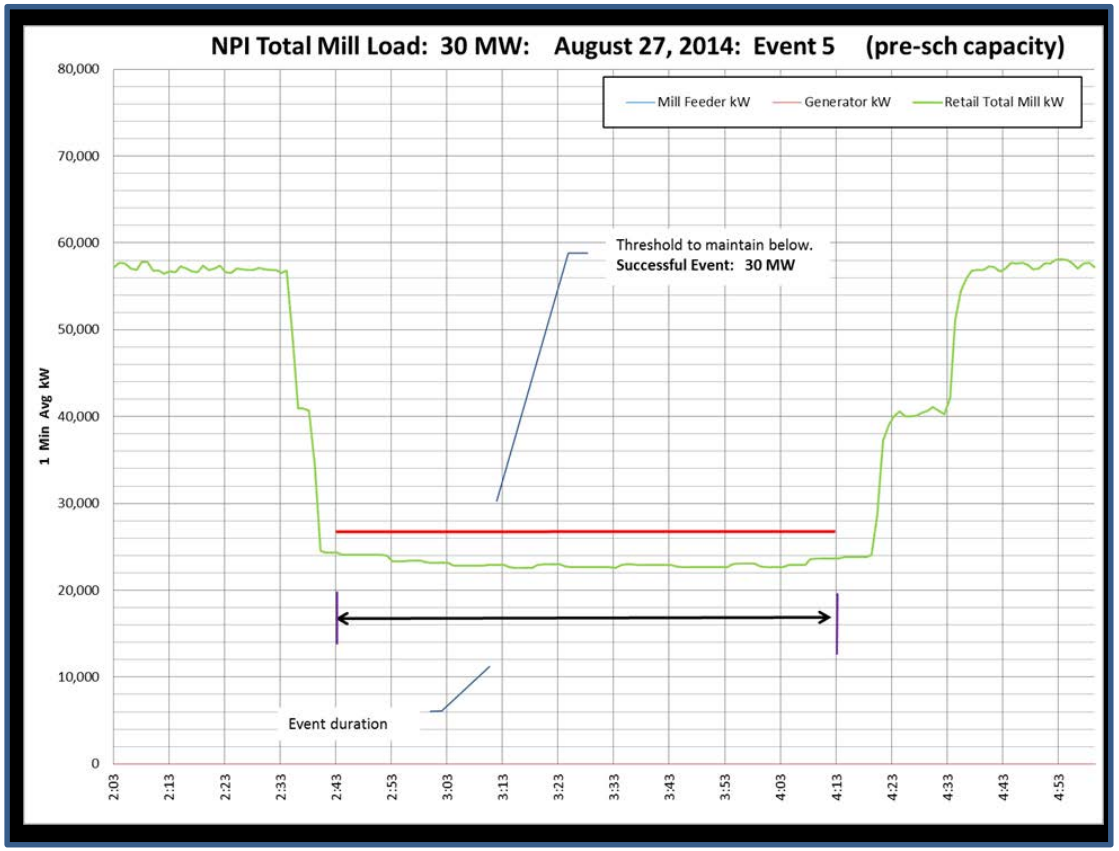
| Entity | Size | Funder | Product Tested |
|---|---|---|---|
| City of Port Angeles | 30 MW | Technology Innovation | ✓ Imbalance Capacity |
| Energy Northwest | 35 MW | Power and Transmission | ✓ Imbalance Capacity |
| EnerNOC | 13 -25 MW | Power and Transmission | ✓ Winter Peak Shave<br>✓ Summer Congestion (South of Allston) |

**Why?** Test all aspects needed to bring demand resources into BPA operations including systems and measurement, deployment, assess customer reception, test reliability, scheduling process, accounting & payment and prepare the organization for a new discipline.

# The City of Port Angeles / Nippon Paper Demonstration: Summary of Results (Completed Sept. 2014)

- **Learnings:**
  - Industrial facilities will have unpredictable downtimes; timely communications on outages is key.
  - High reliance on two refiner lines; no back-up was problematic.
  - The Nippon Paper plant performed well when existing load allowed them to do so.
- **Performance:**
  - Real-time events from Feb – July: 60% success rate.
  - Preschedule events Aug – Sept: 92% success rate.
- **Benefits:**
  - Contract structure, a settlement approach, deployment experience and BPA operations input & buy in.
  - Potential supplier for spring pre-schedule capacity.

**Preschedule Imbalance Event: 2:43 – 4:13 am**



# Energy Northwest Demonstration: Project is Contracted, Enabled, and Now Live

## Overview

- July 2013 - Energy Northwest responds to BPA call for public utility DR Demonstration proposals
- Sept 2014 – BPA / Energy Northwest Contract signed
- Feb 6, 2015 – Project declared ready for go-live

## 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.

**February 2015 Go Live Checklist:**

- ❑ EN contracts in place
- ❑ End-to-end software tested and ready
- ❑ Duty Scheduling trained
- ❑ End loads ready
- ❑ Power and Transmission aware of load scheduling procedures
- ❑ Load Measurement reporting ready (for settlement)
- ❑ End-to-end dry run successful

# Energy Northwest Demonstration: Participating Assets

| Utility | Asset | kW |
|---|---|---|
| Cowlitz PUD | NORPAC | 17,000 |
| City of Richland | DVR | 850 |
| City of Richland | Powin Battery | 30 |
| POPUD | Ponderay Newsprint | ~16,000 |

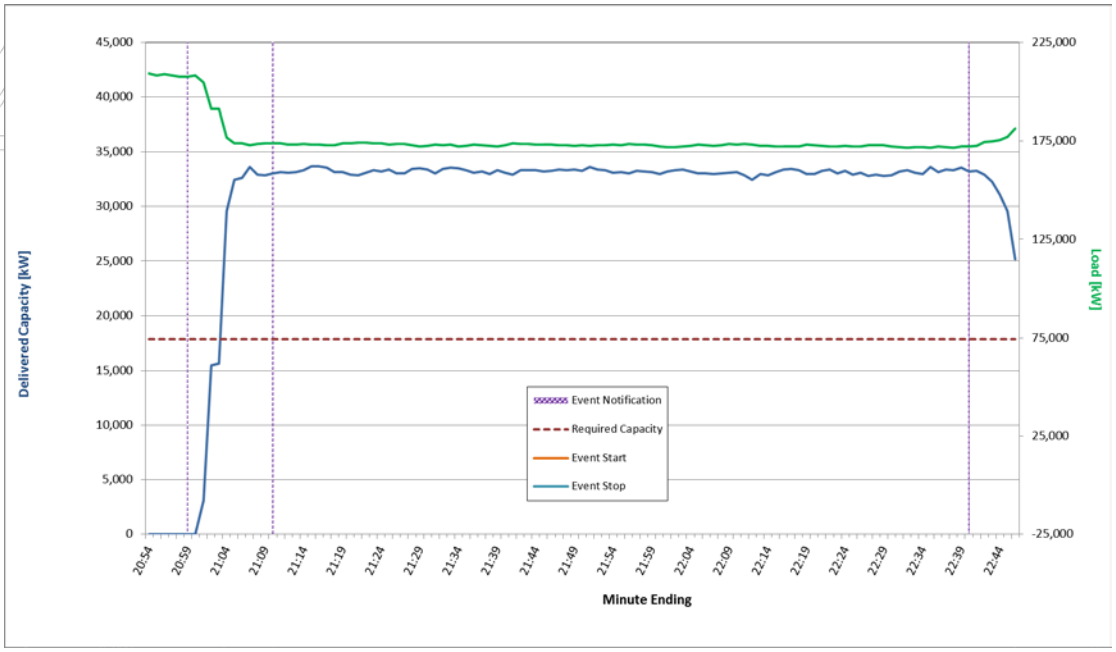

**Notes:**

1. NORPAC will fill in for Ponderay during the months when Ponderay is taking less than 16 MW from BPA, a benefit of aggregation.

2. Powin and Ponderay are direct contracts with the end-loads by Energy Northwest, with concurrence from the serving utilities.

# Energy Northwest Off to Strong Start – First 16 Events Successful

**February 9th, Event Called at 9:59 for 90 minutes**




*** Note: the hours on chart and graph are in Universal Time (UTC)**

**Ramp Profile**

| time (minute ending) | delivered capacity [kW] | load [kW] |
|---|---|---|
| 20:54 | 0 | 209,029 |
| 20:55 | 0 | 208,035 |
| 20:56 | 0 | 208,942 |
| 20:57 | 0 | 208,269 |
| 20:58 | 0 | 207,498 |
| 20:59 | 0 | 207,611 |
| 21:00 | 0 | 208,293 |
| 21:01 | 3,098 | 204,449 |
| 21:02 | 15,505 | 191,318 |
| 21:03 | 15,677 | 191,127 |
| 21:04 | 29,596 | 176,740 |
| 21:05 | 32,427 | 173,894 |
| 21:06 | 32,626 | 173,944 |
| 21:07 | 33,642 | 172,948 |
| 21:08 | 32,897 | 173,678 |
| 21:09 | 32,850 | 173,888 |

# Energy Northwest Initial Media Attention
# Forbes Magazine – February 24, 2015

"

The plan is for dozens to hundreds of these mobile lithium-ion battery energy storage systems to be spread out across the region, all acting in concert, along with the demand response customers.

Matching electricity generation to electricity demand, or load, is a constantly moving target. Organizations that provide that service at regional scales are known as "balancing authorities." As a balancing authority, the Bonneville Power Administration must dispatch generation (on or off) to meet its changing loads across Washington, Oregon, Idaho, Montana and even parts of California, Nevada, Utah and Wyoming.

So demand response could be a huge benefit to a lot of America.

Variable generation sources such as wind and solar have increased over the past 10 years, creating a greater challenge in balancing generation to load. BPA is also required to reserve generation (sometimes as much as 800 MW – more than the total output of most power plants) to deal with this variability. If instituted at a large scale, demand response could deal with that variability on its own.

In the past, BPA provided balancing services solely with capacity from its system of hydroelectric dams. But growing demands on the hydro system have limited its flexibility to provide capacity, so BPA is in need of something like demand response.

"

*Northern Pacific Paper Corporation (NORPAC) in Longview, Washington is a giant consumer of electricity. NORPAC uses huge thermal mechanical pulping refiners, shown here, that are driven by over three dozen 6,000-horsepower motors that use 150 MW to produce 1,600 tons of paper per day. But some of these refiners don't have to be running at any particular time, so can be shut down to lower demand in response from a power company request because of a demand spike elsewhere. This is the core of the Demand Response program to increase energy efficiency in the Pacific Northwest and reduce the need to build new energy plants, wind farms or pipelines. Source: Energy Northwest*

# EnerNOC Commercial Aggregation Demonstration: Contract Signed in February; Recruitment has Begun

- Overview:
  - Two Products
    - Winter Product: Peak Shaving
    - Summer Product: for Transmission (South of Allston)
    - BPA makes energy and monthly capacity payments to EnerNOC
  - Two Year Contract
  - EnerNOC pays :
    - End load an on-going fee
    - Utility a one-time payment
- Status
  - RFP released: May 2014
  - EnerNOC selected: July 2014
  - BPA/EnerNOC contract executed: 2/20/2015
  - First step is EnerNOC and utility agreement
- Go Live with Test Events
  - Targeting August 2015

**Summer load targets:**

1. City of Cascade Locks
2. **Clark Public Utilities**
3. **City of Forest Grove**
4. McMinnville Water & Light
5. Skamania County PUD
6. **Tillamook PUD**
7. West Oregon Electric Coop
8. Blachly Lane Electric Coop
9. **Consumers Power**
10. **Central Lincoln PUD**
11. Emerald PUD
12. **EWEB**
13. Hood River Electric Coop
14. Lane Electric Coop
15. City of Monmouth
16. DOE – NETL, Albany
17. Salem Electric Coop
18. Springfield Utility Board

Outlined utilities have already been contacted by BPA/EnerNOC

# Background on BPA's Selection for Commercial Demonstration Aggregator

## EnerNOC Quick Facts

- 9,000 MW of DR under management globally
- 35,000 load sites
- 54 utility customers
- Publicly traded
- Headquarters and Network Operations Center (NOC) in Boston, MA, with a second NOC in San Francisco
- Previous work with a DR pilot (4 cold storage warehouses) with BPA
- EnerNOC also serves European, Australian, and other overseas utilities

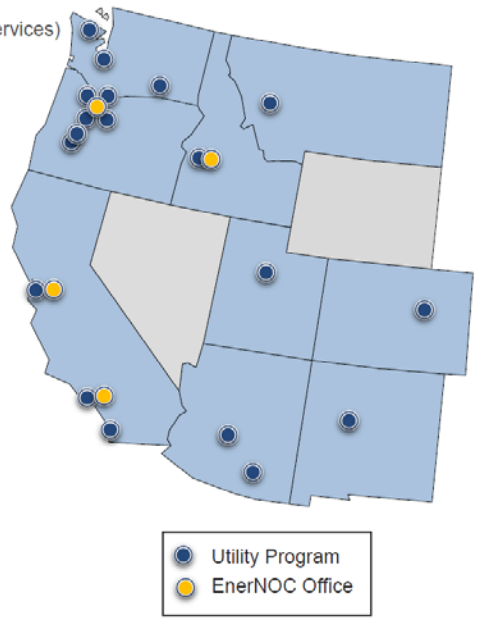
**Presence in the Western US**

**Demand Response**

- Bonneville Power – C&I DR pilots (including City of Forest Grove, Consumers Power, City of Port Angeles, EWEB, Richland Energy Services)
- Idaho Power – 300 MW irrigation DR; 35 MW C&I DR
- PacifiCorp – 185 MW irrigation DR
- PG&E – 120 MW C&I DR
- Portland General Electric – 25 MW C&I DR
- Public Service Company of New Mexico– 30 MW C&I DR
- Puget Sound Energy – C&I DR pilot
- San Diego Gas & Electric – 25 MW C&I DR
- Southern California Edison – 125 MW C&I DR
- Salt River Project – 50 MW C&I DR
- Tucson Electric Power – 40 MW C&I DR
- Xcel Energy (Colorado) – 44 MW C&I DR

**Energy Efficiency**

- Energy Trust –Technical Service Provider on EE Projects
- NEEA – Montana SEM Cohorts
- PacifiCorp – EE Engineering Services
- PG&E – Industrial EE Programs
- Southern California Edison – Industrial EE Programs



# EnerNOC Rollout Being Handled Through AE Channel with Customer Utilities

- AE's have made the initial contact between BPA and Utility, and introduced EnerNOC:
- Utilities decision to "opt in" or "opt out"
- BPA's Energy Efficiency Program which has industrial relationships is being consulted to ensure programs in sync.

**Sample initial load targets:**

- **Linde - gas separator** (Clark)
- **Georgia Pacific in Toledo** (Central Lincoln)
- **Georgia Pacific** (Consumers Power)
- **SnoTemp** (Consumers Power)
- **Tillamook Creamery** (Tillamook PUD)

# We Continue to Test new Concepts….

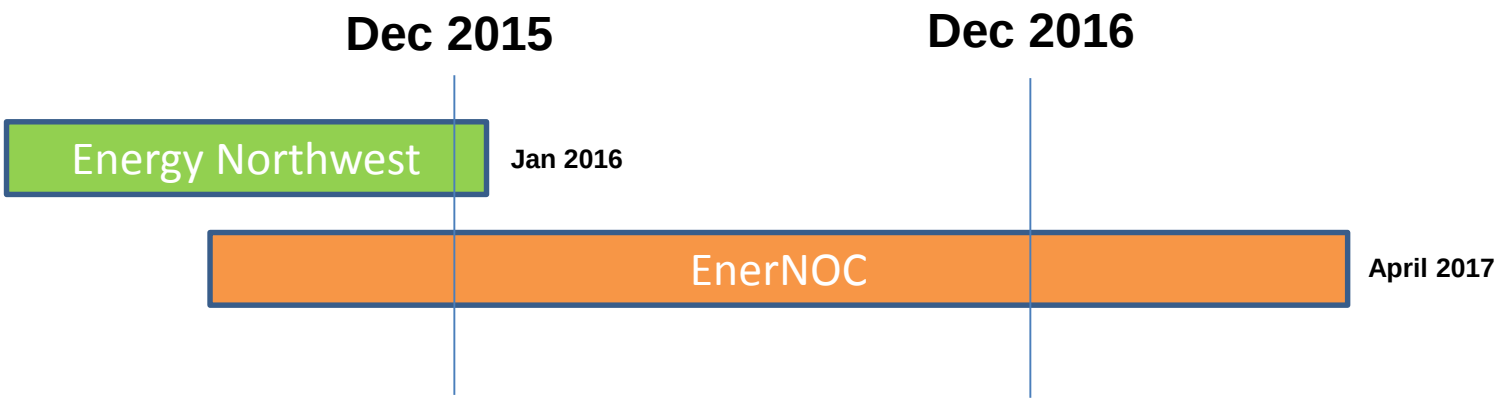
- **Using simultaneous load and generation movement to manage transmission constraints**
  - The EnerNOC contract will test the effectiveness of this approach
- **How to work with SLICE**
  - Slice represents 60% of our load; Critical for BPA to begin to understand how to construct and measure a program that works with Slice.
  - For EnerNOC, we are investigating a capacity tag approach for slice loads such as Clark or EWEB.
- **How to work with Loads outside the BPA BA**
  - Pend Oreille PUD and its Newsprint load is a pure Block customer in the Avista BA
  - Test process set up with Avista, PS Scheduling and BPA transmission involving recallable capacity tags (C-RE) to allow for a clean way to measure load movement & ensure a BPA benefit.
  - Load reductions will only be called on Ponderay Newsprint when monthly block

| Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 47 | 41 | 58 | 57 | 49 | 3 | 0 | 0 | 12 | 12 | 25 |

avialable See below.

# 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<br>2) Transmission Relief for south of the 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. |



# Technology Approach: Energy Northwest and EnerNOC will be triggered with DR Software

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

AutoGrid

**Approach**

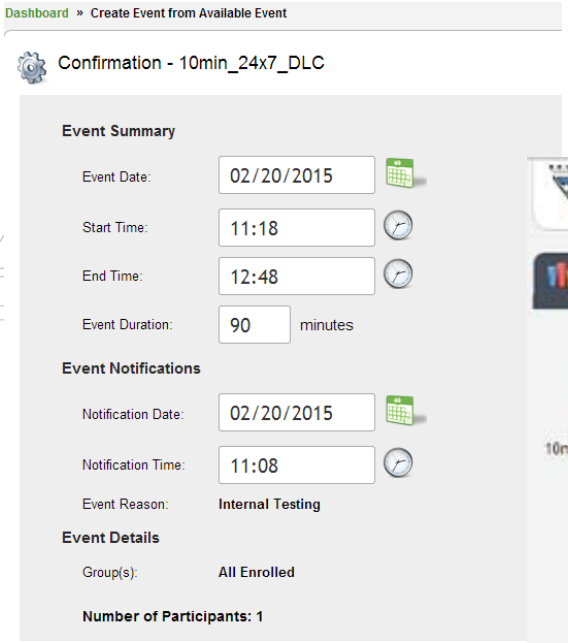
- Worked across the organization to define system requirements.
- Close collaboration with partners, Energy Northwest and RAI.
- Worked with Power and Transmission operations on demand response dispatch, planning and evaluation processes.

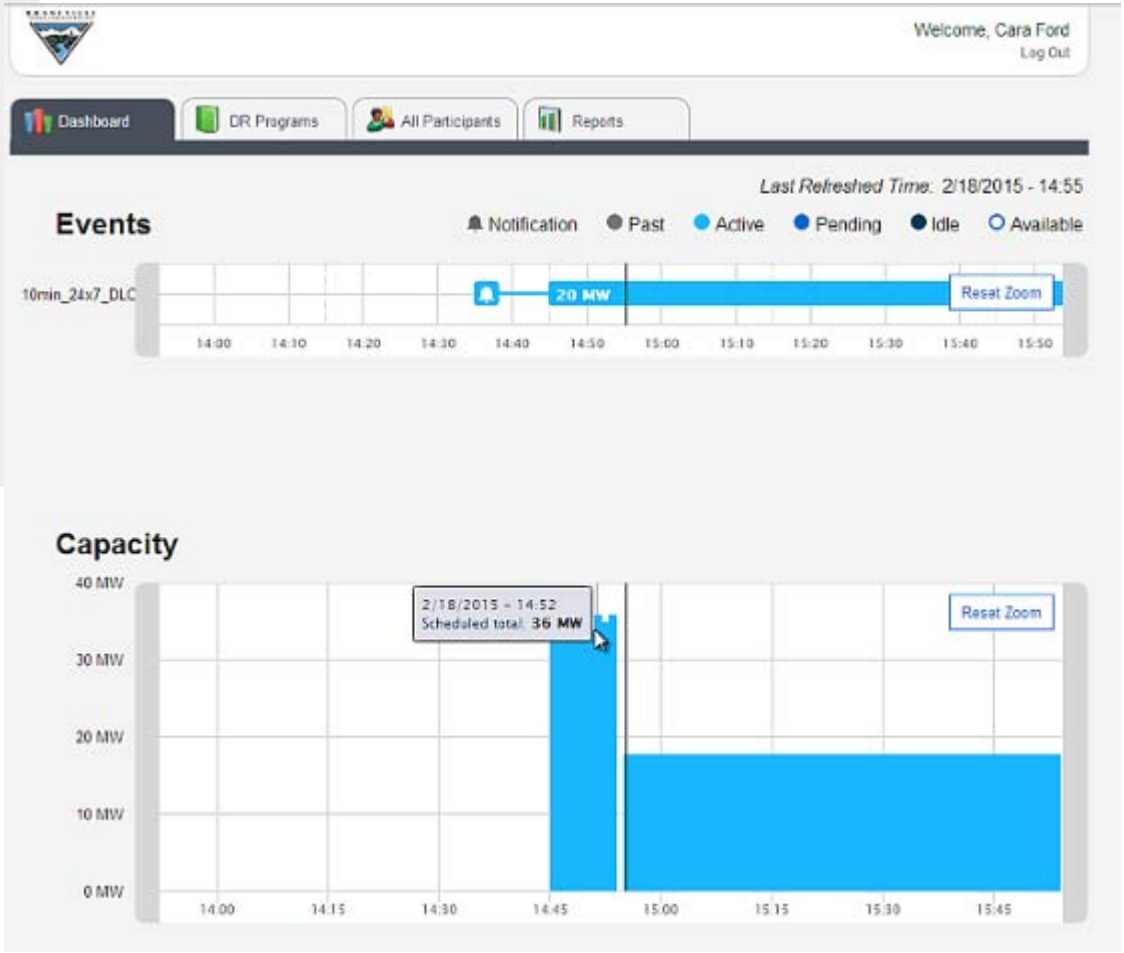
**Successful go live on 2/9/2015**

**Lessons Learned**

- Open ADR provides flexibility, but not plug and play
  - Flexibility results in different interpretations on how to implement
- Requires collaboration and partnerships outside of BPA
- Involve end users from the beginning
  - Real time user feedback helped to define the dashboard to meet their needs

# BPA AutoGrid System: In Action

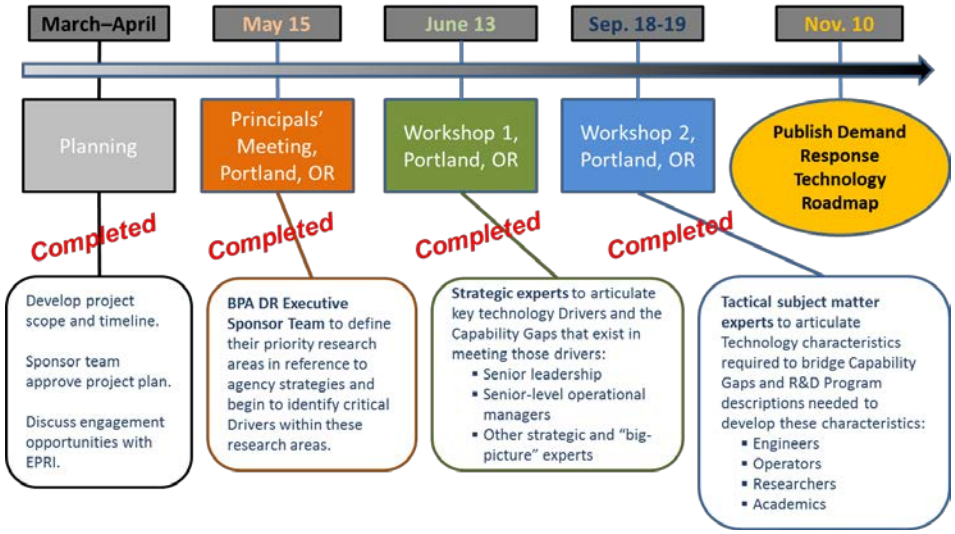


# What's Ahead: Areas for the Next Round of TI DR R & D Pilots Defined by Local & National Experts

## TI 2015 Focus Areas

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




**2014 Roadmapping**

**Solicitation Announcement February, 27th 2015**

# Organizational Interest in DR

- Power operations staff have been actively involved in the Demonstration Contract(s) implementation plans and deployments. This keeps DR on their screen as a potential tool to address current and future needs. It also provides valuable input for process & product improvement.
- Transmission Planning and Operations now has DR on their screen as a real potential tool.
- DR measures are usually a major part of any proposed Non-Wires portfolio.
- Strategy, Power, and Transmission are considering DR as a tool to help smooth spiky investment plans and reduce spending requirements.

# Q & A

Discussion