

Demand Response BPA Program Overview NWPPA

Presented by:

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What is Demand Response?

Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.

-Demand Response Research Center, Lawrence Berkeley National Lab

And...emerging programs indicate that DR can also include increasing load in response to a signal (e.g. for wind integration)



Background – What is Driving Activity?

- **Peak demand** is expected to continue to grow at an average rate of 1.7% annually.
- Load growth, wind integration and fish operations are testing the **capacity** of the Federal Columbia River Power System.
- The **costs of building and permitting new resources** is increasing.
- Legislation, including I-937, renewable portfolio standards, and cap-and-trade are **limiting the types of new resources** that utilities can acquire.
- The Northwest Power and Conservation Council's Sixth Power Plan calls for research of Demand Response (DR) through **pilot projects** and **technology demonstrations**
- The Northwest Energy Efficiency Taskforce has asked BPA to take a role in the Region to **expand DR potential and share learnings** (Action 9, October 2009 report).

“...achievable technical potential for demand response in the region is around 5% of peak load over the 20-year plan horizon. The plan assumes 1,500 to 1,700 megawatts of load reductions in the winter and summer, respectively....”

Sixth Northwest Power Plan, Chapter 5



BPA Demand Response Goals

The theme of BPA's Demand Response program in 2010 and 2011 is to encourage Demand Response learning in the Pacific Northwest, with a view to fostering the creation of a longer term resource in the Region.

Goal 1 – Conduct Pilots. Be a catalyst for innovation by developing a broader base of NW learning and utility familiarity with Demand Response by running pilots.

- Advance testing and adoption of **DR technologies**
- Support **market penetration** in the Pacific Northwest
- Learn from **end-customer engagement**: customer recruitment strategies, education and program participation persistence

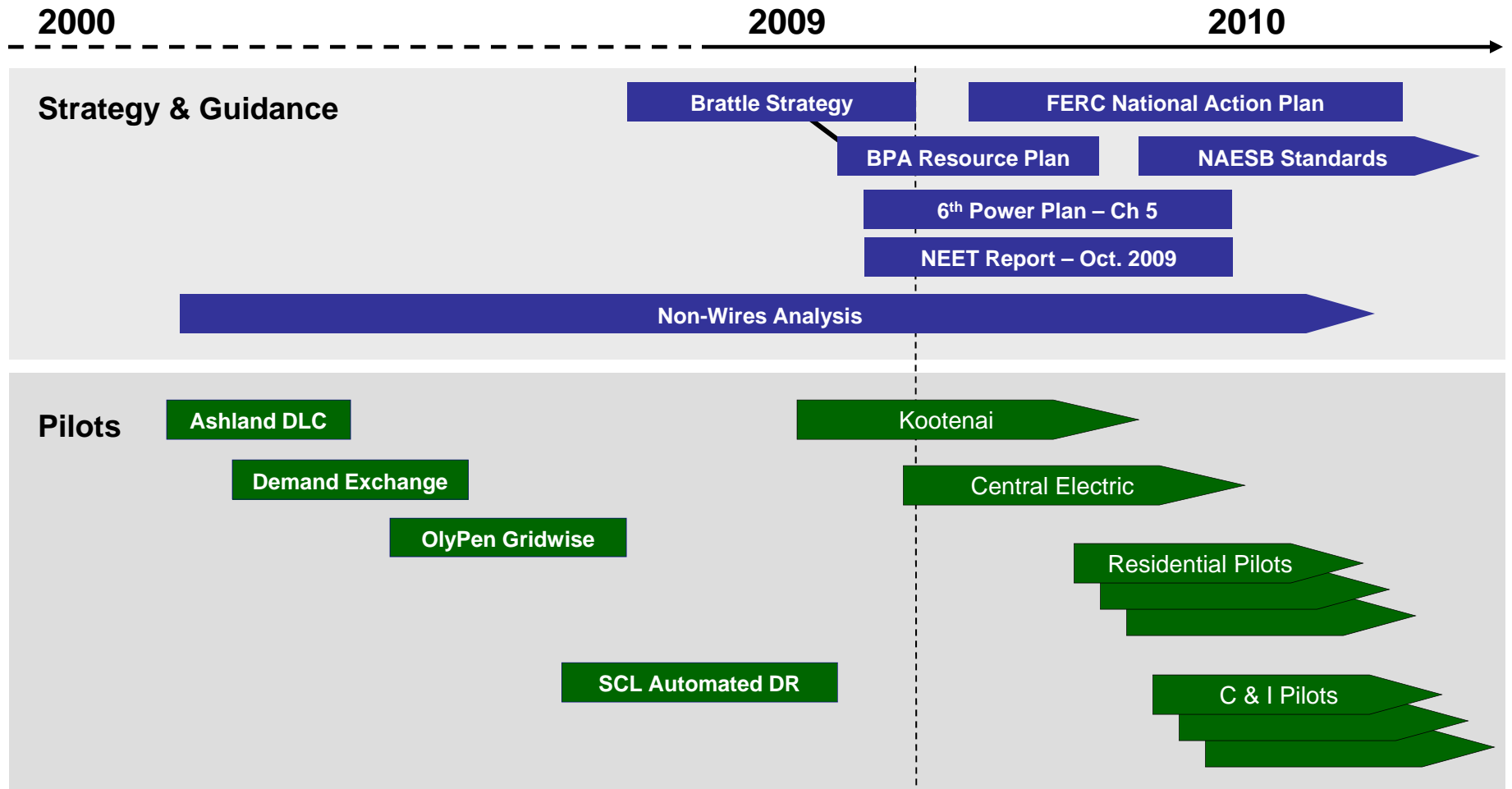
Goal 2 – Evaluate Pilots & Conduct Research. Design and collect data with a view to building a repository of sharable learning through region, and cost effectiveness of various solutions.

Goal 3 – Regional Outreach and Awareness. Share learnings about Demand Response activities/pilots in the region to further awareness of the value and lessons learned around DR as a resource

Goal 4 – Refine Long Term Strategy and Support Development of DR in the Region. Support / collaborate on the creation of a long-term roadmap to build this resource within the region.



Demand Response at BPA



Emphasis:
Pilots & Learning

Future >:
Broader Set of Implemented Programs

Pilots – Informing Long-term Planning

- **Pilots** are designed to **inform long-term DR planning and provide quantification of DR benefits**. Pilot evaluations can help answer:
 - What kind of DR (price response, ancillary services, etc.) is most beneficial?
 - What is the value of DR ?
 - How much DR is needed? Where?
- Also, for the **Pacific Northwest Smart Grid Demonstration**, there will be cost/benefit analysis that includes DR; the Project will provide data and will inform business cases

“The region still lacks the experience with demand response **the region will need to conduct a range of pilot programs involving demand response**. These pilots should pursue two general objectives, research and development/demonstration.”

– **NWPCC, 6th Power Plan, 2009**



BPA Pilots Address Capacity Constraints

(as Outlined in the 2009 Resource Plan)

Constraints >		Summer Heat Wave	Winter Cold Spell	Wind Integration	Large Unit Outage	Difficulty Managing the River
Past Projects	OpenADR Demonstration (SCL)					
	Olympic Peninsula					
	Ashland DLC					
	Demand Exchange					
Current Projects	Kootenai Electric (Peak Prjt)					
	Central Electric (Peak Prjt)					
FY 2010-2011 Proposed Pilots*	C&I Pilots					
	Residential Pilot 1 (PNW Util.)					
	Residential Pilot 2 (PNW Util.)					
	Residential Pilot 3 (PNW Util.)					
	Residential Pilot 4 (PNW Util.)					

* Now under selection, negotiation and contracting



Residential Demand Response Pilots

Orcas Power & Light Cooperative



- Aclara AMI Technology
- Water heater / thermostat control devices
- Home area network capabilities
- Real time communication through the internet to study customer behavior

City of Port Angeles



- Water heating DR controls
- In-home displays with home area network capabilities
- Thermal storage devices for home heating

Mason County PUD #3



- Network configured for a Renewable Demand Response signal
- Enhanced hot water heater control system to store renewable energy

Emerald PUD



- Cooper AMI Technology
- Water heater control devices
- Heat pump control devices
- Programmable thermostat devices

* Each utility project selected for award. Cooperative agreement pending



Commercial & Industrial Pilots

- **Objectives**

- Test DR strategies that provide value to BPA, customer utilities, and/or end users
- Successfully execute pilot projects with engaged partners
- Increase BPA’s understanding about utility needs & considerations in regard to DR
- Share findings with customer utilities and other stakeholders

- **Background**

- Includes Agriculture sector
- BPA hired Global Energy Partners
- Funding opportunity for utilities

- **Upcoming Stakeholder Meetings**

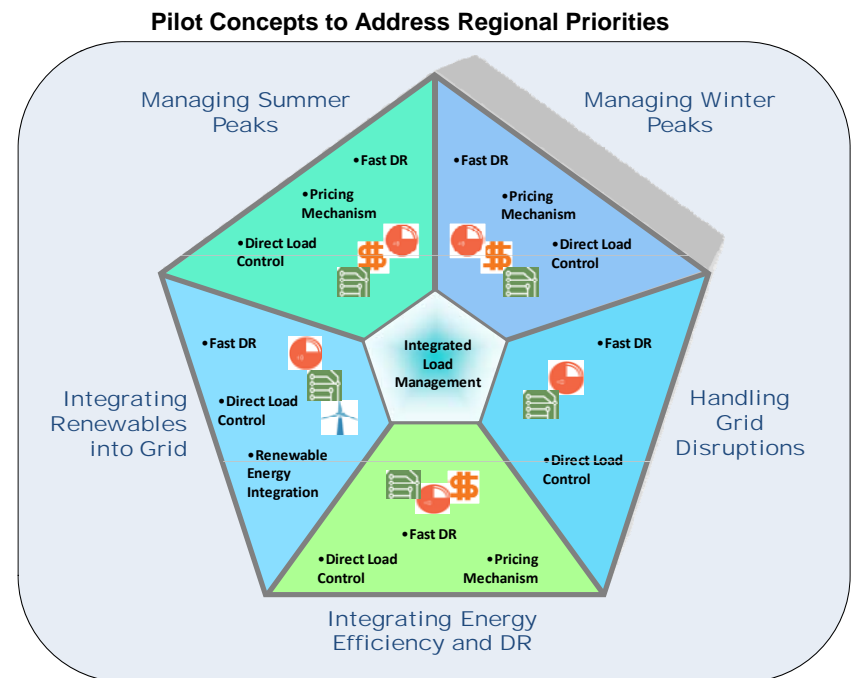
- Portland – already held
- Seattle, July 20
- Spokane, August 10

- **Timeline**

- Proposals due to BPA by Sept. 30
- Pilots selection by the week of Oct. 18

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Many C&I options to configure, adapt or customize

Type of Pilot	Exmples of Pilot Options	Pilot Concepts
Integrated Load Management	Pilot 1	Load shifting in wastewater facilities by integrating EMS with process and control technologies
	Pilot 5	Integrated distributed resources (combines an optimal mix of renewable resources, storage technologies, and load shed opportunities)
	Pilot 6	Thermal energy storage coupled with demand reduction
	Pilot 7	OpenADR, along with integrated EE/DR strategies in energy intensive industries such as refrigerated warehouses
	Pilot 8	Pricing mechanism (super peak TOU type) for C&I customers
	Pilot 9	Interruptible/curtailable for large C&I customers
	Pilot 10	Demand/capacity bidding with or without aggregators using OpenADR
	Pilot 11	Load shifting with thermal mass in large commercial buildings
	Pilot 12	OpenADR strategies for data centers
	Pilot 13	Air-cooled chillers with thermal energy storage replace water-cooled chillers
	Pilot 14	Off-peak non-road electric vehicle charging (e.g., fork lifts, golf carts)
	Pilot 15	Off-peak water pumping to gravity storage
Fast DR	Pilot 2	Fast DR for large C&I customers with Open ADR (events with response requirement less than 10 minutes)
	Pilot 4	Fast DR with small and medium C&I customers, with response requirement less than 10 minutes
Direct Load Control	Pilot 3	Direct load control for small and medium C&I customers using switch and PCT
Renewable energy integration	Pilot 16	Water pumping for reducing variability of renewable generation
	Pilot 17	Wind/PV-powered pumped water storage for electric energy storage
	Pilot 18	Wind/PV-assisted municipal water pumping and building water systems

Note: EMS = Energy Management System; DR = Demand Response; C&I = Commercial and Industrial; OpenADR = Open Automated Demand Response; PCT = Programmable Communicating Thermostat; EE = Energy Efficiency; TOU = Time-Of-Use; and PV = Photovoltaic



Regional Demand Response Knowledge Sharing

Regional Sharing Program
being developed in
recognition of the value of
Demand Response to the
region over the next 20
years.

*“Increase regional collaboration
on programs that address smart
grid, load management,
distribution efficiency and
conservation voltage regulation”*
NEET Report – Action 9, October
2009

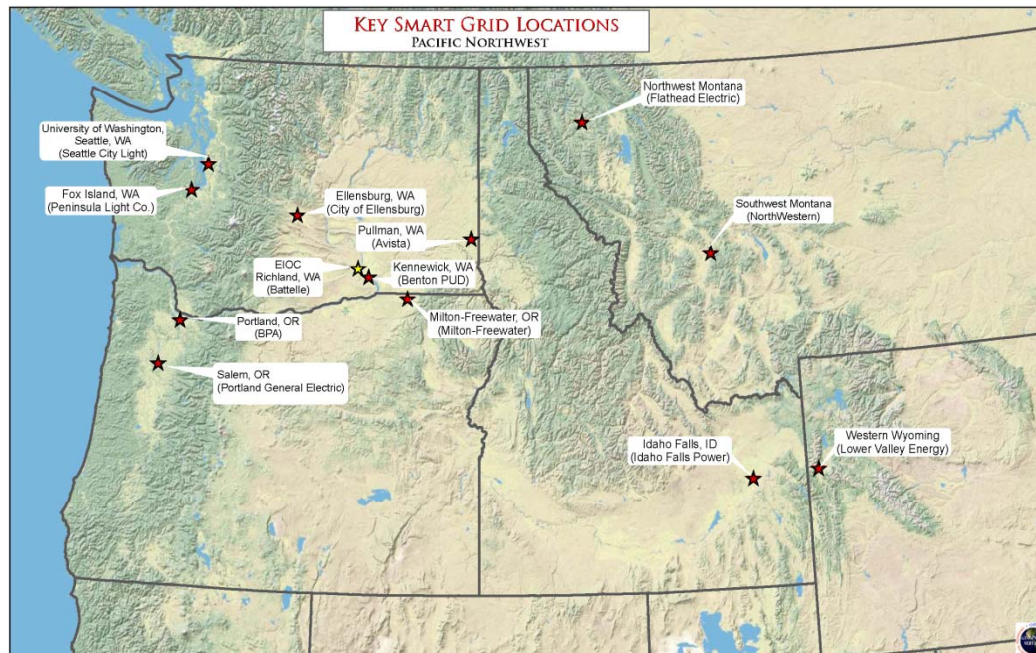
Coming Activities – 2010 and 2011

- Developing a list of Demand Response topics
- Holding focus group with PNW utility representatives
 - Confirm what DR topics and level of DR information will be helpful
- Developing content to be shared
 1. Concepts
 2. Technologies
 3. Strategies
- Rollout to Utilities and other PNW stakeholders



Regional Smart Grid Demonstration

- **Substantially increases smart grid asset installation in the region by purchasing and installing smart grid technology**
 - \$178 Million project led by Battelle
 - Project participants include BPA (\$10M), 11 utilities (\$52M), 5 project-level vendors (\$27M). DOE matched with \$89M.
 - Over 60,000 metered customers directly affected
 - 112 MW of responsive resources (loads and generation) engaged



Pacific Northwest Smart Grid Demonstration has Significant DR scope

Utilities: Summary of Scope of Work
(final SOW's being completed - June 2010)

	Back-up Generation	Battery / Storage	Demand Response	Distributed Generation	Distribution Automation / Management	PHEV / Electric Vehicles	End-user Portals	Diagnostics	AMI	
Avista Utilities					CVR				Itron	Includes microgrid, creating of educational opportunity at WSU, and a test of a full range of DR measures
Benton PUD				Wind					Sensus	Explore interoperability and install a web-based interface for improved data management
City of Ellensburg				Wind / Solar						Test renewable (solar, wind) technologies, evaluate incentives for investing in comm. renewable energy park, involving CWU.
Flathead Electric Coop.									Aclara	An evaluation of four levels of residential smart grid technologies in Libby and near Kallispell
Idaho Falls Power		> MW		Solar	CVR				tbd	Includes microgrid and solar sites at local public schools
Lower Valley Energy			Constraint	Wind / Solar					Aclara / L&G	Includes optimization of resources, reliability improvements in extreme weather locations at sites in Western Wyoming
Milton-Freewater City Light & Power					CVR				Aclara	Includes outage reporting, voltage and frequency stability; dlc for electric heat, hot water heater, cycling of a/c and city water pump
NorthWestern Energy			Constraint		CVR				Itron	Also, data management. Includes state capitol buildings complex in Helena and remote rural areas near Phillipsburg
Peninsula Light Company			Constraint		CVR					Improve reliability and defer construction of underwater cable service to island using direct load control and CVR
Portland General Electric		> MW		Wind / Solar					Sensus	Realize dynamically reconfigurable feeders with intentional islanding and improve integration of intermittent resources
UW / Seattle City Light				Solar					tbd	A utility/university collaboration to create a "smart microgrid" with campus facilities mgt, administrators, faculty and students

Demand Response as part of nine subprojects



Demand Response Project Descriptions - PNW Smart Grid Demonstration

Utility	Location	Sector	Description
Avista Utilities	Pullman, WA	R	Install 2-way AMI for gas and electric service; leverage electric meter as a gateway into homes using ZigBee, Control4 home automation devices will be installed for thermostat and water heater control as well as in-home displays
Idaho Falls Power	Idaho Falls, ID	C/I	Leverage AMI for DR at 22 schools and 2 industrial plants to reduce energy and demand; residential also being explored
Flathead Electric Cooperative	Libby and Kalispell, MT	R	Install TWACS, DRUs/ZigBee-based equipment for control; some volunteers will have two options for hot water heater control; other volunteers would receive appliance incentives) for new dryer and/or new water heater and adapters to TWACS (test 4 level of technology)
Lower Valley Energy	Jackson, WY; other locations in Western WY	R/C	Demand controls on water heaters; work with ski areas to utilize their generators (directly couple motor drives or net-meter back into the grid); in-home displays for consumer education on energy use patterns and behavior change
Milton-Freewater City Light & Power	Milton-Freewater, OR	R/C	Direct load control of space and water heating AC; cycling; direct load control (city water pump)
NorthWestern Energy	Helena and Phillipsburg, MT	R/C/Gov't	Implement utility-imposed customer demand controls; provide customers with info/ways to control usage and modify behavior; appliance cycling and control (water heaters, air conditioning, space heating)
Peninsula Light & Power	Fox Island, WA	R	Load control modules installed on electric hot water heaters to willing customers to reduce peak demand
Portland General Electric	Salem, OR	R/C/I	DRBizNet for DR control (UISOL); battery storage for DR; deploy ADR schemes (control of water heaters, thermostats, lighting, appliances)
University of Washington	UW, Seattle, WA	Ed	Test DR strategies (33 bldg automation systems, 12 lighting control systems)

* Based on 3/2010 interim SOWs



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