PNSGD Project Overview & Transactive Energy

Presented to PNWER Summit – Energy and Environment Working Group Session
Ron Melton, Ph.D., Project Director
Pacific Northwest National Laboratory
July 14, 2015
Pacific Northwest Demonstration Project

What:
- $178M, ARRA-funded, 5-year demonstration started in 2010
- 60,000 metered customers in 5 states

Why:
- Develop communications and control infrastructure using incentive signals to engage responsive assets
- Quantify costs and benefits
- Contribute to standards development
- Facilitate integration of wind and other renewables

Only project of its kind integrating resources across multiple utilities to achieve regional benefits.
Project Objectives

Lay the foundation for a regional Smart Grid

Develop communications and control infrastructure using incentive signals

Measure and validate costs and benefits

Develop Standards for interoperable Smart Grid

Integrate renewable Energy
Project Structure / Roles

Battelle Memorial Institute, Pacific Northwest Division

Bonneville Power Administration

11 utilities (and UW) and their vendors

5 technology infrastructure partners
Transactive Control 101

What is it?

• Transactive control is a distributed method for coordinating responsive grid assets wherever they may reside in the power system.

Incentive and feedback signals

• The incentive signal sends a synthetic price forecast to electricity assets
• The feedback signal sends a consumption pattern in response to the incentive.
Project Basics

Transactive Control Operational objectives

- Manage peak demand
- Facilitate renewable resources
- Address constrained resources
- Improve system reliability and efficiency
- Select economical resources (optimize the system)

Aggregation of Power and Signals Occurs Through a Hierarchy of Interfaces
Developed and demonstrated ability to coordinate incentive signal response across 11 utilities in five states using transactive control technology

At the end of the project:

• ~80 Megawatts of distributed responsive assets engaged
• ~$80M Base of smart grid equipment installed at 11 utilities

Transactive control system design and reference implementation suitable for standardization
Selected Future Research Needs

- Interoperability – improved standards and distributed energy resource integration architectures
- Improved load modeling and forecasting techniques
- Methodology for consistent valuation of operational objectives and asset systems
- Tools to support operation of smart grid sensors and systems – in particular to improve data quality and consistency
Acknowledgement & Disclaimer

• Acknowledgment: "This material is based upon work supported by the Department of Energy under Award Number DE-OE0000190."

• Disclaimer: "This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof."
Summary of Avista Activities in Pullman, WA
Avista - Pullman Smart Grid & Energy Storage

Energy Efficiency
- Voltage drop 2.1%, 7.8 GWh of energy saved/yr
- $111,000 savings/yr with smart transformers
- 3.5 MW of load reduction and generation at WSU

Reliability (August 2013 thru December 2014)
- 353,336 avoided customer outage minutes
- 17 percent fewer outages
- 12 percent shorter outages

Customer Experience
- 9.5% average annual savings with smart thermostat
- High satisfaction with smart thermostat
- Web portal with consumption data had no measurable impact on consumption
- Texting of expected usage and thresholds had positive impact with customers

Energy Storage
- Largest vanadium flow battery in North America and Europe
- Providing ride through for SEL and backup for Avista Customers
- Stores renewable energy for dispatch at peak
- And much more......
For further information

Dr. Ron Melton
ron.melton@pnnl.gov
509-372-6777

Summary of Technology Performance Report:

Full Technology Performance Report: