PNNL-SA-93110

Pacific Northwest
SMART GRID
DEMONSTRATION PROJECT

Project Overview

Ron Melton, Ph.D., Project Director
Battelle, Pacific Northwest Division
September 2015

Pacific Northwest Demonstration Project

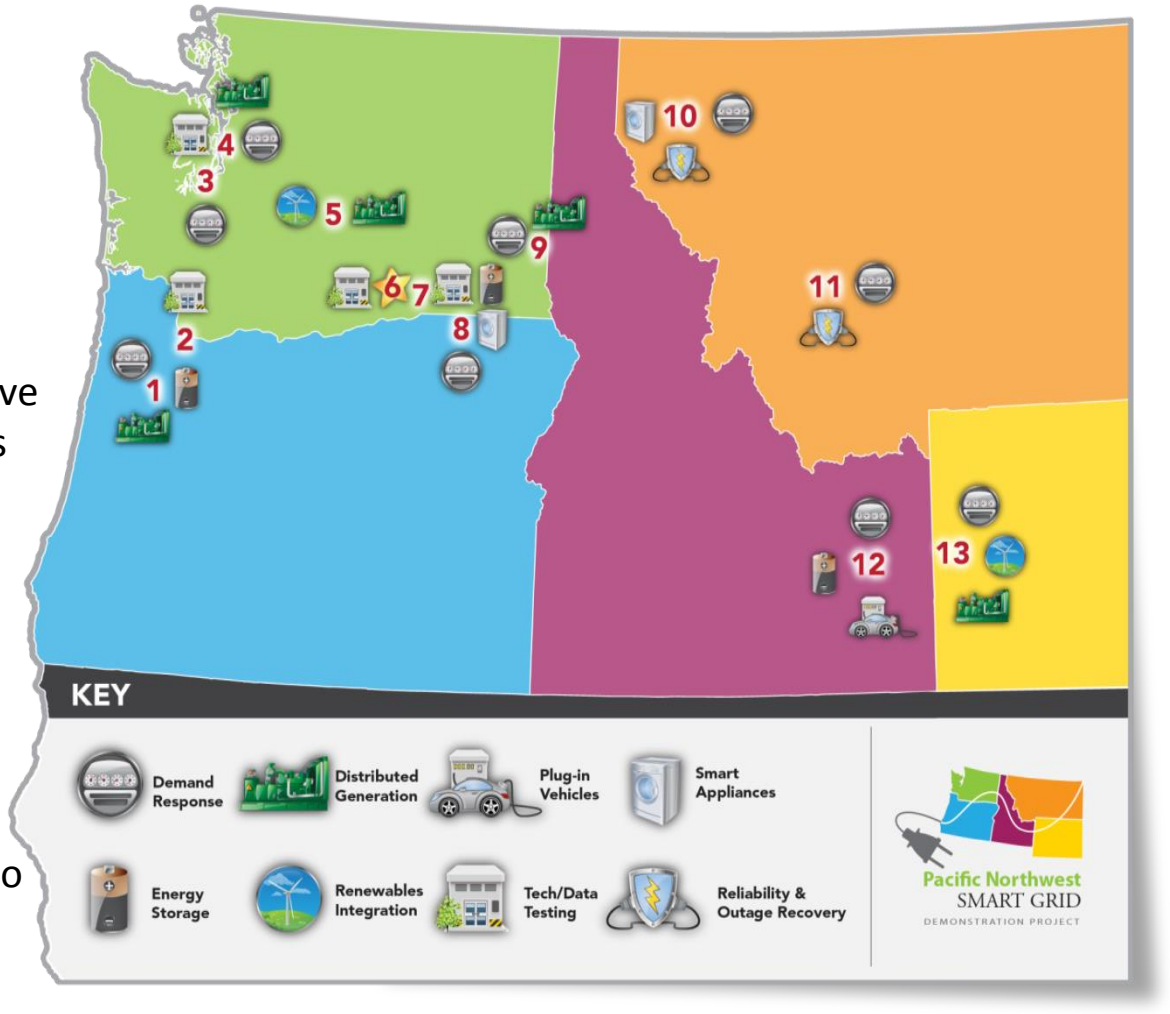
What:

- $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

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Measure and validate costs and benefits

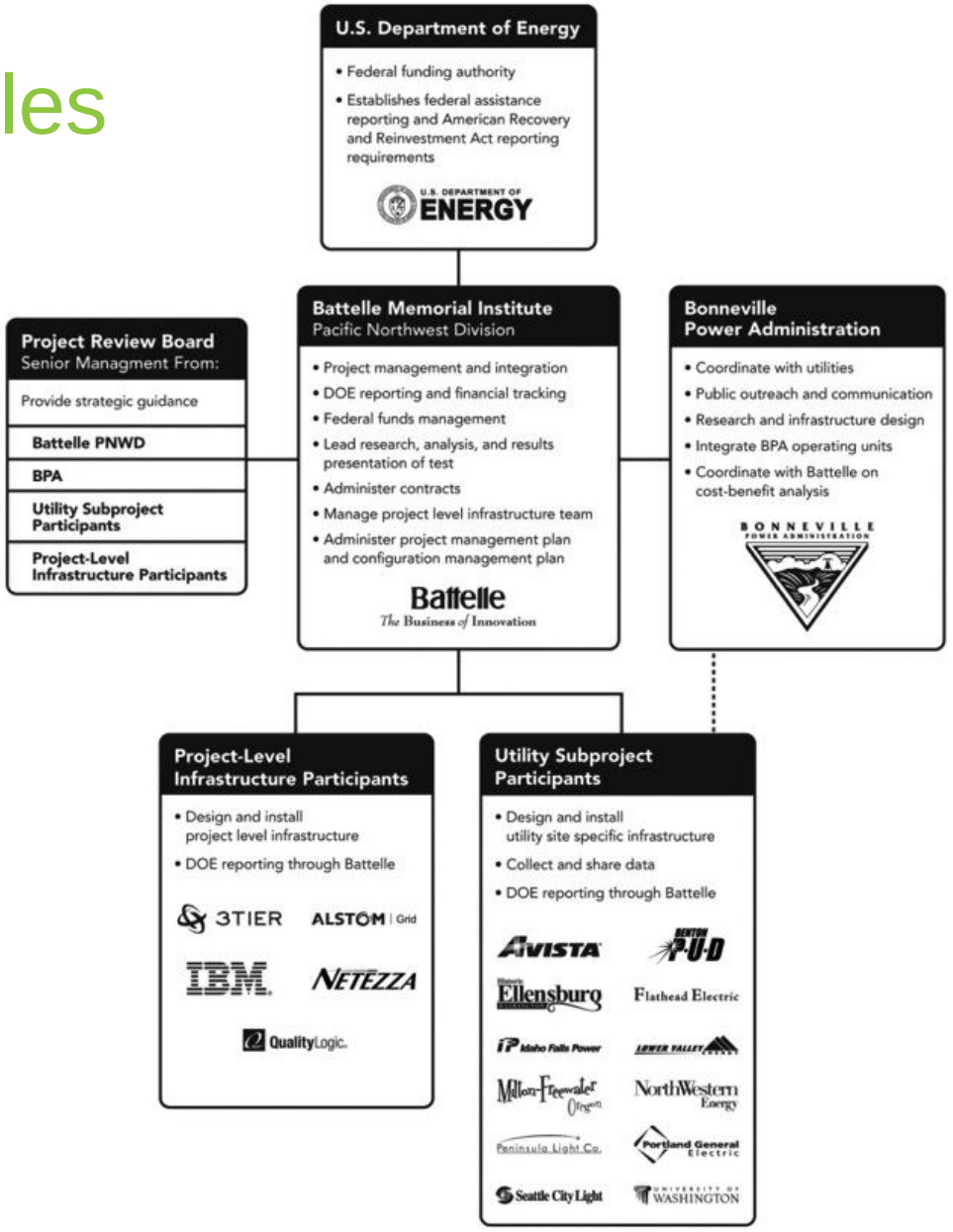
Develop Standards for interoperable Smart Grid

Develop communications and control infrastructure using incentive signals

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



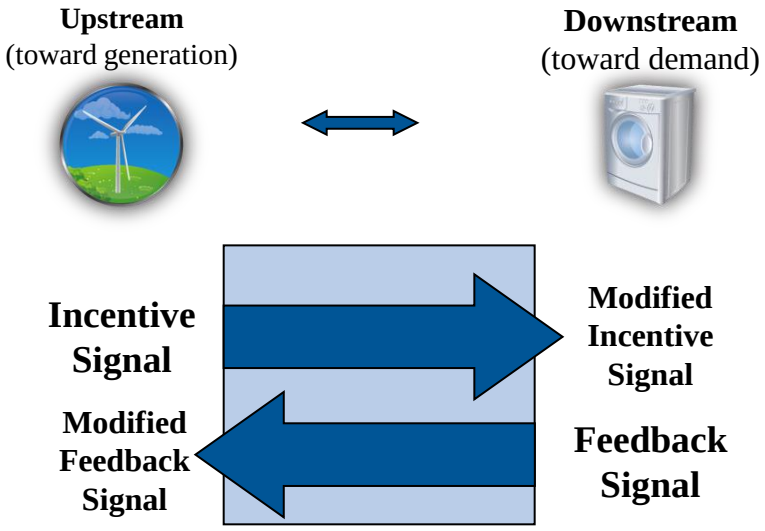
Transactive Control 101

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

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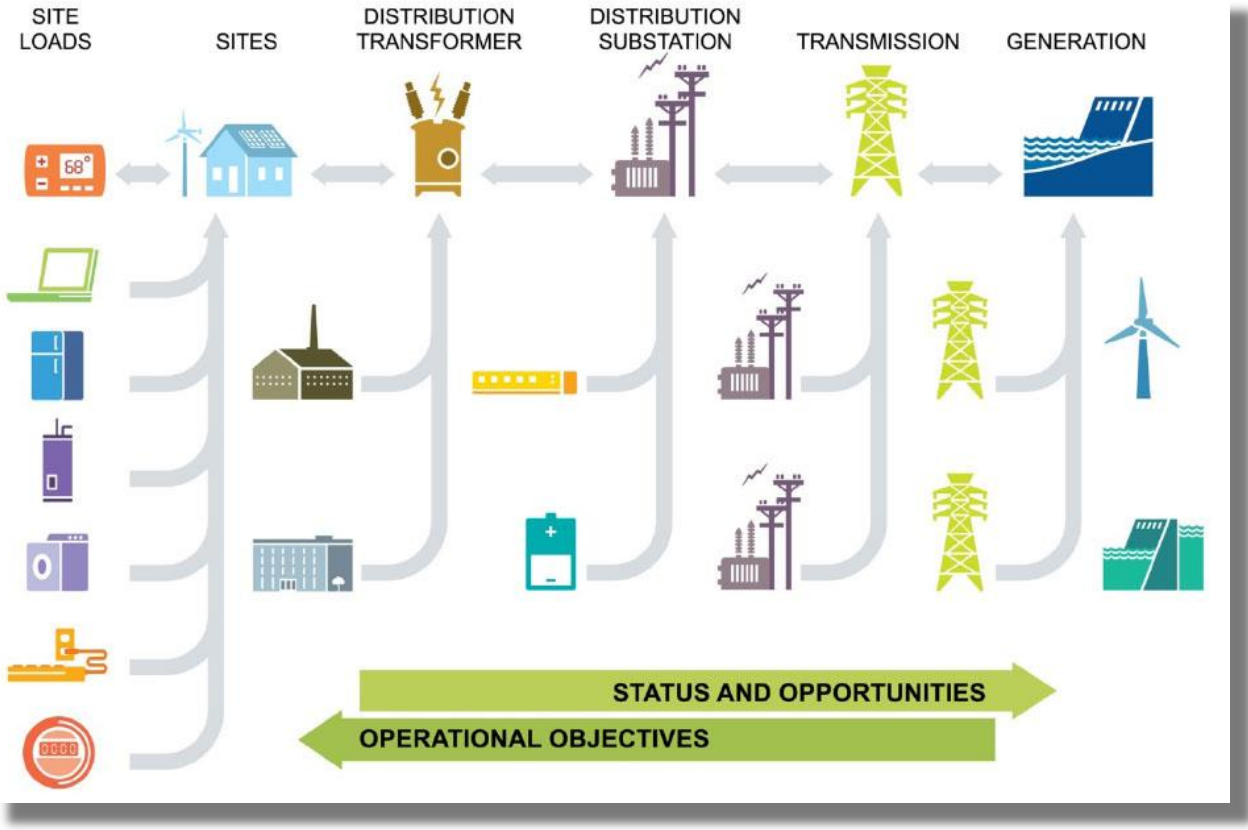
Transactive Control Operational objectives

- 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

Project Successes

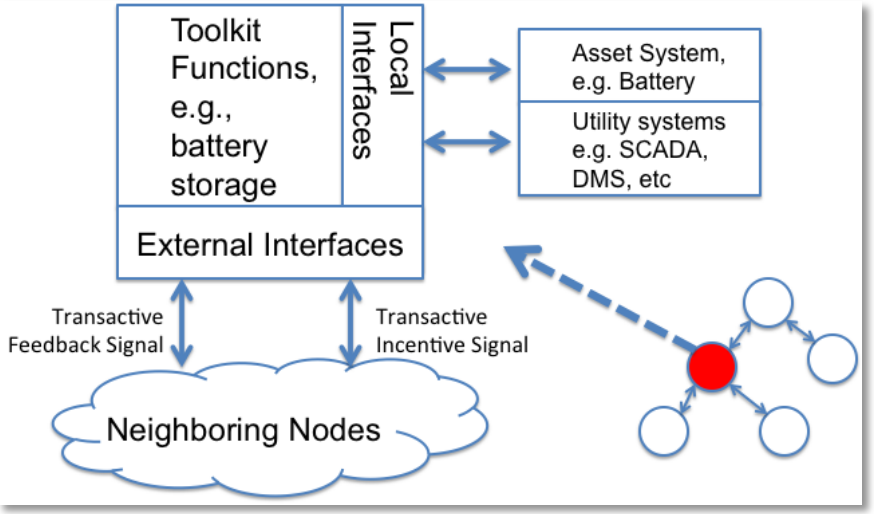
Pacific Northwest SMART GRID DEMONSTRATION PROJECT

Developed and demonstrated ability to coordinate incentive signal response across 11 utilities in five states using transactive control technology

Transactive control system design and reference implementation suitable for standardization

At the end of the project:

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



Selected Future Research Needs

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- Theoretical analysis of transactive control and coordination with attention to convergence, stability and optimality
- 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
- Interoperability – improved standards and distributed energy resource integration architectures

Acknowledgement & Disclaimer

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

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For further information

Dr. Ron Melton

ron.melton@pnnl.gov

509-372-6777

www.pnwsmartgrid.org - for full Technology Performance Report and related material