Project Overview

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Pacific Northwest Demonstration Project

What:

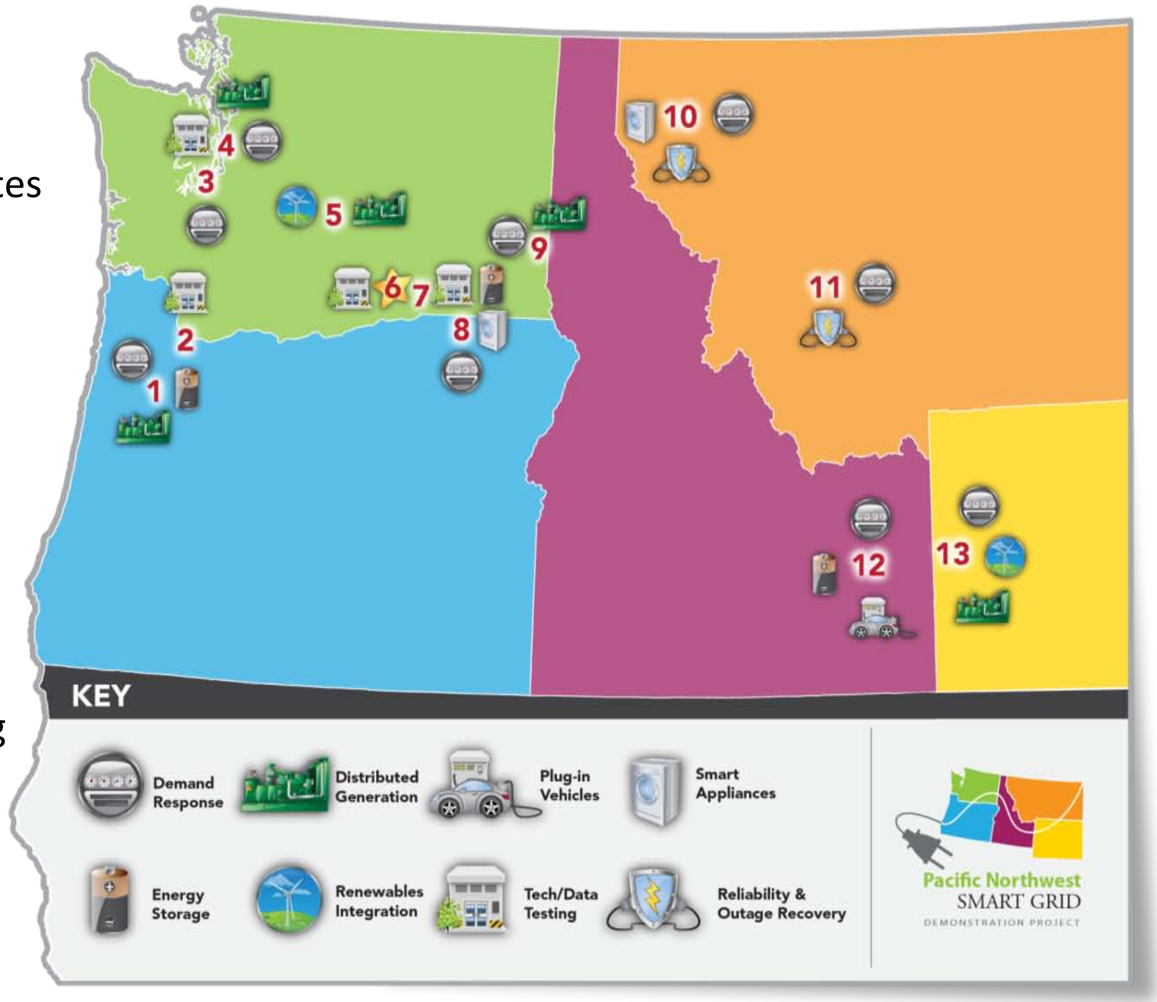
- $178M, ARRA-funded, 5-year demonstration
- 60,000 metered customers in 5 states

Why:

- Quantify costs and benefits
- Develop communications protocol
- Develop standards
- Facilitate integration of wind and other renewables

Who:

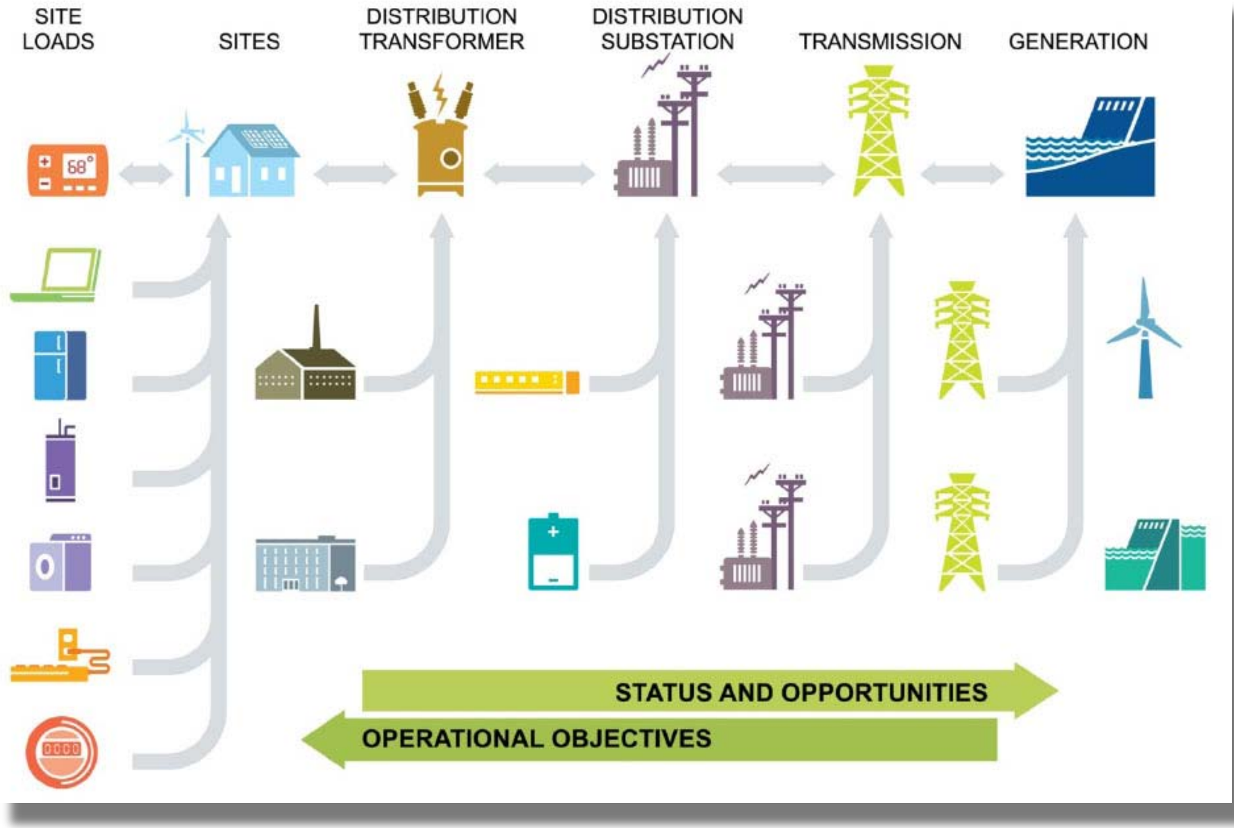
Led by Battelle and partners including BPA, 11 utilities, 2 universities, and 5 vendors



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

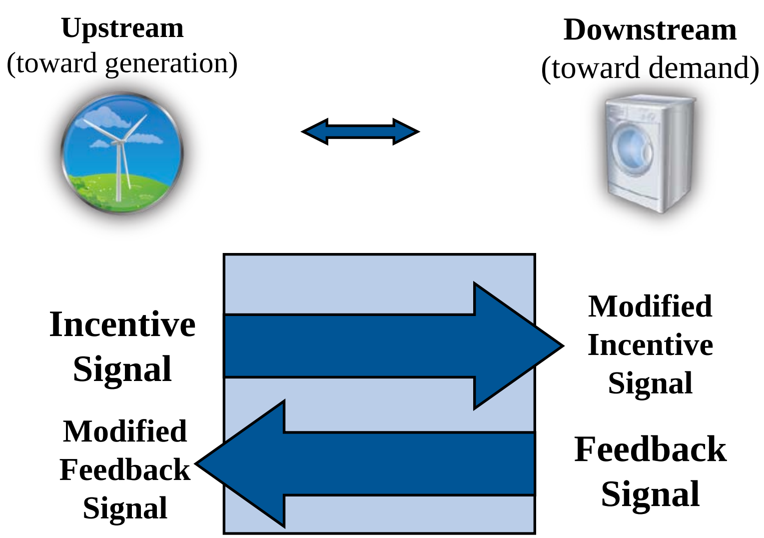
Transactive Control 101

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.



Transactive Control in Action

Getting services out of loads and assets

- Peak Shaving
- Load Balancing
- Balancing Renewables
- Smart PHEV Charging

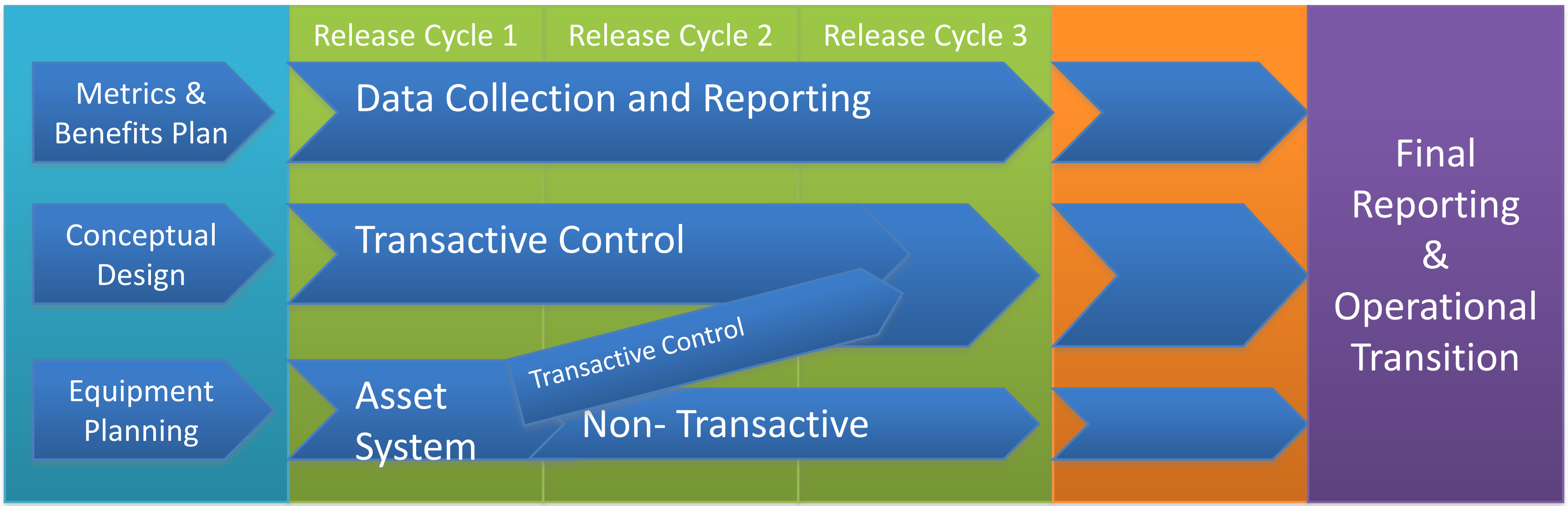
Allows enabling assets and responsive loads to collaborate, ensure reliability and save energy!

Benefits already in action

- Peninsula Light Power sharing program saved residents from blackouts during winter 2010-2011

TC keeping the lights on in Fox Island since 2011!

Technical / Project Management Approach



Phase 1: Planning and Initial Design

Phase 2: Detailed Design, Implementation, & Installation

Phase 3: Operations

Phase 4: Analysis and Reporting

Progress Towards Project Objectives

Project Objectives

Lay the foundation for a regional Smart Grid

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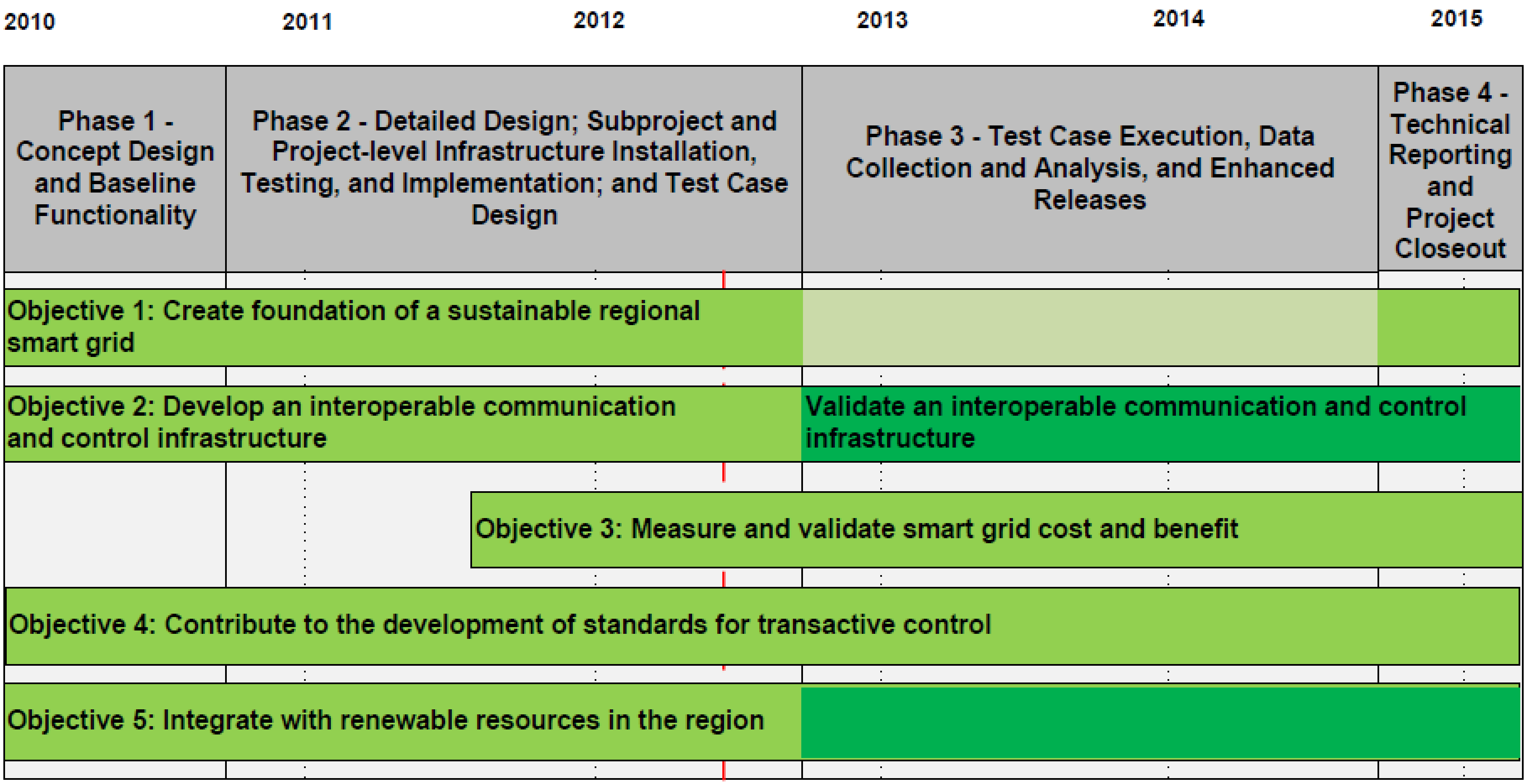
Measure and validate costs and benefits

Develop Standards for interoperable Smart Grid

Develop and validate two communication

Integrate renewable Energy

Progress Towards Project Objectives



Subproject Test Case Summary

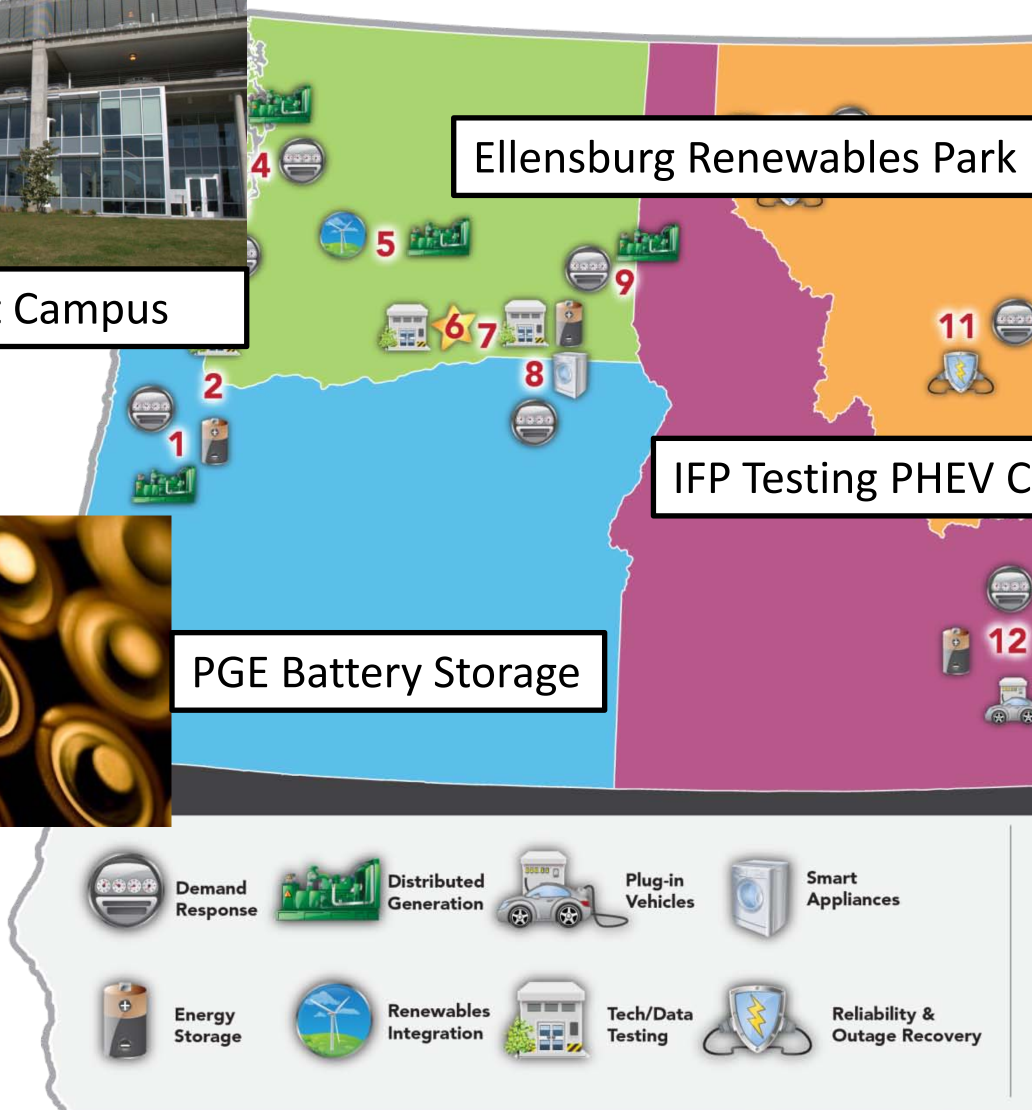
	Transactive Control	Reliability	Conservation /Efficiency	Social	Totals
Avista Utilities	4	3	5	3	15
Benton PUD	1	1	1	0	3
City of Ellensburg	1	0	8	0	9
Flathead Electric	6	2	0	0	8
Idaho Falls Power	8	2	3	3	16
Lower Valley Energy	3	2	6	1	12
Milton-Freewater	3	0	0	0	3
NorthWestern Energy	4	1	3	1	9
Peninsula Light	2	1	1	0	4
Portland General Electric	4	1	1	2	8
UW/Seattle City Light	5	0	3	0	8
Totals	41	13	31	10	95

Pacific Northwest SMART GRID DEMONSTRATION PROJECT

Select Events 2012

UW Smart Campus

Ellensburg Renewables Park

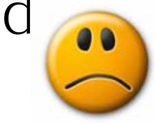


PGE Battery Storage

IFP Testing PHEV Charging

Lessons Learned / Surprises / Challenges

- Many examples of vendors over-promising & und delivering



- Getting access to needed data much harder than expected
- Each utility has different challenges in relating "smart grid" to their customers – meet people where they are
- Customer questions:
  - How will this benefit me?
  - What will it cost me (time and/or money)?

- Students are pushing for adoption
- Customers are more tolerant of cold than heat
- R&D with deployment to utilities is challenging!

Unexpected Benefits to Date

- Fox Island – recovery from unexpected underwater feeder failure benefited from load controls
- Cold-load pickup facilitated by load controls
- Cyber security trickling throughout the utility in a positive way
- Truck rolls surprisingly reduced with remote connect / disconnect capability
- Better integration / collaboration across internal organizations of the utility
- Dedicated customer representative has helped educate consumers – make them more aware of the challenges of operating a utility

To Recap - Why is BPA Involved?

- Opportunity to leverage smart grid assets installed by regional utilities using an innovative incentive structure
- Extend and validate the concepts demonstrated in Oly-Pen project
  - Flexible approach to integrating BPA's and Utility's operational objectives and responsive resources
  - Standardized, interoperable approach to facilitate broad application
- Prove and refine the transactive approach
  - Gather regional cost-benefit information
  - Understand scale-up challenges and opportunities
- Continue the region's legacy of national leadership in power system innovation

2015 and beyond

- At the end of the demo project:
  - ~ 100 Megawatts of distributed responsive assets engaged
  - Transactive control validated as a means of balancing intermittent renewable resources
  - Base of smart grid equipment installed at 11 utilities
- Beyond the demo project
  - Scale up to engage additional responsive assets
  - Transition from R&D to operations
  - Operationalize for balancing authorities (regional value)
  - Further deployment with energy service providers to enhance value to their operations (local value)

For further information

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www.pnwsmartgrid.org

- “Annual Report”
- Quarterly newsletters
- Participant summaries
- Background on technology