The Making of the Smart Grid

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Smart Grid – Elements and Theory

• Customer Benefits: Higher Reliability, Greater Flexibility, Lower Cost, Greenhouse Gas Reductions

• Key Elements:
  – Hierarchical Control – Grid Status & Conditions to Individual Utilities
  – Flexible Generation – For Ramping-Capability to Counteract Intermittent Renewable Generation
  – Distributed Generation – Power Resource Close to Load (CHP, Solar, Community Wind, Storage-EV batteries)
  – Demand Response – Modify Customer Demand (Direct Load Control, Real-Time Pricing)
  – Reliability – Self Healing (Fast Switching, IEDs, Microgrids)
  – Advanced Meter Infrastructure – Billing & Intelligence
PGE Smart Power℠ Initiatives

Smart meters
- 820,000 installed and operating

Smart grid initiatives
- Energy Partner (demand response)
- Distributed generation
- Renewable integration
- Energy storage
- Smart feeders/automatic switching

Salem Smart Power℠ project
- A project of the Pacific NW Smart Grid Demonstration Project
Recovery Act: Smart Grid Regional Demonstrations ($435M Federal; $877M non-Federal)

16 Awards Support Projects in 21 States

- December 2008 Recovery Act: Smart Grid Regional Demonstrations
- Demonstrate cutting edge SG technology (including integration of renewables)
- Prove ability/ease to replicate
- Show benefits (with actual data)
- Validate business models
- Address regulatory and scalability issues
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
PNW Smart Grid Demo Project: PGE Smart Feeder

Where: Salem, Ore.
What: 13kV Feeder serving commercial and residential customers

When: 5-year project 2010-2014

Project objectives:
- Self-healing feeder: Faulted segmented automatically isolated from Grid
- High Reliability Island: Auto isolation of feeder segment from Grid and loads served with available distributed generation
- Advanced battery system. DR, VAR, Power Cost Hedge, & Ancillary Services
- Link system with Battelle's demonstration of a Transactive Control System to demonstrate real time solutions for regional power issues such as low/high wind
Incentive signals and feedback signals propagate through an information network that parallels the physical network.
PGE’s Distributed Resources

Dispatchable Standby Generation

Solar

Biogas

Demand Response
Demand Response
High Reliability Zone

Salem, OR

Residential Demand Response

Commercial Distributed Gen & Demand Response