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April 26, 2012

MEMORANDUM

TO: Council Members

FROM: Ken Corum

SUBJECT: Status of Demand Response and Smart Grid

Demand response is temporary, voluntary adjustment in electricity use to benefit the power system. Historically demand response has been used to reduce peak loads when generating capacity was scarce. Historically this kind of demand response was of limited value in most of the Pacific Northwest, since our hydroelectric system had a large peak generating capacity. Some utilities' circumstances left them short of peak generating capacity at times, however, and these utilities have been interested in demand response as an alternative to building peaking generators. In addition, the growth of loads and the "peakiness" of loads over time for the region as a whole have increased interest in demand response more broadly.

There has also been an expansion of the concept of demand response to include loads that can increase as well as decrease when the power system needs it, faster and more frequently needed to manage peak loads. This variety of demand response can provide forms of ancillary services, ranging from contingency reserves to intra-hour regulation and balancing.

The label "Smart Grid" has come to be used for a wide range of new technologies. In general these technologies fall into three categories: 1) better and cheaper sensors and metering, 2) better and cheaper means of communicating the data gathered by these sensors and metering, and 3) better and cheaper hardware, software, and analytical methods that can improve the operation of the power system based on the better information made available by metering and communication improvements.

I'll be reporting on the status of demand response and smart grid, focusing primarily on the status in the Pacific Northwest but also touching on developments in the rest of the country as well.

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Status Report on Demand Response and Smart Grid

Northwest Power and Conservation Council Meeting

May 9, 2012

Hood River OR

Ken Corum

Demand Response Background

- DR – voluntary temporary change in electricity use to benefit the power system
- Historically, DR = reduction in load at or near peak demand (DR 1.0)
 - Hydro peaking capacity = DR 1.0 not big in PNW
 - Exceptions: PacifiCorp, Idaho Power
- Recently, more interest in DR 1.0

Recent Changes in Concept of DR

- DR for balancing services (DR 2.0)
 - Load increase as well as decrease
 - Many times per year, all hours of day and seasons of year
 - Fast response (minutes to seconds)
- In PNW, driven by need to integrate wind but useful for other purposes
- Not all load can provide DR 2.0

6th Plans Action Items

- Inventory and monitor DR programs
- Evaluate and demonstrate DR (including 2.0)
 - Evaluate DSIs for DR
- Complete work of PNDRP
- Consider DR controls in appliance standards
- Implement NEET findings on DR
- Improve modeling of DR in Council analysis

Current DR in PNW - 1

- **PacifiCorp**
 - ~650 MW* - IRR, Res AC, COM, IND
 - Eastern part of service territory (summer peak)
 - Adding 120 MW by 2013
- **Idaho Power**
 - 336 MW, irrigation, AC, commercial and industrial
- **Avista**
 - Pilots, DR not judged cost effective now

Current DR in PNW - 2

- PGE
 - 16 MW from industrial
 - 50 MW from commercial sector contracted, not operational yet
 - Critical peak pricing pilot underway
- PSE
 - Residential and commercial pilots
 - RFP for peaking capacity found supply side very cheap now, DR expected later
 - Interested in DR 2.0

DR Elsewhere in U.S. - 1

- **Organized markets (e.g. PJM, MISO, NYISO, New England ISO, CAISO, ERCOT)**
 - Continue to develop markets for DR 1.0 and 2.0
 - FERC rules
- **TVA water heater program for DR (1.0)**
- **Western Governors' Association report on integration of renewable generation includes chapter on loads' contribution (DR 2.0)**

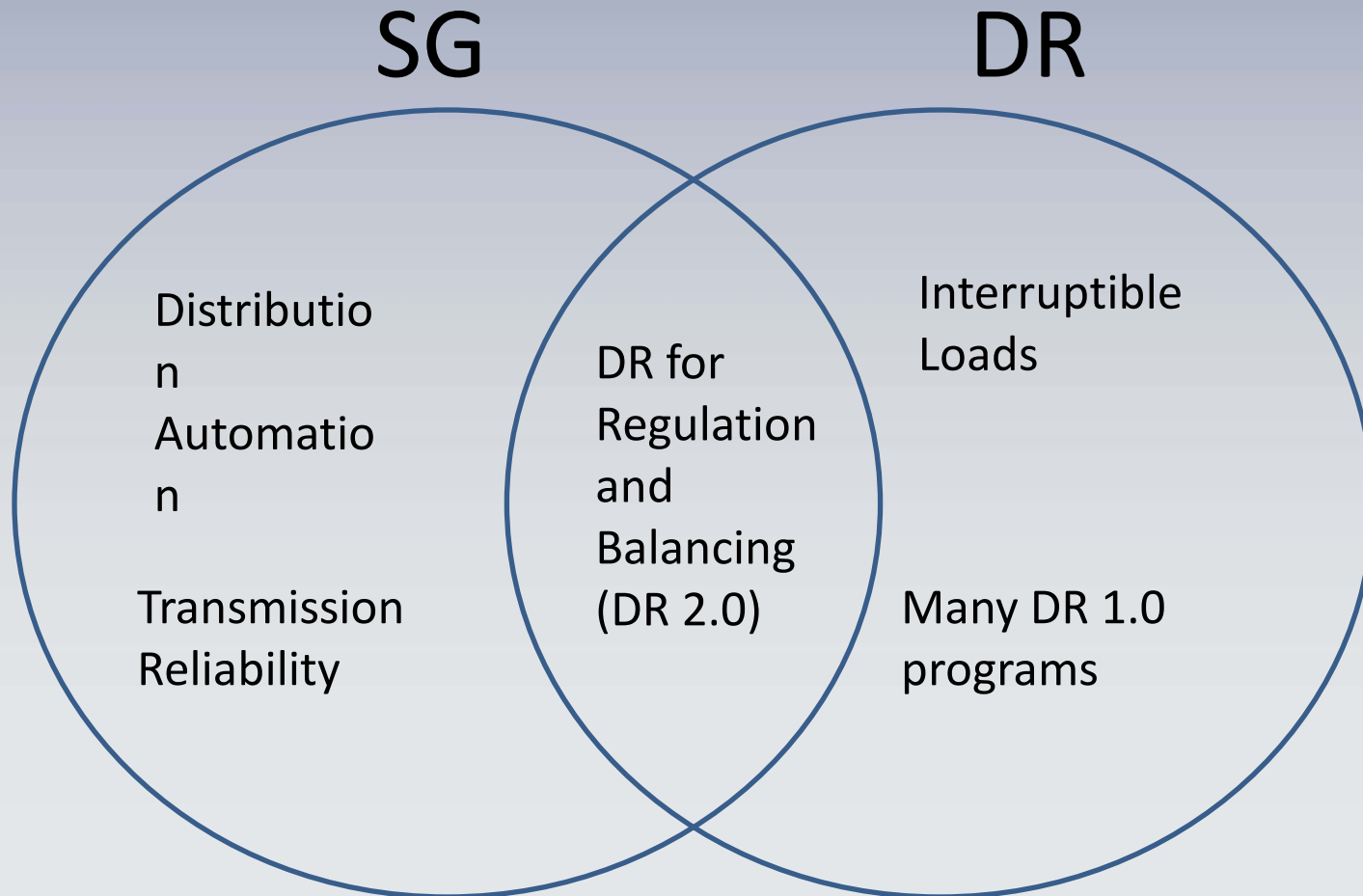
DR Elsewhere in U.S. - 2

- California
 - Budgeted \$454 million through 2014
 - ~3000 MW in 3 IOUs (~6% of summer peak)
 - “Emerging markets” pilots
 - Evaluation
 - Marketing
 - Incentives to participants ~ \$200 million more

Smart(er) Grid

- New and better sensors
- Better communication
- Better intelligence

SG Overlaps with DR - examples



SG can also make many DR programs cheaper

Smart Grid Projects in PNW

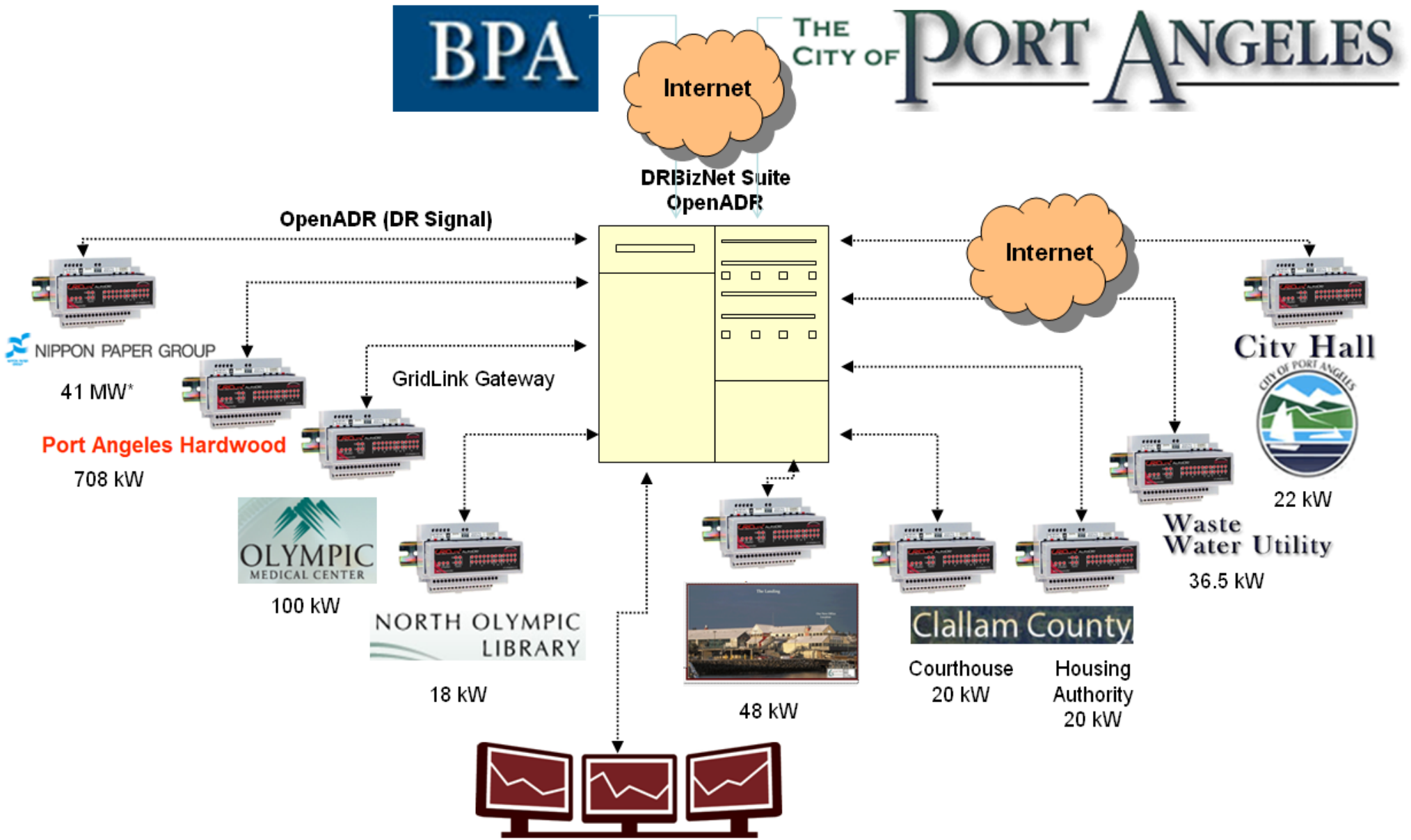
- **Smart Grid Demonstration Project**
 - Battelle/BPA \$178 million total budget
 - 12 utility partners, 5 technology partners
- **Smart Grid Investment Grants**
 - Avista, Central Lincoln Power, Idaho Power, Snohomish PUD, PNGC installing AMI and other equipment
- **PGE has installed 825,000 smart meters (finished in December 2011)**

Utilities: Summary of Scope of Work

(final SOW's being completed - April 2010)

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

BPA-COPA C&I Demand Response Pilot



SCADA Connected to All City Loads via Fiber Optic Network

*Includes INC/DEC Supplement