Status Report on Broadband Deployment by Electric and Gas Utilities in Oregon

A Report to the Oregon Broadband Advisory Council
from Oregon Public Utilities Commission Staff

9/14/2012

Status Report on Broadband Deployment by Utilities in Oregon

This report summarizes actions taken to date by electric and gas utilities with Oregon customers to deploy broadband in Oregon. We have focused on broadband uses related to controlling "mission-critical" functions that support monitoring and managing flows of energy from where they are produced to where they are consumed. We have excluded from this report broadband applications that are not considered mission-critical, such as, office email and customer service functions. Based on our literature search, it appears that the overwhelming majority of writing on broadband deployment and Smart Grid focus on the electric sector. As a result, this report also focuses primarily on the electric sector.

Section One introduces the topic of "Smart Grid" (SG) and the national policy objective of modernizing the electrical grid. Section Two addresses the need for Broadband in implementing SG. Section Three summarizes the information provided by the three investor-owned electric utilities (IOUs) with service areas in Oregon: Portland General Electric, PacifiCorp, and Idaho Power Company. Section Four summarizes the information for the customer-owned utilities (COUs) in Oregon. Section four focuses on broadband deployment by three local natural gas distribution utilities (LDCs) with Oregon customers: Northwest Natural Gas, Avista Corporation, and Cascade Natural Gas. Section Five provides an overview of Smart Meter deployment in Oregon currently and prospects for the future. It also touches on the topic of direct load control.

There are also four appendices. Appendix A contains a summary description of each of the three IOUs and a more detailed summary of their broadband capability. Appendix B contains additional information on broadband capability for each of the reporting COUs. Appendix C contains a summary description of each of the three natural gas LDCs and a more detailed summary of their broadband capability. Appendix D contains the spreadsheets used to calculate the summary statistics for smart meters used in Section Five of the document.

I. How is Smart Grid Defined?

There are many definitions of Smart Grid (SG). In Order 11-172, The Oregon Public Utilities Commission (OPUC) defined SG as follows: "Smart grid investments are utility investments in technology with two-way communication capability that will (I) improve the control and operation of the utility's transmission or distribution system, and (2) provide consumers information about their electricity use and its cost and enable them to respond to price signals from the utility either by using programmable appliances or by manually managing their energy use." [1] This definition was adopted for the purpose of defining the scope of SG investments that the electric utilities regulated by the OPUC must submit in accordance with Order 12-158.

There are other approaches to defining SG. For example, The National Institute of Standards and Technology (NIST), defines it as the "two-way flow of electricity and

[1] OPUC, "Staff Recommendation to Use Oregon Electricity Regulators Assistance Project Funds from the American Recovery and Reinvestment Act of 2009 to Develop Commission Smart Grid Objectives for 2010-2014." Order 11-172, May 25, 2011, p. 2.

information to create an automated, widely distributed energy delivery network."[2] This definition has elements in common with that adopted by the OPUC but is not as detailed. It appears that many of the definitions of SG in the literature define it either in terms of the goals of SG (e.g.: improve the control and operation of the utility's transmission or distribution system) and/or various SG activities or investments that SG supports (e.g.: provide consumers information about their electricity use and its cost).

As the SG Report suggests, goals for SG include:

- A more affordable electric system;
- Fewer environmental impacts;
- Better electrical power reliability;
- Maintain our global competitiveness;
- Improved integration of disbursed renewable resources with traditional central station energy resources;
- Increased customer control over the amount and timing of the electrical use.

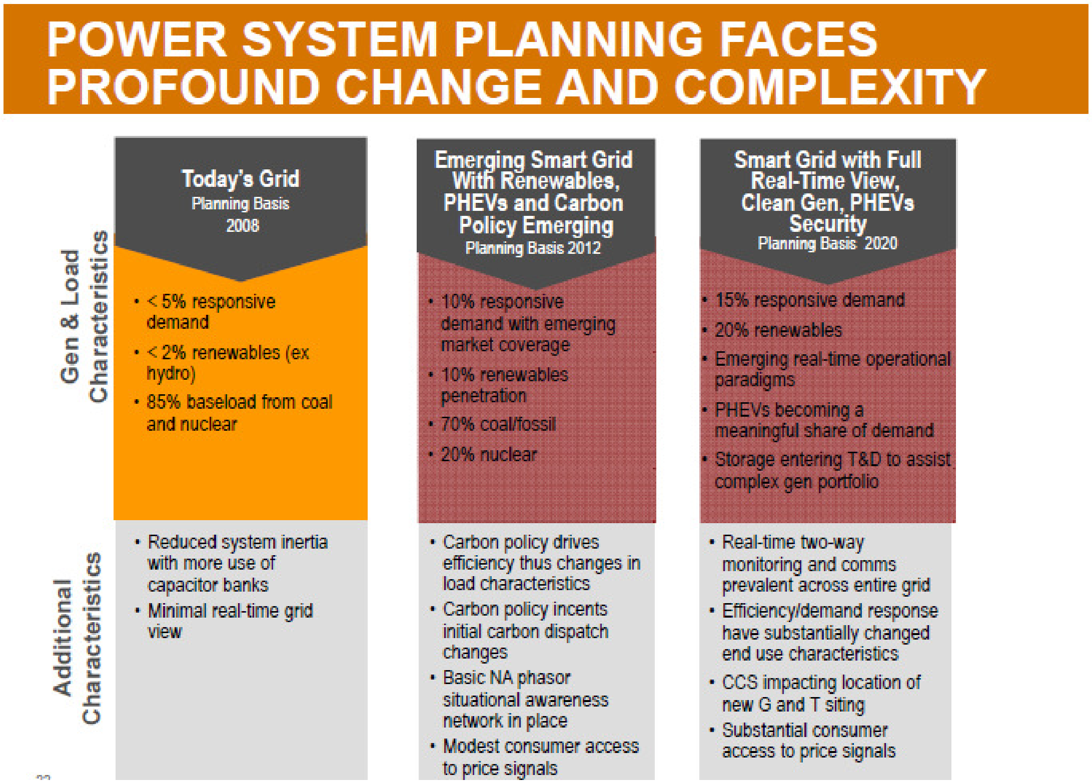
The country may have become complacent regarding the reliability of our electric system because outages occur infrequently. Yet as time passes, the electrical facilities used to deliver power have begun to lag behind the technological evolution in computing and communications. Sustaining the current level of system reliability is also threatened by the growing opposition to centralized power plants and opposition to transmission line additions. The SG Report indicates that "Since 1982, growth in peak demand for

[2] Elec. Power Res. Inst. (EPRI), Report to NIST on the Smart Grid Interoperability Standards Roadmap (2009), a*vailable at* http://www.nist.gov/smartgrid/InterimSmartGridRoadmapNISTRestructure.pdf

electricity […] has exceeded transmission growth by almost 25% every year. Yet spending on Research and Development – the first step toward innovation and renewal – is among the lowest of all industries."

One concise view of the significance of this transformation in how electricity is managed appears below.[3] As that diagram illustrates, moving to a fully implemented SG occurs in phases, which in this diagram is illustrated by two large steps, the first step being an emerging SG that some characterize as a smarter grid and then to a fully operational SG. In a fully operational SG world, renewable resources and efficiency improvements have replaced more traditional fossil/thermal generation, generation portfolios are more complex, and end-users have the potential to respond to electric prices and exercise greater control over their electric use.[4]

[3] Smart Grid, Context and Candidate Outcomes to Shape National Electric System Transformation, Presented at the Annual NARU meeting, November 2008, by Carl Imhoff, Pacific Northwest National Laboratory.
[4] It may also be useful to review the upcoming recommendations of the Oregon Global Warming Commission in their road map to 2020 project, and their futures statement contained in the 2050 vision of the electric and natural gas supply system.



Key policy makers have recognized the importance of modernizing the electrical grid. The Energy Independence and Security Act of 2007 (EISA) established SG as an objective of national policy. Further, the ARRA devoted $4.5 billion to accelerating standardization and deployment of SG. The Electric Power Research Institute (EPRI) estimates that the U.S. will spend $165 billion over the next 20 years building the SG.

SG promises a future grid that better coordinates disbursed electric generating sources, through transmission and distribution investments. As the SG Report indicates, "The move to a smarter grid promises to change the industry's entire business model and its relationship with all stakeholders, involving and affecting utilities, regulators, energy service providers, technology and automation vendors and all consumers of electric power."

II. Is Broadband necessary for Smart Grid?

In a word, yes. As noted above, SG will entail increased communication from all aspects of the electrical grid, from the generation of electricity to the consumption of electricity. The requirements for the speed of such communications are encompassed by Broadband. The Federal Communications Commission (FCC) has recognized this and holds that broadband is a necessary component of SG. According to the FCC, "Broadband service provides higher-speed of data transmission. It allows more content to be carried through the transmission "pipeline."[5]

Chapter 12 of the National Broadband Plan (Broadband Plan) focuses on Energy & the Environment. It begins by noting that "U.S. prosperity and national security, as well as the health of the planet, require a national transition to a low-carbon economy and reduced dependence on foreign oil."[6] The Broadband Plan also recommends the country should pursue three parallel paths. "First, existing commercial mobile networks should be hardened [7] to support mission-critical Smart Grid applications. Second, utilities should be able to share the public safety mobile broadband network for mission-critical

[5] The FCC's broadband plan is available at www.Broadband.gov.

[6] Ch 12 of the National Broadband Plan, Energy and the Environment. Pg. 1 of Ch. 12.

[7] In this context, the term 'hardened' means to make more secure.

communications. Third, utilities should be empowered to construct and operate their own mission-critical broadband networks."[8]

Chapter 12 sets out four goals focusing on Energy and the Environment. These are:

Goal One:	Modernize the electric grid with broadband, making it more reliable and efficient,
Goal Two:	Unleash energy innovation in homes by making energy data readily accessible to consumers,
Goal Three:	Improve the energy efficiency and environmental impact of the information and communication technology (ICT) sector,
Goal Four:	Transition to a safer, cleaner, and more efficient transportation sector.

The Broadband Plan contains specific recommendations under each of these four broad goals. For example, one recommendation for achieving Goal One is a call for the Federal Department of Energy to compile data on utilities current and projected communications requirements and the types of networks and communications they use.[9] This very report is an example of the type of data collection called for by this recommendation. Another recommendation is for states to reduce impediments and financial disincentives to using commercial service providers for smart grid communications.[10]

Another example of a recommendation for state action is under Goal Two, where it recommends that states should require electric utilities to provide consumers access to,

[8] Ibid., pg. 5 of Chapter 12.
[9] This appears as recommendation 12.6 on pg 6 of Chapter 12, Energy and the Environment.
[10] Ibid., Recommendation 12.2 on pg. 5 of Chapter 12.

and control of, their digital energy information, including real-time information from smart meters, historical consumption, price, and bill data over the Internet. If states fail to develop reasonable policies over the next 18 months, the Broadband Plan recommends that Congress should consider national legislation to address consumer privacy and the accessibility of energy data.[11] Two other recommendations under Goal Two are a call for every state PUC to require its IOUs to provide historical consumption, price and bill data over the internet in machine readable standardized formats.[12] It also calls for all IOUs to have implemented this capability by the end of 2011.[13] Furthermore, concerning the second goal of greater energy innovation at home through greater and timelier information to consumers, broadband is seen as helping inform consumers about their energy use – and its cost – and helping them have greater control over energy use.

Turning to the Goal Three, sustainable information and communications technology, the electricity infrastructure has not kept pace with technological improvements. In turn, this contributes to competitive and security risks. The Broadband Plan notes, "Our aging electrical grid is a patchwork of out-dated infrastructure. It's not just a system that delivers energy inefficiently -- the country's electric grid is increasingly vulnerable to failure and attack." Recommendation 12.11 is for the FCC to begin a proceeding to improve the energy efficiency and environmental impact of the communications

---

[11] Ibid., Recommendation 12.7, pg. 8 of Chapter 12.
[12] Ibid., pg. 9 of Chapter 12.
[13] Ibid.

industry.[14] In recommendation 12.12 it suggests that the federal government should take a leadership role in improving the energy efficiency of its data center.[15]

As for the fourth goal, chapter 12 of the Broadband Plan leads off by focusing squarely on the extent to which our high–carbon economy relies on fossil fuels and how broadband is a critical piece of a smart grid that helps move the U.S. to a low-carbon, more energy efficient, economy.

This FCC analysis identifies broadband as the connective tissue between various parts of a digitally integrated system which will include elements such as,

- Smart meters at both home and work locations that allow for two-way communication and can significantly expand end-user control of energy use;
- Outage management systems,
- Energy management systems,
- New sensing technologies, such as synchrophasors (equipment that monitors power flows very rapidly and assists in doing a better job of maintaining the grid).

There are many different levels of broadband as used or defined within the U.S. For example, the FCC defines broadband as 768 kilo-bits-per-second (kb/s) downstream and 256kb/s upstream. The greater the bandwidth (a higher Mb/s or kb/s number), the greater the information-carrying capacity and the faster data are transmitted. Sempra Energy has estimated that an SG will require "pervasive mobile coverage of at

[14] Ibid., p.10 of Chapter 12.
[15] Ibid.

least 100 kbps to all utility assets and customer locations."[16] Similarly, DTE Energy believes it will require connectivity of 200-500 kbps to support pole-mounted distribution devices.[17] Southern California Edison points out, "the history of new technology deployments shows that performance and bandwidth needs were underestimated at early stages."[18]

In the interests of promoting SG, the FCC has also embarked on coordinated efforts on Broadband as a part of the American Recovery and Reinvestment Act (ARRA) of 2009. The FCC views this effort as, "Working to make sure that America has world-leading high-speed broadband networks—both lies at the very core of the FCC's mission in the 21st Century."[19]

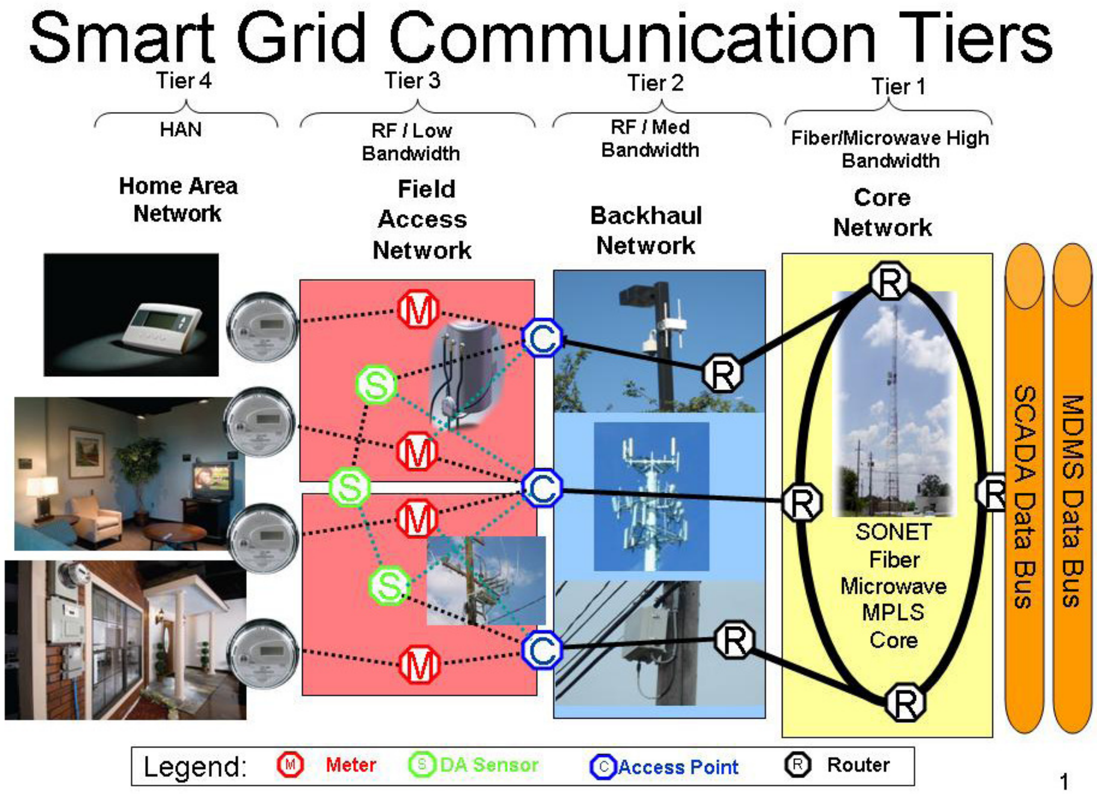
The following schematic illustrates where broadband fits in the communications scheme for Smart Grid deployment in the electric sector.[20]

[16] Sempra Comments in re NBP PN #2, filed Oct. 2, 2009, at 11.

[17] DTE Comments in re NBP PN #2, filed Oct. 2, 2009, at 14.

[18] Southern California Edison (SCE) Comments in re NBP PN #2, filed Oct. 2, 2009, at 14.
[19] Available at(http://www.broadband.gov/issues/energy-and-the-environment.html)

[20] Comments submitted by Excelon Corp. in reply to FDOE Request for Information – Implementing the National Broadband Plan by Studying the Communications Requirements of Electric Utilities to Inform Federal Smart Grid Policy, by Joseph Watson, Jr. Esq. Director Federal Government Affairs, Exelon Corporation, 101 Constitution Avenue, NW, Suite 400 East, Washington, DC 20001

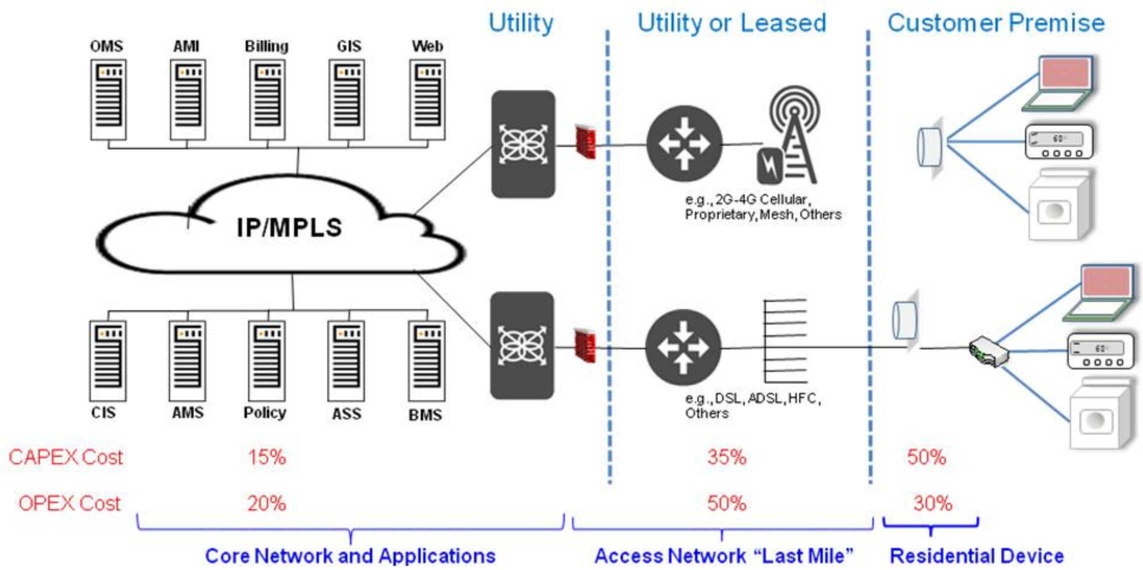


The last section of this report along with Appendices B, C, and D summarize broadband deployment by electric and gas utilities with customers in Oregon. These summaries reflect this same low-high bandwidth typology as is depicted in the above schematic.

As various jurisdictions and parties work to develop SG, that work ought to consider the cost of each segment of the SG communications network and how well it is able to accommodate future needs. For example, the following diagram[21] focuses on the residential sector and illustrates that the Core Network is the least cost and it's also thought to be the segment that is most amenable to re-configuration as future needs arise. As a result, this segment poses less financial risk than other segments of the

[21] Smart Grid System Communications Architecture for Residential Customers. See: http://www.energyauthority.net/smart-grid-%E2%80%93-system-communication-architecture-for-residential-customers/

network. In contrast, the Access Network accounts for about 35 percent of the capital cost and 50 percent of the operating costs, and the Residential level accounts



for about 50 percent of the capital cost and about 30 percent of the operating costs. The residential level will also be the most difficult and costly to change. One conclusion from this observation is that efforts to implement SG through new rules or guidelines ought to pay greater attention to the content of any such rules and guidelines for the residential level (Tier 4) than for the Core Network (Tier 1).

III. Status of Broadband Deployment among Electric Utilities Serving Oregon Customers

Staff of the Oregon Public Utility Commission (OPUC) with assistance from Dave Sabala of Douglas Electric Cooperative, developed and distributed a survey of broadband capabilities to all electric utilities serving Oregon customers. The three electric IOUs with Oregon customers are: Portland General Electric, PacifiCorp, and Idaho Power

Company. There also were 28 COUs in Oregon who replied to the broadband status information request.

Information on communications facilities is considered business sensitive information. As provided for under Oregon statute, the OPUC's broadband information request guaranteed confidentiality to respondents. To meet this confidentiality requirement, the next two sections summarize the responses first for the IOUs and then for the COUs. Appendix B and Appendix C contain a summary of the information received from each IOU and COU, respectively.[22]

A. *Status of Broadband Deployment among the IOUs Serving Oregon Customers*

All of the IOUs use broadband capabilities down into the 60-70 kb/s range for data transmissions that support infrastructure essential to sustaining power flows. One such use of communications down in that speed range includes data used to monitor sub-station status. (Please see the Smart-Grid Communication Tiers (Diagram) on page 9) This Diagram confirms the view that the Field Access Network (their Tier Three) is served by low bandwidth capabilities.

For each IOU, the utility- owned broadband capability is used for such actions as two-way radio communication, generation and/or transmission energy management, along with implementing and monitoring responses to power disturbances, inter-connections with other utilities, and security operations. The broadband capabilities range in data

[22] To meet its confidentiality requirements, the information contained in these two appendices is a summary of the more detailed information submitted by each utility.

rates as low as 12.35 Mb/s and as high as 155.52 Mb/s. Each utility also utilizes commercially owned facilities. These facilities provide data rates at 64 Kb/s.

B. Status of Broadband Deployment among the Consumer Owned Utilities (COUs) in Oregon

It appears there is more variation in broadband capabilities among the Oregon COUs. Some utilities rely solely on third-party providers for their high-speed broadband capabilities while others have large owned networks.

For some, broadband capabilities are used solely for remote meter reading. This is economically efficient for facilities that are quite remote and costly to visit on site. For others, it is also used for some substation monitoring via remote meter reading and SCADA controls. Some utilities have Advanced Metering Infra-structure (AMI) capabilities and others have none. At least three utilities own a subsidiary business that provides wholesale/retail broadband services in the county to medical, education, government, business and residences.

Several of the COUs are in the process of installing AMI capability. A number of them have at least some of their sub-stations wired for remote monitoring, and it appears that at least some of this monitoring is done at fairly high speeds of 1Mb/s – 1,000 Mb/s. Communications between the customer meters and sub-stations are at slower speeds in the 64 kb/s range.

IV. Broadband Deployment by the Three Natural Gas LDCs serving Oregon Customers

At this time, there is no broadband deployment among the three natural gas LDCs serving Oregon customers. One of them, Northwest Natural Gas, reports that they are examining its use for monitoring gas storage.

V. Smart Meter Roll-outs Among Oregon's Electric Utilities

This section addresses issues surrounding the fraction of Oregon's retail electric customers that are currently served by, along with plans for future deployments of a smart meter. This section also touches on utility plans for other enhancements in the current electric grid. This section has two sub-sections: Current Practice and Plans for the Future.

A. Current Practice

Digital meters have been, and are continuing to be, installed by utilities across Oregon. To date, about 55 percent of the approximately 1.8 million hook-ups across the state have a smart meter, which is slightly more than 1 million customers.

As was mentioned earlier in this report, the 41 electric utilities serving Oregon customers fall into one of two categories: three IOUs and 38 COUs. Turning first to the IOUs, of the approximately 1.4 million IOU customers, two IOUs have installed smart meters to serve about 60 percent (about 840,000) of the 1.4 million IOU customers. For the COU's, of the approximately 500,000 customers scattered across 38 utilities, about 41 percent of those customers have a smart meter, which is a little over 200,000 customers.

There are three different organizational forms within the group of 38 COUs. Twelve of the COUs have installed smart meters. Of these twelve, one is a People's Utility District (PUD), one is a municipal utility (Muni), and ten are co-operatives (Co-Op).

For the group of PUDs, 41 percent of their customers are served with a smart meter. A small percent, 2.7 percent, of the MUNI customers are served with a smart meter. Lastly, 79.5 percent of the Co-Op customers are served with a smart meter.

B. Plans for the Future

The table below presents survey results for a selected set of functions that can be supported using broadband. Looking at the row for Advanced Meter Infrastructure (AMI) which includes the subject of this section, Smart Meters,

Electric Utility Broadband Supported Functions

Function Support	Current Yes	Future Yes	Future Maybe
Load Interruption (e.g., direct load control)	6	8	12
Automated Distribution (e.g., fault detection and recovery)	9	11	12
Advanced Meter Infrastructure (AMI)	14	15	10
Supervisory Control & Data Acquisition (SCADA)	16	18	8
Customer Account Pre-pay	2	9	10
Energy Monitoring Web Portal and/or In Home Display	5	11	11
Control/Monitoring of Spinning Reserves	2	2	0
Control/Monitoring of Non-Spinning Reserves	2	2	1
Control/Monitoring of Regulation Service	3	4	2
Demand Bidding and Buyback	1	1	3
Time-of-Use Pricing	4	8	12
Critical Peak Pricing	0	2	15
Real-Time Pricing	0	2	12
Peak Time Rebate	0	2	12

Notes:

1. The sum for a row may be less than 41 (retail utilities serving Oregon customers) due to non-responses and/or deleting responses that fell into the ‘future no’ category. We feel this table more clearly represents the plans for additions/grid improvements in the future.
2. These numbers are based on responses to surveys sent to each of the 41 electric utilities with Oregon customers. The numbers may not add up to 41 for any row due to omissions.

14 utilities have it in place, 15 more utilities have definite plans for its future deployment, and 10 utilities are more uncertain about its future deployment. Considering the importance of AMI to support a variety of grid enhancements (e.g.,

two-way communications of usage and prices, expedite fault detection and repair, potential to support demand response programs), it is encouraging to see that a majority (about 80 percent) of the retail electric utilities in Oregon will be operating with AMI in the future.

Turning to Demand Response (DR), another emerging utility function that AMI supports is Direct Load Control (DLC). DLC is one form of DR that has historically been used by utilities in other regions of the country to manage peak usage. It generally involves the end-user agreeing to allow the utility to interrupt some or all of the end-users electric delivery for some specified period of time. There are usually limits on the number of interruptions that are allowed, and the utility typically must conform to a specific lead-time notice to the customer. DLC can either be automatic or provide for customer override. If it is automatic DLC, the customer has no ability to override the utility's signal to reduce usage. In the case where the customer has some ability to override the utility's signal, the customer typically is limited in the number of such overrides they may exercise without penalty. Whether the DLC is automatic or provides for some customer override, the customer receives a price cut on their deliveries. The customer usually also faces substantial penalties if they are found in violation of the agreement.

DR is a less well known in the Pacific Northwest and Oregon. Though, it is receiving increasing attention within both Oregon and the Pacific Northwest. One factor affecting its use here is that both Oregon and the Pacific Northwest have generally been more concerned with total energy use rather than peak use. Studies from other parts of the country has shown that DR has very little, if any, impact on total energy consumption; it's impact is on the timing of that consumption. Since Oregon's and the Pacific Northwest's electricity planning has historically been more focused on total energy use and less focused on peak usage because of the extensive hydro resources and the ability to purchase energy from California during the winter, DR has received less attention in planning and rate design. However, this is beginning to change as air conditioning becomes a larger amount of the utility's load.

On October 1, 2011, the Bonneville Power Administration (BPA) implemented tiered rates for its wholesale sales to COUs. BPA's tiered rates are designed to allocate the benefits of the existing federal power system and provide more direct price signals about the cost of the new resources to meet load growth. Embedded in BPA's Tier 1 rates are incremental peak demand charges that are about triple their historic cost to COUs on a per kW basis. It is believed this peak demand pricing signal has led to increased interest in DLC strategies by COUs. Presently, six COUs have DLC in place, eight more have plans to include it in the future, and another twelve are considering its adoption.

Finally, all three IOUs either have some form of DLC in place and/or in a pilot phase.

Appendix A

Summary of Broadband Capability for the Three Electric IOUs with Oregon Customers

Idaho Power Company

Idaho Power Company (IPC), with a staff of about 2,000, is headquartered in Boise and was formed in 1916, when five companies combined assets, including water rights and hydroelectric facilities on the Snake River.[23] While IPC's service territory is primarily in Idaho, it also extends into parts of Eastern Oregon including Ontario and outlying areas extending west to near Baker City, John Day, and Prairie City.

IPC has a broadband network of about 350 miles. Among the uses to which this system is put are two-way radio communication, generation and/or transmission energy management, along with implementing and monitoring responses to power disturbances, inter-connections with other utilities, security operations.

Within Oregon, IPC owned and operated facilities include microwave terminals, microwave repeaters, and transmission switching stations. The broadband capabilities range in data rates as low as 12.35 Mb/s and as high as 155.52 Mb/s...

IPC also utilizes commercially-owned telecommunications facilities. Idaho Power leases approximately 240 miles of broadband facilities for carrying automated metering infrastructure service and distribution substation energy management EMS. At least

[23] See: http://www.idahopower.com/AboutUs/CompanyInformation/default.cfm

some of their Oregon substations use leased communication facilities. Finally, there are no past or current efforts between BPA and IPC related to broadband deployment.

Function Support	Current	Future
Load Interruption (e.g., direct load control)	Y (1).	Y
Automated Distribution (e.g., fault detection)	N	N
Advance Meter Infrastructure (AMI)	Y (2).	Y
Supervisory Control and Data Acquisition SCADA)	Y	Y
Customer Account Pre-pay	N	N
Energy Monitoring Web Portal and/or In Home Display	N (3)	N
Control/Monitoring of Spinning Reserves	Y	Y
Control/Monitoring of Non-Spinning Reserves	Y	Y
Control/Monitoring of Regulation Service	Y	Y
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	N
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N
Other (Describe) Oregon Photovoltaic Pilot Program	Y (4)	Y

Notes:

1. Broadband technology is used in the Irrigation Peak Rewards Program.
2. Broadband technology is used for backhaul communication between the Company's substation data collectors and the utility enterprise network, but not to communicate with the individual meters or devices.
3. Idaho Power has a web portal that customers can access for energy monitoring purposes, but it does not broadcast this information to customers using broadband technology.
4. Broadband technology is used to retrieve meter reads and load profiles.

PacifiCorp

PacifiCorp (PP&L), headquartered in Portland, was formed in 1910.[24] PP&L serves approximately 555,000 customers in Oregon.[25] PacifiCorp also serves retail customers in the states of California, Idaho, Utah, Washington and Wyoming. PP&L's Oregon service territory includes sections of: Portland, the coast, Willamette Valley, as well as southern and eastern Oregon.

[24] PP&L is now owned by Berkshire Hathaway, which is headquartered in Omaha, Nebraska.
[25] See: http://www.pacificpower.net/about/cf/qf.html

Given PP&L's Oregon customer base, and its diverse service area, it has a rather extensive broadband network of which the vast majority is owned by PP&L. They also contract with third-party providers for networking into and out of their Portland control center.

PP&L has approximately 600 miles of broadband capability in Oregon related to sustaining power flows in Oregon. Among the uses to which this system is put are two-way radio communication, generation and/or transmission energy management, along with implementing and monitoring responses to power disturbances, inter-connections with other utilities, and security operations. Speeds range from a low of 1.2 kb/s to faster speeds of 64 kb/s and to 1,500 kb/s on the high end.

Function Support	Current	Future
Load Interruption (e.g, direct load control)	N	
Automated Distribution (e.g., fault detection)	N	Line equipment only
Advance Meter Infrastructure (AMI)	N	
Supervisory Control and Data Acquisition SCADA)	Y	
Customer Account Pre-pay	N	
Energy Monitoring Web Portal and/or In Home Display	N	
Control/Monitoring of Spinning Reserves	Y	
Control/Monitoring of Non-Spinning Reserves	Y	
Control/Monitoring of Regulation Service	Y	
Demand Bidding and Buyback	Y	
Time-of-Use Pricing	N	
Critical Peak Pricing	N	
Real-Time Pricing	N	
Peak Time Rebate	N	

Portland General Electric

Portland General Electric (PGE) first began providing electricity in 1889[26] PGE now serves over 800,000 customers within a 4,000 sq. mile service territory located across seven Oregon counties. PGE's service territory focuses on the Portland Metropolitan area as well as the Willamette Valley.

PGE owns and operates about 500 miles of broadband capability related to sustaining power flows within Oregon. This includes microwave capability as well as fiber capability. Most of the systems they use to monitor and control the power grid run at speeds below 1Mbps. Given the need for very low latency, high reliability and redundancy, data are transmitted over a fiber network. Data to and from retail meters are transmitted over a wireless network at very low speeds.

Function Support	Current	Future
Load Interruption (e.g, direct load control)	Y	
Automated Distribution (e.g., fault detection)	Y	
Advance Meter Infrastructure (AMI)	Y	
Supervisory Control and Data Acquisition SCADA)	Y	
Customer Account Pre-pay	N	M
Energy Monitoring Web Portal and/or In Home Display	N	M
Control/Monitoring of Spinning Reserves	Y	
Control/Monitoring of Non-Spinning Reserves	Y	
Control/Monitoring of Regulation Service	Y	
Demand Bidding and Buyback	N	M
Time-of-Use Pricing	N	M
Critical Peak Pricing	N	M
Real-Time Pricing	N	M
Peak Time Rebate	N	M

[26] See: http://www.portlandgeneral.com/our_company/pge_glance/quick_facts.aspx

PGE leases some circuits from local telecom companies and they have transfer speeds upwards of 1.5Bps. PGE has plans to install additional fiber to substations, new buildings, and new generation plants. Finally, their fiber network exceeds 200 miles.

Appendix B

Summary of Broadband Capability for Reporting Oregon COU's[27]

Ashland

They report that they have 5 mile of fiber backbone with over 100 miles of a coax network. In addition, the City of Ashland owns the Ashland Fiber Network and its hybrid fiber – coax (HFC) plant within the city. They are also interested in moving to Smart Meters. They plan to initiate fault indication to their distribution systems connecting through their fiber network.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	No	No
Automated Distribution (e.g., fault detection and recovery)	Yes	
Advance Meter Infrastructure (AMI)	No	Yes
Supervisory Control and Data Acquisition SCADA)	Yes	
Customer Account Pre-pay	No	No
Energy Monitoring Web Portal and/or In Home Display	No	Yes
Control/Monitoring of Spinning Reserves	No	No
Control/Monitoring of Non-Spinning Reserves	No	No
Control/Monitoring of Regulation Service	No	Yes
Demand Bidding and Buyback	No	No
Time-of-Use Pricing	No	Yes
Critical Peak Pricing	No	Yes
Real-Time Pricing	No	Yes
Peak Time Rebate	No	Yes

Blachly-Lane Co-operative

This utility reports they have no broadband nor any plans for it.

[27] Some COU's did not reply to OPUC's request for information. Other COU's have no broadband capability and are excluded from this summary.

Canby

This utility leases DSL capability for SCADA link between a substation and the Operations Center to monitor and control some distribution system and substation functions.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	N
Automated Distribution (e.g., fault detection and recovery)	N	M
Advance Meter Infrastructure (AMI)	N	M
Supervisory Control and Data Acquisition SCADA)	N	M
Customer Account Pre-pay	N	N
Energy Monitoring Web Portal and/or In Home Display	N	M
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	N
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N

Central

This utility uses a fiber network for some substation monitoring via SCADA. They currently are in the process of installing Advance Metering Infrastructure (AMI)/Smart Metering via an USDOE Smart Grid Grant through Pacific Northwest Generating Companies. They also have a subsidiary business that provides retail and wholesale broadband services in central Oregon to medical, education, government, and business.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	NO	MAYBE
Automated Distribution (e.g., fault detection and recovery)	NO	MAYBE
Advance Meter Infrastructure (AMI)	YES	
Supervisory Control and Data Acquisition SCADA)	YES	
Customer Account Pre-pay	NO	YES
Energy Monitoring Web Portal and/or In Home Display	YES	
Control/Monitoring of Spinning Reserves	NO	NO
Control/Monitoring of Non-Spinning Reserves	NO	NO
Control/Monitoring of Regulation Service	NO	NO
Demand Bidding and Buyback	NO	NON
Time-of-Use Pricing	NO	YES
Critical Peak Pricing	NO	MAYBE
Real-Time Pricing	NO	NO
Peak Time Rebate	NO	MAYBE

Central Lincoln PUD

This utility owns Fiber Optic for substation monitoring and control. They lease dark fiber to public and private entities. They lease dark fiber from BPA. They are in the process of installing an AMI/Smart Metering system. They plan to expand the fiber system to increase redundant connections and improve reliability for monitoring and control

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	Y	
Automated Distribution (e.g., fault detection and recovery)	Y	
Advance Meter Infrastructure (AMI)	Y	
Supervisory Control and Data Acquisition SCADA)	Y	
Customer Account Pre-pay		Maybe
Energy Monitoring Web Portal and/or In Home Display	Y	
Control/Monitoring of Spinning Reserves	N	
Control/Monitoring of Non-Spinning Reserves	N	
Control/Monitoring of Regulation Service	N	
Demand Bidding and Buyback	N	
Time-of-Use Pricing	Y	
Critical Peak Pricing		Maybe
Real-Time Pricing		Maybe
Peak Time Rebate		Maybe

City of Drain

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	No	Maybe
Automated Distribution (e.g., fault detection and recovery)	No	Maybe
Advance Meter Infrastructure (AMI)	No	Maybe
Supervisory Control and Data Acquisition SCADA)	No	Maybe
Customer Account Pre-pay	No	Maybe
Energy Monitoring Web Portal and/or In Home Display	No	Maybe
Control/Monitoring of Spinning Reserves	No	No
Control/Monitoring of Non-Spinning Reserves	No	No
Control/Monitoring of Regulation Service	No	No
Demand Bidding and Buyback	No	No
Time-of-Use Pricing	No	Maybe
Critical Peak Pricing	No	Maybe
Real-Time Pricing	No	Maybe
Peak Time Rebate	No	Maybe
Other (Describe)	No	Maybe

Columbia Basin

This utility relies on third-party fiber service using about 40 miles of fiber for their system AMI system that is currently being utilized for automatic meter reading.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Y
Automated Distribution (e.g., fault detection and recovery)	N	Maybe
Advance Meter Infrastructure (AMI)	Y	Y
Supervisory Control and Data Acquisition SCADA)	N	Maybe
Customer Account Pre-pay	N	Y
Energy Monitoring Web Portal/In Home Display	N	Y
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	Maybe
Time-of-Use Pricing	N	Y
Critical Peak Pricing	N	Y
Real-Time Pricing	N	Y
Peak Time Rebate	N	Maybe

Columbia Power Co-operative

This utility reports no broadband nor any plans to deploy it in the future.

Columbia River PUD

This utility reports no broadband nor any plans to deploy it in the future.

Consumers Power

This utility currently utilizes third-party high speed broadband for some substation monitoring via remote meter reading and SCADA controls. They are in the process of installing an AMI/Smart Metering system via an USDOE Smart Grid Grant through PNGC. They are currently involved in a year-long project to install fiber optic cable to connect several substations and a communications site which will provide additional bandwidth to support SCADA and cyber security communications.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	Y	Y
Automated Distribution (e.g., fault detection and recovery)	Y	Y
Advance Meter Infrastructure (AMI)	Y	Y
Supervisory Control and Data Acquisition SCADA)	Y	Y
Customer Account Pre-pay	N	Y
Energy Monitoring Web Portal and/or In Home Display	N	Y
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	Maybe
Critical Peak Pricing	N	Maybe
Real-Time Pricing	N	Maybe
Peak Time Rebate	N	Maybe

Coos Curry

They have an AMI system and system conditions information is delivered by a third-party

. **Function Support**	Currently	In the future
Load Interruption (e.g, direct load control)	N	N
Automated Distribution (e.g., fault detection and recovery)	N	N
Advance Meter Infrastructure (AMI)	Y	
Supervisory Control and Data Acquisition SCADA)	Data Acquisition only	
Customer Account Pre-pay	N	Y
Energy Monitoring Web Portal and/or In Home Display	N	Y
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	N
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N
Other (Describe)	N	N

Douglas

Douglas utilizes SCADA (data acquisition only), video surveillance, voice, and is installing an AMI/Smart Metering system via an USDOE Smart Grid Grant through PNGC. All substations and one low voltage delivery point are connected with Douglas Electric or Subsidiary owned (not third-party) fiber optics (440 miles). Between the meter and substation is PLC. Between their substations and command center is 100 mb/s point-to-point Wide Area Network (WAN) Ethernet. Two low voltage delivery points are connected via third party 20 mb/s Charter Ethernet. Most of this capability is in Douglas Co, with lesser amounts in both Coos and Lane counties.

Their subsidiary business provides retail and wholesale broadband services in Douglas County to medical, education, government, CLEC, ILEC, cable TV, business and residences.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Y
Automated Distribution (e.g., fault detection and recovery)	N	MAYBE
Advance Meter Infrastructure (AMI)	Y	Y
Supervisory Control and Data Acquisition SCADA)	Y	Y
Customer Account Pre-pay	N	Y
Energy Monitoring Web Portal and/or In Home Display	N	Y
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	Y	Y
Critical Peak Pricing	N	MAYBE
Real-Time Pricing	N	MAYBE
Peak Time Rebate	N	Y

Emerald PUD

This utility uses a Cannon power line carrier system that extends from the substations to the retail meters for their AMR system. Most of the substations have telephone service so that BPA can read its meters. These are plain old telephone service (POTS). They do not use leased lines or DSL. Phone lines are supplied by CenturyLink at all substations.

They also rely on wireless communication at the main office and most of the substations for the purpose of obtaining the AMR data. This is regular wireless service; no portion of this system is leased by or otherwise dedicated to Emerald PUD. Service is provided by Unwired West.

Emerald is in the process of installing a SCADA system. The communication system for this will be Verizon wireless modems (i.e.-Essentially the same thing as aircards, but in a different package). Due to the locations, they expect the speed to normally be 56k; a few sites may achieve the advertised maximum of 256k.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Maybe
Automated Distribution (e.g., fault detection and recovery)	N	Maybe
Advance Meter Infrastructure (AMI)	N	Maybe
Supervisory Control and Data Acquisition SCADA)	Y (Verizon)	
Customer Account Pre-pay	N	N
Energy Monitoring Web Portal and/or In Home Display	N	Maybe
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	N
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N
Other (Describe)	N	N

This utility is also undertaking two pilot programs for load management. Both programs involve installing controllable water heaters and/or thermostats in customer homes. One system will utilize pagers to communicate to receivers in the customer homes. This system will not be bidirectional. The paging service has not yet been selected. The second system is actually a Bonneville Power program. They will arrange to use the customer's broadband internet connection.

Eugene Water & Electric Board

This utility interconnects a majority of their substations and local generating facilities with approximately 100 miles of fiber-optics. This operational network is used for monitoring and control of electric substations and generating facilities; relay protection; radio backhaul; water system monitoring and control; and corporate network connectivity to remote facilities.   They plan to deploy some form of communications network to customer meters with future implementation of Advanced Metering Infrastructure in our service area

. **Function Support**	Currently	In the future
Load Interruption (e.g, direct load control)	N	Maybe
Automated Distribution (e.g., fault detection and recovery)	N	Y
Advance Meter Infrastructure (AMI)	N	Y
Supervisory Control and Data Acquisition SCADA)	Y	Y
Customer Account Pre-pay		Maybe
Energy Monitoring Web Portal and/or In Home Display	Y (Pilot)	Y
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	Y	Y
Demand Bidding and Buyback	N	Maybe
Time-of-Use Pricing	N	Y
Critical Peak Pricing	N	Maybe
Real-Time Pricing	N	Maybe
Peak Time Rebate	N	Maybe
Other (Describe)	Y - public agency data exchange	Maybe -commercial carrier data transport

<u>Forest Grove Power & Light</u>

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	N
Automated Distribution (e.g., fault detection and recovery)	N	N
Advance Meter Infrastructure (AMI)	N	Maybe
Supervisory Control and Data Acquisition SCADA)	N	Yes
Customer Account Pre-pay	N	Maybe
Energy Monitoring Web Portal and/or In Home Display	N	Maybe
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	Maybe
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	Maybe
Critical Peak Pricing	N	Maybe
Real-Time Pricing	N	Maybe
Peak Time Rebate	N	N

Harney Electric Co-operative

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	n	Maybe
Automated Distribution (e.g., fault detection and recovery)	n	Maybe
Advance Meter Infrastructure (AMI)	n	Maybe
Supervisory Control and Data Acquisition SCADA)	n	Maybe
Customer Account Pre-pay	n	Maybe

The reminder of the table is ‘no’ for both current and future.

Hermiston Energy

This utility has no broadband nor any future plans for broadband.

Hood River Electric Co-operative

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Maybe
Automated Distribution (e.g., fault detection and recovery)	N	Maybe
Advance Meter Infrastructure (AMI)	N	Maybe
Supervisory Control and Data Acquisition SCADA)	N	Maybe
Customer Account Pre-pay	N	N
Energy Monitoring Web Portal and/or In Home Display	N	Maybe
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	Maybe
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N
Other (Describe)	N	Maybe

Lane Electric

An AMI system is used for meter reading using narrow bandwidth power line carrier.

They also rely on third-party to transmit data for sub-station monitoring.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Maybe
Automated Distribution (e.g., fault detection and recovery)	Y	Y
Advance Meter Infrastructure (AMI)	Y	Y
Supervisory Control and Data Acquisition SCADA)	N	Maybe
Customer Account Pre-pay	Y	Y
Energy Monitoring Web Portal and/or In Home Display	Y	Y
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	Y	Y
Critical Peak Pricing	N	Maybe
Real-Time Pricing	N	N
Peak Time Rebate	N	Maybe

McMinnville

This utility owns a fiber optic network that links control to substation facilities. They plan to deploy fiber as their system expands.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	Y	Y
Automated Distribution (e.g., fault detection and recovery)	Y	Y
Advance Meter Infrastructure (AMI)	N	N
Supervisory Control and Data Acquisition SCADA)	Y	Y
Customer Account Pre-pay	N	N
Energy Monitoring Web Portal and/or In Home Display	N	N
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	N
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N

Midstate

This utility relies on communications to sub-stations at gigabit speeds for supervisory control. They rely on microwave, fiber and 900 MHz for substation, distribution and AMI communications. They have 20 miles of fiber along with microwave and radio system. They are planning additions in Fort Rock, Christmas Valley, and Klamath

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Maybe
Automated Distribution (e.g., fault detection and recovery)	Y- Own	
Advance Meter Infrastructure (AMI)	Y - Own	
Supervisory Control and Data Acquisition SCADA)	Y - Own	
Customer Account Pre-pay	Y	
Energy Monitoring Web Portal and/or In Home Display	Y – WEB	
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	N
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N
Other (Describe)	Dark fiber for Lease	

<u>Milton Freewater</u>

This utility owns fiber connecting their electric substations and SCADA system

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	Y	
Automated Distribution (e.g., fault detection and recovery)		Maybe
Advance Meter Infrastructure (AMI)	Y	
Supervisory Control and Data Acquisition SCADA)	Y	
Customer Account Pre-pay		Maybe
Energy Monitoring Web Portal and/or In Home Display		Maybe
Control/Monitoring of Spinning Reserves		N
Control/Monitoring of Non-Spinning Reserves		N
Control/Monitoring of Regulation Service		N
Demand Bidding and Buyback		N
Time-of-Use Pricing		Maybe
Critical Peak Pricing		Maybe
Real-Time Pricing		Maybe
Peak Time Rebate		N

Northern Wasco PUD

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	TBD
Automated Distribution (e.g., fault detection and recovery)	N	TBD
Advance Meter Infrastructure (AMI)	N	TBD
Supervisory Control and Data Acquisition SCADA)	N	TBD
Customer Account Pre-pay	N	TBD
Energy Monitoring Web Portal and/or In Home Display	N	TBD
Control/Monitoring of Spinning Reserves	N	TBD
Control/Monitoring of Non-Spinning Reserves	N	TBD
Control/Monitoring of Regulation Service	N	TBD
Demand Bidding and Buyback	N	TBD
Time-of-Use Pricing	N	TBD
Critical Peak Pricing	N	TBD
Real-Time Pricing	N	TBD
Peak Time Rebate	N	TBD

Oregon Trail

This utility uses a mix of fiber, modem, and unlicensed ratio frequency to support AMI functions. Most of this is owned system but some is also provided by a third-party.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	Y	
Automated Distribution (e.g., fault detection and recovery)	Y	
Advance Meter Infrastructure (AMI)	Y	
Supervisory Control and Data Acquisition SCADA)	Y	
Customer Account Pre-pay		M
Energy Monitoring Web Portal and/or In Home Display		M
Control/Monitoring of Spinning Reserves		N
Control/Monitoring of Non-Spinning Reserves		N
Control/Monitoring of Regulation Service		M
Demand Bidding and Buyback		N
Time-of-Use Pricing		M
Critical Peak Pricing		M
Real-Time Pricing		M
Peak Time Rebate		M

Salem Electric

This utility has installed fiber from substation to their headquarters for SCADA for purposes of control, communication and security of the substation. Their plan is to expand that system within the next several years.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	N
Automated Distribution (e.g., fault detection and recovery)	N	Maybe
Advance Meter Infrastructure (AMI)	N	Maybe
Supervisory Control and Data Acquisition SCADA)	N	Y
Customer Account Pre-pay	N	Maybe
Energy Monitoring Web Portal and/or In Home Display	N	Maybe
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	Maybe
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N
Other (Describe)	N	N

Springfield

They installed a fiber system with the intent to use it for certain internal functions: electric utility, water utility, and main office communications. We also lease dark fiber to third parties.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Maybe
Automated Distribution (e.g., fault detection and recovery)	N	Maybe
Advance Meter Infrastructure (AMI)	N	Maybe
Supervisory Control and Data Acquisition SCADA)	Y	Y
Customer Account Pre-pay	N	N
Energy Monitoring Web Portal and/or In Home Display	N	Maybe
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	Maybe
Critical Peak Pricing	N	Maybe
Real-Time Pricing	N	Maybe
Peak Time Rebate	N	Maybe

Other (Describe)	N	N

We do acquire broadband services, but do not lease broadband. Cyber security is continuously explored and physical separation of third party communications as well as redundant, self-healing paths are regularly evaluated.

Umatilla

This utility has installed AMI and Wireless connectivity to SCADA. They also rely on third-party systems for some applications. Their plan is to expand a fiber network for substation monitoring. They also have a subsidiary business that provides retail and wholesale broadband services in Umatilla and Morrow Counties to medical, education, government, business, and residential.

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	Probably
Automated Distribution (e.g., fault detection and recovery)	Beginning	Yes
Advance Meter Infrastructure (AMI)	Yes	Yes
Supervisory Control and Data Acquisition SCADA)	Emerging	Yes
Customer Account Pre-pay	N	Yes
Energy Monitoring Web Portal and/or In Home Display	No	Support
Control/Monitoring of Spinning Reserves	No	?
Control/Monitoring of Non-Spinning Reserves	No	Probably
Control/Monitoring of Regulation Service		
Demand Bidding and Buyback	No	Don't Know
Time-of-Use Pricing	Yes	Yes
Critical Peak Pricing	N	Probably
Real-Time Pricing	N	Maybe
Peak Time Rebate	N	Probably

Umpqua Indian Utility Co-operative

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	MAYBE
Automated Distribution (e.g., fault detection and recovery)	N	MAYBE
Advance Meter Infrastructure (AMI)	N	MAYBE
Supervisory Control and Data Acquisition SCADA)	N	N
Customer Account Pre-pay	N	N
Energy Monitoring Web Portal and/or In Home Display	N	N
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	MAYBE
Critical Peak Pricing	N	N
Real-Time Pricing	N	N
Peak Time Rebate	N	N

Wasco Electric Co-operative

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	M
Automated Distribution (e.g., fault detection and recovery)	N	N
Advance Meter Infrastructure (AMI)	N	M
Supervisory Control and Data Acquisition SCADA)	N	M
Customer Account Pre-pay	N	M
Energy Monitoring Web Portal and/or In Home Display	N	N
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	M
Critical Peak Pricing	N	M
Real-Time Pricing	N	M
Peak Time Rebate	N	M

West Oregon Electric Co-operative

Function Support	Currently	In the future
Load Interruption (e.g, direct load control)	N	N
Automated Distribution (e.g., fault detection and recovery)	N	N
Advance Meter Infrastructure (AMI)	Y	Y
Supervisory Control and Data Acquisition SCADA)	N	Maybe
Customer Account Pre-pay	N	Y
Energy Monitoring Web Portal and/or In Home Display	N	Maybe
Control/Monitoring of Spinning Reserves	N	N
Control/Monitoring of Non-Spinning Reserves	N	N
Control/Monitoring of Regulation Service	N	N
Demand Bidding and Buyback	N	N
Time-of-Use Pricing	N	Maybe
Critical Peak Pricing	N	Maybe
Real-Time Pricing	N	N
Peak Time Rebate	N	N

Appendix C

Summary of Broadband Capability for Natural Gas IOUs with Oregon Customers

Avista Utilities

This utility reports they have no owned or leased landline, DSL, fiber, or satellite broadband for purposes of system monitoring in Oregon. Their SCADA system is used solely for monitoring their system. They also use telemetry to send gas pressure information to their SCADA system. .

Cascade Natural Gas

Cascade does not own nor is it in the process of installing any Broadband capabilities at this time. Nor do they lease Broadband services at this time. Lastly, they have no plans to utilize Broadband services.

Northwest Natural Gas

This utility reports they have no owned or leased broadband for SCADA functions. They do rely on narrow band, 25 kHz or to monitor gas pressure, flow, temperature, odorant injection functions, gas quality and building security. NWNG is currently evaluating the deployment of private Ethernet to several gas storage facilities for more effective monitoring and remote controls. The narrow band capability is used to monitor gas pressure, flow, temperature, odorant injection functions, gas quality and building security. NWN does not reply on broadband to support any functions.

Appendix D

EXCEL Spreadsheets for Calculations in Section 5 of the Report

	AMI Penetration in Oregon - Smart Meters - All Electric Customers		
	Utility	Number of Customers	Number of Customers with Smart Meters/AMI
1	Ashland	11,390	
2	Bandon	3,761	
3	Canby	6,758	
4	Blachly-Lane Electric Co-op	3,617	
5	Cascade Locks	806	
6	Central Electric Co-op	31,173	31,173
7	Central Lincoln PUD	38,491	38,491
8	Clatskanie PUD	4,591	
9	Clearwater Power	154	154
10	Columbia Basin Electric Co-op	3,839	3,839
11	Columbia Power Electric Co-op	1,804	
12	Columbia River PUD	18,604	
13	Columbia REA	140	
14	Consumers Power	21,851	21,851
15	Coos-Curry Electric Co-op	17,425	17,425
16	Douglas Electric Co-op	9,717	9,717
17	Drain	686	
18	Emerald PUD	20,419	
19	EWEB	87,695	
20	Forest Grove	9,013	
21	Harney Electric Cooperative	2,378	
22	Hermiston Energy	5,316	
23	Hood River Electric Co-op	3,655	
24	Idaho Power	18,385	18,385
25	Lane Electric Co-op	12,748	12,748
26	McMinnville	17,708	
27	Midstate Electric Cooperative	18,200	18,200
28	Milton-Freewater	4,904	4,904
29	Monmouth	4,216	
30	Northern Wasco PUD	10,780	
31	Oregon Trail Electric Co-op	30,198	30,198
32	Pacific Power	558,721	
33	PGE	823,171	823,171
34	Salem Electric	18,545	
35	Springfield Utility Board	31,591	
36	Surprise Valley Electrification	1,749	
37	Tillamook PUD	20,545	
38	Umatilla Electric Co-op	14,084	14,084
39	Umpqua Indian Utility Co-op (est)	200	
40	Wasco Electric Co-op	4,610	
41	West Oregon Electric Co-op	4,315	
		1,897,953	1,044,340
	minus IOUs	501,453	205,619
	Percentage of electric customers with Smart Meters		55%
	w/o IOUs		41%
	Based on 2010 OPUC Statistical Report and Oregon Utility Broadband Survey, June, 2012		
	Note: Average numbers include completed AMI systems		
	and AMI systems under construction.		

	IOU Only			
	Total	Total		
	Customers	Smart Meters		
Idaho Powe	18,455	18,455		
Pacific Pow	557,779			
PGE	820,266	820,266		
Total	1,396,500	838,721		
Percentage of IOU custoemrs with Smart Meters				60.1%

	AMI Penetration of Smart Meters - ALL COU	Number of Customers	Number of Customers with Smart Meters/AMI
	Utility		
1	Ashland	11,056	
2	Bandon	3,735	
3	Canby	6,777	
4	Blachly-Lane Electric Co-op	3,615	
5	Cascade Locks	792	
6	Central Electric Co-op	31,068	31,068
7	Central Lincoln PUD	38,506	38,506
8	Clatskanie PUD	4,605	
9	Clearwater Power	157	157
10	Columbia Basin Electric Co-op	3,833	3,833
11	Columbia Power Electric Co-op	1,801	
12	Columbia River PUD	18,590	
13	Columbia REA	139	
14	Consumers Power	21,699	21,699
15	Coos-Curry Electric Co-op	17,393	17,393
16	Douglas Electric Co-op	9,704	9,704
17	Drain	704	
18	Emerald PUD	20,279	
19	EWEB	87,320	
20	Forest Grove	8,977	
21	Harney Electric Cooperative	2,347	
22	Hermiston Energy	5,263	
23	Hood River Electric Co-op	3,646	
24	Lane Electric Co-op	12,849	12,849
25	McMinnville	17,075	
26	Midstate Electric Cooperative	18,208	18,208
27	Milton-Freewater	4,899	4,899
28	Monmouth	4,161	
29	Northern Wasco PUD	10,756	
30	Oregon Trail Electric Co-op	29,981	29,981
31	Salem Electric	18,516	
32	Springfield Utility Board	31,502	
33	Surprise Valley Electrification	1,741	
34	Tillamook PUD	20,514	
35	Umatilla Electric Co-op	14,024	14,024
36	Umpqua Indian Utility Co-op (est)	200	
37	Wasco Electric Co-op	4,616	
38	West Oregon Electric Co-op	4,340	
		495,388	202,321
	Percentage of COU customers with Smart Meters		40.8%

	AMI Penetration of Smart Meters - Co Ops Only	Number of Customers	Number of Customers with Smart Meters/AMI
	Utility		
1	Blachly-Lane Electric Co-op	3,615	
2	Central Electric Co-op	31,068	31,068
3	Columbia REA	139	
4	Clearwater Power	157	157
5	Columbia Basin Electric Co-op	3,833	3,833
6	Columbia Power Electric Co-op	1,801	
7	CPI	21,699	21,699
8	Coos-Curry Electric Co-op	17,393	17,393
9	Douglas Electric Co-op	9,704	9,704
10	Harney Electric Cooperative	2,347	
11	Hood River Electric Co-op	3,646	
12	Lane Electric Co-op	12,849	12,849
13	Midstate Electric Cooperative	18,208	18,208
14	Oregon Trail Electric Co-op	29,981	29,981
15	Salem Electric	18,516	
16	Surprise Valley Electrification	1,741	
17	Umatilla Electric Co-op	14,024	14,024
18	Umpqua Indian Utility Co-op (est)	200	
19	Wasco Electric Co-op	4,616	
20	West Oregon Electric Co-op	4,340	
	Total	199,877	158,916
	Percentage of electric customers with Smart Meters		79.5%

	AMI Penetration of Smart Meters - MUNI Only		
			Number of
		Number of	Customers with
	Utility	Customers	Smart Meters/AMI
1	Ashland	11,056	
2	Bandon	3,735	
3	Canby	6,777	
4	Cascade Locks	792	
5	Drain	704	
6	EWEB	87,320	
7	Forest Grove	8,977	
8	Hermiston Energy	5,263	
9	McMinnville	17,075	
10	Milton-Freewater	4,899	4,899
11	Monmouth	4,161	
12	Springfield Utility Board	31,502	
	Total	182,261	4,899
	Percentage of electric customers with Smart Meters	2.7%	

	AMI Penetration of Smart Meters - PUD Only		
	Utility	Number of Customers	Number of Customers with Smart Meters/AMI
1	Central Lincoln PUD	38,506	38,506
2	Clatskanie PUD	4,605	
3	Columbia River PUD	18,590	
4	Emerald PUD	20,279	
5	Northern Wasco PUD	10,756	
6	Tillamook PUD	20,514	
	Totals	113,250	38,506
	Percentage of electric customers with Smart Meters	34.0%	