Smart Grid Northwest Comments on Draft 7th Power Plan

Smart Grid Northwest appreciates the opportunity to offer our comments and suggestions on the draft Seventh Power Plan. Our comments and recommendations are organized into four sections:

Keeping in mind the Council's objective of "assuring the region a safe, reliable, and economical power system with due regard for the environment" and the 20 year time horizon of the Plan, we believe that each of these four areas requires additional attention in the Seventh Power Plan.

Although we address each topic separately, we want to stress that for the purposes of the Council's planning process, it is useful to view most Demand Side Management (DSM) resources, including energy efficiency, demand response, distributed generation, dispatchable standby generation, smart inventers, and many forms of energy storage, from a systems perspective rather than in isolation.

This concept is known as Integrated Demand Side Management (IDSM). Many DSM resources offer multiple and synergistic benefits that can be better understood when their joint benefits and positive interactive effects are considered. Furthermore, a growing body of evidence indicates that many smart grid technologies can enable or enhance the benefits of both individual DSM measures and the synergistic benefits of integrated DSM efforts. In both cases, it appears that smart grid technologies do this by boosting DSM efforts in ways that make them more powerful, effective, and efficient.

Figure 1 provides a helpful way to categorize DSM tools and resources.

Figure 1: Suggested DSM Categories

Class 1	Fully dispatchable or scheduled firm capacity	Dispatched firm DR, Storage, DSG, CVR, dispatchable CHP
Class 2	Non-dispatchable, firm energy and capacity	Energy Efficiency measures, fixed load shifts, CHP, Solar
Class 3	Price-responsive energy and capacity	Time-varying rates (TOU, CPP, PTR, etc.) Higher savings with tech enablement (Smart Devices, Smart Home, etc.)

I. SMART GRID

When Congress developed and adopted the Northwest Power and Conservation Act, creating the Northwest Power and Conservation Council, it listed several key purposes of this legislation. Two of the primary purposes are:

- To encourage…conservation and efficiency and in the use of electric power, and
- To assure the Pacific Northwest of an adequate, efficient, and economical, and reliable power supply.

Various smart grid technologies can contribute in the region achieving both of these objectives and more. It is appropriate and timely to consider smart grid infrastructure solutions as part of the Council's Power Plan. For example, the careful deployment of smart grid technologies can help the Northwest power system achieve:

- Enhanced reliability and operational efficiencies;
- More flexible, economic, and efficient grid operations;
- Downward pressure on rates in the long-term;
- Reduced carbon emissions;
- Peak generation and capacity management;
- A more resilient power system;
- More effective customer education and engagement; and
- Increased customer service options and participation.

Most of these benefits have been demonstrated and discussed in numerous reports and articles, nationally and regionally. It is instructive to highlight just a few benefits that deserve further attention as the Council contemplates the role of smart grid in achieving the Council's objectives in the Northwest.

Peak generation and capacity management will be an increasingly important issue in the region. Consistent with the Northwest Power and Conservation Act's purposes, the Council and the region need to plan and develop an approach for better integration of renewable generation assets when electricity supply exceeds demand. Demand response, innovative approaches to storage, targeted energy efficiency and other smart grid assisted DSM tools can make important contributions to a successful peak generation and peak capacity management strategy.

Until recently, the Council and the region seemed to interpret the Act's focus on power system reliability to mean adequacy of generation. The Draft Plan correctly adds concerns about peak demand to the equation. However, the scope of power system reliability needs to be expanded even further.-The Council and the region need to explore how distributed generation, energy storage, microgrids, data analytics platforms and other DSM tools can help address grid and power system resiliency in the events of natural, or human caused disturbances.

As an example, a project is currently underway at Oregon State University (supported by the BPA) that investigates demand features in real time with Phasor Measurement Units. This feedback built from sparse, yet speedy measurements can be used to enhance visualization tools as well as direct signaling to microgrid controls. Resilient operation in islanded mode is increasingly critical for large, non-traditional loads such as university campuses within rural areas.

Many smart grid technologies can, as part of a cohesive modernized grid strategy, complement and optimize demand-side management tools and other energy resources - including energy efficiency, demand response, distributed generation, microgrids, dispatchable standby generation, and energy storage - more powerful, effective, and efficient.

Understanding for how various DSM options should be viewed from an interactive systems perspective is rapidly developing. The term often used for this systemic approach is Integrated Demand-Side Management (or IDSM). This integrated systems perspective considers the synergies among DSM options and explores the best ways to integrate them in ways that capture more of their joint benefits, and synergistic effects. Smart grid technologies play an important role in enhancing the effectiveness of individual DSM options, but they also play an important role in enhancing the synergistic benefits among DSM options.

IDSM objectives include increasing levels of cost-effective energy efficiency and controllable renewables integration (with smart inverters), lower energy prices, lower capital costs, improved reliability, lower system and network operations costs, enhanced air quality, reduced carbon emissions, and improved customer choice and control. Modern measurement and data analytics are enabling IDSM to become a reality. New evaluation, measurement and verification technologies support rigorous quantification of energy savings from traditional energy efficiency measures and provide significant cost-efficiencies for continuous monitoring of energy savings, as well as notifying customers via alerts when performance of EE measures stop working as installed. Modern measurement ties those savings to the grid, quantifies the savings in near real-time and allows grid operators to target energy efficiency savings to specific areas on the grid.

We encourage the Council staff to explore the relevance of IDSM for the Northwest region within this Draft Plan and if not within this Plan, to set clear direction for these objectives to be addressed as part of the Eighth Power Plan. (For more on IDSM, see, for example, an ACEEE paper by two of its initial advocates, the California Public Utilities Commission's Integrated Demand Side Management Fact Sheet, and the site for the CPUC's IDSM rulemaking efforts.)

The Northwest is recognized as a national and international leader in smart grid demonstrations and deployment. Many Northwest utilities were recipients of Federal Smart Grid Investment and Demonstration Grants and Northwest universities and community colleges received Smart Grid Workforce Training Grants to upgrade their curriculum for smart grid and clean energy options. The most significant of all federally funded projects was the Pacific Northwest Demonstration Project. Led by Battelle, it was the largest of the regional demonstration projects and involved BPA, 11 utilities in five Northwest states, multiple technology participants, universities, and 60,000 metered customers. Among the many important findings is the fact that transactive control works and has demonstrated the potential to provide many regional benefits.

Given the value of the past and current demonstration projects and the data available for analysis, it is disappointing that the Draft Plan included very little discussion of the smart grid, its benefits, and the next steps the region should take on the smart grid related solutions and infrastructure. This is particularly disappointing since the Sixth Power Plan, released almost six years ago, did introduce the smart grid and devoted an entire Appendix to what was known about it at the time. The Seventh Plan should be building on this research and capability.

Additionally regional utilities are working on smart grid solutions that have business drivers for their operations. Seattle City Light is going through a number of smart grid solutions to improve customer service by reducing costs, increasing reliability, continuing support for green energy, and designing a better operating power system. Seattle City Light has additionally completed distribution and substation automation projects and is now rolling out full advanced metering deployment over the next 3 years.

Advanced metering infrastructure (AMI) is a foundational component to maximizing the value of the smart grid, and it will enable the region to more cost-effectively attain the conservation goals outlined in the plan. The NY Reforming the Energy Vision (REV) proceeding is actively discussing AMI infrastructure and smart meters, specifically as they relate to a customer's ability to deploy and monetize distributed energy resources (DERs), and make intelligent grid choices. Functionality provided by AMI is seen as part of a Distributed Systems and Services Platform (DSP). NY utilities envision AMI and accompanying alterative rate designs as a way to "drive customer engagement, allowing all customers to evaluate their energy consumption and make informed energy decision based on their actual interval metering". The remarks go on to say "Their AMI proposals go further to detail how these investments will allow all customers to reduce their energy cost and help provide a distribution benefit by reducing demand and/or on-peak usage."

Currently the NW has mixed deployment for smart meters vs. other markets with Oregon ranking 13th (57% of total meters), Washington 43rd (5%), Idaho 9th (69%) and Montana 45th (3%) according to EIA.

The Council is in a prime position to define within the Plan what the highest value smart grid alternatives are and how the proliferation of smart grid technologies achieves the Council's goals. The Smart Grid Regional Business Case Navigant prepared for BPA, with input from the Council and other parties defines smart grid in a way that should be very useful for Council members and staff as they refine the Draft Plan. The Regional Business Case (RBC) defines smart grid technologies as those that use "two-way communication and automated intelligence to enhance the traditional electricity delivery system." We recommend the Council formally adopt this definition.

The RBC focuses on six smart grid categories:

- Transmission & Distribution (T&D Optimization);
- Grid Reliability;
- Dynamic and Responsive Demand (Smart DR);
- Smart End Use Energy Efficiency (Smart EE);
- Grid Storage Integration & Control; and
- Utility Operational Efficiency.

It reports a very promising business case for smart grid investments. The expected Net Present Value is $5.9 billion, with a low range net present value or $1.8 billion and a high of $9.7 billion. It also suggests that smart grid investments offer very low risk, with less than a 1 percent chance of a negative net present value.

One of the most important conclusions from the RBC is that the smart grid can provide more efficient, economical, and reliable delivery of electricity. Here are some of the examples discussed in the RBC:

- T&D Optimizations, such as Smart Voltage Reduction and related power factor controls that incorporate two-way communication and automatized intelligence, improve the value of electrical infrastructure assets and result in the more efficient delivery of electricity.
- Smart DR Programs can offer more flexible response to changing grid conditions and provide other enhanced benefits that traditional DR approaches cannot offer. These include better response rates, deeper curtailment, higher participation rates, and the use of DR for ancillary services that require more advanced communication and control capabilities than what traditional DR can address.
- The RBC defines smart energy efficiency (EE) as smart grid capabilities that use two-way communication and a way to deliver energy consumption feedback to customers. The RBC notes that Smart EE complements and supports but does not replace traditional energy efficiency, for which the Northwest is (and should continue to be) a global leader. Smart grid technologies can enhance the economics and effectiveness of existing EE programs and provide additional benefits at little additional cost. Examples noted by the RBC include real time customer feedback, increased

participation rates, optimal operation of end-use loads, and the use of EE to diagnose poorly performing equipment that requires maintenance or replacement.

Not all smart grid technologies involve close interface with end-use customers. For example, the RBC explores grid reliability capabilities that reduce the likelihood, duration, or geographic extent of electricity service interruption and maintain or improve the quality of delivered power. These examples include fault location, isolation, and service restoration, enhanced fault prevention, and wide-area monitoring. The report also discusses the significant role that Phasor Measurement Units (PMU's), very precise sensors that communicate grid measurements from across the transmission system. PSU's (also known as Synchrophasors) offer a much better indication of grid stress than traditional methods and can be used to identify and trigger quick corrective actions that maintain grid reliability. They can also support:

- Dynamic Capacity Assessments that will increase the effective capacity of congested transmission lines and lower energy costs;
- Renewable Energy Monitoring and Integration by increasing real time awareness of grid stability concerns and reducing the need for operational reserves to support renewables integration;
- Wide-Area Monitoring and control that reduces the frequency of high-duration and widespread outages stemming from instabilities in the bulk power grid.
- Intelligent Line Switching that reduces distribution system outage times and improves utility System Average Interruption Duration Index (SAIDI) which is commonly used as a reliability indicator by electric power utilities. These systems move towards a "self-healing grid" a major benefit to the region.

Smart Grid Northwest encourages the Council to draw on these and other examples to demonstrate how the smart grid can help the region meet some of its most important objectives, including those presented in the Northwest Power and Conservation Act.

Other resources the Council might find useful include the Pacific Northwest Smart Grid Demonstration Program noted earlier; EQL Energy's report to the Western Interstate Energy Board and the State-Provincial Steering Committee Emerging called *Changes in Electric Distribution Systems in Western States and Provinces*; Seattle City Light's Advanced Meter White Paper; and the final report from the team of Portland State University graduate and professional development students involved in PSU's most recent course *Designing the Smart Grid for Sustainable Communities*. That report, which was requested by the Council staff, is *titled Smart Grid Technology Assessment and Recommendation for the Northwest Power and Conservation Council and Other Interested Parties*.

We have the following additional recommendations related to smart grid:

1. While we support the creation of a Demand Response Advisory Committee (Coun-1), we recommend the committee's scope be expanded to include such closely related topics involving distributed generation, energy storage, dispatchable standby generation, microgrids, advanced metering, smart inverters, smart thermostats, transactive energy, and other DSM and smart grid technologies that are likely to involve significant end-use customer interaction. As we note below in our comments on Demand Response, if the Council agrees to adopt our broader definition of DR, we are comfortable with the suggested title Demand Response Advisory Committee. However, if the Council chooses to stay with the more narrow definition provided in the Draft Plan, we recommend that the name of the committee be revised and expanded to the Demand Side Management Committee or, better still, Integrated Demand Side Management Committee.
2. The Pacific Northwest Demand Response Project (PNDRP) should be continued, but it should also provide an opportunity to explore other technologies such as those discussed above. Frankly, PNDRP already does this to a certain extent so we are simply suggesting that this be formalized. We do not want DR to lose its existing focus. Smart Grid Northwest is willing to help support the PNDRP meetings if Council is interested in such support.
3. The Draft Action Plan should also recommend a review of resources, responsibilities and tools that Council staff and other regional agencies will need to consider so that smart grid and IDSM related strategies and solutions that can be identified, tracked, and tailored to the Northwest's unique energy profile and context. This information should be helpful when the Council begins to consider its Eighth Power and Conservation Plan.
4. The Draft Action Plan should recommend increasing investment for AMI in the entire region and scaling existing efforts around smart grid demonstrations. Interval data will enable the utilities to: improve the measurement and verification of energy efficiency savings, continuously monitor energy savings in near real-time, and support smart T&D planning alongside DER placement on the grid. Investing in a smart grid, and AMI will also allow the Council to make data driven public policy decisions, based on actual consumption data, in their planning efforts on the Eight Power Plan.
5. The Transmission section of the Action Plan should continue to identify and support the benefits of "non-wires solutions" as a serious alternative whenever it appears viable.

II. DEMAND RESPONSE / DEMAND SIDE MANAGEMENT

Smart Grid Northwest is pleased with the high level of interest in the significant role that Demand Response (DR) can play as a least cost resource in the Draft Seventh

Power Plan. The Fifth Plan introduced the concept, while the Sixth Plan took some important steps by outlining possible pricing and programs options and offering an initial estimate of 2,000 megawatts of DR that might be available in the region over that 20-year planning period. In contrast, the Draft Seventh Plan emphasizes the role DR can play as a capacity resource. The Draft Resource Strategy identifies more than 4,300 megawatts of DR potential, and suggests a significant portion, over 1,500 megawatts, could be available at relatively low cost.

As the Draft Plan indicates, by reducing both winter and the summer peak, DR can defer both the need to build generating resources that provide peaking capacity as well as the need to build portions of new transmission and distribution resources. In addition, the Draft Plan notes that some DR resources can do much more than help meet peak load. They can provide a flexible response to changing grid conditions and offer important ancillary services such as contingency reserves, regulation, and load following. These services will become increasingly important as the region outgrows the capacity that has traditionally been provided by the region's hydro system and some natural gas fired peaking plants. In addition, DR can enable customers to take advantage of low-cost energy at times of high renewable energy production for activities such as EV charging or energy storage.

Areas We Support for DR Content in Draft Plan

First, we applaud the call for rapid expansion of the region's DR infrastructure (RES-4). We agree that this expansion should focus on both winter and summer peaks, depending on the each utility's particular situation. And we agree that Bonneville, individual utilities, and the region as a whole need to develop a sense of urgency to test, refine, and verify the reliability of DR programs. It takes time, creativity, and commitment to ensure that DR programs can be relied upon to provide the value contemplated by the investments in DR protocols.

Many Northwest utilities, including BPA and others ranging from Milton-Freewater and Kootenai Electric Cooperative, to the Eugene Water and Electric Board and Seattle City Light, and from to PacifiCorp to the Idaho Power Company, have demonstrated that DR programs can be effective and cost-competitive. There is a mature market of over 30,000MW of demand response relied upon for capacity throughout the US. This experience can be leveraged in the Northwest.

Second, we agree that thoughtful and innovative regional market transformation efforts will be critical to the success of DR (RES-4 and elements of REG-2). NEEA has demonstrated an ability to partner and collaborate with BPA, receptive utilities, the Energy Trust of Oregon, manufacturers, and other parties to lower the cost and increase the market penetration of many energy efficiency products. If NEEA can play an equally important role in advancing new DR products in collaboration with BPA and its utility partners, as the Plan suggests, that will be key to the success of new and innovative DR programs. This will require requisite funding and partnership support from other parties. Smart Grid Northwest is committed to play the appropriate role to support such a partnership.

Third, the process of developing the Seventh Power Plan has highlighted the need for improvement in DR data capture as well as better access to that data (BPA-4). The datasets Navigant and the Council staff used to assess DR program potential need to be updated and more robust. The lack of robust and contemporary regional data is a weakness to fully developing DR scenarios and options as part of the Council's analysis. Additionally, concerns of privacy need to be addressed so DR data is accessible and available for planning, monitoring and tracking purposes.

Fourth, we appreciate the need for the Council to form a Demand Response Advisory Committee (COUN-1). While the Pacific Northwest Demand Response Project (PNDRP) has played an important role in the past and should continue as a valuable informational forum, it has not attempted to serve as a formal advisory committee. If the Council decides to adopt a broader definition of DR the committee might be better positioned to be title the Integrated Demand Side Management Committee (IDSMC).

The name and charter should reflect the relevant technologies and approaches that are closely related and should be approached from an integrated systems perspective that identifies the potential synergies, joint benefits, and positive interactive effects among DSM options and other least-cost options.

Opportunities for Improvement on Demand Response in the Draft Plan

We urge the Council and the region to adopt a broader view of and role for DR than the one identified in the Draft Plan: "…a voluntary and temporary change in consumers' use of electricity when the power system is stressed" (Draft Plan at 14-2).

Although the Council's description is consistent with many narrower and more traditional definitions, industry leaders exploring the full value of DR are moving toward a broader, more robust definition that recognizes the ability for actions on the customer side of the meter to become a full, or at least fuller partner in the power system.

We recommend that the Seventh Power Plan adopt a broader definition that draws on FERC's definition provided in the Congressionally-mandated *National Action Plan on Demand Response*, but also adds key language from the Northwest Power and Conservation Act to provide the appropriate "Northwest context and flavor":

Demand response refers to beneficial grid operational changes to consumers' normal electric consumption patterns in response to a time sensitive signal, (reliability or price), designed to increase, decrease or time shift the consumption of electric energy.

It includes consumer controlled or automated systems via actions that can change any part of the load profile of a utility or region at any designated time including the period of peak usage. To be successful, Demand Response should be done in a manner that contributes to an adequate, efficient, economical, and reliable power system.

Under the broader definition, DR is not relegated to times when the power system is under stress. It opens the door to actions that reduce power system costs and enhances system efficiency throughout the year and at any given instance a beneficial change may be needed. It complements the effective use of controllable distributed resources and other Demand Side Management options that can contribute to reliability by enhancing power system resiliency with the help of storage, smart inverters, and microgrids. It anticipates coordinated actions between bulk power systems and distributed resources that can provide enhanced power system flexibility and grid stability, including new ways to provide additional ancillary services such as contingency reserves, regulation, and load following.

It further enhances efforts to integrate and provide the full value of intermittent renewable resources economically and efficiently. And it offers more effective and politically acceptable ways to respond to future oversupply events.

In short, this broader view of DR helps to direct the region to valuable opportunities that might otherwise be overlooked and under optimized by bringing the DR discussion closer to the more inclusive integrated demand-side management, discussed in our smart grid comments.

The Draft Plan gives serious consideration to only one of DR's significant benefits. Chapter 2 of the Draft Plan, which discusses the State of the Northwest Power System, explains that the large increase in wind generation means that utilities must hold more resources in reserve to help balance demand minute-to-minute. It also notes that the region is outgrowing the capacity and flexibility benefits that have historically been provided by the region's hydro system and traditional fossil fuel-based plants, some of which are now scheduled for retirement. Consequently, both capacity and system flexibility have become increasingly important issues for the region.

The introduction to Chapter 14 on Demand Response begins by building on this theme. It observes that DR has the potential to provide significant value to the region in a variety of ways over and above the traditional benefit of reducing peak load. It then highlights the ancillary services benefits DR can offer. Unfortunately, this discussion is followed by the statement: "*In the Seventh Power Plan, the Council focuses primarily on DR that reduces peak load, and even more specifically, DR that defers the build of generating resources and new transmission resources.*" DR's ability to help reduce both winter and summer peaks is important, but to undervalue DR's other benefits, including its contributions to load shaping and renewables integration, is short-sighted and misleading.

Smart Grid Northwest encourages the Council to ensure DR programs are deployed among all customer classes. While commercial and industrial ("C&I") DR programs are the "low-hanging fruit" of the DR world, residential customers represent a significant source of potential demand reduction particularly in the Northwest. FERC's *National Assessment of Demand Response Potential* found the growth of residential peak demand outstrips that of C&I in all four Northwest Power and Conservation Council States. Addressing residential customers will therefore be key in ensuring the Northwest meets not only its demand reduction potential, but also leverages other key benefits of DR outlined herein. These latter benefits are an important facet of demand response and can be maximized by ensuring residential customers are able to participate.

The Draft Plan does not recognize the other DR benefits and contributions to the power system, therefor some DR resources such as those placed in Bins 3 and 4 appear to be significantly undervalued. The Draft Plan evaluates the cost-effectiveness of DR resources as the full "Enablement Costs" (the costs of purchasing and installing each measure divided by the "standard load reduction") and the full "Implementation Cost" (the costs to marketing the DR program, research new DR opportunities, pay support staff, and pay customers capacity reserve incentives). This methodology may be under-representing DRs cost-effective expansion since it fails to account for investments that customers will be taking (and paying for themselves) to be DR capable or ready. Here are two examples, reported by two of member organizations that illustrate this point.

- Portland General Electric is exploring the EE and DR benefits of "smart" or "learning" thermostats such as those developed by Nest. PGE reports considerable consumer interest and significant early penetration rates prior to developing and launching a specific program. Customers report a wide range of benefits, including convenience and comfort that are over and above any specific EE cost savings and DR benefits. However, since it appears the Draft Plan only considers the thermostat's contribution to peak load reduction, this device falls in the least cost-effective Bin 4.
- Portland State University has been exploring the installation of an intelligent lighting control system with independent sensors that provide pinpoint control, such as the "Enlighted Intelligent Lighting Control System." This system allows for pinpoint dimming of individual lights and could serve as a viable DR resource by controlled dimming non-critical lighting at appropriate times, and with appropriate signals. University planners recognize that potential DR benefits could be combined with the EE benefits and cost savings that would come with a substantially more energy efficient lighting system, and that this could justify the installation of cost-effective lighting controls in more buildings.

Smart Grid Northwest encourages the Council to give further consideration to price responsive DR. The introduction to the Draft Plan's DR chapter explains that the primary need for DR arises from the "mismatch between power system costs and consumers' prices." It continues: *While power system costs vary widely from hour to* *hour as demand and supply circumstances change, consumers generally see prices that change very little in the short term. The result of this mismatch is that consumers do not have the information that might incent them to curb consumption at high-cost times and/or shift consumption to low-cost times.*

The Draft Plan may correctly assert, "*the region does not yet appear to be ready for general adoption of these pricing structures.*" DR is still new to the Northwest, and the region has only recently begun to take DR more seriously as a resource. However, the Council should encourage BPA and the utilities to consider DR "Early Adopter" programs that build on new and existing pilot efforts. Some of these programs should explore and test alternative ways to incorporate price or incentive signals. Specifically the Council should add an additional item to the Action Plan that encourages BPA and the region to take a careful look at the Early Adopter efforts of utilities and local governments that participated in the Early Adopter program for the Model Conservation Standards to see if useful lessons could be learned from those efforts that could be relevant here.

Much of the region's long-term DR potential will be unlocked with the presence of price and incentive signals, smart appliances, and by behavioral changes that are facilitated by effective price signals. Consequently, we also urge the Council to conduct a more comprehensive regional assessment of DR that includes price responsive DR as it pertains to facilitating least cost planning and the establishment of DR targets for the next plan.

III. DISTRIBUTED ENERGY RESOURCES

The Seventh Power Plan should take into consideration distributed energy resources (DERs), including a forecasted penetration potential over the next 20 years. Further, the Plan should include the impact DER will have on the regional energy system along with key value drivers for these resources. This can enable more thoughtful planning and improve the ability to address issues such as integration and changes in resource mix more effectively than some of the other regions in the U.S. (most prominently Hawaii).

Declining prices driving keen customer interest and investment, increasing technological breakthroughs, and other forces in the market are advancing distributed energy resources at a rapid pace.

Distributed Energy Resources (DER) refers to a beneficial grid coordinated combination of distributed generation (DG) and the broad definition of demand response (DR).

From solar and storage on the generation side (DG) to connected thermostats and controllable appliances (the aforementioned DR solutions), Smart Grid Northwest believes that distributed energy resources will be pervasive in the Northwest over the next 20 years and that these resources, provided they are planned for and effectively integrated, can be useful assets both to the owners of those assets (consumers, companies non-profit or government agencies) as well as for the energy grid overall and for the utilities that manage the grid.

While the draft plan does make mention of solar and storage (largely in areas relating to future energy solutions) it would be useful for the region to have a better estimate - led by the Council - as to the likely amount of total distributed energy resources that could be online over the next 20 year period. Various regional entities have taken on work to understand the possible/likely impact of DERs to their systems. At this early stage it could be easy to underestimate the growth of DERs. For example PGE estimated that as much as 233 MW of distributed solar could be installed on their system over the next 20 years - and commercial client adoption of lithium ion batteries would be 26-52 MW.

In order to ensure that investment in and development of DER resources actually materializes, grows and is stable, resources must be included in distribution and transmission resource planning, and they must be reflected in forecasts of load growth and resulting resource needs.

Recognizing the coordinated, controlled and interoperable impact of DER's on grid planning and reliability is a relatively new phenomenon, but states and certainly utilities are beginning to implement processes to address this issue. For example, New York is tackling this issue, with DER integration at the heart of its Reforming Energy Vision (REV) proceedings. In the New York REV whitepaper this year, PSC staff concluded that, "targeted demand management programs help reduce customer peak demand for electricity and avoid costs associated with transmission and distribution infrastructure investment."

Additionally, integrated management/control solutions should be sought to fully realized DER benefits. This may include development of DER management systems (DERMS), expanding SCADA operations to DER, or to developing transactive energy systems.

To realize this emerging trend of integrated grid system management from generation to load, the Council needs to encourage and support Interoperability among grid devices from the bulk power level to end-user homes. DER development without improved Plug & Play interoperability will limit competition, cause increased costs for utilities, and their customers, and ultimately restrict development of innovative products and services related to DER.

With Plug & Play maturity, comes the concept of "interchangeability" between devices. Interchangeability allows DER devices and distribution equipment to be swapped out to other vendor devices without having to undergo a major re-engineering project. This is driven from the interfaces, communications, security and other functions that have all been coordinated between vendors and devices. Interchangeability allows utilities to purchase lower cost products with many vendor choices and allows easier market entry for new vendors – lowering the cost for utility customers.

For all these reasons, the Council should become knowledgeable and encourage support for Plug & Play standards throughout their planning organization and processes.

We have the following additional recommendations related to distributed energy resources:

Smart Grid Northwest commends the inclusion of RES-5 in regard to market transformation to look for ways to bring greater demand response solutions into the Northwest's energy resource management. Note our further comments on demand response and transactive energy.

Smart Grid Northwest also extends comments on the action plan items that will improve forecasting loads for emerging regional markets (ANALYS-2); monitor and track progress of emerging energy technologies (ANALYS-13); and the creation of a white paper on the value of energy storage (ANALYS-15). Smart Grid Northwest supports these actions as positive steps in the direction of the Council and the region to better understanding DERs.

The following are for consideration to be added to ANALYS-13:

- Either add another action item before/after ANALYS-13 related to tracking developments for demand side resources, OR add those technologies to the current list, including: Connected and responsive appliances (such as hot water heaters, refrigerators, or dish washers), controllable and responsive home thermostats, controllable and responsive building energy management systems, variable lighting systems, variable HVAC systems, etc.
- For the list of generation sources a more comprehensive list of distributed resources that includes fuel cells and micro-hydro.

IV. TRANSACTIVE ENERGY

The Seventh Power Plan would benefit by addressing an emerging technology called transactive energy. Coordinated use of resources across the electric energy system, from production, delivery, and end-use can result in efficiency benefits under normal operation, and contribute to stable and resilient performance under stressed conditions. The advancement of information and communications technology is opening avenues to engage resources across the energy value chain and inspiring innovative business ideas to access these benefits.

Grid modernization, smart cities, and connected buildings initiatives are driven by the proposition that better coordination of distributed energy resources has economic and societal benefit for the energy system at large. Transactive energy is defined as a combination of economic and control techniques to provide the coordination necessary to realize those economic and societal benefits of connected and responsive distributed resources. Through transactive energy, distributed resources can be optimally engaged and grid reliability and efficiency improved. Transactive techniques may also be used to optimize operations within a customer's facility. The most definitive discussion of transactive energy can be found in the *GridWise Transactive Energy Framework Version 1.0*, prepared by the GridWise Architecture Council, January 2015.

The Pacific Northwest is home to some of the most advanced research in the world on the topic of transactive energy. The Pacific Northwest Regional Smart Grid Demonstration Project, led by Battelle and including a consortium of leading vendors and regional utilities, has pioneered a form of transactive energy called transactive control. The results of the 5 year, $178 million project can be found in the final Technology Performance Report. One of the key findings is that a simulation of the transactive control system for the BPA Region showed with a 30% penetration of transactively controlled systems, peak generation could be reduced by as much as 7.8%. For a region-wide system with winter peak load of over 10GW, a transactive control system would have a major impact.

Additional information and analysis about the results from the Regional Smart Grid Demonstration project relevant to transactive energy can be seen in a Sep 2, 2015, article, "*Results from the World's Biggest Transactive Energy Test"*, by Jeff St John of GTM. Importantly, transactive energy need not be overly complex; a simple example is smart thermostats responding to time-varying rates, as discussed in, "*Transactive energy: Linking supply and demand through price signals*," a chapter in the 2014 Book "*Distributed Generation and Its Implications for the Utility Industry."*

Beyond the Regional Demonstration Project, recently, PNNL, the University of Washington and Washington State University have received a major grant funded jointly by the Department of Energy and the Washington Clean Energy Fund: "Transactive Campus Energy Systems: An R&D Testbed for Renewables Integration, Efficiency, and Grid Services". This project will investigate how various types of DER (including battery energy storage, thermal energy storage, photovoltaic generation, smart inverters and advanced building controls) can be leveraged using transactive control.

Given the potential impact on the Regions' generation requirements for the future, and the 20 year horizon of the Council's Power Plan, we recommend that the Seventh Power Plan incorporate references to this potential resource and support for research and investigation of transactive energy technology.

In many ways, transactive energy is a natural evolution of technologies designed to automate DR and to integrate and coordinate DER resources (also discussed in these comments). The challenge to the energy industry is to approach these efforts in the context of the broader system rather than the traditional siloed approach that ends up creating independent, stranded systems. A more efficient approach recognizes the potential benefits of supply side bulk generation, viewing DR and DER as part of the larger integrated resource coordination opportunity, one that ultimately engages numerous distributed resources that are tied into transactive energy system with the needs of the bulk power and transmission systems.

Smart Grid Northwest recommendations for the Seventh Power Plan with regard to transactive energy include:

1. Add a specific Task in Chapter 4 Action Plan, directed to the Council Actions or for System Analysis section to: "Investigate and report on the potential for Transactive Energy to contribute to the Resource Plan for the Region for the Eighth Power Plan."
2. Add "transactive energy" to the scope of the proposed Demand Response Advisory Committee (COUN-1) (Addressed above in Smart Grid and Demand Response sections)
3. Add "transactive energy" to ANLYS-13

Smart Grid Northwest would welcome the opportunity to work with the Council and Council staff in the support of more robust analysis and understanding of smart grid, demand response, distributed energy resources, transactive energy, and related areas and their value, impact, and role in the Northwest energy system.

Respectfully Submitted,

Bryce Yonker
Smart Grid Northwest, Executive Director

NOTE: Industry professionals from at least 29 different organizations including utilities, early and growth technology companies, multi-national corporations, higher education, and non-profits directly contributed to these comments.

About Smart Grid Northwest
Smart Grid Northwest is the only multi-state trade organization in the country working to progress smart grid industry and solutions. Founded in 2009, the organization expanded its focus to the broader Northwest in 2014. The organization has a growing member base of over 70 organizations from investor and consumer-owned regional utilities, growth grid modernization technology companies, leading industry corporations, higher education and research organizations, regional & national government agencies, and more. Additional information about Smart Grid Northwest can be found at www.smartgridnw.org

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