EXH. BKG-1T
DOCKETS UE-19___/UG-19___
2019 PSE GENERAL RATE CASE
WITNESS: BOOGA K. GILBERTSON

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-19____** **Docket UG-19____**

PREFILED DIRECT TESTIMONY (NONCONFIDENTIAL) OF

BOOGA K. GILBERTSON

ON BEHALF OF PUGET SOUND ENERGY

JUNE 20, 2019

PUGET SOUND ENERGY

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I. INTRODUCTION

Q. Please state your name, business address, and position with Puget Sound Energy.

A. My name is Booga K. Gilbertson. My business address is 355 110th Ave. NE, Bellevue, WA 98004. I am the Senior Vice President, Operations with Puget Sound Energy ("PSE").

Q. Have you prepared an exhibit describing your education, relevant employment experience, and other professional qualifications?

A. Yes, I have. Please see the First Exhibit to the Prefiled Direct Testimony of Booga K. Gilbertson, Exh. BKG-2, for an exhibit describing my education, relevant employment experience, and other professional qualifications.

Q. What are your duties as Senior Vice President, Operations of PSE?

A. I am responsible for electric and gas operations, including emergency response, maintenance and construction, electric and gas system operations and dispatch, new customer construction, system planning and grid modernization. I also lead project management and engineering across operations.

Q. Please summarize the purpose of this prefiled direct testimony.

A. My testimony provides an overview of PSE's operations. First, I provide a high-level overview of PSE's continuing investment in electric and natural gas operations up to and throughout the rate year.

Second, I describe PSE's approach to providing safe, dependable and efficient gas and electric services for our customers in compliance with state and federal regulations. PSE focuses on four key objectives addressing safety, system integrity, growth and operational excellence. I explain the methodical approach PSE uses to prioritize natural gas and electric transmission and distribution projects so that PSE optimizes benefits for its customers.

Finally, I discuss PSE's approach to grid modernization to meet evolving customer expectations and state policy goals.

II. OVERVIEW OF PSE'S ELECTRIC AND NATURAL GAS OPERATIONS WORK

Q. Please provide a high-level summary of PSE's operations work on its electric and natural gas systems including the work that will continue throughout the rate year in this case.

A. PSE's operations work focuses on three primary categories: (1) core services; (2) reliability, resiliency and grid modernization; and (3) gas system integrity.

1. Core services includes:

- Public and customer safety, including responding to emergencies such as natural gas leaks, electrical system failures and other emergencies that require immediate response.
- Public improvement projects that accommodate and are driven by local jurisdiction community and regional improvements projects and that require PSE to relocate existing infrastructure.
- Customer growth and associated system capacity upgrades, such as the Bainbridge Island Electric System project and the Bonney Lake Gas System project.

The annual volume of core services work is planned according to historical trends and incorporates anticipated changes. This work is generally non-discretionary; however, the specific timing of the work can vary. For example, while the volume of public improvement work can be trended, in any one year the specific timing of a project can vary from a historical trend. I discuss the core services in more detail later in this testimony.

2. The second category consists of reliability and grid modernization efforts, which are discussed later in this testimony. This work focuses on improving the reliability and resiliency of the electric system, and effectively employing smart equipment to enable customer and utility options. Strategies include infrastructure improvement programs that are focused on shorter and fewer power outages for customers. Examples of this work include replacing a specific type of failure-prone high molecular weight underground cable as

well as targeted reliability improvements on PSE's worst performing distribution circuits. Other strategies include vegetation management, installing foundational technology such as Advanced Metering Infrastructure ("AMI") and advanced distribution energy management systems ("ADMS"), preparing the grid for electric vehicle charging stations and integration of distribution energy resources, and meeting North American Electric Reliability Corporation ("NERC") reliability standards.

3. The third category focuses specifically on improving gas pipeline safety and integrity through robust risk management and mitigation work. This includes continuing with PSE's integrity management programs such as eliminating sewer cross bores and DuPont pipe replacement, and installing foundational technology, such as AMI, which will allow PSE to effectively deploy smart equipment that provides upgraded sensing and monitoring capabilities. All of this is discussed in more detail later in my testimony.

Q. Is PSE's pace of spending for electric and natural gas operations necessary and reasonable?

A. Yes, the level of spending that PSE has undertaken for electric and natural gas operations during the test year, and that will continue throughout the rate year, is necessary and reasonable. As discussed above, the core services work is generally non-discretionary in nature. It is required in response to public improvement projects, public and customer safety, and customer growth. The reliability work and gas pipeline safety work respond to federal and state requirements for the

safety and integrity of the bulk electric system and the gas delivery system. PSE is spending at a level that allows it to maintain and improve its reliability in areas where PSE's performance has lagged, including addressing the number and duration of outages. Additionally, PSE is spending to replace obsolete systems, as in the case of installation of AMI meters to replace the Automated Meter Reading ("AMR") system that is nearing the end of its useful life. Further details regarding the need for this work are provided later in my testimony and in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T.

III. PSE CONTINUES TO FOCUS ON PROVIDING SAFE, DEPENDABLE, AND EFFICIENT SERVICE TO CUSTOMERS

A. Overview of PSE's Operations Philosophy and Key Objectives

Q. Please provide an overview of PSE's operations philosophy.

A. PSE is dedicated to providing quality customer service and delivering energy safely, dependably, and efficiently. To meet these goals, PSE has identified four primary objectives: (i) maintain and improve customer and public safety, (ii) enhance system integrity and reliability, (iii) meet the growth and service needs and expectations of our customers and communities, and (iv) maintain our commitment to efficient service through operational excellence and continuous improvement.

Q. How do recent events in the gas industry reinforce the importance of PSE's objectives?

A. Recent incidents such as the September 2018 natural gas system over-pressurization event in Massachusetts[1] underscore the priority of natural gas system safety and integrity. Advancements in natural gas safety processes, such as the American Petroleum Institute recommended practice 1173 on Pipeline Safety Management Systems and the anticipated reauthorization of the Pipeline Safety Act, provide guidance on best practices for pipeline safety management and reinforce the importance of effective safety and integrity practices.

With respect to meeting customer and community needs and expectations for service and growth, the industry continues to see growth in the demand for natural gas. According to the U.S. Energy Information Administration, the use of natural gas for homes, businesses, and transportation has grown an average of three percent per year since 2014.[2]

As additional regulations and process bring cost pressure to the natural gas industry, developments in technology help mitigate cost increases, gain efficiencies, and keep customer rates as low as possible.

Energy efficiency efforts such as high efficiency appliances and windows, home energy audits and weatherization kits, and new demand response efforts such as

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1 *See* https://www.ntsb.gov/investigations/AccidentReports/Pages/PLD18MR003-preliminary-report.aspx

2 *See* https://www.eia.gov/dnav/ng/hist/n3060us2a.htm.

smart thermostats all reinforce the desire customers have for continuous improvement and efficiency.

Q. How do recent events in the electric industry reinforce the importance of PSE's objectives?

A. The need for electric system safety, reliability, and resiliency has been highlighted by recent hurricanes in the southeast United States, wildfires in the western United States, and physical and cyber threats that challenge the industry.

With respect to meeting customer and community needs and expectations for service and growth, the industry continues to see overall growth in the number of electric customers. According to the U.S. Energy Information Administration, the number of customers who use electricity for homes, businesses, and transportation in the U.S. has grown at an average annual rate of one percent since 2014.[3]

Additionally, advancements in technology, industry and policy trends, and customer expectations are driving the need for modernizing the capability of the electric grid as will be discussed later in this testimony.

Technology, automation, and advanced data analytics bring opportunities to mitigate cost increases, gain efficiencies, manage added complexity, and keep rates as low as possible through operational excellence and continuous improvement. According to the National Association of Regulatory Utility Commissioners, these changes in policy, technological cost-effectiveness, local

[3] *See* https://www.eia.gov/electricity/annual/.

economic factors, and consumer interest require utility providers to plan, operate and innovate in a variety of new ways to accommodate changing demands.[4]

B. PSE Is Focused on Improving Customer and Public Safety

Q. Please elaborate on PSE's objective to maintain and improve customer and public safety.

A. PSE's top priority is safety. PSE maintains robust 24-hour response to gas and electric emergencies that are reported by customers and the public or observed through PSE monitoring. For example, PSE has maintained a response time of 30 minutes or less for natural gas emergencies, which is within the Service Quality Index ("SQI") threshold of 55 minutes.[5] PSE continues to be highly responsive to power outages and electric system emergencies; in 2018 the average time from customer call to arrival of field technician was 51 minutes, which is also within the SQI threshold of 55 minutes.[6]

PSE continues to engage our customers and the public in safety messaging. For example, through the use of multi-media platforms, PSE has increased its outreach efforts for public awareness and safety around natural gas pipelines and underground electrical equipment by promoting the state "Call 811 Before You

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4 National Association of Regulatory Utility Commissioners, "The Evolution of the Distribution System & the Potential for Distribution-level Markets: A Primer for State Utility Regulators," available at https://www.naruc.org/default/assets/file/201801%20evolution%20of%20the%20distribution%20system.pdf.

5 SQI No. 7.

6 SQI No. 11.

Dig" service and implementing a damage prevention representative program. Damage prevention representatives work proactively with contractors and homeowners, visiting jobsites to provide education on safe digging techniques and enforce the state dig law. PSE's efforts have paid off; the number of gas and electric damages combined per 1,000 locates has declined 43 percent, from 4.5 per 1,000 at the end of 2015 to 2.6 per 1,000 at the end of 2018.

PSE also builds public awareness and enhances safety by training fire fighters in responding to gas leaks, distributing safety information regarding natural gas leaks and odors, distributing safety fliers to new gas customers, and informing the public about sewer cross bore risks. PSE has increased its public awareness regarding safety during other emergencies such as being prepared with an emergency plan and kit for earthquakes, floods, and storms as well as generator safety tips during power outages.

For major storms and other natural disasters, PSE ensures that safety and service remain top priorities. PSE maintains a comprehensive and robust modified Incident Command Structure that scales to the magnitude and specific nature of the emergency. Each year, PSE trains employees on their emergency response role and practices emergency response procedures through annual mock emergency exercises. Additionally, PSE participates in continuously improving and adopting best practices in emergency preparation, response and mutual assistance. For example, PSE is active in shaping, leading and adopting best practices in electric emergency response and mutual assistance through the Edison

Electric Institute's National Response Executive Committee that was chartered after Super Storm Sandy. These efforts benefit customers by assuring PSE is utilizing leading emergency practices. Additionally, through mutual response, PSE has access to electric and gas emergency personnel from other companies should the need arise. Mutual response allows PSE to temporarily and cost-effectively scale its resources during an emergency event.

C. PSE Is Focused on Enhancing System Integrity and Reliability

Q. Please elaborate on PSE's objective to enhance natural gas system integrity and reliability.

A. A primary objective for PSE is to enhance and maintain pipeline system integrity and reliability. This includes replacing or repairing all identified defects that have been identified as high risk to the public and the natural gas system as described in PSE's Distribution Integrity Management Program and Transmission Integrity Management Program[7] as well as other ongoing programs described in PSE's Continuing Surveillance Report, which is filed annually with the Commission. As an example, in compliance with PSE's settlement agreement in Dockets PG-030080 and PG-030128, dated January 31, 2005, PSE completed the replacement of all known bare steel pipelines in 2015.

[7] 49 CFR Part 192 enacted August 2, 2011 requires gas distribution companies to have developed a risk based approached to evaluating the safety conditions that affect pipelines.

The unfortunate 2010 pipeline explosion in San Bruno, California, resulting in three deaths and numerous injuries,[8] was a catalyst for process review throughout all aspects of the industry including actions of utilities and underlying regulations and regulatory processes.[9] Following the explosion in California, the Commission began an investigation as to whether utilities should do more to enhance natural gas safety, and if so, what steps are necessary to accomplish that goal including incentives for early retirement of pipeline with known but managed risks.[10] At the completion of the investigation, the Commission issued a policy statement and authorized a new cost recovery mechanism that provides utilities an incentive to accelerate replacement of pipe that presents an elevated risk of failure.[11] Through this process, PSE is replacing older DuPont pipes[12] in PSE's system before failure occurs. PSE refers to work aligned with this process and cost recovery mechanism as Pipeline Replacement Program Plan work.

PSE recognizes that additional opportunities exist to advance pipeline safety and has implemented programs such as the mitigation of cross bores, buried meter set remediation, and "C" leak reduction. PSE included the cross bore mitigation

8 National Transportation Safety Board Accident Report PAR-11-01.

9 AGA Chairman Tells Senate "Safety Is Our Core Value and Top Priority" -Terry McCallister, Chairman and Chief Executive Officer of WGL Holdings and Washington Gas and Chairman of the American Gas Association for 2015, September 29, 2015*

10 *See* Commission Policy on Accelerated Replacement of Pipeline Facilities with Elevated Risk, Docket UG-120715 ¶ 12 (December 31, 2012).

11 *See* Commission Policy on Accelerated Replacement of Pipeline Facilities with Elevated Risk, Docket UG-120715, ¶ 58 (December 31, 2012).

12 Older plastic pipes manufactured by DuPont may be prone to leaks and possible failure due to their age, composition, and manner of installation.

program in its May 31, 2019 Pipeline Replacement Program Plan filing. PSE's pipeline safety programs and the PRP are discussed further in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T.

Q. Please elaborate on PSE's objective to enhance electric system integrity, resiliency and reliability.

A. Reliable power is increasingly important to customers, especially with the evolution of digital connectivity; it is essential for businesses, schools, hospitals, homes, manufacturing, and increasingly, transportation. PSE is committed to improve reliability and enhance customer satisfaction by assessing and investing in its transmission and distribution system and working to modernize the grid and upgrade equipment throughout its territory. PSE's efforts are working; for example, through PSE's underground power cable replacement program, power outages due to failing cable were reduced by 38 percent between 2015 and 2018. Other improvements, such as selectively automating the electric system and upgrading the worst performing distribution circuits, are discussed later in this testimony and in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T. PSE has made improvements in these areas, but there is more work to be done, specifically on the underground cable replacement program and improving the worst performing circuits, as discussed later in my testimony.

PSE's investment in resiliency helps minimize damage from extreme weather or other naturally caused events and aligns with customers' expectations and needs. Additionally, PSE's investments are consistent with the increased national, state,

and industry focus on electric grid reliability and resiliency. PSE strives to appropriately balance effectiveness and cost by leveraging existing assets to the extent possible—for example, by installing "tree wire" and strategically deploying upgrades and technology, such as system automation, to increase resiliency at a reasonable cost for our customers.

Q. Does PSE collaborate with others on a state-wide basis to address resiliency and reliability projects?

A. Yes. One example of PSE's participation in a state-wide effort focused on resiliency is the Resilient Washington subcabinet,[13] which Governor Jay Inslee launched in November 2016. The Resilient Washington subcabinet is charged with addressing major disruptions, including utility services, in a catastrophic seismic event. The subcabinet will rely heavily on the expertise of the Washington State Seismic Safety Commission that set target states of recovery for critical services and utility sectors including for transmission and distribution systems.[14] PSE participates in the Critical Infrastructure Resiliency Subcommittee that was formed to support the Resilient Washington efforts.

On a national scale, on March 26, 2019, President Trump issued an executive order establishing a comprehensive policy to build resiliency to electromagnetic

[13] http://www.governor.wa.gov/news-media/inslee-launches-new-resilient-washington-subcabinet-preparation-big-one

[14] http://mil.wa.gov/uploads/pdf/seismic-safety-committee/RWS%20final%20report.pdf

pulses (EMP) that may disrupt critical infrastructure, including utility critical infrastructure; PSE is evaluating its operations against the new policy.[15]

Q. What national standards drive PSE's reliability efforts?

A. PSE meets NERC Reliability Standards, which require plans and infrastructure that ensure the reliability of the Bulk Electric System (i.e., transmission systems operated at voltages of 100 kV or higher). Plans must be implemented that prevent widespread cascading outages in the Bulk Electric System under certain contingency conditions. These standards drive the impact analysis of both near- and long-term system performance and resource allocation for demand growth and timely implementation of needed infrastructure improvements. By complying with NERC standards, PSE also contributes to the reliability of the region's interconnected transmission system.

D. PSE Continues to Meet Growth Needs for Customers and Communities

Q. Please elaborate on PSE's objective to meet the natural gas growth and service needs and expectations of its customers and communities.

A. PSE has continued to serve a growing customer base in the region and provide excellent service to a population that expects a safe and reliable natural gas system. PSE has added over 27,000 new gas customers and averaged 1.5 percent customer growth per year from October 2016 through December 2018. There are

[15] "Executive Order on Coordinating National Resilience to Electromagnetic Pulses", March 26, 2019

areas of stronger localized customer growth (i.e. 2 percent growth in Snohomish County) that require PSE to develop reliability and capacity solutions, such as major gas infrastructure projects, to accommodate growth and meet our customers' natural gas needs. Additionally, PSE executed 147 gas projects between October 2016 and December 2018 to deploy or relocate PSE infrastructure that was in conflict with public improvement projects.

Q. Please elaborate on PSE's objective to meet the electric growth and service needs and expectations of its customers and communities.

A. From October 2016 to December 2018, PSE added roughly 34,000 new electric customers, averaging 1.4 percent customer growth per year. There are areas of stronger localized growth (i.e. nearly half of the new electric customers added during this time period are located in King County) that require PSE to develop reliability and capacity solutions, such as major electrical infrastructure projects, to accommodate growth and meet our customers' electrical needs. Additionally, PSE executed 455 electric projects between October 2016 and December 2018 to deploy or relocate PSE infrastructure that was in conflict with public improvement projects.

PSE strives to meet the evolving expectations of both its gas and electric customers. To better understand these expectations, PSE participates in industry and customer surveys as further discussed in the Prefiled Direct Testimony of Andrew Wappler, Exh. AW-1T, and PSE works to develop solutions to meet customer expectations.

E. PSE Is Focused on Operational Excellence

Q. Please describe PSE's commitment to operational excellence, continuous improvement, and efficient service.

A. PSE strives for operational excellence, continuous improvement, and efficient service; these are the cornerstones of PSE's service philosophy. At PSE, we regularly look for opportunities to improve performance and better serve our customers and a few examples are provided below.

- Through implementation of Integrated Work Management technology and processes, PSE is seeing improvements in both customer service scheduling and worker productivity, even though PSE is still in the process of fully implementing these tools. Customers are now able to request certain meter service appointments within a two-hour window, an option not available before Integrated Work Management. There is an increase in the number of field jobs completed per day, and there is enhanced work management visibility and reporting available to improve organizational performance. Additional detail on Integrated Work Management is discussed in the Prefiled Direct Testimony of Joshua J. Jacobs, Exh. JJJ-1T.

- Customer satisfaction for new customer construction is at high levels and continues to grow. A customer satisfaction survey is sent after every new customer construction project is complete. Customer satisfaction scores have increased over the last few years: PSE's score for year-end 2018 was 8.5 and for year-end 2017 was 8.3 (based on a range of one to ten, with ten being the

highest rating). These scores are up significantly from PSE's score of 6.3 for year-end 2015.

- PSE looks for lower cost ways to perform high quality work. For example, in certain situations PSE is able to add steel reinforcement to a wood pole to return it to design strength rather than replacing the pole. This reinforcement results in cost savings of approximately 90 percent per pole, as compared to the cost of pole replacement.

- To further PSE's commitment to pipeline safety and safety culture, PSE is implementing American Petroleum Institute recommended practice 1173 on Pipeline Safety Management Systems.

- PSE already has a process to confirm that reliability projects deliver anticipated outage reduction benefit through a process called backcasting, which is discussed in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T. In addition, PSE has implemented a new root cause analysis process to further evaluate the cause of large impact outages that have the greatest influence on our reliability metrics. The analyses look at multiple potential issues that may contribute to reliability problems such as environmental conditions and device failure.

- PSE is replacing its AMR system which was installed between 1998 and 2001, is approaching end of life, is experiencing deteriorating performance, and cannot meet the advanced capabilities of a modern grid that customers are

seeking. PSE is replacing its AMR system with AMI, which provides foundational technology that will benefit customers:

- by the avoided cost of installing and maintaining an obsolete AMR system;
- through decreased energy consumption and bills, as PSE is able to implement more conservation voltage reduction; and
- by increased reliability, as PSE is able to utilize the communication system for implementing distribution automation.

Additionally, although not a primary driver of the project, AMI capabilities will enable customer choices and will help modernize the grid through continuous improvements in the future.

F. PSE's Performance On Its Key Objectives Benefits Customers

Q. How do PSE's key objectives serve the interests of customers?

A. PSE focuses on objectives that support safe, dependable, and efficient service, which in turn serves the interests of our customers. The table below provides a few examples.

Objective	Customer Interests
Customer and public safety	• Infrastructure is safe for the public and those who work around it. • Customers and the public have the information they need to stay safe around natural gas and electricity. • Robust preparedness and response when an emergency occurs.

Objective	Customer Interests
System integrity and reliability	• Infrastructure is actively monitored, maintained and managed to reliably perform as designed and in compliance with codes and standards. • Implement modern grid capabilities to improve system reliability, resiliency, flexibility and efficiency.
Growth and service needs and expectations	• Provide gas and electric energy services to new and existing customers under normal and peak conditions according to tariffs and service quality expectations.
Efficient service	• Continuously improve and deploy best practices to operate efficiently and reduce costs. • Provide service in a timely manner. • Utilize cost effective technology and methods to save energy.

Q. How does PSE measure its performance to these objectives?

A. PSE measures performance through key performance indicators, surveys, and other quantitative and qualitative means. Examples of key performance indicators that PSE uses to measure performance include SQIs and the Institute of Electrical and Electronics Engineers Reliability Benchmarking Survey. These are included in PSE's annual Service Quality and Electric Service Reliability Filing.[16] Additional examples are provided in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T.

[16] *See, e.g.,* 2018 Service Quality Program and Electric Service Reliability Filing, Dockets UE-170033 *et al.* (March 29, 2019).

Q. Please provide some examples of PSE's current performance.

A. I previously discussed PSE's strong performance on electric and gas response times (SQI No. 7 and SQI No. 11). In addition:

- PSE achieved a 95 percent customer satisfaction score on gas field service (SQI No. 8) in 2018, which exceeded the benchmark of 90 percent.
- PSE achieved a 99 percent score on customer appointments met (SQI No. 10) in 2018, which exceeded the benchmark of 92 percent.
- PSE achieved 97 percent on its metric measuring the percent of electric construction jobs completed in three weeks or less in 2018, which exceeded the benchmark of 90 percent.
- PSE improved the 2018 System Average Interruption Duration Index ("SAIDI" SQI No. 3) to 145 minutes; which compares to 175 minutes in 2017 and 154 minutes in 2016, and 163 minutes in 2015. While weather events can have a significant impact on SAIDI performance in any single year, PSE attributed the 2018 SAIDI reduction to its reliability projects and other operational improvements.

Q. Please describe how PSE sets performance targets.

A. PSE uses benchmarking and its continuous improvement philosophy to establish performance targets. Certain targets are prescribed in codes and standards that govern PSE's work or are found in the SQIs. Where performance is not

prescribed, PSE benchmarks its performance and stays attuned to industry practices, risks, and policy changes. PSE also considers impacts and benefits to customers when setting performance targets, and those that directly tie to safety are generally set to achieve top quartile performance. Additionally, PSE participates in various industry organizations, forums, and activities to stay abreast of best practices and learn from others. For example, PSE is active with the Institute of Electrical and Electronics Engineers, which allows PSE to stay current on best practices and standards regarding transmission and distribution system operations. PSE also participates in events sponsored by the American Gas Association, Commission Pipeline Safety Staff, Pipeline and Hazardous Materials Safety Administration, and the U.S. Department of Transportation to stay informed of trends, performance, and emerging issues in the natural gas industry.

PSE strives for operational excellence by regularly reviewing performance and practices, utilizing performance trends to drive improvements, and making work plans and performance transparent in order to measure and confirm progress.

Q. Are there other ways PSE measures its progress in achieving operational excellence?

A. Yes. PSE uses JD Power and Market Strategies International to measure customer satisfaction on a wide variety of issues. The Prefiled Direct Testimony of Andrew Wappler, Exh. AW-1T, provides additional detail on these tools and PSE's performance. Mr. Wappler testifies that PSE's performance in meeting customer expectations has improved over the past few years. Overall, in 2018, PSE was a

leader among combination electric and gas utilities on a wide variety of customer-related metrics measured by JD Power, including areas related to operations. Significantly, from an operations perspective:

- PSE scored in the first quartile nationally in providing outage points of information for electric residential customers.
- PSE scored in the second quartile nationally in quality of field work performed, courtesy of field representative, and the timeliness of completing field work for natural gas residential customers.
- PSE scored in the first quartile nationally in courtesy of field service representatives, efforts to maintain a safe gas system, and clarity of gas safety information; and in the second quartile nationally in quality of field service, knowledge of field service representative, timeliness of completing work, and reliability of gas service for natural gas business customers.
- PSE's performance in meeting customer expectations for reliability was a mixed bag, which indicates that PSE has more work to do. For example, PSE scored in the second quartile nationally in providing quality electric power, avoiding brief interruptions, and providing accurate outage information for both electric residential and business customers. However, PSE performed in the third quartile for business customers and in the fourth quartile for residential customers in avoiding lengthy outages. PSE is addressing this lagging performance through its reliability, resiliency, and grid modernization efforts including programs such as high molecular weight underground cable

replacement and worst performing distribution circuits, which are further discussed in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T. Through these and other reliability efforts, PSE is focused on reducing the number and duration of power outages.

G. PSE Balances Benefits and Costs in Planning and Prioritizing Projects

Q. Please describe how work is planned to meet PSE's objectives and how investment decisions are made.

A. PSE's System Planning department is responsible for evaluating system demands and performance, as well as identifying and scoping system projects that deliver safe and dependable service, meet regulatory requirements, and meet customer needs. The process begins with an analysis of current performance, existing operational challenges, known commitments, and anticipated future need. Planning considerations (inputs) include both internal and external factors, such as customer needs and load growth forecasts (peak, localized, known projects, and overall system growth), reliability performance, aging infrastructure, integration of resources, and timing of municipally sponsored projects. Projects are scored against each other to assess the prioritization of system and customer needs. An analysis is conducted to identify alternatives that will address the operational challenge. Benefits and costs are then forecasted for each alternative. Planners select and plan for the alternative that best balances customer needs, system performance, regulatory compliance, PSE economic parameters, and local and regional plans. Using the Investment Decision Optimization Tool ("iDOT"), PSE

compares the relative costs and benefits of various solutions across multiple factors including reliability, safety, current and deferred future costs, capacity addition, and external stakeholder inputs. Total value is optimized across the entire portfolio of system infrastructure projects (electric and gas), which results in a set of capital projects that provide maximum value to PSE customers and stakeholders.

Q. Can the identified set of capital projects change?

A. Yes. While the portfolio of capital projects is considered final, many factors may arise that change PSE's ability to complete the final portfolio of projects. These factors include public improvement projects that arise or are otherwise changed, adjusted forecasts in load growth, and other external factors such as project delays due to permitting. Although such factors may cause individual projects to change, the total portfolio financial forecast remains within established budget parameters, with the continued objective of providing maximum value to customers and stakeholders.

Q. Please provide additional information about iDOT.

A. iDOT, as PSE has labeled it, is essentially PricewaterhouseCoopers Folio software, a project portfolio optimization and value-based decision analysis tool. iDOT allows PSE to compare the relative costs and benefits of various solutions (i.e., projects). iDOT makes it easier to conduct side-by-side comparisons of projects and programs of different types, thus helping PSE evaluate infrastructure

solutions that will be in service for 30 to 50 years. iDOT optimizes benefits and costs for a given financial portfolio.

Q. Are all projects evaluated through iDOT?

A. No. Work that is performed at the request of customers or third parties is not evaluated using iDOT. Instead, this work must meet PSE tariff requirements that evaluate customer contribution based on criteria set forth in the tariffs. Additionally, work that is non-discretionary in nature is not included in the iDOT evaluation. This includes (i) work that results from unplanned events such as emergent and storm outage restoration work, (ii) external commitments and public improvement work due to franchise obligations, and (iii) work related to compliance, meter reading operations, tools, security, and generation.

IV. PSE'S GRID MODERNIZATION EFFORTS

A. Overview of Grid Modernization

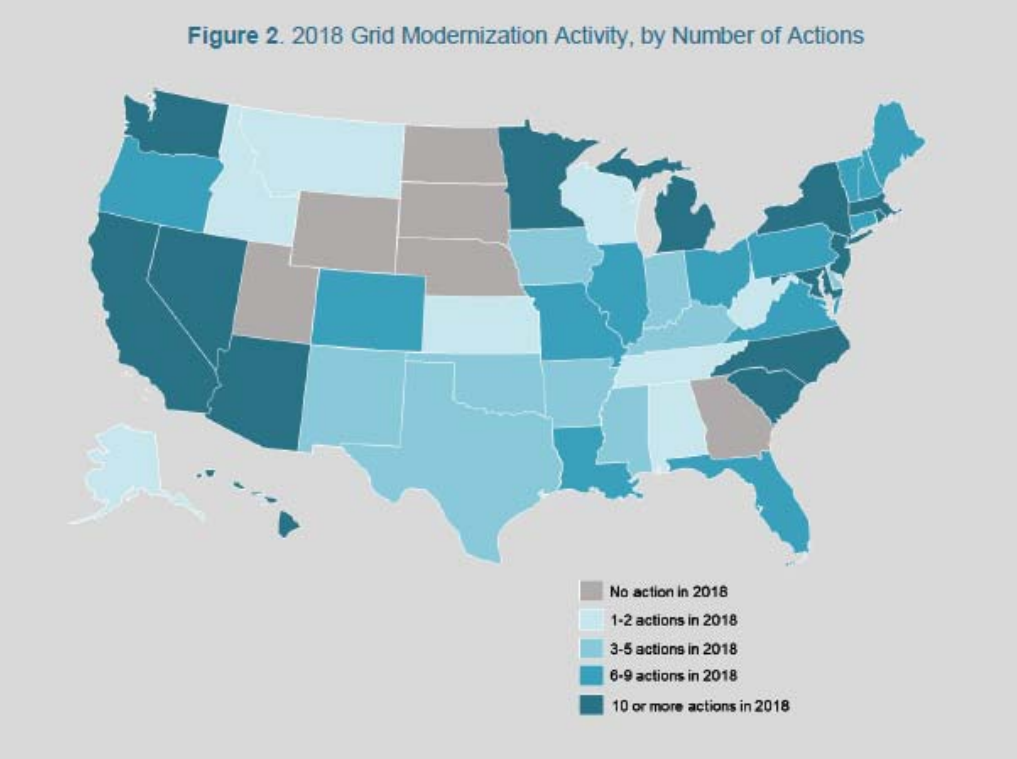
Q. How will the grid of the future differ from today's grid?

A. The grid of the future must anticipate, facilitate, and integrate new uses, structures and capabilities for how energy is produced, distributed, and utilized. The traditional one-way grid—where power is produced at a central facility, transmitted over long distances, and eventually distributed and delivered to customers—will be inadequate to support distributed, customer centric participation in the production, saving, delivery, and utilization of energy.

Q. Is there a standardized path by which grid modernization will occur?

A. Not really. The electric industry is evolving, and there is no standardized path to grid modernization. Each utility and state differ in their focus and approach. Customer behaviors and expectations continue to drive change.

The University of North Carolina Clean Technology Institute February 2019 Report "The 50 States of Grid Modernization"[17] ("UNC Report") stated that in 2018, 44 states and the District of Columbia took a combined 460 policy and deployment actions related to grid modernization. Figure 2 of the UNC Report shown below identifies the most active states in the nation, with Washington being one of them.



[17] https://nccleantech.ncsu.edu/wp-content/uploads/2019/02/Q42018-GridMod-Exec-Final2.pdf.

While the approaches to grid modernization by the various state regulatory bodies vary, some common themes are evident:

- A modern grid is a key requirement and foundational technology for high levels of residential solar, battery storage and electric vehicle penetration.
- Without a modernized grid designed for frequent distributed and large amounts of two-way power flows, high adoption of residential solar, battery storage, electric vehicles and other key requirements of 100 percent clean energy legislation may not be feasible and may increase safety risks.
- These trends also require greater transparency of the grid planning process.
- There is a need for improved reliability.
- There is a need to replace aging infrastructure.
- There is a desire to consider non-wire alternatives to major grid projects.
- There is a need for foundational technologies to support grid modernization such as AMI, ADMS, and data processing and analytics.

Q. What trends in PSE's service territory drive the need for grid modernization?

A. For PSE and Washington State, the primary drivers for grid modernization include (i) the need to maintain a safe, reliable, and resilient grid; (ii) meeting the objectives of the clean energy legislation; and (iii) the ability for customers and PSE to manage energy in additional ways (such as more options on energy consumption, time of use, and energy savings). Emerging and evolving grid modernization technology and capabilities can be utilized to help meet these

objectives and provide a platform for cleaner energy. There are several emerging and maturing technology trends that support the need for action:

- Although still maturing and expensive, battery storage technology continues to decrease in cost and increase in capability. While battery storage options are currently not a viable solution in most grid-scale applications, partnership with solution providers on demonstrations and pilots of battery storage technology will enable PSE to better identify viable applications of battery technology, as further discussed in the Prefiled Direct Testimony of William T. Einstein, Exh. WTE-1T.
- Renewable generation technology continues to decrease in cost and expand in the number of technology options available. For example, although adoption of residential solar is low in PSE's service territory as compared to sunnier parts of the U.S., PSE has roughly 7,700 customer-initiated solar interconnections on its system with an installed capacity of about 52 megawatts ("MW"). Increased penetration of residential solar creates two-way power flow in a grid designed for one-way power flow. At greater levels, it impacts everything from (1) power quality, (2) grid design, (3) transmission and distribution system operations, (4) field worker safety, and (5) field work practices.
- Development of high capacity electric vehicle chargers for residential use (such as the next generation Class 3 electric vehicle chargers) could result in increases in connected load, which would impact transformer and feeder cable

sizes and would require infrastructure reinforcement to handle the increased load.

- Appliances and home equipment are being manufactured with more remote capability, offering opportunity to manage energy differently by providing customers additional information on their energy use and collaborating with customers to reduce energy consumption.

B. PSE's Grid Modernization Efforts

Q. Please describe PSE's grid modernization vision.

A. PSE's vision begins with its goal to continue to provide safe, dependable, efficient and affordable service that meets customer expectations. To meet this goal in the future, PSE needs a grid that is safe, reliable, resilient, smart, and flexible. This means the grid will be:

- safe for the public and for those who work around it as safety continues to be the top priority;
- reliable, with fewer and shorter power outages;
- resilient, so that our region recovers quickly from weather extremes and other emergencies;
- smart, utilizing automation and technology to save energy and improve customer satisfaction; and

- flexible, empowering customers with choices and enabling them to control their energy on the basis of cost, carbon, or other preferences, as well as enabling reliable two-way power flow.

Q. Please provide an overview of how PSE plans to implement a modern grid.

A. Our near-term focus emphasizes reliability and resiliency improvements along with targeted and thoughtful smart/modern grid capabilities. Over time, as foundational systems, such as AMI and ADMS, are established and the highest priority reliability and resiliency objectives are addressed, more focus will be placed on smart and flexible grid capabilities. More specifically, our approach includes:

- replacing and updating underperforming or deteriorating infrastructure;
- designing the grid to withstand more severe conditions to improve resiliency;
- installing smart equipment that senses real-time conditions and operates automatically, all through a secure communications and data and digital processing overlay;
- deploying foundational technology systems such as AMI and ADMS;
- partnering with our customers to enable, pilot, and deploy new capabilities and technologies; and
- continuing to learn from existing smart/modern grid deployments to improve performance, capability and save costs.

Q. How will PSE prioritize this work?

A. Improvements will be prioritized by need, capability, benefit and cost. First, PSE will address known grid performance issues. Aging infrastructure will be replaced by up-to-date equivalents that are more resilient and enabled with smart capability, when practical. The next priorities will address anticipated issues, such as equipment classes with a history of performance problems, and emerging opportunities, such as partnering with jurisdictions to enable modern grid capabilities that are most valued by customers. This sequencing is necessary as smart technologies need a reliable grid as well as baseline technology to function well and deliver their full value. Examples of modern grid pilots and initial successes with smart grid automation are described below and in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T. Additionally, PSE must ensure that secure foundational information technology platforms are in place to support grid modernization efforts. PSE's information technology strategy is further discussed in the Prefiled Direct Testimony of Margaret F. Hopkins, Exh. MFH-1T.

Q. Will PSE's planning and investment strategy evolve to incorporate a modern grid?

A. Yes. The planning strategy described earlier in my testimony will incorporate evolving technologies, non-wire solutions, energy storage options and other benefits. The planning strategy is further addressed in the Prefiled Direct Testimony of Catherine A. Koch, Exh. CAK-1T.

Q. Do you have any examples of modern grid currently deployed?

A. Yes. PSE is in the early pilot phase of some of these strategies, while others have been deployed for several years. The following are examples of PSE's smart grid projects:

- Glacier Battery Storage project: This consists of a 2 MW, 4.4 megawatt-hour lithium-ion battery storage facility located in Glacier, Washington. It is interconnected to the Glacier-12 distribution circuit and is designed to provide a back-up power source for the town core of Glacier in the event of a power loss.

- Transmission Line Automation System program: This improves system reliability by automatically locating a transmission line fault, isolating the fault and then reconfiguring the system to restore power to affected customers.

- Distribution Automation program: This is a relatively new and ongoing group of projects. Within Distribution Automation, Fault Location, Isolation, and Service Restoration (FLISR) implements automation schemes that use remote monitoring and sensing equipment, data and control signal communication pathways and remotely controllable switches to automatically reconfigure circuits when outages occur, thereby automatically restoring power. PSE is in the early stages of piloting Distribution Automation and is already realizing reliability and other benefits. For example, in 2018 with 44 distribution circuits enabled with Distribution Automation capability, PSE avoided over 9,600 customer interruptions. In some Distribution Automation applications,

customers will still experience a brief power outage; however, Distribution Automation significantly reduces the length of the power outage. For example, at one Distribution Automation location on Whidbey Island, what would have historically been a three-hour power outage was reduced to just over two minutes, and the power was restored automatically without the need to dispatch field personnel.

V. CONCLUSION

Q. Does this conclude your prefiled direct testimony?

A. Yes, it does.