**EXHIBIT NO. ___(CAK-1CT)**
**DOCKETS UE-17___/UG-17___**
**2017 PSE GENERAL RATE CASE**
**WITNESS: CATHERINE A. KOCH**

**BEFORE THE**
**WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

| | |
|---|---|
| **WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION,**<br><br>**Complainant,**<br><br>**v.**<br><br>**PUGET SOUND ENERGY,**<br><br>**Respondent.** | **Docket UE-17____**<br>**Docket UG-17____** |

# PREFILED DIRECT TESTIMONY (CONFIDENTIAL) OF

# CATHERINE A. KOCH

# ON BEHALF OF PUGET SOUND ENERGY

**REDACTED VERSION**

**JANUARY 13, 2017**

**PUGET SOUND ENERGY**

**PREFILED DIRECT TESTIMONY (CONFIDENTIAL) OF CATHERINE A. KOCH**

**CONTENTS**

**PUGET SOUND ENERGY**

**PREFILED DIRECT TESTIMONY (CONFIDENTIAL) OF CATHERINE A. KOCH**

## I. INTRODUCTION

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

A. My name is Catherine A. Koch. My business address is 10885 NE 4th Street, Bellevue, Washington, 98009-5591. I am Director, Planning 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. It is Exhibit No. ___(CAK-2).

**Q. What is the scope of your testimony in this proceeding?**

A. My testimony and exhibits in this proceeding will provide additional detail with respect to PSE's request for an Electric Reliability Plan and associated Cost Recovery Mechanism, which is proposed in the Prefiled Direct Testimony of Booga K. Gilbertson, Exhibit No. ___(BKG-1T). First, my testimony reviews PSE's current reliability performance and the areas of improvement that will result from the Electric Reliability Plan and associated Cost Recovery Mechanism. Second, I discuss the structure and framework of the mechanism, which will closely follow the structure endorsed in the Commission Policy on Accelerated Replacement of Pipeline Facilities with Elevated Risk ("Accelerated

Replacement Policy").[1] Third, I address the scope of the mechanism and the two types of work that PSE proposes to include in the mechanism. I will discuss why PSE is targeting underground cable and the worst performing circuits and how improvements will be identified and prioritized. I will include and discuss PSE's first Electric Reliability Master Plan and Two-Year Plan. Fourth, I address the benefits that are expected to result from the mechanism, including lower outage rates and fewer customer interruptions.

**Q. Why is PSE proposing an Electric Reliability Plan and associated Cost Recovery Mechanism?**

A. PSE is proposing to implement an Electric Reliability Plan and associated Cost Recovery Mechanism to improve PSE's electric reliability and resilience by investing in certain targeted work beyond historic levels of spending, in order to prevent outages that adversely affect PSE's customers. This process will allow transparency and a predictable roadmap that drives construction and work efficiencies that minimize customer impacts (i.e., projects can be coordinated to address replacement of assets more holistically within an area in order to prevent multiple planned outages which occur when replacing failed sections incrementally). More importantly it will allow PSE to proactively address deteriorating underground direct-bury high-molecular-weight ("HMW") cable before an outage impacts customers and to more aggressively address infrastructure failures or limitations of PSE's worst performing distribution

[1] Docket UG-120715 (December 31, 2012).

circuits where customers experience multiple and lengthy outages. Finally this process will ensure timely investment recovery for targeted, non-revenue producing work.

## II. PSE'S RELIABILITY PERFORMANCE AND OPPORTUNITIES FOR IMPROVEMENT

**Q. Please describe PSE's reliability performance.**

A. As discussed in the Prefiled Direct Testimony of Booga K. Gilbertson, Exhibit No. ___(BKG-1T), PSE's reliability is generally below the performance of regional peers in non-storm power outage duration ("SAIDI") and the number of non-storm power outages ("SAIFI"), despite PSE's continued efforts to improve this performance. PSE's reliability work over time has been successful, but there is still progress to be made to drive sustainable improvements and meet rising customer expectations. As Ms. Gilbertson discusses in her testimony, PSE's analysis shows that most outage minutes are caused by trees and vegetation and equipment failure. PSE is experiencing an increase in tree and vegetation outages by approximately 23% a year and an increase in underground cable failures by approximately 8% a year since 2013.

**Q. Please describe how the focus for the Electric Reliability Plan and associated Cost Recovery Mechanism will differ from PSE's historic reliability focus.**

A. PSE has invested $314 million since 2011 on reliablity improvements and has been addressing circuits impacted by tree and vegetation and equipment failure. PSE's planning process prioritizes reliability improvements that have the greatest

benefit for the cost, which generally focuses on circuits with a large number of customers that have higher customer interruptions and higher customer minutes of interruption. PSE will continue to initiate reliablity improvements that are the highest priorities through its ongoing reliability efforts; however, the Electric Reliability Plan will target two efforts that PSE believes will improve reliability beyond historic levels and address the specific outage causes that I previously mentioned. Specifically, through the Electric Reliability Plan and associated Cost Recovery Mechanism, PSE proposes to: (1) focus additional resources on the worst performing circuits, and (2) accelerate the replacement of failing underground cable.

*Worst Performing Circuits*

PSE's planning process and use of iDOT[2] is robust, but it does not favor projects on circuits that have a lower number of customers, which tend to be in heavily treed areas. As a result these customers experience the worst performance each year and land on the worst performing circuit list year after year. Despite the improvements and spending made, and as documented in the Service Quality and Electric Service Reliability Report,[3] it can be difficult to improve the reliability on these circuits as they tend to be long, heavily treed, radial circuits or on rights of way that are more difficult to work in and require solutions that may be more

[2] Investment Decision Optimization Tool (iDOT), compares the relative costs and benefits (e.g. reliability, safety, external stakeholder input) of various solutions. Total value is optimized across the entire portfolio of electric and gas infrastructure projects, which results in a set of capital projects that provide maximum value of PSE customers and stakeholders.

[3] *See* Docket UE-110060.

costly. One example of a circuit that has performed poorly from a reliability perspective over the last several years is the Griffin-13 circuit. This circuit serves the south end of the Steamboat Island peninsula and Summit Lake in Thurston County, from a substation that is served from a lateral transmission tap that runs cross country adjacent to trees along 50% of its length. The circuit extends nearly 66 miles, and 56% of the circuit is underground; however, roughly 79% of the circuit feeder is overhead and adjacent to heavily treed areas. For challenging circuits such as the Griffin-13 circuit, a targeted approach to system hardening is necessary in order to make an impact on reliability beyond historic levels.

*Accelerated Replacement of Underground Cable*

PSE has been remediating direct bury HMW cable since 1990. PSE's current planning methodology prioritizes improvements based on the number of failures that have occurred, and PSE is currently on pace to replace all this cable over the next 25-35 years. However, PSE and the industry recognize that this cable is prone to failure, and all of it will need to be replaced. Therefore, a planning methodology that moves away from replacement *after* customers experience an outage to one that *minimizes future outages* will make an impact on reliability beyond historic levels. In 2016 PSE ramped up replacement due to the increasing failure rate, beginning the plan for accelerating the replacement of the entire population.

## III. FRAMEWORK AND STRUCTURE OF THE ELECTRIC RELIABILITY PLAN AND ASSOCIATED COST RECOVERY MECHANISM

**Q. Please explain why a cost recovery mechanism is necessary to address the targeted areas you identified.**

A. There are several reasons why a cost recovery mechanism would help to improve reliability for these targeted areas. As explained in more detail below, through this cost recovery mechanism, PSE will reduce the project completion risk and cost, and over time see a reduction to customer outages.

*Securing needed resources and commitment to long-term efforts*

First, while PSE has been addressing both aging underground cable and the worst performing circuits through its reliability investments, the work plans vary from year to year due to other demands such as unexpected storm repair work, higher levels of new customer construction, and unplanned public works projects. These unpredictable demands create construction and efficiency challenges. A consistent work plan would lead to more efficient scheduling and working with local governments, as well as allowing PSE to consistently hire and retain qualified workers to meet the work plan necessary to address reliability.

*Commitment with permitting agencies*

Given the ever increasing need to work with local and state agencies, PSE has found it challenging, at times, to align the proper permitting and access needs with its plans and intentions to meet work schedules. For example, some of the solutions for the worst performing circuits are located along state right-of-way,

which requires significant coordination with the state Target Zero efforts to clear the right-of-way of poles that pose a potential hazard to vehicles. A focused, long-term initiative to address these circuits would facilitate more effective coordination with these state and local agencies.

*Holistic portfolio of work*

PSE's current prioritization methodology, which is described in Ms. Gilbertson's testimony, prioritizes reliability improvements that result in the greatest benefits for the cost. This generally focuses reliability investments on circuits and locations with more customer density, but tends to constrain investment on circuits that have a lower number of customers. A structured mechanism would provide an incentive for investment in identified areas that may otherwise take PSE a substantial amount of time or resources to address, such as with the worst performing circuits. It would also provide incentive to address the failure prone HMW underground cable before it fails therefore saving the customer from an unnecessary inconvenience and impact due to an outage.

*Transparency*

PSE believes the Electric Reliability Plan and associated Cost Recovery Mechanism will provide greater transparency to PSE's reliability work plan and bring increased collaboration and support to addressing these areas of concern. PSE envisions a process that would allow the Commission and Commission Staff the opportunity to provide feedback on investment plans as they relate to reliability and customer expectations.

**Q. Are there other similar mechanisms implemented by other utilities in other states?**

A. Yes, for example, a similar mechanism was authorized by the Pennsylvania Public Utility Commission. In Pennsylvania, utilities were authorized to recover reasonable and prudent costs incurred to repair, improve, or replace certain eligible distribution property preconditioned on the utilities filing a Long-Term Infrastructure Improvement Plan ("LTIIP"). On April 16, 2016, Duquesne Light filed its LTIIP, which was approved by Pennsylvania Public Utility Commission. Duquesne Light included in its LTIIP investments that address aging infrastructure, which are approaching the end of their expected useful life and therefore at an increasing risk of failure. One of the programs included is the replacement of older underground cable.

**Q. Are there other federal and state directives that encourage utilities to focus on improving reliability?**

A. Yes, there has been increased focus on the need to improve reliability from the state and federal government. For example, President Obama initiated a quadrennial cycle of energy reviews to provide a multi-year roadmap for U.S. energy policy. The first installment addresses the nation's infrastructure for transmitting, transporting, and delivering energy.[4] Additionally, Governor Jay

[4] http://energy.gov/sites/prod/files/2015/04/f22/QER-ALL%20FINAL_0.pdf

Inslee recently created Resilient Washington,[5] a subcabinet charged with addressing major disruptions, including to utility services, in a catastrophic seismic or tsunami event.

**Q. Please describe the framework for PSE's proposed mechanism.**

A. PSE proposes a framework that is very similar to the framework set forth by the Commission in the natural gas Accelerated Replacement Policy. PSE believes that the robust workshops and input gained through the development of the Accelerated Replacement Policy provide a strong foundation that can be similarly applied to an Electric Reliability Plan and associated Cost Recovery Mechanism. The Accelerated Replacement Policy describes how the replacement plan would be structured and how the cost mechanism would work. It also describes filing dates and plan periods and how changes should be addressed. It provides that a utility's replacement plan should: target assets that pose an elevated risk of failure; contain a plan for identifying the location of assets that present elevated risk of failure; be a measured and reasonable response to elevated risk and must not unduly burden rate payers; be in the public interest; and be subject to Commission approval. The Electric Reliability Plan and associated Cost Recovery Mechanism that PSE proposes comply with these guidelines.

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

**Q. What is included in PSE's proposed Electric Reliablity Plan filing?**

A Consistent with the methodology outlined in the Accelerated Replacement Policy, the proposed Electric Reliability Plan consists of two parts: (1) a Master Plan to address all the proposed assets; and (2) a Two-Year Plan that specifically identifies the program goals for the next two calendar years.[6]

**Q. Has PSE filed an Electric Reliability Plan as part of this case?**

A. Yes, PSE's 2017 and 2018 Electric Reliability Plan is included as Exhibit No. ___(CAK-3C). As noted, it includes both the Master Plan and the Two-Year Reliability Plan. PSE's Master Plan articulates the plan objectives and strategies to improve electric reliability, mitigate failure risk, and provide transparency to overall cost and projected reliability benefit. The Two-Year Plan outlines the goals for the next two calendar years including the project location and scope. This plan also includes the rate impact.

**Q. Please describe the plan periods and filing dates proposed for the Electric Reliability Plan and associated Cost Recovery Mechanism.**

A. PSE proposes a calendar-year plan period, from January to December, beginning in 2017. The Prefiled Direct Testimony of Katherine J. Barnard, Exhibit No. ___(KJB-1T), further describes filing dates. Commission Staff would review the plan in a similar manner to the review Staff conducts for natural gas pipeline

[6] The Accelerated Replacement Policy also includes if applicable, a plan identifying the location of the assets. This is not necessary in PSE's proposal as the locations of the assets in focus are known.

replacement plans, for purposes of understanding the areas, cities, and circuits of focus for a given year. Additionally this will help in preparation for Commission Staff's review of the final completion of work for inclusion in the cost recovery mechanism. If during the course of implementing the Master Plan significant changes are necessary, PSE would file updates to the initial plan and the next Two-Year Plan within an appropriate timeframe.

**Q. What would the Electric Cost Recovery Mechanism include?**

A. As described in the Prefiled Direct Testimony of Katherine J. Barnard, Exhibit No. ___(KJB-1T), PSE proposes that the cost accounting and requirements described in the Accelerated Replacement Policy be adopted for the Electric Cost Recovery Mechanism.

**Q. Is PSE proposing filing dates for the Electric Cost Recovery Mechanism?**

A. Yes. The Prefiled Direct Testimony of Katherine J. Barnard, Exhibit No. ___(KJB-1T), discusses the Cost Recovery Mechanism filing dates.

**Q. Please describe how the timing of the mechanism may be different for the first year of the plan.**

A. As discussed, PSE is seeking Commission approval of the Electric Reliability Plan and associated Cost Recovery Mechanism in this case. Additionally, PSE has filed the 2017 and 2018 Electric Reliability Plan as Exhibit No. ___(CAK-3C) and seeks Commission approval of the plan in this case. PSE recognizes that this means the first year of implementing the plan (2017) is concurrent with the proposal of this mechanism and with the general rate case proceeding, which

requires some modifications to the timelines for the initial year in 2017. Modifications to the filing dates are discussed in the Prefiled Direct Testimony of Katherine J. Barnard, Exhibit No. ___(KJB-1T).

## IV. SCOPE OF THE ELECTRIC RELIABILITY PLAN AND ASSOCIATED COST RECOVERY MECHANISM

**Q. Please describe the investments that will be included in this mechanism.**

A. PSE proposes the Electric Reliability Plan and associated Cost Recovery Mechanism include all capital investments made to (1) replace HMW underground cable, and (2) improve reliability on specific identified circuits. With respect to capital investments on specified circuits, this will include:

- circuits identified on the Areas of Greatest Concern list (also known as the Top 50 Worst Performing Circuits list) as documented in the 2011 through 2015 Service Quality and Electric Service Reliability Reports, which is focused on improving PSE's SAIDI performance; and

- circuits that have high circuit customer minute interruptions ("CMI"), SAIDI, and SAIFI, which tend to be circuits with lower customer counts than the circuits on the 2011-2015 Top 50 Worst Performing Circuits list.

**Q. Is PSE proposing to recover through the Electric Cost Recovery Mechanism only expenses above a threshold level for these two targeted areas?**

A. No. PSE proposes to recover through the Electric Cost Recovery Mechanism *all* capital investments in these two targeted areas. This is consistent with the recovery authorized by the Commission for pipe replacement through the gas cost recovery mechanism. It would be difficult from a program management and

tracking perspective to try to recover only investments above a specified dollar threshold for the following reasons:

1) PSE does not track this work in separate ways today. PSE would need to establish several work breakdown structures that divide the work. This would likely create confusion for those implementing the work and require greater effort to ensure data integrity.

2) PSE determines the benefits each project will bring to reliability and determines a total benefit target. Because of specific project challenges, completion of a project within a given year can be hindered. Therefore PSE manages the collective work set to meet the overall benefit target which may require substituting projects, moving a project forward if necessary to ensure the portfolio meets the overall benefit target. This would be complicated by having to separate the work across different work breakdown structures.

**Q. What is the scope of the underground cable replacement work and how will work be identifed and prioritized?**

A. Since 1990, PSE has replaced or silicone injected approximately 2,500 miles of the failure prone HMW cable and approximately 1,800 miles of this cable remains to be replaced at the end of 2015.[7] The Electric Reliability Plan and associated Cost Recovery Mechanism would cover investments to replace all 1,800 miles of HMW cable installed prior to 1982. The cable replacement would ramp up to approximately 160-195 miles per year, with the work completed in approximately ten years. Completion of this work should eliminate all preventable non-injected HMW underground cable outages. At the current pace of approximately 50-70

[7] There is approximately 500 additional miles of HMW cable in conduit that will not be addressed by this mechanism.

miles[8] of underground cable replacement per year, PSE would not complete the replacement for approximately 25 years. Thus, PSE's proposal will significantly accelerate the replacement of this failing cable. This mechanism would also include recovery of expenses related to PSE's continued effort to test for and inject silicone to prevent further failure before being replaced, but realistically it is less and less frequent that these tests prove injection to be a viable alternative. For that reason, PSE may decide at a later date to exclude this work from the mechanism.

Cable replacement projects will be prioritized based on the following factors:

- number of failures;
- vintage (specific years are known to be more prone to failure);
- neutral corrosion concerns;
- system configuration;
- cost; and
- number of customers.

Specific projects may, at times, face unforeseen challenges, and when that occurs, other projects in the Two-Year Plan may be substituted for the affected project in order to maintain the target level of work as set forth in the Two-Year Plan.

[8] Average 2011-2015.

**Q. What amount of capital investment in underground cable replacement is PSE seeking to recover through the Electric Cost Recovery Mechanism?**

A. All targeted replacement for HMW cable will be captured by this mechanism. Between 2011 and September 2016, PSE invested $104 million (capital) in replacing underground cable. In the next five years PSE anticipates capital spending of $[redacted] million. As previously noted, PSE's goal is to complete this cable replacement within ten years.

**Q. What is the scope of the worst performing circuit work and how will this work be identifed and prioritized?**

A. Of PSE's 1,100 distribution circuits, there are a total of 135 circuits that have either been identified as worst performing circuits as reported on Appendix N of the Service Quality and Electric Service Reliability Reports over the last five years (2011-2015) or that have met criteria classifying them as worst performing circuits based on other metrics. These specific circuits are found in Appendix C to the 2017 and 2018 Electric Reliability Plan, which is Exhibit No. ___(CAK-3C). PSE's proposed Electric Cost Recovery Mechanism would recover capital investments made to any of these identified 135 circuits. PSE anticipates that this work would improve reliability by approximately 50% as measured by the metric that resulted in the circuit being on the worst performing circuit list. PSE would target approximately 40 circuits annually as it incrementally works to improve the broader 135 circuits.

Projects will be prioritized based on CMI, circuit SAIDI, and circuit SAIFI. The metric Customers Experiencing Multiple Interruptions ("CEMI") is used to identify pockets of poorest reliability within a worst performing circuit. Additionally system configuration, cost, number of customers, and nature of loads at risk will also factor into prioritization.

As with the underground cable replacement work, specific projects may, at times, face unforeseen challenges, and when that occurs, other projects in the Two-Year Plan may be substituted for the affected project in order to maintain the target level of work on the worst performing circuits as set forth in the Two-Year Plan.

**Q. What is the anticipated capital investment for the worst performing circuit work?**

A. All targeted reliability work associated with the worst performing circuits will be captured by this mechanism. Between 2011 and September 2016, PSE invested $50 million of targeted reliability improvements in the worst performing circuits. PSE estimates investment of approximately $[redacted] million from 2017-2021 to really drive improvements in addressing these circuits.

**Q. Will PSE continue to invest in other reliability work that is outside the scope of this mechanism?**

A. Yes. There are reliability improvements that will be made to PSE's system that are outside the scope of the Electric Reliability Plan and associated Cost Recovery Mechanism as proposed in this case. They involve work other than replacing HMW underground cable and addressing the worst performing circuits. Using

PSE's historic planning process, PSE expects to continue to make reliability investments on circuits that may have average overall reliability performance but have smaller sub-circuit "pockets" of poor reliability with larger numbers of customers or critical facilities. PSE also will continue its commitment to tree trimming on all of its circuits. PSE will continue efforts to build resilience in its infrastructure through system hardening efforts such as pole replacement and adding smart grid technologies such as distribution automation.

Additionally transmission projects that have multiple drivers and infrastructure to serve growing load will not be included in this mechanism but will be a continued focus.

## V. BENEFITS RESULTING FROM THE ELECTRIC RELIABILITY PLAN AND ASSOCIATED COST RECOVERY MECHANISM

**Q. Please describe the benefits that the Electric Reliability Plan and associated Cost Recovery Mechanism will bring to customers.**

A. There are reliability benefits as well as efficiencies to be gained by this mechanism that are valuable to customers.

*Reliability*

In 2015, cable failures accounted for 12 non-major event SAIDI minutes. PSE estimates that over the next two years, it can reduce its SAIDI minutes by an average of 1.5 minutes per year by accelerating the replacement of the HMW underground cable. PSE expects annual failures of the HMW non-injected cable to decrease to 0 in the next 10 years which would eliminate over 195,000

customer interruptions. This benefit analysis is backwards looking only and does not factor in future outages avoided or the potential for greater frequency of outages as cables age that would be avoided. As a result, the benefits of the 2018 work and beyond are expected to be even greater when evaluated at the end of each future year.

Customers will ultimately experience fewer outages as a result of the work undertaken through the Electric Reliability Plan and associated Cost Recovery Mechanism. PSE will scope projects differently under this mechanism with the intent of minimizing overall customer impact. For example, a project will replace HMW cables that have failed and will also proactively replace HMW cables that have not yet failed, but which we know will ultimately fail, in order to minimize construction related service outages, and traffic, and construction inconveniences.

Customers will experience shorter outages as generally customers are impacted more by underground cable failures than overhead equipment failures. On average an underground cable failure results in a 57% longer outage than an overhead equipment failure. These longer outages due to underground cable failure will diminish with this plan.

In 2015, the worst performing circuits accounted for 53 non-major event SAIDI minutes. PSE estimates that over the next two years, addressing these circuits will reduce PSE's non-major event SAIDI by an average of five minutes per year. PSE further estimates that an average of 29,000 customer interruptions will be saved annually. PSE expects the actual benefit to increase as greater focus is

placed on these circuits in year 3-5. As discussed, this benefit analysis is backwards looking only and does not factor in future outages avoided, making the likely actual benefit in the future to be even higher than stated.

*Work efficiencies*

The predictability of this work will help to drive projects to more timely completion due to greater predictability and consistency in the volume of engineering and permitting work and improved coordination with state, county and city projects. Additionally projects can be more efficiently grouped and sequenced to minimize crew mobilization and demobilization efforts as well as minimizing potential construction activity disruption for customers. Over time PSE will see a reduction in repair costs as a result of this plan as well.

*Public Interest*

Improved reliability by fewer long outages and less disruption due to power outages is important to customers. Disruptions to power systems pose more than an inconvenience in today's technology-driven culture; customers depend on reliable, resilient, safe, and secure power systems to ensure vital necessities, including: operating cellular networks; running fuel pumps; providing business and consumer access to banking systems; maintaining home and business climate control, lighting and security systems; and in rural areas on wells, providing access to water. Replacing aging infrastructure with more robust assets enhances public safety.

## VI. CONCLUSION

**Q. Does this conclude your prefiled direct testimony?**

A. Yes.