



Electrical Reliability Workshop  
October 12, 2018 Submitted Questions and Answers

Acronyms used:

- COB – City of Bellevue
- IEEE – Institute of Electrical and Electronics Engineers
- PSE or *PSE* – Puget Sound Energy
- SAIDI – System Average Interruption Duration Index, in minutes per customer. Measures how long outages last.
- SAIFI - System Average Interruption Frequency Index, in events per customer. Measures how many outages occur.
- SCADA – Supervisory control and data acquisition
- UGC – underground conversion
- WUTC – Washington Utilities and Transportation Commission

<p><b>Q1 Assessing Reliability</b></p>	<p>In previous workshops PSE and the city staff have assessed Bellevue’s reliability using SAIDI and SAIFI measurements. Often the community has asked for further assessments, like best practices, comparison to other cities, load flow, etc. Why does PSE not provide these other methods of assessment?</p>
<p>PSE works with the WUTC to determine how to assess and report on electric system performance, including service reliability. Generally, PSE assesses performance on an overall system basis and by distribution circuits. Other assessments or comparisons do not provide any meaningful basis for determining how PSE can identify shortfalls in system performance or actions which could improve system performance. PSE does work to be responsive to customer concerns and does evaluate industry practices to determine which contribute to performance improvement in PSE’s power transmission and distribution systems. <i>PSE</i></p>	

<p><b>Q2 Improving Circuit Reliability</b></p>	<p>What is PSE doing to improve reliability for the thirty-three circuits that performed below average for Bellevue?</p>
<p>City-wide Bellevue’s reliability is better than PSE’s overall system. There are some distribution circuits in Bellevue that do not always perform better than our system average from year to year. For these circuits we identify and address performance deficiencies within the system-wide resource allocation framework. Twenty-seven circuits have been addressed or require no corrective action. The remaining six are under review. <i>PSE</i></p>	



<p><b>Q3 Compare Quartile Reliability</b></p>	<p>Comparing reliability for PSE to their peers, both system-wide and in Bellevue, what quartile is PSE in? See chart p. 6.</p>
<p>Overall, PSE compares favorably with many other utilities, not the very best, but definitely not the worst. Not all utilities do (or can) report on system performance in equivalent ways, so ‘apples-to-apples’ comparisons are not always possible. PSE ranks above average on a nationally-syndicated study that measures customer satisfaction with a variety of PSE service performance, including power quality and service reliability.</p> <p>PSE also participates in an annual IEEE benchmark study of 93 participating electric utilities across the United States and Canada. For 2017 PSE was in the 3<sup>rd</sup> Quartile of SAIDI and SAIFI. Participation in the survey is voluntary, with data submitted by utilities kept private and anonymous to other utilities (PSE does not have access to results for any other utility participating in this study.) <i>PSE</i></p>	
<p><b>Q4 Compare to Other Utilities</b></p>	<p>Can PSE provide a five-year history for comparing PSE reliability to Avista and Pacific Power?</p>
<p>Yes, this exists on the WUTC website at <a href="https://www.utc.wa.gov/regulatedIndustries/utilities/energy/Pages/electricReliabilityReports.aspx">https://www.utc.wa.gov/regulatedIndustries/utilities/energy/Pages/electricReliabilityReports.aspx</a> <i>PSE</i></p>	
<p><b>Q5 Compare Changing Metrics</b></p>	<p>How can we compare the five years of SAIDI and SAIFI metrics if the standards and number of years averaged have changed? Can prior years be recalculated using a uniform standard? <i>PSE</i> <i>Two versions of this question combined</i></p>
<p>Yes, this is possible, but might not give much better data. Going forward, beginning with our annual report for 2018 performance, PSE will report annual SAIDI and SAIFI using year-to-year consistent methodologies. <i>PSE</i></p>	
<p><b>Q6 Graphing Reliability</b></p>	<p>Can we see a graph of SAIDI and SAIFI? A table is difficult to interpret, especially for visually-oriented people.</p>
<p>Yes, we can. Going forward PSE will coordinate with City of Bellevue on report information formatting including possible graphical representations of report information. <i>PSE</i></p>	



<p><b>Q7 Trend Worse for SAIFI</b></p>	<p>Bellevue SAIFI trend numbers have worsened year over year. Why?</p>
<p>During the period 2008 – 2017 annual SAIFI figures for Bellevue ranged between 0.44 and 0.91 while system-wide annual figures ranged between 0.86 and 1.20. In all years the Bellevue figure was significantly better than (bellow) the system-wide figure. Since SAIFI has always excluded storm outage events from the annual calculation, we can exclude storms as a cause for changes in SAIFI. We can't easily say why SAIFI values have been on an upward trend in the past four years. With SAIFI figures in Bellevue remaining below 1, our primary focus is on understanding what drives annual SAIDI figures (outage duration), which generally speaking have more impact for customers experiencing outages. <i>PSE</i></p>	
<p><b>Q8 Trend Worse for SAIDI</b></p>	<p>If you view 2010-2017 Bellevue, has not improved year over year, if you compare Bellevue to PSE each year. Bellevue is not improving at an equal rate. Why?</p>
<p>System-wide SAIDI averages the outage duration experiences of all PSE power customers. The calculation methodology for SAIDI used to assess Service Quality Index (SQI) performance has changed over this period in coordination with the WUTC. Both system-wide and Bellevue SAIDI figures have fluctuated over this period, with the Bellevue figures always significantly better than the system-wide figures. PSE strives to improve performance system wide, including circuits serving Bellevue. <i>PSE</i></p>	
<p><b>Q9 Bellevue Trend Direction</b></p>	<p>How well are we doing on a trend basis for Bellevue? Is Bellevue getting better?</p>
<p>Citywide Bellevue has better reliability than PSE's overall system in both SAIDI and SAIFI. Citywide figures represent an average experience for all customers in Bellevue. Individual distribution circuit SAIDI and SAIFI figures can provide a more local indication of service performance. Circuit level SAIDI and SAIFI figures have been reported annual since 2012. Local reliability performance can vary by the number and impact of events experienced by individual circuits. <i>PSE</i></p>	
<p><b>Q10 Compare to Rural Cities</b></p>	<p>Wouldn't it be apparent that Bellevue should be better than the system cities, many quite rural?</p>
<p>System performance can be influenced/affected by many factors including weather, location, system configuration, customer (electric load) density and proximity of potential cause of system interruption. A given service area being more urban (dense) does not necessarily correspond with better expected reliability. Many parts of Bellevue share characteristics of many 'more rural' communities and share many if not most of the same challenges to system performance. <i>PSE</i></p>	



<p><b>Q11 Compare SAIDI w/ storms</b></p>	<p>Other utilities show SAIDI both with and without storm outages. Can we see data of outages that include storms, which are the biggest source of outages in our area, even if that data is not required by the UTC? Storms influence policy, and the changes that need to be made to the system. We would like ten years of data. <i>Two versions of this question combined</i></p>
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PSE reports SAIDI figures as coordinated with the WUTC. Going forward PSE will coordinate with City of Bellevue on information reported for circuits serving Bellevue. *PSE*

<p><b>Q12 BTR 22 Action</b></p>	<p>Referring to the chart on presentation slide 9, what is the status and schedule for BTR 22 corrective action?</p>
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PSE is working with the property owner where the existing PSE overhead feeder lines are located to acquire the necessary property rights (easements) for this project (to underground the lines). PSE has determined that this undergrounding project is the most appropriate means to address the trees impacting the performance of this circuit at this location. We are hopeful that the project can construct in 2019. *PSE*

<p><b>Q13 Compare Mean Time</b></p>	<p>Does PSE have data that could be used to compute the mean time between failures (MTBF) and mean repair time (MTTR) for each of the ninety-six distribution circuits?</p>
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This is not something PSE currently does for internal assessment nor communication to the WUTC. PSE tracks data and evaluates system performance and reliability based on industry best practices, standards, and metrics. SAIDI and SAIFI are the standard metrics used by the industry to compute average outage duration and frequency rates and reflect repair time and failure frequency. PSE evaluates industry approaches and practices for potential implementation in PSE’s utility systems to improve system performance and reliability. *PSE*

<p><b>Q14 Compare Map Reliability</b></p>	<p>Can PSE provide a map showing which areas are served by each circuit in Bellevue, so that we can see how reliability compares in different parts of Bellevue? Customers want equity of service throughout Bellevue and can’t do that if we don’t know where the circuit problems are.</p>
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PSE will work with the City of Bellevue to determine appropriate content for future performance reports.

Service equity may not be a realistic goal because it assumes the challenges are the same throughout the system. System configurations vary in different parts of the City to meet different needs and conditions. Configurations change from time to time to safely



accommodate work on the system and change over time in response to changes in electrical loads and additions of new system infrastructure. PSE works to be responsive to localized concerns in the context of the system needs and challenges.

PSE can depict approximate geographic service areas by distribution circuit. PSE does not provide this information publicly for several reasons, including:

- 1) making such information publicly available could pose significant risk to the security and safe operation of our system;
- 2) system design, configuration and operation are primarily driven by electric load distribution, not geographic boundaries;
- 3) circuit configurations change such that representations of circuit service areas are just as likely to be misleading as helpful. *PSE*

**Q15 Reliability Equity\***

How does PSE provide reliability equity in circuits throughout Bellevue?  
*\*Reliability equity not an actual term and is thus not measurable in reporting SAIDI or SAIFI metrics. COB*

PSE is responsible for safe, reliable energy delivery to of all customers. PSE actions with respect to reliability are not driven by any intent to achieve any equity, but rather by recognition of performance issues and identification and implementation system changes expected to improve system performance. Reliability equity may not be a realistic goal because it assumes the challenges are the same throughout the system. PSE attempts to be responsive to localized concerns in the context of the system-wide needs, but we cannot assume that every area has the same needs and challenges. *PSE*

**Q16 Tree Canopy Goals**

What does PSE do to help comply with Bellevue’s tree canopy goal of forty percent?

Associated with our Bellevue Electric Franchise, PSE and the City signed an enhanced memorandum of understanding addressing how PSE will work with the City in performing necessary vegetation management in Bellevue. Generally, PSE will always have to manage vegetation including trees in proximity to overhead power lines. Trees are a major cause of power outages, so our crews manage trees to maintain safe, reliable power delivery to customers.

We perform necessary vegetation management in accordance with established best management principles. Furthermore, PSE is a Tree Line USA award recipient from the National Arbor Day Foundation – an honor we’ve proudly held for more than eighteen consecutive years.

For more information on our vegetation program and practices, visit [www.pse.com/pages/tree-trimming](http://www.pse.com/pages/tree-trimming). *PSE*



<p><b>Q17 Listing Outage Events</b></p>	<p>The listing of outage events is helpful, but not immediately available. Can PSE provide outage event reports within a week or two of the event on your website?</p>
<p>This is not a common practice for utilities. We have committed to annual outage reporting which is consistent with how we report to the WUTC.</p> <p>Customers can sign up for outage alerts via their <i>myPSE</i> account. Customers can get an email or text to let them know if their power is out, their estimated restoration time, and when their power has been restored. If possible, we include the cause or reason for the outage.</p> <p>We may be able to deliver our annual report to Bellevue earlier in the year once we have completed our work to report to the WUTC. <i>PSE</i></p>	
<p><b>Q18 DA Cost Solution</b></p>	<p>What is the range of cost for a Distribution Automation (DA) solution for a circuit?</p>
<p>Distribution Automation implementation costs can vary greatly based on the number of circuits involved, existing equipment, new and replacement equipment, changes at substations, communications need between equipment, and similar factors. Not including costs to implement the DA software platform in PSE’s control systems, simple DA implementation projects have come in as low as \$200,000 while more complex projects can cost over a million dollars. Costs for several projects have been in the neighborhood of \$500,000 or more. We anticipate that costs for future projects will vary significantly depending on the complexity of particular project solutions. <i>PSE</i></p>	
<p><b>Q19 Costs of Undergrounding</b></p>	<p>We have been asking for an underground conversion on Newport Way. Falling trees are causing long outages in this area. We are told that a Washington co-op utility can do this for approximately \$200/foot. PSE’s cost is five times higher. Can you explain why are PSE costs so high?</p>
<p>While we can’t comment on what costs may be for other utilities, we can provide rough order of magnitude cost ranges for distribution system underground conversion projects in PSE’s system. Under existing tariff rate schedules governing underground conversions (Schedules 73 and 74) the party requesting undergrounding is responsible for performing and paying for project surface removal, trenching, excavation, backfill, surveying and surface restoration.</p> <p>Generally, there are three levels of overhead distribution system involved in conversions:</p> <ol style="list-style-type: none"> <li>1) single phase distribution - \$150 to \$200 per system lineal foot</li> <li>2) three phase distribution - \$300 to \$400 per system lineal foot</li> </ol>	



3) distribution feeder - \$1,000 to \$1,200 per system lineal foot (requires construction of interconnected parallel underground feeder and local distribution systems)

- *Cost ranges listed here exclude costs for above project elements, and include project design, engineering, materials, and labor to install PSE underground facilities and remove PSE overhead distribution facilities, assuming typical construction location and configuration.*

A second cost not reflected above is the cost for work to replace overhead service lines to homes and businesses with underground service lines as required by state law. Costs for such replacement service lines can be considerable, often many thousands and tens of thousands of dollars for all work necessary to make ready for and installation of underground service lines. By tariff all such costs are the responsibility of the customer. *PSE*

<p><b>Q20</b> Underground conversions done</p>	<p>Did PSE do any underground conversions in 2017 in Bellevue? Where? When was the last underground conversion done and what did it cost?</p>
<p>PSE completed three significant underground conversions project in Bellevue 2017-2018:</p> <ul style="list-style-type: none"> <li>• Schedule 74 UGC along Bellevue Way SE, SE 30<sup>th</sup> Street to 112<sup>th</sup> Avenue SE (\$1,048,000*)</li> <li>• Schedule 74 UGC along Lake Washington Boulevard vicinity 99<sup>th</sup> Avenue NE associated with the Bellevue Meydenbauer Park project (\$224,000*)</li> <li>• Schedule 73 UGC along 120<sup>th</sup> Avenue NE north from NE 12<sup>th</sup> Street (\$327,000*); utilized existing empty conduits and vaults installed with Bellevue’s 120<sup>th</sup> Avenue NE Phase 2 roadway project.</li> </ul> <p><i>*Project PSE cost component in rounded figures not including project permitting, excavation, trenching, backfill, restoration and surveying. PSE</i></p>	

<p><b>Q21</b> Somerset circuit reliability</p>	<p>What is being planned to improve reliability issues for Somerset circuits (which have the some of the longest outages in the city?)</p>
<p>A transmission system SCADA with Automation project was recently complete to improve response time to outage events along the Lakeside-Shuffleton transmission line which is expected to reduce duration for some events affecting the transmission line tap feeding Somerset Substation (which feeds distribution circuits serving a majority of the Somerset neighborhood.)</p> <p>A Distribution Automation (DA) project has been developed for two distribution circuits serving the Somerset neighborhood to provide DA capability between three distribution circuits; design planned to 2019; construction planned for completion in 2020. <i>PSE</i></p>	



<p><b>Q22 Lake Hills reliability</b></p>	<p>Would distribution automation improve reliability and reduce outage duration for customers in the Lake Hills area?</p>
<p>To be most effective, Distributed Automation requires a robust and redundant transmission system to keep power flowing to distribution substations. In the Lake Hills area, PSE’s Lake Hills-Phantom Lake project will provide a backup transmission line to the Lake Hills, College and Phantom Lake substations and improve overall system reliability.</p> <p>Distribution Automation can minimize the number of customers impacted by a power outage and shorten the outage duration for those affected – but it cannot prevent outages from happening and it cannot reliably substitute for a lack of redundant power supply to multiple substations serving the same area. <i>PSE</i></p>	
<p><b>Q23 Exponent Suggestions</b></p>	<p>The electrical reliability workshop was initiated as part of the Exponent [sic—<i>refers to 2011 Electrical Reliability</i>] Study several years ago. These workshops have been useful but have changed little. What five improvements would Exponent recommend? What five community suggestions would Exponent support?</p>
<p>Exponent’s analysis role does not include responsibility for such recommendations or improvements. They are tasked, again with reference to the 2011 Electrical Reliability Study, with analyzing the validity of PSE performance, problems, and identified solutions. <i>COB</i></p>	
<p><b>Q24 Circuits and Substations</b></p>	<p>Why does Slide #4 indicate that there are 96 distribution circuits and 23 substations, but the 2017 Bellevue Reliability Report (pp. 2 and 3) indicate that there are 67 circuits and 21 circuit “areas?”</p>
<p>The 96 and 23 figures refer to total circuits and substations. The 67 and 21 figures are subsets. During the 2013-2017 five-year period 67 circuits serving customers in Bellevue performed below system wide performance in one or more years. The 21 total for 2013 refers to the total of circuits that performed below system wide performance in any of the year-measurement categories. <i>PSE</i></p>	



	Kudos
	<ul style="list-style-type: none"><li>• Andy [Swayne] does a great job in representing his company and this information. The community is here to help all of us get better with constructive ideas</li><li>• Thanks to PSE for coming to help us understand reliability</li><li>• Love distribution automation progress – thank you.</li><li>• Very comprehensive overview with a lot of information. Challenging to present it all and was done well.</li><li>• Appreciate that there is time for conversation.</li><li>• We found the face to face meeting valuable compared to the previous online webinar. Thanks to the city and PSE.</li><li>• We like: AMI, Distribution Automation, Battery storage. We need these technologies and applaud PSE’s efforts to move forward to improve reliability and resiliency.</li><li>• We love distribution automation for Eastgate, Somerset, and Hazelwood. Yay!</li></ul>

	Comments
	<ul style="list-style-type: none"><li>• Being better than system average is not good enough for Bellevue, or simply meeting WUTC objectives (Note: also, only AVISTA &amp; PACIFIC Corp). Nevertheless, in reviewing the 2014 reliability report and today’s 2017 numbers the trends are disturbing.</li><li>• PSE clarified that some of this will be considered for improvements to future annual reports, rather than a re-write of the 2017 numbers.</li><li>• How do we make sure that we are getting better every year?</li><li>• All the women are strong, all the men are good-looking, and all the electrical circuits are above average.</li><li>• Peninsula Light has undergrounded about three-quarters of their distribution system, dramatically improving reliability. It’s been a long-term project. By doing it incrementally, they have kept energy bills low. Lower than PSE. We should follow their lead.</li></ul>