Exh. HEN-16
Dockets UE-220066, UG-220067, UG-210918
Witness: Hanna E. Navarro

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**DOCKETS UE-220066, UG-220067, UG-210918 (consolidated)**
In the Matter of the Petition of **PUGET SOUND ENERGY** **For an Order Authorizing Deferred Accounting Treatment for Puget Sound Energy's Share of Costs Associated with the Tacoma LNG Facility**	

EXHIBIT TO TESTIMONY OF

HANNA E. NAVARRO

STAFF OF WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

Excerpts from PSE's 2020 Electric Service Reliability Report

July 28, 2022

Dockets UE-170033 and UG-170034 (consolidated) and Dockets UE-072300 and UG-072301 (consolidated)

Puget Sound Energy
2020 Service Quality Program and Electric Service Reliability Filing

Attachment A:
Service Quality and Electric Service Reliability Report

Summary of Customer Complaints

In 2020 PSE counted a total of 31 reliability complaints; 13 via the Washington Utilities and Transportation Commission (WUTC) and 18 via directly contacting PSE. **Figure 3f** shows how the results from 2020 compare to previous years.[32] Note that customers may have submitted a complaint with both PSE and the WUTC.

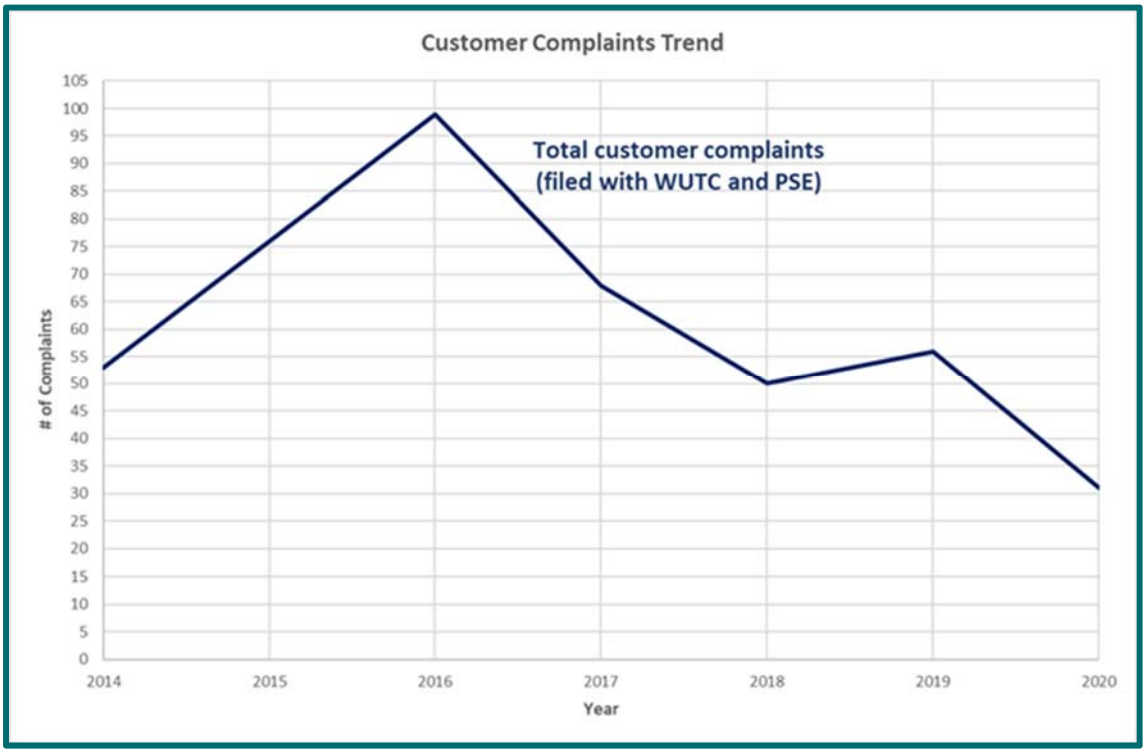

Figure 3f: Trend in Customer Complaints

Though SAIDI and SAIFI saw large increases in 2020, the number of customer complaints decreased. This continues the multi-year trend in decreasing customer complaints related to reliability shown in **Figure 3f**. Note that the number of complaints is very small compared to the number of PSE customers (0.003%). Because the number of complaints is so small and because relatively large changes in the number of complaints can occur depending on where and when storms occur, changes in complaints are not well correlated to SAIDI or SAIFI. As with CEMI, this information is most useful for PSE as a tool to identify customers with reliability concerns that might not be seen in a system-wide or circuit level metric analysis.

[32] The increase in complaints in 2016 was due to organized neighborhood groups calling PSE to complain about electric reliability in their area, specifically customers in Kenmore.

Summary of Plan Moving Forward

Relative to previous years, 2020 was an anomaly with respect to SAIDI and SAIFI. Due to stormy weather in early January, the trend of improving reliability appears to have slowed. However, the proven cost effective processes and policies PSE has implemented over time, combined with the feedback mechanisms PSE has developed and implemented to continuously monitor and improve reliability, will continue to drive improvement in long term reliability performance.

In addition to continuing to implement well-established electric system improvements such as cable replacement, treewire and distribution automation, PSE will continue to identify and evaluate new reliability improving technologies such as transmission line automatic switching, single phase reclosers and fault locating technologies. Through PSE's budget optimization process, specific reliability projects will continue to be chosen for implementation that maximize value for customers.

PSE's processes for evaluating, designing and implementing reliability improvements are intended to reduce SAIDI over the next 10 years. With increasing electric vehicle and distributed energy resource adoption, along with more people working from home, PSE expects customers to likely demand better reliability over time. Continuing to invest in grid modernization will help to meet future customer expectations for reliability as well as maximize customer benefit from wider adoption of these technologies as they mature.

SAIDI (SQI #3) [33]

Overview[34]

SAIDI measures the average number of interruption minutes per customer per year. Most electric utilities use this measurement in reviewing the reliability of their electrical system, excluding events that cause interruptions to a significant portion of their customer base due to extreme weather or unusual events.

SAIDI is similar to SAIFI, but SAIDI measures the average duration of customer interruptions while SAIFI measures the average number of customer interruptions. See **Appendix H**: *Electric Reliability Terms and Definitions* for the SAIDI definition.

The 2020 results based on the recorded outages are reported in **Table 3a**.

Table 3a: 2020 SAIDI Results

	Key Measurement	Benchmark	Baseline	Current Year Results	Achieved
$SAIDI_{Total}$	**Total (all outages current year) Outage Frequency–System Average Interruption Duration Index (SAIDI)**	**n/a**	**532**	**414**	**--**
$SAIDI_{Total\ 5\text{-}year\ Average}$	**Total (all outages five-year average) SAIDI**	**n/a**	**326**	**454**	**--**
$SAIDI_{5\%}$	**<5% Non-Major-Storm (<5% customers affected) SAIDI**	**n/a**	**132**	**220**	**--**
$SAIDI_{IEEE}$	**IEEE Non-Major-Storm (T_{MED}) SAIDI**	**n/a**	**107**	**171**	**--**
$SAIDI_{SQI\text{-}3}$	**IEEE Non-Major Storm (T_{MEDADJ}) SAIDI**	**No more than 155 minutes per customer per year**	**n/a**	**165**	**☒**

Appendix J: *1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements* reports the historical results of the four measurements from 1997 through the current reporting year. See **Appendix I**: *Electric Reliability Data Collection Process and Calculations* and the section on electric service reliability measurements and baseline statistics for details on the established baseline used for comparison.

[33] This section meets a requirement of Attachment B of Docket UE-110060.

[34] This section meets a requirement of Attachment B of Docket UE-110060.

What Influences SAIDI[35]

PSE tracks outages by cause codes and groups. **Figure 3g** illustrates the impact of tree-related outages, accounting for the majority of customer minutes, across the $SAIDI_{Total}$ and $SAIDI_{SQI-3}$ measurements.

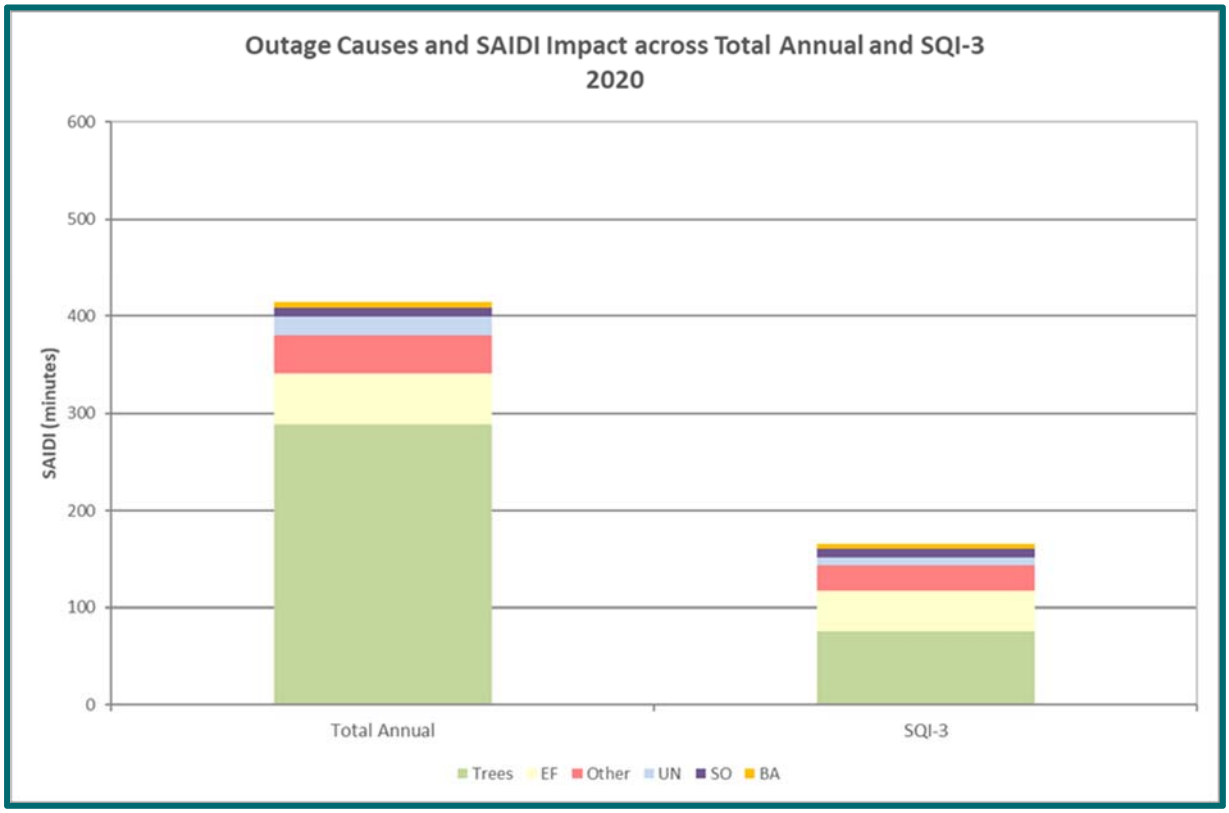

Figure 3g: Outage Causes and SAIDI Impact across Total Annual and SQI-3 in 2020

Despite PSE's best efforts to minimize tree-related outages, these outages can greatly influence SAIDI performance. Falling trees can damage the infrastructure and require a specialized tree removal crew to remove fallen trees before field personnel can begin restoration efforts, producing prolonged interruptions. A fallen tree or large limb will damage the line and may also tear down supporting structures, cross arms and poles.

Other cause categories with a large impact on SAIDI include equipment failure (EF), unknown (UN) and the other (Other) cause category. The equipment failures category is used when a device is suspected of failing for reasons not related to external causes and the unknown category covers

[35] This section meets a requirement of Attachment B of Docket UE-110060.

those outages when electric first response (EFR) personnel were unable to determine the cause of the outage. The Other category includes 20 cause codes that PSE tracks, such as underground dig-ups, vehicle-related outages (vehicle impacting pole, padmounted switch, guy wire, etc.) and errors in operating the electric system.

Historical Trends for SAIDI

Table 3b shows the SQI SAIDI from 2016 to 2020.

Table 3b: SQI SAIDI from 2016 to 2020

	2016	2017	2018	2019	2020
SAIDI (SQI #3)	**148**	**175**	**145**	**136**	**165**
Benchmark	**155 minutes per customer per year, Non-Major Event Days**				

SAIDI results vary widely from year to year. The large increase in SAIDI in 2020, primarily caused by stormy weather in early January, distorts the multi-year trend somewhat. However, while the SAIDI benchmark was missed in 2020, the 5 year SAIDI least squares fit trend shows a slight downward slope indicating that SAIDI is generally trending below the benchmark.

For more detail see **Appendices J**: *1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements*, **K**: *Current Year Electric Service Outage by Cause by Area* and **L**: *Historical SAIDI and SAIFI by Area*.

Impact of Unusual Event on SQI SAIDI

The impacts of the COVID-19 pandemic on reliability are not clear. Disruptions to working environments from distancing and quarantine requirements and recommendations as well as delays from permitting agencies may have had some effect, but their impact on reliability cannot be measured.

SAIFI (SQI #4) [36]

Overview[37]

SAIFI measures the number of interruptions per customer per year. Most electric utilities use this measurement in reviewing the reliability of their electrical system, excluding major interruption events that cause interruptions to a significant portion of their customer base.

SAIFI is similar to SAIDI, but SAIFI measures the average number of customer interruptions while SAIDI measures the average duration of customer interruptions. See **Appendix H**: *Electric Reliability Terms and Definitions* for the SAIFI definition.

The 2020 results based on the recorded interruptions are reported in **Table 3c**.

Table 3c: 2020 SAIFI Results

	Key Measurement	Benchmark	Baseline	Current Year Results	Achieved
$SAIFI_{Total\ Annual}$	**Total (all outages current year) Outage Frequency -- System Average Interruption Frequency Index (SAIFI)**	**n/a**	**1.24**	**1.70**	**--**
$SAIFI_{Total\ 5\text{-}year\ Average}$	**Total (all outages five-year average) SAIFI**	**n/a**	**1.37**	**1.67**	**--**
$SAIFI_{5\%}$	**<5% Non-Major-Storm (<5% customers affected) SAIFI**	**1.30**	**0.80**	**1.24**	☑
$SAIFI_{IEEE}$	**IEEE Non-Major-Storm (TMED) SAIFI**	**n/a**	**0.71**	**1.06**	**--**

Appendix J: *1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements* reports the historical results of the four measurements from 1997 through the current reporting year. See **Appendix I**: *Electric Reliability Data Collection Process and Calculations* and the section on electric service reliability measurements and baseline statistics for details on the established baseline used for comparison.

[36] This section meets a requirement of Attachment B of Docket UE-110060.

[37] This section meets a requirement of Attachment B of Docket UE-110060.

What Influences SAIFI[38]

PSE tracks outages by cause codes and groups. As with SAIDI, system damage caused by trees and vegetation continue to impact the most customers in 2020, which is consistent with previous years. This is followed by equipment failure (EF), other (Other) and unknown (UN) having the greatest impact on SAIFI. See section on SAIDI for more details on these cause categories.

Figure 3h shows the common causes for the recorded outages in 2020 and their impact on customers across $SAIFI_{Total}$ and $SAIFI_{5\%}$ measurements.

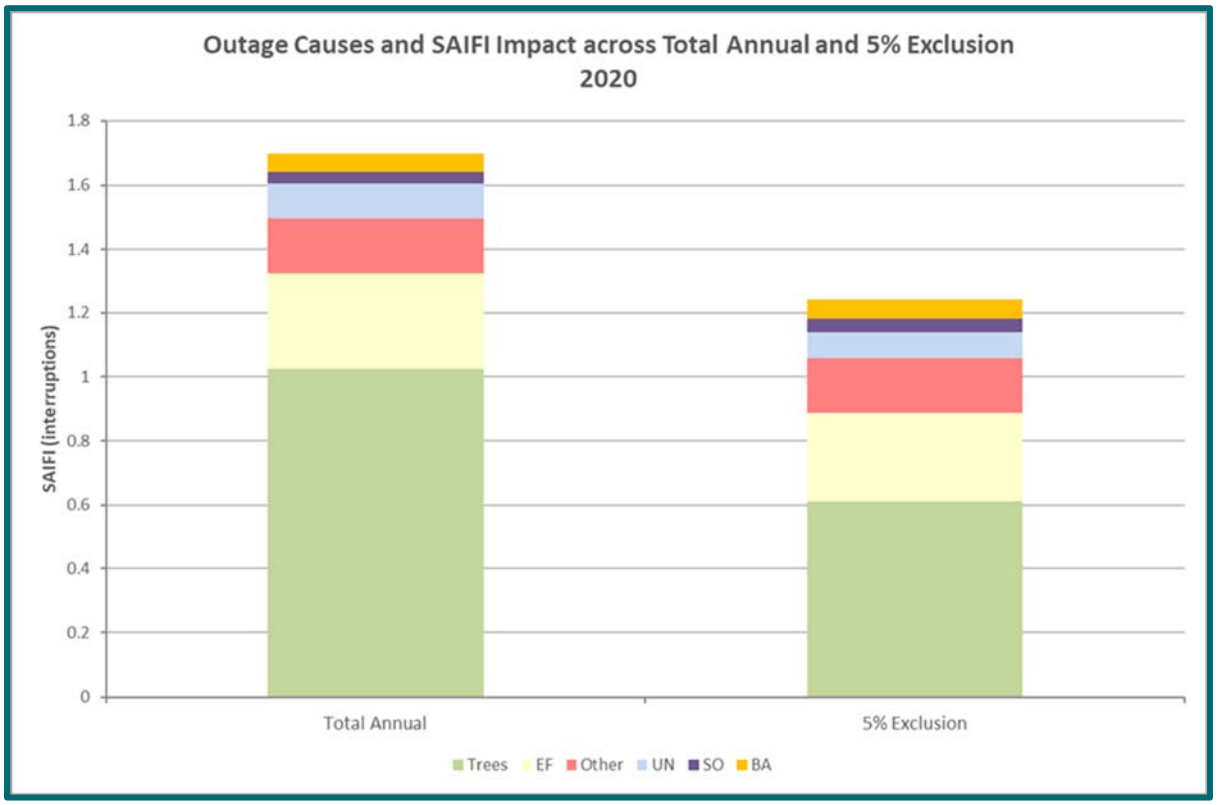

Figure 3h. Common Outage Causes and SAIFI Impact a across Total Annual and 5% Exclusion in 2020

[38] This section meets a requirement of Attachment B of Docket UE-110060.

Historical Trends for SAIFI[39]

Table 3d shows SQI SAIFI from 2016 to 2020.

Table 3d: SQI SAIFI from 2016 to 2020 (excluding 5% Major Events)

	2016	2017	2018	2019	2020
$SAIFI_{5\%}$ **(SQI #4)**	**1.06**	**1.20**	**1.02**	**0.98**	**1.24**
Benchmark	**1.30 interruptions per year per customer**				

As with SAIDI, SAIFI results can vary widely from year to year. The issues that caused a large increase in SAIDI in 2020 also caused the large increase in SAIFI. Despite this, the result was below the benchmark and has been below the benchmark for 5 years as shown in **Table 3d**. For more details see **Appendices J**: *1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements*, **K**: *Current Year Electric Service Outage by Cause by Area* and **L**: *Historical SAIDI and SAIFI by Area.*

Impact of Unusual Event on SQI SAIFI

The impacts of the COVID-19 pandemic on reliability are not clear. Disruptions to working environments from distancing and quarantine requirements and recommendations as well as delays from permitting agencies may have had some effect, but their impact on reliability cannot be measured. .

[39] This section meets a requirement of Attachment B of Docket UE-110060.

Customer Experiencing Multiple Interruptions

Overview

Starting in 2018, PSE agreed to report on Customers Experiencing Multiple Interruptions (CEMI) as part of Dockets UE-072300 and UG-072301 Order 29. Whereas SAIDI and SAIFI are an average measure of customer experience, CEMI provides the range of customer experiences related to interruption frequency. Metrics like SAIDI and SAIFI are useful for tracking system-wide progress but may hide customer level reliability concerns. CEMI fills this gap, however, instead of describing it as a unique specific measure, it is expressed here as a range. This gives an overall profile of multiple interruptions experienced by PSE customers.

CEMI measures the percentage of customers who have experienced zero to multiple sustained interruptions. It is calculated by totaling the number of non-major event day interruptions experienced by each customer. Then the number of customers who had the set number of interruptions is totaled and divided by the average annual number of electric customers.

Results

Figure3i shows the percentage of PSE customers experiencing varying numbers of interruptions. For example, 45% of customers experienced no sustained interruptions while 30% of customers experienced one sustained interruption.

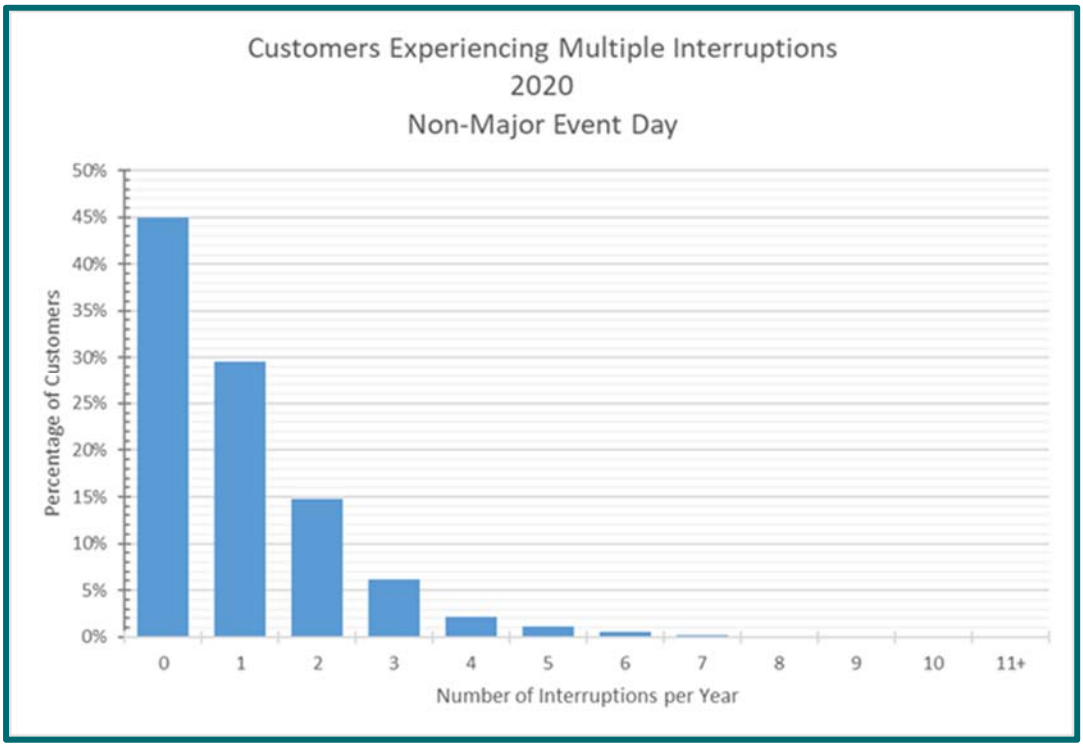

Figure 3i: Customers Experiencing Multiple Interruptions in 2020