Docket Nos. UE-072300 and UG-072301

Puget Sound Energy
2016 SQ Program and Electric Service Reliability Filing

Attachment A:
PSE 2016 Service Quality and Electric Service Reliability Report

Puget Sound Energy
2016
Service Quality and Electric Service Reliability Report

Filed on March 31, 2017

PUGET SOUND ENERGY
The Energy To Do Great Things

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INTRODUCTION

Executive Summary

As Washington State's oldest and largest energy utility, with a 6,000-square-mile service territory stretching across 10 counties, Puget Sound Energy (PSE) serves approximately 1.1 million electric customers and over 800,000 natural gas customers primarily in the Puget Sound region of Western Washington. PSE meets the energy needs of its customer base through cost-effective energy efficiency measures, procurement of sustainable energy resources and far-sighted investment in the energy-delivery infrastructure. PSE employees are dedicated to providing quality customer service and to delivering energy that is safe, dependable, efficient and environmentally responsible.

The report provides PSE's 2016 performance for the following areas: Customer Service Guarantee, Restoration Service Guarantee, service quality performance of PSE and its service providers, and electric service reliability performance.

For the 2016 Service Quality Program year, PSE met its benchmarks for each Service Quality Index (SQI): WUTC Complaint Ratio (SQI[1] #2), System Average Interruption Duration Index (SQI #3), System Average Interruption Frequency Index (SQI #4), Customer Access Center Answering Performance (SQI #5), Customer Access Center Transactions and Field Service Operations Transactions Customer Satisfaction (SQI #6 and #8), Gas and Electric Safety Response Time (SQI #7 and #11), and Kept Appointments (SQI #10).

The 2016 performance results improved for SQI #2, 4, and 5. For SQI #6, 7, 8 and 10, the performance has been consistently better than the benchmark.

Background

PSE first implemented its Service Quality Program (the SQ Program) when the Washington Utilities and Transportation Commission (UTC, or WUTC, or the Commission) authorized the merger of Washington Natural Gas Company and Puget Sound Power & Light Company in 1997.[2] The stated purpose of the SQ

[1] Service Quality Index

[2] Under consolidated Docket Numbers UE-951270 and UE-960195.

Program was to "provide a specific mechanism to assure customers that they will not experience deterioration in quality of service" and to "protect customers of PSE from poorly-targeted cost cutting." The SQ Program has been further extended[3] with various modifications to demonstrate PSE's continuous commitment to customer protection and quality service.

Service Quality Program

The Service Quality Program includes three components:

- **Service Quality Index (SQI)**—PSE reports annually to the UTC on the final performance of these nine SQIs. This document explains the SQIs, how they are calculated and PSE's performance on each of the SQIs for the performance year of 2016.
- **Customer Service Guarantee**—The Customer Service Guarantee (CSG) provides for a $50 missed appointment credit for both natural gas and electric service. This on-time appointment guarantee has been available to all customers since the inception of PSE's Service Quality Program in 1997.
- **Restoration Service Guarantee**—The Restoration Service Guarantee (RSG) provides for a $50 electric outage restoration credit to a qualified PSE electric customer based upon the conditions and exceptions outlined in PSE's electric Schedule 131. There are two RSGs: the 120-hour guarantee during any storm event and the 24-hour guarantee during a non-storm event. The 120-hour guarantee was established in 2008. The 24-hour guarantee became effective on January 1, 2017.

In addition to these three components, the SQ Program also prescribes reporting requirements for PSE's primary service providers. Several Service Provider Indices (SPIs) benchmark performances in areas of construction standards compliance, reliability/service restoration and kept appointments.

The SQ Program also includes PSE's gas emergency response plans for outlying areas, which are filed concurrently with this Report as Attachment B to the annual UTC SQI and Electric Service Reliability filing.

Attachment C to the 2016 annual UTC SQI and Electric Service Reliability Report filing is PSE's 2016 Critical Infrastructure Security Annual Report, which contains a discussion of PSE's cybersecurity and physical security policies and related information for 2016.

[3] Under consolidated Docket Numbers UE-011570, UG-011571, UE-072300 and UG-072301.

SQI and Electric Service Reliability Report

This *Puget Sound Energy 2016 SQI and Electric Service Reliability Report* meets PSE's SQ Program reporting requirements[4] and the electric service reliability reporting requirements set forth by the UTC.[5,6] To facilitate external review of PSE's SQI and Electric Service Reliability performance, the two reports were combined starting with the 2010 reporting year.[7]

Overview of Performance

Table 1a summarizes PSE's 2016 SQI and Electric Service Reliability performance, along with relevant service providers' performance metrics and the two service guarantees. PSE met nine of the nine Service Quality Indices under PSE's Service Quality Program.

Table 1a: SQI and Electric Service Reliability and Service Provider Performance Metrics

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Customer Satisfaction				
WUTC complaint ratio	**Service Quality Index #2**	**No more than 0.40 complaints per 1,000 customers, including all complaints filed with WUTC**	**0.18**	☑
Customer Access Center transactions customer satisfaction	**Service Quality Index #6**	**At least 90% satisfied (rating of 5 or higher on a 7-point scale)**	**93%**	☑
Field Service Operations transactions customer satisfaction	**Service Quality Index #8**	**At least 90% satisfied (rating of 5 or higher on a 7-point scale)**	**95%**	☑

[4] The performance benchmark, calculation and reporting of each of the Service Quality Indices (SQIs) in this Report reflect all modifications regarding SQI mechanics stipulated in the Twelfth Supplemental Order of Docket Numbers UE-011570 and UG-011571, Orders 1 and 2 of UE-031946, and Orders 12, 14, 16, 17, 18, 19,20, 21, 23, and 29 of consolidated Docket Numbers UE-072300 and UG-072301.

[5] The Electric Service Reliability section of this Report reflects all of PSE's electric service reliability reporting requirements outlined in Docket No. UE-110060 and in the following sections of the electric service reliability WAC:

- WAC 480-100-388, Electric service reliability definitions,
- WAC 480-100-393, Electric service reliability monitoring and reporting plan,
- WAC 480-100-398, Electric service reliability reports.

[6] Two PSE commitments regarding the preparation of the Electric Service Reliability section, as outlined in Section F, Reporting of Customer Compliant Information, of Appendix D to Order 12 of consolidated Docket Numbers UE-072300 and UG-072301 (Section F), are also satisfied in this annual report. 1) Chapter 13 Customer Electric Reliability Complaints section describes how the customer complaint information is used in PSE's circuit reliability evaluation. Appendix M details PSE's actions to resolve these complaints. 2) Prior to the filing of each annual report, PSE used to invite UTC Staff and the Public Counsel Section of the Washington State Attorney General's Office ("Public Counsel") to discuss the format and content of the Electric Service Reliability section since the adoption of Order 12. However, as agreed to by Public Counsel, UTC Staff and PSE at the March 13, 2012 meeting, an annual external review meeting of PSE's reliability results prior to the filing is not required. If, however, an external meeting on the format and content of PSE's Electric Service Reliability section is called for by an external party or PSE, then Public Counsel should be invited.

[7] The annual reporting of the Service Quality Program and the electric service reliability was due separately before the UTC by February 15 and March 31 of each year, respectively. To facilitate external review, PSE filed a petition in October 2010 to consolidate the two reporting requirements, among other petition requests. The UTC granted PSE's petition in November 2010 (Order 17 of consolidated Docket Numbers UE-072300 and UG-072301) and the reporting consolidation became effective for the 2010 performance periods and each report thereafter.

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Customer Service				
Customer Access Center answering performance	Service Quality Index #5	At least 75% of calls answered by a live representative within 30 seconds of request to speak with live operator	77%	☑
Operations Services—*Appointments*				
Appointments kept	Service Quality Index #10	At least 92% of appointments kept	100%[8]	☑
Service provider appointments kept—Quanta Electric	Service Provider Index #3B[9]	At least 92% of appointments kept	99%	☑
Service provider appointments kept—Quanta Gas	Service Provider Index #3C	At least 92% of appointments kept	99%	☑
Customer Service Guarantee	Service Guarantee #10	A $50 credit to customers when PSE fails to meet a scheduled SQI appointment	$19,000	--
Operations Services—*Gas*				
Gas safety response time	Service Quality Index #7	Average 55 minutes or less from customer call to arrival of field technician	31 minutes	☑
Secondary safety response time—Quanta Gas	Service Provider Index #4D	Within 60 minutes from first response assessment completion to second response arrival	49 minutes	☑
Key Measurement	**Type of Metric**	**Benchmark/Description**	**2016 Performance Results**	**Achieved**
Service provider standards compliance—Quanta Gas	Service Provider Index #1C	At least 97% compliance with site audit checklist points	99%	☑

[8] Results shown are rounded from 99.6% to the nearest whole percentage per UTC order. However, the 100% 2016 annual performance result does not reflect that PSE and its service providers met all the appointments during the reporting period. Numbers of missed appointments by appointment type are detailed in Appendix F: *Customer Service Guarantee Performance Detail*.

[9] There was no result for Service Provider Indices #1A, #2A, #3A and #4A. These indices were assigned to a service provider, Pilchuck, which no longer works for PSE. PSE transitioned all natural gas construction and maintenance work to Quanta Gas as of April 30, 2011. Service Provider Indices #2B and #2C, Service Provider Customer Satisfaction for Quanta Electric and Quanta Gas, respectively, were applicable in the prior years' reporting had been ended since the 2013 reporting period.

Operations Services—*Electric*				
Electric safety response time	**Service Quality Index #11**	**Average 55 minutes or less from customer call to arrival of field technician**	**55 minutes**	☑
Secondary Core-Hours, Non-Emergency Safety Response and Restoration Time—Quanta Electric	**Service Provider Index #4B**	**Within 250 minutes from the dispatch time to the restoration of non-emergency outage during core hours**	**246 minutes**	☑
Secondary Non-Core-Hours, Non-Emergency Safety Response and Restoration Time—Quanta Electric	**Service Provider Index #4C**	**Within 316 minutes from the dispatch time to the restoration of non-emergency outage during non-core hours**	**283 minutes**	☑
Service provider standards compliance—Quanta Electric	**Service Provider Index #1B**	**At least 97% compliance with site audit checklist points**	**99%**	☑
Restoration Service Guarantee—120 -Hour	**Service Guarantee #2**	**A $50 credit to eligible customers when experienced a power outage is longer than 120 consecutive hours**	**$50**	**--**
Electric Service Reliability—*SAIFI & SAIDI*				
$SAIFI_{Total}$ Total (all outages current year) Outage Frequency—System Average Interruption Frequency Index (SAIFI)	**Reliability**	**Power interruptions per customer per year, including all types of outage event**	**1.70 interruptions**	**--**

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
$SAIFI_{Total\ 5\text{-}year\ Average}$ Total (all outages five-year average) SAIFI	**Reliability**	**Five years average of the power interruptions per customer per year, including all types of outage event**	**1.56 interruptions**	**--**
$SAIFI_{5\%}$ <5% Non-Major-Storm (<5% customers affected) SAIFI	**Service Quality Index #4**	**No more than 1.30 interruptions per year per customer**	**1.06 interruptions**	**☑**
$SAIFI_{IEEE}$ IEEE Non-Major-Storm (T_{MED}) SAIFI	**Reliability**	**Power interruptions per customer per year, excluding days exceeding the T_{MED} threshold**	**1.02 interruptions**	**--**
$SAIDI_{Total}$ Total (all outages current year) Outage Frequency–System Average Interruption Duration Index (SAIDI)	**Reliability**	**Outage minutes per customer per year, including all types of outage event**	**391 minutes**	**--**
$SAIDI_{Total\ 5\text{-}year\ Average}$ Total (all outages five-year average) SAIDI	**Reliability**	**Outage minutes per customer per year, including all types of outage event five-year average**	**317 minutes**	
$SAIDI_{5\%}$ <5% Non-Major-Storm (<5% customers affected) SAIDI	**Reliability**	**Outage minutes per customer per year, excluding outage events that affected 5% or more customers**	**154 minutes**	**--**
$SAIDI_{IEEE}$ IEEE Non-Major-Storm (T_{MED}) SAIDI	**Reliability**	**Outage minutes per customer per year, excluding days exceeding the T_{MED} threshold**	**163 minutes**	**--**
$SAIDI_{SQI}$ SQI IEEE Non-Major-Storm (T_{MEDADJ}) SAIDI	**Service Quality Index #3**	**No more than 155 minutes per customer per year Outage minutes, excluding days exceeding the T_{MEDADK} threshold with catastrophic day adjustment**	**148 minutes**	**☑**

Detailed SQI monthly performance results and supplemental information can be found in the following appendices:

- **Appendix A: Monthly SQI** Performance—This appendix details monthly PSE SQI performance and the relevant performance of PSE's service providers. The attachments to this appendix provide

information on the major outage event and localized electric emergency event days and the natural gas reportable incidents and control time. This appendix has three attachments:

- **Attachment A to Appendix A**—Major Event and Localized Emergency Event Days (Affected Local Areas Only),
- **Attachment B to Appendix A**—Major Event and Localized Emergency Event Days (Non Affected Local Areas Only),
- **Attachment C to Appendix A**—Gas Reportable Incidents and Control Time.

- **Appendix B: Certification of Survey Results**—The independent survey company, EMC Research, certify that all SQI-related customer surveys were conducted with applicable guidelines and the results are unbiased and valid in accordance with the survey procedures established in consolidated Docket Nos. UE-011570 and UG-011571[10].
- **Appendix C: Penalty Calculation**—This appendix shows penalty calculations and allocation if PSE incurs any SQI penalty. For the 2016 reporting year, PSE's performance met or was better than the benchmark for each of the SQIs. There is no penalty calculation in Appendix C.
- **Appendix D: Proposed Customer Notice (Report Card)**—This appendix presents PSE's proposed 2016 customer service performance report. The Customer Service Performance Report Card is designed to inform customers of how well PSE delivers its services in key areas to its customers.
- **Appendix E: Disconnection Results**—This appendix provides the number of disconnections per 1,000 customers for non-payment of amounts due when the UTC disconnection policy would permit service curtailment.
- **Appendix F: Customer Service Guarantee Performance Detail**—This appendix details annual and monthly Kept Appointments and Customer Service Guarantee payment results by appointment type.
- **Appendix G: Customer Awareness of Customer Service Guarantee**—This appendix discusses the ways PSE makes customers aware of its Customer Service Guarantee and the results of the survey.

Detailed Electric system and reliability information is found in the following appendices:

- **Appendix H: Electric Reliability Terms and Definitions**—This appendix discusses the terms and definitions found in this report.
- **Appendix I: Electric Reliability Data Collection Process and Calculations**—This appendix discusses data collection methods and issues. It explains how the various data were collected.
- **Appendix J: Current Year Electric Service Outage by Cause by Area**—This appendix details the 2016 Outage Cause by County.
- **Appendix K: Historical SAIDI and SAIFI by Area**—This appendix details the three-year history of SAIDI and SAIFI data by county.

[10] PSE's compliance filing pursuant to the paragraph 13 of Order 21 of Docket Nos. UE-072300 and UG-072301 (consolidated), Granting in Part, and Denying in Part, Puget Sound Energy, Inc's Petition for Waiver and Suspension of Service Quality Index Nos. 6 AND 8 (June 21, 2013)

- **Appendix L: 1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements**—This appendix presents PSE SAIFI and SAIDI performance from 1997 through the current year using different measurements.
- **Appendix M: Current-Year Commission and Rolling-Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions**—This appendix lists the current-year UTC and rolling two year PSE customer electric service reliability complaints with resolutions.
- **Appendix N: Areas of Greatest Concern with Action Plan**—This appendix details the areas of greatest concern with an action plan.
- **Appendix O: Current Year Geographic Location of Electric Service Reliability Customer Complaints on Service Territory Map with Number of Next Year's Proposed Projects and Vegetation-Management Mileage**—This appendix illustrates current-year geographic location of electric service reliability customer complaints on PSE's service territory map with the number of next year's proposed projects and vegetation-management mileage.

Customer Notice of SQI Performance

Appendix D: **Proposed Customer Notice (Report Card)** is PSE's proposed customer notice of PSE's 2016 SQI performance. After consultation with the UTC staff and Public Counsel, PSE will begin distributing the final SQI report card by June 29, 2017, as part of the customer billing package.

Data and Reporting Issues

There was no data gathering or reporting difficulty in 2016 that impacted the SQI performance categories, or their results, in any way.

UTC Approved Exclusion of Extraordinary Events for SQI SAIDI Annual Performance Calculation

The UTC approved the exclusion of the August 2015 and November 2015 extraordinary events in the SQI SAIDI performance calculation. PSE's overall 2015 SQI SAIDI performance with the exclusion is 272 minutes, which met the performance benchmark of 320 minutes.

The two extraordinary events that occurred in August and November 2015 affected PSE's service quality performance, especially SAIDI. It took PSE's crews longer to restore power in the aftermath of these two severe windstorms due to a very high number of fallen trees that had been weakened by the year's extreme drought conditions. Those fallen trees prevented PSE's crews from immediate access to neighborhoods. PSE's SQ Program mechanics provides a provision for the exclusion of any unusual event from the SQI SAIDI calculation with UTC's approval. Concurrently with the filing of the 2015 annual report, PSE filed a petition with the UTC to demonstrate that the two events were extraordinary. PSE's preparation and readiness before the events and restoration and communication efforts during and after the events were deemed appropriate and reasonable.

On May 12, 2016, in UE-160345 Order 1, the UTC granted the exclusion of August 2015 and November 2015 storm events from the SQI SAIDI performance calculation.

> "The Commission finds that PSE's response to the August and November 2015 Storm Events was appropriate and reasonable, and grants PSE's Petition for Exclusion of August 2015 and November 2015 Storm Events from SQI-3 Performance Calculation."[11]

Service Quality Program Changes

On June 17, 2016, the UTC adopted[12] the following changes to the SQ Program

The following changes became effective in 2016:

- Use of the Institute of Electrical and Electronics Engineers (IEEE) Standard 1366 method for calculating System Average Interruption Duration Index (SAIDI).
- New SAIDI benchmark of 155 outage minutes per customer per year.
- Informing customers about the new 24-hour customer guarantee and how to take advantage of the guarantee.
- Retention of the customer guarantee that requires PSE to provide a $50 credit towards the bill for customers who have been without power for 120 hours or more and who have either requested the guarantee or reported the outage. This guarantee includes outages that occur during Major Events.
- Defining "catastrophic day" as any major event that exceeds 4.5 Beta (i.e., standard deviations) of the daily system SAIDI.
- Collection of Customers Experiencing Multiple Interruptions (CEMI) data, with reporting to start in 2019.
- Informing customers of consecutive years missed on PSE's annual service quality report card, if applicable.
- Elimination of potential monetary penalties of up to $1.5 million for missing the SAIDI benchmark.

The applicable new and revised reporting and performance measurement elements of the Service Quality Program for the 2016 reporting have be reflected and incorporated in this report.

[11] Docket No. UE-160345, Order No. 1, page 5, paragraph 17.

[12] Consolidated Dockets No. UE-072300 and UG-072301, Order 29, Final Order Approving and Adopting Multiparty Settlement; Closing Docket

The following change became effective on January 1, 2017:

- Establishment of a new customer guarantee that requires PSE to provide a $50 credit towards the bill for customers who are without power for 24 hours, or more, under certain circumstances (excluding Major Events) and who have either requested the guarantee or reported their outage.

PSE started the promotion of this new 24-hour Restoration Service Guarantee in November 2016. These promotion efforts are detailed in the Appendix F: Customer Service Guarantee Performance Detail.

Continuing to Improve Customer Experience

PSE has begun a long-term initiative called Get to Zero. PSE's goal for the technology and business processes advanced by the Get to Zero initiative is to anticipate customer needs and provide solutions to address those needs. The Get to Zero initiative will further improve customer experience with PSE by providing more self-service options that customers have been requesting, by developing new ways to proactively communicate with customers and by creating seamless, integrated operations to tie PSE's business processes together.

CHAPTER 2

CUSTOMER SERVICES AND SATISFACTION AND OPERATIONS SERVICES

PSE has been meeting the Puget Sound region's energy needs for more than 135 years. PSE proudly embraces the responsibility to provide customers with safe, reliable, reasonably priced energy service.

This section summarizes the 2016 results of PSE's seven service quality indices (SQIs) related to customer services and satisfaction and operation services:

- WUTC Complaint Ratio (SQI #2)
- Customer Access Center Answering Performance (SQI #5)
- Customer Access Center Transactions Customer Satisfaction (SQI #6)
- Gas Safety Response Time (SQI #7)
- Field Service Operations Transactions Customer Satisfaction (SQI #8)
- Appointments Kept (SQI #10)
- Electric Safety Response Time (SQI #11)
- Service Provider Performance
- Service Guarantees

WUTC Complaint Ratio (SQI #2)

Table 2a: WUTC Complaint Ratio for 2016

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Customer Satisfaction				
WUTC complaint ratio	**Service Quality Index #2**	**No more than 0.40 complaints per 1,000 customers, including all complaints filed with WUTC**	**0.18**	☑

Overview

Each year the UTC receives complaints from PSE customers on a variety of topics. In 2016, there were a total of 350 complaints, down from 446 in 2015. The total year-end customer count was 1.9 million. The 2015 SQI #2 complaint ratio was 0.23.

About the Benchmark

The WUTC complaint ratio is calculated by dividing the sum of all natural gas and electric complaints reported to the UTC by the average monthly number of PSE customers. The quotient is then multiplied by 1,000. The formula follows:

$$WUTC\ complaint\ ratio = \frac{electric\ and\ natural\ gas\ complaints\ recorded\ by\ WUTC}{average\ monthly\ number\ of\ electric\ and\ natural\ gas\ customers} \times 1{,}000$$

The average monthly customer count is the average of the total number of PSE customers, per month, during the reporting period.

Going Forward

PSE will continue identifying potential issues that could trigger any customer complaints. The focus is on prevention of the cause of these issues through timely and accurate support for each customer. Areas of focus for 2017 include:

- Continue to focus on UTC "Consumer Upheld" complaint dispositions to identify root cause, to establish preventive and corrective actions, and follow-up to determine the effectiveness of the actions.
- Continue to improve PSE's company-wide customer experience by using knowledge gained in managing escalated complaints for training and education of others in PSE.
- Continue to work with the UTC staff to make complaint response and resolution processes more efficient for UTC and PSE.

Customer Access Center Answering Performance (SQI #5)

Table 2b: Customer Access Center Answering Performance for 2016

Key Measurement	Benchmark	2016 Performance Results	Achieved
Customer Service			
Customer Access Center answering performance (SQI #5)	**At least 75% of calls answered by a live representative within 30 seconds of request to speak with live operator**	**77%**	**Yes**

Overview

PSE's Customer Care Center (i.e. Customer Access Center) receives all of PSE's customer general inquiries and typically represents PSE to customers. Customers calling PSE have the option of going into an Interactive Voice Response (IVR) system where they are able to perform self-serve transactions or to speak with a representative. PSE's customer service representatives (CSRs) answer calls promptly providing customers with the information or assistance they require, including natural gas and electric emergencies.

The Service Quality Program's benchmark for the Customer Care Center's call answering performance is to answer at least 75% of calls within 30 seconds on an annual basis. This goal is achieved through training on quality, efficient call handling and adherence to CSR performance expectations.

In 2016, the CSRs answered 77 percent of the calls within 30 seconds of customer requests.

About the Benchmark

The Customer Care Center call answering performance is measured from the time the customer initiated a request to speak with a CSR until a CSR arrived on the line. The annual performance is determined by the average of the 12 monthly call answering performance percentages. The calculation of the monthly answering performance is demonstrated through the following formula:

$$\textit{Monthly call answering performance} = \frac{\textit{aggregate number of calls answered by a company rep within 30 seconds}}{\textit{aggregate number of calls received}}$$

Busy Calls

PSE's phone system is configured with a backup system to handle overflow customer calls to 1-888-Call-PSE. Overflow calls from PSE's main IVR system are routed to a separate IVR system provided by PSE's phone

service vendor that enables customers to contact PSE through a different channel. All 2.4 million calls received in 2016 to 1-888-Call-PSE either went through the main phone system or the overflow phone backup system.

Going Forward

PSE is engaged in initiatives to further the Customer Care Center's answering performance and ensure the performance benchmark of 75% will be achieved. In 2017, PSE will:

- Continue to deliver on-going agent training to improve proficiency and elevate the customer experience
- Through PSE's Get to Zero initiative, improve self-service options that allow customers to complete various transactions online and reduce incoming calls into the Customer Care Center
- Continually improve processes to optimize efficiency and leverage the potential of the Customer Information System (CIS)
- Continue to improve the quality of each customer contact through the ongoing collaboration and efforts with the Customer Care Center's quality & analysis team
- Continue to improve upon the debt collection and disconnection processes to ensure sound business practices are followed.

Customer Access Center Transactions Customer Satisfaction (SQI #6)

Table 2c: Customer Access Center Transactions Customer Satisfaction for 2016

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Customer Satisfaction				
Customer Access Center transactions customer satisfaction	**Service Quality Index #6**	**At least 90% satisfied (rating of 5 or higher on a 7-point scale)**	**93%**	☑

Overview

Most of the telephone calls to PSE's general customer help phone number 1-888-CALL-PSE are handled by PSE's Customer Care Center (i.e. Customer Access Center). EMC Research, an independent research company for PSE's Service Quality Program[13], conducted telephone surveys with PSE customers and prepared monthly and semi-annual reports on customer satisfaction regarding Customer Access Center transactions during the 2016 SQ Program year. The independent survey-results found that 93% of customers surveyed were satisfied with Customer Access Center's overall transaction performance (SQI #6). This is a 1% decrease over the 2015 survey results of 94%.

About the Benchmark

An independent research company conducts phone surveys to customers who have made calls to PSE and asks the following questions:

> "Overall, how would you rate your satisfaction with this call to Puget Sound Energy? Would you say 7-completely satisfied, 1-not at all satisfied or some number in between?"

A customer is considered to be satisfied if they responded 5, 6 or 7. The annual performance is determined by the weighted monthly average percent of satisfied customers. The formula for the monthly percentage follows:

$$\textit{Monthly percentage of satisfied customers} = \frac{\textit{aggregate number of survey responses of 5, 6 or 7}}{\textit{aggregate number of survey responses of 1, 2, 3, 4, 5, 6 or 7}}$$

[13] SQI-related customer surveys were conducted with applicable guidelines and the results are unbiased and valid in accordance with the survey procedures established in consolidated Docket Nos. UE-011570 and UG-011571. PSE's compliance filing pursuant to the paragraph 13 of Order 21 of Docket Nos. UE-072300 and UG-072301 (consolidated), Granting in Part, and Denying in Part, Puget Sound Energy's Petition for Waiver and Suspension of Service Quality Index Nos. 6 AND 8 (June 21, 2013)

Going Forward

PSE recognizes that continuous improvements are required to maintain customer satisfaction.

Areas of focus for 2017 include:

- Continued focus on the enhancement of the quality assurance audit process. The quality assurance process improves the customer experience at each customer touch point within the Customer Care Center. It also contributes to the following improvements:
  - Regulatory compliance assurance
  - The information provided to customers
  - Customer Care Center management
  - Response to customer questions
- Continue deployment of soft-skills training programs and process refreshers to improve handling for call control, mitigate escalated calls, and improve overall customer experience

Gas Safety Response Time (SQI #7)

Table 2d: Gas Safety Response Time for 2016

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Operations Services				
Gas Safety Response Time	**Service Quality Index #7**	**Average 55 minutes or less from customer call to arrival of field technician**	**31 minutes**	☑

Overview

The primary responsibility of PSE's Gas First Response (GFR) team is to respond to natural gas emergencies. In 2016, PSE responded to more than 24,500 calls concerning natural gas safety. These emergencies include reports of inside or outside odors, third-party damage to PSE's system, leaks and carbon monoxide concerns. The GFR team also supports local and state first-response organizations, such as fire departments. PSE has GFR personnel located throughout its service territory. These responders are available on a 24/7/365 basis.

In addition to responding to the natural gas emergencies, the GFR team performs various natural gas system maintenance and inspection activities, adjusts and performs minor repairs on customer equipment and monitors construction excavation when it occurs near certain underground facilities.

About the Benchmark

The natural gas safety response time is calculated by logging the time each customer service call is created and the time the natural gas field technician arrives on site. The calculated response time for each service call is averaged for all emergency calls during the performance year to determine the overall annual performance.

$$\textit{Gas safety response time annual performance} = \frac{\textit{sum of all natural gas emergency response times}}{\textit{annual number of natural gas emergency calls received}}$$

Going Forward

In 2017, PSE will focus on the following:

- Continue to monitor and evaluate emergency response time data daily
- Adjust processes, balance workload with staffing, make necessary shift adjustments, and provide continuous employee coaching

Field Service Operations Transactions Customer Satisfaction (SQI #8)

Table 2e: Field Service Operations Transactions Customer Satisfaction for 2016

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Customer Satisfaction				
Field Service Operations transactions customer satisfaction	**Service Quality Index #8**	**At least 90% satisfied (rating of 5 or higher on a 7-point scale)**	**95%**	☑

Overview

EMC Research[14], an independent research company, conducts telephone surveys with PSE customers who have requested and received natural gas field service. In 2016, these surveys found that 95% of customers were satisfied with PSE's field service operations transaction performance.

About the Benchmark

Every week, EMC Research contacts randomly-selected customers who have called PSE the previous week and received natural gas field service. The firm prepares monthly and semi-annual reports on PSE's field service operations transaction performance.

Customers are asked a number of questions including the following question for the purpose of SQI #8:

> "Thinking about the entire service, from the time you first made the call until the work was completed, how would you rate your satisfaction with Puget Sound Energy? Would you say 7- completely satisfied, 1- not at all satisfied or some number in between?"

A customer is considered to be "satisfied" if they responded 5, 6 or 7.

The annual performance is determined by the weighted monthly average of percent of satisfied customers. The formula for the monthly percentage follows:

$$\textit{Monthly percent of satisfied customers} = \frac{\textit{aggregate number of survey responses of 5, 6 or 7}}{\textit{aggregate number of survey responses of 1, 2, 3, 4, 5, 6 or 7}}$$

[14] SQI-related customer surveys were conducted with applicable guidelines and the results are unbiased and valid in accordance with the survey procedures established in consolidated Docket Nos. UE-011570 and UG-011571. EMC Research and the survey procedures used by EMC Research met these guidelines as detailed in PSE's compliance filing pursuant to the paragraph 13 of Order 21 of Docket Nos. UE-072300 and UG-072301 (consolidated), Granting in Part, and Denying in Part, Puget Sound Energy, Inc's Petition for Waiver and Suspension of Service Quality Index Nos. 6 AND 8 (June 21, 2013).

Going Forward

In 2017 PSE will focus on the following:

- Continue to monitor customer satisfaction survey data and provide feedback to field service technicians to ensure a high level of customer service is maintained
- Continue to review customer comments on the survey to identify changes in PSE's current operation and business processes that may be implemented to provide greater customer satisfaction
- Continue to evaluate new tools and technologies that would enable a higher level of customer service and convenience
- Through PSE's Get to Zero initiative, offer better ways for self-service options including scheduling of field services

Appointments Kept (SQI #10)

Table 2f: Appointments Kept for 2016

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Operations Services				
Appointments kept	**Service Quality Index #10**	**At least 92% of appointments kept**	**100%**	☑

Overview

PSE provides its customers with a variety of scheduled service appointments including:

- **Permanent service**—Permanent natural gas service from an existing main or permanent electric secondary voltage service from existing secondary lines
- **Reconnection of existing service**—Reconnection following move-out, move-in or disconnection for non-payment
- **Natural gas diagnostic service request**—For water heater, furnace checkup, furnace not operating, other diagnostic or repair or follow-up appointments

Service appointments that involve safety do not require scheduling and are performed on a 24/7/365 basis. These non-scheduled services include restoring electric service or responding to a reported gas odor.

When a natural gas or electric customer requests a scheduled field service, PSE provides the customer with either a guaranteed appointment date and time-frame or a guaranteed commitment to provide service on or before a specified date.

In 2016, PSE achieved a result of 100%[15] for this appointments kept metric. Data on missed appointments and other appointment information by service type is detailed in Appendix F: *Customer Service Guarantee Performance Detail.*

[15] Results shown are rounded from 99.6% to the nearest whole percentage per UTC order. However, the 100% 2016 annual performance result does not reflect that PSE and its service providers met all the appointments during the reporting period. Numbers of missed appointments by appointment type are detailed in Appendix F: *Customer Service Guarantee Performance Detail*.

About the Benchmark

The appointments kept SQI is calculated by dividing the number of appointments kept by the total number of appointments made. The formula follows:

$$Appointments\ kept = \frac{annual\ appointments\ kept}{annual\ appointments\ missed + annual\ appointments\ kept}$$

Appointments are considered missed when PSE does not arrive during the time period or on the agreed upon date except when the appointments have been missed due to the following reasons:

- The customer fails to keep the appointment
- The customer calls PSE to specifically request the appointment be rescheduled
- PSE reschedules the appointment because conditions at the customer site make it impractical to perform the service
- The appointment falls during an SQI Major Event[16] period

These types of appointments are not considered missed appointments but "excused" appointments.

Appointments that were canceled by the customer, regardless of the customer's reason, will be considered "canceled" appointments.

Excused and canceled appointments are not counted as either kept or missed appointments.

Additional appointments to complete repairs are considered new appointments.

Going Forward

In 2017 PSE will focus on the following:

- Continue to review the reasons for missed appointments and work to find solutions so that PSE can meet all its customer commitments
- Through the Get to Zero initiative, evaluate tools and technologies that would enable a higher level of customer service and convenience

[16] Major Event Days when 5% or more electric customers are without power during a 24 hour period and associated carry-forward days that it will take to restore electric service to these customers, which are excluded from the performance calculations of SQI #4-SAIFI and SQI #11-Electric safety response time.

Electric Safety Response Time (SQI #11)

Table 2g: Electric Safety Response Time for 2016

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Operations Services				
Electric Safety Response Time	**Service Quality Index #11**	**Average 55 minutes or less from customer call to arrival of field technician**	**55 minutes**	☑

Overview

PSE's Electric First Response (EFR) team has the primary responsibility of responding to electric outages and electric emergencies. Examples of the types of outages and emergency events that PSE responds to include: downed wires, equipment failures, car-pole accidents, bird and animal-related outages, trees or limbs on lines, third-party dig-ins and voltage quality problems.

EFR personnel are located throughout PSE's service territory and are available to respond on a 24/7/365 basis. EFR's priority is to ensure public and worker safety and then to restore service to customers. After addressing safety concerns, service restoration is made through temporary or permanent repairs or reconfiguration of the electric system. If the repair is beyond the capability of EFR personnel, construction crews are called in to make permanent repairs. PSE responded to more than 26,000 electric incidents in 2016.

About the Benchmark

The electric safety response time is calculated by logging the time of each customer service call and the time the EFR personnel arrives on site. The annual performance is determined by the average number of minutes from the time a customer calls to the arrival of the EFR personnel for electric safety incidents occurring during the performance year. The formula follows:

$$\textit{Annual electric safety response time} = \frac{\textit{sum of all response times}}{\textit{annual number of electric safety incidents}}$$

Certain incidents are excluded from the measurement if they occurred during the following days:

- Major Event Days when 5% or more electric customers are without power during a 24-hour period and associated carry-forward days that it will take to restore electric service to these customers.
- Localized emergency event days when all available EFR in a local area are dispatched to respond to service outages.

Going Forward

In 2017, PSE will continue its efforts to improve communication and coordination among EFR personnel, system operators and dispatchers to reduce electric safety incident response time. The efforts include:

- Continue to analyze staffing levels to ensure adequate response. In 2016, analysis was completed on the EFR staffing levels in relation to their impact on response times. This study resulted in additional staff to EFR in order to meet our customers' needs in this area.
- Continue to enhance the outage management system technology, providing improved electric system information to increase efficiency in managing outage events and first response personnel
- Through the Get to Zero initiative, update PSE's dispatching scheduling and mobility solution over the course of 2017–2018. Modernizing these tools should have a positive effect on response time by allowing more efficient dispatch and routine assistance
- Continue to improve switching efficiency between PSE's service provider, EFR and substation operators to better utilize any qualified personnel that are the closest available to the outage to perform system switching
- Continue to improve the process to check single customer outage reports for accuracy before dispatching field resource. Integrating meter pinging into the Outage Management System (OMS) has positively impacted this process in 2016.

Service Provider Performance

Table 2h: Service Provider Performance for 2016

Key Measurement	Type of Metric	Benchmark/Description	2016 Performance Results	Achieved
Customer Services and Satisfaction and Operations Services				
Service provider standards compliance—Quanta Electric	**Service Provider Index #1B**	**At least 97% compliance with site audit checklist points**	**99%**	☑
Service provider standards compliance—Quanta Gas	**Service Provider Index #1C**	**At least 97% compliance with site audit checklist points**	**100%**	☑
Service provider appointments kept—Quanta Electric	**Service Provider Index #3B**	**At least 92% of appointments kept**	**99%**	☑
Service provider appointments kept—Quanta Gas	**Service Provider Index #3C**	**At least 92% of appointments kept**	**99%**	☑
Secondary safety response time—Quanta Gas	**Service Provider Index #4D**	**Within 60 minutes from first response assessment completion to second response arrival**	**49 minutes**	☑
Secondary Core-Hours, Non-Emergency Safety Response and Restoration Time—Quanta Electric	**Service Provider Index #4B**	**Within 250 minutes from the dispatch time to the restoration of non-emergency outage during core hours**	**246 minutes**	☑
Secondary Non-Core-Hours, Non-Emergency Safety Response and Restoration Time—Quanta Electric	**Service Provider Index #4C**	**Within 316 minutes from the dispatch time to the restoration of non-emergency outage during non-core hours**	**283 minutes**	☑

Overview

This section details the service provider metrics relevant to PSE's SQ Program. PSE monitors and assesses the performance of its primary natural gas and electric service providers (Quanta Gas and Quanta Electric). The metrics addresses PSE standards compliance, new construction service appointments, and safety response and restoration time. Each measure is designed to monitor and improve PSE's service. There were no results for Service Provider Indices (SPI) #1A, #2A, #3A and #4A. These indices were assigned to a service provider, Pilchuck that no longer works for PSE. PSE transitioned all natural gas construction and maintenance work to Quanta Gas as of April 30, 2011.

Service Provider Indices #2B and #2C, Service Provider Customer Satisfaction, Quanta Electric and Quanta Gas, respectively, which were applicable in prior years' reports, have been terminated since the 2013 reporting period.

About the Benchmark

- Service Provider Standards Compliance (SPI #1): Service providers must meet a minimum of 95 percent compliance with PSE's site audit checklists.
- Service Provider New Customer Construction Appointments Kept (SPI #3):
  - Quanta Gas and Quanta Electric must keep at least 92% of their new customer construction appointments.
- Secondary Safety Response Time (SPI #4): This SPI consists of three sub-indices:
  - Service Provider Indices #4B and #4C — Quanta Electric's secondary safety response and restoration time during core and non-core hours, respectively. Quanta Electric must respond and complete power restoration in less than 250 minutes on average during core hours and less than 316 minutes on average during non-core hours. Core hours are 7:00 a.m.–5:30 p.m., Monday through Friday, except holidays. Restoration time is measured from the time a Quanta Electric crew is dispatched to the time the problem causing the interruption has been resolved and the line has been re-energized. Both the core-hours and non-core-hours measurements exclude emergency events and significant storm events.
  - Service Provider Index #4D—Secondary safety response time—Quanta Gas. Quanta Gas must respond within 60 minutes on average from PSE's Gas First Response assessment completion to the service provider's secondary response arrival.

Service Provider Appointments and Related Penalties

Table 2i shows the number of new customer construction appointments completed by PSE service providers and the amount of penalties paid due to missed appointments.

Table 2i: 2016 Service Provider Appointments and Missed Appointment Penalties for 2016

Service Provider Appointments				Missed Appointment Penalties		
Service Provider	Electric	Natural Gas	Total	Electric	Natural Gas	Total
Quanta Gas	N/A	9,846	9,846	N/A	$7,000	$7,000
Quanta Electric	8,348	N/A	8,348	$7,000	N/A	$7,000
Total	***8,348***	***9,846***	***18,194***	***$7,000***	***$7,000***	***$14,000***

Going Forward

PSE and our service providers will continue the following initiatives for 2017:

- Identify areas of improvement to meet core-hour benchmark of 250 minutes
- Partner with large municipalities to improve the permitting process
- Identify and implement improvements to customer scheduling for new construction

Service Guarantees

Overview

PSE offers two types of service guarantees to its customers: Customer Service Guarantee (Service Guarantee #1) and Restoration Service Guarantee (Service Guarantee #2).

PSE promotes its Customer Service Guarantee and the Restoration Service Guarantee on *PSE.com*, the back of billing stock, and on the billing/return envelope. It is also highlighted in the customer newsletter[17] as part of customer bill inserts. PSE also surveys its customers monthly about the Customer Service Guarantee. Appendix G discusses the ways PSE has made customers aware of its Customer Service Guarantee and the results of the customer awareness survey.

Starting in 2017 reporting, this section will be expanded to include the discussion and the result of the new 24-hour Restoration Service Guarantee.

PSE started the promotion of this new the 24-hour Restoration Service Guarantee in November 2016. These promoting efforts are detailed in Appendix F: Customer Service Guarantee Performance Detail.

Customer Service Guarantee

The Customer Service Guarantee (CSG) is designed to give customers a $50 missed appointment credit if PSE or its service providers fail to arrive by the mutually agreed upon time and date to provide one of the following types of service:

- **Permanent service**—Permanent natural gas service from an existing main or permanent electric secondary voltage service from existing secondary lines
- **Reconnection**—Reconnection following move-out, move-in or disconnection for non-payment
- **Natural gas diagnostic service request**—For water heater, furnace checkup, furnace not operating, other diagnostic or repair or follow-up appointments

This service appointment guarantee applies in the absence of Major Storms, earthquakes, supply interruptions or other adverse events beyond PSE's control. In these cases, PSE will reschedule service appointments as quickly as possible.

The number of CSG by energy, service type, and month is detailed in Appendix F: *Customer Service Guarantee Performance Detail.* For additional details on the promotion and communication of CSG, see Appendix G: *Customer Awareness of Customer Service Guarantee.*

[17] SQI settlement requirement: "A promotion of the customer service guarantee will be included in the customer newsletter, "EnergyWise," at least three times per year."

Restoration Service Guarantee

Whenever a customer experiences a 120 consecutive-hour power outage, the customer may be eligible for a $50 Restoration Service Guarantee (RSG) credit. The total annual payments are limited to $1.5 million, or 30,000 customers, payable to eligible customers who request such payment or report their outage on a first-come, first-served basis. The pledge is always applicable but will be suspended if PSE lacks safe access to its facilities to perform the needed assessment or repair work. To receive the RSG credit, affected customers must report the outage or request the credit within seven days of their service restoration.

The availability of the Restoration Service Guarantee is emphasized and messaged in PSE's phone system when customers call and report their outage during a major outage event, when 5% or more PSE electric customers are without power, or when PSE opens its Emergency Operations Center in response to a significant outage event.

2016 Service Guarantees Credits

Customer Service Guarantee Credits

In 2016, PSE credited customers a total of $19,000 for missing 380 of the 104,163 SQI #10 appointments. Table 2j provides summary values of Service Guarantee counts and payments to customers in 2016 by service type.

Table 2j: 2016 PSE SQI #10 Appointment Count and Customer Service Guarantee Credits

SQI #10 Appointment Count				Service Guarantee Payment to Customers		
Service Type	Electric	Natural Gas	Total	Electric	Natural Gas	Total
Permanent Service	8,348	9,846	18,194	$7,000	$7,000	$14,000
Reconnection	45,863	19,025	64,888	$2,200	$1,350	$3,550
Diagnostic	N/A	21,081	21,081	N/A	$1,450	$1,450
Total	***54,211***	***49,952***	***104,163***	***$9,200***	***$9,800***	***$19,000***

Appendix F: *Customer Service Guarantee Performance Detail* provides additional detail on missed appointments along with the credits paid by month and appointment service type as of December 31, 2016.

Restoration Service Guarantee Credits

PSE is committed to reviewing all prolonged outages that may trigger the Restoration Service Guarantee and any customer requests for the RSG credit within 30 days of a request. For 2016, there was one payment to a customer in Langley in January 2016 due to a prolonged outage event occurred in November 2015.

CHAPTER 3

ELECTRIC SERVICE RELIABILITY

Safe and reliable electric service is one of PSE's paramount goals. Information in this report provides the Washington Utilities and Transportation Commission and customers with reliability metrics on the services that PSE provides its customers.

Information on electric reliability is provided by the commonly used reliability metrics including the number and duration of outages as measured against the Service Quality Index (SQI) as approved by the UTC since 1997. Additionally, customer concerns about service quality and reliability are received either first-hand or through the UTC. Reported customer concerns provide an important perspective of electric reliability.

The following sections detail PSE's System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI) performance and discuss the annual reliability reporting requirements and results for the 2016 performance year.

As noted in Chapter 1, the UTC approved in June 2016 certain SQI SAIDI changes that establish a new benchmark and associated calculation methodology and the catastrophic event definition. These SQI SAIDI changes became effective starting in this annual report. The SQI SAIFI benchmark and calculation methodology did not change. Based on the recorded outages, PSE met both SQI SAIDI and SQI SAIFI performance benchmark.

PSE experienced four significant wind events during 2016: three in March and one in October. The last March windstorm met the definition of a catastrophic event. Wind gusts ranged from 45 mph in the Puget Sound lowlands to 75 mph in the north inland waters[18] and approximately 260,000 PSE customers experienced power outages during this event.

Annually, PSE participates in a benchmarking survey coordinated by IEEE. IEEE collects information from participating utilities and documents the IEEE Standard 1366[19] performance based on an individual ranking (#1 being the best) and within four quartiles (first quartile being the best). It's important to note that since

[18] The Olympic Peninsula Extratropical Cyclone of March 13, 2016 at http://www.climate.washington.edu/stormking/

[19] Refer to Appendix H: *Terms and Definitions* for the IEEE Standard 1366 definition.

participation is voluntary, the number of utilities that participate varies from year to year. While there are guidelines for how to provide the outage data, how each utility tracks its outages can and does create inconsistencies in the results. It is also important to note that the IEEE survey does not adjust its methodology for catastrophic event days. Therefore, PSE's annual performance in the IEEE survey versus the SQI SAIDI results could be different. IEEE conducts the annual survey in the spring with results available in August for the outages that occurred in the preceding year. Due to the timing of the survey, there is a year time-lag in reporting our annual rank. In the 2015 IEEE survey of 96 member utilities, PSE ranked 44th (2nd quartile) and 71st (3rd quartile) of SAIFI and SAIDI, respectively. PSE remained in the same quartiles as 2014. The results of the 2016 IEEE survey are expected in August 2017.

While PSE believes that this annual report provides useful information to interested parties for a given calendar year, PSE cautions against putting too much emphasis on the usefulness of annualized metrics in concluding trends pertaining to system performance. Factors such as variation in weather, service territory and normal random variation in events such as third-party damage will all impact year-to-year comparisons of system performance.

A single year's result may not lend to adequate identification of the best solution for long-term improvement, and actions taken based on an annual snapshot may result in Band-Aid solutions that may not meet long-term objectives. Notwithstanding the limits of using the annual reports to assess year-to-year trends, PSE believes the annual snapshots provide a useful view in context of the overall trends.

PSE's electric system covers an eight county geographical area. Refer to Appendix O: *Current Year Geographic Location of Electric Service Reliability Customer Complaints on Service Territory Map with Number of Next Year's Proposed Projects and Vegetation Management Mileage* for a map of the service area.

SAIFI (SQI #4)

Overview

For electric companies, maintaining a high level of reliability requires constant commitment. Supplying power depends on an interconnected network of generation, transmission and distribution systems to get power to homes and businesses. Most customer interruptions can be traced to trees and equipment failure.

The System Average Interruption Frequency Index (SAIFI) measures the number of outages or interruptions per customer per year. Most electric utilities use this measurement in reviewing the reliability of their electrical system, excluding major outage events that cause interruptions to a significant portion of their customer base. As mentioned, the methodology of this measure was not adjusted with the 2016 UTC approved SQI SAIDI changes.

About the Benchmark

SAIFI is calculated by adding up the number of customers experiencing a sustained outage of 60 seconds or longer during the reporting period and then dividing it by the average annual number of electric customers.[20]

At PSE, for the purpose of measuring the SAIFI SQI, major outage events are excluded from the performance calculation per the following 5% Exclusion SAIFI definition. More details concerning major outage events are in the *Major Events* discussion in the *About Electric Service Reliability Measurements and Baseline Statistics* section.

The SQI SAIFI measurement is also referred to as $SAIFI_{5\%}$.

- **5% Exclusion SAIFI ($SAIFI_{5\%}$) (Non-major-storm SAIFI)**—Excludes customer interruptions during a Major Event. Major Events are defined as days when 5% or more of the electric customer base in a 24-hour period experiences power interruption and the days following (carried-forward days), until all those customers have service restored.

In addition to the SQI SAIFI measurement, PSE also reports on three additional key measurements:

- **Total SAIFI ($SAIFI_{Total}$)**—Includes all customer interruptions that occurred during the current reporting year, without exclusion.
- **Total 5-Year Average SAIFI ($SAIFI_{Total\ 5\text{-}year\ Average}$)**—Includes all customer interruptions that occurred during the current reporting year and the previous four years, except for events that have been approved by the UTC for exclusion.
- **IEEE SAIFI ($SAIFI_{IEEE}$)**—Measures the number of customer interruptions utilizing the IEEE Standard 1366 methodology. Days that exceed the IEEE T_{MED}[21] are excluded. The 2016 T_{MED} is 6.45

[20] Refer to Appendix H: *Terms and Definitions* for the SAIFI formula

[21] Refer to Appendix H: *Terms and Definitions* for the IEEE T_{MED} definition

minutes—that is, any day that exceeds 6.45 minutes per customer is excluded due to IEEE-defined Major Event Days.

The *About Electric Service Reliability Measurements and Baseline Statistics* section provides more detailed discussion of the four reporting measurements and the establishment of the 2003 results as the baseline statistic. Appendix L: *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.

2016 SAIFI Results

The 2016 results based on the recorded outages are reported in Table 3a.

Table 3a: 2016 SAIFI Results

	Key Measurement	Benchmark	Baseline	Current Year Results	Achieved
$SAIFI_{Total}$	**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**	**1.56**	**--**
$SAIFI_{5\%}$ **(SQI #4)**	**<5% Non-Major-Storm (<5% customers affected) SAIFI**	**No more than 1.30 interruptions per year per customer**	**0.80**	**1.06**	☑
$SAIFI_{IEEE}$	**IEEE Non-Major-Storm (T_{MED}) SAIFI**	**n/a**	**0.71**	**1.02**	**--**

What Influences SAIFI

PSE tracks outages by cause codes and groups the outage causes into three major categories: tree-related, preventable and third party. System damage caused by trees and limbs during a major event continued to impact the most customers in 2016, as in previous years. The other major causes of outages were:

- Preventable:
  - Equipment failures—In addition to equipment that ceases to operate unexpectedly, this category also includes outages when a fuse properly operates to protect equipment when a branch or tree brushes against the line. This represents approximately 15% of customer interruptions related to equipment failure.
  - Bird or animal
- Third Party:
  - Car-pole accidents

– Scheduled outages for system maintenance or installation of new infrastructure

Figure 3a shows the common causes for the recorded outages in 2016 and their impact on customers across $SAIFI_{Total}$ and $SAIFI_{5\%}$ measurements.

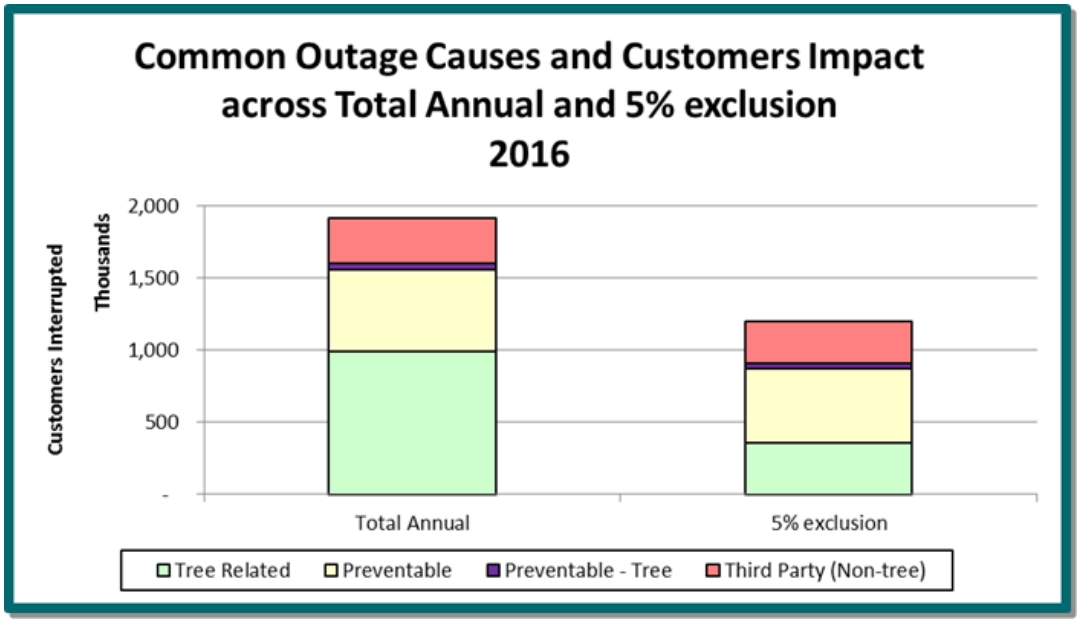

Figure 3a: Common Outage Causes and Customer Impact across the Key Measurements in 2016

Historical Trends for SAIFI

Table 3b shows SQI SAIFI from 2012 to 2016.

Table 3b: SQI SAIFI from 2012 to 2016 (excluding 5% Major Events)

	2012	2013	2014	2015	2016
$SAIFI_{5\%}$ **(SQI #4)**	**0.92**	**0.86**	**1.05**	**1.11**	**1.06**
Benchmark	**1.30 interruptions per year per customer**				

As shown in Table 3b, the SQI SAIFI requirements have been met annually for the past five years.

Appendix L: *1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements* illustrates the comparison between the four SAIFI measurements for 1997–2016. Based on the recorded outages, the 2016 results across three of the measurements improved when compared to 2015. The 2016 $SAIFI_{Total\ 5\text{-}Yr\ Average}$ worsened when compared to 2015. The 2015 $SAIFI_{Total\ 5\text{-}Yr\ Average}$ is comprised of the 2011-2015 $SAIFI_{Total}$

performance and the 2016 $SAIFI_{Total\ 5\text{-}Yr\ Average}$ is comprised of the 2012-2016 $SAIFI_{Total}$ performance. Since the 2016 $SAIFI_{Total}$ had worse performance than the 2011 $SAIFI_{Total}$, the 2016 $SAIFI_{Total\ 5\text{-}Yr\ Average}$ is higher.

Appendix K: *Historical SAIDI and SAIFI by Area* illustrates the 2014–2016 results by county under the $SAIFI_{Total}$ and $SAIFI_{5\%}$ measurements. A summary of Appendix K indicates that the 2016 SAIFI performance level was consistent across counties. Several changes noted in 2016, in comparison to the 2015 performance for each county, were noted as follows:

- Whatcom, King, Pierce and Kitsap Counties saw an improvement across the two measurements
- Skagit, Island, Kittitas and Thurston Counties saw decline in performance across the two measurements
  - Skagit County decline was due to more accident related outages.
  - Island County $SAIFI_{5\%}$ decline in performance was due to more customers being affected by scheduled outages and tree related outages. $SAIFI_{Total}$ was impacted by those same outages as well as the March and October windstorms.
  - Kittitas County decline was due to an outage caused by a third party.
  - Thurston County decline in performance was due to a widespread outage of unknown cause and more customers affected by scheduled outages.

As described more fully in the *Areas of Greatest Concern* discussion of the *About Electric Service Reliability Measurements and Baseline Statistics* section, PSE continues to focus on identifying projects that will improve SAIFI, while managing other aspects of electric system performance.

SAIDI (SQI #3)

Overview

Providing reliable electric service is a top priority of electric companies. PSE's maintenance programs (i.e. vegetation management and substation inspections), capital investments, and improvement efforts around response and repair time, are targeted to prevent or reduce the number and duration of outages. Despite PSE's best efforts, sometimes power outages are simply unavoidable. Most outage minutes are caused by equipment failure, trees and vegetation. When power failures occur, PSE works around the clock to restore service as soon as possible.

The System Average Interruption Duration Index (SAIDI) measures the number of outage minutes per customer per year. Most electric utilities use this measurement in reviewing the reliability of their electrical system, excluding outage 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 duration of customer interruptions while SAIFI measures the number of customer interruptions.

About the Benchmark

SAIDI is calculated by adding up the outage minutes of all the customers that have been without power and then dividing by the average annual number of electric customers.[22]

At PSE, for the purpose of measuring SQI SAIDI, days that exceed the annual adjusted Major Event Day Threshold (T_{MEDADJ}) are excluded from the performance calculation. Starting in the 2016 reporting year, PSE's SQI SAIDI calculation is based on the industry standard IEEE 2.5 beta methodology and PSE is allowed to adjust catastrophic days to establish the annual T_{MEDADJ}. A catastrophic day is defined as any day that exceeds the 4.5 Beta threshold (T_{CAT}). Only outages longer than 5 minutes are included in this metric.

More details concerning major outage events and catastrophic days are in the *Major Events* discussion in the *About Electric Service Reliability Measurements and Baseline Statistics* section.

For the purposes of this report, the SQI SAIDI measurement is referred to as $SAIDI_{SQI}$.

- **SQI SAIDI ($SAIDI_{SQI}$)—** Measures the number of customer-minute interruptions utilizing the IEEE Standard 1366 methodology. Days that exceed the IEEE T_{MEDADJ} are excluded. The 2016

[22] Refer to Appendix H: *Terms and Definitions* for the formula

T_{MEDADJ} is 5.53 minutes—that is, any day that exceeds 5.53 minutes per customer is excluded from the annual SQI SAIDI results.

In addition to the SQI SAIDI measurement, PSE also reports on five additional key measurements:

- **Total SAIDI ($SAIDI_{Total}$)**—Includes all customer minute interruptions that occurred during the current reporting year, without exclusion.
- **Total 5-Year Average SAIDI ($SAIDI_{Total\ 5\text{-}year\ Average}$)**—Includes all customer-minute interruptions that occurred during the current reporting year and the previous four years, except for extreme weather or unusual events.
- **5% Exclusion SAIDI ($SAIDI_{5\%}$) (Non-major-storm SAIDI)**—Excludes customer-minute interruptions during Major Events, where Major Events are defined as days when 5% or more of the electric customer base in a 24-hour period experiences power interruption and the days following (carried-forward days), until all those customers have service restored.
- **IEEE SAIDI ($SAIDI_{IEEE}$)**—Measures the number of customer-minute interruptions utilizing the IEEE Standard 1366 methodology. Days that exceed the IEEE T_{MED} are excluded. The 2016 T_{MED} is 6.45 minutes—that is, any day that exceeds 6.45 minutes per customer is excluded due to IEEE-defined Major Event Days.

The *About Electric Service Reliability Measurements and Baseline Statistics* section provides more detailed discussion of the four reporting measurements and the establishment of the baseline statistics. Appendix L: *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.

2016 SAIDI Results

The 2016 results based on the recorded outages are reported in Table 3c.

Table 3c: 2016 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**	**391**	**--**
$SAIDI_{Total\ 5\text{-}year\ Average}$	**Total (all outages five-year average) SAIDI**	**n/a**	**326**	**317**	
$SAIDI_{5\%}$	**<5% Non-Major-Storm (<5% customers affected) SAIDI**	**n/a**	**132**	**154**	**--**
$SAIDI_{IEEE}$	**IEEE Non-Major-Storm (T_{MED}) SAIDI**	**n/a**	**107**	**163**	**--**
$SAIDI_{SQI}$	**IEEE Non-Major Storm (T_{MEDADJ}) SAIDI**	**No more than 155 minutes per customer per year**		**148**	☑

What Influences SAIDI

As noted in the SAIFI section, PSE tracks outages by cause codes and groups the outage causes into three major categories: tree-related, preventable and third party. Figure 3c illustrates the impact of tree-related outages, accounting for 33–67% of customer minutes, across the $SAIDI_{Total}$ and $SAIDI_{SQI}$ measurements.

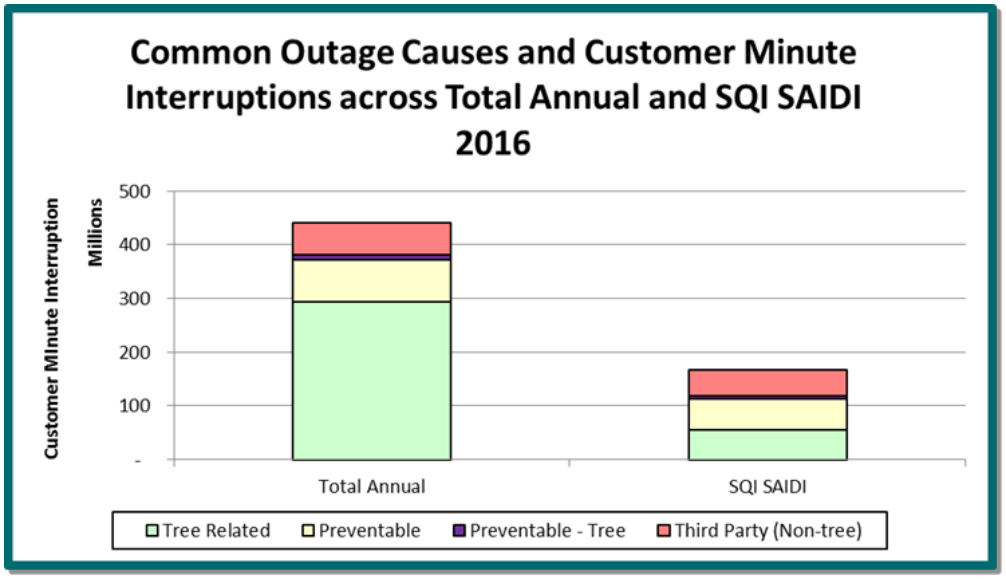

Figure 3c: Common Outage Causes and Customer Minute Interruptions across Total Annual and SQI in 2016

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 outages.

A fallen tree or large limb will damage the line and may also tear down supporting structures, cross arms and poles. The number of trees growing near power lines in the Pacific Northwest is unique among other regions in the United States. Nearly 75% of PSE right-of-way edge is treed. On average there are 1,995 trees per mile on PSE's transmission system. In comparison, National Grid, the second largest utility in the United States representing four states on the East Coast, has 313 trees per mile.[23]

High winds in the fall season increase the risk of tree limb failure in deciduous trees because the trees have not fully shed their leaves. The crown of a tree is less permeable when fully leafed; thus, there is a greater degree of

[23] Ecological Solutions Inc. study, March 3, 2009, page 79 and page 82.

limb breakage due to the "sail" effect. The fully leafed crown acts like a sail, causing a higher degree of wind loading or pressure on branches and limbs and increases the potential for breakage.[24]

Response and Repair Time

Response and repair time also play an important factor to SAIDI. How long it takes to restore service depends on the complexity of the system, the number and types of damaged system components, the extent of the damage, and the location of the problem. The number of outages occurring at one time can also impact the availability of repair personnel to respond, thus adding to outage minutes.

PSE tracks all outage events longer than sixty seconds. The outage length is composed of response, assessment and repair time. Response time, the time from when the customer notifies PSE that an outage has occurred until an EFR personnel arrives at the site of the outage, is measured by SQI #11, Electric Safety Response Time. See *Electric Safety Response Time (SQI #11)* section in Chapter 2 for more detail.

The average response time for 2015 was 54 minutes and 2016 was 55 minutes. The 5% Exclusion Major Events, SQI SAIDI events, as well as localized emergency event days, are excluded from this metric.

Response and repair time for service providers are also tracked and measured. Certain outages are either excluded from the metric or adjusted on a case-by-case basis. Examples include access issues and third-party constraints that might limit the service provider's ability to repair the outage in a timely manner. Please see the Service Provider Performance section in Chapter 2 for more details.

The Electric Safety Response Time metric (SQI #11) and the service provider secondary safety response and restoration time metrics (SP Indices #4B and 4C) are designed to measure specific parts of PSE's outage restoration effort, which should not be compared with any of the SAIDI measures. The three response time metrics track different tasks of restoration and exclude specific outages; therefore they are not comparable to each other.

[24] E. Thomas Smiley and Brian Kane, *"The Effects of Pruning Type on Wind Loading of Acer Rubrum," –Arboriculture & Urban Forestry* 32(1): January 2006, pages 33-40, International Society of Arboriculture.

Historical Trends for SAIDI

Table 3d shows SQI SAIDI from 2012 to 2016.

Table 3d: SQI SAIDI from 2012 to 2016

	2012	2013	2014	2015	2016
$SAIDI_{Total\ 5\text{-}year\ Average}$ **(SQI #3)**	**245**	**247**	**312**	**272**	**148**
Benchmark	**320 minutes per customer per year, all outage events**				**155 minutes per customer per year, Non-Major Event Days**

Appendix L: *1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements* illustrates the comparison between the SAIDI measurements for 1997-2016. Based on the recorded outages, the 2016 results across three of the measurements improved when compared to 2015. The 2016 $SAIDI_{Total\ 5\text{-}Yr\ Average}$ worsened when compared to 2016. The 2015 $SAIDI_{Total\ 5\text{-}Yr\ Average}$ is comprised of the 2011-2015 $SAIDI_{Total}$ performance and the 2016 $SAIDI_{Total\ 5\text{-}Yr\ Average}$ is comprised of the 2012-2016 $SAIDI_{Total}$ performance. Since the 2016 $SAIDI_{Total}$ had worse performance than the 2011 $SAIDI_{Total}$, the 2016 $SAIDI_{Total\ 5\text{-}Yr\ Average}$ is higher.

Appendix K: *Historical SAIDI and SAIFI by Area* illustrates the 2014–2016 results by county under the $SAIDI_{Total}$ and $SAIDI_{SQI}$ measurements. A summary of Appendix K indicates that 2016 SAIDI performance varied in each county as compared to 2015:

- All counties saw an improvement in $SAIDI_{Total}$ performance.
- Whatcom, Island, King, and Kitsap Counties saw an improvement in $SAIDI_{SQI}$ performance.
- The decline in Skagit County $SAIDI_{SQI}$ performance was driven by outages caused by third parties and scheduled outages.
- The decline in Kittitas County $SAIDI_{SQI}$ was driven by an outage caused by a third party.
- The decline in Pierce County $SAIDI_{SQI}$ was driven by more tree related and scheduled outages.
- The decline in Thurston County $SAIDI_{SQI}$ was driven by equipment failure and scheduled outages.

As described more fully in the *Areas of Greatest Concern* discussion in the *About Electric Service Reliability Measurements and Baseline Statistics* section, PSE continues to focus on identifying projects that will affect SAIDI, while managing other aspects of electric system performance.

About Electric Service Reliability Measurements and Baseline Statistics

Overview

PSE, like most utilities, uses industry standard electric service reliability indices to monitor its annual performance. PSE reports the electric service reliability in four key measurements, which provide a more complete representation of the overall electric customer service reliability. The standard formulas, as noted in Appendix H: *Electric Terms and Definitions*, are used to calculate each of the measurements but with one critical difference that showcases a particular area of electric service reliability performance. Each measurement is based on specific criteria:

- **Total Annual**
  - **SAIFI**—Measures all electric customer service interruptions that occurred during a calendar year without any exclusion.
  - **SAIDI**—Measures total number of all electric customer outage minutes in a calendar year without any exclusion.
- **Total 5-Year Average Annual**
  - **SAIFI—**Measures the rolling five-year average of all customer interruptions that occurred during the current reporting year and the previous four years, except for extreme weather or unusual events.
  - **SAIDI—**Measures the rolling five-year average of all customer minute interruptions from the current reporting year and previous four years, except for extreme weather or unusual events.
- **5% Exclusion**
  - **SAIFI**—Measures the annual average number of customer interruptions excluding major outage event days when 5% or more of customers are without power during a 24-hour period and the additional days needed to restore service to all those customers.
  - **SAIDI**—Measures the total annual number of customer outage interruption minutes from the current year excluding major outage event days when 5% or more of customers are without power during a 24-hour period and the additional days needed to restore service to all those customers.
- **IEEE 1366**
  - **SAIFI**—Measures the annual average number of customer interruptions utilizing the IEEE Standard 1366 methodology. Days with daily total SAIDI that exceed the IEEE T_{MED} threshold value are excluded.
  - **SAIDI**—Measures number of customer-minute interruptions utilizing the IEEE Standard 1366 methodology. Daily SAIDI results that exceed the IEEE T_{MED} threshold value are excluded.
- **SQI SAIDI**
  - **SAIDI**—Measures number of customer-minute interruptions utilizing the IEEE Standard 1366 methodology. Catastrophic days are normalized before calculating the annual threshold value. Daily SAIDI results that exceed the IEEE T_{MEDADJ} threshold value are excluded

The formula for calculating each of these measurements can be found in Appendix H: *Terms and Definitions*.

Baseline Year

To meet UTC requirements, PSE established 2003 as its baseline year. While meeting the requirements, PSE would prefer to develop a baseline using multiple years, which mitigates the fluctuation of reliability statistics and proves more useful in trend analysis. PSE cautions against the attempt to use a single year's system performance data or information to assess year-to-year trends. Such trend analysis may prove inconclusive, and PSE believes that there is limited usefulness in designating one specific year's information as a "baseline." As a result, comparing current year results to a baseline year that was established based on different outage data collection methods is not meaningful.

Major Events

In 2016, PSE experienced the following major storm events that met the SQI SAIDI, 5% SQI exclusion, or the IEEE Standard 1366 exclusion criteria:

- A March 1st event that affected customers in Pierce, Thurston, Kitsap Counties and Vashon Island
- A March 10th event that affected customers in Whatcom, Skagit, Island, Kitsap, Kittitas Counties, the northern part of King County and Vashon Island
- A March 13th event that affected customers throughout PSE's Western Washington service territory
- A September event that affected customers in northern part of King County
- An October event that affected customers throughout PSE's service territory except for the southern part of King County

Per Order 29 of consolidated Docket Nos. UE-072300 and UG-072301 approved by the Commission in June 2016, catastrophic days are identified based on the 4.5 Beta of the IEEE Standard 1366. Prior to 2016, PSE could petition to exclude an outage event from the performance calculation, with the mitigation standard requiring that the event was unusual or exceptional and PSE's level of preparedness and response was reasonable. If the exclusion was approved by the Commission, PSE did not include the catastrophic event in the total annual SQI SAIDI value. The new catastrophic definition aligns with the same events that were previously excluded via the petition process but is more objective in nature and the transparency does not require a petition process.

Table 13a details the dates, causes and exclusion criteria for the SQI SAIDI, IEEE, and 5% exclusion events in 2016. Typically, an event that meets the 5% Exclusion Major Event Day criteria will also exceed the SQI SAIDI T_{MEDADJ} and IEEE T_{MED} criteria. Since the initial reporting of the IEEE methodology in 2003, all 5% Exclusion Major Event Days have met the IEEE T_{MED}. With the addition of reporting SQI SAIDI events in 2016, all 5% Exclusion Major Event Days met the SQI SAIDI T_{MEDADJ} as well.

IEEE T_{MED} and SQI SAIDI are based on the customer minutes rather than the number of customers impacted. Therefore, if PSE experiences a storm event that is isolated to a small geographic area or a less populated county, it is possible that events exceed the IEEE T_{MED} and SQI SAIDI but not meet the 5% exclusion criteria. In 2016,

all five of the IEEE T_{MED} events and four of the five SQI SAIDI events also met the 5% Exclusion Major Event Day criteria.

Table 3e: 2016 SQI SAIDI, IEEE T_{MED} and SQI SAIFI Exclusion Events

SQI SAIDI Exclusion Date	IEEE T_{MED} Exclusion Date	Daily SAIDI	Exceed T_{CAT}	5% Customers Out Exclusion	Cause	Span of 5% Customers Out Exclusion Period
3/1/2016	3/1/2016	34.9	--	9.7%	Wind	3/1/2016 1:30 PM - 3/4/2016 12:00 AM
3/10/2016	3/10/2016	49.1	--	12.6%	Wind	3/10/2016 2:00 AM - 3/13/2016 4:00 AM
3/13/2016	3/13/2016	116.1	☑	24.2%	Wind	3/13/2016 12:30 PM - 3/15/2016 9:00 PM
9/10/2016	n/a	5.9	--	n/a	Tree	n/a
10/14/2016	10/14/2016	27.4	--	10.9%	Wind	10/14/2016 2:00 AM - 10/17/2016 2:30 PM
10/15/2016	10/15/2016	9.4				

Table 3f details the threshold values and number of major events IEEE SAIDI and 5% SQI exclusion from 2012 through 2016 and the 2016 SQI SAIDI threshold values and number of events for major and catastrophic events.

Table 3f: Comparison of the threshold values and major events

	2012	2013	2014	2015	2016
SQI SAIDI T_{MEDADJ}	n/a	n/a	n/a	n/a	5.53
Number of SQI SAIDI Major Event Days	n/a	n/a	n/a	n/a	6
IEEE SAIDI T_{MED}	5.38	5.62	5.60	6.10	6.46
Number of IEEE T_{MED} Major Event Days	10	3	12	10	5
SQI SAIDI T_{CAT}	n/a	n/a	n/a	n/a	99.25
Number of SQI SAIDI Catastrophic Event Days	n/a	n/a	n/a	n/a	1
Number of SQI SAIFI Major Events	1	3	6	5	4
Number of SQI SAIFI Major Event Days	11	7	22	18	10

Areas of Greatest Concern

PSE's regional area planners investigate "area-of-concern" circuits and propose projects that will improve the reliability for customers being served by those circuits. These areas of greatest concern provide focus for the planners in developing electric system improvement projects; however, all areas are continually evaluated for electric service reliability improvement. To assist with identifying the highest priority projects for reliability, PSE focuses on the Top 50 worst-performing distribution circuits over the past five years that consistently contributed the most customer-minute interruptions.

Each circuit is ranked by the total customer-minute interruptions seen by the circuit for each of the previous five years. The Top 50 worst-performing distribution circuits are the circuits with the highest ranking. The percentage contribution of the Top 50 worst-performing distribution circuits towards the total distribution of customer-minute interruptions continues to decrease slightly, indicating that the system projects previously completed on the circuits has improved reliability.

Based upon reviewing the outage history, number of customers impacted, outage location and other factors, planners propose projects that are designed to improve reliability on these circuits. Appendix N: *Areas of Greatest Concern with Action Plan* details the Year End 2016 and Year End 2015 annual ranking of the Top 50 worst-performing distribution circuits along with PSE's completed or future plan for system improvements on each circuit. Comparing the Year End 2016 Top 50 worst-performing distribution circuits to the Year End 2015 Top 50 worst-performing distribution circuits, there was a turnover of 9 circuits and 41 remained on the list from the previous year. Since annual outage data for the year is not typically finalized until the following mid-February, the planners identify and develop projects throughout the year. Projects are approved and released throughout the year, and some may be identified for the following budget year. While PSE funds projects to improve the reliability on the Top 50 worst-performing distribution circuits, some of the circuits have remained on the list year after year. In the Electric Reliability Plan put forth in the Docket UE-170033 of the general rate case proceeding, PSE has proposed increased funding for projects on the worst performing circuits. The focus of the Electric Reliability Plan is to aggressively work towards improving the reliability performance on these chronic worst circuits with additional accelerated and targeted investment. Appendix N: *Areas of Greatest Concern with Action Plan* includes projects that are part of the Electric Reliability Plan. Future plans will be adjusted based on the outcome of the 2017general rate case proceeding.

In addition, PSE also evaluates the 50 worst-performing distribution circuits based on "circuit SAIDI." Circuit SAIDI measures the performance of individual circuits as experienced by the customers on those circuits. This tends to be a more customer-centric view because customer density on the circuit has less influence on the measure.

For the four regional areas in PSE's service territory—Whatcom/Skagit/Island, North King County, South King County, Pierce/Thurston/Kitsap—the regional planning team reviews the performance of the distribution system. Each team reviews the 50 worst-performing distribution circuits in their regions in proposing reliability projects for the upcoming year. These projects are evaluated against other system-related projects for funding.

The system planning process used by the planners to have their proposed projects considered for funding is described below.

The goal of the planning process is to determine cost-effective ways to meet customer needs and maximize value to the company, customers and community. The system planning process begins with an analysis of the current situation and an understanding of the existing operational and reliability challenges. Planning considerations include internal inputs such as reliability indices, company goals and commitments, and reviewing the root causes of the historic outages. In addition, external inputs such as regulations, municipalities' infrastructure plans, and customer complaints of service issues are also considered.

These inputs assist in determining specific solutions and alternatives to address the overall system reliability. Each proposed project alternative is evaluated with quantitative benefits such as number of outages and outage duration, number of customers impacted, and qualitative benefits such as improving customer satisfaction and reducing customer complaints. Each proposed project alternative is compared using a value modeling tool that involves building a hierarchy of the value these benefits against the project cost. Total value is optimized across the entire portfolio of electric and natural gas system infrastructure projects, which results in a set of capital projects that provide maximum value to PSE customers.

In addition to the annual process as described above, new system planning projects are identified throughout the year. These projects can be a result of a new initiative such as a new reliability program, a municipality altering its infrastructure plans, new system performance issues or addressing a resource need for a given area. PSE also identifies and implements projects throughout the year to address emergency repairs and replacements that emerge.

Since 2011, PSE has invested approximately $314 million on reliability improvements.

Customer Electric Reliability Complaints

Customer inquiries and complaints about electric reliability and power quality are additional metrics that measure PSE's success in delivering safe and reliable electric service. When two or more customer inquiries on outage frequency or duration and/or power quality have been recorded from the same customer, during the current and prior reporting year, PSE considers this combination as a complaint.

For the four years from 2010 through 2013, PSE experienced a decrease in the number of complaints received either by PSE or the UTC. However, since 2014, PSE had an increase in both complaint categories, which might be attributed to the severity and frequency of storm events. Also, an improvement in the data collection method and business processes for customer inquiries could have resulted in an increase in the number of reported PSE complaints.

During the rolling two-year period of 2015–2016, PSE received complaints from 81 customers relating to reliability and power quality concerns. PSE's complaint process and the change in data collection is described in Appendix I: *Electric Reliability Data Collection Process and Calculations* and are shown in tabular form in Appendix M: *Current-Year Commission and Rolling-Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions.*

In 2016, the UTC received 18 complaints relating to PSE's electric service quality. These complaints are shown in Appendix M: *Current-Year Commission and Rolling-Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions.*

PSE investigates these customer inquiries and UTC complaints, and tracks service issues. Customers receive follow-up correspondence to discuss their concern, as well as plans for resolution. The outage history surrounding each of these customer inquiries and complaint is reviewed for the overall circuit reliability and then an appropriate plan for resolution is prepared.

Depending on the nature of the circuit reliability, the plan for resolution could be continued monitoring of the circuit or a system planner may propose projects which will improve the circuit reliability. The map in Appendix O: *Current Year Geographic Location of Electric Service Reliability Customer Complaints on Service Territory Map with Number of Next Year's Proposed Projects and Vegetation-Management Mileage* summarizes the number of complaints by county for 2016.

Working to Uphold Reliability

To continually improve and provide reliable electric service throughout its service area, PSE reviews the cause of outages to better understand performance at the subsystem level. Appendix J: *Current Year Electric Service Outage by Cause by Area* details the recorded outage causes in each county in 2016. It shows that trees (TF, TO, TV), birds and animals (BA) and equipment failures (EF) continue to be the primary reasons for outages in 2016 as in previous years. Scheduled outages (SO), for the purpose of performing system upgrades and maintenance, also contribute a significant number of outages. The duration of the scheduled outages is minimized to lessen the effect on customers. This section discusses the efforts PSE takes to reduce the number and the overall duration of tree-related and preventable outages.

The map in Appendix O: *Current Year Geographic Location of Electric Service Reliability Customer Complaints on Service Territory Map with Number of Next Year's Proposed Projects and Vegetation-Management Mileage* shows the number of reliability projects and vegetation mileage by county PSE has proposed for completion in 2017.

Vegetation Management

Outages related to trees and vegetation continue to be a major factor in the SAIDI and SAIFI performance. Trees remain a vital element of the region's quality of life, but they are also a major cause of power outages. To mitigate trees and limbs falling into electric power lines, PSE performs vegetation maintenance based on a cyclical schedule. The maintenance programs focus on achieving a safe and reliable electric system. Vegetation Management involves a variety of practices and techniques designed to keep trees and limbs from coming in

contact with power lines and causing outages. Less than 10% of tree-related outages are caused by tree growth, illustrating an effective vegetation management program[25].

Cyclical Programs

PSE spends more than $13 million annually on a systematic, cyclical vegetation management program to reduce outages in its overhead electric distribution, high-voltage distribution and transmission systems.

- **Overhead distribution system**—Usually trees are trimmed every four years for distribution lines in urban areas and every six years for lines in rural areas.
  - Danger trees, trees that are an imminent threat of falling into power lines, are removed in these rights-of-way or within 12 feet of the system at the same time that trees are trimmed.
  - In 2016, PSE completed 2,144 miles of vegetation management. The maintenance cycle is on schedule.
- **High-voltage distribution system and cross-country transmission corridor system**—Trees are trimmed every three years on PSE's high-voltage distribution rights-of-way and annually in transmission corridors. Spray and mowing activities are performed and danger trees are removed along the edge of these corridors, typically within 12 feet of the system at the same time trees are trimmed.
  - In 2016, 580 miles of high-voltage distribution lines were maintained and
  - 375 miles of transmission corridors were maintained under federal clearing requirements.
- **Fast growing, undesirable species**—Hot spotting and mid-cycle work and patrols occur yearly on the overhead distribution, high-voltage distribution and the transmission corridors to remove fast-growing, undesirable species of trees.
  - In 2016, roughly 300 miles were treated for undesirable trees.

TreeWatch Program

PSE also manages vegetation impacts and spends $2 million annually with its TreeWatch program. Within this program, certified arborists work with communities and property owners to identify and remove "at-risk" trees on private property that are more than 12 feet away from power lines located beyond the limits of normal cyclical vegetation management standards. In 2016, the TreeWatch program addressed approximately 300 miles of transmission and high-voltage distribution lines and over 500 miles of distribution lines. Over 30,000 trees were removed or pruned, far exceeding the plan proposed in the 2015 report. The trim and removal numbers vary year to year due to the size and complexity of the trees targeted to be trimmed and removed. The focus in 2016 was on critical high voltage distribution lines, and those distribution circuits that are on the top 50 worst circuits for tree-related outages. In 2016, the Tree Watch budget was increased by an additional $2 million. The additional funding specifically addressed six distribution circuits that historically reoccur on the Top 50 worst

[25] Ecological Solutions Inc., study, October 2008, page 39.

circuits for tree-related outages. The six distribution circuits are Griffin-13 and Prine-13 in Thurston County, Hickox-16 and Kendall-12 in Whatcom County, Silverdale-15 in Kitsap County and Vashon-13 in King County.

Tree Replanting Program

PSE devotes about $500,000 each year to replanting trees and non-construction related mitigation in PSE's service area. In addition, PSE developed and makes available to customers a vegetation planning handbook called *Energy Landscaping*. The handbook helps customers evaluate landscaping opportunities and is a how-to for planting trees and shrubs and tree-care solutions. It also lists recommended trees and shrubs to plant near power lines.

Distribution, High-Voltage Distribution and Transmission Vegetation-Management Study

A vegetation management study was conducted on PSE's overhead transmission system by Ecological Solutions, Inc. The results[26] validate that PSE's pruning maintenance cycles are appropriate for the local tree growth rates. Additionally, the study illustrates that trees growing off the right-of-way are increasingly contributing to transmission system outages. The study concluded that 80% of tree-related outages are caused by trees from outside the right-of-way and 68% of trees that fail and cause outages are healthy trees.

The study further suggests that outages caused by healthy trees can only be addressed by reducing the electric system's exposure to trees, which based upon species and quantities in PSE's electric service territory may be impractical.

The study also revealed that one-third of all tree-related outages are due to limbs falling on lines. A tree with branches overhanging a power line is twice as likely to cause an outage as a tree that had its overhanging branches removed. The study recommended that all branches overhanging power lines be removed (sometimes referred to as 'lines to sky trimming'), resulting in a reduction of tree-related outages.

In 2012, PSE initiated a pilot project to test the recommendation. The circuit chosen is one of the least reliable circuits in the PSE service territory, Chico-12, which is located in Kitsap County. Customers in the area are served by a 54-mile-long power line that runs through dense forested areas. The length of the line and the high number of nearby trees is a combination ripe for tree-related outages—the more miles of power line, the more area of exposure to trees and tree branches. The concept of the pilot is simple: by removing tree branches that overhang power lines, the probability of tree branches falling into or coming in contact with power lines will decrease, as well as any associated power outages. The tree work was completed in the fall of 2012. Results indicate that the circuit experienced fewer non-Major Event outages per year after trimming than occurred prior to the trimming. There was an average of 44 non-Major Event outages per year from 2010-2012 versus an

[26] Ecological Solutions Inc. study, March 2009, page 12 and page 71.

average of 31 non-Major Event outages per year from 2013-2016. PSE will continue to monitor Chico-12 reliability, but it appears that trimming was effective in reducing non-Major Event outages.

In 2013, PSE initiated an additional pilot project similar to the Chico-12 project. The circuit selected was Duvall-15 located in east King County. Although tree-related circuit outages on Duvall-15 were significantly less than Chico-12, PSE selected the circuit because the vegetation component was significantly different than Chico-12. Chico-12 vegetation was primarily evergreen or conifer forest edge. Duvall-15 was a mix of both evergreen and deciduous trees. Current results indicate that Duvall-15 experienced the same number of Non-Major Event outages per year after trimming than occurred prior to trimming: the 2010-2013 average was eight non-Major Event outages per year versus eight non-Major Event outages per year from 2014-2016. PSE will continue to monitor Duvall-15 reliability and report results next year.

In 2014, PSE initiated an outage reduction program that focuses on removing overhanging limbs and selective removal of danger trees on the top 50 worst performing circuits. This effort was combined with circuits scheduled for maintenance.

Substation Landscape Renovation

As the 2015 report proposed, two substation renovation projects were completed in 2016. The substation landscape renovation projects at Chico Substation were completed following an outage caused by trees during the November 2015 storm events. With the support of local government and community, Douglas Fir trees surrounding the substation were removed and replaced with utility-friendly trees. These trees provide screening of the substation without unnecessary risk to the equipment. This also provides a demonstration of tree species appropriate for planting near power lines.

In Skagit County at the Riverbend Substation, large cottonwood trees that had been shedding limbs and risking the substation for future outages were removed on the west side of the substation. PSE opted to grass seed the area rather than plant new trees.

FAC-003-3 Audit

FAC-003 standard requires electrical utilities to maintain a reliable electric transmission system by using a defense-in-depth strategy to manage vegetation located on transmission rights of way (ROW) and minimize encroachments from vegetation located adjacent to the ROW, thus preventing the risk of those vegetation-related outages that could lead to cascading outages. FAC-003 is a reliability standard enforceable in all interconnected jurisdictions in North America: the continental United States; the Canadian provinces of Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec, and Saskatchewan; and the Mexican state of Baja California Norte. Following adoption of a standard by the North American Electric Reliability Corporation (NERC) Board of Trustees, NERC files the standard with the appropriate authority in each jurisdiction. In the United States, NERC petitions the Federal Energy Regulatory Commission (FERC) for approval of standards.

Western Electricity Coordinating Council (WECC) is a regional non-profit corporation that exists to assure a reliable bulk electric system. WECC has been approved by the Federal Energy Regulatory Commission (FERC)

as the regional entity for the western interconnection. North American Electric Reliability Corporation (NERC) delegated some of its authority to create, monitor and enforce reliability standards to WECC through a delegated agreement. WECC is responsible for enforcing FAC-003-3 to improve reliability of the transmission system by preventing and minimizing outages caused by Vegetation. In 2016, PSE underwent an audit from WECC for (NERC) standard FAC-003-3 and was found to be in full compliance with all audited requirements.

Targeted Reliability Improvements

Along with vegetation management to minimize tree-related outages, PSE has implemented other programs to reduce the frequency and duration of outages on the transmission and distribution systems, with a particular focus on improving the reliability on the Top 50 worst-performing distribution circuits. These programs include replacing existing overhead distribution wire with tree wire to prevent tree limb outages, installing more sectionalizing devices (some which are remotely monitored and control), replacing aging infrastructure, installing covered wire and devices to prevent animal-related outages and maintaining key equipment in substations.

Tree Wire

PSE works to reduce outages by installing 'tree wire', which is a tough, thick-coated power line capable of withstanding contact with tree branches that would otherwise cause an outage. The vast majority of tree wire is installed at locations where there has been a previous five year history of outages related to tree branches and a field assessment confirms that installing tree wire would reduce the likelihood of outages. In 2016, over 57 distribution circuit miles of tree wire was installed.

Distribution Sectionalizing Devices

In 2008, a high-level roadmap was developed to improve reliability and identify cost-effective tactics for planning consideration. One effective tactic is the installation of reclosers. These devices are an improvement over conventional fuses. With a conventional fuse, a temporary fault, typically a branch brushing against the power line, which causes the fuse to blow open and de-energize the line. Service is not restored until EFR personnel patrols the line and manually replaces the blown fuse using a bucket truck.

In comparison, reclosers sense the fault on the power line and automatically attempt to re-energize the line. If the recloser no longer senses the fault, it will reclose and re-energize the line. If the fault is not temporary, the recloser can isolate the damaged section of the line and customers upstream from the recloser do not experience an outage. Another effective tactic implemented is the installation of gang-operated switches. Gang-operated switches provide the ability to simultaneously disconnect the three-phase lines rather than disconnecting one phase at a time, and to better isolate damaged infrastructure so more customers can continue to be served.

In 2016, 33 additional line reclosers and 16 gang-operated disconnect switches were installed. Currently, there are 13 line reclosers installed with remote monitoring and control. New installations in 2016 are being used for the pilot Distribution Automation Program. There are further details in the Pilot Projects section of this report.

Substation Maintenance

Substations are the key hubs connecting high-voltage power lines and the electric distribution power lines that serve customers. Substations typically serve between 500 and 5,000 customers and contain major pieces of equipment, technologies to monitor and operate the system, and backup systems. Substations are inspected monthly and maintenance programs are in place to ensure performance and efficiently maintain expensive equipment.

As PSE continues adding more infrastructure, reliability measures are incorporated into the design. For example, building a substation requires the installation of the transmission and distribution lines; to enhance reliability and operational flexibility, the power lines typically connect to adjacent substations. New substations enable the operational ability to shift customers to the neighboring substations during an outage.

The transmission and distribution substation maintenance program utilizes low cost, non-intrusive diagnostic tasks to identify problems that could result in equipment failure. The current reliability improvement program also includes battery maintenance, inspection and planned replacement. Station infrared scanning is performed every other year to identify problem areas on the electrified portion of the station. The program also covers PSE's substation portion of the transmission maintenance and inspection plan reported to the North American Reliability Corporation. It covers system protection relay maintenance for distribution/transmission relays, auto-switch schemes, trip circuits and station reclosers.

SCADA

Supervisory Control and Data Acquisition (SCADA) is an important aspect of managing the power system. SCADA is a system used for monitoring and controlling substation equipment that will enable faster restoration of power to the customers. In 2016, feeder breakers at four stations were upgraded with full SCADA control and monitoring.

Bellevue Central Business District SCADA project

The electric distribution system serving the City of Bellevue's Central Business District (CBD) is very dense. When an outage occurs, it takes time to access switches in parking garages and/or sidewalks within the downtown core to identify, isolate and restore power to the high-rise buildings. In a review of how other utilities serve similar loads, there is an indication that for urban areas, manual restoration should be replaced with SCADA switchgear that can be remotely monitored and controlled to reduce the outage impact and to manage the system. In 2016 six additional SCADA switches were installed bringing the total number of switches retrofitted with SCADA to 30 in the CBD. Since this construction occurred in late 2016, none of the six have been connected to PSE's Energy Management System. PSE is planning to replace a total of 66 existing switches as well as adding new ones in strategic locations as new customer construction occurs in the downtown area. It is expected that many of the feeders in the distribution system serving the Bellevue CBD area will be ready for distribution automation within the next five years.

Pilot Projects

In addition to these ongoing targeted reliability improvement programs, PSE continues to monitor the three pilot projects implemented in 2016.

Tripsavers

This project is to replace 250 100T overhead fuses with tripsavers which are single-phase reclosing devices. The tripsavers will help reduce temporary outages related to tree limbs and animal contact similar to a recloser but at a reduced cost. In the 2016 pilot program, 240 tripsavers were installed in 103 locations and PSE estimates that they prevented 41 outages, which would have lasted about 120 minutes each. Based upon the pilot results, PSE expects the 250 tripsavers could prevent 44 outages. During the 2016 pilot, several design and operational issues came to light. It was decided to suspend further tripsaver installations in 2017 while these issues are addressed.

Exacter

The intent of this 2015/16 pilot project was to proactively identify and replace overhead equipment before it failed, thus eliminating outages to customers. Exacter technology identifies equipment where partial discharge or electromagnetic interference is present which indicates that the equipment is approaching failure. In 2015, the seventy worst performing distribution circuits with overhead equipment outages were evaluated using this technology. Over 378 overhead circuit miles were scanned and 55 pieces of equipment were identified with electromagnetic interference signatures. PSE identified 38 of the 55 devices as needing replacement. The remaining 17 devices served looped transmission lines, which if a failure occurred on the device, the line could easily be switched around during the repair without customer impact.

Results to date of this pilot program indicate the anticipated benefit of the Exacter technology was not seen. PSE made the decision not to proactively replace the 38 devices identified by the scan but to simply monitor them. None of these identified devices failed during the test year. However, there were multiple failures of equipment not identified by the scan on the seventy scanned circuits.

Tollgrade Sensor

This pilot project involved installing 51 Tollgrade Lighthouse sensors on the three worst performing circuits (Chico-12, Baker River Switch-24, and Cottage Brook-13). The sensors can help improve reliability due to immediate notification of a fault beyond the sensor, and the ability to proactively identify potential problems on the line that may cause momentary or permanent outages. The sensors can also help diagnose the pattern of events prior to customer complaints, and help identify failing or mis-operating equipment. In practice these benefits have not yet been proven. No quantifiable actions were taken in 2016 as a result of the Tollgrade Sensor outputs.

Distribution Automation

In 2016, a new pilot was launched to automate outage restoration on the distribution grid by using sensors to locate faults, remotely operated switches to isolate faulted sections and to restore power to the non-faulted

sections. A computer control system automates this action by collecting information from grid devices and determining the optimal switching to restore power to the largest number of customers. Circuits with this automation can self-heal and recover from an outage in less than 5 minutes. The faulted section will still remain without power until crews can repair the damage. In 2016, PSE completed the installation of the computer control system that orchestrates the self-healing and fully implemented one project on Birch Bay-13. Eight other distribution automation projects are underway.

Aging Infrastructure

Cable Remediation

For an underground power-distribution system, age and moisture make buried cable vulnerable to failures and prolonged outages. Since 1989, PSE has managed a cable remediation program that considers two remediation options: silicone injection or cable replacement.

- Silicone injection extends the life of underground power cable for 20 years by restoring the cable's insulating properties. This alternative is only used on single phase cables due to cost of testing and implementing on three phase cables.
- Cable replacement has an expected life that exceeds 30 years.

In 2016, 120 miles of cable were remediated which is up from 70 miles in 2015.

Pole Test and Treat and Replacement Programs

In an overhead electric system, the failure of a utility pole can cause an outage that could affect thousands of customers. In 2016, there were 79 outages caused by a structural failure on the pole. To minimize the risk of a large outage, PSE has a pole inspection and replacement program for both transmission and distribution wood poles.

PSE assesses each pole's condition by excavating around the base to determine the extent of below-ground decay and by boring into the pole to assess decay within the pole. The remaining strength of the pole is calculated based on the measurements of decay. Poles with remaining strength that still meets the National Electric Safety Code (NESC) guidelines are treated with an internal fumigant, which extends its serviceable life. Poles not meeting NESC guidelines are scheduled for replacement.

Industry data shows that the average serviceable life of a pole in the Pacific Northwest without remedial treatment is 43 years. Poles which have received routine treatment throughout their life last significantly longer. Industry data suggests the average life could be 100 years or more.

In 2016, 1,696 poles were replaced (1,637 distribution poles and 59 transmission poles). In addition to the programmatic investment in pole replacement, PSE also replaces poles identified as near failure during the year and in storm restoration efforts which are included in the total number.

Aging Overhead Infrastructure

Many of the tree-related outages result from the failure of smaller diameter aging overhead wires, such as copper primary and open-wire secondary. These smaller wires break due to the impact of the failing branches, leading to longer customer outages. PSE is replacing these smaller aging wires with larger steel-reinforced stranded-aluminum wires, per current standards, that will better withstand the impact of falling branches. The larger wires will improve reliability and enable more customers to be served in the future. In 2016, 4.38 circuit miles of smaller diameter wire was replaced.

Substation Equipment Replacement Programs

Upgrades to the substations and equipment are important strategies for reliability. Specific types of equipment are proactively replaced under replacement programs to maintain system reliability, reduce operational costs and offset impacts from aging infrastructure. In 2016, three transformers, fourteen transmission breakers, nineteen distribution breakers and eight relay packages were replaced. Additionally, four transformer protection devices, eight circuit switchers, twenty station batteries and two spill prevention, control, and countermeasures were completed under these programs.

Wildlife

In 2016, there were 1,926 bird and animal-caused outages which was a slight decrease from the 1,944 bird and animal-caused outages in 2015 as shown in Figure 3d. From 2012 to 2016 PSE averaged 1,608 animal-caused outages per year. Since 2010, PSE has reduced animal caused outages by approximately 500 outages per year even though squirrel and bird populations have been steadily increasing.

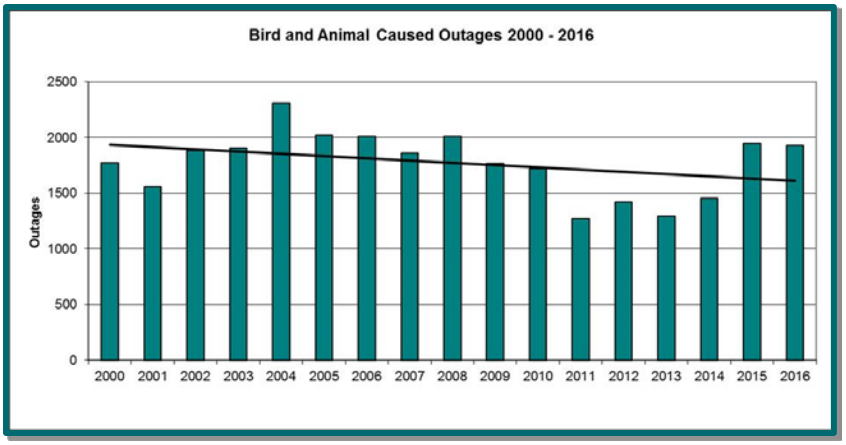

Figure 3d: Bird and Animal Caused Outages 2000 - 2016

In early 2000, PSE modified its construction standards to reduce the risk of animal-related outages. Today, in an effort to avoid bird and animal-caused outages, equipment poles are upgraded with bushing covers, cutout covers and covered jumpers when maintenance activities are performed. In 2016, 1,525 transformer bushing covers were installed to prevent outages and mortality of small birds and small mammals; 1,725 line markers were installed to prevent swan collisions; and 225 bird guards were installed to prevent raptor electrocution. In addition, over 2,300 new transformers were installed which come equipped with bushing covers, reducing the risk of animal caused outages. New electric infrastructure projects that are located within avian-safe designated habitats are constructed to avian-safe standards.

PSE's Avian Protection Program tracks all avian-related outages and retrofits mortality sites using avian protection products and techniques to reduce the risk of recurring outages and avian mortality. The program evaluates circuits that are identified as higher risk for an avian-related outage or mortality. Where appropriate, avian protection is installed proactively to prevent avian mortality and outages. In 2016, the PSE Avian Protection Program completed 46 avian protection retrofit projects for a total of 380 poles and spans that are now avian-safe. These projects were completed in response to over 200 bird mortalities, including 57 trumpeter swans, 7 eagles, and 14 other raptors.

The avian protection program aims to provide regular avian protection training to servicemen to keep them up-to-date on avian protection procedures, materials, and regulatory requirements. The avian protection team provided training for 20 servicemen in 2016, including six newly hired servicemen so they are familiar with protocols for responding to bird and animal caused outages to help reduce this risk systematically.

Third-Party Outages

When a vehicle hits a utility pole, some customers will likely lose power. As part of an ongoing effort to prevent outages and improve motor vehicle safety, PSE planners review the location of the poles whenever a car-pole incident causes an outage. The pole may be relocated if the pole is likely to be hit again.

In addition, PSE continues to work toward preventing third party damage to the underground electric distribution system. Prior to excavating, customers and builders are required to request locates of underground power lines in order to prevent accidental contact. The accidental contact could lead to customer outages.

In the second quarter of 2016, PSE implemented a pilot program in King County increasing field representative oversight on contractors excavating around gas and electric lines. The goal was to reduce gas damage per 1,000 locates in King County. The goal was to reduce the King County gas damage ratio by 10% from 7.8 to 7.0 in the month of December 2016 as compared to December of 2015. Comparing 2016 results to 2015, in December, PSE finished with a King County Gas Damage ratio of 4.63, a 40% reduction.

Planned Outages

Planned outages, which are typically for connecting new or upgrading existing infrastructure, are the third leading cause and account for 16% of recorded non-Major Event service interruptions in 2016. In many cases, service must be interrupted to safely connect new power lines or replace aging or damaged infrastructure. As additional improvements are made, more planned outages may be necessary.

The recording of all planned outages and the associated outage data accuracy continues to be an area of focus. The OMS interface improvements and increased OMS user proficiency has improved the data accuracy associated with planned outages. PSE continues the ongoing effort to review outage communication processes between the service crews and system operations to ensure that planned outage changes are recorded into the OMS. PSE continues to make improvements in recording planned outages that do not require system switching oversight although a small portion of these outages remain unrecorded. The total impact of these unrecorded planned outages to SAIDI and SAIFI is very low, as this type of outage impacts very few customers for a short duration.

Going Forward

In 2017, PSE will continue its programs as described earlier. Specifically:

- **Areas of Greatest Concern**
  - To address limitations of PSE's worst performing distribution circuits where customers experience multiple and lengthy outages, under the proposal of the Electric Reliability Plan put forth in the consolidated Docket Nos. UE-170033 and UG-170034 of the 2017 general rate case proceeding, the worst performing circuit criteria has been further defined, expanding the worst circuit list to 135 (45 from the new worst performing criteria and 90 from the legacy worst performing criteria over the past five years).
  - Continue to monitor the performance of the Top 50 worst-performing circuits as outlined in the *Areas of Greatest Concern* section of this chapter and implement value-added projects to improve

the reliability of these circuits. Appendix N: *Areas of Greatest Concern with Action Plan* provide specific plans for system improvements on each circuit.

- **Vegetation Management**
  - Continue cycle maintenance to remain on cycle. Remove or prune between 5,000 off-right-of-way trees under the TreeWatch program, again focusing on PSE's critical high voltage distribution lines, the worst performing distribution circuits, and transmission lines.
  - Continue the outage reduction plan and complete over 500 miles of distribution on the Top 50 worst circuits that are scheduled for maintenance.
  - Continue with additional funding to target five of the Top 50 worst performing circuits: Fragaria-13 and Miller Bay-21 in Kitsap County, Hobart-16 and Kenmore-23 in King County, and Longmire-17 in Thurston County.

- **Targeted Reliability Improvements**
  - **Targeted Reliability Programs**—Continue to install covered conductor (tree wire) to prevent tree-limb outages and convert overhead lines to underground. Replace failing poles and install animal guards as appropriate in these projects. This has a secondary benefit of preventing outages caused by wildlife.
  - **Distribution Sectionalizing Devices**—Continue to install additional sectionalizing devices on the distribution system to help minimize outages and outage times. These devices include reclosers, switches and fuses. PSE will continue to evaluate the merits of implementing remote monitoring and control at additional locations.
  - **SCADA**— Continue to install SCADA in the distribution substations based on specific benefit and cost. For 2017 and beyond, the next level of SCADA implementation will be to upgrade substation feeder breakers with supervisory control on those currently without this feature. These upgrades will be implemented on substation feeders based upon a prioritization decision matrix of reliability considerations. The annual budget will be prioritized using the decision matrix. The implementation will occur over a period of years.
  - **Bellevue Central Business District SCADA**—Continue efforts to build the foundation for automation of the distribution system serving the Bellevue CBD and help reduce outage duration.
  - **Pilot Projects**—
    - **Tripsavers**—Installations will be suspended while several design and operational issues are addressed. Data will continue to be collected from existing tripsavers to further ascertain the effectiveness of their ability to reduce customer outage minutes.
    - **Exacter**— Complete analysis of the 2016 data and proceed based on those results.
    - **Tollgrade Sensor**— Study alternate uses for this equipment as a diagnostic tool: e.g. trouble shooting customer problems, validating distribution load flow models, evaluating power quality issues and locating faults on difficult to patrol distribution lines.
    - **Distribution Automation**—Continue to expand the footprint of automated switching schemes throughout the distribution system. PSE will monitor the performance of the 2016 project and any project put into service during the year.
    - **Transmission Automation**—Pilot enhancements to the automated switching schemes in use on the transmission system. The goal of these enhancements is to further reduce the number of impacted customers when a transmission outage occurs. The pilot will test fault detection sensors that can better identify the location of the fault so that sectionalizing

devices can isolate the faulted section initially, instead of using reclose attempts to locate the faulted section. The pilot has been scoped in 2016 and the first stage, without automation, is planned for implementation in 2017.

- **Aging Infrastructure**
  - **Cable Remediation**—As part of the cable replacement plan, PSE anticipates replacing approximately 134 cable miles.
  - **Poles**—Plan to replace 687 distribution poles and approximately 50 transmission poles. This number will increase due to unplanned replacements for bad poles identified in the field or due to storm damage.
  - **Aging Overhead Infrastructure**—Plan to replace approximately 2 miles of smaller overhead diameter wire
  - **Substation Equipment**—The ongoing substation reliability improvement plan includes replacement of three transformers, five oil circuit breakers, five circuit switchers, two transformer protection packages, fifteen station batteries, twelve relay packages and two substation spill prevention plans.
- **Wildlife—**
  - Continue the on-going avian protection training of servicemen to keep them up-to-date on avian protection procedures, materials, and regulatory requirements.
  - Provide training resource to all PSE employees on the importance of avian protection via an on-line course. The main drivers are 1) compliance with avian protection regulations; 2) improved reliability; and 3) positive relationship with customers and agencies.
  - Continue to work cooperatively with state and federal agencies to monitor avian populations in PSE's service territory to better understand trends and impacts on both wildlife and PSE's electrical system.
- **Third Party**—Expand the Damage Prevention Program to PSE's Western Washington service territory by adding three field representative positions to monitor construction.
- **Planned Outages**—Continue to monitor the data accuracy of recorded planned outages.

Appendices

This section contains the following appendices:

- A: Monthly SQI Performance
  - *Attachment A to Appendix A—Major Event and Localized Emergency Event Days (Affected Local Areas Only)*
  - *Attachment B to Appendix A—Major Event and Localized Emergency Event Days (Non Affected Local Areas Only)*
  - *Table A5: Attachment C to Appendix A—Natural Gas Reportable Incidents and Control Time*
- B: Certification of Survey Results
- C: Penalty Calculation
- D: Proposed Customer Notice (Report Card)
- E: Disconnection Results
- F: Customer Service Guarantee Performance Detail
- G: Customer Awareness of Customer Service Guarantee
- H: Electric Reliability Terms and Definitions
- I: Electric Reliability Data Collection Process and Calculations
- J: Current Year Electric Service Outage by Cause by Area
- K: Historical SAIDI and SAIFI by Area
- L: 1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements
- M: Current-Year Commission and Rolling Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions
- N: Areas of Greatest Concern with Action Plan
- O: Current Year Geographic Location of Electric Service Reliability Customer Complaints on Service Territory Map with Number of Next Year's Proposed Projects and Vegetation-Management Mileage

A
Monthly SQI Performance

Appendix A consists of Tables A1 and A2 that provide monthly details on the nine service quality indices.

It also contains the following attachments:

Attachment A to Appendix A—Major Event and Localized Emergency Event Days (Affected Local Areas Only)

Attachment B to Appendix A—Major Event and Localized Emergency Event Days (Non-Affected Local Areas Only)

Attachment C to Appendix A—Natural Gas Reportable Incident and Control Time

Table A1: PSE Monthly SQI Performance

Category of Service	SQI No.	Description	Annual Benchmark	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016
Customer Satisfaction	2	WUTC Complaint Ratio	0.40 complaints per 1000 customers, including all complaints filed with WUTC	0.017	0.021	0.020	0.019	0.019	0.019	0.010	0.013	0.018	0.009	0.008	0.008
	6	Customer Access Center Transactions Customer Satisfaction	90% satisfied (rating of 5 or higher on a 7-point scale)	95%	93%	93%	91%	93%	93%	95%	94%	95%	95%	92%	95%
	8	Field Service Operations Transactions Customer Satisfaction	90% satisfied (rating of 5 or higher on a 7-point scale)	95%	95%	95%	98%	94%	97%	97%	96%	95%	95%	96%	93%
Customer Services	5	Customer Access Center Answering Performance[27]	75% of calls answered by a live representative within 30 seconds of request to speak with live operator	78%	72%	82%	87%	88%	81%	81%	77%	72%	72%	61%	70%
Operations Services	4	SAIFI	1.30 interruptions per year per customer	0.950	0.070	0.080	0.050	0.070	0.110	0.090	0.070	0.110	0.090	0.130	0.120
	3	SAIDI	320 minutes per customer per year	11	9	18	6	8	13	12	13	14	14	17	14
	7	Gas Safety Response Time	Average of 55 minutes from customer call to arrival of field technician	31	29	29	29	30	34	30	33	31	32	31	35
	10	Kept Appointments[28]	92% of appointments kept	100%	100%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	11	Electric Safety Response Time	Average of 55 minutes from customer call to arrival of field technician	55	54	55	52	51	57	56	53	53	59	53	56

[27] Results shown exclude calls abandoned within 30 seconds, which had been included in the calculation for SQI reporting years 2009 and prior. The change was proposed in PSE's 2009 SQI annual report and agreed to by UTC staff and Public Counsel via their e-mails to PSE on April 1, 2010.

[28] Results shown are rounded to the nearest whole percentage per UTC order. However, these 100% monthly performance results do not reflect that PSE met all its appointments during the reporting period. Numbers of missed appointments by appointment type are detailed in Appendix F: Customer Service Guarantee Performance Detail.

Table A2: Service Providers Monthly Service Quality Performance

Category of Service	Index	Service Provider	Annual Benchmark Description	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016
Operations Services	Service Provider New Customer Construction Appointments Kept	Quanta Electric	At least 92% of appointments kept	100%	99%	98%	99%	99%	99%	99%	100%	100%	99%	98%	98%
		Quanta Gas	At least 92% of appointments kept	97%	100%	99%	100%	99%	100%	100%	100%	98%	100%	98%	99%
	Service Provider Standards Compliance	Quanta Electric	At least 97% compliance with site audit checklist points	100%	99%	98%	99%	97%	100%	99%	99%	98%	100%	99%	99%
		Quanta Gas	At least 97% compliance with site audit checklist points	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	99%
	Secondary Safety Response and Restoration Time-CoreHour	Quanta Electric	Within 250 minutes from the dispatch time to the restoration of non-emergency outage during core hours	258	224	238	250	247	254	241	248	247	250	250	247
	Secondary Safety Response and Restoration Time-NonCore-Hour	Quanta Electric	Within 316 minutes from the dispatch time to the restoration of non-emergency outage during non-core hours	298	269	288	261	271	296	257	280	287	288	310	292
	Secondary Safety Response Time	Quanta Gas	Within 60 minutes from first first response assessment completion to second response arrival	45	49	53	42	47	45	49	44	49	50	50	65

Table A3: Attachment A to Appendix A—Major Event and Localized Emergency Event Days (Affected Local Areas Only)

This Attachment A to Appendix A provides detail on Major Event and localized emergency event days (Affected local areas only).

PUGET SOUND ENERGY

SQI #11 Supplemental Reporting Major Event And Localized Emergency Event Days Affected Local Areas Only

Date	Type of Event	Local Area	Duration (Days)	No. of Customers Affected	No. of Customers in Area	% of Customers Affected	No. of Outage Events	Resource Utilization (for the event, EFR Count only)	>5% Customer Affected or SAIDI Tmed Event	Comments[29]
1/28/2016	Wind	North	1	1,838	199,225	0.9%	37	15 (of 15)	Yes	15 EFRs Event Duty
3/1/2016	Wind	North	4	9,766	199,376	4.9%	37	14 (of 14)	Yes	14 EFRs Event Duty
3/1/2016	Wind	Central North	4	10,108	309,627	3.3%	62	18 (of 18)	Yes	18 EFRs Event Duty
3/1/2016	Wind	Central South	4	5,862	239,988	2.4%	63	11 (of 11)	Yes	11 EFRs Event Duty
3/1/2016	Wind	South	4	14,775	246,585	6.0%	97	15 (of 15)	Yes	15 EFRs Event Duty
3/1/2016	Wind	West	4	80,031	126,911	63.1%	201	12 (of 12)	Yes	12 EFRs Event Duty
3/10/2016	Wind	North	3	93,579	199,376	46.9%	448	14 (of 14)	Yes	14 EFRs Event Duty
3/10/2016	Wind	Central North	3	14,537	309,627	4.7%	70	18 (of 18)	Yes	18 EFRs Event Duty
3/10/2016	Wind	Central South	3	2,452	239,988	1.0%	30	11 (of 11)	Yes	11 EFRs Event Duty
3/10/2016	Wind	South	3	2,701	246,585	1.1%	34	15 (of 15)	Yes	15 EFRs Event Duty
3/10/2016	Wind	West	3	49,863	126,911	39.3%	158	12 (of 12)	Yes	12 EFRs Event Duty
3/13/2016	Wind	North	3	47,133	199,376	23.6%	247	14 (of 14)	Yes	14 EFRs Event Duty

Table continues on next page.

[29] **EFR**—Electric First Responder, **PTO**—Paid Time Off, **STD**—Short-Term Disability, **SP**—Service Provider

Table A3: Attachment A to Appendix A—Major Event and Localized Emergency Event Days (Affected Local Areas Only)

Date	Type of Event	Local Area	Duration (Days)	No. of Customers Affected	No. of Customers in Area	% of Customers Affected	No. of Outage Events	Resource Utilization (for the event, EFR Count only)	>5% Customer Affected or SAIDI Tmed Event	Comments[30]
3/13/2016	Wind	Central North	3	98,088	309,627	31.7%	229	18 (of 18)	Yes	18 EFRs Event Duty
3/13/2016	Wind	Central South	3	23,775	239,988	9.9%	93	11 (of 11)	Yes	11 EFRs Event Duty
3/13/2016	Wind	South	3	39,785	246,585	16.1%	105	15 (of 15)	Yes	15 EFRs Event Duty
3/13/2016	Wind	West	3	81,081	126,911	63.9%	293	12 (of 12)	Yes	12 EFRs Event Duty
9/10/2016	Tree	North	1	33	200,658	0.0%	7	14 (of 14)	Yes	14 EFRs Event Duty
9/10/2016	Tree	Central North	1	18,198	311,472	5.8%	16	18 (of 18)	Yes	18 EFRs Event Duty
9/10/2016	Tree	Central South	1	8	241,085	0.0%	3	11 (of 11)	Yes	11 EFRs Event Duty
9/10/2016	Tree	South	1	46	248,268	0.0%	5	15 (of 15)	Yes	15 EFRs Event Duty
9/10/2016	Tree	West	1	1,493	127,355	1.2%	3	12 (of 12)	Yes	12 EFRs Event Duty
10/7/2016	Wind	West	1	3,436	127,414	2.7%	24	10 (of 12)	No	10 EFRs, 1 PTO, 1 reg day-off., 8 Line Crews, 3 Tree
10/8/2016	Wind	West	1	854	127,414	0.7%	15	9 (of 12)	No	9 EFRs, 1 PTO, 2 reg day-off, 8 Line Crews, 2 Tree Crews.
10/13/2016	Wind	West	1	6,023	127,414	4.7%	16	12 (of 12)	No	12 EFRs Event Duty
10/14/2016	Wind	North	4	48,277	200,772	24.0%	334	14 (of 14)	Yes	14 EFRs Event Duty
10/14/2016	Wind	Central North	4	20,760	311,743	6.7%	154	18 (of 18)	Yes	18 EFRs Event Duty
10/14/2016	Wind	Central South	4	18,246	241,120	7.6%	77	11 (of 11)	Yes	11 EFRs Event Duty

Table continues on next page.

[30] **EFR**—Electric First Responder, **PTO**—Paid Time Off, **STD**—Short-Term Disability, **SP**—Service Provider

Table A3: Attachment A to Appendix A—Major Event and Localized Emergency Event Days (Affected Local Areas Only)

Date	Type of Event	Local Area	Duration (Days)	No. of Customers Affected	No. of Customers in Area	% of Customers Affected	No. of Outage Events	Resource Utilization (for the event, EFR Count only)	>5% Customer Affected or SAIDI Tmed Event	Comments[31]
10/14/2016	Wind	South	4	33,221	248,436	13.4%	136	15 (of 15)	Yes	15 EFRs Event Duty
10/14/2016	Wind	West	4	61,328	127,414	48.1%	225	12 (of 12)	Yes	12 EFRs Event Duty
11/18/2016	Wind	Central South	1	1,996	241,271	0.8%	27	11 (of 17)	No	11 EFRs, 6 PTO, 7 Line Crews, 5 Tree Crews.
11/24/2016	Wind	North	1	4,675	200,992	2.3%	35	12 (of 14)	No	12 EFRs, 2 PTO, and 37 Line Crews, 2 Tree
11/24/2016	Wind	Central South	1	447	241,271	0.2%	6	8 (of 11)	No	8 EFRs, 3 PTO
11/24/2016	Wind	South	1	5,284	248,625	2.1%	24	8 (of 15)	No	8 EFRs, 7 PTO
11/24/2016	Wind	West	1	3,907	127,464	3.1%	19	6 (of 12)	No	6 EFRs, 6 PTO
12/8/2016	Wind	Central South	1	6,636	241,510	2.7%	45	12 (of 12)	No	12 EFRs, 7 Line Crews, 3 Tree Crews
12/9/2016	Wind	West	1	192	127,513	0.2%	13	10 (of 12)	No	10 EFRs, 1 PTO, 1 reg day-off, 7 Line Crews, 2
12/19/2016	Wind	West	1	3,821	127,513	3.0%	18	12 (of 12)	No	12 EFRs, 8 Line Crews, 1 Tree Crew
12/26/2016	Wind	North	1	877	201,084	0.4%	12	7 (of 14)	No	7 EFRs, 5 PTO, 2 reg day-off, 8 Line Crews, 1
12/26/2016	Wind	West	1	3,232	127,513	2.5%	8	7 (of 12)	No	7 EFRs, 3 PTO, 2 reg day-off., 7 Line Crews.

[31] **EFR**—Electric First Responder, **PTO**—Paid Time Off, **STD**—Short-Term Disability, **SP**—Service Provider

Table A4: Attachment B to Appendix A—Major Event and Localized Emergency Event Days (Non-Affected Local Areas Only)

This Attachment B to Appendix A provides detail on Major Event and localized emergency event days (Non-affected local areas only).

PUGET SOUND ENERGY

SQI #11 Supplemental Reporting Major Event And Localized Emergency Event Days Non-Affected Local Areas Only

Date	Type of Event	Local Area	Duration (Days)	No. of Customers Affected	No. of Customers in Area	% of Customers Affected	No. of Outage Events	Resource Utilization (for the event, EFR Count only)	>5% Customer Affected or SAIDI Tmed Event)	Comments
1/28/2016	Wind	Central North	1	2,908	309,210	0.9%	7	18	No	
1/28/2016	Wind	Central South	1	948	239,452	0.4%	8	11	No	
1/28/2016	Wind	South	1	6,333	246,203	2.6%	14	15	No	
1/28/2016	Wind	West	1	550	126,825	0.4%	10	12	No	
10/7/2016	Wind	North	1	4,524	200,772	2.3%	36	14	No	
10/7/2016	Wind	Central North	1	598	311,743	0.2%	16	18	No	
10/7/2016	Wind	Central South	1	101	241,120	0.0%	7	11	No	
10/7/2016	Wind	South	1	6,075	248,436	2.4%	19	15	No	
10/8/2016	Wind	North	1	505	200,772	0.3%	14	14	No	
10/8/2016	Wind	Central North	1	2,043	311,743	0.7%	12	18	No	
10/8/2016	Wind	Central South	1	176	241,120	0.1%	6	11	No	
10/8/2016	Wind	South	1	2,172	248,436	0.9%	11	15	No	

Table continues on next page.

Table A4: Attachment B to Appendix A—Major Event and Localized Emergency Event Days (Non-Affected Local Areas Only)

Date	Type of Event	Local Area	Duration (Days)	No. of Customers Affected	No. of Customers in Area	% of Customers Affected	No. of Outage Events	Resource Utilization (for the event, EFR Count only)	>5% Customer Affected or SAIDI Tmed Event	Comments
10/13/2016	Wind	North	1	4,319	200,772	2.2%	30	14	No	
10/13/2016	Wind	Central North	1	4,190	311,743	1.3%	15	18	No	
10/13/2016	Wind	Central South	1	627	241,120	0.3%	11	11	No	
10/13/2016	Wind	South	1	10,785	248,436	4.3%	24	15	No	
11/18/2016	Wind	North	1	2,350	200,992	1.2%	11	14	No	
11/18/2016	Wind	Central North	1	19,644	312,459	6.3%	32	18	No	
11/18/2016	Wind	South	1	273	248,625	0.1%	6	15	No	
11/18/2016	Wind	West	1	80	127,464	0.1%	8	12	No	
11/24/2016	Wind	Central North	1	1,344	312,459	0.4%	12	21	No	
12/8/2016	Wind	North	1	521	201,084	0.3%	17	14	No	
12/8/2016	Wind	Central North	1	3,119	312,915	1.0%	19	18	No	
12/8/2016	Wind	South	1	327	248,831	0.1%	8	15	No	
12/8/2016	Wind	West	1	2,191	127,513	1.7%	8	12	No	
12/9/2016	Wind	North	1	27	201,084	0.0%	6	14	No	
12/9/2016	Wind	Central North	1	1,749	312,915	0.6%	13	18	No	
12/9/2016	Wind	Central South	1	1,325	241,510	0.5%	10	12	No	
12/9/2016	Wind	South	1	543	248,831	0.2%	11	15	No	

Table continues on next page.

Table A4: Attachment B to Appendix A—Major Event and Localized Emergency Event Days (Non-Affected Local Areas Only)

Date	Type of Event	Local Area	Duration (Days)	No. of Customers Affected	No. of Customers in Area	% of Customers Affected	No. of Outage Events	Resource Utilization (for the event, EFR Count only)	>5% Customer Affected or SAIDI Tmed Event)	Comments
12/19/2016	Wind	North	1	2,159	201,084	1.1%	19	14	No	
12/19/2016	Wind	Central North	1	879	312,915	0.3%	22	18	No	
12/19/2016	Wind	Central South	1	49	241,510	0.0%	9	12	No	
12/19/2016	Wind	South	1	6,339	248,831	2.5%	25	15	No	
12/26/2016	Wind	Central North	1	14	312,915	0.0%	7	18	No	
12/26/2016	Wind	Central South	1	2	241,510	0.0%	1	12	No	
12/26/2016	Wind	South	1	7,262	248,831	2.9%	24	15	No	

Table A5: Attachment C to Appendix A—Natural Gas Reportable Incidents and Control Time

This Attachment C to Appendix A provides detail on each natural gas reportable incident and response times.[32]

Natural Gas Reportable Incidents and Control Time (in Hours : Minutes)						
Date	City	Address	1st Notice to PSE	First PSE Arrival	Emergency Controlled	Emergency Control Time
1/9/2016	Federal Way	32900 Pacific HWY S	13:27	13:58	15:52	1:54
1/9/2016	Seattle	12410 78th Ave S	13:26	14:05	14:11	0:45
1/19/2016	Seattle	3501 SW Avalon Way	12:13	12:37	12:55	0:18
1/25/2016	Lynnwood	202nd ST SW & 60th Ave W	12:16	12:24	23:00	10:36
2/11/2016	Everett	900 West casino Rd	22:24	22:42	23:24	0:42
2/20/2016	Redmond	18422 NE 95th CT	18:29	18:51	18:51	0:00
2/26/2016	Fife	4802 Pacific Highway E	12:25	12:44	13:05	0:21
3/4/2016	Seattle	900 SW Holden ST	0:15	0:19	1:45	1:26
3/9/2016	Seattle	8411 Greenwood Ave N.	1:17	2:00	7:28	5:28
3/10/2016	Lynnwood	17928 36th Ave W	8:58	9:22	10:45	1:23
3/10/2016	Tacoma	912 112th St S	4:42	5:11	5:23	0:12

Table continues on next page.

[32] Report of the time duration from first arrival to control of gas emergencies, for incidents subject to reporting under the 2003 edition of WAC 480-93-200 and WAC 480-93-210, Order R-374, Docket Number UG-911261.

Natural Gas Reportable Incidents and Control Time (in Hours : Minutes)						
Date	City	Address	1st Notice to PSE	First PSE Arrival	Emergency Controlled	Emergency Control Time
3/13/2016	Shoreline	16024 Interlake Ave N	22:54	23:19	23:23	0:04
3/18/2016	Seattle	8118 15th Ave SW	15:56	16:18	16:20	0:02
3/22/2016	Seattle	2425 Eyres PL W	10:55	11:29	11:57	0:28
3/22/2016	Seattle	16 Valley St	10:59	11:13	11:30	0:17
3/30/2016	Mountlake Terrace	23507 64th Ave W	8:45	9:15	9:42	0:27
4/2/2016	Chehalis	3188 Jackson Highway	8:30	10:40	10:45	0:05
4/6/2016	Olympia	5012 Brassfield DR SE	13:42	14:04	14:38	0:34
4/6/2016	Seattle	127 N 36th ST	12:00	12:18	12:24	0:06
4/11/2016	Chehalis	850 NW Ohio Ave	12:30	13:00	14:15	1:15
4/14/2016	Bellevue	14810 SE 9th PL	12:29	12:39	13:12	0:33
4/16/2016	Lynnwood	19229 71st PL W	10:57	11:25	11:29	0:04
4/19/2016	Puyallup	14400 116th Ave CT E	13:20	13:20	14:00	0:40
4/28/2016	Woodinville	19738 144TH AVE NE, Woodinville	11:43	11:59	13:00	1:01
5/6/2016	Fife	3013 20th ST SE, Fife	7:29	7:51	8:00	0:09
5/9/2016	Buckley	7905 227 Ave Ct E	8:56	9:53	11:20	1:27
5/11/2016	Kirkland	11420 NE 94th St	9:45	10:15	10:27	0:12

Table continues on next page.

Natural Gas Reportable Incidents and Control Time (in Hours : Minutes)						
Date	City	Address	1st Notice to PSE	First PSE Arrival	Emergency Controlled	Emergency Control Time
5/18/2016	Seattle	2053 NW 64th St	10:02	10:26	11:53	1:27
5/22/2016	Kenmore	6817 NE 154 CT	15:22	15:54	17:28	1:34
5/23/2016	Lynnwood	14702 40th Ave W	17:49	18:09	18:20	0:11
5/23/2016	Redmond	11650 154th PL NE	12:25	12:38	14:26	1:48
5/25/2016	Renton	1447 Hillcrest Ln NE	10:21	10:36	10:47	0:11
5/26/2016	Seattle	400 4th Ave	11:58	12:06	12:24	0:18
5/29/2016	Duvall	27606 NE 140th Pl	12:41	13:13	13:28	0:15
6/2/2016	Puyallup	16312 135th Ave Ct E	17:17	17:46	17:57	0:11
6/13/2016	Bothell	18218 Bothell Way NE	9:13	9:30	10:44	1:14
6/20/2016	Tacoma	1009 S Ferry St	13:48	13:58	14:04	0:06
6/24/2016	Tukwila	14855 Tukwila International Blvd	14:45	14:53	14:58	0:05
7/10/2016	Bothell	1929 171st Pl SE	12:19	12:49	12:57	0:08
7/11/2016	Olympia	9303 Littlerock Rd SW	12:39	12:39	15:33	2:54
7/12/2016	Seattle	1521 Western Ave	12:10	12:17	12:48	0:31
8/9/2016	Tacoma	10014 Park Ave S	8:57	9:19	9:31	0:12
8/11/2016	Kent	823 Central Ave N	1:15	2:00	3:31	1:31
8/15/2016	Tacoma	1144 Market St	11:46	12:06	12:15	0:09

Table continues on next page.

Natural Gas Reportable Incidents and Control Time (in Hours : Minutes)						
Date	City	Address	1st Notice to PSE	First PSE Arrival	Emergency Controlled	Emergency Control Time
8/16/2016	Seattle	4121 49th Ave S	9:13	9:34	9:44	0:10
8/24/2016	Everett	6410 Highland Dr	10:10	10:19	10:42	0:23
8/24/2016	Renton	629 Cedar Ave S	9:13	9:37	9:58	0:21
8/26/2016	Seattle	3616 SW Oregon Street	8:12	8:35	8:43	0:08
9/11/2016	Tacoma	5909 E K St	8:55	9:11	9:24	0:13
9/12/2016	Issaquah	265 SW Edgewood Ct	14:57	15:23	16:03	0:40
9/14/2016	Seattle	1708 & 1710 NW 60 St	11:09	11:21	12:04	0:43
9/20/2016	Seattle	321 27th Ave E	10:49	11:16	11:37	0:21
9/23/2016	Bellevue	14220 NE 8th St.	8:58	9:19	9:19	0:00
9/27/2016	Seattle	2833 E Arthur PL	17:18	17:28	17:53	0:25
10/7/2016	Seattle	1120 19th Ave	0:34	1:24	3:11	1:47
10/7/2016	Bellevue	6053 153rd Ave SE	8:26	8:57	9:15	0:18
10/20/2016	Seattle	1823 Minor Ave	10:14	10:33	11:02	0:29
10/24/2016	Olympia	1519 Oak Ave	16:05	16:05	18:28	2:23
10/31/2016	Seattle	1555 4th Ave S	12:25	12:38	16:50	4:12
11/3/2016	Seattle	1731 4th Ave S	11:12	11:25	18:45	7:20
11/9/2016	Graham	22320 9th Ave E	9:15	9:36	11:30	1:54

Table continues on next page.

Natural Gas Reportable Incidents and Control Time (in Hours : Minutes)						
Date	City	Address	1st Notice to PSE	First PSE Arrival	Emergency Controlled	Emergency Control Time
11/21/2016	Bothell	9431 Cullens Rd SE	8:11	8:45	8:55	0:10
11/23/2016	Bothell	17511 Bothell Way NE	9:14	9:38	9:38	0:00
11/29/2016	Seattle	1403 Dexter Ave N	13:43	14:00	14:06	0:06
12/13/2016	Tacoma	8912 36th St W	17:27	17:35	17:39	0:04
12/14/2016	Lynnwood	3500 156th St SW	16:45	17:11	17:37	0:26
12/16/2016	Seattle	340 NE 53rd St	18:46	19:22	21:18	1:56
12/27/2016	Seattle	1505 Westlake Ave N	10:34	10:57	11:08	0:11
12/27/2016	Cle Elum	212 E 1st St	11:58	12:28	12:44	0:16
					Average Control Time for 2016	**0:59**

B

Certification of Survey Results

EMC RESEARCH MARKET & OPINION RESEARCH SERVICES

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EMCresearch.com

TO: Eric Haechrel, Puget Sound Energy
FR: Andrew Thibault, EMC Research, Inc.
DT: January 2017
RE: PSE Service Quality Index Research

This memo constitutes certification by EMC Research, Inc. that the attached report and underlying surveys were conducted and prepared in accordance with the procedures established in Docket Nos. UE-011570 and UG-011571.

These procedures, data collection methods, and quality controls are consistent with industry practices and, we believe, ensure that the data collected and information produced in the surveys is unbiased and valid.

We are glad to answer any questions about the research methodology and provide any additional information you may need.

Sincerely,

Andrew Thibault, Principal
EMC Research Inc.

C
Penalty Calculation

PSE met all the performance benchmarks for the 2016 reporting year and did not incur any penalty associated with the service quality index performance.

D
Proposed Customer Notice (Report Card)

2016 Service Quality Report Card

The Customer Service Performance Report Card is designed to inform customers of how well PSE delivers its services in key areas to its customers. The Report Card will be distributed to customers only after adequate consultation with Staff and Public Counsel, but no later than 90 days after PSE files its annual SQI and Electric Service Reliability Report.

Figure D1 shows PSE's proposed Customer Service Performance Report Card.

Figure D1: Draft 2016 Service Quality Report Card

Key measurement	Benchmark	2016 Performance	Achieved
Customer Satisfaction			
Percent of customers satisfied with our Customer Care Center services, based on survey	At least 90 percent	93 percent	✓
Percent of customers satisfied with field services, based on survey	At least 90 percent	95 percent	✓
Number of complaints to the WUTC per 1,000 customers, per year	Less than 0.40	0.18	✓
CUSTOMER SERVICES			
Percent of calls answered live within 30 seconds by our Customer Care Center	At least 75 percent	77 percent	✓
OPERATIONS SERVICES			
Frequency of non-major-storm power outages, per year, per customer	Less than 1.30 outages	1.06 outages	✓
Length of power outages per year, per customer	Less than 2 hours, 35 minutes	2 hours, 28 minutes	✓
Time from customer call to arrival of field technicians in response to electric system emergencies	No more than 55 minutes	55 minutes	✓
Time from customer call to arrival of field technicians in response to natural gas emergencies	No more than 55 minutes	31 minutes	✓
Percent of service appointments kept	At least 92 percent	100 percent *	✓

* Percent in table rounded up from 99.6 percent result.

Each year Puget Sound Energy measures service-quality benchmarks established in cooperation with the Washington Utilities and Transportation Commission (UTC), and the Public Counsel Section of the Attorney General's Office to gauge how well we deliver our services to you and all of our customers. Failure to achieve all nine service-quality measurements in a reporting year would have put us at risk of a penalty up to $12 million or $1.5 million per measurement, except the index for the length of power outages per year, per customer.

2016 Performance Highlights

In 2016 we met all nine service metrics (see chart above).

Through our two Service Guarantees —keeping scheduled appointments and restoring power interruptions as soon as we can— we provide a $50 credit on your bill. In 2016, we credited customers a total of $19,000 for missing 380, or 0.4 percent, of our total 104,163 scheduled appointments.

Every day our employees continually aim to achieve new levels of providing safe, dependable and efficient service to meet your expectations of us.

E
Disconnection Results

Tables E1 and E2 provide the annual and monthly number of disconnections per 1,000 customers for non-payment of amounts due when the UTC disconnection policy would permit service curtailment.

Table E1: Annual Disconnection Results from 2012 to 2016 per 1,000 Customers

2012	2013	2014	2015	2016
33	13	47	50	42

Table E2: Monthly Disconnection Results per 1,000 Customers for 2016

Month	Disconnections per 1000 Customers
January	4
February	5
March	4
April	5
May	1
June	4
July	3
August	3
September	3
October	3
November	5
December	2

F
Customer Service Guarantee Performance Detail

This appendix provides detail on SQI #10, Appointments Kept, performance and customer service guarantee payment by service type and month.

Definition of the Categories:

Canceled—Appointments canceled by either customers or PSE

Excused—Appointments missed due to customer reasons or due to SQI Major Events

Manual Kept—Adjusted missed appointments resulting from review by the PSE personnel

Missed Approved—Appointments missed due to PSE reasons and customers are paid the $50 Customer Service Guarantee payment

Missed Open—Appointments not yet reviewed by PSE for the $50 Service Guarantee payment

Customer Service Guarantee Payment—Total for the $50 Customer Service Guarantee payments made to customers for each missed approved appointment

System Kept—Appointments in which PSE arrived at the customer site as promised

Total Appointments (Excludes Canceled and Excused)—Sum of Total Missed and Total Kept

Total Kept—Total number of Manual Kept and System Kept

Total Missed—Total number of Missed Approved, Missed Denied, and Missed Open

Table F1: SQI #10 and Customer Service Guarantee Payment Annual Summary for 2016

2016 SQI #10 and Customer Service Guarantee Payment Annual Summary											
	Total Appts (Exclude Canceled)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment	Percent Kept (Exclude Canceled and Excused) [33]
Electric											
Permanent Service	8,348	140	-	140	296	7,912	8,208	-	1	$7,000	98%
Reconnection	45,863	44	-	44	153	45,666	45,819	-	14	$2,200	100%
Sub-total	54,211	184	-	184	449	53,578	54,027	-	15	$9,200	100%
Gas											
Diagnostic	21,081	29	-	29	763	20,289	21,052	-	-	$1,450	100%
Permanent Service	9,846	140	-	140	421	9,285	9,706	-	-	$7,000	99%
Reconnection	19,025	27	-	27	246	18,752	18,998	-	-	$1,350	100%
Sub-total	**49,952**	**196**	**-**	**196**	**1,430**	**48,326**	**49,756**	**-**	**-**	**$9,800**	**100%**
Grand	**104,163**	**380**	**-**	**380**	**1,879**	**101,904**	**103,783**	**-**	**15**	**$19,000**	**100%**

[33] Results shown are rounded to the nearest whole percentage per UTC order for performance calculation and comparison to the benchmark. However, these 100% monthly performance results do not reflect that PSE met all its appointments during the reporting period.

Table F2: SQI #10 and Customer Service Guarantee Payment Annual Details for 2016

2016 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appts (Exclude Canceled and Excused)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Jan-16	Electric	Permanent Service	**601**	4	0	4	13	584	597	0	0	$200
Jan-16	Electric	Reconnection	**3,879**	0	0	0	14	3,865	3,879	0	0	$0
Jan-16	Gas	Diagnostic	**2,475**	3	0	3	90	2,382	2,472	0	0	$150
Jan-16	Gas	Permanent Service	**765**	20	0	20	63	682	745	0	0	$1,000
Jan-16	Gas	Reconnection	**1,278**	1	0	1	17	1,260	1,277	0	0	$50
Jan-16 Total			**8,998**	28	0	28	197	8,773	8,970	0	0	$1,400
Feb-16	Electric	Permanent Service	**804**	4	0	4	150	650	800	0	0	$200
Feb-16	Electric	Reconnection	**4,727**	1	0	1	17	4,709	4,726	0	0	$50
Feb-16	Gas	Diagnostic	**1,749**	1	0	1	56	1,692	1,748	0	0	$50
Feb-16	Gas	Permanent Service	**876**	9	0	9	67	800	867	0	0	$450
Feb-16	Gas	Reconnection	**1,493**	1	0	1	9	1,483	1,492	0	0	$50
Feb-16 Total			**9,649**	16	0	16	299	9,334	9,633	0	0	$800
Mar-16	Electric	Permanent Service	**721**	57	0	57	24	640	664	0	0	$2,850
Mar-16	Electric	Reconnection	**3,820**	6	0	6	7	3,807	3,814	0	7	$300
Mar-16	Gas	Diagnostic	**1,975**	2	0	2	84	1,889	1,973	0	0	$100
Mar-16	Gas	Permanent Service	**930**	9	0	9	54	867	921	0	0	$450
Mar-16	Gas	Reconnection	**1,173**	2	0	2	12	1,159	1,171	0	0	$100
Mar-16 Total			**8,619**	76	0	76	181	8,362	8,543	0	7	$3,800

Table continues on next page.

2016 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appts (Exclude Canceled and Excused)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Apr-16	Electric	Permanent Service	**666**	11	0	11	10	645	655	0	0	$550
Apr-16	Electric	Reconnection	**4,285**	4	0	4	9	4,272	4,281	0	0	$200
Apr-16	Gas	Diagnostic	**977**	1	0	1	46	930	976	0	0	$50
Apr-16	Gas	Permanent Service	**790**	2	0	2	47	741	788	0	0	$100
Apr-16	Gas	Reconnection	**947**	0	0	0	11	936	947	0	0	$0
Apr-16 Total			**7,665**	**18**	**0**	**18**	**123**	**7,524**	**7,647**	**0**	**0**	**$900**
May-16	Electric	Permanent Service	**669**	3	0	3	10	656	666	0	0	$150
May-16	Electric	Reconnection	**3,056**	0	0	0	14	3,042	3,056	0	0	$0
May-16	Gas	Diagnostic	**805**	2	0	2	30	773	803	0	0	$100
May-16	Gas	Permanent Service	**764**	17	0	17	35	712	747	0	0	$850
May-16	Gas	Reconnection	**1,548**	5	0	5	14	1,529	1,543	0	0	$250
May-16 Total			**6,842**	**27**	**0**	**27**	**103**	**6,712**	**6,815**	**0**	**0**	**$1,350**
Jun-16	Electric	Permanent Service	**662**	3	0	3	13	646	659	0	0	$150
Jun-16	Electric	Reconnection	**4,280**	3	0	3	19	4,258	4,277	0	0	$150
Jun-16	Gas	Diagnostic	**921**	0	0	0	23	898	921	0	0	$0
Jun-16	Gas	Permanent Service	**900**	7	0	7	33	860	893	0	0	$350
Jun-16	Gas	Reconnection	**1,607**	2	0	2	28	1,577	1,605	0	0	$100
Jun-16 Total			**8,370**	**15**	**0**	**15**	**116**	**8,239**	**8,355**	**0**	**0**	**$750**

Table continues on next page.

2016 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appts (Exclude Canceled and Excused)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Jul-16	Electric	Permanent Service	**611**	6	0	6	15	590	605	0	0	$300
Jul-16	Electric	Reconnection	**3,626**	6	0	6	14	3,606	3,620	0	0	$300
Jul-16	Gas	Diagnostic	**768**	1	0	1	19	748	767	0	0	$50
Jul-16	Gas	Permanent Service	**771**	11	0	11	22	738	760	0	0	$550
Jul-16	Gas	Reconnection	**1,408**	1	0	1	19	1,388	1,407	0	0	$50
Jul-16 Total			**7,184**	**25**	**0**	**25**	**89**	**7,070**	**7,159**	**0**	**0**	**$1,250**
Aug-16	Electric	Permanent Service	**820**	6	0	6	15	799	814	0	0	$300
Aug-16	Electric	Reconnection	**3,712**	2	0	2	15	3,695	3,710	0	0	$100
Aug-16	Gas	Diagnostic	**969**	3	0	3	40	926	966	0	0	$150
Aug-16	Gas	Permanent Service	**843**	16	0	16	16	811	827	0	0	$800
Aug-16	Gas	Reconnection	**1,739**	2	0	2	17	1,720	1,737	0	0	$100
Aug-16 Total			**8,083**	**29**	**0**	**29**	**103**	**7,951**	**8,054**	**0**	**0**	**$1,450**
Sep-16	Electric	Permanent Service	**678**	8	0	8	18	652	670	0	1	$400
Sep-16	Electric	Reconnection	**3,734**	7	0	7	10	3,717	3,727	0	0	$350
Sep-16	Gas	Diagnostic	**1,626**	2	0	2	63	1,561	1,624	0	0	$100
Sep-16	Gas	Permanent Service	**752**	12	0	12	28	712	740	0	0	$600
Sep-16	Gas	Reconnection	**1,855**	5	0	5	20	1,830	1,850	0	0	$250
Sep-16 Total			**8,645**	**34**	**0**	**34**	**139**	**8,472**	**8,611**	**0**	**1**	**$1,700**

Table continues on next page.

2016 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appts (Exclude Canceled and Excused)	Missed Approved	Missed open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Oct-16	Electric	Permanent Service	**776**	17	0	17	11	748	759	0	0	$850
Oct-16	Electric	Reconnection	**3,591**	9	0	9	12	3,570	3,582	0	7	$450
Oct-16	Gas	Diagnostic	**2,911**	1	0	1	96	2,814	2,910	0	0	$50
Oct-16	Gas	Permanent Service	**807**	5	0	5	26	776	802	0	0	$250
Oct-16	Gas	Reconnection	**1,960**	2	0	2	30	1,928	1,958	0	0	$100
Oct-16 Total			**10,045**	**34**	**0**	**34**	**175**	**9,836**	**10,011**	**0**	**7**	**$1,700**
Nov-16	Electric	Permanent Service	703	12	0	12	11	680	691	0	0	$600
Nov-16	Electric	Reconnection	4,653	2	0	2	11	4,640	4,651	0	0	$100
Nov-16	Gas	Diagnostic	2,400	5	0	5	93	2,302	2,395	0	0	$250
Nov-16	Gas	Permanent Service	907	20	0	20	21	866	887	0	0	$1,000
Nov-16	Gas	Reconnection	2,223	4	0	4	36	2,183	2,219	0	0	$200
Nov-16 Total			**10,886**	**43**	**0**	**43**	**172**	**10,671**	**10,843**	**0**	**0**	**$2,150**
Dec-16	Electric	Permanent Service	637	9	0	9	6	622	628	0	0	$450
Dec-16	Electric	Reconnection	2,500	4	0	4	11	2,485	2,496	0	0	$200
Dec-16	Gas	Diagnostic	3,505	8	0	8	123	3,374	3,497	0	0	$400
Dec-16	Gas	Permanent Service	741	12	0	12	9	720	729	0	0	$600
Dec-16	Gas	Reconnection	1,794	2	0	2	33	1,759	1,792	0	0	$100
Dec-16 Total			**9,177**	**35**	**0**	**35**	**182**	**8,960**	**9,142**	**0**	**0**	**$1,750**
Grand Total			**104,163**	**380**	**0**	**380**	**1,879**	**101,904**	**103,783**	**0**	**15**	**$19,000**

G
Customer Awareness of Customer Service Guarantee

2016 Awareness: Customer Service Guarantee

Contacts by phone or in person with Customer Care Center representatives and field employees
In 2016, every newly-hired PSE Customer Care Center and Customer Service Office representatives received training about the Service Guarantee. An online job aid that explains the circumstances for notifying customers about the Service Guarantee is available to all representatives and field employees.

In their conversations with customers, representatives as well as field employees who meet with customers for scheduled appointments, follow this script:

> *If we miss your customer service guarantee appointment under normal operating conditions, we will automatically credit your energy account with $50—guaranteed.*

In 2016, with the creation of a third service guarantee—24-hour outage guarantee—
Puget Sound Energy broadened awareness about the new guarantee as well as all three guarantees through the use of photographs and multimedia channels, including the news media.

Informed every new customer
Included in the Your customer rights and responsibilities[34] brochure, delivered to every customer new to PSE service. Brochure is posted year-round on pse.com.

Other 2016 service guarantee awareness efforts include:
1. News Stories
KING 5 / Dec. 30. 2016
http://www.king5.com/news/local/puget-sound-energys-24-hour-power-restoration-guarantee-starts-january-1/380450636
Puget Sound Energy's 24-hour power restoration guarantee starts January 1
Puget Sound Energy's new 24-hour power restoration guarantee takes effect on January 1st. It says the public utility company will restore power within 24 hours or pay customers a $50 credit.

A PSE spokesperson said the new policy was created because reliability is important to PSE, and the company hopes to show people just how serious they take power outages.
KING 5 went to one of King County's most power outage plagued neighborhoods to ask what people think about the change.

[34] http://pse.com/accountsandservices/Documents/6275_wb.pdf

"I'm cashing in on that one, you bet I am," said Kathy Myers, whose home on 65th Avenue Northeast in Kenmore has lost power more times than she can count over the last few years.
"It can go for days," she said of the outages. "One month, back in September or October, it was off for several days, several times through that three or four week period. And it's not always storm related."

Homeowners in Myers' Kenmore neighborhood often joke that they are the first to lose power and the last to get it back.

It's a known trouble spot that Puget Sound Energy refers to as Circuit 26, and an area the company is actively working on, to improve service. Kenmore city leaders have also met with PSE, to express concerns about the frequent outages there.

In the meantime, Myers said she appreciates the 24-hour restoration guarantee. She hopes it will serve as motivation for PSE and it's power crews to work quickly when the power goes out.
"If they're willing to put that offer for money out then they're willing to put the work out to prevent them having to pay that money," she said. "Because otherwise, it would cost them big time, it happens too often."

There are a few important qualifications and conditions that must be met for a customer to receive the $50 credit.

Those conditions are outlined in the policy's fine print, but first and foremost, PSE says customers must either report their outage to PSE, or request the credit within seven calendar days following restoration.
Outages can be reported by phone or on Puget Sound Energy's app.

The 24-hour restoration guarantee is not applicable during a major storm or event. PSE must also have safe access to its facilities to perform the needed repair within 24 hours.

The new policy takes effect on January 1st, 2017. All of Puget Sound Energy's 1.1 million electric customers are eligible to apply for the $50 credit, during non-storm related outages that last more than 24 hours.

KOMO News / Dec. 30, 2016
http://komonews.com/news/local/pses-50-power-outage-rebate-starts-sunday
PSE's $50 power outage rebate starts Sunday
Dec. 30, 2016
By Jon Humbert, KOMO News

The Christmas lights are coming down at Peter Schultz's house.

He says he's lucky they stayed lit this December.

"The grid that PSE has up here is a little behind the times," the Kenmore resident said as he wrapped multicolored coils around one another. Schultz said he loses power a few times every winter and says Puget Sound Energy's upgrades have helped only slightly.

There could be help on the way and something for PSE customer pocketbooks.

Starting Jan. 1, PSE will start a $50 rebate program for any customer who has lost power for 24 hours. The program is modeled after an existing program for power losses of 120 hours or more.

The Utilities and Transportation Commission came to a settlement with PSE over possible fines from failed benchmark tests. The rebate program was a way to offset fines according to the UTC.

The rules state that to qualify, you must notify PSE about the outage because notification in its system isn't automatic. Crews must be able to access your property.

But here's the kicker: You cannot be paid when the outage is due to a major weather event. That decision is made by a PSE mathematical formula when approximately 5 percent of customers are affected.

Schultz just wants steady power at the flip of a switch.

"So, $50 in my pocket versus $50 to actually fix the system? I'd pay 50 bucks to fix it."

KGMI Radio/ Dec. 30, 2016

New PSE program pays you for outages longer than 24 hours

Puget Sound Energy starts a new program to pay you $50 if you lose power for 24 hours.

The rules for the program that started Sunday state you must tell PSE about the outage and crews must be able to get to your property.

But, the fine print says you cannot be paid when the outage is due to a major weather event.
Some customers like Peter Schultz aren't sure it's worth it.

"$50 in my pocket versus $50 to actually fix the system, I'd pay $50 to fix it," Schultz says.
PSE says customers have seven days from the outage to report the power failure.
The rebates will be sent out after about two billing cycles.

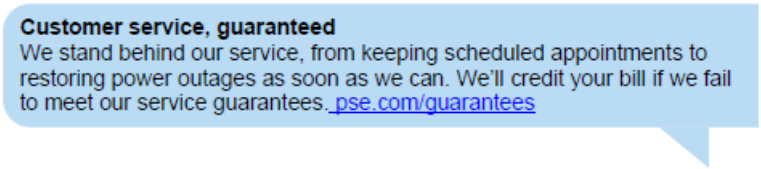
2. PSE News Release

November 2016 PSE news release announcing 24-hour outage restoration service guarantee
http://pse.com/aboutpse/PseNewsroom/NewsReleases/Pages/24-hour%20power%20outage%20restoration%20in%20effect%20January%201.aspx

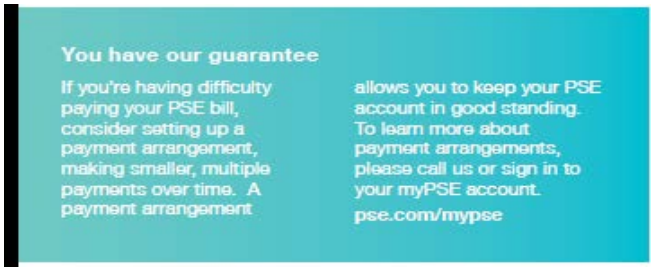
3. PSE Bill Package

Link to October 2016 bill package with customer newsletter and page 1 bill message in blue bubble. http://pse.com/accountsandservices/YourAccount/monthlyPromotions/Documents/Customer_bill_2016-10.PDF

October 2016 bill-print blue-bubble message appearing on all PSE statements



January 2016 "Voice" customer newsletter article

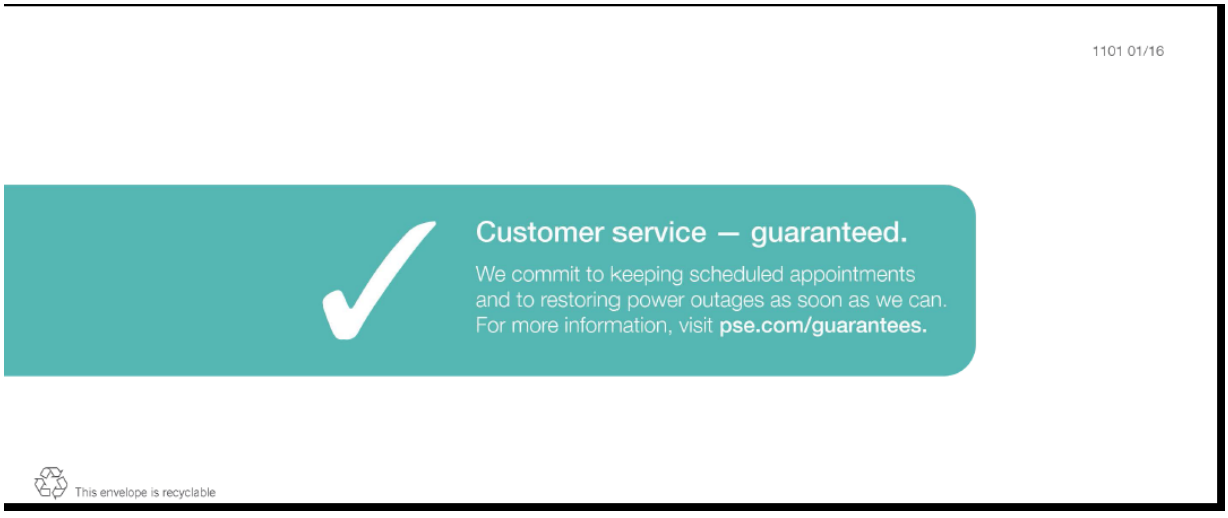


May 2016 "Voice" customer newsletter article

[October 2016 "Voice" customer newsletter, page 1]

January 2017 "Voice" customer newsletter article

Mailing envelope for bills



4. **PSE.com,** posted year-round
   http://pse.com/accountsandservices/NewToPSE/Pages/Service-Guarantees.aspx

Customer service guarantees

We stand behind our service to you. We're continually tracking how we're doing and using your feedback to improve. And we'll credit your bill if we fail to meet our service guarantees.

Appointment service guarantee
We'll credit your bill $50 if we don't keep an appointment to install new service, reconnect existing service or inspect natural gas equipment. Learn more.▼

24 hour power outage restoration guarantee
You may be eligible for a $50 credit if your power is out for longer than 24 hours, barring a major storm or other event. Conditions apply and you must either report your outage to PSE or request the credit within seven (7) calendar days following restoration. Learn more.▼

120 hour power outage restoration guarantee
You may be eligible for a $50 credit if your power is out for 120 consecutive hours or longer. Qualifications apply and you must either report your outage to PSE or request the credit within seven (7) calendar days following restoration. Learn more.▼

Tracking our performance
Every year we set goals for improving our service. These performance report cards show how we're doing in areas such as customer satisfaction, appointment scheduling, response time, field services and more. We also track the effectiveness of our energy efficiency programs.

2015 Service Quality report card

pse.com/guarantees[35], explains the conditions
Detail in the /guarantees link

24 hour power outage restoration guarantee

You may be eligible for a $50 credit if your power is out for longer than 24 hours, barring a major storm or other event. Conditions apply and you must either report your outage to PSE or request the credit within seven (7) calendar days following restoration. Learn more.▼

Guarantee effective as of Jan. 1, 2017

[35] https://pse.com/accountsandservices/NewToPSE/Pages/Service-Guarantees.aspx

- The consecutive 24-hour period begins when PSE is first notified of the outage. In the event PSE cannot safely access its facilities, the consecutive 24-hour period begins when safe access is made available for the company's personnel and standard equipment
- The guarantee is not applicable in the following circumstances:
    - The outage is associated with a major storm or event, which includes subsequent days;
    - Restoration is prevented by an action or default by someone outside PSE's control (other than a company employee or agent);
    - PSE does not have safe access to its facilities in order to perform the needed repair;
    - PSE verifies that there was no outage as reported by the customer;
    - The customer's equipment has caused the outage; or
    - The customer's system has not received the proper electrical inspections and certifications.
- All qualifications and conditions

Table G1: Customer Awareness of Customer Service Guarantee

Field Service Operations Transactions Customer Satisfaction Survey		Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
Q26A. When you called to make the appointment for a service technician to come out, did the customer service representative tell you about PSE $50 Service Guarantee?	Yes	81	60	64	54	50	63	55	73	62	84	72	92
	No	126	98	106	128	112	128	109	94	111	112	87	118
	Don't Know	42	42	45	47	44	41	54	35	35	41	38	38
	Refused Response	1	-	-	-	-	-	-	-	3	-	3	2
	Total Customers Surveyed	**250**	**200**	**215**	**229**	**206**	**232**	**218**	**202**	**211**	**237**	**200**	**250**
Q26C. Which of the following best fits your understanding of how the service guarantee works if a scheduled appointment has to be changed by PSE.	You are given the $50 service guarantee if the rescheduled time causes you inconvenience.	31	26	26	24	20	31	18	30	20	43	26	47
	Whenever PSE changes an appointment, you are given the $50.	29	24	28	22	28	35	26	33	31	30	38	27
	You have no understanding or expectations about this part of the service guarantee plan.	152	128	130	160	130	137	115	101	128	120	99	145
	Don't Know	35	19	29	21	26	25	58	37	29	39	35	29
	Refused Response	3	3	2	2	2	4	1	1	3	5	2	2
	Total Customers Surveyed	**250**	**200**	**215**	**229**	**206**	**232**	**218**	**202**	**211**	**237**	**200**	**250**

Table continues on next page.

Field Service Operations Transactions Customer Satisfaction Survey		Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
Q26D. Did your appointment have to be rescheduled or did it occur as planned?	It occurred as planned.	239	182	208	213	189	211	199	188	192	228	190	224
	It was rescheduled.	8	12	4	9	8	14	7	8	8	6	8	15
	Technician arrived but was late.	2	3	-	1	2	-	3	-	4	-	1	1
	Don't Know	1	3	1	5	6	6	8	5	6	3	-	8
	Refused Response	-	-	2	1	1	1	1	1	1	-	1	2
	Total Customers Surveyed	**250**	**200**	**215**	**229**	**206**	**232**	**218**	**202**	**211**	**237**	**200**	**250**
Q26E. Who initiated rescheduling your appointment?	Myself (Customer Initiated)	4	7	1	6	6	11	5	7	6	5	7	11
	Puget Sound Energy (PSE) Initiated	3	4	3	3	1	3	1	1	2	1	1	4
	Don't Know	1	1	-	-	1	-	1	-	-	-	-	-
	Refused Response	-	-	-	-	-	-	-	-	-	-	-	-
	Total Customers Surveyed	**8**	**12**	**4**	**9**	**8**	**14**	**7**	**8**	**8**	**6**	**8**	**15**

H

Electric Reliability Terms and Definitions

Terms and Definitions

Area of Greatest Concern—An area targeted for specific actions to improve the level of service reliability or quality.

Catastrophic Event Days —Days when the daily SAIDI is greater than the annual catastrophic event day threshold (T_{CAT})

Cause Codes—Codes used to identify PSE's best estimation of what caused a Sustained Interruption to occur. The codes are listed below:

Code	Description	Code	Description
AO	Accident Other, with Fires	**FI**	Faulty Installation
BA	Bird or Animal	**LI**	Lightning
CP	Car Pole Accident	**SO**	Scheduled Outage (was WR − Work Required)
CR	Customer Request	**TF**	Tree − Off Right-of-Way
DU	Dig Up Underground	**TO**	Tree − On Right-of-Way
EF	Equipment Failure	**TV**	Trees/Vegetation
EO	Electrical Overload	**UN**	Unknown Cause (unknown equipment involved only)
EQ	Earthquake	**VA**	Vandalism

Commission Complaint—Any single-customer electric-service reliability complaint filed by a customer with the Washington Utilities and Transportation Commission (UTC).

Customer Complaint—Repeated customer inquiries relating to dissatisfaction with the resolution or explanation of a concern related to a Sustained Interruption or Power Quality. This is indicated by two or more recorded contacts in PSE's customer information system during current and prior year.

Customer Count—The number of electric customers per the outage reporting system that is a part of SAP, PSE's work management, customer information and financial information system.

Customer Inquiry—An event whereby a customer contacts the Customer Care Center to report a Sustained Interruption or Power Quality concern.

Duration of Sustained Interruption—The period beginning when PSE is first informed that service to a customer has been interrupted, and ending when the problem which caused the interruption has been resolved and the line has been re-energized (measured in minutes, hours or days).

Equipment Codes

Code	Description	Code	Description
OCN	Overhead Secondary Connector	**OTF**	Overhead Transformer Fuse
OCO	Overhead Conductor	**OTR**	Overhead Transformer
OFC	Overhead Cut − Out	**UEL**	Underground Elbow
OFU	Overhead Line Fuse / Fuse Link	**UFJ**	Underground J – Box
OJU	Overhead Jumper Wire	**UPC**	Underground Primary Cable
OPO	Distribution Pole	**UPT**	Padmount Transformer
OSV	Overhead Service	**USV**	Underground Service

IEEE 1366—IEEE Standard 1366-2003, a guide approved and published by the Institute of Electrical and Electronics Engineers that defines electric power reliability indices and factors that affect their calculations.

Major Event—An event, such as a storm, that causes serious reliability problems. PSE utilizes three Major Event criteria to evaluate its reliability performance: $SAIDI_{SQI}$ Exclusion Major Event Days and $SAIFI_{SQI}$ Exclusion Major Event Days and IEEE 1366 T_{MED} Exclusion Major Event Days.

Major Event Days—Days when outage events can be excluded from the reliability performance calculation. The three types of Major Event Days are:

$SAIDI_{SQI}$ Major Event Days—Any day in which the daily system SAIDI exceeds the threshold value, T_{MEDADJ}.

5% Exclusion Major Event Days—Days that five percent or more of electric customers are experiencing an electric outage during a 24-hour period and subsequent days when the service to those customers is being restored

IEEE 1366 T_{MED} Exclusion Major Event Days—Any days in which the daily system SAIDI exceeds the threshold value, T_{MED}.

Momentary Interruption: The brief loss of power delivery to one or more customers caused by the opening and closing of an interrupting device

$SAIDI_{SQI}$ – any interruption five minutes or shorter

$SAIFI_{SQI}$ – any interruption one minute or shorter

Outage—The state of a system component when it is not available to perform its intended function, due to some event directly associated with that component. For the most part, a component's unavailability is considered an outage when it causes a Sustained Interruption of service to customers. The system component can be transmission, distribution or customer owned if it causes a Sustained Interruption to other customers.

Power Quality—Industry standards are not broad enough to define power quality or how and when to measure it. For purposes of this plan, power quality includes all other physical characteristics of electrical service except for Sustained Interruptions, including momentary outages, voltage sags, voltage flicker, harmonics and voltage spikes.

SAIDI—System Average Interruption Duration Index—This index is commonly referred to as customer-minutes of interruption (CMI) or customer hours, and is designed to provide information about the average time the customers are interrupted. The measurements used in PSE's Plan and reporting include Total methodology ($SAIDI_{Total}$), Total with five-year-rolling average methodology ($SAIDI_{Total\ 5\text{-}year\ Average}$), 5% exclusion methodology ($SAIDI_{5\%}$), IEEE methodology ($SAIDI_{IEEE}$) and SQI methodology ($SAIDI_{SQI}$). The performance result for each of the measurements is calculated based on the below formula:

$$\textbf{SAIDI} = \frac{\Sigma\, Customer\ Minute\ Interruptions}{Average\ Annual\ Electric\ Customer\ Count}$$

$SAIDI_{Total}$: the numerator includes all customer minute interruptions on outages one minute or longer.

$SAIDI_{Total\ 5\text{-}year\ Average}$:Rolling five-year average of current year Annual $SAIDI_{Total}$ and prior four years Annual $SAIDI_{Total}$ results, excluding any exclusion that has been approved by the UTC. Exclusions for an entire year will be replaced by the preceding Annual $SAIDI_{Total}$ performance results until there are five years included in the calculation of current year $SAIDI_{Total\ 5\text{-}year\ Average.}$ Exclusions for an event will not be included in the Annual $SAIDI_{Total}$ performance results.

$SAIDI_{5\%}$: the numerator includes customer minute interruptions during non-5% Exclusion Major Event Days. Outages one minute and longer are included in this metric

$SAIDI_{IEEE}$= the numerator includes customer minute interruptions during non-IEEE 1366 T_{MED} Exclusion Major Event Days. Outages that are longer than 5 minutes are included in this metric.

$SAIDI_{SQI}$: the numerator includes customer minute interruptions during non-SQI SAIDI T_{MEDADJ} Exclusion Major Event Days. Outages that are longer than 5 minutes are included in this metric.

SAIFI—System Average Interruption Frequency Index—This index is designed to give information about the average frequency of Sustained Interruptions per customers (CI). The measurements used in PSE's Plan and reporting include Total methodology, SQI-4 methodology and IEEE SAIFI methodology. The performance results for each of the measurement will be calculated according to the following:

$$\textbf{SAIFI} = \frac{\Sigma Number\ of\ Customer\ Interruptions}{Average\ Annual\ Electric\ Customer\ Count}$$

$SAIFI_{Total}$: the numerator includes all customer interruptions on outages one minute or longer.

$SAIFI_{Total\ 5\text{-}year\ Average}$:Rolling five-year average of current year Annual $SAIFI_{Total}$ and prior four years Annual $SAIFI_{Total}$ results, excluding any exclusion that has been approved by the UTC. Exclusions for an entire year will be replaced by the preceding Annual $SAIFI_{Total}$ performance results until there are five years included in the calculation of current year $SAIFI_{Total\ 5\text{-}year\ Average.}$ Exclusions for an event will not be included in the Annual $SAIFI_{Total}$ performance results.

$SAIFI_{5\%}$: the numerator includes customer interruptions during non-5% Exclusion Major Event Days. Outages one minute and longer are included in this metric

$SAIFI_{IEEE}$= the numerator includes customer interruptions during non-IEEE 1366 T_{MED} Exclusion Major Event Days. Outages that are longer than 5 minutes are included in this metric.

SQ—PSE's Service Quality Program was first established per conditions of the Puget Power and Washington Natural Gas merger in 1997 under Docket Nos. UE-960195. The SQ Program has been since extended and modified in Docket Nos. UE-011570 and UG-011571 (consolidated), Docket Number UE-031946, and Docket Nos. UE-072300 and UG-072301 (consolidated).

Step Restoration—The restoration of service to blocks of customers in an area until the entire area or feeder is restored.

Sustained Interruption—Any interruption not classified as momentary.

$SAIDI_{SQI}$ - Any interruption longer than five minutes

$SAIFI_{SQI}$ - Any interruption longer than one minute

T_{CAT}—The Catastrophic Event Day identification threshold value that is calculated at the end of each reporting year for use during the next reporting year. It is determined by reviewing the past five years of daily system SAIDI, and using a 4.5 beta methodology of the IEEE Standard 1366 in calculating the catastrophic threshold value. Any days having a daily system SAIDI greater than T_{CAT} are days on which the energy-delivery system experienced catastrophic stresses, which are classified as Catastrophic Event Days.

$T_{CAT} = e^{(\alpha + 4.5\beta)}$ where α is the log-average of the data set and β is the log-standard deviation of the data set

T_{MED}—The Major Event Day identification threshold value that is calculated at the end of each reporting year for use during the next reporting year. It is determined by reviewing the past five years of daily system SAIDI, and using the IEEE 1366 2.5 beta methodology in calculating the threshold value. Any days having a daily system SAIDI greater than T_{MED} are days on which the energy-delivery system experienced stresses beyond those normally expected, which are classified as Major Event Days.

$T_{MED} = e^{(\alpha + 2.5\beta)}$ where α is the log-average of the data set and β is the log-standard deviation of the data set.

T_{MEDADJ}—The SQI-3 SAIDI Major Event Day identification threshold value that is calculated at the end of each reporting year for use during the next reporting year. It is determined by reviewing the past five years of daily system SAIDI. Any catastrophic event day (T_{CAT}) daily SAIDI is replaced with the previous five year monthly average daily SAIDI. A T_{MEDADJ} is then calculated using the IEEE 1366 2.5 beta methodology to determine threshold value. Any days having a daily system SAIDI greater than T_{MEDADJ} are days on which the energy-delivery system experienced stresses beyond those normally expected, which are classified as SQI-3 Major Event Days.

$T_{MEDADJ} = e^{(\alpha + 2.5\beta)}$ where α is the log-average of the data set and β is the log-standard deviation of the data set.

I
Electric Reliability Data Collection Process and Calculations

Data Collection – Methods and Issues

This appendix discusses data collection methods and issues. It explains how the various data were collected. Changes in methods from prior reporting periods are highlighted and the impact of the new method on data accuracy is discussed.

In April 2013, PSE implemented the new OMS and CIS replacing a legacy system. With the legacy system, the Automated Meter Reading (AMR) System had provided some of the data to indicate when a Sustained Interruption began or ended but this functionality was not implemented in the OMS. Today, the AMR System is integrated to OMS for the purpose of validating outage status through meter pings. In 2017, PSE is performing analysis to determine if the outage data integrity from the AMR is robust enough to enhance PSE's current processes for identifying the start and end times of an interruption. Pending the outcome of this analysis, PSE may pursue additional integration of the AMR System with OMS.

Methods for Identifying when a Sustained Interruption Begins

The following methods are used to determine the beginning point of an interruption:

- A customer calls to PSE's Customer Care Center, either through the automated voice response unit or talking with a customer representative.
- A customer calls to a PSE employee rather than through the Customer Care Center.
- A customer logging into their online PSE account and reporting an outage.
- A substation breaker operation that is reflected in the OMS based on a SCADA interface.

Possible Causes of Data Inconsistencies:

- If service to a customer affected by a service interruption remains out after the interruption has been corrected, a follow-up call from the customer may be reported as a new incident.
- Data entry mistakes can create inconsistencies.
- During a major storm event, the focus is on ensuring a safe environment for the responders and restoring customers as quickly as possible. While outage information is recorded, given the magnitude of the event and number of outages, the records may not accurately report the extent of the outage or if customers were systematically restored.

Methods to Specify When the Duration of a Sustained Interruption Ends

The following methods are used to determine the ending point of an interruption:

- PSE Service personnel will log the time when customers are restored.
- SCADA provides a signal to the OMS that a substation breaker has been restored.

Possible Causes of Data Inconsistencies:

- Multiple layers of issues may be contributing to a Sustained Interruption for a specific customer as described in the definition of Duration of Sustained Interruption.
- Data entry errors can affect the accuracy of the information.
- Getting consistent feedback from the field personnel responding to the outage.
- During a major storm event, the focus is on ensuring a safe environment for the responders and restoring customers as quickly as possible. While outage information is recorded, given the magnitude of the event and number of outages, the records may not accurately report the extent of the outage or if customers were systematically restored.

Recording Cause Codes

Outage cause codes are reported by the PSE service personnel responding to the outage location.

Possible Causes of Data Inconsistencies:

- During a major storm event, the focus is on ensuring a safe environment for the responders and restoring customers as quickly as possible. While outage information is recorded, given the magnitude of the event and number of outages, the records may not accurately report the extent of the outage or if customers were systematically restored.
- Restoration efforts take precedence over pinpointing the exact cause and location of the outage, especially in cross-country terrain or in darkness.

Recording and Tracking Customer Complaints

The CSR in PSE's Customer Care Center handling the call listens for key words and then categorizes the customer comments accordingly.

- The CSR creates a Service Miscellaneous request for the appropriate PSE personnel to contact the customer and discuss their concerns.
- All contact is tracked as an interaction record in PSE's Customer Information System and Service Miscellaneous Notification in PSE's work management system, SAP, and counted as a customer inquiry for electric reliability reporting purposes.
- When two or more customer inquiries on outage frequency or duration and/or power quality have been recorded in SAP from a customer during current and prior reporting year, these customer inquiries together will be considered as a PSE "Customer Complaint."

Possible Causes of Data Inconsistencies:

- Data entry errors from the initial inquiry or during the feedback loop can affect the accuracy of the information.
- High volumes of customer inquiries, during storms for example, may increase likelihood of data entry errors.

Change in Definitions and Calculations

This section describes the methodology used in defining and calculating reliability metrics, which are then used to evaluate performance. The UTC in WAC 480-100-398 (2) requires a utility to report changes made in this methodology including data collection and calculation of reliability information after the initial baselines are set. The utility must explain why the changes occurred and how the change is expected to affect comparisons of the newer and older information.

Change to Include the IEEE Methodology

In the 2004 Annual Electric Service Reliability Report, PSE indicated that starting in 2005, reliability metrics using the IEEE Standard 1366 methodology as a guideline would be included. This change and other modifications for monitoring and reporting electric service reliability information were adopted by PSE in UE-060391. The purpose for moving to the IEEE Standard 1366 methodology is to

- Provide uniformity in reliability indices
- Identify factors which affect these indices
- Aid in consistent reporting practices among utilities

T_{MED} (Major Event Day Threshold) is the reliability index that facilitates this consistency. A detailed equation for calculating T_{MED} is provided in Appendix H: *Electric Reliability Terms and Definitions*.

While the IEEE guidelines provide a standard for the industry, companies can create a variety of definitions of an outage or sustained outage.

- PSE defines sustained outages as those lasting longer than one minute
- IEEE defines a sustained outage to be longer than five minutes

PSE will continue to use the one minute definition as PSE believes that tracking shorter duration outages allows us to better monitor the performance of the electric system and subsequently assess potential system improvements. It is also consistent with the definition of an outage used in the SQI methodology.

Changes for 2010 and Subsequent Years Reporting

In 2010, PSE met with the UTC staff to enhance the format of the Electric Service Reliability report and the reliability statistics information provided. Specific enhancements included clarification of baseline statistics and

detailed comparison of and expanded set of reliability metrics. This annual report reflects all these reporting enhancements and the SQI SAIDI performance and benchmark calculation changes approved by the UTC.

Baseline Data Reliability Statistics

Pursuant to the WAC Electric Service Reliability requirements, PSE establishes 2003 as its baseline year as the performance from the year was about average for each of the reliability measurements. However, PSE would rather develop a baseline using multiple years to mitigate the fluctuation of weather conditions and other external factors. PSE feels there is limited usefulness in designating one specific year's information as a "baseline" and cautions against the use of a single year's data to assess year-to-year system reliability trends.

Timing of Annual Report Filings

PSE will be reporting data and information on a calendar year basis. PSE's annual Electric Service Reliability report will be filed as part of the annual SQI and Electric Service Reliability report with the UTC no later than the end of March of each year.[36]

Tree-related Outage Codes

PSE conducted a review of tree-related outages and the use of the tree on-right-of-way (TO) and tree off-right-of-way (TF) cause codes on outage notifications. However, it was found that during an outage it was difficult for field personnel to accurately assess the correct use of TF and TO cause codes.

As a result, PSE created a new outage cause code, Trees/Vegetation (TV) and revised the tree-related outage coding process. After a tree-related outage has occurred on a transmission line or causes a complete distribution circuit outage, a certified arborist field-verifies if the tree was on or off right-of-way and the correct code is added to the outage notification. All other tree-related outages are coded as TV.

PSE complaints

The business process for recording customer inquiries changed with the new CIS implementation in March 2013. For the 2014 reporting, PSE used the service notification records pertaining to outage duration/frequency or power quality for reporting the number of PSE complaints for the last two calendar years. PSE feels that using this new method of data collection provides a more complete assessment of customer inquiries pertaining to reliability and power quality concern.

[36] Order 17 of consolidated Docket Numbers UE-072300 and UG-072301, page 10, section 26.

Changes for 2016 and Subsequent Years Reporting

SQI SAIDI Benchmark and Calculation Methodology

PSE, the Washington State Public Counsel Unit personnel, and the UTC staff met throughout 2015 and 2016 to determine a new SQI SAIDI benchmark and calculation methodology. On June 17, 2016, in Order 29 of consolidated Docket Nos. UE-072300 and UG-072301 (Order 29), the UTC adopted the changes on how PSE will calculate SQI SAIDI results using the IEEE Standard 1366 for 2016 and subsequent reporting years. The new SQI SAIDI benchmark is 155 minutes. Also a part of the Order 29, PSE will not be penalized if the SQI SAIDI benchmark is missed but PSE has new non-major event 24-hour Restoration Service Guarantee.

The Electric Reliability Terms and Definitions appendix was expanded to include the new terms and definitions as a result of the SQI SAIDI changes per Order 29. In addition, the SAIDI and SAIFI definitions and formulas were streamlined for ease of reading.

Areas of Greatest Concern

This section of the annual reporting includes information on specific areas PSE is targeting for specific actions to enhance the level of service reliability. For the 2016 Electric Service Reliability Report, PSE continues to designate the Areas of Greatest Concern as the Top 50 worst-performing circuits[37] over the previous five years that rank worst in terms of customer interruption minutes.

- Each circuit is first ranked by the annual total customer interruption minutes seen by the circuit for each of the previous five years.
- The yearly ranking results are then averaged to determine the overall Top 50 worst-performing circuits over the past five years.

The following information will be reported on each of these areas:

- Identification of each Area of Greatest Concern.
- Explanation of the specific actions PSE plans to take in each Area of Greatest Concern to improve the service in each area during the coming year.

In 2016, PSE reviewed the worst performing circuit methodology. As a result of this analysis, PSE expanded the methodology of worst performing circuits to also align with the new SQI SAIDI methodology established per Order 29. These worst performing circuits are identified in the Electric Reliability Plan put forth in consolidated Docket Nos. UE-170033 and UG-170034 of PSE's 2017 general rate case. Criteria for worst performing circuits include the circuit's contribution to PSE's overall SQI SAIDI and the individual circuit SQI SAIDI and SAIFI performance. While PSE's SQI SAIFI performance does not use the IEEE Standard 1366, for the purpose of

[37] This definition of Areas of Concern became effective in 2012 considering the trend in system performance based on circuits that exceed the SQI, number of customers affected by those circuits and the number of complaints.

the new worst performing circuit criteria, PSE calculates circuit SAIFI excluding the same days that are excluded in the circuit SAIDI performance.

Exclusion Events

Per Docket Nos. UE-072300 and UG-072300 (consolidated), from 2010 through 2015 PSE petitioned to exclude certain annual results or outage minutes from the performance calculation for the current year and years following that will be affected. PSE demonstrated that event was unusual or extraordinary and that PSE's level of preparedness and response was reasonable. The UTC granted the following events to be considered extraordinary:

- Total SAIDI results for 2006.
- January 2012 storm event.
- August 2015 storm event
- November 2015 storm event

In June 2016, Order 29 sets forth an objective approach in identifying catastrophic events. Catastrophic days are identified based on the 4.5 Beta of the IEEE Standard 1366. Any days having a daily system SAIDI greater than T_{CAT} is considered a catastrophic event for purposes of the SQI SAIDI mechanics. While these catastrophic days are excluded from the annual SQI SAIDI results, these days negatively impact the standard 2.5 beta threshold value in the next year and the following four years. Per Order 29, the daily system SAIDI value for that day is replaced with the five year average of that month's previous daily SAIDI. The major event day threshold value is then calculated using the adjusted data (T_{MEDADJ}). The following day is considered catastrophic for the 2016 reporting year:

- March 13, 2016

J
Current Year Electric Service Outage by Cause by Area

This appendix details the 2016 Outage Cause by County. In Tables J1 through J3 color codes indicate which major outage category the outage cause is grouped into. The Cause Code definitions can be found in Appendix H: *Electric Reliability Terms and Definitions*.

Table J1: Color Code Legend

Color Code Legend
Preventable
Third Party (Non-Tree)
Tree-related

Table J2: Total Outages by Cause

	Northern			King/Kittitas		Southern/Western			
	Whatcom	Skagit	Island	King	Kittitas	Pierce	Thurston	Kitsap	Total
AO	46	38	2	130	6	10	20	19	271
BA	187	113	63	970	21	111	233	241	1,939
CP	22	29	15	128	5	40	78	43	360
CR	1	1	0	20	3	1	8	0	34
DU	11	10	7	121	10	9	17	18	203
EF	656	345	251	1,769	133	384	671	422	4,631
EO	0	0	0	4	0	0	2	4	10
EQ	0	0	0	0	0	0	0	1	1
FI	5	5	2	51	5	5	6	9	88
LI	1	1		24	3	13	26	18	86
SO	213	144	70	1,011	41	188	310	412	2,389
TF	0	0	0	5	0	1	0	1	7
TO	2	1	1	0	0	0	0	0	4
TV	586	459	328	1,372	41	168	417	1,185	4,556
UN	90	74	29	734	13	142	85	151	1,318
VA	1	0	0	20	0	2	4	0	27
Misc[Note]	48	21	4	117	31	44	35	38	338
Total	1,869	1,241	772	6,476	312	1,118	1,912	2,562	16,262

Note: Miscellaneous causes are included in both Preventable and Third Party (Non-Tree) categories

Table J3: SQI-3 Outages by Cause (non-major event day)

	Northern			King/Kittitas		Southern/Western			
	Whatcom	Skagit	Island	King	Kittitas	Pierce	Thurston	Kitsap	Total
AO	44	37	2	127	6	10	19	16	261
BA	186	113	62	962	21	111	232	239	1,926
CP	20	29	14	120	5	40	72	38	338
CR	1	1	0	19	2	0	8	0	31
DU	11	9	7	116	10	9	16	18	196
EF	597	329	230	1,677	131	359	637	407	4,367
EO	0	0	0	4	0	0	2	4	10
EQ	0	0	0	0	0	0	0	1	1
FI	4	4	1	49	5	5	6	9	83
LI	1	1	0	22	3	13	23	16	79
SO	197	134	64	926	38	177	289	381	2,206
TF	0	0	0	4	0	1	0	1	6
TO	0	1	1	0	0	0	0	0	2
TV	256	240	162	881	37	100	272	602	2,550
UN	81	64	26	694	12	134	80	130	1,221
VA	1	0	0	20	0	2	4	0	27
Misc[Note]	31	14	2	106	31	34	34	34	286
Total	1,430	976	571	5,727	301	995	1,694	1,896	13,590

Note: Miscellaneous causes are included in both Preventable and Third Party (Non-Tree) categories

K
Historical SAIDI and SAIFI by Area

This appendix details in Table K1, the three-year history of SAIDI and SAIFI data by county.

Table K1: SAIDI and SAIFI Data for the Past Three Years by County [Note]

Region/County	Year	Total SAIFI	SQI SAIFI	Total SAIDI	SQI SAIDI
Northern					
Whatcom	2016	**1.80**	**0.92**	**446**	**122**
	2015	2.07	1.15	1056	154
	2014	1.57	1.26	314	180
Skagit	2016	**2.13**	**1.52**	**496**	**211**
	2015	2.11	1.18	948	163
	2014	2.07	1.50	493	274
Island	2016	**2.64**	**0.87**	**471**	**147**
	2015	2.05	0.81	1430	208
	2014	2.95	1.23	1197	253
King/Kittitas					
King	2016	**1.29**	**0.93**	**276**	**123**
	2015	1.92	0.94	597	132
	2014	1.72	0.86	590	122
Kittitas	2016	**1.35**	**1.34**	**198**	**197**
	2015	1.21	1.00	289	209
	2014	2.94	2.26	639	518

Note: Reported figures are based on most current SAP outage data, as of January 2017.

Table continues on next page.

Region/County	Year	Total SAIFI	SQI SAIFI	Total SAIDI	SQI SAIDI
Southern/Western					
Pierce	2016	**1.07**	**0.70**	**156**	**101**
	2015	1.95	0.84	433	79
	2014	1.70	1.05	290	128
Thurston	2016	**1.75**	**1.43**	**289**	**225**
	2015	1.39	0.88	382	129
	2014	1.67	0.89	498	112
Kitsap	2016	**3.59**	**1.50**	**1149**	**209**
	2015	4.69	2.40	1715	290
	2014	2.87	1.45	607	210

L

1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements

This appendix presents PSE SAIFI and SAIDI performance from 1997 through the current year using different measurements.

Figure L1: 1997–2016 SAIFI Performance by Different Measurements

1997-2016 PSE SAIFI Performance in Different Measurements
(Average number of interruptions per year per customer)

Calendar Year	(a) Annual SAIFI Excluding Any Days That 5% or More Customers Are w/o Power	(b) Annual IEEE SAIFI Excluding Daily Results over T_{MED}	(c) Annual Total SAIFI Results: No Exclusions	(d) Annual Total SAIFI Results with Exclusions	(e) Total SAIFI 5-Year Rolling Annual Average with Exclusions
1997	1.04	1.11	1.53	1.53	
1998	0.85	0.92	1.42	1.42	
1999	0.98	0.96	1.88	1.88	
2000	0.85	0.91	1.32	1.32	
2001	0.98	0.79	1.34	1.34	1.50
2002	0.83	0.80	1.07	1.07	1.41
2003	0.80	0.71	1.24	1.24	1.37
2004	0.77	0.77	1.09	1.09	1.21
2005	0.94	0.93	1.18	1.18	1.18
2006	1.23	1.05	2.52		
2007	0.98	0.91	1.42	1.42	1.20
2008	1.01	0.98	1.12	1.12	1.21
2009	1.09	0.94	1.24	1.24	1.22
2010	0.86	0.87	1.59	1.59	1.31
2011	1.02	1.02	1.07	1.07	1.29
2012	0.92	0.83	1.62	0.92	1.19
2013	0.86	0.86	1.13	1.13	1.19
2014	1.05	1.00	1.89	1.89	1.32
2015	1.11	1.04	2.18	2.18	1.44
2016	1.06	1.02	1.70	1.70	1.56

Figure L2: 1997–2016 SAIFI Performance by Different Measurements

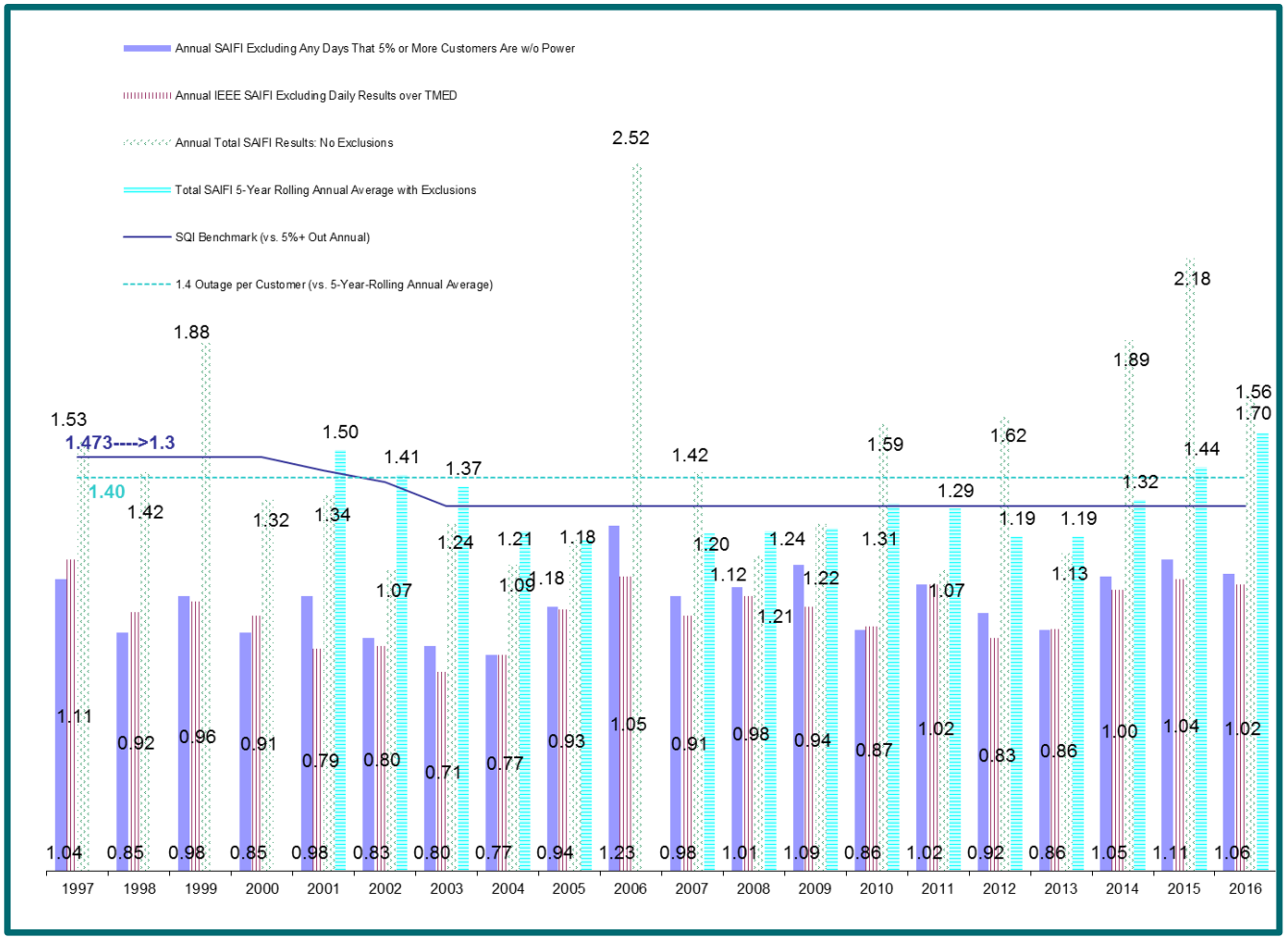


Figure L3: 1997–2016 SAIDI Performance by Different Measurements

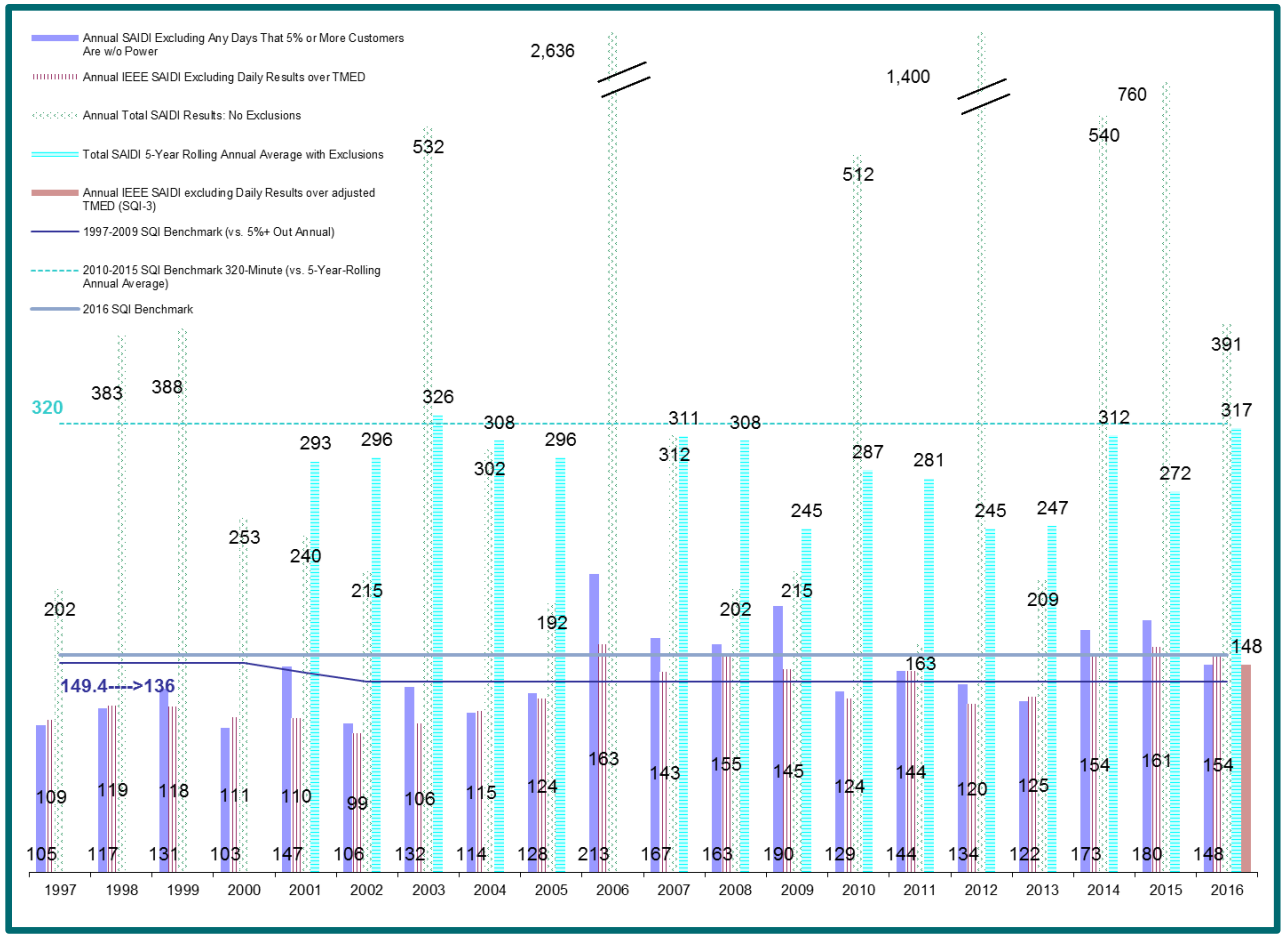
1997-2016 PSE SAIDI Performance in Different Measurements
(Average number of outage minutes per customer per year)

Calendar Year	(a) Annual SAIDI Excluding Any Days That 5% or More Customers Are w/o Power	(b) Annual IEEE SAIDI Excluding Daily Results over T_{MED}	(c) Annual Total SAIDI Results: No Exclusions	(d) Annual Total SAIDI Results with Exclusions	(e) Total SAIDI 5-Year Rolling Annual Average with Exclusions	(f) Annual SQI SAIDI excluding Daily Results over T_{MEDADJ} (SQI-3)
1997	105	109	202	202		
1998	117	119	383	383		
1999	131	118	388	388		
2000	103	111	253	253		
2001	147	110	240	240	293	
2002	106	99	215	215	296	
2003	132	106	532	532	326	
2004	114	115	302	302	308	
2005	128	124	192	192	296	
2006	213	163	2,636			
2007	167	143	312	312	311	
2008	163	155	202	202	308	
2009	190	145	215	215	245	
2010	129	124	512	512	287	
2011	144	144	163	163	281	
2012	134	120	1,400	134[1]	245	
2013	122	125	209	209	247	
2014	173	154	540	540	312	
2015	180	163	760	313[2]	272	
2016	148	154	391	391	317	148

[1] Per UTC approval, excludes the January 2012 Storm Event

[2] Per UTC approval, excludes the August 2015 and November 2015 storm events

Figure L4: 1997–2016 SAIDI Performance by Different Measurements



M
Current-Year Commission and Rolling Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions

This appendix lists, in Tables M1 and M2, the current-year UTC and rolling two-year PSE customer electric service reliability complaints with resolutions.

Table M1: Current Year Commission Complaints

No.	Complaint Type	Date of Complaint	Location	Closing Date
1	Reliability	3/23/2016	Clyde Hill	3/28/2016
2	Reliability	3/24/2016	Bellevue	6/17/2016
3	Reliability	5/27/2016	Bow	6/16/2016
4	Reliability	6/13/2016	Olympia	6/16/2016
5	Reliability	7/25/2016	Federal Way	7/28/2016
6	Reliability	9/8/2016	Bremerton	11/2/2016
7	Reliability	9/14/2016	Kenmore	10/6/2016
8	Reliability	9/16/2016	Bothell	9/21/2016
9	Reliability	9/16/2016	Kenmore	9/23/2016
10	Reliability	9/16/2016	Kenmore	9/28/2016
11	Reliability	9/22/2016	Kenmore	10/13/2016
12	Reliability	9/27/2016	Kenmore	9/29/2016
13	Reliability	10/17/2016	Port Orchard	12/6/2016
14	Reliability	11/18/2016	Silverdale	11/30/2016
15	Power Quality	1/4/2016	Yelm	1/7/2016
16	Power Quality	2/4/2016	Yelm	3/15/2016
17	Power Quality	7/27/2016	Medina	8/5/2016
18	Power Quality	8/15/2016	Bellingham	10/24/2016

Table M2: Rolling Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions (Sorted by County)

No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
1	Island	Sep 2016 Nov 2016	Coupeville	Reliability	Coupeville-15	Contacted customer to discuss concerns.	Underground cable replacement project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
2	Island	Aug 2016 Sep 2016	Oak Harbor	Reliability Power Quality	Hillcrest-24	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
3	Island	May 2015 Aug 2016 Aug 2016	Oak Harbor	Power Quality	Clover Valley-16	Contacted customer to discuss concerns.	A system project is being evaluated for feasibility and cost effectiveness. On-going circuit monitoring and maintenance will continue.
4	Island	Sept 2016 Sept 2016	Oak Harbor	Power Quality	Swantown-12	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
5	Island	Mar 2015 Mar 2015	Clinton	Power Quality	Langely-16	Reported in 2015. No new inquiries in 2016.	On-going circuit monitoring and maintenance will continue.
6	Island	Jan 2015 Aug 2015 Aug 2015	Freeland	Reliability	Freeland-15	Reported in 2015. No new inquiries in 2016.	A system project completed in 2015 should provide reliability improvement. On-going circuit monitoring and maintenance will continue
7	King	Oct 2015 Jul 2016	Enumclaw	Reliability	Osceola-23	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.

Table continues on next page

No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
8	King	Dec 2016 Dec 2016	Renton	Reliability	Fairwood-16	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
9	King	Dec 2015 Nov 2016	Kent	Reliability	Soos Creek-23	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
10	King	Dec 2015 Jun 2016	Maple Valley	Reliability	Lake Wildnerness-12	Contacted customer to discuss concerns.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
11	King	Nov 2016 Nov 2016 Nov 2016	Auburn	Reliability	Sherwood-18	Contacted customer to discuss concerns.	A distribution automation project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
12	King	Aug 2016 Aug 2016 Aug 2016	Enumclaw	Reliability	Osceola-26	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
13	King	Aug 2015 Aug 2015	Kent	Reliability	Lake Meridian-13	Reported in 2015. No new inquiries in 2016.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
14	King	Jun 2015 Jul 2015	Renton	Reliability	Fairwood-14	Reported in 2015. No new inquiries in 2016.	On-going circuit monitoring and maintenance will continue.
15	King	Jan 2015 Dec 2015	Snoqualmie Pass	Reliability	Hyak-13	Reported in 2015. No new inquiries in 2016.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.

Table continues on next page

No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
16	King	Aug 2015 Dec 2015 Nov 2016	Renton	Reliability	Lake McDonald-23	Reported in 2015. One new inquiry in 2016. Contacted customer to discuss concerns.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
17	King	Mar 2016 Mar 2016	Bellevue	Reliability	Factoria-13	Contacted customer to discuss concerns.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
18	King	Dec 2015 Mar 2016 Mar 2016	Bellevue	Reliability Power Quality	Eastgate-12	Contacted customer to discuss concerns.	A system project is being evaluated for feasibility and cost effectiveness. On-going circuit monitoring and maintenance will continue.
19	King	Sep 2015 Oct 2015	Renton	Reliability	Highlands-16	Reported in 2015. No new inquiries in 2016.	On-going circuit monitoring and maintenance will continue.
20	King	Jan 2015 Feb 2015 Feb 2015	Bellevue	Power Quality	Somerset-15	Reported in 2015. No new inquiries in 2016.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
21	King	Oct 2015 Feb 2016	Carnation	Reliability	Tolt-15	Contacted customer to discuss concerns.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
22	King	Dec 2015 Mar 2016	Kenmore	Reliability	Kenmore-27	Contacted customer to discuss concerns.	Two system projects completed in 2016 and one system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
23	King	Aug 2016 Sep 2016	Kenmore	Reliability	Kenmore-26	Contacted customer to discuss concerns.	A system project completed in 2016 and one system project scheduled for 2017 should improve reliability improvement. On-going circuit monitoring and maintenance will continue.
24	King	Jun 2016 Jul 2016	Kenmore	Reliability	Inglewood-17	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
25	King	Nov 2015 Aug 2016	Kirkland	Reliability	South Kirkland-12	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
26	King	Dec 2016 Dec 2016	Kenmore	Reliability	North Bothell-26	Contacted customer to discuss concerns.	Two system projects completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
27	King	Jul 2015 Aug 2015	Kenmore	Reliability	Kenmore-27	Reported in 2015. No new inquiries in 2016.	Two system projects completed in 2016 and one system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
28	King	Aug 2015 Oct 2015	Kirkland	Reliability	Wayne-16	Reported in 2015. No new inquiries in 2016.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
29	King	Jun 2015 Jun 2015 Jul 2015	Woodinville	Power Quality	Hollywood-25	Reported in 2015. No new inquiries in 2016.	PSE checked the voltage and showed that the dips were within the normal range of voltage variation. On-going circuit maintenance and monitoring will continue.
30	King	Sep 2015 Oct 2015 May 2016	Woodinville	Reliability	Hollywood-26	Reported in 2015. One new inquiry in 2016. Contacted customer to discuss concerns.	An underground cable replacement project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
31	King	Jun 2016 Dec 2016	Renton	Reliability	Panther Lake-15	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
32	King	Sept 2016 Sept 2016	Auburn	Reliability	Ellingson-16	Contacted customer to discuss concerns.	An underground cable replacement project scheduled for 2017. On-going circuit monitoring and maintenance will continue.
33	King	Mar 2015 Mar 2015	Burien	Reliability	North Normandy-12	Reported in 2015. No new inquiries in 2016.	A system project was completed 2015 and another system project completed in 2016 should improve reliability. Ongoing circuit maintenance and monitoring will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
34	Kitsap	Nov 2015 Mar 2016	Bainbridge Island	Reliability	Winslow-15	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
35	Kitsap	Oct 2016 Oct 2016	Silverdale	Power Quality	Silverdale-15	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
36	Kitsap	Mar 2016 Apr 2016	Poulsbo	Power Quality	Poulsbo-13	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
37	Kitsap	Jan 2015 Mar 2016	Kingston	Reliability	Kingston-24	Contacted customer to discuss concerns.	Two system projects scheduled for 2017 and two system projects scheduled for 2018 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
38	Kitsap	March 2016 March 2016	Silverdale	Reliability	Central Kitsap-14	Contacted customer to discuss concerns.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
39	Kitsap	Dec 2016 Dec 2016	Seabeck	Reliability	Chico-12	Contacted customer to discuss concerns.	A system project completed in 2015 and another completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
40	Kitsap	Mar 2016 Sep 2016	Silverdale	Reliability	Silverdale-16	Contacted customer to discuss concerns.	Two system projects scheduled for 2017 and 2018 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
41	Kitsap	Dec 2015 Jul 2016	Bremerton	Reliability	Chico-12	Contacted customer to discuss concerns.	A system project completed in 2015 and another completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
42	Kitsap	Nov 2015 Mar 2016	Poulsbo	Reliability	Poulsbo-16	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
43	Kitsap	Dec 2015 Dec 2015	Bremerton	Reliability	Chico-12	Reported in 2015. No new inquiries in 2016.	A system project completed in 2015 and another completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
44	Kitsap	Nov 2015 Dec 2015	Bremerton	Reliability	Chico-12	Reported in 2015. No new inquiries in 2016.	A system project completed in 2015 and another completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
45	Kitsap	Nov 2015 Nov 2015	Silverdale	Reliability	Central Kitsap-14	Reported in 2015. No new inquiries in 2016.	On-going circuit maintenance and monitoring will continue.
46	Kitsap	Nov 2015 Nov 2015	Suquamish	Reliability	Miller Bay-17	Did not report in 2015. Contacted customer to address concerns.	On-going circuit maintenance and monitoring will continue
47	Kitsap	Nov 2015 Nov 2015	Bainbridge Island	Reliability	Port Madison-16	Reported in 2015. No new inquiries in 2016.	A system project completed in 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
48	Kitsap	Aug 2015 Nov 2015	Bainbridge Island	Reliability	Winslow-16	Reported in 2015. No new inquiries in 2016.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
49	Kitsap	Nov 2015 Dec 2015	Poulsbo	Reliability	South Keyport-22	Reported in 2015. No new inquiries in 2016.	On-going circuit maintenance and monitoring will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
50	Kitsap	Nov 2015 Nov 2015	Bremerton	Reliability	Chico-13	Reported in 2015. No new inquiries in 2016.	A system project completed in 2015 and another completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
51	Kitsap	Mar 2015 Mar 2015	Poulsbo	Reliability	Central Kitsap-14	Reported in 2015. No new inquiries in 2016.	A system project completed in 2015 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
52	Kitsap	Nov 2015 Dec 2015	Bremerton	Reliability	Chico-16	Did not report in 2015. Contacted customer to address concerns.	On-going circuit maintenance and monitoring will continue.
53	Kitsap	Nov 2015 Mar 2016	Bainbridge Island	Reliability	Winslow-13	Contacted customer to discuss concerns.	A system project completed in 2015 and another system project scheduled for 2018 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
54	Kitsap	Dec 2015 Dec 2015	Seabeck	Reliability	Chico-12	Reported in 2015. No new inquiries in 2016.	A system project completed in 2015 and another completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
55	Pierce	Dec 2016 Dec 2016	Graham	Reliability	Kapowsin-16	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
56	Pierce	Mar 2016 Sep 2016 Dec 2016	Puyallup	Reliability	Stewart-13	Contacted customer to discuss concerns.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
57	Pierce	Nov 2015 Nov 2015	Bonney Lake	Reliability	Bonney Lake-15	Reported in 2015. No new inquiries in 2016.	A system project is being evaluated for feasibility and cost effectiveness. On-going circuit monitoring and maintenance will continue.
58	Pierce	Jul 2015 Aug 2015	Lake Tapps	Reliability	Lake Tapps-18	Reported in 2015. No new inquiries in 2016.	Two system projects completed in 2016 which should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
59	Skagit	Sep 2015 Aug 2016	La Conner	Reliability	Peths Corner-15	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
60	Skagit	Oct 2016 Oct 2016	Sedro Woolley	Reliability	Hamilton-15	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
61	Skagit	March 2016 March 2016	Burlington	Reliability	Burlington-38	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
62	Skagit	Sep 2016 Sep 2016	Sedro Woolley	Power Quality	Norlum-16	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
63	Skagit	Aug 2016 Aug 2016 Aug 2016	Concrete	Power Quality	Baker River Switch-13	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
64	Thurston	May 2015 Jun 2015 Jul 2015	Roy	Power Quality	Longmire-25	Reported in 2015. No new inquiries in 2016.	PSE checked the voltage and showed that the dips were within the normal range of voltage variation. On-going circuit maintenance and monitoring will continue.
65	Thurston	Jun 2016 Jun 2016	Olympia	Power Quality	Luhr Beach-15	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
66	Thurston	Sept 2016 Sept 2016	Olympia	Power Quality	Griffin-13	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
67	Thurston	Aug 2016 Aug 2016	Olympia	Reliability	Prine-23	Contacted customer to discuss concerns.	A system project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
68	Thurston	Aug 2016 Sep 2016	Olympia	Reliability	Southwick-17	Contacted customer to discuss concerns.	On-going circuit maintenance and monitoring will continue.
69	Thurston	Feb 2016 Mar 2016	Olympia	Reliability	Rochester-16	Contacted customer to discuss concerns.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
70	Thurston	Dec 2016 Dec 2016	Tumwater	Reliability	Olympia Brewery-16	Contacted customer to discuss concerns.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
71	Thurston	Jan 2016 Jun 2016 Jun 2016	Tumwater	Reliability	Airport-25	Contacted customer to discuss concerns.	A major transmission project scheduled for 2019-2020 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
72	Thurston	Sep 2015 Nov 2015	Rochester	Reliability	Rochester-17	Reported in 2015. No new inquiries in 2016.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
73	Thurston	Jul 2015 Oct 2015	Rochester	Reliability	Rochester-15	Reported in 2015. No new inquiries in 2016.	On-going circuit monitoring and maintenance will continue.

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No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
74	Thurston	Jun 2015 Aug 2015 Aug 2015	Olympia	Reliability	Griffin-15	Reported in 2015. No new inquiries in 2016.	On-going circuit monitoring and maintenance will continue.
75	Thurston	Aug 2015 Nov 2015	Olympia	Reliability	McAllister-16	Reported in 2015. No new inquiries in 2016.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
76	Whatcom	Mar 2016 Mar 2016	Ferndale	Reliability	Lynden-24	Contacted customer to discuss concerns.	A system project completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
77	Whatcom	Apr 2015 Sep 2016	Bellingham	Reliability	Hannegan-15	Contacted customer to discuss concerns.	Underground cable replacement project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
78	Whatcom	Apr 2016 Apr 2016	Bellingham	Reliability	Happy Valley-16	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
79	Whatcom	Dec 2015 Feb 2016	Bellingham	Power Quality	Britton-15	Contacted customer to discuss concerns.	On-going circuit monitoring and maintenance will continue.
80	Whatcom	Oct 2015 Oct 2015	Lynden	Reliability	Vista-26	Reported in 2015. No new inquiries in 2016.	Underground cable replacement project scheduled for 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
81	Whatcom	Feb 2015 Mar 2015	Bellingham	Power Quality	Woburn-23	Reported in 2015. No new inquiries in 2016.	On-going circuit maintenance and monitoring will continue.

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Areas of Greatest Concern with Action Plan

This appendix details the areas of greatest concern with an action plan. The 2017 and 2018 action plan includes projects that are in the Electric Reliability Plan put forth in the Docket UE-170033 of the 2016 general rate case proceeding. PSE has proposed increased funding for projects on the worst performing circuits with the focus to aggressively work towards improving the reliability performance on these chronic worst circuits with additional accelerated and targeted investment. Future plans will be adjusted based on the outcome of the general rate case proceeding.

Table N1 provides the 2016 and 2015 list of the Top 50 Worst-Performing Circuits in the PSE territory. The nine circuits that dropped off in 2016 are listed at the bottom of the table and noted as "Not on 2016 Top 50 List". The nine circuits that are new in 2016 are noted as "Not on 2015 Top 50 List."

CMI refers to Customer Minutes of Interruptions.

Table N1: 2016 and 2014 Year End 50 Worst-Performing Circuits

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Chico-12	Kitsap	1	5,712,507	1	5,690,841	Completed enhanced tree pruning pilot project in 2012. Installed a second 7.5 MVA autotransformer allowing for a second feeder tie. Completed an underground system improvement project in 2015. Installed Tollgrade sensors and completed one underground cable project in 2016. Four underground cable projects, one underground system project and installing a recloser and switch planned for 2017
Cottage Brook-13	King	2	3,633,301	2	3,609,904	Completed an underground conversion project in 2015. Completed the following underground cable remediation projects: three in 2014, four in 2015 and three in 2016. Installed Tollgrade sensors in 2015. Six underground cable remediation projects and a tree wire project planned for 2017.
Orting-22	Pierce	3	4,805,820	3	4,627,492	Completed a tree wire project in 2012. A new substation bank installed 2014. Completed one cable replacement project in 2015 and one in 2016. Completed one system improvement project in 2016. A tree wire project and one underground cable remediation project planned for 2018.
Longmire-17	Thurston	4	3,384,829	4	3,175,923	Completed a tree wire project and underground conversion project in 2012. Completed one cable remediation project and installed a recloser in 2016. Two tree wire projects planned for 2017.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Silverdale-15	Kitsap	5	3,976,729	6	3,188,025	Installed reclosers in 2014 and in 2016. Installed tripsavers and completed a tree wire project in 2016. One tree wire project, two system rebuild projects and four underground cable remediation projects planned for 2017. One overhead system rebuild project planned for 2018.
Freeland-12	Island	6	3,128,704	10	2,975,056	Completed phase balancing and fuse coordination in East Harbor area and one underground cable remediation project in 2014. Installed two switches in 2016. Reconfigured circuit in early 2017 with the new Maxwelton substation. A project to improve overhead reliability and construct a new feeder tie planned for 2018.
Hobart-15	King	7	2,472,647	24	2,234,142	One underground cable remediation project completed in 2014. One project to replace old vintage conductor, one distribution automation project and one underground cable remediation project planned for 2017. Two tree wire projects planned for 2018.
Baker River Switch-24	Skagit	8	2,181,890	11	1,873,195	Two underground conversion projects completed in 2013. One underground conversion project completed in 2014. One underground cable remediation project planned for 2017. One underground system rebuild project planned for 2018.
Vashon-23	King	9	2,133,128	7	2,219,733	Completed two tree wire projects and one underground conversion project in 2014. Installed two switches in 2015. Installed tripsavers in 2016. One switch project, two tree wire projects, two underground cable remediation projects, replacing all circuit breakers and adding distribution automation planned for 2017.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Big Rock-15	Skagit	10	2,809,772	13	2,405,405	Installed recloser in 2013. Installed regulators in early 2017. One underground cable remediation project, two tree wire projects and a project construct new underground feeder and upgrade the overhead system planned for 2017. An overhead system rebuild project and reconfiguration of circuit planned for 2018.
Prine-13	Thurston	11	3,423,246	9	3,368,173	Completed a tree wire project in 2015. Completed one cable remediation project and installed tripsavers in 2016. One distribution automation project, three underground cable remediation projects and a tree wire project are planned for 2017.
Vashon-13	King	12	2,098,476	5	2,124,812	Completed two projects to reconductor overhead line to tree wire in 2014. Replacement of substation circuit breakers, adding distribution automation, one tree wire project and nine underground cable remediation projects planned for 2017. Two overhead system rebuild projects planned for 2018.
Hickox-16	Skagit	13	1,978,125	14	1,655,885	Completed a tree wire project in 2013. One distribution automation project, installation of regulators and one underground cable remediation project planned for 2017.
Kingston-24	Kitsap	14	3,360,668	17	2,481,825	Completed a tree wire project in 2013. Completed underground cable remediation projects in 2015 and 2016. Installed tripsavers in 2016. A tree wire project and an overhead system rebuild project planned for 2017. Two overhead system rebuild projects and installation of reclosers planned for 2018.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Vashon-12	King	15	2,029,669	12	1,986,562	Completed one underground conversion project and a tree wire project completed in 2014. Completed an underground cable remediation project in 2015. Installed tripsavers in 2016. Replacement of substation circuit breakers, adding distribution automation, one underground conversion project and one overhead system project planned for 2017. Two tree wire projects and one overhead system rebuild project planned for 2018.
Kenmore-23	King	16	2,593,395	18	2,145,504	Installed switch and recloser in 2012. Completed two underground cable remediation projects in 2015. Two underground cable remediation projects and a tree wire project planned for 2017.
Fragaria-13	Kitsap	17	1,898,007	30	1,380,953	Completed a tree wire project in 2012. Installed tripsavers in 2016. Completion of a system improvement project, four underground cable remediation projects and installation of additional tripsavers planned for 2017. Two tree wire projects planned for 2018.
Soos Creek-25	King	18	2,288,674	16	2,241,656	Installed recloser and completed a tree wire project in 2013. Two underground cable remediation projects completed in 2014. A tree wire project and adding distribution automation planned for 2017. Two underground cable remediation projects planned for 2018. Future plans for Jenkins and Lake Holmes substations will improve reliability.
Marine View-13	King	19	2,007,664	8	2,044,847	Completed a tree wire project and installed recloser in 2014. Adding distribution automation planned for 2017.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Cottage Brook-15	King	20	1,750,380	20	1,606,046	Completed three underground cable remediation project in 2016. Two underground cable remediation projects planned for 2017.
Nugents Corner-26	Whatcom	21	1,890,205	25	1,502,974	Added supervisory control (SCADA) to the feeder breaker in 2016. Four underground cable remediation projects planned for 2017.
Avondale-15	King	22	1,629,275	39	1,148,355	Completed one underground cable remediation project in 2015 and three in 2016. One underground cable remediation project planned for 2017 and one in 2018.
Sherwood-18	King	23	3,190,936	21	3,224,204	Future plans for Lake Holm substation and overhead conversion will improve reliability. Substation construction dependent on area growth. One tree wire project completed in 2015. Completed a project to replace old vintage conductor in 2016. One underground cable remediation project and one distribution automation project planned for 2017.
Fragaria-15	Kitsap	24	1,863,686	32	1,520,073	Completion of a tree wire project planned for 2017.
Pipe Lake-22	King	25	2,001,473	Not on 2015 List		One underground system project completed in 2016. One underground cable remediation project and a tree wire project planned for 2017. One underground cable remediation project planned for 2018.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Duvall-15	King	26	1,546,504	22	1,504,068	Completed on underground cable remediation project in 2016. One underground cable remediation project and a project to upgrade the underground system planned for 2017. One underground cable remediation project planned for 2018.
Greenwater-16	King	27	2,841,038	36	2,677,416	Completed relocation of poles that were in imminent danger of being washed out by the White River in 2016.
Longmire-25	Thurston	28	1,580,179	49	1,442,263	Completed two underground cable remediation projects and installed tripsaver in 2016. An overhead system rebuild project and a tree wire project planned for 2017. One underground cable remediation project planned for 2018.
Poulsbo-15	Kitsap	29	2,197,239	34	1,734,125	An overhead system rebuild project and installation of a switch planned for 2017.
Hamilton-15	Skagit	30	1,870,012	19	2,013,980	Completed a tree wire project in 2014. A project to improve overhead reliability and one underground cable remediation project planned for 2018.
Griffin-13	Thurston	31	1,520,387	28	1,428,015	Completed a tree wire project in 2012. Completed one underground cable remediation project in 2014 and two in 2015. Installed one recloser and tripsavers in 2016. One distribution automation project, a tree wire project and three underground cable remediation projects planned in 2017.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Port Gamble-13	Kitsap	32	2,240,739	Not on 2015 List		Completed a tree wire project in 2013. One underground cable remediation project planned for 2017.
Pipe Lake-23	King	33	1,532,776	Not on 2015 List		One underground cable replacement project planned for 2018.
Lake Leota-16	King	34	1,462,038	Not on 2015 List		Three underground cable remediation projects planned for 2018.
Fernwood-16	Kitsap	35	1,645,001	Not on 2015 List		Completed one underground cable replacement project and installed tripsaver in 2016. Completion of a tree wire project planned for 2017. Two underground cable remediation projects planned for 2018.
Fragaria-16	Kitsap	36	1,754,340	37	1,645,560	Completed a tree wire project in 2014 and 2015. Completed one underground cable remediation in 2015. Three underground cable remediation projects, one tree wire project and installation of switch planned for 2017.
Miller Bay-17	Kitsap	37	2,127,407	33	2,168,073	Completed tree wire project and installed tripsavers in 2016. One underground cable remediation project planned for 2017. Construction of new feeder tie planned for completion by 2018 or later.
Langley-16	Island	38	2,897,523	41	2,787,258	A system improvement project and reconfiguration of circuit with the new Maxwelton substation planned for 2018. One underground cable remediation project planned for 2017 and one in 2018.
Kendall-12	Whatcom	39	1,378,564	46	1,029,493	Added supervisory control (SCADA) to the feeder breaker in 2016. One underground cable remediation project planned for 2017. A tree wire project planned for 2018.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Fernwood-17	Kitsap	40	1,196,162	38	1,078,159	Completed a tree wire project in 2014. Installed recloser and completed a system project in 2015. Installed tripsavers and completed an underground cable remediation project in 2016. Four underground cable remediation projects planned for 2017. A project to install tree wire and upgrade of underground system planned for 2018.
Greenbank-13	Island	41	1,325,565	Not on 2015 List		A tree wire project and three underground cable remediation projects planned for 2017.
Miller Bay-23	Kitsap	42	1,282,867	29	1,371,174	Completed a tree wire project in 2012 and 2013.
Central Kitsap-14	Kitsap	43	1,781,879	Not on 2015 List		A tree wire project and one underground cable remediation project planned for 2017. One underground cable remediation project planned for 2018.
Peths Corner-13	Skagit	44	1,655,355	Not on 2015 List		Planning is currently reviewing system reliability projects for future construction.
Hollywood-25	King	45	1,449,034	Not on 2015 List		Completed one underground cable remediation project in 2015 and one in 2016. A distribution automation project planned for 2017. One cable remediation project planned for 2018.
Sequoia-16	King	46	2,634,361	27	2,650,730	Completed an underground cable remediation project in 2013 and two in 2016. One underground cable remediation project planned for 2017.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Black Diamond-13	King	47	3,068,953	23	3,087,836	Future plans for Lake Holm substation and overhead conversion will improve reliability. Substation construction dependent on area growth. One underground cable remediation project was completed in 2015. One tree wire project and a distribution automation project planned for 2017. One underground cable remediation project planned for 2018.
Blumaer-17	Thurston	48	1,744,175	40	1,713,497	Completed a tree wire project and reconfigured the circuit in 2012. Completed one underground cable remediation project in 2014 and one in 2016. One underground cable remediation project planned for 2017 and two for 2018.
Alger-15	Skagit	49	1,167,415	42	1,137,773	Installed tripsaver in 2016. A project to improve overhead reliability and underground conversion planned for 2017. Three underground cable remediation projects planned for 2018.
Inglewood-15	King	50	1,334,782	35	1,449,348	Completed one underground cable remediation project in 2015. Installed tripsaver in 2016. Two underground cable remediation projects and one distribution automation project planned for 2017. Two underground cable remediation projects planned for 2018.
Duvall-12	King	Not on 2016 List		15	2,654,730	Installed switches in 2013. Completed system projects in 2014, 2016, and 2017. Completed underground cable remediation projects in 2015 and 2016. Construction of a new feeder planned to be completed by 2018. One underground cable remediation project planned for 2017 and four planned for 2018.

Circuit	County	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	2015 Year End 5 Year Avg Rank	2015 Year End 5 Year Average Total CMI	Action by PSE
Hobart-16	King	Not on 2016 List		26	2,323,012	Completed an underground conversion project in 2013. Completed two underground cable remediation projects in 2014. Completed a tree wire project in 2015. Two underground cable remediation projects planned for 2017.
Skykomish-25	King	Not on 2016 List		31	1,663,350	Installation of a tripsaver planned for 2017.
Orchard-13	King	Not on 2016 List		43	2,532,164	Completed an underground cable remediation project in 2015. Completed installation of line spacers to eliminate line slapping related outages in 2015.
Silverdale-13	Kitsap	Not on 2016 List		44	876,598	A tree wire project completed in 2015. One tree wire project planned for 2017 and one planned for 2018.
Langley-12	Island	Not on 2016 List		45	2,094,876	Two underground cable remediation projects planned for 2018.
Fall City-15	King	Not on 2016 List		47	906,238	Completed an underground conversion project in 2013. Completed a system improvement project to install spacers in 2014.
Chambers-15	Thurston	Not on 2016 List		48	1,966,358	Completed a tree wire project, feeder tie and recloser projects in 2012. Completed one underground cable remediation project in 2014 and two in 2015. Three underground cable remediation projects planned for 2018.
Freeland-13	Island	Not on 2016 List		50	1,611,541	Installed switches in 2016. Reconfigured circuit with new Maxwelton substation in early 2017. One underground cable remediation project planned for 2018.

O Current Year Geographic Location of Electric Service Reliability Customer Complaints on Service Territory Map with Number of Next Year's Proposed Projects and Vegetation-Management Mileage

This appendix illustrates current-year geographic location of electric service reliability customer complaints on service territory map with number of next year's proposed projects and vegetation-management mileage.

Figure O1: 2016 Customer Complaints with 2017 System Projects