Puget Sound Energy

2017

Service Quality and Electric Service Reliability Report

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PUGET SOUND ENERGY

The Energy To Do Great Things

TABLE OF CONTENTS

Chapter 1 1
Introduction 1
Chapter 2 10
Customer services, Customer satisfaction and operations services 10
WUTC Complaint Ratio (SQI #2) 11
Customer Access Center Answering Performance (SQI #5) 12
Customer Access Center Transactions Customer Satisfaction (SQI #6) 14
Gas Safety Response Time (SQI #7) 16
Field Service Operations Transactions Customer Satisfaction (SQI #8) 17
Appointments Kept (SQI #10) 19
Electric Safety Response Time (SQI #11) 21
Service Provider Performance 23
Service Guarantees 26
Chapter 3 29
Electric Service Reliability 29
About Electric Service Reliability Measurements and Baseline Statistics 33
SAIFI (SQI #4) 42
SAIDI (SQI #3) 46
Working to Improve Reliability 51

APPENDICES

A Monthly SQI Performance 75
B Certification of Survey Results 92
C Penalty Calculation 93
D Proposed Customer Notice (Report Card) 94
E Disconnection Results 97
F Customer Service Guarantee Performance Detail 98
G Customer Awareness of Customer Service Guarantee 104
H Electric Reliability Terms and Definitions 111
I Electric Reliability Data Collection Process and Calculations 116
J Current Year Electric Service Outage by Cause by Area 122
K Historical SAIDI and SAIFI by Area 125
L 1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements 127
M Current-Year Commission and Rolling Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions 131
N Areas of Greatest Concern with Action Plan 142
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 172
P System Planning Budget Process 173

CHAPTER 1

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 2017 performance and results for the following areas: Customer Service Guarantee, Restoration Service Guarantees, service quality of PSE and its service providers, and electric service reliability.

For the 2017 Service Quality Reporting year, PSE met its benchmarks for the following Service Quality Indices (SQI): WUTC Complaint Ratio (SQI[1] #2), 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 electric service reliability section provides explanation about PSE's System Average Interruption Duration Index (SQI #3) performance.

Background

PSE first implemented its Service Quality Program (the SQ Program) when the Washington Utilities and Transportation Commission (UTC, 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 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

[1] Service Quality Index

[2] Under consolidated Dockets UE-951270 and UE-960195.

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 2017 reporting year. PSE also provides preliminary SQI results to the UTC semi-annually.
- **Customer Service Guarantee (CSG)**—The Customer Service Guarantee provides for a $50 credit when PSE misses an SQI #10 appointment. This appointment guarantee has been available to all customers since the inception of PSE's Service Quality Program in 1997.
- **Restoration Service Guarantees (RSG)**—The Restoration Service Guarantees provides for a $50 credit to a qualified PSE electric customer based upon the conditions and exceptions outlined in PSE's electric Schedule 131 Restoration Service Guarantees. There are two RSGs: the 120-hour guarantee during any storm event and the 24-hour guarantee during a non-major 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 natural gas emergency response plans for outlying areas, which are filed concurrently with this Report as Attachment B to the annual UTC SQ and Electric Service Reliability filing. Starting from the 2018 SQ filing, PSE will provide updates of the natural gas emergency response plans for outlying areas in its semi-annual report instead of a set of the detailed plans, which will still be submitted as an attachment in the annual filing.

Attachment C to the 2017 annual UTC SQ and Electric Service Reliability Report filing is PSE's 2017 Critical Infrastructure Security Annual Report, which contains a discussion of PSE's cybersecurity and physical security policies and related information for 2017.

[3] Under Dockets UE-011570 and UG-011571 (consolidated), and UE-072300 and UG-072301 (consolidated).

SQI and Electric Service Reliability Report

This *Puget Sound Energy 2017 SQ 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 SQ 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 2017 SQ and Electric Service Reliability performance, along with relevant service providers' performance metrics and the two service guarantees. PSE met eight of the nine Service Quality Indices under PSE's Service Quality Program.

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

Key Measurement	Type of Metric	Benchmark/Description	2017 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**	**0.20**	☑
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)**	**94%**	☑

[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 Dockets 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 Dockets 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 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 Dockets UE-072300 and UG-072301 (Section F), are also satisfied in this annual report. 1) Chapter 3 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 Dockets 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	2017 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	78%	☑
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	$23,250	--
Operations Services—*Gas*				
Gas safety response time	Service Quality Index #7	Average 55 minutes or less from customer call to arrival of field technician	32 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	☑

[8] Results shown are rounded from 99.6% to the nearest whole percentage per UTC order. However, the 100% 2017 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.

Key Measurement	Type of Metric	Benchmark/Description	2017 Performance Results	Achieved
Service provider standards compliance—Quanta Gas	Service Provider Index #1C	Level 1 ≤ 15 dev/1000 Level 2 ≤ 25 dev/1000 Level 3 ≤ 25 dev/1000	Level 1 5.54 Level 2 13.37 Level 3 3.95	☑
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	254 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	278 minutes	☑
Service provider standards compliance—Quanta Electric	Service Provider Index #1B	Level 1 ≤ 15 dev/1000 Level 2 ≤ 25 dev/1000 Level 3 ≤ 25 dev/1000	Level 1 4.94 Level 2 11.27 Level 3 8.52	☑
120-Consecutive –hour power outage restoration guarantee	Service Guarantee #2	A $50 credit to eligible customers when experienced a power outage is longer than 120 consecutive hours	$300	--
24-Consecutive-hour non-major storm power outage restoration guarantee	Service Guarantee #3	A $50 credit to eligible customers when experienced a power outage is longer than 24 consecutive hours during non-major storms	$12,500	--
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	1.80 interruptions	--

Key Measurement	Type of Metric	Benchmark/Description	2017 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**	**1.74 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**	**1.20 interruptions**	**☑**
$SAIFI_{IEEE}$ IEEE Non-Major-Storm (T_{MED}) SAIFI	**Reliability**	**Power interruptions per customer per year, excluding days exceeding the T_{MED} threshold**	**1.12 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**	**477 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**	**386 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**	**222 minutes**	**--**
$SAIDI_{IEEE}$ IEEE Non-Major-Storm (T_{MED}) SAIDI	**Reliability**	**Outage minutes per customer per year, excluding days exceeding the T_{MED} threshold**	**175 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_{MEDADJ} threshold with catastrophic day adjustment**	**175 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 Dockets 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 2017 reporting year, PSE met all the performance benchmarks with potential penalty assessment, therefore PSE did not incur any penalty associated with its service quality index performance.
- **Appendix D: Proposed Customer Notice (Report Card**)—This appendix presents PSE's proposed 2017 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 2017 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 paragraph 13 of Order 21 of Dockets 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)

- **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 service territory map with the number of 2018 and 2019 proposed projects and 2018 vegetation-management mileage.
- **Appendix P: System Planning Budget Process**— This appendix illustrates the System Planning Budget Process from project identification through project completion and post-project reliability improvement verification.

Customer Notice of SQI Performance

Appendix D: **Proposed Customer Notice (Report Card)** is PSE's proposed customer notice of PSE's 2017 SQI performance. After consultation with the UTC staff and Public Counsel, PSE will begin distributing the final SQI report card by June 27, 2018, as part of the customer billing package.

Data and Reporting Issues

There was no data gathering or reporting difficulty in 2017 that impacted the SQI performance categories, or their results, in any way.

Service Quality Program Changes

PSE's new 24-hour Restoration Service Guarantee became effective in 2017.[11] PSE has been promoting the new guarantee since November 2016 to inform customers about the new 24-hour customer guarantee and how to take advantage of the guarantee. The Service Guarantees section and associated appendices have been expanded to include the new Restoration Service Guarantee.

[11] Consolidated Dockets 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 is continuing 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 further improves 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. Some of the key highlights that were completed within 2017 include:

- Outage Communication
    - Proactively communicate outage information (per customer's preference) via channel of their choice including email, text messaging, and voice
    - Enable customer outage reporting via text messaging
    - Improve Outage Maps at PSE.com for better customer experience
- Interactive Voice Response (IVR) System Enhancements
    - Menu adjustments to simplify the customer experience
    - Messaging adjustments to provide consistent information
    - Faster routing to live customer service representatives
- Start, Stop, Transfer
    - Improved online experience for customers seeking to self-serve via PSE.com
- Billing & Payment
    - Additional bill code clarity and specificity

CHAPTER 2

CUSTOMER SERVICES, CUSTOMER 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 2017 results of PSE's seven service quality indices (SQIs) related to customer services, customer satisfaction and operations 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 2017

Key Measurement	Type of Metric	Benchmark/Description	2017 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**	**0.20**	☑

Overview

Each year the UTC receives complaints from PSE customers on a variety of topics. In 2017, there were a total of 388 complaints, up from 350 in 2016. The 2016 SQI #2 complaint ratio was 0.18, while the 2017 complaint ratio was 0.20.

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:

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

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 2018 include:

- Continue to focus on the 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 the UTC and PSE.

Customer Access Center Answering Performance (SQI #5)

Table 2b: Customer Access Center Answering Performance for 2017

Key Measurement	Benchmark	2017 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**	**78%**	**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 2017, the CSRs answered 78 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. With the exception of four busy calls that occurred during the phone service vender's maintenance window, all 2.6 million calls received in 2017 to 1-888-Call-PSE went through either 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 that the new SQI #5 benchmark of 80% of calls being answered within 60 seconds will be achieved. This is a change from the 2017 benchmark of 75% of calls being answered by a live customer service representative within 30 seconds of request to speak with a live operator. In 2018, PSE will:

- Continue to deliver on-going agent training to improve proficiency and elevate the customer experience
- 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 Performance Quality team
- Continue to improve upon the debt collection and disconnection processes to ensure sound business practices are followed
- Through PSE's Get to Zero initiative, continue to improve self-service options that allow customers to complete various transactions online

Customer Access Center Transactions Customer Satisfaction (SQI #6)

Table 2c: Customer Access Center Transactions Customer Satisfaction for 2017

Key Measurement	Type of Metric	Benchmark/Description	2017 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[12], conducted telephone surveys with PSE customers and prepared monthly and semi-annual reports on customer satisfaction regarding Customer Access Center transactions during the 2017 SQ reporting year. The independent survey-results found that 93% of customers surveyed were satisfied with the Customer Access Center's overall transaction performance (SQI #6). This is unchanged from 2016.

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:

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

[12] 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 Dockets UE-011570 and UG-011571. PSE's compliance filing pursuant to the paragraph 13 of Order 21 of Dockets 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 2018 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 2017

Key Measurement	Type of Metric	Benchmark/Description	2017 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**	**32 minutes**	☑

Overview

The primary responsibility of PSE's Gas First Response (GFR) team is to respond to natural gas emergencies. In 2017, PSE responded to more than 25,082 calls concerning natural gas safety. These emergencies include reports of odors, third-party damage to PSE's system, and 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 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 2018, PSE will focus on the following:

- Continue to daily monitor and evaluate emergency response time data
- Adjust processes and balance resource coordination
- Provide continuous employee coaching

Field Service Operations Transactions Customer Satisfaction (SQI #8)

Table 2e: Field Service Operations Transactions Customer Satisfaction for 2017

Key Measurement	Type of Metric	Benchmark/Description	2017 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)**	**94%**	☑

Overview

EMC Research[13], an independent research company, conducts telephone surveys with PSE customers who have requested and received natural gas field service. In 2017, these surveys found that 94% 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:

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

[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 Dockets 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 Dockets 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 2018 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 by offering better ways for self-service options, including scheduling of field services

Appointments Kept (SQI #10)

Table 2f: Appointments Kept for 2017

Key Measurement	Type of Metric	Benchmark/Description	2017 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 2017, PSE achieved a result of 100%[14] 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.*

[14] Results shown are rounded from 99.6% to the nearest whole percentage per UTC order. However, the 100% 2017 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[15] 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 2018 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
- Continue to evaluate tools and technologies that would enable a higher level of customer service and convenience through PSE's Get to Zero initiative by offering better ways for self-service options, including scheduling of field services

[15] 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 2017

Key Measurement	Type of Metric	Benchmark/Description	2017 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 responded to more than 18,000 electric incidents in 2017. 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, etc.

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.

About the Benchmark

The electric safety response time for emergency incidents 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 or safety incidents.

Going Forward

In 2018, 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:

- Adding two EFR personnel in 2018 and continue to analyze 2018 EFR staffing levels to ensure adequate response.
- Continue to enhance the Outage Management System(OMS)technology, providing improved electric system information to increase efficiency in managing outage events and first response personnel
- Evaluate an automatic call-out tool in 2018 to increase visibility of available resources and drive dispatch efficiencies for field personnel responders
- Through the Get to Zero initiative, continue efforts to update PSE's dispatching, scheduling and mobility solution.
- Continue to improve the process to check single customer outage reports for accuracy before dispatching field resource. Integrating meter pinging into the OMS has positively impacted this process in 2017.

Service Provider Performance

Table 2h: Service Provider Performance for 2017

Key Measurement	Type of Metric	Benchmark/Description	2017 Performance Results	Achieved
Customer Services and Satisfaction and Operations Services				
Service provider standards compliance—Quanta Electric	**Service Provider Index #1B**	**Level 1 ≤ 15 dev/1000 Level 2 ≤ 25 dev/1000 Level 3 ≤ 25 dev/1000**	**Level 1 4.94 Level 2 11.27 Level 3 8.52**	☑
Service provider standards compliance—Quanta Gas	**Service Provider Index #1C**	**Level 1 ≤ 15 dev/1000 Level 2 ≤ 25 dev/1000 Level 3 ≤ 25 dev/1000**	**Level 1 5.54 Level 2 13.37 Level 3 3.95**	☑
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**	**254 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**	**278 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 achieve a level of conformance to PSE standards as follows:

    - Quanta Gas
        - For Level 1 inspection items: ≤ 15 deviations/1000 items inspected
        - For Level 2 inspection items: ≤ 25 deviations/1000 items inspected
        - For Level 3 inspection items: ≤ 25 deviations/1000 items inspected

    - Quanta Electric
        - For Level 1 inspection items: ≤ 15 deviations/1000 items inspected
        - For Level 2 inspection items: ≤ 25 deviations/1000 items inspected
        - For Level 3 inspection items: ≤ 25 deviations/1000 items inspected

- 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.–3:30 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: 2017 Service Provider Appointments and Missed Appointment Penalties for 2017

Service Provider Appointments				Missed Appointment Penalties		
Service Provider	Electric	Natural Gas	Total	Electric	Natural Gas	Total
Quanta Gas	**N/A**	**10,007**	**10,007**	**N/A**	**$13,700**	**$13,700**
Quanta Electric	**8,247**	**N/A**	**8,247**	**$3,900**	**N/A**	**$3,900**
Total	***8,247***	***10,007***	***18,254***	***$3,900***	***$13,700***	***$17,600***

Going Forward

PSE and our service providers will continue the following initiatives for 2018:

- 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) for a scheduled appointment and Restoration Service Guarantees (Service Guarantee #2 and Service Guarantee #3) for electric service restoration.

PSE promotes its Customer Service Guarantee and the Restoration Service Guarantees on *PSE.com*, the back of billing stock, and on the billing/return envelope. It is also highlighted in the customer newsletter[16] as part of customer bill inserts. These promoting efforts are detailed in Appendix F: Customer Service Guarantee Performance Detail.

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.

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.*

[16] 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 Guarantees

PSE has two Restoration Service Guarantees (RSG) under the conditions of electric Schedule 131 that provides a $50 credit to a qualified customer who experiences a prolonged outage during a non-storm outage for more than 24 consecutive hours or is out of electric service for at least 120 consecutive hours for any outage. To receive the RSG credit, affected customers must report the outage or request the credit within seven days of their service restoration. The 120-hour Restoration Service Guarantee has been effective since November 1, 2008. The 24-hour Restoration Service Guarantee became effective on January 1, 2017, which was established to replace the SQI #3 SAIDI penalty mechanism.

Both Restoration Service Guarantees will be suspended if PSE lacks safe access to its facilities to perform the needed repair work. To receive either or both the service guarantee payments, affected customers must report the outage or apply within 7 days after the restoration of their electric service.

The maximum credit payment to customers for the 120-hour Restoration Service Guarantee is $1.5 million. There is no limit of PSE's 24-hour Restoration Service Guarantee credit payment to customers.

The availability of the 120-hour 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.

2017 Service Guarantees Credits

Customer Service Guarantee Credits

In 2017, PSE credited customers a total of $23,250 for missing 465 of the 114,005 SQI #10 appointments. Table 2j provides summary values of Service Guarantee counts and payments to customers in 2017 by service type.

Table 2j: 2017 PSE SQI #10 Appointment Count and Customer Service Guarantee Credits

	SQI #10 Appointment Counts			Customer Service Guarantee Payments to Customers		
Service Type	Electric	Natural Gas	Total	Electric	Natural Gas	Total
Permanent Service	**8,247**	**10,007**	**18,254**	**$3,900**	**$13,700**	**$17,600**
Reconnection	**51,712**	**20,547**	**72,259**	**$2,150**	**$1,200**	**$3,350**
Diagnostic	**N/A**	**23,492**	**23,492**	**N/A**	**$2,300**	**$2,300**
Total	***59,959***	***54,046***	***114,005***	***$6,050***	***$17,200***	***$23,250***

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, 2017.

Restoration Service Guarantee Credits

PSE is committed to reviewing all prolonged outages that may trigger the Restoration Service Guarantees and any customer requests for the RSG credit within 30 days of a request. The following table summarizes payments to customers in 2017.

Key Measurement	Type of Metric	Benchmark/Description	No. of Customers	Restoration Service Guarantee Payments to Customers
120-Consecutive – hour power outage restoration guarantee	**Service Guarantee #2**	**A $50 credit to eligible customers when experienced a power outage is longer than 120 consecutive hours**	**6**	**$300**
24-Consecutive-hour non-major storm power outage restoration guarantee	**Service Guarantee #3**	**A $50 credit to eligible customers when experienced a power outage is longer than 24 consecutive hours during non-major storms**	**250**	**$12,500**
Total			***256***	***$12,800***

CHAPTER 3

ELECTRIC SERVICE RELIABILITY

Safe and reliable electric service is one of PSE's paramount goals. This report defines what electric system reliability is at PSE and provides the Washington Utilities and Transportation Commission (UTC) 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 and by PSE's resolution of customer concerns. The two commonly used reliability metrics are System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI). Customer concerns about electric service quality and reliability are received either directly by PSE or through the UTC. Reporting of these customer concerns and PSE's resolution provides another important perspective of electric reliability.

PSE follows SQI #3 and #4 as a partial indicator of reliability improvement progress and understands that there are variations such as weather which impact the results. PSE has a long term strategy to focus on reliability and this report details PSE's current progress and roadmap to improve reliability for customers.

This year's report is different than previous versions in creating more transparency into the planning process, actions, challenges and future plans to improve electric system reliability. PSE's intent is to ensure a better understanding of how planned projects are identified; to report on actions taken to improve reliability; to compare project progress to previously reported planned improvements; and to present the five-year reliability strategy roadmap to drive reliability performance above the industry average.

PSE believes electric service reliability performance should be looked at from multiple lenses in addition to the system-wide SAIDI and SAIFI over a single year's time frame. PSE's reliability strategy roadmap includes expanding lenses to include reliability metrics beyond the system-wide SAIDI and SAIFI by further evaluating Customers Experiencing Multiple Interruptions (CEMI), reviewing econometric based targets, Momentary Average Interruption Frequency Index (MAIFI), as well as individual customer reliability to ensure a more comprehensive view of overall electric service reliability performance. This multiple lenses approach is in recognition that there is more than one consideration, metric and method for which reliability performance can be solely based upon.

While this annual report provides useful information to interested parties for a given calendar year, a single year's result may not lend to adequate identification of the best solution for long-term electric system improvement,

and the actions taken based on an annual snapshot may result in Band-Aid solutions that may not meet long-term objectives. Factors such as variation in weather, service territory change[17] and random events (e.g. third-party damage) will all impact year-to-year comparison of system performance. Notwithstanding the limits of using the annual reports to assess year-to-year trends, PSE believes the annual snapshots provide a useful lens to consider in context of the overall electric system performance trends. PSE serves approximately 1.1 million electric customers across 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 electric service area. More information about PSE's infrastructure can be found at PSE.com[18].

SQI Performance

The following sections detail PSE's SQI SAIDI and SAIFI performance and discuss the annual reliability reporting requirements and results for the 2017 reporting year. Based on the recorded outages, both SQI SAIDI and SQI SAIFI saw an increase in 2017 as compared to 2016, 22% and 13% respectively, as illustrated in Table 3a. PSE met the benchmark for SQI SAIFI but did not meet the benchmark for SQI SAIDI, primarily due to an increase in customer minute interruptions associated with tree related outages.

Table 3a: 2016 and 2017 SQI-4 SAIFI and SQI-3 SAIDI Annual Results

	Benchmark	2016	2017
SQI #4 SAIFI	**1.30**	**1.06**	**1.20**
SQI #3 SAIDI	**155**	**148**	**175**

2017 Weather Events

Weather events continue to impact overall reliability performance and are a key contributing factor PSE considers as one lens to evaluate reliability. PSE utilizes "Total" electric reliability performance information which includes "storm" days, in addition to "blue-sky" days which excludes these storm days. PSE recognizes that customer expectations may be different during these storms versus a blue-sky day, and as such both storm and non-storm information continues to be a focus.

PSE experienced seven significant weather events during 2017: one each in February, April, October, November, and December; and two in May. The February wind and snow storm was a week-long event that was unusual in that PSE's service territory was impacted by snow in the first part of the week and as PSE was restoring power to customers impacted by the snow a wind storm hit the service territory later in the week. Per the exclusion criteria for SQI SAIFI, the entirety of the event is excluded from the SQI SAIFI performance calculation.

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[17] Prior to April 1, 2013, PSE provided electric service to Jefferson County. On April 1, 2013, the government of Jefferson County assumed responsibility for the electric service in the county.

[18] https://pse.com/aboutpse/CorporateInfo/Pages/PSE-Primer.aspx

However, per the exclusion criteria for SQI SAIDI, only three of the seven days are excluded from the SQI SAIDI performance calculation. And one of those days, February 6th, meets the definition of a catastrophic event day. During the course of the event, approximately 329,890 customers, about one third of PSE customers were without power.

Long-Term Electric Service Reliability Strategy

The SQI targets are used as a guideline for a reasonable level of reliability. In addition, PSE has also tracked industry metrics through the Institute of Electrical and Electronics Engineers (IEEE) Reliability Benchmarking Survey[19] to measure how performance aligns with industry. In 2017, PSE added analysis information from the econometric benchmarking study initiated by UTC staff as well as data from the Interruption Cost Estimate (ICE) calculator[20] to come up with new targets for system-wide SAIDI and SAIFI reliability metrics. The analysis suggested that achieving a SAIDI of 120 – 130 and maintaining SAIFI at 1.00 – 1.15 should be PSE's primary focus over the next five years and achieving first quartile performance should be a long-term target.

Figure 3a illustrates PSE's system-wide SAIDI and SAIFI goals to achieve 2nd quartile performance in the IEEE Reliability Benchmarking Survey by 2022 and the long-term target of achieving 1st quartile performance.

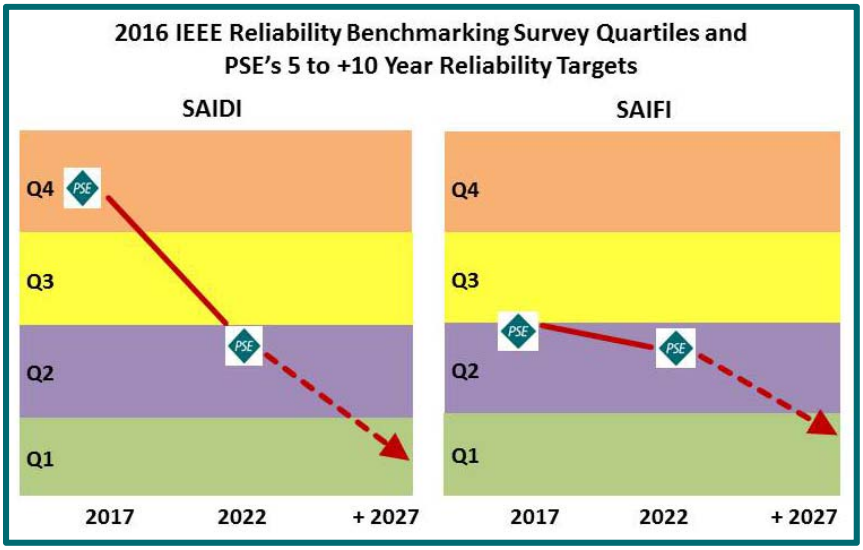

Figure 3a: PSE's 5 to +10 Year Reliability Targets

[19] Refer to the IEEE Reliability Benchmarking Survey discussion in the *About Electric Service Reliability Measurements and Baseline Statistics* section for more information

[20] The Interruption Cost Estimate (ICE) Calculator is a tool estimating electric service interruption costs. It was funded by the Office of Electricity Delivery and Energy Reliability at the U.S. Department of Energy and developed by Freeman, Sullivan & Co. and Lawrence Berkeley National Laboratory.

PSE does not believe system level performance or targets provide the clarity or vision of what customers expect for reliability and therefore in 2018, PSE will also begin evaluating targets for individual customer reliability in addition to the system targets. To meet these reliability goals, PSE will be focusing on improving inter-departmental coordination, electric system design, data analysis, new metrics and incorporating emerging technologies. PSE's reliability strategy moving forward and details on these strategies can be found in the Going Forward– Action Plan for 2018 to 2022 discussion in the *Working to Improve Reliability* section.

About Electric Service Reliability Measurements and Baseline Statistics

Overview

PSE, like most electric utilities, uses industry standard electric service system-wide reliability indices, SAIFI and SAIDI, to monitor its annual performance. PSE reports the SAIFI and SAIDI performance results in many 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, as noted in the respective SAIFI (SQI #4) and SAIDI (SQI #3) sections.

In addition to system-wide reliability metrics, it is useful to look at customer level metrics such as CEMI. In 2018, PSE will be working to develop more granular reliability measures to facilitate CEMI reporting starting in 2019 as well as identifying pockets of customers experiencing poor reliability that may not be visible when focusing on system-wide or circuit level reliability.

Baseline Year

To meet UTC requirements[21], 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 recommends using multi-year trends in addition to multiple lenses to be more aligned with industry best practices to evaluate overall reliability performance, such as a five-year average. An attempt to use a single year's system performance data or information to assess year-to-year trends may prove inconclusive. PSE believes that there is limited usefulness in designating one specific year's information as a "baseline." Also, comparing current year results to a 14-year old baseline year that was established based on different outage data collection methods and changing customer expectations is not meaningful.

[21] WAC 480-100-393, Electric service reliability monitoring and reporting plan, (b) When the utility will establish baseline reliability statistics to report to the commission. Prior to establishing baseline reliability statistics, the utility must report the best information available. The utility must establish baseline reliability statistics within three years of the effective date of this rule.

IEEE Reliability Benchmarking Survey

Annually, PSE participates in a benchmarking survey coordinated by IEEE. IEEE collects information from participating utilities and documents the IEEE Standard 1366[22] performance based on an individual utility ranking (#1 being the best) and within four quartiles (first quartile being the best). It is important to note that since 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.[23] IEEE conducts the annual survey in the spring of each year with results available in late summer for the outages that occurred in the preceding year. Due to the timing of the survey, there is a year time-lag in reporting PSE's annual rank. In the 2016 IEEE survey of 89 member utilities, PSE ranked 66th (3rd quartile) in SAIDI and 36th (2nd quartile) in SAIFI. PSE remained in the same quartiles as 2015. Figure 3b illustrates PSE ranking in the survey since 2013. The results of the 2017 IEEE survey are expected in late summer 2018.

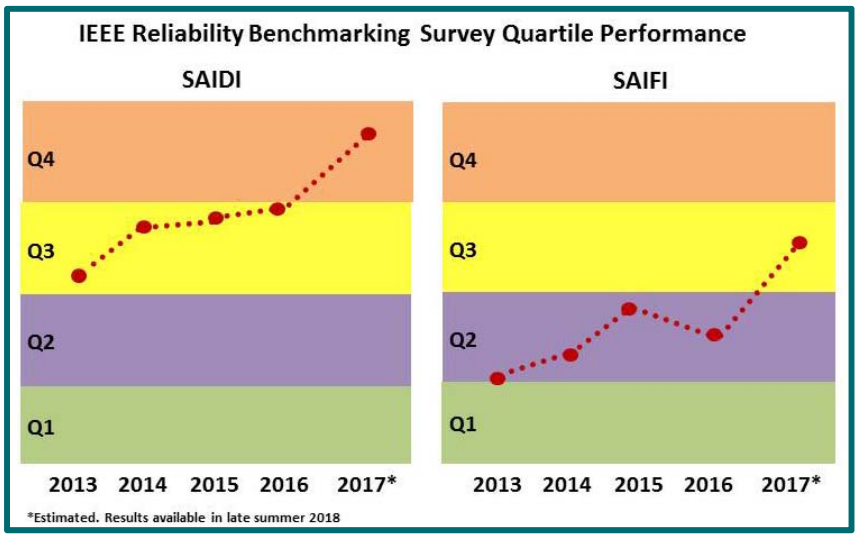

Figure 3b: IEEE Reliability Benchmarking Survey Quartile Performance

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

[23] Refer to the Major Events discussion for more information

Major Events

PSE has multiple major event definitions that apply to SAIFI (also referred to as 5% SQI Exclusion) or SAIDI metrics. For SAIFI, 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. The days that meet that criterion are excluded from that metric.

For the purpose of measuring SQI SAIDI, days that exceed the annual adjusted Major Event Day Threshold 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. A catastrophic day is defined as any day that exceeds the 4.5 Beta threshold. In addition, PSE also calculates SAIDI using the IEEE 1366 2.5 Beta methodology without adjusting for catastrophic days, referred to IEEE SAIDI. More information concerning these metrics, definitions and calculations can be found the About the Benchmark discussion in the *SAIFI SQI #4* and *SAIDI SQI #3* sections of this report.

In 2017, PSE experienced the following major storm events that met the SQI SAIDI, 5% SQI exclusion, or the IEEE Standard 1366 exclusion criteria:

- A February event that affected customers throughout PSE's Western Washington service territory.
- An April event that affected customers in Pierce and Thurston Counties.
- An early May event that affected customers in the southern part of King County and Thurston County.
- A late May event that affected customers Whatcom, Skagit and Island Counties.
- An October event that affected customers throughout PSE's Western Washington service territory.
- A November event that affected customers throughout PSE's Western Washington service territory except for Pierce County.
- A December event that affected customers in Whatcom County and the northern part of King County.

Table 3b, on the following page, details the dates, causes and exclusion criteria for the SQI SAIDI, IEEE, and 5% exclusion events in 2017. 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 2017, 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 2017, three of the IEEE T_{MED} and SQI SAIDI events did not meet the 5% Exclusion Major Event Day criteria.

Table 3b: 2017 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 SAIFI Exclusion	Cause	Span of 5% Customers Out Exclusion Period
2/5/2017	2/5/2017	20.44	--	5.83%	Wind, Snow, Ice	2/4/2017 7:30 AM - 2/11/2017 4:21 AM
2/6/2017	2/6/2017	102.92	☑			
2/9/2017	2/9/2017	12.22	--			
4/7/2017	4/7/2017	13.04	--	n/a	Wind	n/a
5/4/2017	5/4/2017	31.45	--	n/a	Lightning, Wind, Hail	n/a
5/23/2017	5/23/2017	7.08	--	n/a	Wind	n/a
10/18/2017	10/18/2017	21.02	--	5.87%	Wind	10/18/2017 1:30 PM - 10/20/2017 12:00 AM
11/13/2017	11/13/2017	64.46	--	18.71%	Wind	11/13/2017 2:00 AM - 11/16/2017 1:30 AM
12/29/2017	12/29/2017	28.42	--	6.62%	Wind, Snow, Ice	12/29/2017 2:00 PM - 1/6/2018 2:45 PM

Table 3c details the threshold values and number of major events IEEE SAIDI and 5% SQI exclusion from 2013 through 2017 and the 2016 through 2017 SQI SAIDI threshold values and number of events for major and catastrophic events.

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

	2013	2014	2015	2016	2017
SQI SAIDI T_{MEDADJ}	n/a	n/a	n/a	5.53	5.62
Number of SQI SAIDI Major Event Days	n/a	n/a	n/a	6	9
IEEE SAIDI T_{MED}	5.62	5.60	6.10	6.46	6.72
Number of IEEE T_{MED} Major Event Days	3	12	10	5	9
SQI SAIDI T_{CAT}	n/a	n/a	n/a	99.25	98.72
Number of SQI SAIDI Catastrophic Event Days	n/a	n/a	n/a	1	1
Number of SQI SAIFI Major Events	3	6	5	4	4
Number of SQI SAIFI Major Event Days	7	22	18	10	17

Outage Causes

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 2017. The five-year history of number of outages by cause and customer minute interruptions by cause is illustrated in Figure 3c and Figure 3d respectively. Both figures show that equipment failures (EF), trees (TF, TO, TV) and scheduled outages (SO) continue to be the primary reasons for non-Major Event Day (non-MED) outages in 2017 as in previous years. The 'Other' cause is an accumulation of 20 other cause codes, which explains the high customer minute interruptions in Figure 3d.

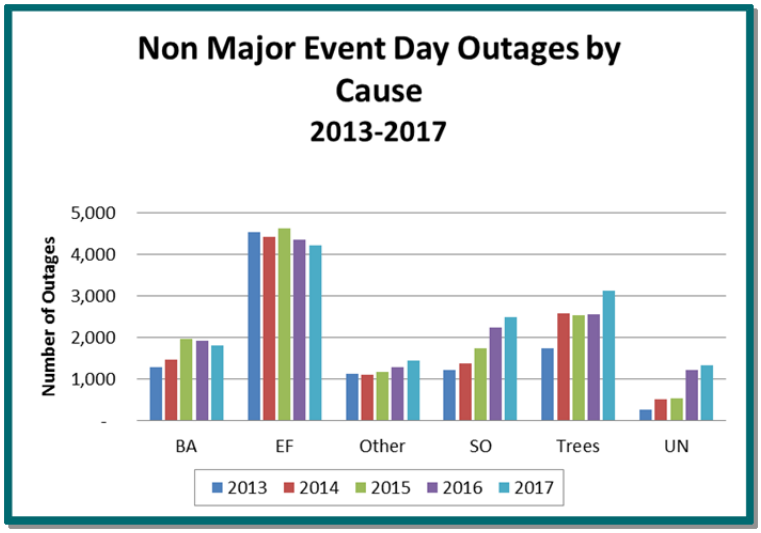

Figure 3c: Non Major Event Day Number of Outages by Cause

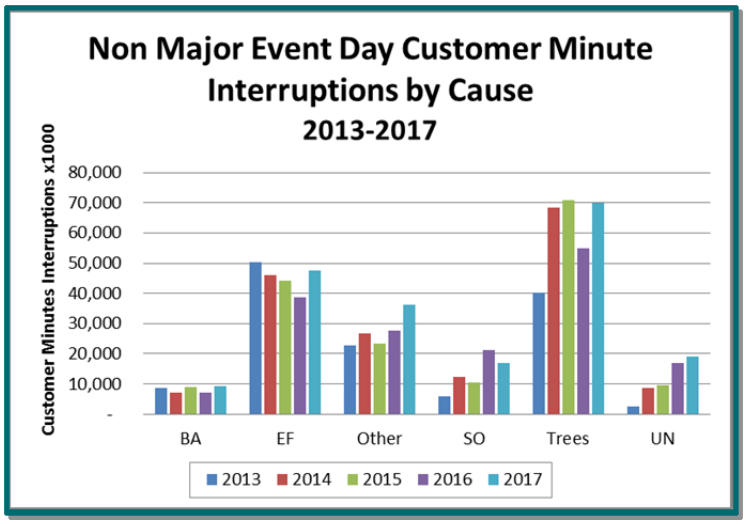

Figure 3d: Non Major Event Day Customer Minute Interruptions by Cause

With over 23,000 miles of equipment in PSE's electric system, equipment failure (EF) is a large contributor to the number of outages. The equipment failure category covers many equipment types, the largest of which, as measured by number of outages, SAIDI and SAIFI, was underground cable. Aging cable is addressed by PSE's cable remediation program and is described in the Aging Infrastructure discussion in the *Working to Improve Reliability* section of this report.

A significant number of outages from trees make sense given that PSE's territory is heavily forested with approximately twice the United States average in number of trees per mile.[24] Trees are the largest outage contributor to customer minute interruptions; even though trees are the second largest contributor to outage count. This is because, on average, tree-caused outages affect three times more customers and have longer outage durations than equipment failure caused outages. Trees off right-of-way, in particular, cause 86% of tree related outages and can only partially be avoided with traditional tree trimming and alternatives such as replacing conductor with stronger insulated "tree wire". Entirely avoiding tree outages requires converting overhead lines to underground systems or developing ways to gain access to trees on private property.

Because the Northwest is heavily forested, many trees provides habitat for large populations of birds and squirrels. The overall relatively flat trend in the bird and animal (BA) outages is impressive considering that squirrels, in particular the Eastern grey squirrel, have been increasing both in population and territory. This is discussed further in the Wildlife discussion in the *Working to Improve Reliability* section of this report.

Scheduled outages, 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 and the system is reconfigured prior to construction to minimize the number of customers affected. Though the number of scheduled outages slightly increased in 2017, the total customer minute interruptions decreased. Both the average duration and number of customers impacted of a scheduled outage decreased in 2017.

Figure 3c also illustrates that outages labeled as unknown (UN) have recently had a sizable increase which is partially due to improvements in guidelines on how outages are categorized. Previously these outages would likely have been categorized as trees or equipment failures. Beginning in 2018, fault location technologies and root cause analyses, as noted in the Going Forward– Action Plan for 2018 to 2022 discussion in the *Working to Improve Reliability* section, will help to identify outage causes and begin to reduce the number of outages with unknown causes.

[24] CN Utility Consulting's 2016 Distribution Utility Vegetation Management (UVM) benchmark survey. The survey was initiated to fulfill the Ontario Energy Board's request to compare Hydro One Networks' vegetation program with peer North American UVM programs. The participants of the survey included PSE and 40 other utilities.

Balanced Approach to Reliability Improvements Targeting Areas of Concern

PSE's system planning personnel (Planners) investigate multiple "areas-of-concern" and propose projects that will improve the reliability for customers being served by those circuits. To assist with identifying the highest priority projects for reliability, PSE focuses on the "areas of greatest concern" which historically included the Top 50 worst-performing distribution circuits over the past five years that consistently contributed the most customer-minute interruptions (CMI). Each circuit is ranked by the total CMI seen by the circuit for each of the previous five years and those with the highest ranking are considered the Top 50 worst-performing distribution circuits. In 2017, as part of Docket UE-170033, PSE has expanded the areas of greatest concern to also include circuits that exceed specific SAIDI, SAIFI and CMI thresholds. The Top 50 and these expanded thresholds are now considered as PSE's worst performing circuits (WPC). The WPC provide focus areas for the Planners in developing electric system improvement projects; however, all areas are continually evaluated for electric service reliability improvement.

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 2017 WPC along with PSE's completed or future plan for system improvements on each circuit. It is a multi-year process to completely address the WPC, as it will take a number of years to plan, approve, design and build the necessary improvements. A one year snapshot comparing the Year End 2017 Top 50 worst-performing distribution circuits to the Year End 2016 Top 50 worst-performing distribution circuits, PSE found that 12 circuits were improved enough to fall off the list and 38 remained on the list from the previous year.

The Planners also monitor performance on circuits that do not meet the current WPC criteria to ensure the reliability performance does not falter in other parts of the system. The Planners review outage history, number of customers impacted, outage location, as well as receiving feedback from field personnel to identify and propose reliability improvement projects. Collectively, the information gathered is used to establish a project benefit which is compared to the overall cost of the improvement resulting in a benefit-to-cost (B/C) ratio. This system planning process is detailed in the Planning Process discussion in the *Working to Improve Reliability* section, and allows PSE to distinguish those improvements that can help significantly improve reliability.

The system planning process also establishes a B/C ratio for projects to address the reliability on WPC. This helps optimize work on those circuits which best improves system reliability. It is important to note that projects to address the reliability on WPC do not always bring the greatest value to all customers. Those projects are needed to address the on-going reliability concerns of the customers on WPC. Without this distinct focus on the WPC, the individual customer experience will continue to degrade.

As customer level reliability reporting, such as CEMI, is developed, smaller pockets of customers with reliability issues are identified and evaluated for improvements. This complements the WPC analysis to provide a comprehensive approach to reviewing reliability performance for all customers. As system management tools improve and new technologies, such as Advanced Metering Infrastructure (AMI), are implemented, the accuracy of this reporting will improve and allow for ever more efficient targeting of reliability improvement projects.

Customer Electric Reliability Complaints

Customer complaints and jurisdictional concerns about electric reliability and power quality are additional metrics that measure PSE's success in delivering safe and reliable electric service.

PSE Complaints

PSE responds to customer inquiries concerning outage frequency or duration and/or power quality. Most of the first inquiries are adequately addressed in the initial response and the customer does not contact PSE again. However, 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.

Figure 3e illustrates the 2013 – 2017 number of recorded PSE complaints. During the rolling two-year period of 2016–2017, PSE received complaints from 56 customers relating to reliability and power quality concerns as compared to 81 complaints recorded in the rolling two year period of 2015-2016. On average, PSE has seen an increase in the number of complaints since 2012-2013 which might be attributed to the improvement in the data collections method and business processes for customers inquiries. Another increase in complaints can be attributed to organized neighborhood groups calling PSE to complain about electric reliability in their area. This occurred most recently in 2016, as a number of customers in the Kenmore area called PSE. PSE's complaint process and the change in data collection are described in Appendix I: *Electric Reliability Data Collection Process and Calculations*. The 2016-2017 complaints are shown in tabular form in Appendix M: *Current-Year Commission and Rolling-Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions*.

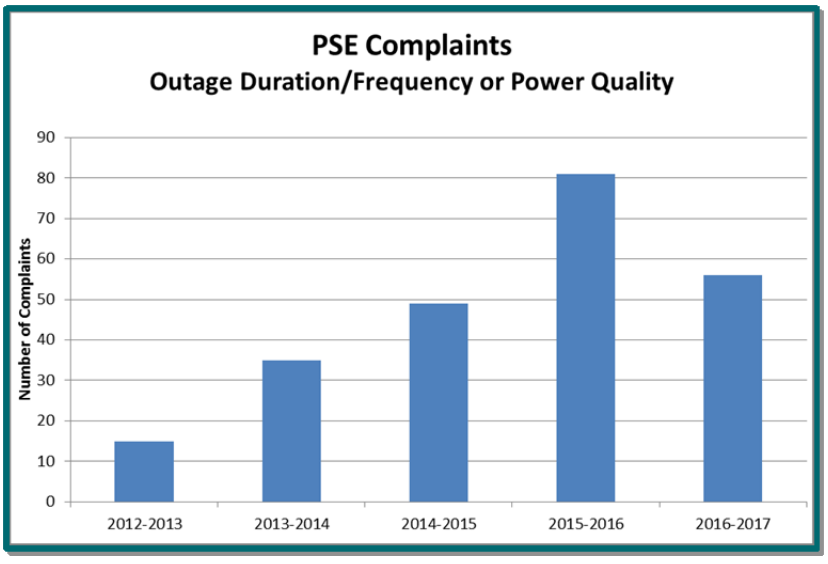

Figure 3e: Five Year History of PSE Complaints

UTC Complaints

The number of electric service quality complaints received by the UTC in regards to outage duration or frequency and/or power quality is another important indicator to measure PSE's electric service reliability success. Figure 3f illustrates 2013 – 2017 number of UTC electric service quality complaints in regards to outage duration or frequency and/or power quality. PSE believes the increase in 2015 was primarily due to the UTC's ad campaign which encouraged the public to reach out to them with reliability concerns**.** In 2017, the UTC received 12 complaints relating to PSE's electric service quality as compared to 18 in 2016. The 2017 complaints are shown in Appendix M: *Current-Year Commission and Rolling-Two-Year PSE Customer Electric Service Reliability Complaints with Resolutions.*

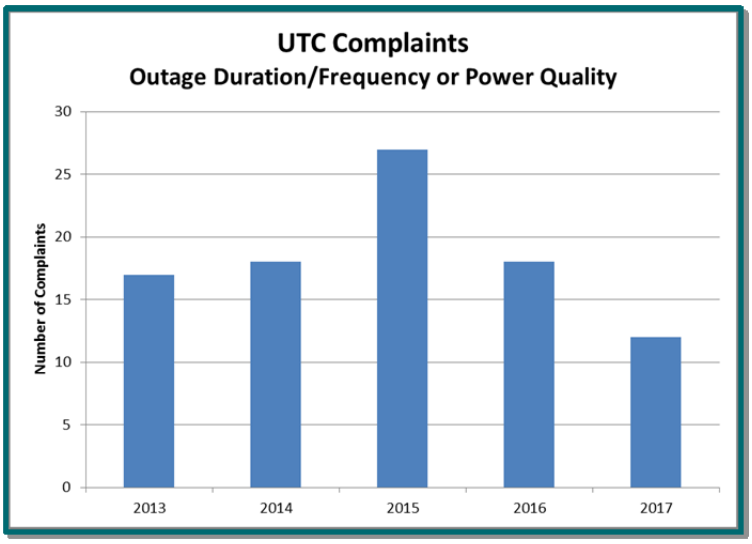

Figure 3f: Five Year History of UTC Complaints

In addition to the customer inquiries and UTC complaints, jurisdictions also have concerns about electric service reliability. Oftentimes, this is a result of constituents initiating contact with their local government entity to act as a unified voice to PSE. PSE works with these jurisdictions to address the reliability concerns.

PSE investigates these customer inquiries, UTC complaints and jurisdictional concerns, and tracks service issues. Customers receive follow-up correspondence from PSE that address their specific concern, as well as PSE's plan 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 and communicated.

Depending on the nature of the circuit reliability, the plan for resolution could be continued monitoring of the circuit or a 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 2017.

With SAIDI performance declining and customer expectations rising, PSE can anticipate continued complaints and will continue to work to address concerns at the initial inquiry to decrease PSE and UTC complaints.

SAIFI (SQI #4)

Overview

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.

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.

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.[25]

At PSE, for the purpose of measuring the SQI SAIFI, 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.

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

- **IEEE SAIFI ($SAIFI_{IEEE}$)**—Measures the number of customer interruptions utilizing the IEEE Standard 1366 methodology. Days that exceed the IEEE T_{MED}[26] are excluded. The 2017 T_{MED} is 6.71 minutes—that is, any day that exceeds 6.71 minutes per customer is excluded due to IEEE-defined Major Event Days.

2017 SAIFI Results

The 2017 results based on the recorded outages are reported in Table 3d.

Table 3d: 2017 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**	**1.80**	**--**
$SAIFI_{Total\ 5\text{-}year\ Average}$	**Total (all outages five-year average) SAIFI**	**n/a**	**1.37**	**1.74**	**--**
$SAIFI_{5\%}$ **(SQI #4)**	**<5% Non-Major-Storm (<5% customers affected) SAIFI**	**No more than 1.30 interruptions per year per customer**	**0.80**	**1.20**	☑
$SAIFI_{IEEE}$	**IEEE Non-Major-Storm (T_{MED}) SAIFI**	**n/a**	**0.71**	**1.12**	**--**

Appendix L: *1997-Current Year PSE SAIFI and SAIDI Performance by Different Measurements* details the historical results of the four measurements from 1997 through the current reporting year.

What Influences SAIFI

PSE tracks outages by cause codes and groups. System damage caused by trees and vegetation continue to impact the most customers in 2017, as in previous years. The other major causes of outages were:

- Equipment failures (EF): This outage cause covers many equipment types, the largest of which is underground cable failures. Aging cable is addressed by PSE's cable remediation program and is described in the Aging Infrastructure discussion in the *Working to Improve Reliability* section of this report.
- Unknown (UN): This cause code covers those outages when electric first response (EFR) personnel were unable to determine the cause of the outage.

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

- Scheduled Outages (SO): Planned outages to perform system maintenance or installation of new infrastructure
- Bird and Animal (BA): Outages cause by wild life, primarily squirrels
- Other: The Other category includes the other 20 cause codes that PSE tracks, such as underground dig-ups, vehicle-related outages (vehicle impacting pole, padmount switch, guy wire, etc.) and errors in operating the electric system.

Figure 3g shows the common causes for the recorded outages in 2017 and their impact on customers across $SAIFI_{Total}$ and $SAIFI_{5\%}$ measurements.

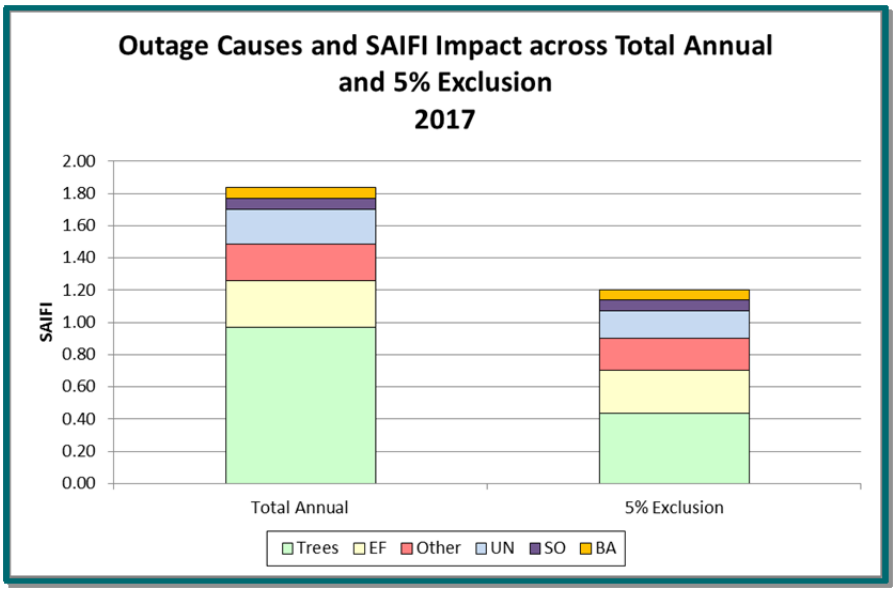

Figure 3g: Common Outage Causes and SAIFI Impact a across Total Annual and 5% Exclusion in 2017

Historical Trends for SAIFI

Table 3e shows SQI SAIFI from 2013 to 2017.

Table 3e: SQI SAIFI from 2013 to 2017 (excluding 5% Major Events)

	2013	2014	2015	2016	2017
$SAIFI_{5\%}$ **(SQI #4)**	**0.86**	**1.05**	**1.11**	**1.06**	**1.20**
Benchmark	**1.30 interruptions per year per customer**				

As shown in Table 3e, 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 among the four SAIFI measurements for 1997–2017. Based on the recorded outages, the 2017 results across all four of the measurements worsened when compared to 2016. The primary driver for decline in performance was due to more customers impacted by tree related outages than in 2017.

Appendix K: *Historical SAIDI and SAIFI by Area* illustrates the 2015–2017 results by county under the $SAIFI_{Total}$ and $SAIFI_{5\%}$ measurements. A summary of Appendix K indicates that the 2017 SAIFI performance level was consistent across counties. Several changes in 2017, in comparison to the 2016 performance for each county, noted as follows:

- Whatcom, King, Kittitas, Pierce and Thurston Counties saw decline in performance across the two measurements
  - Whatcom County $SAIFI_{Total}$ decline in performance was due to more outages of unknown cause. $SAIFI_{5\%}$ decline in performance was due to additional tree related outages.
  - King County $SAIFI_{Total}$ and $SAIFI_{5\%}$ decline in performance was due to more customers being affected by outages of an unknown cause and additional tree related outages.
  - Kittitas County $SAIFI_{Total}$ and $SAIFI_{5\%}$ decline in performance was due to a widespread equipment failure outage.
  - Pierce County $SAIFI_{Total}$ and $SAIFI_{5\%}$ decline in performance was due to a widespread transmission outage, an outage caused by a third party, and additional tree related outages.
  - Thurston County $SAIFI_{Total}$ and $SAIFI_{5\%}$ decline in performance was due to more customers affected by tree related outages.
- Skagit, Island and Kitsap Counties saw a decline in $SAIFI_{5\%}$ performance but an improvement in $SAIFI_{Total}$
  - Skagit County $SAIFI_{5\%}$ decline in performance was due to more customers being affected by tree outages and outages caused by a third party.
  - Island County $SAIFI_{5\%}$ decline in performance was due to more customers being affected by tree outages.
  - Kitsap County $SAIFI_{5\%}$ decline in performance was due an accident related outage caused by a third party.

As described more fully in the *Working to Improve Reliability* 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 for PSE. PSE's electric service reliability 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 and trees. Whenever power failures occur, PSE works around the clock to restore service as soon as possible.

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.[27]

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 with an additional and adjustment of 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 five 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 2017 T_{MEDADJ} is 5.62 minutes—that is, any day that exceeds 5.62 minutes per customer is excluded from the annual SQI SAIDI results.

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

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 2017 T_{MED} is 6.71 minutes—that is, any day that exceeds 6.71 minutes per customer is excluded due to IEEE-defined Major Event Days.

2017 SAIDI Results

The 2017 results based on the recorded outages are reported in Table 3f.

Table 3f: 2017 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**	**477**	**--**
$SAIDI_{Total\ 5\text{-}year\ Average}$	**Total (all outages five-year average) SAIDI**	**n/a**	**326**	**386**	
$SAIDI_{5\%}$	**<5% Non-Major-Storm (<5% customers affected) SAIDI**	**n/a**	**132**	**222**	**--**
$SAIDI_{IEEE}$	**IEEE Non-Major-Storm (T_{MED}) SAIDI**	**n/a**	**107**	**175**	**--**
$SAIDI_{SQI}$	**IEEE Non-Major Storm (T_{MEDADJ}) SAIDI**	**No more than 155 minutes per customer per year**		**175**	☒

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.

What Influences SAIDI

As noted in the SAIFI section, PSE tracks outages by cause codes and groups. Figure 3h illustrates the impact of tree-related outages, accounting for 35–67% of customer minutes, across the $SAIDI_{Total}$ and $SAIDI_{SQI}$ measurements.

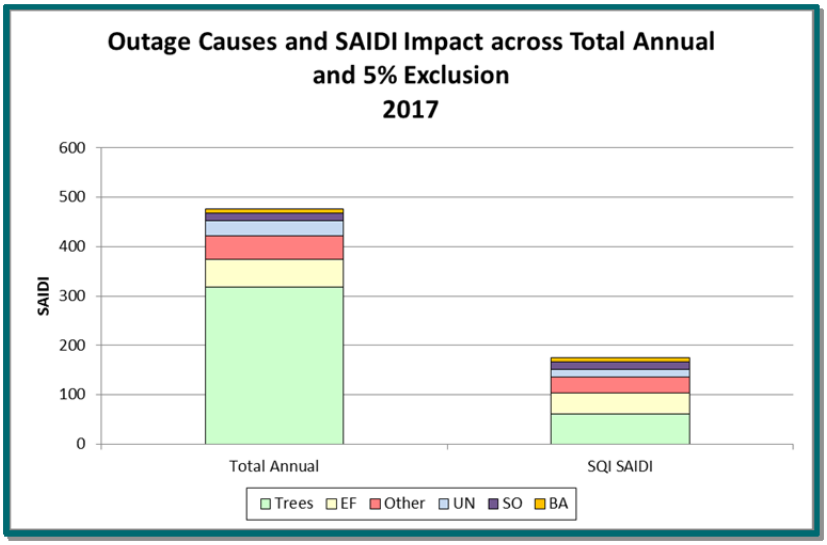

Figure 3h: Outage Causes and SAIDI Impact across Total Annual and SQI SAIDI in 2017

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. [28] In comparison, National Grid, the second largest utility in the United States representing four states on the East Coast, has 313 trees per mile.[29]

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

[28] Ecological Solutions Inc. study, March 3, 2009, page 73.

[29] Ecological Solutions Inc. study, March 3, 2009, 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.[30]

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 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 2016 was 55 minutes and 2017 was 55 minutes. The 5% Exclusion Major 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 service provider metrics 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 that are included in the SAIDI measures. As an example, the inability to repair and restore outages due to a third party constraint can be excluded or adjusted in both the Electric Safety Response Time and Service Provider metrics but the entire duration of that outage is included in the SAIDI measures..

[30] 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 3g shows the SQI SAIDI from 2013 to 2017.

Table 3g: SQI SAIDI from 2013 to 2017

	2013	2014	2015	2016	2017
SAIDI **(SQI #3)**	**247**	**312**	**272**	**148**	**175**
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 among the different SAIDI measurements for 1997-2017. Based on the recorded outages, the 2017 results across all the measurements worsened when compared to 2016. The primary driver for the decline in SAIDI performance for 2017 is the higher than average tree related outages impacting customers in Whatcom, Skagit and Island Counties.

Appendix K: *Historical SAIDI and SAIFI by Area* illustrates the 2015–2017 results by county under the $SAIDI_{Total}$ and $SAIDI_{SQI}$ measurements. A summary of Appendix K indicates that 2017 SAIDI performance varied in each county as compared to 2016:

- Kitsap County saw an improvement across both $SAIDI_{Total}$ $SAIDI_{SQI}$ and measurements.
- Whatcom, King, Kittitas, and Pierce Counties saw a decline in performance across the two measurements
    - Whatcom County $SAIDI_{SQI}$ decline in performance was due to more tree related outages. $SAIDI_{Total}$ was impacted by those tree related outages and by an increase in equipment failure and third party outages.
    - King County $SAIDI_{Total}$ decline in performance was due to more tree related outages. King County $SAIDI_{SQI}$ decline in performance was due a widespread outage caused by a third party.
    - Kittitas County $SAIDI_{Total}$ $SAIDI_{SQI}$ decline in performance was due to a widespread equipment failure outage.
    - Pierce County $SAIDI_{Total}$ decline in performance was due to more tree related outages. $SAIDI_{SQI}$ decline was due more third party outages.
- Skagit and Island Counties improved in $SAIDI_{Total}$ performance but saw a decline in $SAIDI_{SQI}$ performance. The decline in $SAIDI_{SQI}$ performance for both counties was due to more customers impacted by equipment failure and tree related outages.
- Thurston County saw a decline in $SAIDI_{Total}$ performance but an improvement in $SAIDI_{SQI}$ performance. The decline in $SAIDI_{Total}$ performance was due to more customers impacted by tree related outages.

As described more fully in the *Working to Improve Reliability* section, PSE continues to focus on identifying projects that will affect SAIDI, while managing other aspects of electric system performance.

Working to Improve Reliability

Overview

PSE continues to implement existing processes and programs to address the reliability of the electric system. In addition, PSE evaluates and identifies new strategies to further improve reliability across PSE's service territory. This section covers PSE's system planning analysis and optimization process, the 2017 reliability programs and completed work, and the roadmap for the long term reliability strategy as outlined in the 2018 & Beyond Action Plan.

System Planning Process

Figure 3i illustrates the system planning process for both natural gas and electric system infrastructure projects. The following discussion focuses on how the system planning process is used to evaluate electric reliability projects.

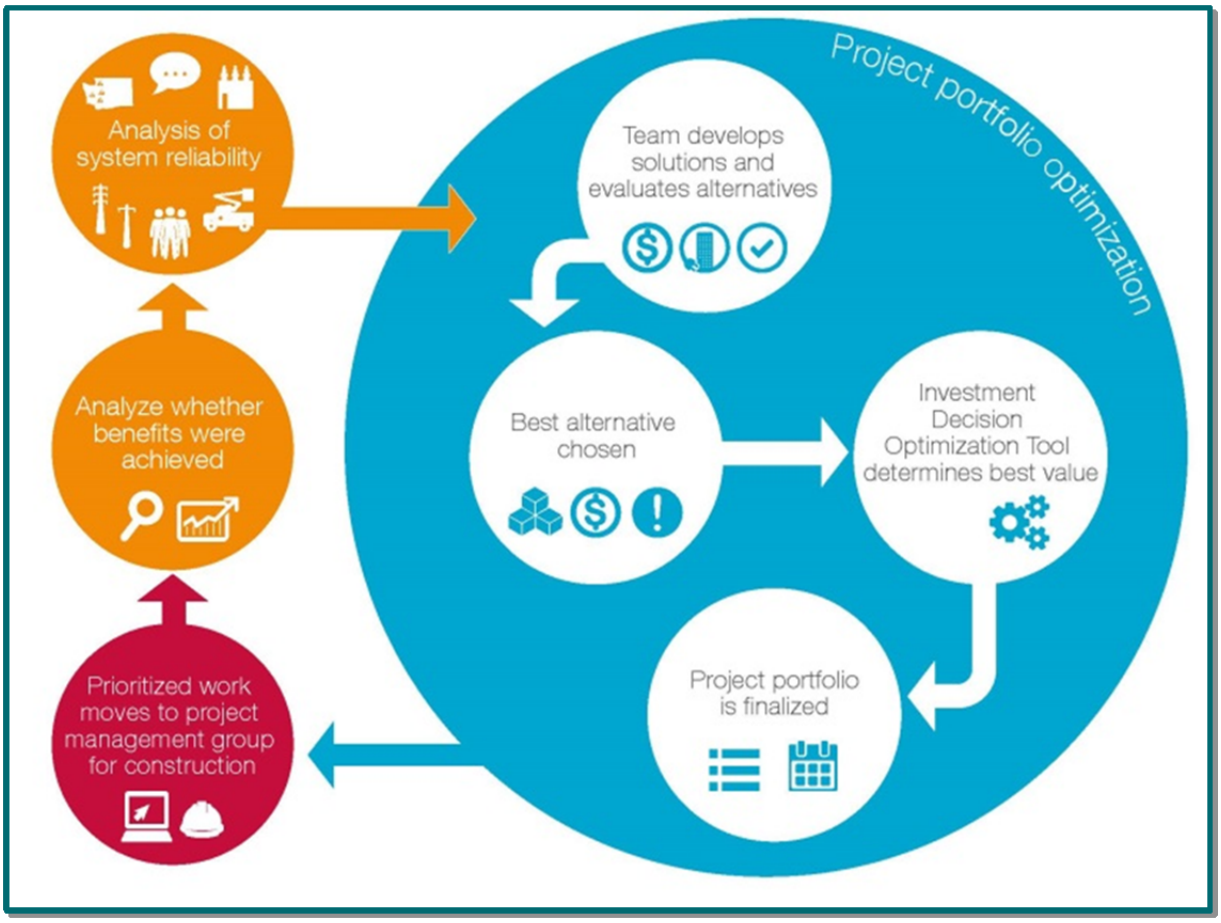

Figure 3i: System Planning Process

As it relates to improving the electric system reliability, PSE's system planning process begins with an analysis and evaluation of the system's current performance. System planning considerations include multiple inputs such as reliability indices (CMI, SAIDI, SAIFI, etc.), customer complaints/feedback, equipment condition or failure analysis, outage causes, etc. Additionally, PSE identifies smaller targeted areas to improve reliability at the customer level. This approach ensures that customers with poor reliability, regardless of their circuit's reliability, are identified and improved. Targeted customers are identified based on a high number of interruptions or high outage duration.

Next, projects solutions and alternatives are developed and reviewed. PSE has multiple strategies and methodologies to resolve reliability issues, such as, rebuilding/re-routing existing infrastructure, installing tree-wire conductors, converting overhead conductors to underground, adding new sectionalizing devices, adding automation to the system, or implementing distributed energy resources.

Each viable project solution entered into the Investment Decision Optimization Tool (iDOT) that involves building a hierarchy of the value of benefits, illustrated in Figure 3j, and compares the net present value against the total project cost, also known as the B/C ratio. For a particular reliability issue where the planner identifies multiple project solutions, the tool supports the identification of which individual solution may have the best value for the reliability of the impacted customers.

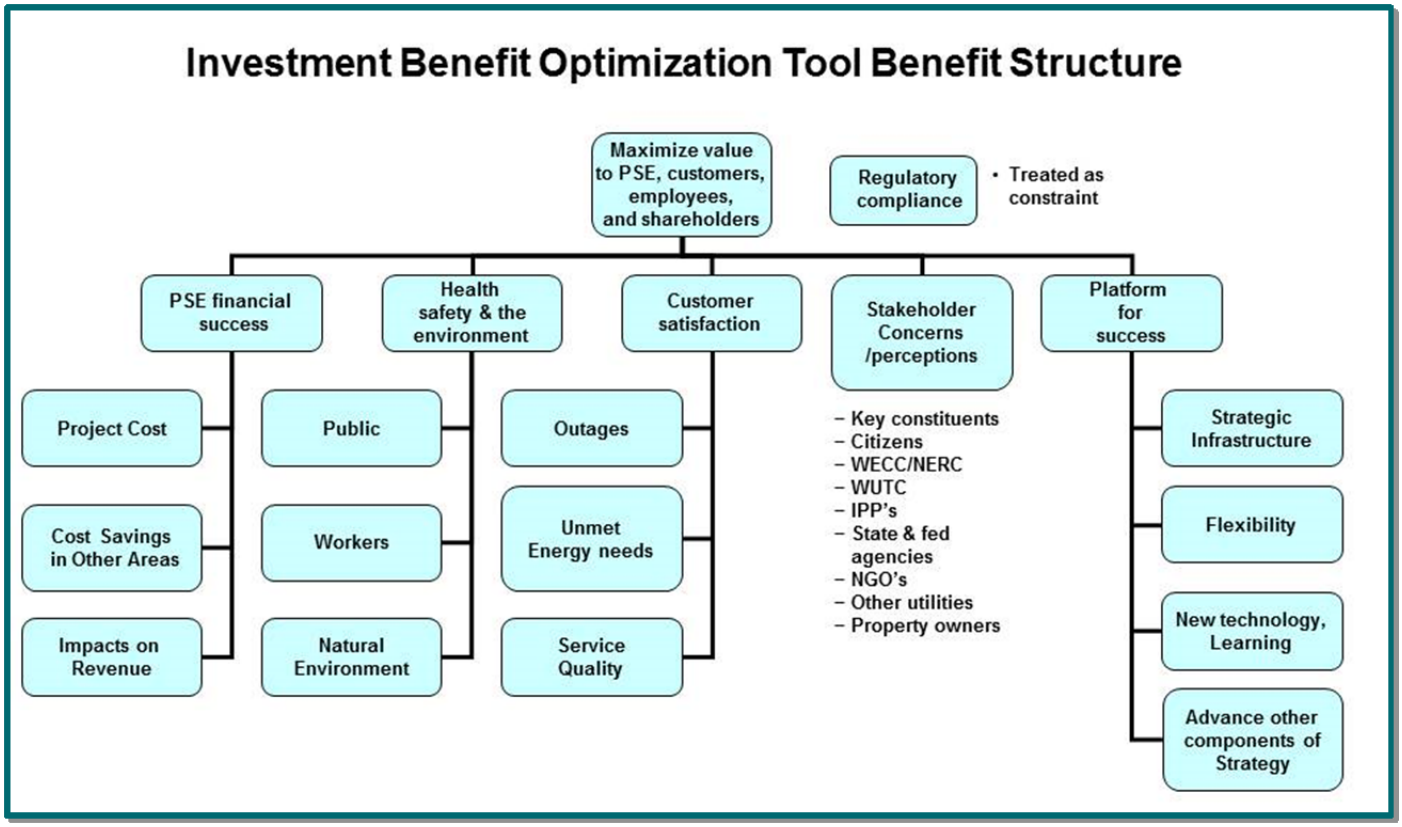

Figure 3j: Investment Benefit Optimization Tool Benefit Structure

On a broader portfolio perspective iDOT optimizes the total value of the project across the electric and natural gas system infrastructure projects, and identifies a list of selected projects to meet a financial constraint, which

are then analyzed and reviewed for prudency. Finally, System Planning approves the final set of capital projects that provides the maximum value to PSE's customers. Appendix P: *System Planning Budget Process* provides more detail on the Planning Process.

In addition to the annual process as described above, some system planning projects are identified throughout the year. These projects can be a result of a municipality altering its infrastructure plans such as a road widening, 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 as they emerge.

After projects are put into service, PSE performs a Reliability Improvement Verification (Backcasting) to confirm the expected benefits. The outages within the improved project area are typically reviewed several years after being placed in service to provide "outage opportunity" and compared to the outage history, prior to the system improvement project. This verification helps to confirm the success of certain reliability strategies or provides insight on how to make adjustments and improvements in the future.

2017 Reliability Programs and Completed Work

Table 3h illustrates PSE's different programs and projects that directly impact the reliability of the electric transmission and distribution systems. Each program addresses one or multiple outage causes, such as Trees (TF, TO, TV), Bird and Animal (BA), Equipment Failure (EF), Scheduled Outages (SO), Unknown (UN), or others. The table also includes the 2017 plan for each program as well as what was completed at the end of 2017. Program descriptions and details are below the table.

Table 3h: Reliability Programs and 2017 Completed Work

Program Category	Outage Cause Each Program Addresses						2017 Completed
	TREES	BA	EF	SO	UN	Other	
Vegetation Management							
Cyclical Programs	✓						3,089 miles
TreeWatch	✓						30,000 trees
Tree Replanting	✓						On-going
Substation Landscape Renovation	✓						83 trees
Targeted Reliability Improvements							
Areas of Greatest Concern / Worst Performing Circuits	✓	✓	✓			✓	71 projects
Tree Wire	✓	✓					9 projects
Distribution Sectionalizing Devices	✓	✓	✓	✓	✓	✓	29 projects
Other System Reliability Projects	✓	✓	✓			✓	27 projects
Distribution Automation	✓	✓	✓	✓	✓	✓	2 projects
Transmission & Distribution SCADA	✓	✓	✓		✓	✓	8 projects
Pilot Projects							
Single Phase Reclosers	✓	✓	✓			✓	On hold
Tollgrade Sensors	✓	✓	✓			✓	Monitor
Transmission Automation	✓	✓	✓			✓	Pilot implemented
Aging Infrastructure							
Cable Remediation			✓			✓	281 projects
Pole Test & Treat/Replacement			✓				402 poles
Substation Equipment Replacement			✓				40 projects
Substation Maintenance			✓				On-going
Wildlife		✓					5,900 protection devices
Third Party Outages						✓	On-going
Scheduled Outages				✓			Monitor

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 growing 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[31].

Cyclical Programs

PSE spends more than $14 million annually on 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 2017, PSE completed 2,123 miles of vegetation management. The maintenance cycle is on schedule.
- **55/115kV transmission corridor system**—Trees are trimmed every three years on PSE's 55/115kV transmission rights-of-way. 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 2017, 582 miles of 55/115kV transmission lines were maintained.
- **230kV transmission corridor system**—Trees are trimmed annually in transmission corridor system over 200kV. Spray and mowing activities are performed and danger trees are removed along the edge of these corridors, typically within 16 feet of the system at the same time trees are trimmed.
  - In 2017, 384 miles of transmission corridors were maintained under North American Electric Reliability Corporation (NERC) clearing requirements and are compliance driven.
- **Hotspotting—**occurs yearly on the overhead distribution and 55/115kV transmission systems. Hotspotting, or unscheduled trimming or removal, is driven by PSE field technicians or customer requests.
  - In 2017, approximately 3,000 fast growing trees were trimmed and 250 trees were removed.

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

TreeWatch Program

PSE also manages vegetation impacts from beyond the 12 foot right of way and spends $2 million annually on 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 2017, the TreeWatch program addressed over 300 miles of transmission and high-voltage distribution lines and over 500 miles of distribution lines. Nearly 30,000 trees were removed or pruned. 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 2017 was on critical 55/115kV transmission lines, and those distribution circuits that are the worst circuits for tree-related outages. In 2017, the TreeWatch program budget was increased by an additional $1.6 million. The additional funding specifically addressed four distribution circuits that historically reoccur as the worst circuits for tree-related outages. The four circuits are Fragaria-13, Hobart-16, Longmire-17 and Miller Bay-17.

Tree Replanting Program

PSE devotes about $500,000 each year to replanting trees and non-construction related mitigation in PSE's service area to prevent future reliability concerns from developing. 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.

Substation Landscape Renovation

In 2017, PSE renovated the 230kV Novelty Substation located in east King County. A total of 33 hemlocks, all in decline, were felled in an effort to reduce the risk of future outages. PSE topped and created habitat trees of an additional 40-50 failing conifers, to further eliminate the risk of branches "windsailing" into the substation. Understory species were preserved. PSE opted to seed with a WSDOT approved erosion control mix of grasses rather that plant new trees.

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 worst-performing circuits. These programs include Worst Performing Circuits, replacing existing overhead distribution wire with tree wire to prevent tree limb outages, installing more sectionalizing devices (some which are remotely monitored and control), adding distribution automation and enhancing the transmission and distribution Supervisory Control and Data Acquisition (SCADA) devices.

Worst Performing Circuits

As discussed earlier, PSE's Planners investigate areas of greatest concern and proposes projects that will improve the reliability for customers being served by those circuits. Planners focused their attention to improve the reliability of 135 circuits that were identified as worst-performers. Different reliability strategies were applied to these circuits, including tree wire, underground conversions, overhead rebuilds, adding new feeder ties and distribution automation.

Tree Wire

The vast majority of tree wire, a thick-coated power line, is installed at locations where there has been a previous history of outages related to tree branches and a field assessment confirms that installing tree wire would reduce the likelihood of outages. Tree wire improvements also provide a benefit to reduce the number of bird or animal caused outages.

Distribution Sectionalizing Devices

Installation of reclosers has been an effective tactic to improve reliability. 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.

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 five 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.

Transmission and Distribution SCADA

Supervisory Control and Data Acquisition (SCADA) is an important aspect of managing the electric transmission and distribution power systems. SCADA is a system used for monitoring and controlling electrical equipment that will provide situational awareness for PSE's operators and enable faster restoration of power to the customers. Approximately 98% of PSE's feeder breakers have loading visibility and indication only, while 40% of PSE's feeder breakers have loading visibility, indication and supervisory control.

Pilot Projects

In addition to these ongoing targeted reliability improvement programs, PSE continued to monitor the pilot projects implemented in 2017.

Single-Phase Reclosers *(Tripsavers)*

Tripsavers are single-phase reclosing devices that would replace 100T lateral overhead fuses. 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 2016-2017 pilot program, 245 tripsavers were installed in 106 locations and PSE estimates that they could prevent 44 outages per year, which would have lasted about 120 minutes each. During the pilot, several design and operational issues came to light. It was identified that operational training to our field personnel would improve on the issues previously identified. Training is currently on-going and concurrently, PSE is taking this opportunity to evaluate and compare the tripsaver device to other similar products from different vendors.

Tollgrade Sensors

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. No quantifiable actions were taken in 2017 as a result of the Tollgrade sensor outputs. PSE is continuing to collect the outage information provided from these devices and plan to evaluate the benefits achieved from them.

Transmission Automation

Currently, PSE has existing automation schemes on PSE's transmission system. These schemes were developed back in the 1970's, and were state-of-the-art technology for that time. Using local sensors, and multiple reclosing at either end of the transmission line, a logic scheme was set up to restore the maximum number of customers and isolate the faulted section of the transmission line. Though the restoration of customers is typically

optimized, the existing automatic schemes do not cover every scenario, thus leaving a potential for extended outages to one or more substations on a particular transmission line. This pilot project will provide a solution that automatically locates a transmission line fault, isolates the fault, and reconfigure the system to restore the power to the maximum number of customers. The pilot was scoped in 2016. In 2017, the hardware equipment was installed, and the automation logic was under development.

Aging Infrastructure

Cable Remediation

For an underground electric-distribution system, age and moisture make buried cable vulnerable to failures and prolonged outages, particularly the commonly installed high molecular weight ("HMW") bare concentric neutral direct-bury cable installed prior to 1965. Since 1989, PSE has managed a cable remediation program that considers two remediation options: silicone injection or cable replacement. At the end of 2015, PSE had approximately 1,800 miles of HMW cable remaining in the system.

- 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 which have been pre-tested to verify the condition. Due to cost of testing and implementing on three phase cables there is more value in replacement.
- Cable replacement has an expected life that exceeds 30 years.

In 2017, there were about 144 miles of cable remediated which is an increase in comparison to the 120 miles in 2016 and 70 miles in 2015. The Electric Reliability Plan[32] has provided the focus to address specific system needs such as the underground cable. Figure 3k, on the following page, illustrates the reliability benefits of increased investment in the cable remediation program, outages are decreasing as PSE is increasing the investment in the cable remediation program.

[32] Refer to Areas of Greatest Concern discussion in *Appendix I: Electric Reliability Data Collection Process and Calculation* for more information on the Electric Reliability Plan.

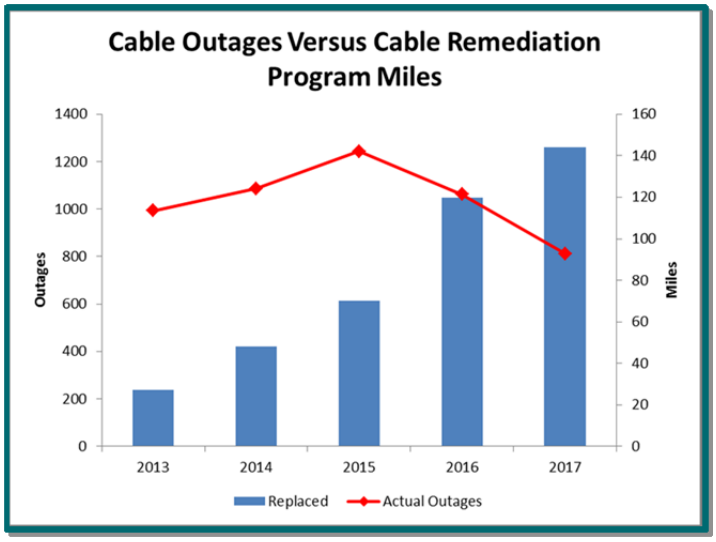

Figure 3k: Five Year History of Cable Outages versus Cable Remediation Program Miles

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 2017, there were 213 total outages (including storms) 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 wood 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 or restoration. In 2017, there were 17,512 distribution poles and 2,132 transmission poles assessed.

Industry data shows that the average serviceable life of a wood 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 2017, 402 wood poles were replaced (344 distribution poles and 58 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 not included in these numbers.

While PSE's wood pole inspection program includes reviewing all parts of the pole including the cross arms, in 2017 PSE increased its requirements of data capture relative to the condition of cross arms and has initiated a plan to visit poles with specific cross arm configurations to ensure ongoing reliability.

Substation Equipment Replacement Programs

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 electric system equipment, technology 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.

Upgrades to the substations and equipment are important strategies for reliability and overall asset management. Specific types of equipment are proactively replaced under replacement programs to maintain system reliability, reduce operational costs and offset impacts from aging infrastructure. In 2017, the following number of substation equipment was replaced:

- Transformers – 3
- Transmission Breakers – 7
- Relay Packages – 9
- Transformer Protection Devices – 4
- Substation Batteries – 15
- Spill Prevention, Control, and Countermeasures (SPCC) – 2

Substation Maintenance

In addition to the planned replacements, PSE administers planned maintenance based on time and condition criteria in order to improve performance and increase the asset life. The transmission and distribution substation maintenance program utilizes low cost, non-intrusive diagnostic tasks to identify problems that could result in equipment failure. Several diagnostic tests on substation major equipment which help to determine equipment needs are:

- Infrared scans, performed every other year to identify problem areas on the electrified portion of the station
- Dissolved gas analysis in oil to determine overheating or arcing
- Breaker profiling to evaluate the quality of mechanism operation
- SF6 gas testing to determine insulation integrity

- Monthly inspections for a visual evaluation

Depending on diagnostic testing and time since last maintenance the portfolio of planned maintenance is scheduled each year to more thoroughly evaluate the condition and administer maintenance tasks per the manufacturer recommendation. The current substation maintenance program includes maintenance activities for:

- Large substation equipment (transformer, breaker, regulator, etc), which includes the equipment required by Western Electric Coordinating Council (WECC), per the Transmission Maintenance and Inspection Plan
- Station batteries
- Protective relays, which includes transmission line & transformer relays (required per NERC compliance) and distribution transformer, feeder and line recloser relays
- Transmission automatic switch controllers

Wildlife

In 2017, there were 1,844 bird and animal-caused outages which was a decrease of 82 from the 1,926 bird and animal-caused outages in 2016. Figure 3l illustrates that bird and animal caused outages have trended down for the last 15 years. From 2003 -2012 PSE averaged 1,827 animal caused outages per year. In the last 5 years, 2013-2017, PSE has averaged 1,713 animal caused outages per year. Therefore, PSE has reduced animal caused outages on average, by approximately 114 outages; even as eastern gray squirrels population and territory have been increasing (squirrels account for approximately 90% of PSE's animal caused outages). The fact that outages are trending down or even remaining the same while both the squirrel populations and PSE's customer base are increasing indicates that the efforts to strengthen PSE's electrical systems to wildlife are positively impacting reliability.

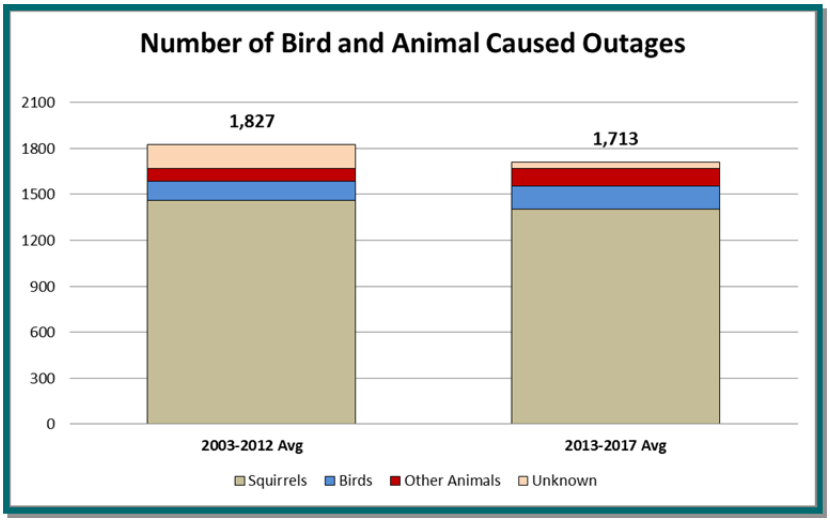

Figure 3l: Number of Bird and Animal Caused Outages 2003-2017

Figure 3m demonstrates the effectiveness of the PSE's Avian Protection Program in reducing trumpeter swan

collision and associated outages. From 2008-2017, the trumpeter swan population in PSE's service territory has more than doubled. PSE began marking lines to prevent outages and trumpeter swan mortalities in 2008. In an effort to reduce outages and mortalities, over 15,000 line markers have been installed on approximately 1,500 high risk spans to date. In addition to markers, PSE has been installing tree wire which is more visible than bare conductor and also helps reduce risk of trumpeter swan phase to phase contact. Scientific studies[33] indicate that markers reduce bird mortality and outages by approximately 60%. Since PSE began installing line markers and tree wire, the number of swan mortalities due to power line contact has trended downward.

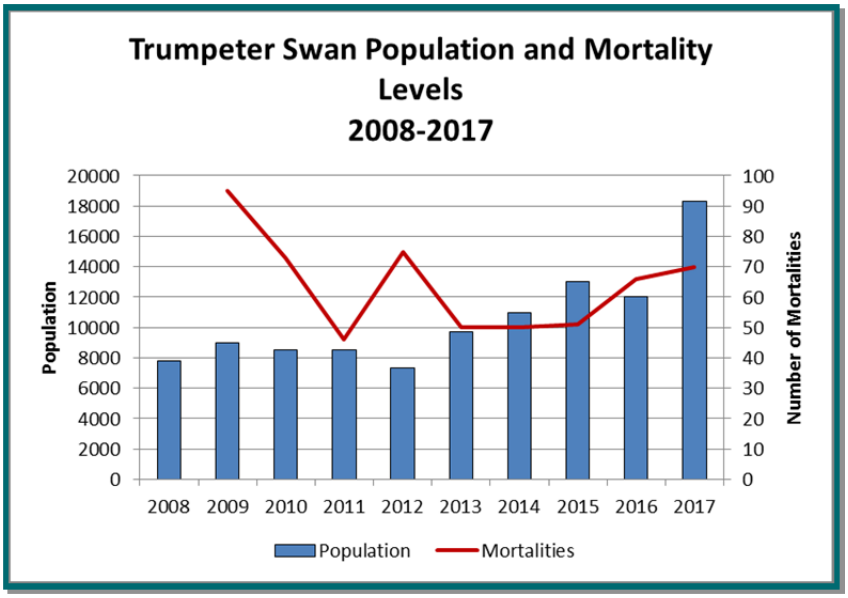

Figure 3m: Trumpeter Swan Population and Mortality Levels

Since early 2000, PSE has 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 2017, 1,267 transformer bushing covers were installed to prevent outages and mortality of small birds and small mammals; 1,462 line markers were installed to prevent swan collisions; and 216 bird guards were installed to prevent raptor electrocution. In addition over 2,619 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,

[33] Avian Power Line Committee, *"Reducing Avian Collisions with Power Lines: The State of the Art in 2012"*, October 2012, page 97, Edison Electric Institute

avian protection techniques and products are used proactively to prevent avian morality and outages. In 2017, the PSE Avian Protection Program completed 42 avian protection retrofit projects for a total of 336 poles and spans that are now avian-safe. These projects were completed in response to over 190 bird mortalities, including 70 trumpeter swans, 16 eagles and 13 other raptors.

PSE's Avian Protection Program aims to provide regular avian protection online training to all PSE employees. In addition, more targeted training is provided to operational employees to keep them up-to-date on avian protection procedures, materials and regulatory requirements. In 2017, PSE provided targeted training to 25 vegetation management employees, 27 customer and system project employees and 6 new electric servicemen. In addition, PSE provided train the trainer instructions to the System Operations supervisory team so that they could provide avian training to their personnel as needed.

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 PSE's Clear Zone program also relocates poles that are in danger of being hit. In 2017, PSE was only able to relocate 30 poles, lower than planned due to construction constraints and crew response needed for storm restoration. 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 which could lead to outages.

In 2017, PSE added two new field representatives and expanded the program throughout PSE's service territory to increase awareness and education of the state law requirements which resulted in a 34.58% increase in locate volume. This effort also focused on those that are reoccurring offenders as well. As a result, PSE was able to reduce the electric damage ratio from 2.2 damages per 1000 locates in 2016 to 1.7 in 2017.

Scheduled Outages

Scheduled outages, which are typically for connecting new or upgrading existing infrastructure, are the third leading outage cause and account for 14% of recorded interruptions in 2017. 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 scheduled outages may be necessary. Table 3i illustrates the 2013-2017 number of scheduled outages, CMI and number of customers interrupted (CI). While the number of scheduled outages have increased in 2017 as compared to 2016, the impact of those outages to customers and the duration of the service interruption was lower than 2016.

Table 3i: Five Year history of Scheduled Outages

Total Scheduled Outages			
Year	**Outage Count**	**CMI**	**CI**
2013	1,200	6,105,307	32,502
2014	1,363	12,501,901	48,808
2015	1,819	15,697,154	48,848
2016	2,207	21,970,541	83,580
2017	2,538	17,703,300	69,621

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

Reliability Improvement Verification (Backcasting)

PSE believes it is very important to validate if the expected reliability benefits on projects were achieved. This involves comparing the reliability of the project area, before and after improvement, approximately three years after the project has been completed. Due to the number of projects completed each year, PSE verifies a sample of projects from each program. It is important to note that sometimes outages are unique and the effort to review performance several years later has an underlying assumption that there is similar outage potential after project completion. Post project specific outages may not be exactly the same so there is a little art blended with the science. Table 3j illustrates the reliability improvement verification results for projects completed between 2010 through 2014.

Table 3j: Reliability Improvement Verification on selected 2010-2014 projects

			Customer Minutes			
Program	**Number of Projects Completed**	**Number of Projects Studied**	**Before Estimate**	**After Actuals**	**Savings**	**Benefit achieved**
Tree Wire	148	38	8,040,012	959,162	7,080,850	88.1%
Other System Reliability Projects	92	39	2,832,123	26,640	2,805,483	99.1%
Cable Remediation	412	162	3,104,582	7,709	3,096,873	99.8%
Total	**652**	**239**	**13,976,717**	**993,511**	**12,983,206**	**92.9%**

The reliability improvement verification results validate, that on average for the above three programs, the projects achieved most of the expected benefit. Overall, these projects identified to improve targeted outage vulnerabilities prove successful based on the backcasting analysis.

Going Forward – Action Plan for 2018 to 2022

The SQI SAIDI and SAIFI targets are used as a guideline for a reasonable level of reliability. In addition, PSE has also tracked its reliability performance through the IEEE reliability benchmarking survey to measure how its performance aligns with industry. In 2017, PSE added analysis information from the econometric benchmarking study initiated by the UTC staff as well as data from the ICE calculator and a report from industry experts estimating the costs to achieve specific levels of reliability to come up with new targets for system-wide SAIDI and SAIFI. The analysis suggested that achieving a SAIDI of 120 – 130 and maintaining SAIFI at 1.00 – 1.15 should be PSE's primary focus over the next five years.

In addition, PSE has been developing the capability to measure reliability at the customer level using data from OMS. This will allow PSE to begin reporting CEMI and provide the ability to set new targets to help identify pockets of customers experiencing poor reliability that may not be identified through circuit level reliability metrics or customer complaints. As new technologies are implemented over time, it is expected that more accurate measurements will be possible and that metrics that more fully account for the customer experience will be available. For example, MAIFI provides the ability to track outages that are less than five minutes in length.

PSE has been continuously working on improving its electric reliability for many years. As the simplest and least cost reliability improvements are implemented first, additional levels of reliability require ever more complex or costly solutions. What has become apparent in other industries is the need to link activities together through more holistic management and awareness, often seen in practices such as safety management systems, quality management system, and most recently applicable to PSE is a pipeline safety management system (known as API Recommended Practice 1173). To achieve the improvement to reliability that is desired, PSE will apply this type of management system thought. As a result, PSE has developed alignment of infrastructure improvement and operational work and set a collective roadmap forward that will drive greater effectiveness as illustrated in Figure 3n. The strategy identifies five elements for focus over the next five years: improving inter-departmental coordination, electric system design, data analysis, new metrics and emerging technologies. This roadmap is not intended to be static or assume all the opportunities for improvement are known, and will change as new information becomes known, providing flexibility, but continued focus towards established targets. This focus will closely tie together infrastructure design, construction, operation and maintenance as well as add constant feedback on progress through system monitoring to drive continuous improvement. In addition to continuing the types of reliability improvement projects and programs from 2017, work in 2018 will include an emphasis on analyzing and piloting the ideas and technologies identified in the strategy.

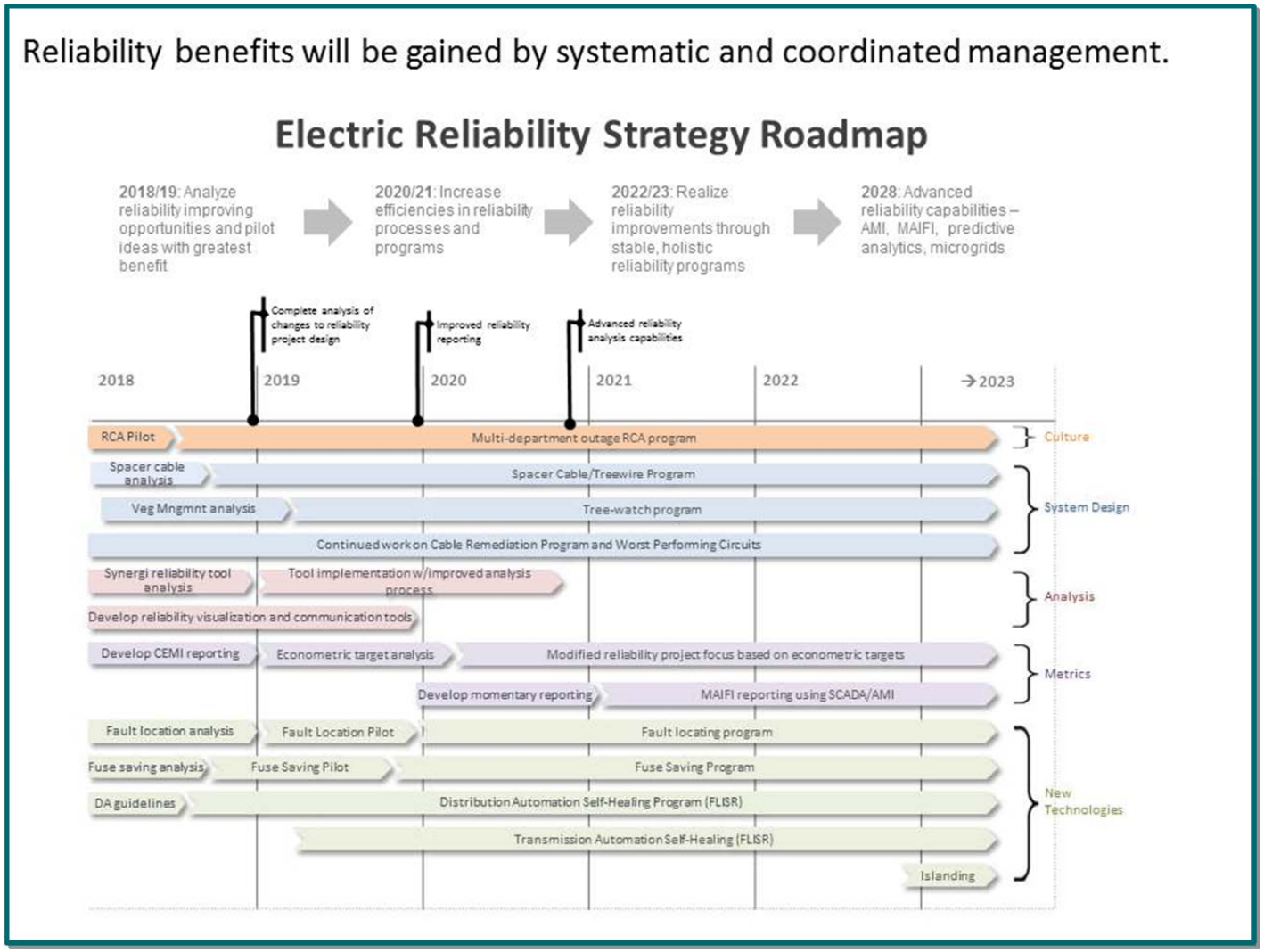

Figure 3n: Electric Reliability Strategy Roadmap

In 2018 and 2019, PSE will implement existing and new strategies to achieve PSE's reliability goals. Table 3k details PSE's plan, for 2018 and 2019, of the different programs and projects that directly impact the reliability of the system, which includes some newly developed initiatives. Each program addresses one or multiple outage causes, such as Trees (TF, TO, TV), Bird/Animal (BA), Equipment Failure (EF), Scheduled Outages (SO), Unknown (UN), or others. The table includes the plan for 2018 and 2019, which is subject to change, as well as, a list of 2017 completed work for comparison purposes. The estimated SAIDI savings is determined when an investment is made after there have been one or many outages. It assumes the future outages will be similar to the historic if not addressed. However this model does not provide for the full value of investing in replacement in advance of failure, in essence preventing outages from occurring at all. For some assets this can be determined and investments made proactively to benefit customers such as with the cable remediation or pole program. PSE is working to determine this type of a predictive savings model as it is logical that this also has SAIDI savings value.

Table 3k: Reliability Programs Plan for 2018 and 2019

Program Category	Outage Cause Each Program Addresses						2017 Completed	2018 Plan	2019 Plan	2018 and 2019 Estimated SAIDI Savings
	Trees	BA	EF	SO	UN	Other				
Reliability Strategy Initiatives										
Root Cause Analysis / Outage Review					✓		n/a	Design/Implement	Implement recommendations /Improve	TBD
Spacer Cable Application Analysis	✓						n/a	Assessment	Pilot	n/a
CEMI Reporting	✓	✓	✓		✓	✓	n/a	Develop/Monitor	Utilize Report	n/a
Fault Locating Technologies	✓	✓	✓		✓	✓	n/a	Assessment	Pilot	n/a
Vegetation Management										
Cyclical Programs	✓						3,089 miles	3,078 miles	Adjust if needed	n/a
TreeWatch	✓						30,000 trees	30,000 trees / Investigate increased application	Consider historic UTC approved program	n/a
Tree Replanting	✓						On-going	On-going	On-going	n/a
Substation Landscape Renovation	✓						83 trees	On-going	On-going	n/a
Targeted Reliability Improvements										
Worst Performing Circuits	✓	✓	✓			✓	71 projects	45 projects	57 projects	14 minutes
Tree Wire	✓	✓					9 projects	13 projects	19 projects	2 minutes
Sectionalizing Devices	✓	✓	✓	✓		✓	29 projects	20 projects	20 projects	2 minutes
Other System Reliability Projects	✓	✓	✓			✓	27 projects	32 projects	13 projects	2 minutes
Distribution Automation	✓	✓	✓	✓	✓	✓	2 projects	7 projects	7 projects	1 minute
Transmission & Distribution SCADA	✓	✓	✓		✓	✓	8 projects	17 projects	14 projects	TBD?

Table continues on next page

Program Category	Outage Cause Each Program Addresses						2017 Completed	2018 Plan	2019 Plan	2018 and 2019 Estimated SAIDI Savings
	Trees	BA	EF	SO	UN	Other				
Pilot Projects										
Single Phase Reclosers	✓	✓	✓			✓	On hold	Assessment	Pilot	n/a
Transmission Automation	✓	✓	✓			✓	On-going	Pilot	Monitor/New Projects	TBD?
Aging Infrastructure										
Cable Remediation			✓			✓	281 projects	382 projects	339 projects	2 minutes
Pole Treat/Replacement			✓				402 poles	823 poles	TBD	TBD?
Substation Equipment Replacement			✓				40 projects	47 projects	38 projects	TBD
Substation Maintenance			✓				On-going	On-going	On-going	n/a
Wildlife		✓					On-going	On-going	On-going	
Third Party Outages						✓	On-going	Monitor construction actively	Monitor construction actively	<1 minute
Scheduled Outages				✓			Monitor	Manage to minimize impact	Manage to minimize impact	TBD

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 2018 and 2019 planned reliability projects and the planned 2018 vegetation mileage by county.

- **Reliability Strategy Initiatives**
  - **Root Cause Analysis/ Outage Review**—Currently PSE performs in-depth Root Cause Analysis reports on Substation equipment failures and outage events. This process will be expanded to include distribution circuit outages with high customer impacts. Other utilities who have implemented in-depth root cause analysis have seen significant reliability improvements. The root causes analysis process will be designed and implemented in 2018 and 2019.
  - **Spacer Cable Application Analysis**—Spacer cable is a tightly spaced set of aerial insulated conductors that reduce vegetation related outages. Utilities in other states using spacer cable have experienced reliability improvements as it tends to be stronger and more resilient than even tree wire. Each utility has unique geographic, regulatory, and operating challenges that must be assessed to determine if spacer cable would be a cost effective solution. PSE will be reviewing where spacer cable might be a cost effective solution in its service territory in 2018.
  - **CEMI Reporting**—Develop individual customer reliability, including CEMI metric, to be included in next year's Reliability Report, per consolidated Docket Nos. UE-072300 and UG-072301 Order 29. Using this metric expands PSE's approach to include a focus on the individual customer.
  - **Fault Locating Technologies**—PSE will continue to evaluate Tollgrade Sensors, as a fault locating device. These devices can also to be used 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. PSE will continue to look into alternative fault locating technologies, such as analyzing protective relay fault data.
- **Vegetation Management**
  - Continue cycle maintenance to remain on cycle. Remove or prune between 20,000-30,000 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.
- **Targeted Reliability Improvements**
  - **Worst Performing Circuits** —Continue to focus on the worst performing circuits, defined by the Top 50 and reliability metric thresholds. In addition, PSE will expand the focus to target individual customers or smaller pockets experiencing a lower level of reliability. PSE will continue to evaluate, explore and adopt new strategies to improve the reliability of the Areas of Greatest Concern.
  - **Tree Wire** —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.
  - **Distribution Automation**—Continue to expand the footprint of automated switching schemes throughout the distribution system. PSE will monitor the performance of the in-service automation schemes.
  - **Transmission & Distribution SCADA**—Continue to upgrade distribution substations circuits with supervisory control and RTUs for enhanced data collection, as well as, adding supervisory control to transmission switches, based on specific benefit and cost.

- **Pilot Projects**
  - **Single-Phase Reclosers**—Data will continue to be collected from existing tripsavers to further ascertain the effectiveness of their ability to reduce customer outage minutes. In addition, the Planning team will be evaluating and comparing the tripsaver device to other similar products from different vendors.
  - **Transmission Automation**—In 2018, the project team plans to develop and test the automation logic. The communication systems at each of the substations along the pilot transmission lines. The project team intends on enabling the automation on these three lines in 2019.
- **Aging Infrastructure**
  - **Cable Remediation**—As part of the cable replacement plan, PSE anticipates replacing approximately 124 cable miles in 2018.
  - **Poles**—Plan to replace 209 distribution poles and approximately 64 transmission poles. This number will increase due to unplanned replacements for bad poles identified in the field or due to storm damage. Also, there will be more than 500 distribution and 50 transmission poles restored in order to bring the pole back to its necessary strength requirements.
  - **Substation Equipment**—The ongoing substation reliability improvement plan includes replacement of four transformers, six oil circuit breakers, three circuit switchers, one transformer protection package, ten station batteries, and twenty three relay packages.
- **Wildlife**
  - Continue the on-going avian protection training of servicemen to keep them up-to-date on avian protection procedures, materials, and regulatory requirements.
  - Continue training resources 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 Outages**
  - Continue to monitor construction activities and work towards achieving a 20% reduction of the electric damage ratio, which is comparable to 2017 results.
- **Scheduled Outages**
  - Continue to monitor the data accuracy of recorded scheduled outages. Monitor impact on customer groups to minimize cumulative impact proactively.
- **Reliability Improvement Verification (Backcasting)**
  - Verify the expected benefits on selected projects completed in 2014 by reviewing outages within a project area, after an improvement was made to the system. This process compares the reliability of the project area, before and after improvement.

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
- P: System Planning Budget Process

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 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Sep 2017	Oct 2017	Nov 2017	Dec 2017
Customer Satisfaction	2	WUTC Complaint Ratio	0.40 complaints per 1000 customers, including all complaints filed with WUTC	0.013	0.017	0.019	0.018	0.022	0.019	0.016	0.020	0.014	0.017	0.011	0.013
	6	Customer Access Center Transactions Customer Satisfaction	90% satisfied (rating of 5 or higher on a 7-point scale)	93%	91%	92%	92%	94%	92%	92%	95%	95%	95%	92%	94%
	8	Field Service Operations Transactions Customer Satisfaction	90% satisfied (rating of 5 or higher on a 7-point scale)	91%	97%	96%	95%	93%	94%	94%	95%	97%	93%	94%	93%
Customer Services	5	Customer Access Center Answering Performance[34]	75% of calls answered by a live representative within 30 seconds of request to speak with live operator	52%	56%	73%	80%	77%	75%	90%	94%	88%	88%	87%	80%
Operations Services	4	SAIFI	1.30 interruptions per year per customer	0.930	0.052	0.091	0.142	0.152	0.073	0.063	0.094	0.064	0.113	0.163	0.055
	3	SAIDI	320 minutes per customer per year	19	19	14	7	13	10	11	14	11	17	29	12
	7	Gas Safety Response Time	Average of 55 minutes from customer call to arrival of field technician	34	32	36	32	32	30	32	30	32	33	33	32
	10	Kept Appointments[35]	92% of appointments kept	100%	100%	100%	100%	100%	100%	100%	100%	99%	100%	99%	99%
	11	Electric Safety Response Time	Average of 55 minutes from customer call to arrival of field technician	51	61	50	53	58	56	52	56	59	60	54	50

[34] 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.

[35] 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 17	Feb 17	Mar 17	Apr 17	May 17	Jun 17	Jul 17	Aug 17	Sep 17	Oct 17	Nov 17	Dec 17
Operations Services	Service Provider New Customer Construction Appointments Kept[Note1]	Quanta Electric	At least 92% of appointments kept	98%	99%	99%	99%	99%	100%	100%	99%	99%	99%	98%	99%
		Quanta Gas	At least 92% of appointments kept	100%	98%	100%	99%	99%	100%	99%	100%	98%	100%	99%	99%
	Service Provider Standards Compliance	Quanta Electric	At least 97% compliance with site audit checklist points	100%	100%	100%	N/A								
		Quanta Electric	Achieve a level of QA/QC compliance rate conformance to PSE Standards as follows: Level 1 inspection items: ≤ 15 deviations/1000 items inspected	N/A			6.88	1.83	7.61	2.66	2.18	9.11	2.81	3.56	7.81
		Quanta Electric	Level 2 inspection items: ≤ 25 deviations/1000 items inspected	N/A			17.04	5.68	12.66	9.00	10.00	26.10	7.44	11.16	2.34
		Quanta Electric	Level 3 inspection items: ≤ 25 deviations/1000 items inspected	N/A			7.57	9.02	12.40	7.54	11.19	8.69	9.06	5.21	6.04
		Quanta Gas	At least 97% compliance with site audit checklist points	98%	100%	100%	N/A								
		Quanta Gas	Achieve a level of QA/QC compliance rate conformance to PSE Standards as follows: Level 1 inspection items: ≤ 15 deviations/1000 items inspected	N/A			2.12	3.10	11.96	7.19	5.69	8.4	8.37	3	0
		Quanta Gas	Level 2 inspection items: ≤ 25 deviations/1000 items inspected	N/A			16.89	34.65	15.15	10.8	9.4	7.42	9.28	13.02	3.69
		Quanta Gas	Level 3 inspection items: ≤ 25 deviations/1000 items inspected	N/A			2.53	2.37	2.63	9.22	1.58	0	5.96	1.91	9.41
	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	243	250	245	234	241	246	273	251	261	279	254	275
	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	287	263	268	262	276	277	273	295	287	286	281	281
	Secondary Safety Response Time	Quanta Gas	Within 60 minutes from first first response assessment completion to second response arrival	53	50	51	40	48	41	50	46	42	57	48	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[36]
1/4/2017	Wind	Central South	1	3,735	241,640	1.5%	22	11 of 13	No	11 Event Duty, 1 PTO, 1 Reg Day-off, 8 Line Crews
1/4/2017	Wind	North	1	361	201,165	0.2%	10	8 of 15	No	8 Event Duty, 1 PTO, 6 Reg day-off, 9 Line Crews
1/8/2017	Wind	Central South	2	10,898	241,640	4.5%	47	11 of 21	No	11 Event Duty, 2 Reg Day-off, 8 Line Crews, 9 Tree Crews
1/10/2017	Wind	North	2	10,768	201,165	5.4%	79	15 of 19	No	15 EFR's, 4 PTO, 9 Line Crews, 1 Tree Crew
2/1/2017	Wind	Central South	1	18,527	241,788	7.7%	46	12 of 13	No	12 Even Duty, 1 PTO
2/4/2017	Wind	Central South	1	1,248	241,788	0.5%	5	9 of 15	No	9 Event Duty, 1 PTO, 5 Reg Day-off, 9 Line Crews, 1 Tree Crews
2/4/2017	Wind	North	1	11,067	201,235	5.5%	96	7 of 13	No	7 Event Duty, 1 PTO, 5 Reg Day-off, 9 Line Crews, 5 Tree Crews
2/5/2017	Wind	Central North	7	92,379	313,394	29.5%	477	21 of 21	Yes	21 Event Duty, 32 Line Crews, 9 Tree Crews
2/5/2017	Wind	Central South	7	45,059	241,788	18.6%	303	13 of 13	Yes	13 Event Duty, 12 Line Crews, 4 Tree Crews
2/5/2017	Wind	North	7	34,477	201,235	17.1%	324	15 of 15	Yes	15 Event Duty, 5 Line Crews, 9 Tree Crews
2/5/2017	Wind	South	7	30,872	249,580	12.4%	342	15 of 15	Yes	15 Event Duty, 6 Line Crews, 9 Tree Crews
2/5/2017	Wind	West	7	118,690	127,613	93.0%	522	11 of 11	Yes	11 Event Duty, 31 Line Crews, 12 Tree Crews

Table continues on next page.

[36] **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[37]
3/9/2017	Wind	West	2	10,903	127,698	8.5%	43	9 of 11	No	9 Event Duty, 1 PTO, 1 Reg Day-off, 7 Line Crews, 3 Tree Crews
4/7/2017	Wind	South	3	28,952	250,213	11.6%	138	15 of 15	No	15 Event Duty, 7 Line Crews, 6 Tree Crews
5/4/2017	Wind	Central South	4	8,944	242,083	3.7%	102	13 of 13	No	13 Event Duty, 13 Line Crews, 8 Tree Crews
5/4/2017	Wind	South	4	46,908	250,378	18.7%	209	15 of 15	No	15 Event Duty, 48 Line Crews, 4 Tree Crews
5/23/2017	Wind	North	2	13,001	201,475	6.5%	89	15 of 15	No	15 Event Duty, 15 Line Crews, 5 Tree Crews
6/15/2017	Wind	North	1	4,488	201,599	2.2%	24	11 of 13	No	11 Event Duty, 1 PTO, 1 Reg Day-off
9/8/2017	Wind	North	2	1,241	201,791	0.6%	36	11 of 13	No	11 Event Duty, 1 PTO, 1 Reg Day-off, 9 Line Crews, 3 Tree Crews
10/6/2017	Wind	West	1	8,329	127,883	6.5%	18	9 of 12	No	9 Event Duty, 1 PTO, 2 Reg Day-off, 9 Line Crews, 4 Tree Crews
10/17/2017	Wind	North	1	16,475	201,599	8.2%	78	12 of 14	No	12 Event Duty, 2 PTO, 8 Line Crews, 6 Tree Crews
10/18/2017	Wind	Central North	2	13,244	314,685	4.2%	72	21 of 21	Yes	21 Event Duty
10/18/2017	Wind	Central South	2	19,297	242,695	8.0%	67	12 of 12	Yes	12 Event Duty
10/18/2017	Wind	North	2	24,703	201,955	12.2%	184	14 of 14	Yes	14 Event Duty

Table continues on next page.

[37] **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[38]
10/18/2017	Wind	South	2	16,204	251,485	6.4%	90	15 of 15	Yes	15 Event Duty
10/18/2017	Wind	West	2	11,861	127,897	9.3%	51	12 of 12	Yes	12 Event Duty
10/22/2017	Wind	Central South	1	4,916	242,695	2.0%	18	7 of 12	No	7 Event Duty, 5 Reg Day-off, 8 Line Crews, 4 Tree Crews
10/22/2017	Wind	South	1	1,948	251,485	0.8%	16	9 of 15	No	9 Event Duty, 1 PTO, 5 Reg Day-off, 10 Line Crews, 2 Tree Crews
10/22/2017	Wind	West	1	8,534	127,897	6.7%	18	6 of 12	No	6 Event Duty, 6 Reg Day-off, 9 Line Crews, 5 Tree Crews
11/3/2017	Wind	North	1	9,622	202,127	4.8%	445	10 of 14	No	10 Event Duty, 4 PTO, 9 Line Crews, 5 Tree Crews
11/5/2017	Wind	North	1	5,136	202,127	2.5%	20	14 of 14	No	5 Event Duty, 1 PTO, 8 Day-off, 9 Line Crews, 3 Tree Crews
11/13/2017	Wind	Central North	4	83,507	314,922	26.5%	343	21 of 21	Yes	21 Event Duty
11/13/2017	Wind	Central South	4	30,309	242,832	12.5%	120	12 of 12	Yes	12 Event Duty
11/13/2017	Wind	North	4	57,591	202,127	28.5%	269	14 of 14	Yes	14 Event Duty
11/13/2017	Wind	South	4	50,022	251,802	19.9%	138	15 of 15	Yes	15 Event Duty
11/13/2017	Wind	West	4	57,591	127,977	45.0%	269	12 of 12	Yes	12 Event Duty

Table continues on next page.

[38] **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[39]
11/19/2017	Wind	North	2	9,863	202,127	4.9%	73	12 of 14	No	12 Event Duty, 2 PTO, 9 Line Crews, 4 Tree Crews
11/26/2017	Wind	Central South	1	995	242,832	0.4%	18	7 of 13	No	7 Event Duty, 6 Day-off, 8 Line Crews, 1 Tree Crew
11/26/2017	Wind	North	1	9,146	202,127	4.5%	40	10 of 14	No	10 Event Duty, 3 PTO, 1 Reg Day-off, 9 Line Crews, 2 Tree Crews
12/29/2017	Wind	Central North	9	55,418	315,482	17.6%	126	21 of 21	Yes	21 Event Duty
12/29/2017	Wind	Central South	9	5,510	243,022	2.3%	53	12 of 12	Yes	12 Event Duty
12/29/2017	Wind	North	9	28,196	202,463	13.9%	328	14 of 14	Yes	14 Event Duty
12/29/2017	Wind	South	9	7,527	252,373	3.0%	64	15 of 15	Yes	15 Event Duty
12/29/2017	Wind	West	9	4,044	128,168	3.2%	54	12 of 12	Yes	12 Event Duty

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[39] **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
1/4/2017	Wind	Central North	1	683	313,112	0.2%	13	Local	No	
1/4/2017	Wind	South	1	11,941	249,140	4.8%	60	Local	No	
1/4/2017	Wind	West	1	15	127,555	0.0%	3	Local	No	
1/8/2017	Wind	Central North	2	3,908	313,112	1.2%	48	Local	No	
1/8/2017	Wind	North	2	2,788	201,165	1.4%	24	Local	No	
1/8/2017	Wind	South	2	1,810	249,140	0.7%	16	Local	No	
1/8/2017	Wind	West	2	12,531	127,555	9.8%	11	Local	No	
1/10/2017	Wind	Central North	2	285	313,112	0.1%	16	Local	No	
1/10/2017	Wind	Central South	2	1,228	241,640	0.5%	12	Local	No	
1/10/2017	Wind	South	2	2,259	249,140	0.9%	22	Local	No	
1/10/2017	Wind	West	2	6,794	127,555	5.3%	46	Local	No	
2/1/2017	Wind	Central North	1	308	313,394	0.1%	7	Local	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
2/1/2017	Wind	North	1	519	201,235	0.3%	8	Local	No	
2/1/2017	Wind	South	1	1,338	249,580	0.5%	15	Local	No	
2/1/2017	Wind	West	1	672	127,613	0.5%	4	Local	No	
2/4/2017	Wind	Central North	1	107	313,394	0.0%	7	Local	No	
2/4/2017	Wind	South	1	12	249,580	0.0%	2	Local	No	
2/4/2017	Wind	West	1	79	127,613	0.1%	3	Local	No	
3/9/2017	Wind	Central North	2	1,650	313,555	0.5%	18	Local	No	
3/9/2017	Wind	Central South	2	631	241,963	0.3%	8	Local	No	
3/9/2017	Wind	North	2	1,643	201,334	0.8%	24	Local	No	
3/9/2017	Wind	South	2	247	249,963	0.1%	6	Local	No	
4/7/2017	Wind	Central North	3	12,489	313,819	4.0%	51	SAIDI	No	
4/7/2017	Wind	Central South	3	3,623	242,024	1.5%	33	SAIDI	No	
4/7/2017	Wind	North	3	7,355	201,425	3.7%	55	SAIDI	No	
4/7/2017	Wind	West	3	6,879	127,770	5.4%	32	SAIDI	No	
5/4/2017	Wind	Central North	4	1,271	314,016	0.4%	60	SAIDI	No	
5/4/2017	Wind	North	4	1,212	201,475	0.6%	53	SAIDI	No	
5/4/2017	Wind	West	4	922	127,794	0.7%	15	SAIDI	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
5/23/2017	Wind	Central North	2	8,173	314,016	2.6%	48	SAIDI	No	
5/23/2017	Wind	Central South	2	110	242,083	0.0%	13	SAIDI	No	
5/23/2017	Wind	South	2	3,686	250,378	1.5%	30	SAIDI	No	
5/23/2017	Wind	West	2	2,649	127,794	2.1%	10	SAIDI	No	
6/15/2017	Wind	Central North	1	310	314,158	0.1%	15	Local	No	
6/15/2017	Wind	Central South	1	316	242,176	0.1%	9	Local	No	
6/15/2017	Wind	South	1	2,424	250,643	1.0%	19	Local	No	
6/15/2017	Wind	West	1	60	127,804	0.0%	8	Local	No	
6/25/2017	Wind	Central North	1	447	314,158	0.1%	17	Local	No	
6/25/2017	Wind	Central South	1	914	242,176	0.4%	7	Local	No	
6/25/2017	Wind	South	1	407	250,643	0.2%	9	Local	No	
9/4/2017	Wind	Central North	1	3,463	314,513	1.1%	8	Local	No	
9/4/2017	Wind	Central South	1	227	242,573	0.1%	7	Local	No	
9/4/2017	Wind	South	1	549	251,173	0.2%	8	Local	No	
9/4/2017	Wind	West	1	92	127,883	0.1%	9	Local	No	
9/8/2017	Wind	Central North	2	517	314,513	0.2%	14	Local	No	
9/8/2017	Wind	Central South	2	98	242,573	0.0%	7	Local	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
9/8/2017	Wind	South	2	237	251,173	0.1%	14	Local	No	
9/8/2017	Wind	West	2	180	127,883	0.1%	13	Local	No	
10/6/2017	Wind	Central North	1	7,974	314,513	2.5%	21	Local	No	
10/6/2017	Wind	Central South	1	215	242,573	0.1%	12	Local	No	
10/6/2017	Wind	North	1	140	201,791	0.1%	5	Local	No	
10/6/2017	Wind	South	1	43	251,173	0.0%	2	Local	No	
10/17/2017	Wind	Central North	1	2,494	314,685	0.8%	27	Local	No	
10/17/2017	Wind	Central South	1	948	242,695	0.4%	11	Local	No	
10/17/2017	Wind	South	1	117	251,485	0.0%	10	Local	No	
10/17/2017	Wind	West	1	6,388	127,897	5.0%	19	Local	No	
10/22/2017	Wind	Central North	1	4,916	314,685	1.6%	18	Local	No	
10/22/2017	Wind	North	1	121	201,955	0.1%	9	Local	No	
10/22/2017	Wind	West	1	2,881	127,897	2.3%	9	Local	No	
11/3/2017	Wind	Central North	1	2,563	314,922	0.8%	9	Local	No	
11/3/2017	Wind	Central South	1	285	242,832	0.1%	5	Local	No	
11/3/2017	Wind	South	1	13,215	251,802	5.2%	13	Local	No	
11/3/2017	Wind	West	1	293	127,977	0.2%	9	Local	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
11/5/2017	Wind	Central North	1	11,003	314,922	3.5%	24	Local	No	
11/5/2017	Wind	Central South	1	3,488	242,832	1.4%	8	Local	No	
11/5/2017	Wind	South	1	1,281	251,802	0.5%	18	Local	No	
11/5/2017	Wind	West	1	865	127,977	0.7%	13	Local	No	
11/19/2017	Wind	Central North	2	1,373	314,922	0.4%	18	Local	No	
11/19/2017	Wind	Central South	2	8,859	242,832	3.6%	6	Local	No	
11/19/2017	Wind	South	2	23,904	251,802	9.5%	27	Local	No	
11/19/2017	Wind	West	2	3,161	127,977	2.5%	18	Local	No	
11/26/2017	Wind	Central North	1	136	314,922	0.0%	6	Local	No	
11/26/2017	Wind	South	1	27	251,802	0.0%	6	Local	No	
11/26/2017	Wind	West	1	421	127,977	0.3%	6	Local	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.[40]

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
1/6/2017	Kenmore	7318 NE 201st Pl	23:25	1:28	N/A	2:02
1/9/2017	Federal Way	35002 Pacific Hwy S	10:56	11:04	15:45	4:41
1/9/2017	Duvall	14441 Carnation Duvall Rd NE	12:20	12:51	13:16	0:25
1/11/2017	Seattle	400 Yesler Way	19:40	20:11	21:11	1:00
1/18/2017	Kirkland	7038 NE 134th St	10:42	11:10	14:36	3:26
1/23/2017	Kent	6403 S 194th St	13:25	13:49	15:40	1:51
1/26/2017	Kirkland	12541 120th Ave NE	17:51	18:11	6:05	11:54
1/27/2017	Seattle	1500 NE 50th St	12:33	12:33	13:13	0:40
2/6/2017	Auburn	36512 32nd Ave S	8:05	8:49	11:21	2:32
2/6/2017	Auburn	18056 SE 317th St	11:42	12:00	18:06	6:06
2/10/2017	Seattle	4755 22nd Ave NE	9:25	9:45	12:02	2:17

Table continues on next page.

[40] 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 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
3/1/2017	Lacey	4408 Ingleside Dr SE	15:16	15:34	17:20	1:46
3/6/2017	Seattle	400 Yesler Way	14:09	14:28	14:43	0:15
3/7/2017	Seattle	9130 15th Pl S. A	15:23	15:54	15:54	0:00
3/11/2017	Kent	615 Alvord Ave N	1:29	2:19	2:19	0:00
3/14/2017	Auburn	12900 SE 312th St	1:37	1:40	11:07	9:27
4/6/2017	Kirkland	203 1st Ave S	11:50	12:13	12:44	0:31
4/6/2017	Seattle	1520 Broadmoor Dr E	11:45	11:53	11:59	0:06
4/7/2017	Auburn	2826 I St SE	8:41	9:25	9:44	0:19
4/7/2017	Seattle	804 N Motor Pl	2:16	2:36	2:45	0:09
4/18/2017	Kent	827 W Valley Hwy	11:53	12:08	12:48	0:40
4/19/2017	Bellevue	3205 162nd Pl SE	11:25	11:39	12:05	0:26
4/27/2017	Lakewood	11123 110th St SW	10:40	11:07	12:42	1:35
5/8/2017	Renton	1716 Kennewick Ct SE	17:17	18:02	18:20	0:18
5/16/2017	Mill Creek	15500 Village Green Dr	12:05	12:19	14:22	2:03
5/22/2017	Puyallup	2400 13th St SW	9:02	9:10	9:30	0:20
5/23/2017	Lake Stevens	11629 16th Pl SE	14:21	14:37	15:05	0:28

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
6/8/2017	Mill Creek	15003 16th Ave SE	10:29	10:48	11:03	0:15
6/15/2017	Tukwila	16201 West Valley Hwy	6:38	7:14	8:31	1:17
6/24/2017	Seattle	10054 14th Ave NW	12:16	12:31	12:43	0:12
6/26/2017	Federal Way	33510 Pacific Hwy S	8:53	9:23	9:28	0:05
6/26/2017	Seatac	15011 30th Ave S	11:02	11:07	11:24	0:17
7/1/2017	Seattle	8717 7th Ave S	12:42	12:55	13:16	0:21
7/10/2017	Seattle	164 Galer St	9:28	9:55	10:37	0:42
7/11/2017	Seattle	117 W McGraw St	15:03	15:11	19:26	4:15
7/11/2017	Tacoma	5909 E K St	13:31	13:48	14:05	0:17
7/16/207	Mtlk Terrace	4201 214th St SW	11:00	11:26	11:30	0:04
7/25/2017	Seattle	4626 51st Ave S	10:04	10:17	10:21	0:04
7/29/2017	Seattle	4702 S Juneau St	7:57	8:24	8:42	0:18
7/29/2017	Seattle	6403 29th Ave S	11:45	11:53	12:02	0:09
7/30/2017	Tacoma	5802 S Washington St	11:52	12:09	13:00	0:51
7/31/2017	Seattle	7506 16th Ave NW	12:21	12:31	12:39	0:08
8/2/2017	Tacoma	2615 N Pearl St	13:02	13:11	13:33	0:22
8/4/2017	Tacoma	5922 Pennsylvania Ave	9:27	9:46	10:14	0:28

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
8/8/2017	Seattle	1202 Harrison St	13:01	13:21	13:21	0:00
8/13/2017	Puyallup	2205 25th Ave SE	9:22	9:42	9:47	0:05
8/19/2017	Duvall	26326 NE Kennedy Drive	13:19	13:56	14:38	0:42
8/21/2017	Lake Stevens	8325 5th St SE	15:07	15:16	15:24	0:08
8/31/2017	Everett	16 Madison St	10:54	11:08	15:03	3:55
9/3/2017	Seattle	2323 NE 89th St	10:39	10:56	11:02	0:06
9/4/2017	Renton	18011 SE 144th St	12:15	12:23	13:10	0:47
9/12/2017	Bellevue	12072 SE 41st St	18:15	19:02	18:50	0:35
9/13/2017	Lynnwood	15607 34th Pl W	11:42	11:51	12:19	0:28
9/13/2017	Cle Elum	107 Big Hill Dr	11:47	12:26	12:44	0:18
9/18/2017	Tacoma	8404 Golden Given Rd	0:53	1:31	1:59	0:28
9/28/2017	Burien	13708 12th Ave SW	9:00	9:23	9:27	0:04
10/9/2017	Mercer Island	6125 79th Ave SE	11:38	12:08	12:45	0:37
10/19/2017	Edmonds	16109 73rd PL W	4:12	4:57	6:12	1:15
10/23/2017	Maple Valley	28206 230th Ave SE	11:27	11:59	12:12	0:13
10/30/2017	Edmonds	1010 Spruce St	13:27	13:35	13:50	0:15
11/2/2017	Kirkland	11420 NE 112th St	9:02	9:25	9:47	0:22

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
11/2/2017	Sultan	1209 Kesller Dr	6:01	6:55	7:10	0:15
11/3/2017	Puyallup	10312 120th St E	9:33	10:06	11:59	1:53
11/27/2017	Lake Stevens	3327 Lake Dr	9:20	9:41	9:46	0:05
11/29/2017	Seattle	4242 University Way NE	13:36	14:02	14:02	0:00
12/18/2017	Issaquah	1885 15th Pl NW	1:44	2:39	2:39	0:00
12/18/2017	Lake Tapps	2024 Channel Rd E	16:01	16:19	16:27	0:08
					Average Control Time for 2017	**1:09**

B

Certification of Survey Results

EMC RESEARCH MARKET & OPINION RESEARCH SERVICES

Oakland, CA 510.844.0680
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Columbus, OH 614.268.1660
Washington, DC 202.686.5900
Portland, OR 503.444.6000
Irving, TX 972.717.7427
Orlando, FL 407.704.6208
EMCresearch.com

TO: Eric Haechrel, Puget Sound Energy
FR: Andrew Thibault, EMC Research, Inc.
DT: January 2018
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

For the 2017 reporting year, PSE met all the performance benchmarks with potential penalty assessment therefore PSE did not incur any penalty associated with its service quality index performance.

D
Proposed Customer Notice (Report Card)

2017 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 SQ and Electric Service Reliability Report.

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

Figure D1: Draft 2017 Service Quality Report Card

2017 Service Quality Report Card

Key measurement	Benchmark	2017 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	94 percent	✓
Number of complaints to the WUTC per 1,000 customers, per year	Less than 0.40	0.20	✓
CUSTOMER SERVICES			
Percent of calls answered live within 30 seconds by our Customer Care Center	At least 75 percent	78 percent	✓
OPERATIONS SERVICES			
Frequency of non-major-storm power outages, per year, per customer	Less than 1.30 outages	1.20 outages	✓
Length of power outages per year, per customer	Less than 2 hours, 35 minutes	2 hours, 55 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	32 minutes	✓
Percent of service appointments kept	At least 92 percent	100 percent	✓

Each year Puget Sound Energy measures service-quality benchmarks established in cooperation with the Washington Utilities and Transportation Commission (UTC), the Public Counsel Section of the Attorney General's Office and other parties to gauge how well we deliver our services to you and all of our customers.

2017 Performance Highlights

In 2017 we met eight of our nine service metrics (see chart above).

We missed the benchmark for the amount of time in restoring power outages. In 2017, several severe storms hit our region, with the greatest damage primarily occurring in the northern part of our service territory where there were power outages at hundreds of locations. The number of outage locations added the amount of time it took our teams to get from one location to another to repair the damage and restore service.

We have three service guarantees. We credit your bill $50 if we fail to meet these guarantees.

- Keeping scheduled appointments
- If your power is out for 120 consecutive hours or longer
- If your power is out for 24 consecutive hours or longer

We credited customers a total of $23,250 for missing 465, or 0.4 percent, of our total 114,004 scheduled

appointments.

We credited six customers for not restoring electric service within 120 consecutive hours and 250 customers for not restoring service within 24 consecutive hours.

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 2013 to 2017 per 1,000 Customers

2013	2014	2015	2016	2017
13	47	50	42	53

Table E2: Monthly Disconnection Results per 1,000 Customers for 2017

Month	Disconnections per 1,000 Customers
January	4
February	3
March	5
April	5
May	5
June	6
July	4
August	5
September	4
October	4
November	4
December	3

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 2017

	Total Appointments (Exclude Canceled and Excused)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment	Percent Kept (Exclude Canceled and Excused) [41]
Electric											
Permanent Service	8,247	78	-	78	121	8,048	8,169	-	30	$3,900	99%
Reconnection	51,712	43	-	43	173	51,496	51,669	-	3	$2,150	100%
Subtotal	**59,959**	**121**	**-**	**121**	**294**	**59,544**	**59,838**	**-**	**33**	**$6,050**	**100%**
Natural Gas											
Diagnostic	23,492	46	-	46	787	22,659	23,446	-	-	$2,300	100%
Permanent Service	10,007	274	-	274	335	9,398	9,733	-	5	$13,700	97%
Reconnection	20,547	24	-	24	256	20,267	20,523	-	-	$1,200	100%
Subtotal	**54,046**	**344**	**-**	**344**	**1,378**	**52,324**	**53,702**	**-**	**5**	**$17,200**	**99%**
Grand Total	**114,005**	**465**	**-**	**465**	**1,672**	**111,868**	**113,540**	**-**	**38**	**$23,250**	**100%**

[41] Results shown are rounded to the nearest whole percentage per UTC order for performance calculation and comparison to the benchmark. However, these 100% 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 2017

2017 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appointments (Exclude Canceled and Excused)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Jan-17	Electric	Permanent Service	**623**	11	0	11	11	601	612	0	0	$550
Jan-17	Electric	Reconnection	**3,419**	7	0	7	19	3,393	3,412	0	0	$350
Jan-17	Gas	Diagnostic	**2,974**	8	0	8	117	2,849	2,966	0	0	$400
Jan-17	Gas	Permanent Service	**795**	8	0	8	39	748	787	0	0	$400
Jan-17	Gas	Reconnection	**1,674**	3	0	3	31	1,640	1,671	0	0	$150
Jan-17 Total			**9,485**	37	0	37	217	9,231	9,448	0	0	$1,850
Feb-17	Electric	Permanent Service	**566**	5	0	5	4	557	561	0	4	$250
Feb-17	Electric	Reconnection	**3,352**	5	0	5	8	3,339	3,347	0	2	$250
Feb-17	Gas	Diagnostic	**2,007**	4	0	4	77	1,926	2,003	0	0	$200
Feb-17	Gas	Permanent Service	**625**	17	0	17	23	585	608	0	5	$850
Feb-17	Gas	Reconnection	**1,434**	0	0	0	15	1,419	1,434	0	0	$0
Feb-17 Total			**7,984**	31	0	31	127	7,826	7,953	0	11	$1,550
Mar-17	Electric	Permanent Service	**640**	3	0	3	11	626	637	0	0	$150
Mar-17	Electric	Reconnection	**4,674**	2	0	2	15	4,657	4,672	0	0	$100
Mar-17	Gas	Diagnostic	**1,852**	2	0	2	76	1,774	1,850	0	0	$100
Mar-17	Gas	Permanent Service	**797**	11	0	11	27	759	786	0	0	$550
Mar-17	Gas	Reconnection	**1,965**	1	0	1	14	1,950	1,964	0	0	$50
Mar-17 Total			**9,928**	19	0	19	143	9,766	9,909	0	0	$950

Table continues on next page.

2017 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appointments (Exclude Canceled and Excused)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Apr-17	Electric	Permanent Service	**722**	4	0	4	5	713	718	0	0	$200
Apr-17	Electric	Reconnection	**4,474**	6	0	6	7	4,461	4,468	0	0	$300
Apr-17	Gas	Diagnostic	**1,278**	2	0	2	36	1,240	1,276	0	0	$100
Apr-17	Gas	Permanent Service	**849**	26	0	26	36	787	823	0	0	$1,300
Apr-17	Gas	Reconnection	**1,577**	1	0	1	16	1,560	1,576	0	0	$50
Apr-17 Total			**8,900**	39	0	39	100	8,761	8,861	0	0	$1,950
May-17	Electric	Permanent Service	714	4	0	4	20	690	710	0	0	$200
May-17	Electric	Reconnection	5,010	2	0	2	19	4,989	5,008	0	0	$100
May-17	Gas	Diagnostic	1,157	3	0	3	47	1,107	1,154	0	0	$150
May-17	Gas	Permanent Service	891	12	0	12	44	835	879	0	0	$600
May-17	Gas	Reconnection	1,580	1	0	1	31	1,548	1,579	0	0	$50
May-17 Total			**9,352**	22	0	22	161	9,169	9,330	0	0	$1,100
Jun-17	Electric	Permanent Service	737	2	0	2	18	717	735	0	0	$100
Jun-17	Electric	Reconnection	5,567	5	0	5	19	5,543	5,562	0	0	$250
Jun-17	Gas	Diagnostic	948	1	0	1	31	916	947	0	0	$50
Jun-17	Gas	Permanent Service	849	14	0	14	22	813	835	0	0	$700
Jun-17	Gas	Reconnection	1,594	2	0	2	22	1,570	1,592	0	0	$100
Jun-17 Total			**9,695**	24	0	24	112	9,559	9,671	0	0	$1,200

Table continues on next page.

2017 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appointments (Exclude Canceled and Excused)	Missed Approved	Missed Open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Jul-17	Electric	Permanent Service	620	3	0	3	4	613	617	0	0	$150
Jul-17	Electric	Reconnection	4,426	1	0	1	9	4,416	4,425	0	0	$50
Jul-17	Gas	Diagnostic	851	1	0	1	32	818	850	0	0	$50
Jul-17	Gas	Permanent Service	837	10	0	10	20	807	827	0	0	$500
Jul-17	Gas	Reconnection	1,447	2	0	2	16	1,429	1,445	0	0	$100
Jul-17 Total			8,181	17	0	17	81	8,083	8,164	0	0	$850
Aug-17	Electric	Permanent Service	855	8	0	8	23	824	847	0	0	$400
Aug-17	Electric	Reconnection	4,753	5	0	5	15	4,733	4,748	0	0	$250
Aug-17	Gas	Diagnostic	948	0	0	0	36	912	948	0	0	$0
Aug-17	Gas	Permanent Service	924	25	0	25	21	878	899	0	0	$1,250
Aug-17	Gas	Reconnection	1,623	3	0	3	21	1,599	1,620	0	0	$150
Aug-17 Total			9,103	41	0	41	116	8,946	9,062	0	0	$2,050
Sep-17	Electric	Permanent Service	677	7	0	7	6	664	670	0	0	$350
Sep-17	Electric	Reconnection	4,622	2	0	2	15	4,605	4,620	0	0	$100
Sep-17	Gas	Diagnostic	2,103	5	0	5	52	2,046	2,098	0	0	$250
Sep-17	Gas	Permanent Service	853	48	0	48	20	785	805	0	0	$2,400
Sep-17	Gas	Reconnection	1,834	4	0	4	30	1,800	1,830	0	0	$200
Sep-17 Total			10,089	66	0	66	123	9,900	10,023	0	0	$3,300

Table continues on next page.

2017 SQI #10 and Customer Service Guarantee Payment Monthly Details												
Month	Fuel	Type	Total Appointments (Exclude Canceled and Excused)	Missed Approved	Missed open	Total Missed	Manual Kept	System Kept	Total Kept	Canceled	Excused	Customer Service Guarantee Payment
Oct-17	Electric	Permanent Service	856	12	0	12	16	828	844	0	0	$600
Oct-17	Electric	Reconnection	4,706	4	0	4	16	4,686	4,702	0	0	$200
Oct-17	Gas	Diagnostic	3,252	9	0	9	102	3,141	3,243	0	0	$450
Oct-17	Gas	Permanent Service	920	16	0	16	39	865	904	0	0	$800
Oct-17	Gas	Reconnection	2,265	6	0	6	18	2,241	2,259	0	0	$300
Oct-17 Total			**11,999**	47	0	47	191	11,761	11,952	0	0	$2,350
Nov-17	Electric	Permanent Service	612	12	0	12	2	598	600	0	26	$600
Nov-17	Electric	Reconnection	3,726	3	S0	3	18	3,705	3,723	0	1	$150
Nov-17	Gas	Diagnostic	3,167	7	0	7	94	3,066	3,160	0	0	$350
Nov-17	Gas	Permanent Service	907	48	0	48	25	834	859	0	0	$2,400
Nov-17	Gas	Reconnection	1,904	0	0	0	19	1,885	1,904	0	0	$0
Nov-17 Total			**10,316**	70	0	70	158	10,088	10,246	0	27	$3,500
Dec-17	Electric	Permanent Service	625	7	0	7	1	617	618	0	0	$350
Dec-17	Electric	Reconnection	2,983	1	0	1	13	2,969	2,982	0	0	$50
Dec-17	Gas	Diagnostic	2,955	4	0	4	87	2,864	2,951	0	0	$200
Dec-17	Gas	Permanent Service	760	39	0	39	19	702	721	0	0	$1,950
Dec-17	Gas	Reconnection	1,650	1	0	1	23	1,626	1,649	0	0	$50
Dec-17 Total			8,973	52	0	52	143	8,778	8,921	0	0	$2,600
Grand Total			**114,005**	**465**	**0**	**465**	**1,672**	**111,868**	**113,540**	**0**	**38**	**$23,250**

G
Customer Awareness of Customer Service Guarantee

2017 Awareness: Customer Service Guarantee

Contacts by phone or in person with Customer Care Center representatives and field employees
In 2017, every newly-hired PSE Customer Care Center and Customer Service Office representative received training about the Service Guarantee. An online job aid that explains the circumstances for notifying customers about the Customer 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 2017, with the creation of a third service guarantee—24-consecutive-hour non-major storm power outage restoration 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
Every customer new to PSE service receives the Your customer rights and responsibilities[42] brochure, which is also posted year-round on pse.com.

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

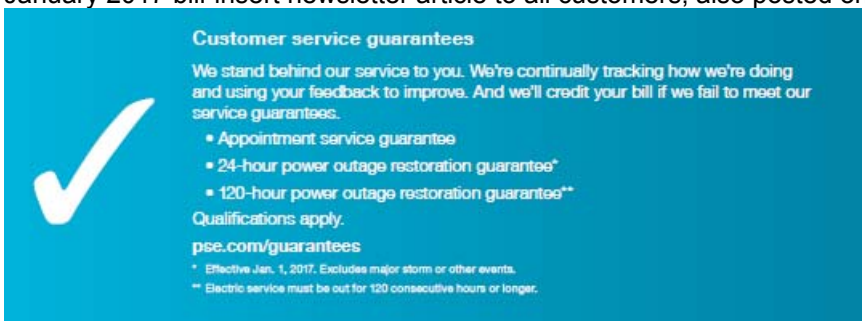
Other 2017 service guarantee awareness efforts include:

In 2017, the first full year of the 24-consecutive-hour non-major storm power outage restoration guarantee, Puget Sound Energy made customers aware of the three service guarantees through bill inserts, bill mailing envelopes, bill-print messages, recorded phone-greeting messages and in-person conversations.

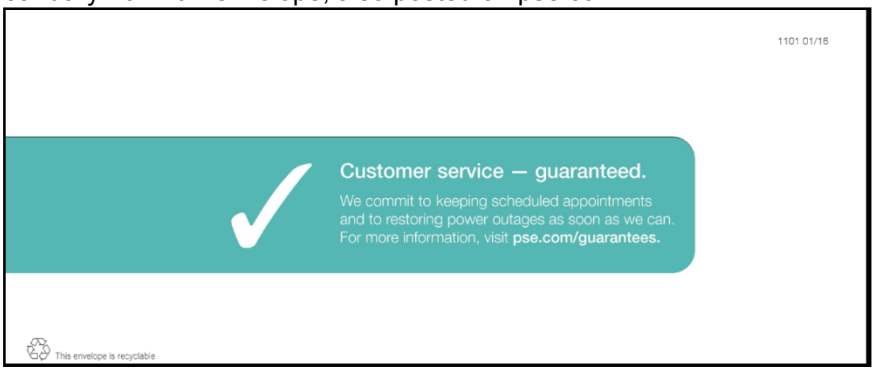
The samples below illustrate some of the communications used to raise awareness about PSE's three Service Guarantees.

1. PSE Bill Package

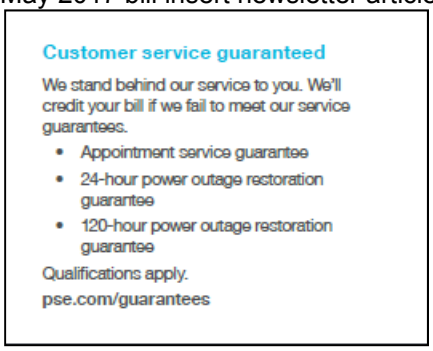
January 2017 bill-insert newsletter article to all customers, also posted on pse.com:



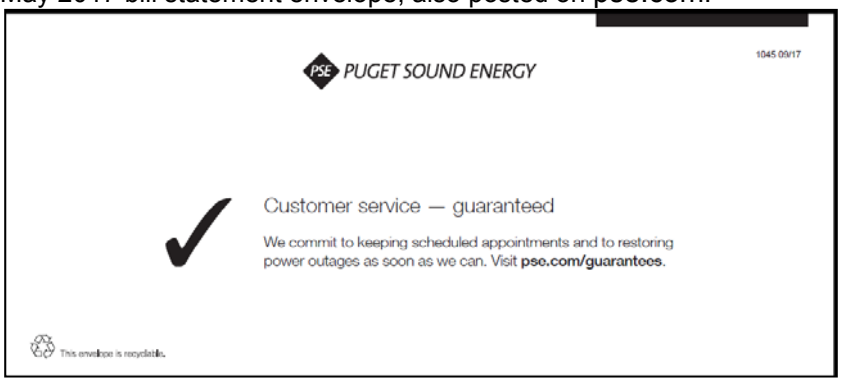
January 2017 bill envelope, also posted on pse.com:



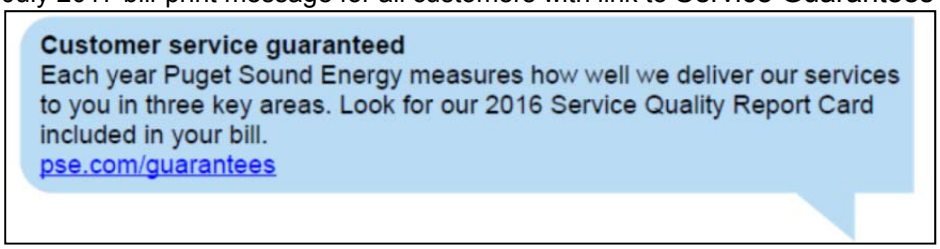
May 2017 bill insert newsletter article to all customers, also posted on pse.com:



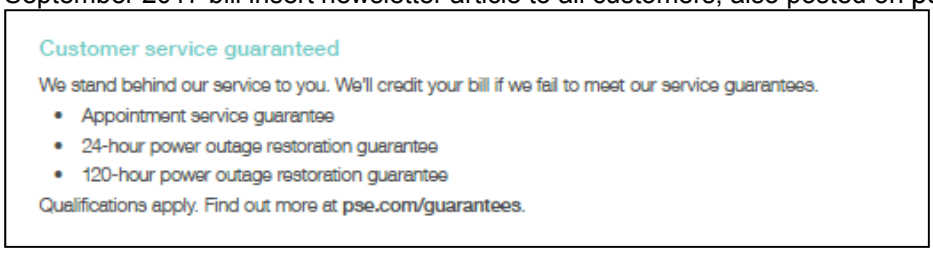
May 2017 bill statement envelope, also posted on pse.com:



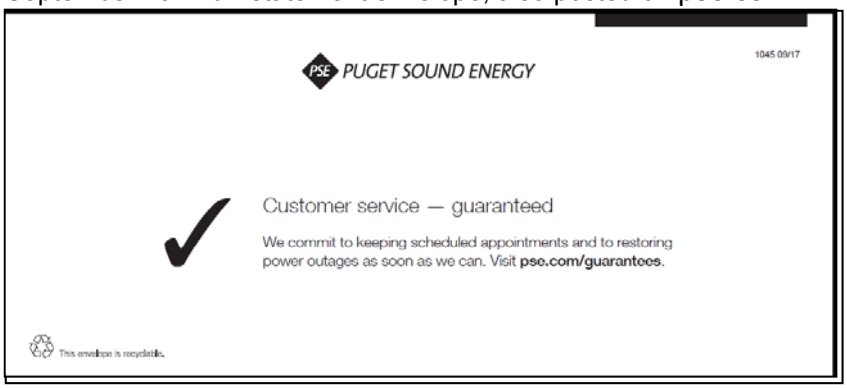
July 2017 bill-print message for all customers with link to Service Guarantees page on pse.com:



September 2017 bill insert newsletter article to all customers, also posted on pse.com:



September 2017 bill statement envelope, also posted on pse.com



October 2017 bill print message for all customers with link to Service Guarantees page on pse.com:

Customer service, guaranteed
We stand behind our service, from keeping scheduled appointments to restoring power outages as soon as we can. We'll credit your bill if we fail to meet our service guarantees. pse.com/guarantees.

December 2017 bill-insert newsletter article to all customers, also posted on pse.com

Customer service guaranteed

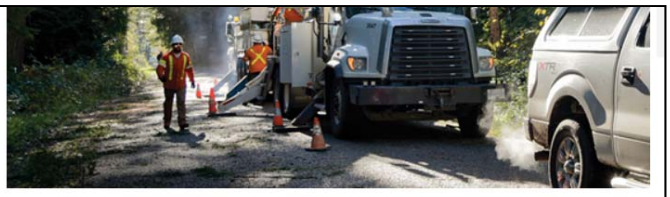
We stand behind our service to you. We continuously track our performance and use your feedback to make improvements. We'll credit your bill if we fail to meet our service guarantees.

- Appointment service guarantee
- 24-hour power outage restoration guarantee
- 120-hour power outage restoration guarantee

Conditions apply.

pse.com/guarantees

2. **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.

2016 Service Quality report card

2014-15 Energy Efficiency report card

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

- 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

		Jan -17	Feb -17	Mar -17	Apr -17	May -17	Jun -17	Jul -17	Aug -17	Sep -17	Oct -17	Nov -17	Dec -17
Field Service Operations Transactions Customer Satisfaction Survey													
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	60	52	74	73	67	77	63	67	46	70	70	71
	No	104	111	122	91	112	122	101	142	101	85	123	116
	Don't Know	36	37	44	34	30	48	39	41	47	37	42	41
	Refused Response	-	-	-	1	2	-	-	-	-	-	-	1
	Total Customers Surveyed	**200**	**200**	**240**	**199**	**211**	**247**	**203**	**250**	**194**	**192**	**235**	**229**
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.	21	20	37	30	18	24	20	32	28	28	24	22
	Whenever PSE changes an appointment, you are given the $50.	31	25	43	20	23	36	28	27	28	27	25	34
	You have no understanding or expectations about this part of the service guarantee plan.	125	121	130	130	138	160	120	150	113	108	151	130
	Don't Know	22	28	29	18	27	21	34	39	22	26	29	41
	Refused Response	1	6	1	1	5	6	1	2	3	3	6	2
	Total Customers Surveyed	**200**	**200**	**240**	**199**	**211**	**247**	**203**	**250**	**194**	**192**	**235**	**229**

Table continues on next page.

Field Service Operations Transactions Customer Satisfaction Survey		Jan -17	Feb -17	Mar -17	Apr -17	May -17	Jun -17	Jul -17	Aug -17	Sep -17	Oct -17	Nov -17	Dec -17
Q26D. Did your appointment have to be rescheduled or did it occur as planned?	It occurred as planned.	185	188	222	179	182	229	181	231	184	177	218	212
	It was rescheduled.	5	8	8	8	16	9	15	8	4	10	7	7
	Technician arrived but was late.	1	2	2	-	3	2	-	1	-	-	1	3
	Don't Know	8	2	8	7	4	5	6	7	5	3	3	7
	Refused Response	1	-	-	5	6	2	1	3	1	2	6	-
	Total Customers Surveyed	**200**	**200**	**240**	**199**	**211**	**247**	**203**	**250**	**194**	**192**	**235**	**229**
Q26E. Who initiated rescheduling your appointment?	Myself (Customer Initiated)	5	5	7	6	8	5	7	7	3	7	3	5
	Puget Sound Energy (PSE) Initiated	-	3	1	2	6	4	8	1	-	3	3	2
	Don't Know	-	-	-	-	2	-	-	-	1	-	1	-
	Refused Response	-	-	-	-	-	-	-	-	-	-	-	-
	Total Customers Surveyed	**5**	**8**	**8**	**8**	**16**	**9**	**15**	**8**	**4**	**10**	**7**	**7**

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.

Blue-sky Days—Days when the energy-delivery system operates as normal

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

$CEMI_n$—Customers Experiencing Multiple Interruptions—This index indicates the ratio of individual customers experiencing n or more sustained interruptions to the total number of customers served. The performance result is calculated based on the below formula:

$$\mathbf{CEMI_n} = \frac{Total\ Number\ of\ Customers\ that\ experienced\ more\ than\ n\ sustained\ interruoptions}{Average\ Annual\ Electric\ Customer\ Count}$$

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

iDOT— Investment Decision Optimization Tool—An analysis tool that helps to identify a set of projects that will create maximum value by comparing the relative costs and benefits of each project

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.

MAIFI—Momentary Average Interruption Frequency Index—This index indicates the average frequency of momentary interruptions. The performance result is calculated based on the below formula:

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

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 UE-960195. The SQ Program has been since extended and modified in Dockets UE-011570 and UG-011571 (consolidated), Docket UE-031946, and Dockets 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.

Worst Performing Circuit—Another term for Areas Of Greatest Concern to describe areas targeted for specific actions to improve the level of service reliability or quality.

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 SQ and Electric Service Reliability report with the UTC no later than the end of March of each year.[43]

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.

[43] Order 17 of consolidated Dockets UE-072300 and UG-072301, page 10, section 26.

Changes for 2017 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 Dockets 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 2017 Electric Service Reliability Report, PSE continues to designate the Areas of Greatest Concern as the Top 50 worst-performing circuits[44] 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 2017, 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 Dockets 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 the new worst performing circuit criteria, PSE calculates circuit SAIFI excluding the same days that are excluded in the circuit SAIDI performance.

[44] 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.

Exclusion Events

Per Dockets 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 days are considered catastrophic:

- March 13, 2016
- February 6, 2017

J
Current Year Electric Service Outage by Cause by Area

This appendix details the 2017 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	47	27	9	131	6	21	40	22	303
BA	197	94	67	843	38	116	217	272	1,844
CP	17	33	17	115	5	37	57	31	312
CR	3	0	0	0	0	4	0	2	9
DU	11	14	7	96	8	23	30	25	214
EF	703	337	231	1,755	146	379	583	361	4,495
EO	0	1		5	0	4	4	0	14
EQ	0	0	0	0	0	0	0	1	1
FI	11	3	2	55	1	11	13	8	104
LI	7	7	5	119	13	50	30	8	239
SO	230	164	127	985	30	182	341	479	2,538
TF	10	12	4	29	0	4	4	5	68
TO	5	0	1	2	0	1	1	1	11
TV	695	391	253	2,118	30	335	682	1,064	5,568
UN	171	103	55	767	14	134	122	172	1,538
VA	0	0	0	6	0	2	2	1	11
Misc[Note]	167	22	4	174	32	77	27	47	550
Total	2,274	1,208	782	7,200	323	1,380	2,153	2,499	17,819

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	26	9	127	5	19	40	21	291
BA	195	92	67	834	38	114	214	268	1,822
CP	17	33	17	113	4	37	53	29	303
CR	3	0	0	0	0	4	0	2	9
DU	11	14	7	94	8	22	30	25	211
EF	637	317	217	1,681	142	358	539	340	4,231
EO	0	1	0	4	0	4	3	0	12
EQ	0	0	0	0	0	0	0	1	1
FI	10	3	2	53	1	10	11	8	98
LI	5	3	2	38	13	14	16	3	94
SO	228	164	127	954	29	178	338	477	2,495
TF	10	12	4	28	0	4	4	5	67
TO	5	0	1	2	0	1	1	1	11
TV	409	261	150	1,092	30	164	341	604	3,051
UN	131	90	50	694	14	115	102	147	1,343
VA	0	0	0	4	0	2	2	1	9
Misc[Note]	104	22	4	146	32	51	25	43	427
Total	1,809	1,038	657	5,864	316	1,097	1,719	1,975	14,475

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	2017	**1.95**	**1.30**	**702**	**287**
	2016	1.80	0.92	446	122
	2015	2.07	1.15	1056	154
Skagit	2017	**2.05**	**1.77**	**467**	**283**
	2016	2.13	1.52	496	211
	2015	2.11	1.18	948	163
Island	2017	**2.07**	**1.49**	**468**	**238**
	2016	2.64	0.87	471	147
	2015	2.05	0.81	1430	208
King/Kittitas					
King	2017	**1.57**	**0.97**	**398**	**130**
	2016	1.29	0.93	276	123
	2015	1.92	0.94	597	132
Kittitas	2017	**1.84**	**1.85**	**238**	**237**
	2016	1.35	1.34	198	197
	2015	1.21	1.00	289	209

Note: Reported figures are based on most current SAP outage data, as of January 2018.

Table continues on next page.

Region/County	Year	Total SAIFI	SQI SAIFI	Total SAIDI	SQI SAIDI
Southern/Western					
Pierce	2017	**1.31**	**1.15**	**227**	**129**
	2016	1.07	0.70	156	101
	2015	1.95	0.84	433	79
Thurston	2017	**2.06**	**1.63**	**635**	**216**
	2016	1.75	1.43	289	225
	2015	1.39	0.88	382	129
Kitsap	2017	**2.73**	**1.62**	**745**	**203**
	2016	3.59	1.50	1149	209
	2015	4.69	2.40	1715	290

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.

1997-2017 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
2017	1.20	1.12	1.80	1.80	1.74

Figure L1: 1997–2017 SAIFI Performance by Different Measurements

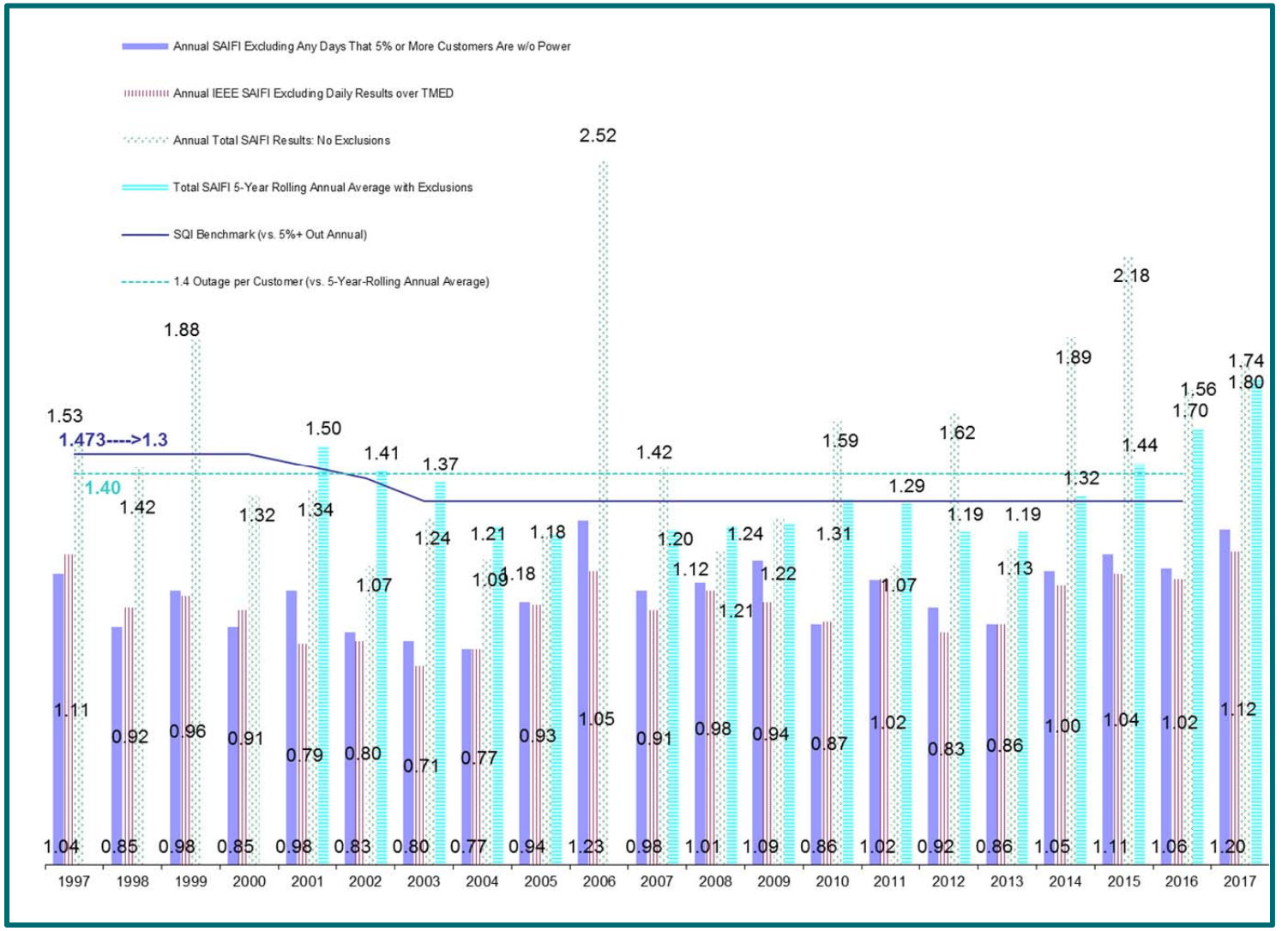


Figure L2: 1997–2017 SAIFI Performance by Different Measurements

1997-2017 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
2017	222	175	477	477	386	175

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

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

Figure L3: 1997–2017 SAIDI Performance by Different Measurements

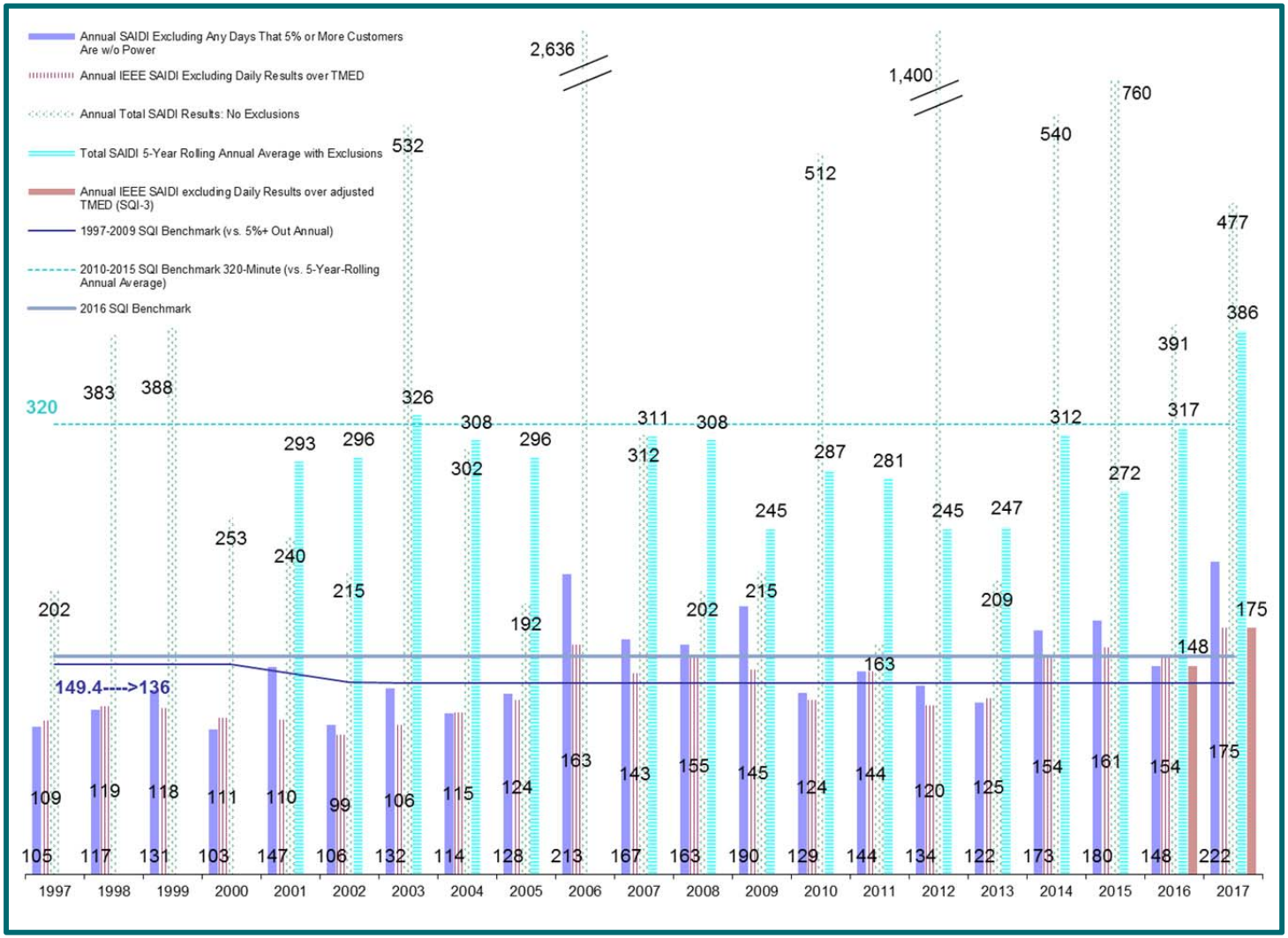


Figure L4: 1997–2017 SAIDI Performance by Different Measurements

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	Case Resolution
1	Reliability	2/3/2017	Issaquah	2/13/2017	Company upheld
2	Reliability	7/18/2017	Graham	7/21/2017	Consumer upheld
3	Reliability	8/17/2017	Bellevue	8/25/2017	Company upheld with violations
4	Reliability	9/26/2017	Bellevue	9/6/2017	Company upheld
5	Reliability	9/26/2017	Bellevue	9/29/2017	Company upheld
6	Reliability	10/12/2017	Olympia	11/8/2017	Consumer upheld
7	Reliability	11/2/2017	Rainier	11/6/2017	Company upheld
8	Reliability	11/6/2017	Sedro Woolley	11/6/2017	Company upheld
9	Reliability	11/15/2017	Normandy Park	11/20/2017	Company upheld
10	Power Quality	3/3/2017	Mercer Island	3/10/2017	Company upheld
11	Power Quality	6/14/2017	Duvall	6/19/2017	Company upheld
12	Power Quality	7/6/2017	Ellensburg	9/25/2017	Company upheld

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	Sept 2016 Nov 2016	Coupeville	Reliability	Coupeville-15	Reported in 2016. No new inquiries in 2017.	An underground cable replacement project completed in 2017 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
2	Island	June 2016 Aug 2016	Oak Harbor	Power Quality	Clover Valley-16	Reported in 2016. No new inquiries in 2017.	A project to install tree wire planned for 2019 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
3	Island	Aug 2016 Sept 2016	Oak Harbor	Reliability Power Quality	Hillcrest-24	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
4	Island	Jan 2017 Jan 2017 Feb 2017	Oak Harbor	Reliability	Swantown-12	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue.
5	Island	Sep 2016 Jun 2017	Oak Harbor	Power Quality	Swantown-12	Reported in 2016. One new inquiry in 2017.	On-going circuit monitoring and maintenance will continue.
6	King	Sept 2016 Sept 2016 Nov 2017	Auburn	Reliability Power Quality	Ellingson-16	Reported in 2016. One new inquiry in 2017.	An underground cable replacement project completed in 2017 should provide reliability improvement. 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
7	King	Nov 2016 Nov 2016 Nov 2016	Auburn	Reliability Power Quality	Sherwood-18	Reported in 2016. No new inquiries in 2017.	A distribution automation project completed in 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
8	King	Mar 2016 Mar 2016	Bellevue	Reliability	Eastgate-12	Reported in 2016. No new inquiries in 2017.	A project to install tree wire planned for 2018 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
9	King	Nov 2017 Dec 2017	Bellevue	Reliability	Eastgate-12	Contacted customer to address concerns.	A project to install tree wire planned for 2018 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
10	King	Jul 2017 Sept 2017	Bellevue	Reliability	Factoria-12	Contacted customer to address concerns.	An underground cable replacement project and another system project planned for 2018 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
11	King	Mar 2016 Mar 2016	Bellevue	Reliability	Factoria-13	Reported in 2016. No new inquiries in 2017.	A reconfiguration of this circuit 2016 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
12	King	Dec 2016 Jan 2017	Bellevue	Power Quality	Kenilworth-25	Contacted customer to address concerns.	A repair of the customer's neutral connection completed in 2017 should provide a power quality improvement. On-going circuit monitoring and maintenance will continue.
13	King	Jan 2017 Jan 2017	Bellevue	Power Quality	Midlakes-16	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue.
14	King	Jan 2017 Oct 2017	Bellevue	Reliability Power Quality	Northrup-27	Contacted customer to address concerns.	An overhead system rebuild project completed in 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
15	King	Jun 2017 Sept 2017	Des Moines	Reliability	Des Moines-12	Contacted customer to address concerns.	An underground cable replacement project completed in 2017 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
16	King	Jun 2016 Jul 2016	Kenmore	Reliability	Inglewood-17	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
17	King	Dec 2016 Feb 2017	Kenmore	Reliability	Kenmore-23	Contacted customer to address concerns.	A project to install tree wire completed in 2017 should provide reliability improvements. 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
18	King	Mar 2016 Nov 2017	Kenmore	Reliability	Kenmore-26	Contacted customer to address concerns.	A transmission line rebuild completed in 2016 and a project to install tree wire along with system reconfiguration completed in 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
19	King	Aug 2016 Sept 2016	Kenmore	Reliability Power Quality	Kenmore-26	Reported in 2016. No new inquiries in 2017.	A transmission line rebuild completed in 2016 and a project to install tree wire along with system reconfiguration completed in 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
20	King	Dec 2016 Dec 2016	Kenmore	Reliability	North Bothell-26	Reported in 2016. No new inquiries in 2017.	A transmission line rebuild project and recloser installation completed in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
21	King	Feb 2017 Oct 2017	Kirkland	Power Quality	Norkirk-24	Contacted customer to address concerns.	The lowering of customer's service wires and repairing the customer's neutral connection in 2017 should provide power quality 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
22	King	Jan 2017 Mar 2017	Kirkland	Reliability	South Kirkland-16	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue.
23	King	Oct 2016 Sept 2017	Mercer Island	Reliability Power Quality	South Mercer-12	Contacted customer to address concerns.	A distribution automation project planned for 2019 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
24	King	Jan 2017 Jan 2017	Normandy Park	Power Quality	North Normandy-15	Contacted customer to address concerns.	Tree trimming performed on this circuit in 2017 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
25	King	Dec 2016 Nov 2017	Redmond	Reliability Power Quality	Avondale-15	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue
26	King	Oct 2017 Nov 2017	Redmond	Reliability	Avondale-15	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue.
27	King	Nov 2016 Sept 2017	Redmond	Reliability	Avondale-15	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue.
28	King	Dec 2016 Dec 2016	Renton	Reliability	Fairwood-16	Reported in 2016. No new inquiries in 2017.	An underground cable replacement project completed in 2017 should provide reliability improvements. 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
29	King	Jun 2016 Dec 2016	Renton	Reliability	Panther Lake-15	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
30	King	Jul 2017 Jul 2017 Oct 2017	Woodinville	Reliability	Cottage Brook-13	Contacted customer to address concerns.	A project to install tree wire and recloser installation completed in 2017 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
31	King	May 2016 Aug 2017	Woodinville	Reliability	Cottage Brook-13	Contacted customer to address concerns.	A project to install tree wire and recloser installation completed in 2017 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
32	King	Jul 2017 Nov 2017	Woodinville	Reliability	Lake Leota-16	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue.
33	Kitsap	Mar 2016 June 2016	Bainbridge Island	Reliability	Winslow-13	Reported in 2016. No new inquiries in 2017.	A project to install tree wire in 2018 should provide reliability improvement.
34	Kitsap	Jul 2016 Jan 2017	Bremerton	Reliability Power Quality	Chico-12	Reported in 2016. One new inquiry in 2017.	A project to install a gang operated switch in 2017 and a project to create a feeder tie between two circuits planned for 2018 should provide reliability improvement.

Table continues on next page

No.	County	Date of Complaint	Location	Complaint Type	Circuit	Response	Action by PSE
35	Kitsap	Mar 2016 Apr 2016	Poulsbo	Power Quality	Poulsbo-13	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
36	Kitsap	Dec 2016 Dec 2016	Seabeck	Reliability	Chico-12	Reported in 2016. No new inquiries in 2017.	A project to install a gang operated switch in 2017 and a project to create a feeder tie between two circuits planned for 2018 should provide reliability improvement.
37	Kitsap	Oct 2016 Oct 2016	Silverdale	Reliability Power Quality	Silverdale-15	Reported in 2016. No new inquiries in 2017.	Three projects to install tree wire and one project to convert a section of the overhead system to underground completed in 2017 and an underground system upgrade project planned for 2018 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
38	Kitsap	May 2017 Dec 2017	Silverdale	Reliability	Silverdale-16	Contacted customer to address concerns.	Two projects to install tree wire completed in 2017 and an underground cable replacement project planned for 2018 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
39	Kitsap	Mar 2016 Sept 2016	Silverdale	Reliability	Silverdale-16	Reported in 2016. No new inquiries in 2017.	Two projects to install tree wire completed in 2017 and an underground cable replacement project planned for 2018 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
40	Kitsap	Sept 2016 Jun 2017	Silverdale	Reliability	Silverdale-16	Contacted customer to address concerns.	Two projects to install tree wire completed in 2017 and an underground cable replacement project planned for 2018 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
41	Pierce	Dec 2016 Dec 2016	Graham	Power Quality	Kapowsin-16	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
42	Pierce	Mar 2016 Sept 2016 Dec 2016	Puyallup	Reliability	Stewart-13	Reported in 2016. No new inquiries in 2017.	An underground cable replacement project completed in 2017 and a project to convert a section of the overhead system to underground planned for 2019 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
43	Skagit	Mar 2017 Mar 2017	Burlington	Power Quality	Burlington-36	Contacted customer to address concerns.	A project to install tree wire completed in 2017 should provide reliability improvement. 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
44	Skagit	Mar 2016 Mar 2016	Burlington	Reliability	Burlington-38	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
45	Skagit	Aug 2016 Aug 2016 Aug 2016	Concrete	Power Quality	Baker River Sw-13	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
46	Skagit	Feb 2017 Feb 2017	La Conner	Reliability Power Quality	Peths Corner-15	Contacted customer to address concerns.	On-going circuit monitoring and maintenance will continue.
47	Skagit	Oct 2016 Oct 2016	Sedro Woolley	Reliability	Hamilton-15	Reported in 2016. No new inquiries in 2017.	A project to convert sections of the overhead system to underground and create a feeder tie between two circuits planned for 2018 should provide reliability improvement. On-going circuit maintenance and monitoring will continue.
48	Skagit	Sept 2016 Sept 2016	Sedro Woolley	Power Quality	Norlum-16	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
49	Thurston	June 2016 June 2016	Olympia	Reliability Power Quality	Luhr Beach-15	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
50	Thurston	Aug 2016 Aug 2016	Olympia	Reliability	Prine-23	Reported in 2016. No new inquiries in 2017.	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
51	Thurston	Feb 2016 Mar 2016	Olympia	Reliability	Rochester-16	Reported in 2016. No new inquiries in 2017.	A project to install tree wire planned for 2018 should provide reliability improvements. On-going circuit maintenance and monitoring will continue.
52	Thurston	Jan 2016 Jun 2016 Jun 2016	Tumwater	Reliability	Airport-25	Reported in 2016. No new inquiries in 2017.	A reconfiguration of this circuit moves this customer to Prine-22. On-going circuit maintenance and monitoring will continue.
53	Thurston	Dec 2016 Dec 2016	Tumwater	Reliability	Olympia Brewery-16	Reported in 2016. No new inquiries in 2017.	An underground cable replacement project completed in 2017 should provide reliability improvements. On-going circuit maintenance and monitoring will continue.
54	Whatcom	Apr 2016 Apr 2016	Bellingham	Reliability Power Quality	Happy Valley-16	Reported in 2016. No new inquiries in 2017.	On-going circuit monitoring and maintenance will continue.
55	Whatcom	Mar 2016 Mar 2016	Bellingham	Reliability	Laurel-12	Reported in 2016. No new inquiries in 2017.	The removal of several hazard trees in 2016 should provide reliability improvement. On-going circuit monitoring and maintenance will continue.
56	Whatcom	Mar 2017 Mar 2017	Point Roberts	Reliability	Point Roberts-16	Contacted customer to address concerns.	A project to install tree wire and create a tie between two circuits planned for 2018 should provide reliability improvements. On-going circuit maintenance and monitoring will continue.

N
Areas of Greatest Concern with Action Plan

This appendix details the areas of greatest concern with the 2018 and 2019 action plan.

Table N1 provides the 2017 and 2016 list of the Top 50 Worst-Performing Circuits in the PSE territory. The twelve circuits that dropped off in 2017 are noted as "Not on 2017 Top 50 List". The twelve circuits that are new in 2017 are noted as "Not on 2016 Top 50 List." Table N1 also includes the expanded list of circuits that have met SAIDI, SAIFI and CMI thresholds. Circuits that meet the SAIDI, SAIFI and CMI threshold are noted as "WPC".

CMI refers to Customer Minutes of Interruptions.

Table N1: 2017 and 2016 Year End Worst Performing Circuits

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Chico-12	Kitsap	1	5,560,930	1	5,712,507	✓	Completed one underground cable replacement project in 2013. Installed a second 7.5 MVA autotransformer allowing for a second feeder tie. Completed an underground system improvement project in 2015. Installed Tollgrade sensors in 2016. Completed one underground cable replacement project in 2016 and four in 2017. One underground system project and installing a recloser and switch planned for 2018.
Spurgeon-13	Thurston	2	4,737,846	Not on 2016 list			Installed reclosers and completed an underground conversion project in 2017.
Kenmore-23	King	3	3,385,588	16	2,593,395	✓	Two underground cable replacement projects completed in 2015. Two underground cable replacement projects and a tree wire project completed in 2017. A distribution automation project completed in 2017.
Longmire-17	Thurston	4	3,722,755	4	3,384,829	✓	Completed one underground cable replacement project and installed a recloser in 2016. Two tree wire projects, one system relocation project and two recloser installations completed in 2017.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Big Rock-15	Skagit	5	3,269,553	10	2,809,772	✓	Installed recloser in 2013. Installed regulators in early 2017. One underground cable replacement project, two tree wire projects and a project to construct new underground feeder and upgrade the overhead system completed in 2017. One overhead system rebuild project and reconfiguration of circuit and one underground cable replacement project planned for 2018.
Kingston-24	Kitsap	6	3,581,503	14	3,360,668	✓	Completed a tree wire project in 2013. Completed an underground cable replacement project in 2015 and one in 2016. Installed tripsavers in 2016. A tree wire project and an overhead system rebuild project completed in 2017. Two overhead system rebuild projects and installation of reclosers planned for 2018.
Cottage Brook-13	King	7	3,156,640	2	3,633,301	✓	Completed an underground conversion project in 2015. Completed three underground cable replacement projects in 2014, four in 2015 and three in 2016. Installed Tollgrade sensors in 2015. Five underground cable replacement projects completed in 2017. One tree wire project completed in 2017.
Spurgeon-14	Thurston	8	2,649,773	Not on 2016 list			Planning is reviewing for future reliability projects.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Baker River Switch-24	Skagit	9	2,549,290	8	2,181,890	✓	Two underground conversion projects completed in 2013. One underground conversion project completed in 2014. One underground cable replacement project and one overhead recloser project completed in 2017. One underground system rebuild project planned for 2018.
Fragaria-15	Kitsap	10	2,622,685	24	1,863,686	✓	Completed one underground cable replacement project in 2014. One tree wire project completed in 2017. One underground cable replacement project planned for 2019.
Fragaria-13	Kitsap	11	2,142,757	17	1,898,007	✓	One underground cable replacement project completed in 2015. Installed tripsavers in 2016. A system improvement and four underground cable replacement projects completed in 2017. Two tree wire projects planned for 2018.
Freeland-12	Island	12	2,946,596	6	3,128,704	✓	Completed phase balancing and fuse coordination in East Harbor area and one underground cable replacement project in 2014. Installed two switches in 2016. Reconfigured circuit in early 2017 with the new Maxwelton substation. A tree wire project completed in 2017.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Poulsbo-15	Kitsap	13	2,412,750	29	2,197,239	✓	One underground cable replacement project completed in 2014 and two in 2015. Installed a recloser and completed a tree wire project and one underground cable replacement project in 2017. One underground cable replacement project planned for 2019.
Langley-16	Island	14	3,182,307	38	2,897,523	✓	A system improvement project and reconfiguration of circuit with the new Maxwelton substation and three underground cable replacement projects planned for 2018. Two overhead tree wire projects planned for 2019.
Nugents Corner-26	Whatcom	15	2,913,051	21	1,890,205	✓	Added supervisory control (SCADA) to the feeder breaker in 2016. Three underground cable replacement projects completed in 2017. One underground cable replacement project and one overhead reconductor project planned for 2018.
Hickox-16	Skagit	16	1,980,001	13	1,978,125	✓	Completed a tree wire project in 2013. One distribution automation project with installation of regulators completed and one underground cable replacement project completed in 2017. One recloser installation and one underground cable replacement project planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Vashon-23	King	17	1,854,724	9	2,133,128	✓	Completed two projects to reconductor overhead line to tree wire and one underground conversion project in 2014. Installed two switches in 2015. Installed tripsavers and completed one underground cable replacement project in 2016. Completed one switch project, two tree wire projects, two underground cable replacement projects, replaced all circuit breakers and adding distribution automation in 2017. One underground cable replacement project planned for 2018 and two in 2019.
Fragaria-16	Kitsap	18	2,581,784	36	1,754,340	✓	Completed a tree wire project in 2014 and 2015. Completed one underground cable replacement project in 2015 and one in 2016. Installed tripsavers in 2016. Three underground cable replacement projects, one tree wire project and installation of switch completed in 2017.
Silverdale-15	Kitsap	19	3,662,116	5	3,976,729	✓	Installed reclosers in 2014 and in 2016. Installed tripsavers and completed a tree wire project in 2016. Two tree wire projects, two system rebuild projects and four underground cable replacement projects completed in 2017. One switch cabinet installation project planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Vashon-13	King	20	2,161,687	12	2,098,476	✓	Completed two projects to reconductor overhead line to tree wire in 2014. Completed underground cable replacement project in 2015. Completed two Tripsaver system improvement projects in 2016. Replacement of substation circuit breakers, adding distribution automation, one tree wire project and nine underground cable replacement projects completed in 2017. Two overhead system rebuild projects and one underground cable replacement project planned for 2018. Five underground cable replacement projects planned for 2019.
Fernwood-16	Kitsap	21	1,845,067	35	1,645,001	✓	A tree wire project was completed in 2013. Completed one underground cable replacement project and installed tripsaver in 2016. A tree wire project and two underground cable replacement projects completed in 2017. Two underground cable replacement projects planned for 2019.
Central Kitsap-14	Kitsap	22	1,909,073	43	1,781,879	✓	Underground feeder tie project completed in 2014. A tree wire project and one underground cable replacement project completed in 2017. Three underground cable replacement projects planned for 2018.
Hamilton-15	Skagit	23	2,225,757	30	1,870,012	✓	Completed a tree wire project in 2014. An overhead reliability and an underground cable replacement project planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Vashon-12	King	24	2,257,569	15	2,029,669	✓	Completed one underground conversion project and a tree wire project in 2014. Completed an underground cable replacement project in 2015. Installed tripsavers in 2016. Three underground cable replacement projects, one distribution automation project, one tree wire project and undergrounding getaway project completed in 2017. Three underground cable replacement projects and three tree wire projects planned for 2018.
Lake Leota-16	King	25	1,744,627	34	1,462,038		One overhead switch installed in 2013. Three underground cable replacement projects completed in 2017 and three planned for 2018. One tree wire project planned for 2019.
Langley-12	Island	26	2,409,370	Not on 2016 list		✓	One tripsaver installation completed in 2016. Four underground cable replacement projects planned for 2018 and two for 2019.
Fernwood-17	Kitsap	27	2,150,699	40	1,196,162	✓	Completed a tree wire project in 2014. Installed recloser and completed a system project in 2015. Installed tripsavers and completed an underground cable replacement project in 2016. Three underground cable replacement projects completed in 2017. A project to install tree wire and upgrade the underground system and one underground cable replacement project planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Duvall-15	King	28	1,705,263	26	1,546,504	✓	Installed overhead switches in 2013. Completed on underground cable replacement project and installed tripsavers in 2016. Two underground cable replacement projects and a project to upgrade the underground system completed in 2017. One underground cable replacement project planned for 2018 and one in 2019.
Slater-16	Whatcom	29	1,974,021	Not on 2016 list		✓	Completed a tree wire project in 2013. One underground cable replacement project completed in 2016. One recloser installation and one underground cable replacement project planned for 2018.
Greenwater-16	King	30	3,098,952	27	2,841,038	✓	Completed relocation of poles that were in imminent danger of being washed out by the White River in 2016. Installed a recloser and overhead switch in 2017. An underground cable replacement project planned for 2018 and underground conversion project planned for 2019.
Cottage Brook-15	King	31	1,633,233	20	1,750,380	✓	Three underground cable replacement projects completed in 2016 and three completed in 2017. Two underground cable replacement projects planned for 2018.
Manchester-15	Kitsap	32	1,690,877	Not on 2016 list		✓	Installed two reclosers in 2016. One underground cable replacement project planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Hobart-15	King	33	1,564,748	7	2,472,647	✓	One underground cable replacement project completed in 2014. Installed tripsavers in 2016. One project to replace old vintage conductor, one distribution automation project and one underground cable replacement project completed in 2017. One tree wire project planned for 2018.
Alger-15	Skagit	34	1,451,737	49	1,167,415	✓	Installed tripsaver in 2016. A project to improve overhead reliability and an underground conversion completed in 2017. Five underground cable replacement projects planned for 2018. One tree wire project planned for 2019.
Longmire-25	Thurston	35	1,484,226	28	1,580,179	✓	One underground cable replacement project completed in 2014. Completed two underground cable replacement projects and installed tripsaver in 2016. An overhead system rebuild project and a tree wire project were completed in 2017. Three underground cable replacement projects planned for 2018.
Kendall-12	Whatcom	36	1,926,578	39	1,378,564	✓	Added SCADA to the feeder breaker in 2016. One underground cable replacement project completed in 2016 and one in 2017. A tree wire project and two underground cable replacement projects planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Skykomish-25	King	37	1,538,354	Not on 2016 list		✓	One tripsaver installed in 2016. One underground cable replacement project planned for 2018.
Woburn-23	Whatcom	38	1,284,187	Not on 2016 list		✓	A tree wire project and three underground cable replacement projects completed in 2017. One underground cable replacement project planned for 2018.
Greenbank-13	Island	39	1,383,173	41	1,325,565	✓	A tree wire project and three underground cable replacement projects completed in 2017. One underground cable replacement project planned for 2018.
Prine-13	Thurston	40	1,299,307	11	3,423,246	✓	Completed three underground cable replacement projects in 2014. Completed a tree wire project and one underground cable replacement project in 2015. Completed one underground cable replacement project and installed tripsavers in 2016. One distribution automation project, three underground cable replacement projects and a tree wire project completed in 2017. One tree wire project planned for 2018 and one underground cable replacement project planned for 2019.
Fernwood-13	Kitsap	41	2,187,670	Not on 2016 list			Completed an underground cable replacement project in 2014. One tree wire project planned for 2018 and two underground cable replacement projects planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Peths Corner-13	Skagit	42	1,724,976	44	1,655,355		One tree wire project completed in 2013. Two underground cable replacement projects completed in 2015. One underground cable replacement project planned for 2018.
Port Gamble-12	Kitsap	43	1,516,971	Not on 2016 list		✓	Completed an overhead switch replacement project in 2016. One underground cable replacement project completed in 2017. Two tree wire and one underground cable replacement project planned for 2018.
Brooks Hill-15	Island	44	2,358,593	Not on 2016 list			One underground cable replacement project completed in 2016 and one in 2017. One system improvement project completed in 2017. One underground cable replacement project planned for 2018.
Miller Bay-23	Kitsap	45	1,336,961	42	1,282,867	✓	Completed a tree wire project in 2013.
Miller Bay-17	Kitsap	46	2,148,351	37	2,127,407	✓	Completed tree wire project and installed tripsavers in 2016. One underground cable replacement project completed in 2017. Recloser installation planned for 2018. Construction of new feeder tie planned for 2019.
Inglewood-13	King	47	2,519,308	Not on 2016 list		✓	A distribution automation project with completed in 2017.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Port Gamble-13	Kitsap	48	2,156,746	32	2,240,739	✓	Completed a tree wire project in 2013. One underground cable replacement project completed in 2017. One underground cable replacement project planned for 2018.
Marine View-13	King	49	1,250,068	19	2,007,664	✓	Completed a tree wire project and installed recloser in 2014. Installed a new overhead switch and completed one underground cable replacement project in 2016. A distribution automation project completed in 2017. One tree wire project planned for 2019.
Pine Lake-26	King	50	1,876,823	Not on 2016 list			One underground cable replacement project completed in 2014.
Orting-22	Pierce	Not on 2017 list		3	4,805,820	✓	A new substation bank installed 2014. Completed one underground cable replacement project in 2015 and one in 2016. Completed one system improvement project in 2016. A tree wire project and one underground cable replacement project planned for 2018.
Avondale-15	King	Not on 2017 list		22	1,629,275	✓	Completed one underground cable replacement project in 2015, two in 2016 and one in 2017. Two underground cable replacement projects planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Soos Creek-25	King	Not on 2017 list		18	2,288,674	✓	Installed recloser and completed a tree wire project in 2013. Two underground cable replacement projects completed in 2014. A tree wire project and adding distribution automation completed in 2017. Two underground cable replacement projects planned for 2018 and one in 2019. Future plan for Jenkins and Lake Holmes substations will improve reliability. Substation construction dependent on area growth.
Sherwood-18	King	Not on 2017 list		23	3,190,936	✓	Two tree wire projects completed in 2015. Completed a project to replace old vintage conductor in 2016. One underground cable replacement project and one distribution automation project completed in 2017. One underground cable replacement project planned for 2018 and one in 2019. Future plans for Lake Holm substation and overhead conversion will improve reliability. Substation construction dependent on area growth.
Pipe Lake-22	King	Not on 2017 list		25	2,001,473	✓	An underground rebuild project and one underground cable replacement project completed in 2016. One underground cable replacement project completed in 2017. One tree wire project and one underground cable replacement project planned for 2018. One underground cable replacement project planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Griffin-13	Thurston	Not on 2017 list		31	1,520,387	✓	Completed one underground cable replacement 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 replacement projects completed in 2017. One underground cable replacement project planned in 2018.
Pipe Lake-23	King	Not on 2017 list		33	1,532,776	✓	A recloser was installed in 2016. One underground cable project completed in 2017. One underground cable replacement project planned for 2018 and one in 2019.
Hollywood-25	King	Not on 2017 list		45	1,449,034	✓	One underground cable replacement project completed in 2015 and one in 2016. One recloser installed in 2016. Distribution Automation project completed in 2017. Two underground cable replacement projects are planned for 2018.
Sequoia-16	King	Not on 2017 list		46	2,634,361	✓	Completed an underground cable replacement project in 2013, two in 2016 and one underground cable replacement project in 2017. A tree wire project planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Black Diamond-13	King	Not on 2017 list		47	3,068,953	✓	One underground cable replacement project completed in 2015. One tree wire project and a distribution automation project completed in 2017. Two underground cable replacement projects planned for 2018 and one planned for 2019. Future plans for Lake Holm substation and overhead conversion will improve reliability. Substation construction dependent on area growth.
Blumaer-17	Thurston	Not on 2017 list		48	1,744,175	✓	Completed one underground cable replacement project and installed a SCADA recloser in 2014. Completed an underground cable replacement project in 2016 and one in 2017. Four underground cable replacement projects are planned for 2018.
Inglewood-15	King	Not on 2017 list		50	1,334,782	✓	Completed one underground cable replacement project in 2015. Installed tripsaver in 2016. Three underground cable replacement projects and one distribution automation project completed in 2017. Two underground cable replacement projects planned for 2018.
Tolt-15	King	Not on 2017 list		Not on 2016 list		✓	An overhead reconductor project planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Silverdale-13	Kitsap	Not on 2017 list		Not on 2016 list		✓	A tree wire project completed in 2015. One underground cable replacement project completed in 2016. One tree wire project completed in 2017 and one planned for 2018.
Hobart-16	King	Not on 2017 list		Not on 2016 list		✓	Completed one underground conversion project and one underground cable replacement project in 2013. Completed two underground cable replacement projects in 2014. Completed a tree wire project in 2015. Two underground cable replacement projects completed in 2017 and three planned for 2018.
Happy Valley-16	Whatcom	Not on 2017 list		Not on 2016 list		✓	One tree wire project completed in 2015. One underground conversion project and one underground cable replacement project completed in 2017. Three underground cable projects planned for 2018.
South Mercer-12	King	Not on 2017 list		Not on 2016 list		✓	Completed one underground cable replacement and one underground system project in 2013. Installed a recloser and completed two underground cable replacement projects in 2016. An underground feeder cable was replaced in 2017. One distribution automation project planned for 2018/2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Airport-23	Thurston	Not on 2017 list		Not on 2016 list		✓	Spurgeon Substation completed in 2017 should reduce overhead feeder exposure by moving some customers from Airport-23 to the new station. Two reclosers installed, a new switch, and five underground cable replacement projects completed in 2017. One underground cable replacement project planned in 2019.
Port Madison-12	Kitsap	Not on 2017 list		Not on 2016 list		✓	Installed recloser and completed one underground cable replacement project in 2014. Completed a tree wire project and underground cable replacement project in 2016. Completed three underground cable replacement projects in 2017. A system improvement project planned in 2018 and an underground cable replacement project planned in 2019.
Long Lake-21	Kitsap	Not on 2017 list		Not on 2016 list		✓	Completed an overhead system rebuild in 2015. One underground cable replacement project completed in 2016 and one in 2017. A recloser project and two underground cable replacement projects planned for 2018.
Fragaria-12	Kitsap	Not on 2017 list		Not on 2016 list		✓	Completed a tree wire project and one underground cable replacement project in 2014. One underground cable replacement project completed in 2016. One tree wire project completed in 2017. One underground cable replacement project planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Fall City-15	King	Not on 2017 list		Not on 2016 list		✓	Completed an underground conversion project in 2013. Completed a system improvement project to install spacers in 2014. A project to reconfigure the circuit planned for 2019.
Lake Wilderness-14	King	Not on 2017 list		Not on 2016 list		✓	One tree wire project completed in 2015. Overhead switch replacement planned for 2018. Future plans for Jenkins substation will improve reliability. Substation construction dependent on area growth.
Wayne-15	King	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2015. One recloser installation completed in 2016.
Mckinley-17	Thurston	Not on 2017 list		Not on 2016 list		✓	Completed two underground cable replacement projects and installed two gang operated switches in 2013. Completed one underground cable replacement project in 2015. Overhead reconductor project and underground cable replacement project completed in 2016. Recloser installation planned for 2018 and one underground cable replacement project planned for 2019.
Griffin-16	Thurston	Not on 2017 list		Not on 2016 list		✓	Tripsavers were installed in 2016. One underground cable replacement project completed in 2017. One underground cable replacement project planned for 2018 and three planned for 2019.

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Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Freeland-13	Island	Not on 2017 list		Not on 2016 list		✓	Completed tree wire project in 2014. Installed switches in 2016. Reconfigured circuit with Maxwelton substation in early 2017. Two underground cable replacement projects planned for 2018.
Winslow-12	Kitsap	Not on 2017 list		Not on 2016 list		✓	Completed reconductor of two overhead lines to tree wire in 2014. One underground cable replacement project completed in 2014. Installed three reclosers and one underground cable replacement project completed in 2015. Three underground cable replacement projects completed in 2017. One underground cable replacement project planned in 2019.
Yelm-27	Thurston	Not on 2017 list		Not on 2016 list		✓	Completed a tree wire project in 2013. A system improvement project completed in 2016. Two underground cable replacement projects completed in 2017.
Blumaer-16	Thurston	Not on 2017 list		Not on 2016 list		✓	Completed three underground cable replacement projects and two overhead tree wire projects in 2014. Installed a tripsaver and completed one underground cable replacement project in 2016. Four underground cable replacement projects completed in 2017. Two tree wire projects planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Silverdale-16	Kitsap	Not on 2017 list		Not on 2016 list		✓	Two reclosers installed in 2014 and one installed in 2015. Three tree wire projects and two underground cable replacement projects completed in 2017. One tree wire project planned in 2018.
Lake Tapps-18	Pierce	Not on 2017 list		Not on 2016 list		✓	One tree wire project and two underground cable replacement projects completed in 2013. One tree wire project completed in 2015. One tree wire project completed and one underground cable replacement project completed in 2016. Two underground cable replacement projects planned for 2018 and one planned for 2019.
Winslow-13	Kitsap	Not on 2017 list		Not on 2016 list		✓	A tree wire project completed and two reclosers installed in 2015. One underground cable replacement project completed in 2017. One tree wire project planned for 2018.
Sinclair Inlet-25	Kitsap	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2016. One system improvement project and one tree wire project completed in 2017. One system improvement and one underground cable replacement project planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Duvall-12	King	Not on 2017 list		Not on 2016 list		✓	Installed switches and completed an overhead reconductor project in 2013. Completed an underground cable replacement project in 2015. Completed one underground cable replacement project in 2016. One underground cable replacement project and construction of a new feeder (DUV-16) was completed in 2017. Three underground cable replacement projects planned for 2018.
Winslow-15	Kitsap	Not on 2017 list		Not on 2016 list		✓	Completed one underground cable replacement project in 2016 and one in 2017. Two underground cable replacement projects planned for 2018 and one in 2019.
Chambers-15	Thurston	Not on 2017 list		Not on 2016 list		✓	Completed one underground cable replacement project in 2014 and two in 2015. One tree wire project completed in 2015. Three underground cable replacement projects completed in 2017.
Freeland-15	Island	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2016. One underground cable replacement project planned for 2018 and one in 2019.
West Olympia-23	Thurston	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2015 and two completed in 2016. One underground cable replacement project planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Snoqualmie-13	King	Not on 2017 list		Not on 2016 list		✓	One tree wire project and one underground feeder project completed in 2017. An underground system improvement project planned for 2018.
Lake Tapps-17	Pierce	Not on 2017 list		Not on 2016 list		✓	Two tree wire projects completed 2013.
Patterson-15	Thurston	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2014, one completed in 2015, and three completed in 2016. Two reclosers installed and one underground cable replacement project completed in 2017. One underground cable replacement project planned for 2018.
Luhr Beach-14	Thurston	Not on 2017 list		Not on 2016 list		✓	Completed two tree wire projects in 2013. Completed two underground cable replacement projects in 2014. Completed a tree wire project in 2015. Two underground cable replacement projects completed in 2016. One underground cable replacement project planned for 2018 and one planned for 2019.
Long Lake-23	Kitsap	Not on 2017 list		Not on 2016 list		✓	Installed a recloser and overhead switch in 2014. One underground cable replacement project completed in 2016 and two in 2017. One underground cable replacement project planned for 2018.

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Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Dieringer-15	Pierce	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2013. One tree wire completed in 2015 and one in 2016. One underground cable replacement project planned for 2019.
Orchard-13	King	Not on 2017 list		Not on 2016 list		✓	Completed an underground cable replacement project in 2015. Completed installation of line spacers to eliminate line slapping related outages in 2015. Two underground cable replacement projects planned in 2019.
Lake Meridian-15	King	Not on 2017 list		Not on 2016 list		✓	A tree wire project and underground cable replacement project completed 2015. One underground cable replacement project completed in 2017. One underground cable replacement project planned for 2019.
Southwick-15	Thurston	Not on 2017 list		Not on 2016 list		✓	Completed an underground cable replacement project in 2014. Installed tripsavers, completed a tree wire project and one underground cable replacement project in 2016.
Chambers-13	Thurston	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2013, one in 2014, two in 2016 and one in 2017. Two underground cable replacement projects planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Marine View-17	King	Not on 2017 list		Not on 2016 list		✓	Tree trimming completed in 2015. One tree wire project and one underground cable replacement project planned for 2019.
Lea Hill-17	King	Not on 2017 list		Not on 2016 list		✓	An underground conversion project completed in 2014. One underground cable replacement project completed in 2015 and one in 2016.
Rainier View-13	Thurston	Not on 2017 list		Not on 2016 list		✓	Completed one underground cable replacement project in 2015 and one in 2017. A tree wire project and three underground cable replacement projects planned for 2018. One underground cable replacement project planned for 2019.
Eld Inlet-25	Thurston	Not on 2017 list		Not on 2016 list		✓	Installed a recloser and completed one underground cable replacement project in 2014. One cable replacement project was completed in 2015. Completed one tree wire project in 2017. Three underground cable replacement projects planned for 2019.
Skykomish-23	King	Not on 2017 list		Not on 2016 list		✓	Planning is reviewing for future reliability projects.
Birch Bay-15	Whatcom	Not on 2017 list		Not on 2016 list		✓	Installed a recloser and completed one underground cable replacement project in 2015. One tree wire and one underground cable replacement project planned for 2018.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Pickering-21	King	Not on 2017 list		Not on 2016 list		✓	A tree wire project was completed in 2017. One tree wire project is planned for 2018.
Goodes Corner-15	King	Not on 2017 list		Not on 2016 list		✓	Planning is reviewing for future reliability projects.
Knoble-11	Pierce	Not on 2017 list		Not on 2016 list		✓	One underground cable project completed in 2015. One tree wire project planned for 2018.
Easton-13	Kittitas	Not on 2017 list		Not on 2016 list		✓	One tree wire project completed in 2017. One recloser installation and two underground cable replacement projects planned for 2018. One underground rebuild project planned for 2019.
Langley-15	Island	Not on 2017 list		Not on 2016 list		✓	One tree wire project completed in 2015.
Wilson-16	Skagit	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2016. One underground feeder conversion project planned for 2018. One underground cable replacement project planned for 2019.
Four Corners-14	King	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2013 and one completed in 2017. Recloser installation planned for 2018.
Serwold-13	Kitsap	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2013. Installed a tripsaver and completed two underground cable replacement projects in 2017. Two tree wire projects planned for 2018. New feeder tie project planned for 2019.
Belmore-26	King	Not on 2017 list		Not on 2016 list		✓	Transformer remediation project completed in 2015.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Point Roberts-16	Whatcom	Not on 2017 list		Not on 2016 list		✓	One overhead feeder reconfiguration project planned for 2018.
Lake Louise-17	Whatcom	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2016. Substation breaker getaways replaced in 2017. One underground conversion and one underground cable replacement project planned for 2018.
Hyak-13	King	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2015. One underground cable replacement project planned for 2019.
Evergreen-13	King	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2014.
Burrows Bay-13	Skagit	Not on 2017 list		Not on 2016 list		✓	Two tree wire projects completed in 2016 and one underground cable replacement project completed in 2017. One tree wire project planned for 2019.
Mcallister Springs-15	Thurston	Not on 2017 list		Not on 2016 list		✓	A tree wire project planned for 2018.
Greenwater-13	King	Not on 2017 list		Not on 2016 list		✓	Completed switch replacement in 2016. One tree wire project planned for 2018.
Norlum-15	Skagit	Not on 2017 list		Not on 2016 list		✓	One overhead feeder project planned for 2018.
Port Gamble-16	Kitsap	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2016.
Cle Elum-11	Kittitas	Not on 2017 list		Not on 2016 list		✓	One overhead rebuild project completed in 2013 and one completed in 2016.

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Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Summit Park-21	Skagit	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2014. One tree wire project and two underground cable replacement projects planned for 2018. Five underground cable replacement projects and three tree wire projects planned for 2019.
Semiahmoo-13	Whatcom	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project planned for 2018.
Blaine-13	Whatcom	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2016. One tree wire project, one underground conversion project and one underground cable replacement project completed in 2017. Three underground cable replacement projects planned for 2018. Smart breaker installation and one tree wire project planned for 2019.
Friendly Grove-24	Thurston	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2013. One tree wire project planned for 2018. Two underground cable projects planned for 2019.
Lake Leota-13	King	Not on 2017 list		Not on 2016 list		✓	Installed tripsavers in 2016. A tree wire project planned for 2019.
Kenmore-26	King	Not on 2017 list		Not on 2016 list		✓	Installed tripsavers and completed two underground cable replacement projects in 2016. One underground cable replacement project and an overhead relocation tree wire project completed in 2017.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Eld Inlet-27	Thurston	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2014. Two tree wire projects, two underground cable replacement projects and a switch replacement were completed in 2017. A feeder tie tree wire project planned for 2018. An underground cable replacement project planned for 2019.
Mottman-14	Thurston	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project completed in 2014 and two completed in 2015. Installed tripsavers and replaced an overhead switch in 2016. Two tree wire projects completed in 2017.
Snoqualmie-17	King	Not on 2017 list		Not on 2016 list		✓	One underground cable replacement project, one tree wire project and one recloser installation were completed in 2015. One underground cable replacement project completed in 2017. Spacer cable project and recloser installation planned for 2019
Blaine-12	Whatcom	Not on 2017 list		Not on 2016 list		✓	Smart breaker installation and one tree wire project planned for 2019.
Alger-12	Skagit	Not on 2017 list		Not on 2016 list		✓	One underground conversion feeder tie project and two underground cable replacement projects planned for 2018. One underground cable replacement project planned and two tree wire projects planned for 2019.

Table continues on next page

Circuit	County	2017 Year End 5 Year Avg Rank	2017 Year End 5 Year Average Total CMI	2016 Year End 5 Year Avg Rank	2016 Year End 5 Year Average Total CMI	On WPC List	Action by PSE
Christensens Corner-23	Kitsap	Not on 2017 list		Not on 2016 list		✓	Installed three overhead switches in 2015. One underground cable replacement project completed in 2017.
Miller Bay-22	Kitsap	Not on 2017 list		Not on 2016 list		✓	Completed a tree wire project in 2016 and an underground cable replacement project in 2017. One tree wire project and one underground cable replacement project planned for 2018.
South Keyport-22	Kitsap	Not on 2017 list		Not on 2016 list		✓	Completed an underground cable replacement project and one tree wire project in 2015. Installed tripsavers in 2016. One underground cable replacement project planned for 2018. One tree wire project and one underground cable replacement project planned for 2019.
Gardella-16	Pierce	Not on 2017 list		Not on 2016 list		✓	Completed one tree wire project in 2016. One tree wire project planned for 2019.
Gravelly Lake-15	Pierce	Not on 2017 list		Not on 2016 list		✓	Installed a recloser and completed an underground cable replacement project in 2015. One tree wire project completed in 2017.
Sheridan-16	Kitsap	Not on 2017 list		Not on 2016 list		✓	Completed an underground cable replacement project in 2013 and 2016. Three underground cable replacement projects planned for 2019.

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 the number of 2018 and 2019 proposed projects and 2018 vegetation-management mileage.

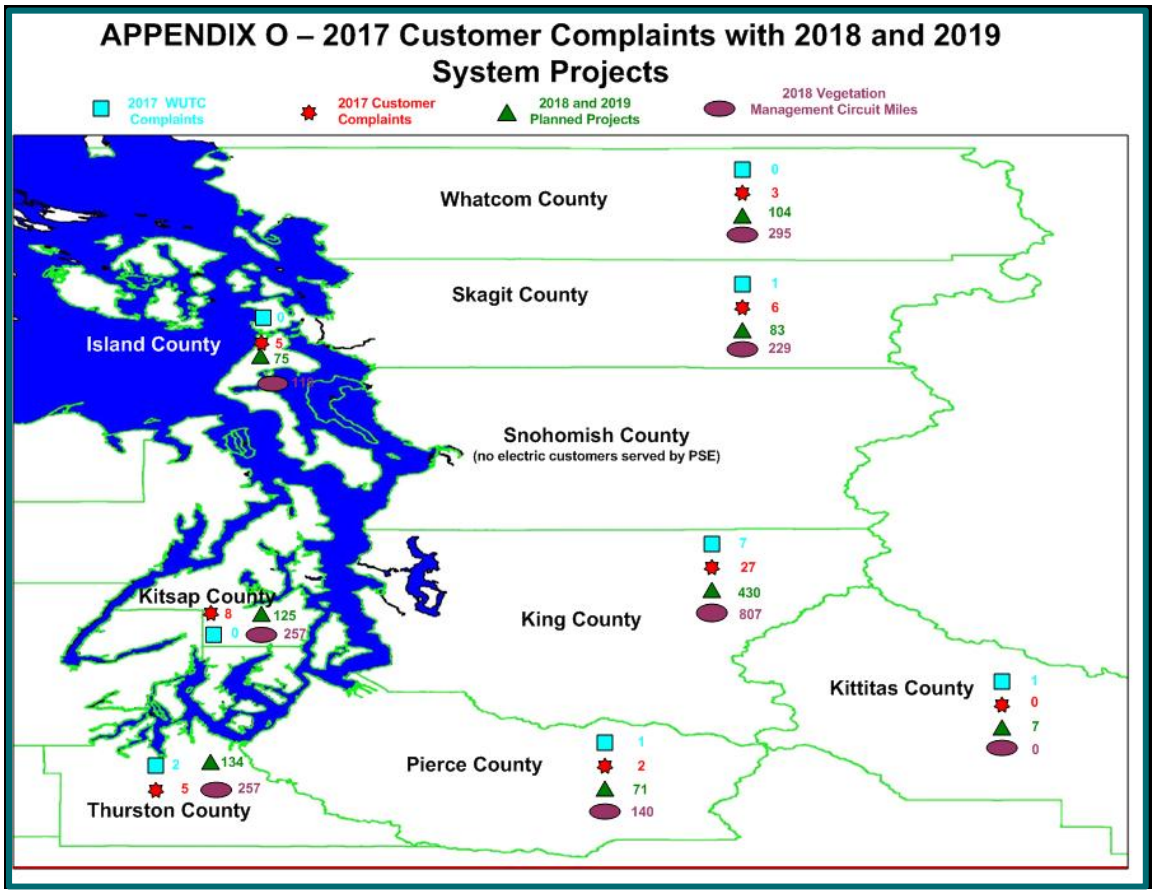

Figure O1: 2017 Customer Complaints with 2018 and 2019 System Projects

P

System Planning Budget Process

This appendix illustrates the System Planning Budget Process from project identification through project completion and post-project reliability improvement verification.

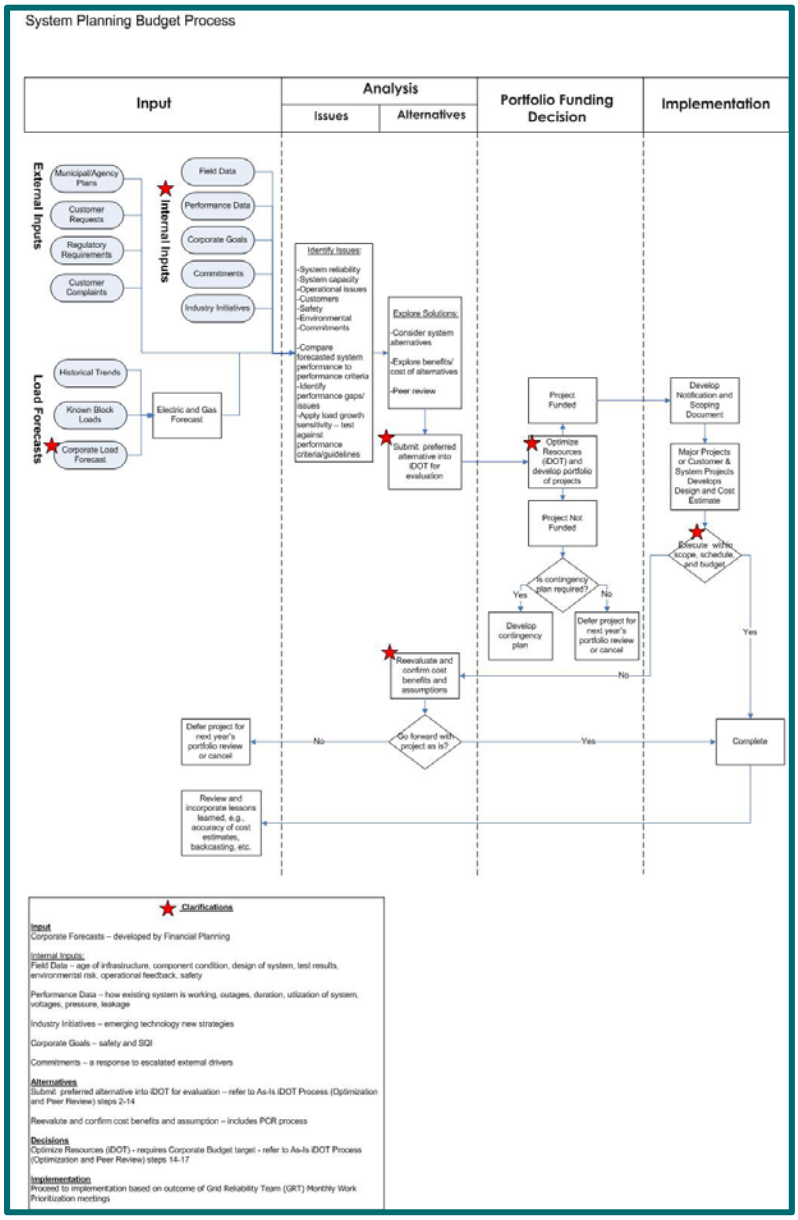

Figure P1: System Planning Budget Process