BEFORE THE
WASHINGTON UTILITIES & TRANSPORTATION COMMISSION

In the Matter of the Petition of: PUGET SOUND ENERGY For Modification of SQI SAIDI Benchmark and Performance Evaluation Mechanics	Docket Nos. UE-072300 and UG-072301 (consolidated) PETITION FOR MODIFICATION OF SQI SAIDI MECHANICS

I.   INTRODUCTION

1.   In accordance with WAC 480-07-370(b), Puget Sound Energy ("PSE") respectfully petitions the Commission for an order authorizing PSE to permanently modify its Service Quality Index ("SQI") No. 3: System Average Interruption Duration Index ("SAIDI")[1] as described in this petition ("Petition"). This Petition is consistent with commitments PSE made to stakeholders to propose a set of permanent SAIDI benchmark and performance evaluation mechanics once PSE implemented its outage management system ("OMS") and Geographic Information System ("GIS"), and after it has collected sufficient data under the new OMS to adopt permanent SAIDI mechanics. PSE's proposed changes to SAIDI mechanics are consistent with standards of the Institute of Electrical and Electronics Engineers, Inc. ("IEEE"). Additionally, PSE's proposal is consistent with past practice before this Commission, which recognizes and adjusts for the fact that the implementation of an OMS can result in an increase in a utility's reported SAIDI score – without any degradation in reliability – due to the more

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[1] SAIDI measures the average outage duration for each customer served. SAIDI is the reliability index commonly used by electric utilities. It is calculated as the total customer minute interruptions (outage duration [in minutes] multiplied by number of customers impacted by the outage) divided by the average number of electric customers served typically over the course of a calendar year.

accurate identification of the actual number of customers experiencing an outage as reported under OMS.

2.   As discussed in more detail herein, PSE proposes to adopt the following SQI-3 SAIDI mechanics:

- An annual SQI SAIDI performance determination that is consistent with the IEEE standards.
- A benchmark design that incorporates the IEEE standards and the effect of the new OMS.
- A catastrophic event definition and threshold calculation that ensure consistent and reasonable measurement of SQI SAIDI performance and benchmark going forward.

3.   PSE is engaged in the business of providing electric and gas service within the State of Washington as a public service company, and is subject to the regulatory authority of the Commission as to its retail rates, service, facilities and practices. Its full name and mailing address are:

> Puget Sound Energy
> Attn: Ken Johnson,
> Director -- State Regulatory Affairs
> P.O. Box 97034
> Bellevue, Washington 98009-9734

4.   Rules and statutes that may be brought at issue in this Petition include RCW 80.01.040 and WAC 480-07-370(b).

5.   This Petition presents a background summary of PSE's SQI No. 3 (Section II), PSE's proposal for the new benchmark for SQI No. 3 SAIDI (Section III), a full discussion of and explanation of PSE's proposal (Section IV), PSE's analysis supporting the new SQI SAIDI mechanics (Section V), and a summary of the proposal elements (Section VI). Attachments A through H include the reference documents cited in this Petition.

II. BACKGROUND

A. 1995-1996 Merger Dockets[2]

6.   PSE first implemented its Service Quality Program ("SQ Program") pursuant to a settlement stipulation in the dockets approving the merger between Washington Natural Gas Company and Puget Sound Power & Light Company. 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"[3] and to "protect customers of PSE from poorly-targeted cost cutting"[4] as a result of the merger. The SQ Program was initially set to be effective for five years. The SQ Program mechanics outlined the benchmarks, the potential penalty calculations, and the reporting requirements. The mechanics also prescribed the determination of the effective SQI No. 3: SAIDI performance and benchmark used in calculation of potential penalties. The benchmark and the performance calculation excluded Major Events, which were days when more than five percent of PSE's customers are without service.[5]

B. 2001 General Rate Case Dockets[6]

7.   The SQ Program was extended for a minimum of five years as part of the settlement in PSE's 2001 general rate case. The settling parties agreed to measure PSE's SQI SAIDI performance based upon a single-year SAIDI result, rather than the five-year rolling average that had previously been in place. The settling parties also agreed to the fixed benchmark

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[2] Docket Nos UE-951270 and UE-960195.
[3] Docket Nos. UE-951270 and UG-960195, Fourteenth Supplemental Order Accepting Stipulation (Feb. 5, 1997) (Stipulation at 11:11-15).
[4] *Id.,* Fourteenth Supplemental Order at 32.
[5] Major Events are days when more than five percent of PSE's customers are out and involve associated carry-forward days, which end when those customers have their service restored.
[6] *WUTC v. PSE*, Docket Nos UE-011570 and UG-011571 (consolidated), Twelfth Supplemental Order, Appendix A: Settlement Stipulation, Exhibit J.

of 136 outage minutes per customer per year with the five percent-customer-out Major-Event exclusion.

C.   Puget Holdings/PSE Merger Docket U-072375

8.   In 2007, Puget Holdings LLC and Puget Sound Energy, Inc. filed an application seeking approval of the acquisition of Puget Energy by Puget Holdings, an investor consortium. The first commitment made by the Joint Applicants in that docket was that PSE would continue its service quality indicators. As part of a multi-party settlement stipulation, PSE and Puget Holdings ultimately committed "to continue the Service Quality measures currently in place for PSE or as may be modified in any future proceeding."[7] The Commission approved the merger and the commitments made by PSE.

D.   2007 General Rate Case Dockets[8]

9.   The SQ program was extended indefinitely with additional modifications in PSE's 2007 general rate case.[9] The SQI No. 3 benchmark remained set at an average of 136 outage minutes per customer per year excluding Major Events and carry-forward days. Additionally, potential penalty amounts were increased to $1.5 million per index with a doubling of penalty amounts if an index has been missed two years in a row.

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[7]*In re Joint Application of Puget Holdings LLC and Puget Sound Energy, Inc., For an Order Authorizing Proposed Transaction*, Docket U-072375, Order 08 Approving and Adopting Settlement Stipulation; Authorizing Transaction Subject to Conditions, Appendix A to Attachment A at 1.

[8] Docket Nos. UE-072300 and UG-072301 (consolidated).

[9] *See WUTC v. PSE,* Dockets UE-072300 & UG-072301, Appendix D to Order 12: Partial Settlement Stipulation Re: Service Quality, Meter and Billing Performance, and Low-Income Bill Assistance ("Partial Settlement").

E. 2010 SQI SAIDI Petition[10]

10. In 2010, PSE proposed a change to the SQI-3 SAIDI benchmark and associated performance calculation that would be effective for four annual reporting periods, 2010 through 2013, in anticipation of PSE's implementation of a new outage management system and the availability of analysis-ready data from the new system. Following this period, PSE would establish permanent SQI SAIDI mechanics based on the industry accepted benchmark similar to IEEE Standard 1366.[11] With Commission Staff's support, the Commission approved the proposed temporary SQI No. 3: SAIDI mechanics,[12] which included an annual total SQI SAIDI benchmark of 320 minutes and a corresponding annual performance calculation based on the 5-year-rolling average of annual all-inclusive SAIDI results.[13] There was no provision for excluding Major Events in this temporary SQI SAIDI mechanics except certain exclusions approved by the Commission.

F. 2012 SQI SAIDI Petition[14]

11. In 2012, the target date of implementation for the OMS was revised to April 1, 2013, due to PSE accelerating its GIS deployment so that both the OMS and the GIS could be implemented at the same time. PSE petitioned for an one-year extension of the temporary SQI SAIDI benchmark of 320 to 2014 in order to collect a full year of data from the new OMS

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[10] Docket Nos. UE-072300 and UG-072301 (consolidated), Petition for Approval of Modifications to Service Quality Index Program (Oct. 21, 2010).

[11] *Id.* at ¶ 18.

[12] *Id.*, Order 17, Granting PSE's Petition for Approval of Modifications to Its Service Quality Index Program, (Nov. 29, 2010).

[13] The actual annual results used in the SQI No. 3 evaluation exclude 2006 annual results due the catastrophic impact of the 2006 the Hanukkah Eve windstorm. The exclusion was petitioned by PSE and approved by the Commission in Order 17.

[14] Dockets UE-072300 and UG-072301, Petition for Approval of Extending SQI SAIDI Temporary Mechanics (July 13, 2012).

system. Commission Staff supported PSE's petition because it advanced deployment of the electric GIS by over two years (from the original target of 2015 to 2013).[15] The Commission approved PSE's petition.

G. 2014 SQI SAIDI Petition[16]

12.   In 2014, PSE petitioned for an additional one-year extension of the temporary SQI No. 3: SAIDI benchmark because it recognized the need of additional data for the design of permanent electric service reliability measures. In its petition, PSE cited the results of studies that suggest that utilities would report "worse" SAIDI results initially due to a more accurate measurement of reliability, after implementation of an OMS system.[17] Again, Commission Staff supported the 2014 petition because it allowed PSE "to collect sufficient data from the new OMS with accuracy supported by the GIS."[18] The extension of the temporary SQI SAIDI mechanics would also allow PSE to work with the Staff and other stakeholders to establish permanent SQI electric service reliability measures that are based upon both PSE's OMS experience and industry-accepted standards. The Commission approved PSE's petition.

H. 2015 PSE Effort with Commission Staff and Public Council

13.   PSE, Commission Staff, and the Public Counsel Unit of the Attorney General ("Public Counsel") participated in a series of nine discussions on PSE's SQI No. 3: SAIDI benchmark and performance evaluation mechanics in 2015. The initial discussion was held on June 18, 2015. Additional meetings were held on July 27, August 10, August 31, September 14,

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[15] *Id.,* Answer of Commission Staff in Support of Petition for Extending SQI SAIDI Temporary Mechanics (July 19, 2012).
[16] *Id.,* Petition Seeking a One-time Extension of the Current Mechanics Associated with SQI No. 3: SAIDI Temporary Mechanics Through 2015 (Nov. 26, 2014).
[17] *Id.* at ¶ 9.
[18] *Id.,* Answer in Support of Petition for Extending SQI SAIDI Temporary Mechanics at ¶7 (Dec. 9, 2014).

September 25, October 7, October 21, and October 28. While the meetings were productive and educational, the stakeholders and PSE were not able to agree on the design of permanent electric service reliability measures. Therefore, this Petition presents PSE's proposal for the permanent SQI No. 3: SAIDI benchmark and performance evaluation mechanics.

I.   Business and System Process Changes Impacted by OMS and GIS

14.   On April 1, 2013, PSE implemented an OMS, GIS, and a Customer Information System ("CIS"). The OMS, along with GIS and CIS, provides PSE with a fully integrated platform for managing electric service restoration and tracking and reporting reliability performance. The implementation of these major information systems is part of PSE's effort to modernize its infrastructure and enhance PSE's capability to better serve its customers. Through the implementation of these new information systems and other programmatic electric infrastructure investments (such as its Cable Remediation Program, Tree Wire Installation, and Automatic Sectionalizing Device Installation), PSE can improve its electric service reliability and provide reliable, safe, and efficient electric service. Not surprisingly, the automated OMS highlights some gaps that existed with the prior outage management, data collection and reporting processes (CLX processes or CLX). Specifically, the key changes occurring in the migration to OMS are:

(a)   **Identifying the number of impacted customers during an outage:** Because the SAIDI calculation is affected by the number of customers experiencing outages, PSE's implementation of the OMS has had an impact on PSE's SAIDI metrics, causing PSE's SAIDI results to trend upward without any degradation in reliability. This is because the OMS, coupled with geospatial information from the GIS, produces a more accurate number of customers affected during an outage as compared to the number reported by CLX. The OMS has

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functionality to include all customers impacted, regardless if the customer reports the outage. The CLX did not have the functionality to automatically include all customers affected by an outage; it only estimated the number of customers based on those customers who called in to report the outage. Experienced outage managers could adjust the CLX estimate based on their expertise but nonetheless the number of customers out of service was still an estimated count rather than an exact figure. As discussed in more detail later in this Petition, the increase in identified customer outage count after implementing OMS has been documented by other utilities and state commissions, and PSE has also documented a specific instance where a more robust customer outage count was available with OMS.

(b)   **Identification of the outage location based on the customer call:** Prior to the implementation of the OMS, PSE used paper maps to correlate the customers who reported the outage with the likely source of the outage. With the OMS, the reported customer location is immediately and automatically identified on the electronic network map when the customer calls in, and the prediction rules automate the identification of the source of the outage so that response personnel can be dispatched to source of the outage. The OMS provides a faster and more precise identification of an outage than the CLX processes.

(c)   **Auditing and correcting outage data:** From 2004 through 2009, all non-Major-Event[19]outages that were 20,000 customer minute interruptions or higher were audited by PSE and corrected if necessary. The audited outages account for approximately 10 percent of the recorded outages. In 2010, PSE added Major-Event outages with 20,000 customer minutes or higher to the audit process. Since the OMS implementation in 2013, PSE enhanced

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[19] See note 5.

the business process and is now reviewing all outage data on a daily basis. Therefore the data is more inclusive and accurate compared to CLX based processes.

III.   PSE'S PROPOSAL FOR PERMANENT SQI SAIDI MECHANICS

A.   SQI SAIDI Annual Performance

15.   PSE proposes aligning the SQI No. 3: SAIDI annual performance calculation to the IEEE Standard 1366 method (called 'IEEE SAIDI' herein). This includes adopting the IEEE definition of a "momentary outage," which is five minutes or less, and adopting the IEEE definition of a "sustained outage," which is any interruption lasting longer than five minutes. Additional details regarding the IEEE Standard 1366 method are discussed in Section IV. Additionally, PSE proposes establishing a new benchmark for SQI No. 3 described below.

B.   SQI SAIDI Benchmark

16.   Herein, the Proposed SQI No. 3: SAIDI benchmark calculation will be called "Benchmark Calculation." Given the limited number of years of longitudinal data available from OMS, PSE proposes implementing a path that both establishes a SAIDI benchmark for 2016 – 2018 and also leads to the determination of a permanent SQI SAIDI benchmark for SQI reporting year 2019 and after. The Benchmark Calculation uses (i) 2010-2012 adjusted pre-OMS IEEE SAIDI data, (ii) 2014-2015 unadjusted post-OMS IEEE SAIDI data that is currently available, and (iii) future years of unadjusted post-OMS IEEE SAIDI 2016-2018 data as they become available. In doing so, a full five years of post-OMS implementation performance can be incorporated into formulation of a permanent SQI No. 3: SAIDI benchmark for SQI reporting years 2019 and years after. For the 2016 through 2018 reporting years, five years of data will also be used, but PSE proposes to adjust the pre-OMS IEEE SAIDI values by 22 percent to address the step-change in IEEE SAIDI resulting from installation of the OMS.

Further discussion of the rationale for adjustment of pre-OMS IEEE SAIDI and the selection of a

22 percent adjustment factor are described in Section V.

17.   Table 1, below, provides the proposed SAIDI Benchmark Calculation for each

reporting year beginning in 2016. Note that the SQI SAIDI Benchmark Calculation will exclude

2013 data because it contains both pre- and post-OMS results that are not easily parsed.

Table 1: Proposed SQI No. 3 SAIDI Benchmark Calculation

Reporting Year	Proposed SQI No. 3 SAIDI Benchmark Calculation[20]	Benchmark Submitted to Commission
2016	[(Sum of 2010-2012 IEEE SAIDI * 1.22) + (Sum of actual 2014-2015 IEEE SAIDI)]/5 + (1 Standard Deviation of adjusted 2010-2012 IEEE SAIDI, actual 2014-2015 IEEE SAIDI)	March 2016
2017	[(Sum of 2011-2012 IEEE SAIDI * 1.22) + (Sum of actual 2014-2016 IEEE SAIDI)]/5 + (1 Standard Deviation of adjusted 2011-2012 IEEE SAIDI, actual 2014-2016 IEEE SAIDI)	March 2017
2018	[(2012 IEEE SAIDI * 1.22) + (Sum of actual 2014-2017 IEEE SAIDI)]/5 + (1 Standard Deviation of adjusted 2012 IEEE SAIDI, actual 2014-2017 IEEE SAIDI)	March 2018
2019 and onward	(Sum of actual 2014-2018 IEEE SAIDI)/5 + (1 Standard Deviation of actual 2014-2018 IEEE SAIDI)	March 2019

18.   Table 2 provides an example of the SQI SAIDI Benchmark Calculation for 2017

using hypothetical values for 2015 and 2016, as the actual values for these years are not yet

known.

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[20] Resultants will be rounded to the nearest whole number.

Table 2: Hypothetical Example of 2017 Benchmark Calculation

Year	Pre-OMS IEEE SAIDI	Adjusted Pre-OMS IEEE SAIDI (adjusted by 22 percent)	Post-OMS SAIDI	SAIDI value to be used in Benchmark Calculation
2011	144	176	-	176
2012	120	146	-	146
2014	-	-	154	154
2015	-	-	137*	137*
2016	-	-	160*	160*
2017 Benchmark Components (Based on hypothetical values)				
5-Year Average	155* = Average of (176, 146, 154, 137, 160)			
Standard Deviation	13* = Standard Deviation of (176, 146, 154, 137, 160)			
2017 Benchmark	168* = 155 + 13			

*Hypothetical values

C. Catastrophic Events

19.   PSE also proposes through this Petition to establish a definition of catastrophic events using a 4.5 Beta threshold. Any outage event exceeding the 4.5 Beta threshold will be replaced through the methods described in Section IV.C. This will eliminate the current catastrophic event petition process but will provide for exclusion of catastrophic events that are similar to those excluded by the Commission in past years.

IV. EXPLANATION OF THE PROPOSED SQI SAIDI MECHANICS USING THE IEEE STANDARD 1366-2012 METHODOLOGY

20.   As stated in PSE's 2010 and subsequent SQI SAIDI petitions, PSE is committed

to incorporating into the permanent SAIDI mechanics the Institute of Electrical and Electronics

Engineers, Inc. Standard 1366[21] ("IEEE Std 1366"). Attachment A to this Petition outlines the

standard.[22] The IEEE Standards Association[23] publishes a third of the world's technical

literature in electrical engineering, computer science and electronics and is a leading developer

of international standards that underpin many of today's telecommunications, information

technology and power generation products and services. The purpose of IEEE Std 1366 is to

foster uniformity in the development of electric service reliability indices, to identify factors

which affect the indices, and to aid in consistent reporting practices among utilities.[24] The IEEE

Std 1366 is widely used by utilities and utility commissions to establish electric service

reliability measurements.

A.   IEEE Major Event Day

21.   PSE proposes to exclude Major Event Days ("MEDs") from its SAIDI

calculation, consistent with the IEEE Std 1366 methodology. MEDs are days in which the daily

system SAIDI exceeds a threshold value, T_{MED}. The T_{MED} value 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 Std 1366 2.5 Beta methodology in calculating

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[21] The most current version of the standard is IEEE Std 1366™-2012. PSE intends to adopt all elements of the standard including any future updates. If future updates conflict with PSE's then-existing reliability measurements, any such conflicts would be addressed in the future SQ Program reporting.

[22] McDaniel, J. "Uses of IEEE 1366 and Catastrophic Days." IEEE presentation, April 2012, attached hereto as Attachment A.

[23] http://standards.ieee.org/about/ieeesa.html.

[24] IEEE 1366™-2012 at 6 and 10.   IEEE Standards are proprietary, commercial documents, which PSE does not have permission to copy or distribute. PSE will make the standards available for review at its offices, as needed.

the threshold value. Page 10 of IEEE Std 1366 has the specific methodology and formulas. Any days having a daily system SAIDI greater than T_{MED} are days on which the electric distribution system experienced stresses beyond those normally expected, *i.e.,* IEEE Std 1366 Major Event Days. It should be noted that the major event exclusion defined in the SQI No. 3 for 2002-2009 is different than the definition of the major event day exclusion under IEEE Std 1366, which PSE is proposing to use in this Petition.

B.   **IEEE Definition of Sustained Interruption**

22.   Per IEEE Std 1366, only sustained outages defined as outage duration longer than five minutes are included in the reliability indices. PSE agrees with adopting this definition of a sustained interruption. Under the current mechanics, PSE has considered a sustained interruption as an outage one minute or longer. PSE will continue to record outages five minutes or less in the OMS but those outages would not be included in the future SQI SAIDI reportable results. PSE discussed the adoption of the five-minute definition with the Commission Staff and Public Counsel during the June 18, 2015 meeting and no one objected to PSE implementing this IEEE Std 1366 element going forward.

C.   **Catastrophic Event Definition**

23.   As utilities use the IEEE Std 1366 2.5 Beta methodology to classify major event days, some have experienced large scale events that result in unusually high daily SAIDI values. If not addressed, these extremely high daily SAIDI values will persist in the data set for five years, affecting the T_{MED} calculation by causing a notable upward shift in the T_{MED} value. As T_{MED} rises, it is more difficult to have a day exceed the higher T_{MED}. Attachment A to this Petition also outlines the catastrophic days related issues identified by a member of IEEE's Distribution Reliability Working Group. Current guidance in IEEE Std 1366 is that the

identification and processing of catastrophic events for reliability purposes should be determined

on an individual company basis by regulators and utilities.[25] The IEEE Distribution Reliability

Working Group continues to study potential methodologies to address this shift, but has yet to

formally adopt a set definition for catastrophic events.[26] These methodologies form the basis for

PSE's proposal on catastrophic events.

24.   Currently, PSE can petition to exclude an outage event from SQI No. 3: SAIDI

performance calculation, with the mitigation standard requiring that the event was unusual or

exceptional and PSE's level of preparedness and response was reasonable. If the exclusion is

approved by the Commission, PSE does not include the catastrophic event in the total annual

SQI SAIDI value. Due to the subjective nature of this process, PSE proposed adoption of an

objective approach to measuring catastrophic events during its 2015 discussions with the

Commission Staff and Public Counsel.

25.   PSE proposes that any daily system SAIDI exceeding 4.5 standard deviations of

the daily system SAIDI will be considered a catastrophic event for the purpose of the SQI No.

3: SAIDI mechanics. The daily SAIDI value for that day will be replaced with a five-year

average of that month's previous daily SAIDI as calculated with IEEE Std 1366. Similar to the

T_{MED} calculation, the formula to determine the 4.5 Beta threshold (T_{CAT}) for a year is:

$$T_{CAT} = e^{(\alpha + 4.5\beta)}$$

where α and β are found in the same manner as the T_{MED} calculation covered in IEEE Std 1366-

2012, page 10.

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[25] IEEE 1366[TM]-2012, Section 5.3. at 19.
[26] McDaniel, J. "Uses of IEEE 1366 and Catastrophic Days." IEEE presentation (April 2012), attached hereto as Attachment A.

26.   Table 3 shows the T_{CAT} Values for 2006-2014, and the dates with system daily SAIDI values that exceed the T_{CAT} threshold, *i.e.,* days that would be considered as catastrophic event days and be replaced in the T_{MED} calculation. The table also shows by year the catastrophic events approved by Commission for exclusions in the current SQI SAIDI performance evaluation.

Table 3: T_{CAT} Values, the Dates That Exceed T_{CAT}, and the Catastrophic Events Approved by Commission for Current SQI SAIDI Exclusions

Year	T_{CAT} Threshold (in SAIDI Minutes)	Dates SAIDI > T_{CAT} Under Proposal	Commission Approved Exclusion for Current SQI SAIDI[27]
2006	79.13	Feb 6, Nov 15, Dec 14-16	Yes
2007	126.3	-	-
2008	131.09	-	-
2009	115.46	-	-
2010	120.21	Nov 22	PSE did not petition
2011	132.2	-	-
2012	77.59	Jan 18-20	Yes
2013	86.48	-	-
2014	87.44	Oct 25	PSE did not petition

27.   As can be seen from this retrospective review, the days that met the T_{CAT} threshold, as proposed by PSE in this case, are similar to the catastrophic event exclusions for SQI SAIDI calculation previously approved by the Commission: 2006 annual system SAIDI

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[27] Catastrophic event days that PSE did not petition for mitigation include November 22, 2010 (126 minutes) and October 25, 2014 (93 minutes). These events were SQI Major Events.

results due to the Hanukkah Eve windstorm of 2006, and the January 2012 outage events due to the January 2012 Pacific Northwest snowstorm. The 4.5 Beta methodology that establishes the T_{CAT} value creates an objective threshold that most closely reflects a level of severity that PSE and the Commission have considered catastrophic in the past, and the majority of catastrophic events that would be excluded under the proposed SQI SAIDI methodology were excluded by the Commission in response to a petition filed by PSE.

V.   PSE ANALYSES SUPPORTING ADJUSTMENTS TO PRE-OMS PSE IEEE SAIDI RESULTS FOR BENCHMARK CALCULATION

28.   As discussed in Section III.B above, PSE proposes that the Benchmark Calculation for reporting years 2016 through 2018 will use five years of data, but the pre-OMS IEEE SAIDI values will be adjusted by 22 percent to address the step-change in IEEE SAIDI resulting from installation of the OMS. To determine the adjustment factor for the pre-OMS SAIDI, PSE performed the following four separate analyses to understand the overall impact of the OMS implementation and associated business and system process revisions on SAIDI reporting:

- Researched other utilities' experiences specific to OMS impacts on SAIDI reporting and benchmarking, including PacifiCorp's experience in Washington;

- Manually examined a small population of PSE outages occurring at the same location pre- and post-OMS to confirm the existence of differences in the customer counts between the legacy CLX processes and the new OMS;

- Utilized methodology provided in the IEEE Standard 1782[TM]-2014[28] to assess the change in data collection processes, and

- Utilized the 1.75 Beta method (explained below) to demonstrate the daily SAIDI experienced during blue-sky[29] days under the pre- and post-OMS processes.

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[28] IEEE 1782-2014. "IEEE Guide for Collecting, Categorizing, and Utilizing Information Related to Electric Power Distribution Interruption Events"(March 27, 2014).

29.   PSE's OMS does not have the capability to replay legacy outage data nor did PSE run the OMS and CLX processes in parallel to allow the precise computation of the actual differences between the CLX processes and the OMS processes. Hence, PSE is relying upon the aforementioned analyses to estimate the impact of implementation of OMS processes on SAIDI.

A.   Research, Past Commission Practice and Experience of Other Utilities

1.   Studies discussing post-OMS changes to reliability metrics

30.   In order to better understand how PSE should approach setting a benchmark following the implementation of an OMS, PSE compiled evidence from independent studies and peer utilities, which it presented to, and discussed with, Commission Staff and Public Council throughout the discussions in the nine meetings. Chief among the research findings is a 2012 Lawrence Berkeley National Labs ("LBNL") study[30] that concluded utilities would report "worse" SAIDI due to more accurate measurement of reliability. This study analyzed up to ten years of reliability data from each of 155 U.S. utilities, and created a multivariate regression model with explanatory variables that show the magnitude and statistical significance each has on reliability scores. The study found:

> statistically significant evidence that installation or upgrade of an
> OMS is correlated an increase in the reported duration of power
> interruptions. This finding confirms previous studies and
> anecdotal evidence long been known within the utility industry that

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[29] Blue-sky day: A regular-day state, before an event happens, during which utilities typically operate.
http://www.naruc.org/Grants/Documents/Resilience%20in%20Regulated%20Utilities%20ONLINE%2011_12.pdf
and
http://www.naruc.org/grants/Documents/Resilience_for_Black_Sky_Days_Stockton_Sonecon_FINAL_ONLINE_F
eb5.pdf.
[30] Eto, Joseph et al., *An Examination of Temporal Trends in Electricity Reliability Based on Reports from U.S. Electric Utilities*, (Jan. 2012), attached hereto as Attachment B.

reliance on prior (manual) measurement methods under-reports reliability.[31]

31. Within the regression analysis of the LBNL study, the research team found that an OMS implementation results in a one-time increase in SAIDI without major events of 16 percent, with a standard error of ±4.9 percent.[32] This can be attributed to the implementation of an OMS specifically, as the study's authors found that the "individual utility effects are uncorrelated with the other regressors in the model."[33] That is, the 16 percent increase in SAIDI is not caused by any other variable or utility-specific characteristic, regardless of whether it was explicitly stated as a variable in the regression or not.[34]

32. Furthermore, the Massachusetts Electric and Gas Distribution Companies commissioned Navigant Consulting to conduct a study[35] in response to the Massachusetts Department of Telecommunications and Energy D.T.E 99-84. In this study, Navigant found utilities that employ more sophisticated data collection methods often experience an increase in measured reliability performance metrics as a function of collecting more accurate information.

> Industry surveys have shown an increase between 25 percent and 150 percent in stated indices. In these cases, significant improvements have been made in processes and systems that collect reliability information. It is important to expect a step change when new systems come on-line and to adjust benchmarks accordingly. [36]

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[31] Attachment B at 16.
[32] Attachment B at 50.
[33] Attachment B at 45.
[34] *Id.*
[35] *Summary of Findings Related to Service-Quality Benchmarking Efforts*, Navigant Consulting, (Dec. 19, 2002), attached hereto as Attachment C.
[36] Attachment C at 30.

33.   In terms of setting reliability benchmarks to measure reliability, the Pacific

Economics Group ("PEG") Research prepared a report in 2010 on best practices when measuring

a utility's service reliability. The PEG Research team states that

> one important criterion is that benchmarks should be calculated on
> the same basis as the reliability indicators. If the data used to
> measure reliability are not comparable to those used to set the
> benchmark, the regulatory plan will not lead to an objective
> comparison of the company's measured reliability relative to the
> benchmark. This is almost literally a case of "comparing apples to
> oranges." Discrepancies between measured and historical
> benchmark performance can arise if utilities change the
> measurement systems used to record reliability data, such as
> installing a new OMS. [37]

34.   The report continues to outline a path forward when such changeovers occur:

> In some cases, however, a lack of data available at the outset of
> regulatory plan may make it more difficult to set benchmarks that
> are viewed as reliable over the term of a multi-year plan. This
> would be true if the information systems used to record reliability
> data had changed recently or if there was little confidence that a
> short data series reflected typical external business conditions for
> the utility. If this is the case, benchmarks can be updated using
> data that becomes available during the term of the plan, but this
> should be done according to well-defined rules that are established
> at the outset of the plan. . . . Setting benchmarks according to such
> objective rules creates as much stability as is feasible given data
> constraints.[38]

35.   The above-cited studies are consistent with PSE's expectation prior to selecting

and implementing an OMS system. PSE expected reported reliability data to be affected

following an OMS rollout.[39] PSE expected the OMS to have a positive impact in managing

outages, and anticipated the data that OMS generated would tell a more complete and accurate

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[37] L. Kaufman, L. Getachew, M. Makos, and J. Rich. 2010, *System Reliability Regulation: A Jurisdictional Survey* at 38, attached hereto as Attachment D.
[38] Attachment D at 39.
[39] 2014 PSE Petition at ¶ 8.

story when compared to pre-OMS data. As stated in PSE's 2014 Petition for Extending SQI

SAIDI Temporary Mechanics, a previous "case study of a single example utility with 1994-2003

outage data prepared by IEEE members indicates that both reported pre-OMS SAIDI and SAIFI

results should be adjusted upward in comparison with the OMS data, *i.e.*, the implementation of

OMS would result in higher SAIDI and SAIFI statistics in general."[40]

2. Adjustment of pre-OMS data by utilities

36.   PacifiCorp implemented an OMS more than a decade ago and its experience

provides helpful direction in this case. As a condition of the merger of PacifiCorp and Scottish

Power in Docket No. UE-981627, PacifiCorp agreed to submit an annual report that would, in

part, "describe any technological advancements in data collection that would significantly

change any performance indicator" following the merger.[41]

37.   In 2004, PacifiCorp filed a Commission report on network performance[42] in

Washington State in which the utility detailed its post-merger adoption of an outage management

system called Computer Aided Distribution Operations ("CADOPS") and the impact of

CADOPS on its paper-based outage reporting processes. PacifiCorp identified that a

combination of CADOPS and better reporting processes caused a large uplift in its outage

reporting without a corresponding degradation in actual customer reliability. Given the

technological and business process changes, PacifiCorp applied a normalizing "uplift" to its

1995-1999 reliability data from which to set its merger commitment targets for reliability. Based

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[40] *Id.* at ¶ 9, citing M. McGranaghan, A. Maitra, C. Perry, and A.Gaikwad, *Effect of Outage Management System Implementation on Reliability Indices*, (2006), attached hereto as Attachment E.
[41] Docket No. UE-981627, Fifth Supplemental Order Accepting Stipulations, Approving Transaction, and Granting Securities Issuance Exemption, Appendix A (Oct. 14, 1999) attached hereto as Attachment F, at 5.
[42] "PacifiCorp Network Performance And Outage Reporting" (Apr. 1, 2003 – Mar. 31, 2004), attached hereto as Attachment G.

upon its statistical relationship calculation, PacifiCorp determined that its Washington State historical SAIDI measurements required a 67 percent uplift to properly reflect the difference in reporting methodology. PacifiCorp then used this 67 percent uplift to recalculate its reliability performance baseline from 87 SAIDI minutes up to 146 minutes.[43]

38.   Similarly, the New York Public Service Commission ("PSC") has addressed changes to reliability metrics following the implementation of an OMS. The utility Central Hudson Gas & Electric experienced large increases in its SAIDI and SAIFI after its OMS implementation in 2002. The utility ran its paper-based Transmission and Distribution System ("TDS") and new OMS in parallel for one year during this time, and found that its OMS-reported customer counts were 29 percent higher than the legacy TDS. The utility attributed the increase to higher customer counts recorded by its OMS, causing increases in reliability scores for the exact same reliability conditions.[44] The PSC stayed Central Hudson's reliability penalties in 2002 and 2003, but denied Central Hudson's request to adjust its reliability scores to account for the changes uncovered through its in-parallel analysis. The utility subsequently missed its reliability metrics in 2004 and 2005. In 2006, the PSC and utility avoided litigation over the cause of these missed metrics through a settlement that revised its reliability metrics upward to account for the impact of OMS.[45]

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[43] Attachment G at 18. The report also details PacifiCorp's adoption of IEEE Standard 1366, including momentary outage length and excluding major event days from SAIDI calculations. *Id.* at 8.

[44] State of New York Public Service Commission, Case 00-E-1273, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Central Hudson Gas and Electric Corporation for Electric Service at 4, (Sept. 29, 2003), attached hereto as Attachment H.

[45] State of New York Public Service Commission, Cases 05-E-0934 & 05-G-0935, Staff Statement in Support of Restated Joint Proposal at 39, (May 1, 2006) attached hereto as Attachment I.

B.   Pre- and Post-OMS Outage Customer Counts Example

39.   In light of the above, PSE examined its pre- and post-OMS data to see if similar

findings were borne out. As discussed below, PSE identified an increase in reliability metrics

coincident with the transition to PSE's OMS and associated business processes. The example

discussed below shows how dramatically differently an outage could be represented in CLX and

OMS.

40.   PSE analyzed similar outages isolated to the same segment of a specific electric

circuit, and found significantly different numbers of estimated customers identified as out of

service on CLX system as compared to OMS. Five customers were estimated to be without

service on an outage in the pre-OMS system, as compared to post-OMS where 158 customers

were without service on an outage where a similar set of conditions existed. After further

reviewing this outage for the purposes of demonstrating the differences between pre-OMS and

post-OMS, PSE found that the pre-OMS outage (Table 4, outage No. E357291476) was

underreported by 250 customers (*i.e.,* 5 reported customers with outages pre-OMS vs. 255

customers with outages that should have been reported).

Table 4: Pre-OMS and Post-OMS Outages Customer Count Comparison

Outage Date	Outage Notification Number	Customers Out of Service Reported	Number of Customers Out that should have been reported*	Customer Count Comments
Comparison of No. of Customers Out on Pre- and Post-OMS outages that occurred on Circuit No. Birch Bay-15. Protective Device No. 2747				
11/13/2010	E357291476	5	255	Initially, only B⁻phase opened. Crew opened the other 2 phases in order to repair damage.
4/2/2015	P00178360-1	158	158	B-phase was the only phase that opened.
* Customer counts from 2015. PSE does not have historical customer counts available.				

41.   This granularity, while useful, was a very time-intensive, manual process for PSE to conduct for a single outage, and therefore it is not practicable to expand the effort to review pre-OMS outages and determine the step change with the OMS implementation. A broad calculation of the step change in this manner is not feasible, as some data elements required for the analysis are not readily available. Information, such as the protective device number, was not consistently noted on the pre-OMS outage notifications. In addition, PSE does not have historical circuit maps consistently available to verify the circuit configuration at the time of the outage, nor is the history of the number of customers on the circuit consistently available under the pre-OMS system.

C.   Analysis of PSE's Pre- and Post-OMS SAIDI Results

42.   PSE used two methods to analyze the differences between the pre-OMS results and the post-OMS results, both consistent with IEEE methodology. The results of these methods fell within the range of increase seen elsewhere due to OMS implementation. The first method is

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based on IEEE's Standard 1782 concerning interruption events. The second methodology, the

1.75 Beta Method, is a methodology focusing on blue-sky type of events that has been discussed

by IEEE members through the Distribution Reliability Working Group.

1. IEEE Standard 1782

43. IEEE Standard 1782 is titled "IEEE Guide for Collecting, Categorizing, and

Utilizing Information Related to Electric Power Distribution Interruption Events" ("IEEE Std

1782"). First published in 2014, it gives specific guidelines on data collection methodology.

Section 4.4.1.2, page 14, outlines a method of using a cumulative moving (trailing) average of

the utility's annual SAIDI to determine whether any change exists within the reliability

performance, or if it can be attributed to a change in how the reliability is measured.

44. These cumulative moving averages are calculated for each year of reported

SAIDI, with a running average beginning each year. This accumulation of averages helps to

smooth outlier years and show a trend over time of an overall average. If a significant change

has occurred in how SAIDI is measured, a step change in the outages will appear, with two

distinct sets of running averages appearing. With this information, a utility can calculate the

average post-change performance by taking the average of cumulative averages pre-changeover

and comparing it to the post-change values.

45. PSE elected to calculate the trailing averages from 2007 onward to eliminate the

effect in the analysis of the severe 2006 Hanukkah Eve windstorm. Starting with the first full

year of post-OMS data for 2014, PSE calculated a pre-OMS average of 136 SAIDI minutes and a

13 percent increase in post-OMS IEEE SAIDI with this method. While the pre-OMS IEEE

SAIDI values are converging in the 130-140 range, the post-OMS values are anticipated to have

an average within the 150-160 range based on the data populating this model, with an expected degree of variability comparable to pre-OMS reporting.

Figure 1: PSE's IEEE Std 1782 Cumulative Moving Averages Method Results
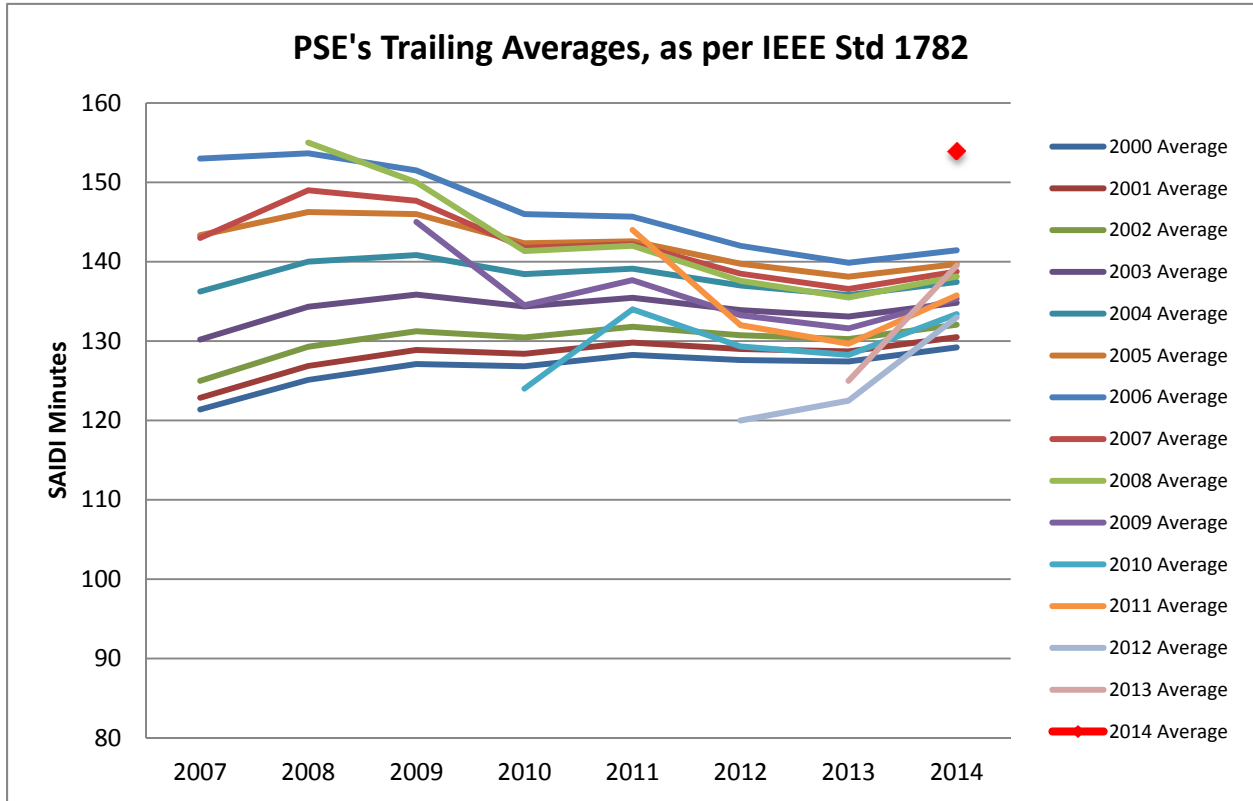
2.   1.75 Beta Method

46.   The second analytical approach PSE used to examine PSE's post-OMS SAIDI results involved a granular examination of pre- and post-OMS daily SAIDI. This method, referred to as the "1.75 β" (Beta) Method, has been discussed by IEEE members through the IEEE Distribution Reliability Working Group.[46] It focuses on blue-sky days with SAIDI values lower than 1.75 standard deviations of daily SAIDI data which, assuming a normal distribution

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[46] Discussions occurring at the IEEE Joint Technical Committee Meeting of the Distribution Reliability Working Group, January 12, 2015 form the basis of the 1.75 Beta Method.

of values, accounts for 96 percent of days included in the IEEE SAIDI values. This helps to isolate and eliminate variability introduced by major storms excluded by the major event day cutoff (T_{MED}) as well as outage events that are significant but below the major event day cutoff of 2.5 Beta (1.75 standard deviations equal 95.99 percent of a normal distribution, 2.5 standard deviations are 99.38 percent).

47.   In undertaking the 1.75 Beta Method, PSE excluded 2013 data from this analysis for three major reasons, all caused by the PSE's changeover from CLX to OMS in April 2013. First, the timing of this changeover resulted in 25 percent of 2013 to be recorded as pre-OMS data. Second, differences in daily SAIDI related to seasonality complicated parsing out this year of data to fit the daily ranking approach used in this analysis. Finally, PSE continued to implement major business process changes throughout 2013 related to outage recording through the OMS stabilization process. This continuous improvement further inhibits designating a bright-line changeover of 2013 date from CLX to complete OMS processes for this analysis.

48.   For the 1.75 Beta Method, PSE ran two time series. First, it examined historical daily SAIDI data from 2007-2014. Second, it examined historical daily SAIDI data from January-September for each of the years 2007-2015.[47] The former gave the full year picture, while the latter maximized the number of post-OMS data points by bringing in the year-to-date 2015 performance.

49.   In each run of this analysis, PSE found the average and standard deviation of the set, and then arranged the days from each year from highest to lowest SAIDI value. By doing so,

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[47] During discussions with Commission Staff and Public Counsel in 2015, PSE initially presented this analysis for 2010-2014, but has since expanded it to 2007-2014 and to 2015 for the January-September monthly analysis. Both expanded time series have an outcome within 0.5 percent of the 2010-2014 outcomes that PSE originally found and presented to Commission Staff and Public Counsel.

PSE could compare the pre- and post-OMS years for evidence of a shift-change in reporting after the changeover from CLX to OMS. In the full-year analysis, PSE found that the 2014 average SAIDI under 1.75 standard deviations was 30 percent higher than the 2007-2012 average. In the January-September analysis, PSE found that 2014-2015 was 22 percent higher than the 2010-2012 average.

50.   Figure 2, below, shows the results of PSE's analysis using the 1.75 Beta Method. The top line, representing the year 2014, is an average of 30 percent higher on days under 2.16 daily SAIDI minutes (1.75 Beta) than in pre-OMS years.

Figure 2: PSE's 1.75 Beta Method Blue-sky Daily SAIDI Analysis Results
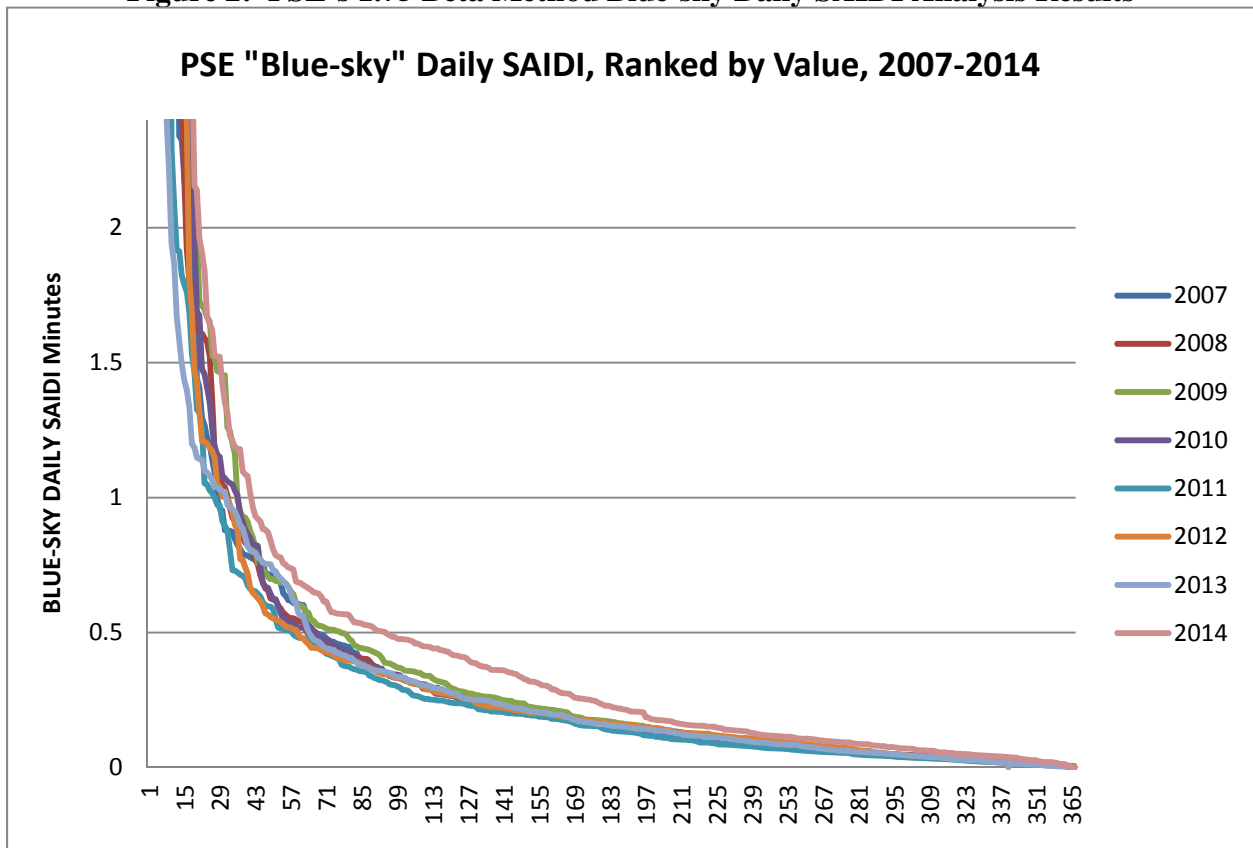
51.   As the literature research suggested, PSE has experienced a step-change in its reported SAIDI minutes following its installation of the OMS system and the change of business processes that accompanied the OMS installation. The magnitude of this step-change is

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consistent with national-level studies, consultant studies, and individual utility experiences over the past decade. PSE's analysis points to an average post-OMS average increase of 22 percent in its SAIDI reporting over its legacy CLX system and recommends that this factor be used to adjust pre-OMS data upward to make it comparable to the data obtained from OMS. PSE believes that its analysis demonstrates the inadequacy of prior SAIDI benchmarks to assess PSE's reliability performance today, as these prior benchmarks relied upon a very different outage recording environment and were not determined based upon IEEE Std 1366.

VI.   SUMMARY OF PROPOSAL ELEMENTS

A.   Adoption of IEEE Std 1366 for SAIDI Calculation

52.   PSE proposes to adopt IEEE Std 1366 for computing IEEE SAIDI, which includes defining a sustained outage as an outage greater than five minutes of interruption, and adopting the IEEE T_{MED} approach to determine Major-Event exclusions.

B.   Addressing Catastrophic Events

53.   PSE proposes establishing an objective alternative to the petition process for excluding extraordinary events from the T_{MED} calculation. PSE proposes to set the threshold for catastrophic events at 4.5 standard deviations above the daily system SAIDI. This is based on (i) the direction of the IEEE Distribution Reliability Working Group; and (ii) PSE's retrospective analysis, which demonstrates that the results of the proposed 4.5 Beta threshold, T_{CAT} applied to the time period 2006-2014 closely matches the events approved for exclusion by the Commission in the SQI SAIDI performance evaluation.

C.   Adjusting Pre-OMS IEEE SAIDI Results for use in the SQI SAIDI Benchmark Calculation

54.   The changeover to an OMS tied to a GIS results in the adoption of a different and more accurate method of identifying and measuring outages, and allows the utilities to shift to an

automated tool that models the most current electrical connectivity down to the customer level. Once fully implemented and stabilized, an OMS can capture more complete and consistent data. Without an adjustment of the pre-OMS IEEE SAIDI results, the legacy IEEE SAIDI values derived from different processes in the Benchmark Calculation could prevent the benchmark from being an objective standard for post-OMS performance. For the purposes of the Benchmark Calculation, PSE proposes adjusting pre-OMS IEEE SAIDI by a fixed adjustment factor.

D.   Pre-OMS Data Adjustment Factor Set at 22 Percent in the Benchmark Calculation

55.   PSE proposes a pre-OMS data adjustment factor of 22 percent based upon PSE's IEEE 1782 analysis of 13 percent and PSE's 1.75 Beta method of 30.5 percent adjustment adjustments to pre-OMS IEEE SAIDI. PSE's external research showed adjustment factors for pre-OMS SAIDI data ranging from +16 percent to as much as +150 percent.[48] PSE's proposed 22 percent adjustment factor is reasonable and falls within the range used by other utilities.

E.   2016-2019 Benchmark Calculation Derived from an Average of Five years Annual SAIDI Performance

56.   PSE proposes basing the Benchmark Calculation on five years of adjusted pre-OMS IEEE SAIDI and post-OMS IEEE SAIDI data because with this time interval, the data begins to sufficiently reflect the variability inherent in measuring reliability. While a greater number of historical years of outage data would certainly give a better understanding of this variability, it would also incorporate more years where reliability reporting followed different business processes.

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[48] Attachment B at 49-50; Attachment C at 30.

F.   Benchmark Calculation Incorporates One Standard Deviation of Variation

57.   Outages caused by weather or other events outside the control of a utility can vary widely from year to year. PSE proposes to continue the SQI SAIDI benchmark methodology for the Benchmark Calculation of applying one standard deviation to a five-year average of its annual SAIDI results. This addition of one standard deviation acknowledges that SAIDI is a measurement that will inherently vary.

G.   The Benchmark Calculation Will Adjust Annually Through 2019

58.   PSE's proposed Benchmark Calculation methodology uses five years of historic IEEE SAIDI data. PSE does not yet have five full years of IEEE SAIDI data from its OMS, and so the proposed Benchmark Calculation incorporates future years of reliability data as they become available, until it has five years of IEEE SAIDI data from OMS. At that time (2019), PSE proposes making the Benchmark Calculation static.

H.   Excluding 2013 Data from the Benchmark Calculation

59.   PSE proposes to exclude 2013 data in the Benchmark Calculation because PSE used both CLX processes and the new OMS processes in 2013. PSE used CLX from Jan 1, 2013 through March 31, 2013 and then changed over to OMS starting on April 1, 2013. Throughout 2013, PSE continued to make significant business process and system updates related to OMS that affected the reliability data.

I.   Posting of the Annual Benchmarks for 2016-2018 and the Permanent Benchmark for 2019 and Beyond

60.   Because the SQI SAIDI Benchmark Calculation incorporates future years of post-OMS data, PSE proposes to report its SQI No. 3: SAIDI benchmark for the subsequent year in its annual SQI and Electric Service Reliability Report, filed annually in March for the prior

year performance results. For example, in its 2015 annual report, PSE will post the SQI No. 3: SAIDI benchmark for 2016 and associated calculation.

VII.   REQUEST FOR COMMISSION APPROVAL OF PROPOSED SQI SAIDI MECHANICS

61.   For the reasons set forth above, PSE respectfully requests that the Commission issue an order approving the above proposed SQI SAIDI mechanics as outlined in Section VI as the permanent mechanics for SQI No. 3: SAIDI for the SQI reporting years 2016 and subsequent years.

DATED: November 30, 2015

PUGET SOUND ENERGY, INC.

By _____

Ken Johnson
Director - State Regulatory Affairs