2020 Electric System Reliability Performance Report

May 25, 2021

Prepared by
Distribution and Engineering Services Division
SNOHOMISH COUNTY PUBLIC UTILITY DISTRICT NO. 1
Everett, Washington

Executive Summary

This report describes the Snohomish County PUD's (District) electric system reliability from January 1, 2020, through December 31, 2020.

In 2017, the District retired the legacy Outage Reporting System (ORS) as the system of record when the new Outage Management System (OMS) was put into service. In conjunction with the adoption of OMS as the system of record, several significant changes occurred.

The number of outages recorded in 2017 and beyond increased as compared to previous years because outage records are automatically generated in OMS, rather than the manual process required by ORS. IEEE recognizes this phenomenon as typical, and provides a calculation method for an 'uplift factor', described in IEEE Standard 1782, as a means of allowing more accurate comparison of records prior to an OMS implementation, to post-OMS data. This 'uplift factor' has been applied to the previous five years' average data. Appendix C provides additional data on historical performance without the uplift factor applied.

Before OMS, manually tracking outages in ORS was suspended during declared major events, and high-level estimates of outages were used. Because of the ability to record all outages in OMS, the District has adopted the IEEE defined term, Major Event Day (MED). This allows outages occurring during non-routine conditions to be differentiated from daily operations. MEDs are defined in IEEE Guideline 1366 "Guide for Electric Power Distribution Reliability Indices."

In addition to tracking outages during non-routine conditions, the District now tracks planned outages, although neither planned outages nor those occurring on MEDs will be included in the District's SAIDI, SAIFI and CAIDI system indices, and are listed separately. This will allow these reliability indices to reflect reliability experienced under routine conditions to better reveal trends in daily operation, which could be skewed by major events or construction.

District customers lost power for an average of 123.6 minutes (SAIDI) in 2020 during routine operation. This is higher than the adjusted five-year average of 100.2 minutes. The average length of time required to restore power after an outage was 106.4 minutes (CAIDI) in 2020 during routine operation. This is higher than the adjusted five-year average of 98.6 minutes. District customers lost power an average of 1.16 times (SAIFI) in 2020 during routine operation. This is higher than the adjusted five-year average of 1.02 interruptions.

There were five MEDs for the year, which occurred on January 12, January 13, January 15, January 31, November 13.

Table of Contents

List of Figures

List of Tables

1 Background

1.1 Introduction

Understanding the causes of outages and developing methods or programs to reduce their rate of occurrence are two of the most important goals in the operation of any electric utility. This report identifies the causes of the outages in 2020 and their impacts on system reliability.

The District receives power from the Bonneville Power Administration (BPA) at three delivery points, the BPA Murray, SnoKing, and Snohomish substations. Transmission lines from those substations deliver power at 115 kV to 94 (including Jackson Hydro) distribution substations and switching stations in the District's service area. A typical distribution substation has four 12.47 kV circuits and serves an average of 4,000 customers. The District's service territory includes long circuits in the eastern and northern areas of the county, with high tree exposure through rural areas. These circuits experience relatively more outages. The urban and suburban areas in Everett and the south county area typically have shorter circuits and fewer outages.

1.2 Statistical indicators used

The District measures electric system reliability using indices defined by the Institute of Electrical and Electronics Engineers (IEEE). The definitions come from the current revision of IEEE Standard 1366- IEEE Guide for Electric Power Distribution Reliability Indices. The standard defines these indices as "sustained interruption indices," meaning a loss of service to one or more customers for more than five minutes. At present the District defines an outage as a loss of service for one or more minutes.

SAIDI (System Average Interruption Duration Index)

This index measures the total duration of interruption for the average customer during a predefined period of time. It is commonly measured in customer minutes of interruption. Mathematically, this is calculated using the following equation:

$$\text{SAIDI} = \frac{\sum \text{Customer Interruption Durations}}{\text{Total Number of Customers Served}}$$

SAIDI can be calculated for any defined set of customers, such as all customers served from a specific circuit, all customers served from a specific substation, or for all District customers.

CAIDI (Customer Average Interruption Duration Index)

This index represents the average time required to restore service to customers after an interruption. Mathematically, this is calculated using the following equation:

$$\text{CAIDI} = \frac{\sum \text{Customer Interruption Durations}}{\text{Total Number of Customers Interrupted}}$$

CAIDI can also be calculated for any defined set of customers.

SAIFI (System Average Interruption Frequency Index)

This index indicates how often the average customer experiences a sustained interruption over a predefined period of time. Mathematically, this is calculated using the following equation:

$$\text{SAIFI} = \frac{\sum \text{Total Number of Customers Interrupted}}{\text{Total Number of Customers Served}}$$

Similar to SAIDI and CAIDI, SAIFI can be calculated for any defined set of customers.

MED (Major Event Day)

A Major Event Day is used to define a 24-hour period during which SAIDI exceeds a threshold, separating these statistics from those for typical day-to-day operations. This will prevent exceptional days from skewing statistics, allowing reliability analysis to be based on typical days. The SAIDI threshold to distinguish a day as a MED is calculated using the equation:

$$\text{MED} = e^{(\alpha + 2.5\beta)}$$

Where α is the average of the logarithms of the daily non-zero SAIDI and β is the log-standard deviation of the daily SAIDI.

In 2020 the SAIDI threshold to distinguish a day as MED was found to be 13.66.

MAIFI (Momentary Average Interruption Frequency Index)

This index indicates how often the average customer experiences a momentary interruption over a predefined period of time. Mathematically, this is calculated using the following equation:

$$\text{MAIFI} = \frac{\sum \text{Total Number of Customers Experiencing a Momentary Interruption}}{\text{Total Number of Customers Served}}$$

Because OMS uses breaker status change information, a portion of the momentary outages that customers experience can now be tracked as well. Similar to SAIDI and CAIDI, MAIFI can be calculated for any defined set of customers.

2 Outage Data Collection

2.1 Record-keeping

Until February 2017, the District used a computerized Outage Reporting System (ORS) to manually record information on outages occurring during routine operations. The District's practice was not to record outages that occurred during major events. This was done to alleviate the need for time spent recording outages, so that efforts could be focused on restoration.

Starting in February 2017, the District switched to using an Outage Management System (OMS). OMS automatically creates outage records based on customer calls, prediction rules and switching operations regardless of a major event, on all days of the year. The purpose of this change is to be more consistent and comprehensive in outage information recording. The effect of implementing this new system has been an increase in recorded SAIDI and SAIFI, as all customer outages are now accounted for automatically.

2.2 Change in record-keeping during non-routine operations

The District no longer excludes outages during major events from reliability calculations. Moving forward the MED threshold will be used to determine which outages will be excluded from routine-operation statistics. MEDs will be included in their own category for record keeping.

3 System Reliability Statistics

3.1 Data for 2020

The tables below show the statistical data for outages in 2020, as well as average data for the five previous years. Refer to Section 1 for definitions of the terms SAIDI, CAIDI, and SAIFI.

The 2020 system SAIDI and SAIFI values were higher than the five-year averages. There were four MEDs in 2020. Outages that occurred during an MED, prearranged/planned and outages caused by another utility were excluded from these numbers but are shown in their own row for reference.

Table 3-1: General Descriptive Data

Year	2020
System Customers	368,222
Area Served	2,200 square miles

Table 3-2: Outage Data for 2020

(Sustained Outage > 1 Minute)

	SAIDI	CAIDI	SAIFI	Customer Outages
Distribution	107.1	105.2	1.02	374,731
Transmission	16.5	114.5	0.14	53,092
Overall	123.6	106.4	1.16	427,823
Planned, MED, or External	139.1	261.9	0.53	195,484
Total	262.6	155.2	1.69	623,307

Table 3-3: Five-Year Average Annual Outage Data for the Period 2015-2019 (Non-Adjusted)

(Sustained Outage > 1 Minute)

	SAIDI	CAIDI	SAIFI	Customer Outages
Distribution	80.6	103.6	0.78	280,003
Transmission	8.6	62.5	0.14	49,522
Overall	89.2	97.4	0.92	329,525
Planned, MED, or External	51.3	220.9	0.23	83,108
Total	140.5	122.4	1.15	412,633

Table 3-4: Five-Year Average Annual Outage Data for the Period 2015-2019 adjusted for OMS increase

(Sustained Outage > 1 Minute)

	SAIDI	CAIDI	SAIFI	Customer Outages
Distribution	90.1	104.9	0.86	309,293
Transmission	10.1	64.3	0.16	56,423
Overall	100.2	98.6	1.02	365,716
Planned, MED, or External	51.3	220.9	0.23	83,131
Total	151.5	121.3	1.25	448,846

3.2 Effect of Major Event Days on the District

MEDs are days in which the daily system SAIDI exceed a calculated threshold. These are independent of declared major events, which had been used in the past to separate extreme outage days. MEDs are identified to allow study of the system's daily operation, without being influenced by a few large events.

Beginning in 2017, the District implemented OMS, which captures all outage information, including Major Event Days.

Table 3-5: 2020 Major Event Days

Date	SAIDI	SAIFI	MAIFI	CAIDI	Customers Affected (Sustained) - Distribution	Customers Affected (Sustained) - Transmission
2020-01-12	36.5	0.08	0.03	484.3	14,006	13,795
2020-01-13	19.4	0.09	0.03	211.9	25,310	6,704
2020-01-15	14.6	0.05	0.01	280.6	18,492	665
2020-01-31	49	0.2	0.07	248.9	62,440	9,986
2020-11-13	15.3	0.09	0.01	171.1	8,010	24,850

4 The Transmission System

4.1 Introduction

For consideration as a transmission outage, an outage must involve the operation of a 230 kV or 115 kV protective device, such as those operating circuit switcher or power circuit breaker. Transmission system outages usually have an impact on a significant number of customers, as all substations fed by that portion of the system are affected, and substation outages affect all customers fed by the station.

4.2 Outages

Of the twenty six transmission system operations in 2020, eleven resulted in sustained outages to District customers. In twelve of the transmission line operations, auto-sectionalizing schemes operated. Of these twelve, the total customer minutes of interruption was reduced in five of the cases and was eliminated in four cases. In three cases, auto-sectionalizing schemes operated but did not affect the customer minutes of interruption. Table 4-1 provides summary information for each transmission or substation operation during 2020.

Table 4-1: Transmission Outages

Outage Number	Date	Line or Device	Substation(s)	Cause	Customer Minutes
1	1/2/2020	Beverly Park-Paine Field 115 kV Line	Mukilteo, Harbour Pointe, Picnic Point, Casino	Unknown	Momentary
2	1/2/2020	Beverly Park-Paine Field 115 kV Line	Mukilteo, Harbour Pointe, Picnic Point, Casino	Unknown	Momentary
3	1/14/2020	Jackson North Loop 115 kV Line	Lake Chaplain, Three Lakes	Tree	Momentary
4	1/31/2020	Stimson Crossing-Camano 115 kV Line	Camano, Sunset, South Camano	Tree	4,352,401
5	4/23/2020	Beverly Park-Paine Field 115 kV Line	Mukilteo, Harbour Pointe, Picnic Point, Casino	Motor Vehicle	Momentary
6	4/28/2020	Harbour Pointe Substation 115 kV – 12 kV Transformer	Harbour Pointe	Equipment Failure	173,602
7	4/30/2020	BPA Murray-BPA Snohomish 115 kV Line	Bunk Foss, Lake Stevens, Frontier, East Marysville, Granite Falls, Hartford	Unknown	Momentary

Outage Number	Date	Line or Device	Substation(s)	Cause	Customer Minutes
8	5/10/2020	Jackson North Loop 115 kV Line	Lake Chaplain, Three Lakes	Failed Insulator	Momentary
9	5/30/2020	BPA Snoking- North Creek 115 kV Line	Clearview, Cascade, Murphy's Corner, North Creek	Unknown	Momentary
10	6/6/2020	Lake Goodwin-North Stanwood 115 kV Line	None	Unknown	None
11	6/7/2020	Jackson North Loop 115 kV Line	Lake Chaplain, Three Lakes	Tree	Momentary
12	6/9/2020	Lake Goodwin-North Stanwood 115 kV Line	None	Unknown	None
13	6/17/2020	Lake Goodwin-North Stanwood 115 kV Line	None	Unknown	None
14	6/30/2020	Jackson South Loop 115 kV Line	Snohomish, West Monroe, Sultan Wallace River, Goldbar	Failed Insulator	678,625
15	7/16/2020	Delta-Navy 115 kV Line	Norton Avenue	Safety-Fire	237,054
16	8/1/2020	Paine Field-BPA Snohomish 115 kV Line	Olivia Park	Motor Vehicle	977,094
17	8/16/2020	Stimson Crossing-East Arlington 115 kV Line	Portage, Lake Goodwin	Unknown	Momentary
18	8/31/2020	Beverly Park-BPA Snoking 115 kV Line	Silver Lake, Mariner, Polaris, Martha Lake, North Creek	Tree	3,398,308
19	9/3/2020	Beverly Park-BPA Snohomish 115 kV Line	Pinehurst	Failed Insulator	None
20	9/3/2020	Beverly Park 230 kV – 115 kV Substation Transformer	Beverly Park Bank	Misoperation	None
21	9/27/2020	East Arlington-Oso 115 kV Line	Oso	Unknown	Momentary

Outage Number	Date	Line or Device	Substation(s)	Cause	Customer Minutes
22	10/13/2020	BPA Snoking-North Creek 115 kV Line	Cascade, North Creek, Murphys	Tree	55,336
23	11/4/2020	Stimson Crossing-East Arlington 115 kV Line	Lake Goodwin	Unknown	275,971
24	11/13/2020	Stimson Crossing-Camano 115 kV Line	Camano, Sunset, South Camano	Failed Insulator	4,123,779
25	11/13/2020	Lake Goodwin-North Stanwood 115 kV Line	North Stanwood	Failed Insulator	428,595
26	11/16/2020	Brightwater-BPA Snoking 115 kV Line	Park Ridge	Tree	284,545

Transmission Outage Summaries:

1. **1/2/2020 Beverly Park-Paine Field 115 kV Line - Trip #1**: The Beverly Park-Paine Field line tripped due to a temporary SLG (A-G) fault. Both terminals of the line tripped as designed and the line reclosing scheme in combination with the Picnic Point auto-sectionalizing scheme restored the loop. This temporary fault resulted in a momentary outage at Mukilteo, Harbour Pointe, Picnic Point and Casino substations. It is unclear what the exact root cause of the fault was but windy conditions were reported at the time of the event and the reported fault location appears to be a treed area.
2. **1/2/2020 Beverly Park-Paine Field 115 kV Line - Trip #2**: The Beverly Park-Paine Field line which, had tripped earlier the same day, tripped again due to a temporary SLG (A-G) fault. Both terminals of the line tripped as designed and the line reclosing scheme in combination with the Picnic Point auto-sectionalizing scheme restored the loop. This temporary fault resulted in a momentary outage at Mukilteo, Harbour Pointe, Picnic Point and Casino substations. It is unclear what the exact root cause of the fault was but windy conditions were reported at the time of the event and the reported fault location appears to be in a treed area.
3. **1/14/2020 Jackson North Loop 115 kV Line**: The Jackson-BPA Snohomish North line tripped due to a permanent LL fault caused by a fallen tree during that day's snow storm. The auto-sectionalizing schemes at Three Lakes and Lake Chaplain operated as designed to isolate the faulted section of the North Loop and restore service at those two substations. This permanent fault resulted in momentary outages at Three Lakes and Lake Chaplain (<5 mins).
4. **1/31/2020 Stimson-Camano 115 kV Line**: The Stimson Crossing- Camano Line tripped due to a permanent 3-phase fault caused by a fallen tree. The North Stanwood auto-sectionalizing scheme helped automatically restore the Stimson Crossing-North Stanwood section of the line and the remaining section of the line was restored manually later. This event occurred during that day's major wind storm event. This fault resulted in a momentary outage at North Stanwood and a permanent one at Camano (241 minutes), Sunset (266 minutes) and South Camano (1,056 minutes) substations.
5. **4/23/2020 Beverly Park-Paine Field 115 kV Line**: The Beverly Park-Paine Field line tripped due to a temporary 2LG (BC-G) fault, caused by a car-pole accident at Pole CO-PP 1/3 . Both terminals of the line tripped as designed and the line reclosing scheme in combination with the Picnic Point auto-sectionalizing scheme were able to restore the loop, as the pole was sheared off clean. The damaged pole was replaced

later the same day. This temporary fault resulted in a momentary outage at Mukilteo, Harbour Pointe, Picnic Point and Casino substations.

6. **4/28/2020 Harbour Pointe Substation 115 kV – 12 kV Substation Transformer**: Sudden pressure bank trip.
7. **4/30/2020 BPA Murray-BPA Snohomish 115 kV Line**: The BPA Murray-BPA Snohomish line tripped due to a momentary SLG fault (C-G); the East Marysville auto-sectionalizing scheme in conjunction with the line reclosing at both terminals of the line operated as designed to restore the loop. This temporary fault resulted in a momentary outage at Bunk Foss, Lake Stevens, Frontier, East Marysville, Granite Falls and Hartford substations. It is unclear what the root cause of the fault was; it was initially reported by ECC that the cause might have been a fallen tree which caused a trip to lockout of Granite Falls feeder 12-4613 on the 12kV underbuild at Pole CJ-127 which is located about 8.3 miles from BPA Murray. Although the location is close to the one reported by the line relays given the margin of fault location errors for ground faults, the SCADA data shows feeder 12-4613 tripping ~6 secs after the transmission loop was restored, so there's no clear correlation between the two events.
8. **5/10/2020 Jackson North Loop 115 kV Line**: The Jackson-BPA Snohomish North line tripped due to a permanent LL fault (B-C) caused by a failed insulator stack at pole SP-TL 9/6 between Three Lakes and Lake Chaplain. The auto-sectionalizing schemes at Three Lakes and Lake Chaplain operated as designed to isolate the faulted section of the North Loop and restore service at those two substations. The loop was fully restored later the same day. This permanent fault resulted in momentary outages at Three Lakes and Lake Chaplain.
9. **5/30/2020 BPA Snoking-NorthCreek 115 kV Line**: The Snoking-North Creek line tripped due to a temporary LL fault (A-C). The Snoking PCB B-1582 reclosing operated as designed to restore the line. This temporary fault resulted in momentary outages at Clearview, Cascade, Murphy's Corner and North Creek.
10. **6/6/2020 Lake Goodwin-North Stanwood 115 kV Line**: The Lake Goodwin-North Stanwood line tripped due to a temporary SLG fault (B-G). PCB 3015 was able to auto-reclose and restore the unloaded line. This temporary fault resulted in no outages as the line was unloaded at the time.
11. **6/7/2020 Jackson North Loop 115 kV Line**: The Jackson-BPA Snohomish North line tripped due to a permanent LL fault (A-C) caused by a fallen tree at pole SP-TL 4/10 between Three Lakes and Lake Chaplain. The auto-sectionalizing schemes at Three Lakes and Lake Chaplain operated as designed to isolate the faulted section of the North Loop and restore service at those two substations. The loop was fully restored later on the same morning. This permanent fault resulted in momentary outages at Three Lakes and Lake Chaplain.
12. **6/9/2020 Lake Goodwin-North Stanwood 115 kV Line**: The Lake Goodwin-North Stanwood line tripped due to a temporary SLG fault (B-G). PCB 3015 was able to auto-reclose and restore the unloaded line. This temporary fault resulted in no outages as the line was unloaded at the time.
13. **6/17/2020 Lake Goodwin-North Stanwood 115 kV Line**: The Lake Goodwin-North Stanwood line tripped due to a temporary SLG fault (B-G). PCB 3015 was able to auto-reclose and restore the unloaded line. This temporary fault resulted in no outages as the line was unloaded at the time. Fault indicators were installed on the line at multiple locations on June 22nd to locate the root cause of this recurring fault.
14. **6/30/2020 Jackson South Loop 115 kV Line**: The Jackson-BPA Snohomish South Loop tripped due to a permanent B-G fault caused by a failed insulator at Pole WMO-WC 1/12 right outside of Woods Creek substation. The auto-sectionalizing schemes at Sultan and West Monroe operated as designed to isolate the faulted line section and restore the Jackson-Sultan and BPA Snohomish-West Monroe line sections. The loop was fully restored early the next morning (7/1). This permanent fault resulted in momentary outages at SNPD Snohomish, West Monroe, Sultan, Wallace River and Goldbar substations and an extended outage at Woods Creek (490 mins).
15. **7/16/2020 Delta-Navy 115 kV Line**: Three 115 kV breakers were opened via SCADA to de-energize the line to facilitate safe response to a structure fire near the line. This operation resulted in an outage to Norton (45 minutes). The line was restored after fire was put out.
16. **8/1/2020 Paine Field-BPA Snohomish 115 kV Line**: The Paine Field-BPA Snohomish line tripped to lockout due to a permanent B-G fault caused by a car-pole incident at pole S-PF 9/2. The line was fully

restored later the same day after repairs were performed. This permanent fault resulted in an extended outage at Olivia Park (107 minutes).

17. **8/16/2020 Stimson Crossing-East Arlington 115 kV Line**: The Stimson Crossing-East Arlington line tripped due to a temporary A-G fault which evolved into an AC-G one. Both terminals of the line reclosed as designed; the root cause of the fault remains unknown. This temporary fault resulted in momentary outages at Portage and Lake Goodwin.
18. **8/31/2020 Beverly Park-BPA Snoking 115 kV Line**: The Beverly Park-Snoking Line tripped due to a permanent A-C fault caused by a fallen tree which also caused a pole with pre-existing woodpecker damage near Floral Hills substation to break. A couple of Distribution feeders which were being used at the time to offload some Floral Hills circuits on the line's 12kV underbuild also tripped as a result of this fault. The autosectionalizing scheme at Mariner operated as designed to restore the Beverly Park-Mariner section of the line, but Martha Lake and Polaris substations experienced sustained outages. This permanent fault resulted in momentary outages at Silver Lake and Mariner substations. Polaris and Martha Lake substations (~67 mins) and North Creek 12-1410 (~73 mins) all experienced extended outages.
19. **9/3/2020 Beverly Park-BPA Snohomish #3 115 kV Line**: The Beverly Park-BPA Snohomish #3 Line tripped due to a permanent SLG (C-G) fault caused by broken insulators resulting in a down wire which then tripped a Pinehurst distribution feeder on the 12kV underbuild and damaged three distribution transformers on Scenic Drive. Both terminals of the line tripped to lockout as designed and the line was restored later the same night. The Beverly Park-BPA Snohomish #3 Line doesn't feed any tapped load, but Pinehurst feeder 12-0149 experienced a sustained outage (56min) as a result of the 115kV conductor landing on the 12kV underbuild. It is to be noted that the Beverly Park Bank 1 transformer also tripped offline simultaneously with the Beverly Park-BPA Snohomish #3 Line as a result of a misoperation of the bank relays' restricted earth fault elements (see separate Bank 1 misoperation investigation report).
20. **9/3/2020 Beverly Park Bank 230 kV – 115 kV Substation Transformer**: When the Beverly Park - BPA Snohomish #3 115 kV line tripped, the Beverly Park 230-115 kV transformer experienced a misoperation of its restricted-earth element and tripped out. No outages resulted from this operation.
21. **9/27/2020 East Arlington-Oso 115 kV Line**: The East Arlington-Oso Line tripped due to a temporary SLG (A-G) fault. It is not clear what the exact root cause of the fault was but it occurred simultaneously with a trip of Eagle Creek feeder 12-2617 and about 4 secs after Eagle Creek feeder 12-2618 had just tripped to lockout. Both feeders are on the line's 12kV underbuild.
22. **10/13/2020 BPA Snoking-North Creek 115 kV Line**: A momentary outage occurred and caused partial operation of the North Creek transfer scheme. North Creek was restored via SCADA after a short outage.
23. **11/4/2020 Stimson Crossing-East Arlington 115 kV Line**: The Stimson Crossing-East Arlington line tripped to lockout due to a permanent 3LG tree fault. Service was restored at Lake Goodwin after the faulted section of the line was isolated by opening Switch 1699 at Sills Corner. This permanent fault resulted in an extended outage at Lake Goodwin (54 mins); Portage was offline and didn't experience any outage.
24. **11/13/2020 Stimson Crossing-Camano & Lake Goodwin-North Stanwood 115 kV Line**: The Stimson Crossing-Camano Line tripped due to a permanent L-L fault (A-C). The Stimson breakers reclosed and restored the Stimson Crossing-North Stanwood section of the line after the North Stanwood auto-sectionalizing scheme isolated the faulted line section. Servicemen patrolled the North Stanwood-South Camano section of the line but couldn't find the root cause of the fault. They noticed that some sleeves and insulators at Pole CI 15/3, located 13.3 miles from Stimson Crossing showed some signs of deterioration but didn't see any sign of flashover, so the day's windy conditions were suspected as a contributing factor. Another patrol of the Stanwood-Camano line section revealed that the sleeves and insulators at Pole CI 15/3 had failed; crews proceeded to repair the sleeves and replace the insulators. This permanent fault resulted in extended outages at Camano, Sunset and South Camano (~353 mins). North Stanwood experienced intermittent temporary outages (~7.5 mins).
25. **11/13/2020 Lake Goodwin-North Stanwood 115 kV Line**: While attempting restoration of the Stimson Crossing – Camano 115 kV line, the Lake Goodwin – North Stanwood 115 kV line also experienced a trip to lockout. This resulted in another momentary outage to North Stanwood substation and continued sustained outages to Camano, Sunset and South Camano substations.

26. **11/16/2020 Brightwater-BPA Snoking 115 kV Line**: The Brightwater-Snoking line tripped due to a temporary L-L fault (A-C) and was able to reclose successfully. It then tripped to lockout due to a permanent A-G fault. The cause of the fault was a tree in the line during heavy wind. This permanent fault resulted in an extended outage at Park Ridge substation (41 minutes).

5 The Distribution System

5.1 Introduction

This section describes outages on the District 12.47 kV distribution system. These outages are more frequent and involve fewer customers per event than most transmission system outages. While the number of the outages are somewhat balanced between trees, animals, and equipment failures, most of the outage minutes are due to outages caused by trees and motor vehicle accidents. Animal and equipment failures often involve distribution transformers and affect a small number of customers. Damage caused by trees and motor vehicles is less discriminating and can affect infrastructure such as feeders and large branch circuits, which have larger customer impacts.

5.2 System Performance

5.2.1 Outage Causes

Figures 5-1 and 5-2 show the count of distribution outages by cause for 2020 and average for the five-year period of 2015-2019. In 2020, 2,353 distribution outages were recorded during routine operation, compared to the five-year average of 2,036 annual outages. The percentages shown in Figures 5-1 and 5-2 are percentages of these total number of outages in each period. The District started tracking planned outages in 2017.

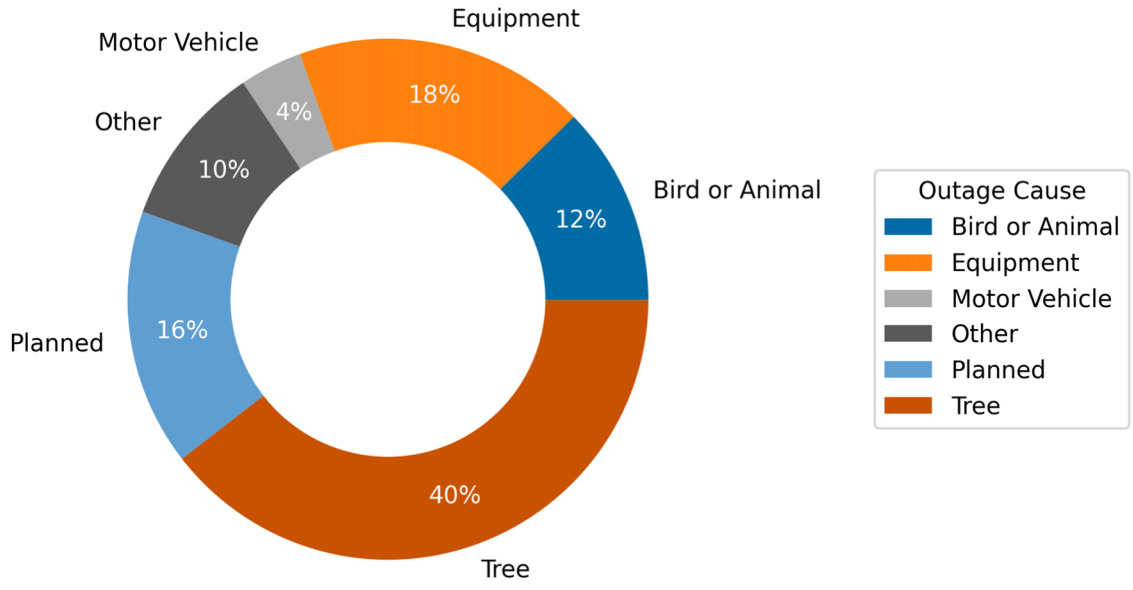

Figure 5-1: 2020 Distribution Outages by Cause

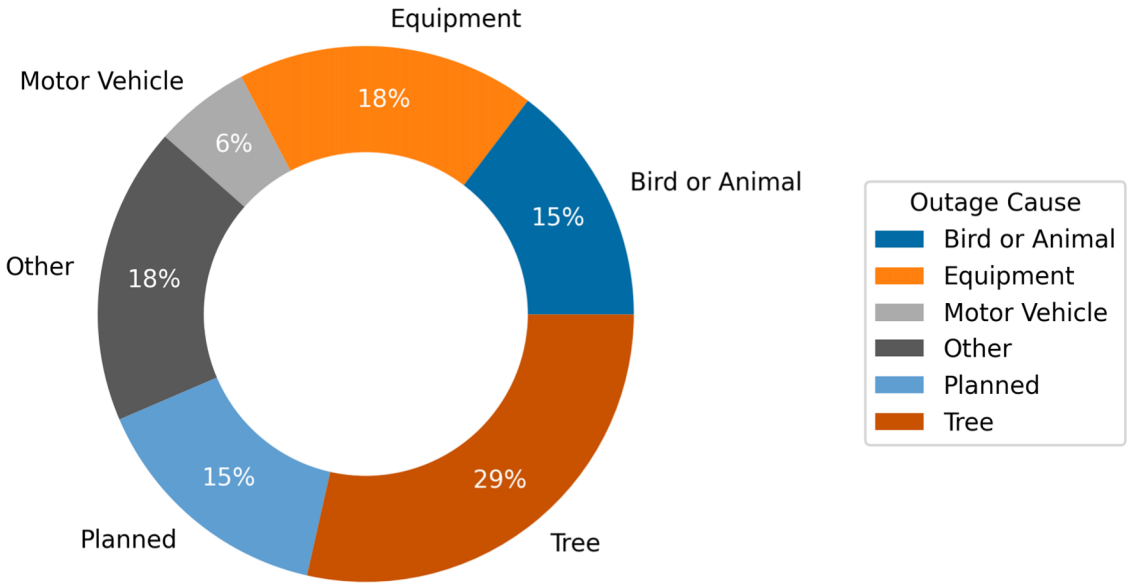

Figure 5-2: Five-Year Average Distribution Outages by Cause (2015-2019)

Figures 5-3 and 5-4 show the 2020 and five-year average percent of customer outage minutes by cause. District customers lost power for a combined total of 39,642,806 minutes in 2020 due to distribution outages, compared to the five-year average of 29,011,789 uplifted minutes. Both the number of outages and the customer minutes of outage are important parameters for planning effective outage impact reduction measures.

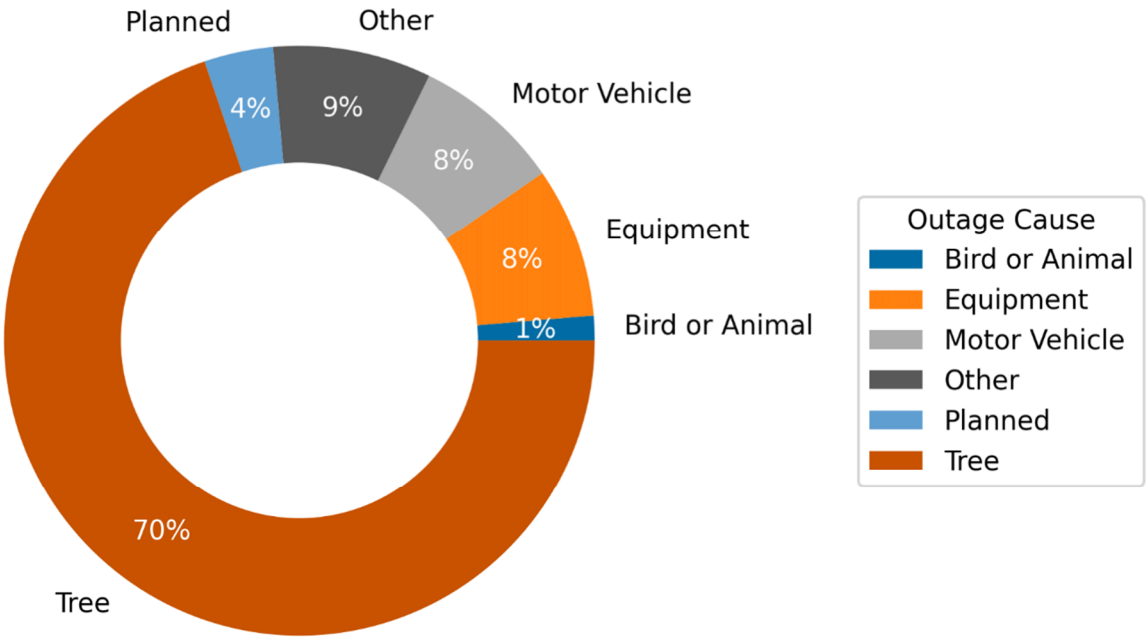

Figure 5-3: 2020 Distribution Outage Minutes by Cause

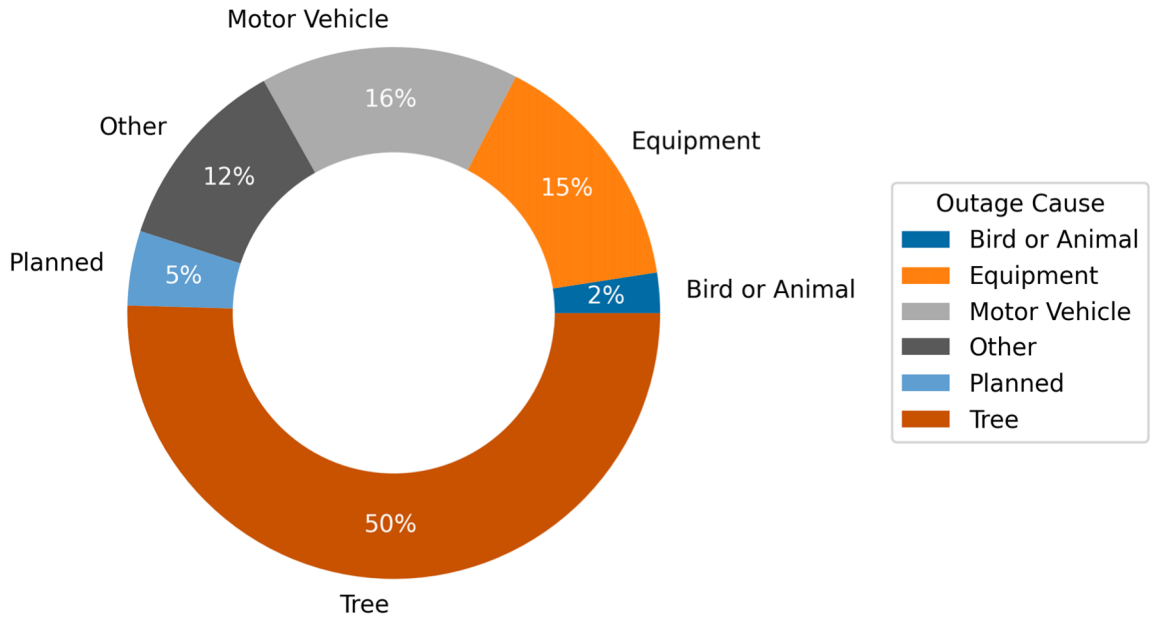

Figure 5-4: Five-Year Average Distribution Outage Minutes by Cause (2015-2019)

5.2.2 Explanation of Equipment Failure Category

Equipment failures may include any component of the distribution system, from primary overhead conductor, to fuses, transformers, insulators, and secondary service conductors. Figure 5-5 shows the number of recorded equipment failures by category during 2020. The ten most common types of equipment failure accounted for 506 outages in 2020. For comparison, Figure 5-6 shows the five-year average of the number of equipment failures for each category.

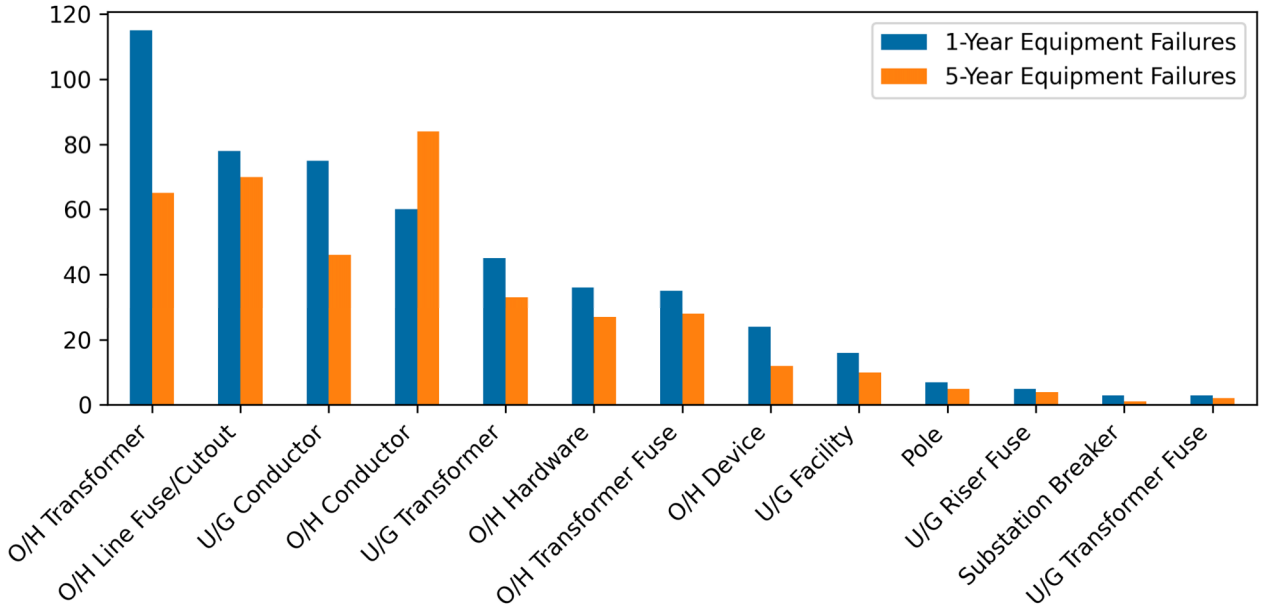

Figure 5-5: 2020 Equipment Failures

5.3 Urban, Suburban, Rural Classifications

IEEE Standard 1782 defines circuits as urban (greater than 150 customers per mile), suburban (between 150 and 50 customers per mile) and rural (less than 50 customers per mile). Classifying circuits gives an indication of how susceptible those circuits are to having an outage. Shorter circuits are less likely to have an outage, due to less available exposure to faults. Conversely, longer circuits have more conductor, and thus are more likely to be damaged. To compare similar circuits, circuits are identified by performance based on circuit length.

Classification (# of circuits)	Average Circuit Length	Average Number of Customers	Customers per Mile	Average SAIDI	Average SAIFI	Average Number of Outages
Urban (26)	7.4 miles	1,354	204	33.2	0.61	3
Suburban (180)	12.9 miles	1,147	95.5	46	0.68	4
Rural (109)	32.4 miles	833	25.6	259	2.2	15

5.4 Reliability Improvement Priority

Before 2017, the System Planning and Protection department used the "20 Worst Circuits" annually to target circuits for reliability improvements. This method had flaws. Typically, the same circuits would show up year after year due to their circuit length, rather than their relative reliability. There were also circuits on the list that had experienced no distribution outages, with all outage minutes caused by transmission outages. While valuable to know, that measure was irrelevant, as no distribution improvements would improve reliability for the circuit. In 2017, an objective metric to help prioritize feeders for reliability work was developed comparing SAIDI normalized by circuit length and SAIFI. The metric is based on distribution outages only, allowing results to guide engineers to help decide which distribution changes should be prioritized to improve reliability. For this list, the circuit SAIDI and SAIFI were based on the number of customers on their original circuit. The OMS system has a design flaw when counting CMI for outages that involve multiple circuits. This happens when a breaker opens while a circuit is picking up a second circuit. This causes highly inaccurate reliability statistics for circuits with this type of outage. This should reduce the impact of the OMS design flaw on our reliability statistics.

$$rank(d,f) = \frac{d - \mu_d}{\sigma_d} + \frac{f - \mu_f}{\sigma_f}$$

Where 'd' is the circuit SAIDI divided by the circuit length, 'f' is the circuit SAIFI, 'μ' is the mean, and 'σ' is the standard deviation

Table 5-1: Circuit Reliability Improvement Priority

	Feeder	Substation	Length	SAIFI	SAIDI	Incident Count	Customers	Score
1	12-2034	Lake Chaplain	8.4	4.03	511.1	6	98	7.95
2	12-0810	Granite Falls	38.9	8.36	1128.6	43	1077	7.91
3	12-5004	Sultan	8.2	3	464	3	1	6.77
4	12-3092	Stimson Crossing	5.8	2.16	361.9	4	248	6.75
5	12-4486	Wallace River	1.5	2	79	2	1	5.48
6	12-3502	Portage	5.9	8.17	40.8	10	193	5.45
7	12-2036	Lake Chaplain	29.1	3.2	1054.4	18	487	4.76
8	12-0808	Granite Falls	34.9	4.92	821	21	573	4.74
9	12-3505	Portage	15.9	3.03	573.6	7	1170	4.62
10	12-2516	North Mountain	2.6	1	131	1	2	4.52
11	12-5395	York	20.3	5.28	347.4	16	763	4.34
12	12-2617	Eagle Creek	84	5.95	908.7	41	1517	4.19
13	12-0554	Goldbar	63.8	4.42	1338.9	63	1995	4.09
14	12-1818	Three Lakes	25.7	3.33	651	22	784	3.72
15	12-5208	Sunset	40.4	4.73	561.2	21	1347	3.59
16	12-5393	York	22.5	3.81	395.8	7	1850	3.27
17	12-0149	Pinehurst	11.3	2.2	326.7	11	1736	3.24
18	12-1847	Waterfront	7.1	2	210.3	3	605	3.15
19	12-4615	Granite Falls	58.5	4	781.2	31	1384	2.98
20	12-0092	Perrinville	9.2	4.04	119.6	10	767	2.98

Appendix A

District Outage Management System

These tables include outages that occurred on both the transmission system and on the distribution system. They do not include outages that occurred during declared major events and do not have an uplift factor applied to previous years.

Table A-1: Substation Metrics

This table shows the substation reliability metrics for 2019 and the previous five year average.

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
20th Ave	2020	2486	9	66009	26.6	0.74	35.7
20th Ave	2015-2019	2447	10	117336	48.1	0.95	50.8
52nd St	2020	3545	11	162447	45.8	0.33	139.4
52nd St	2015-2019	3482	15.2	168886	48.3	0.51	95.3
Alderwood	2020	3283	12	116253	35.4	0.6	58.8
Alderwood	2015-2019	4242	14	170531	40	0.52	77.6
Ballinger	2020	3688	11	103821	28.2	0.43	65.9
Ballinger	2015-2019	3673	15.8	132231	36	0.35	103.4
Brier	2020	5863	23	187012	31.9	1.27	25.2
Brier	2015-2019	5763	22	545364	94.4	1.14	82.6
Bunk Foss	2020	2265	19	206222	91	1.33	68.7
Bunk Foss	2015-2019	2243	20.2	102736	45	0.55	81.4
Canyon Park	2020	5198	11	24748	4.8	0.23	20.3
Canyon Park	2015-2019	5024	25.6	276559	55.1	0.59	94
Cascade	2020	9845	6	9303	0.9	0.01	150
Cascade	2015-2019	9870	9.8	429624	44.4	0.56	78.9
Casino	2020	3788	8	110588	29.2	0.36	80.1
Casino	2015-2019	3861	10.6	258826	67.4	0.45	149.3
Cedar Valley	2020	2116	3	94565	44.7	0.52	86.1
Cedar Valley	2015-2019	1993	1	2717	1.4	0.02	74.2
Central Marysville	2020	5375	17	51219	9.5	0.1	94.5
Central Marysville	2015-2019	5347	15	113279	20.9	0.08	258.9
Clearview	2020	4788	83	1269505	265.1	2.27	116.7

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Clearview	2015-2019	5205	73.6	1148477	229.7	2.24	102.5
Delta	2020	1051	7	8004	7.6	0.1	77
Delta	2015-2019	1014	6.4	14255	14.2	0.38	37.3
Eagle Creek	2020	8871	138	2499770	281.8	2.96	95.1
Eagle Creek	2015-2019	8653	103.6	1328998	156	1.46	107
East Marysville	2020	11224	31	734761	65.5	1.04	62.9
East Marysville	2015-2019	10642	25.6	475826	45	0.47	96.7
Edgecomb	2020	3755	21	268473	71.5	0.96	74.2
Edgecomb	2015-2019	3427	20	203481	59.7	0.55	108.3
Esperance	2020	5951	11	141952	23.9	0.09	253
Esperance	2015-2019	5858	18.6	160479	27.5	0.29	96.4
Everett	2020	5336	10	149118	27.9	0.52	53.4
Everett	2015-2019	4996	17.4	249719	49.6	0.39	128.5
Fitzgerald	2020	1090	5	169067	155.1	2.02	76.6
Fitzgerald	2015-2019	1009	0.6	7049	6.7	0.18	36.6
Five Corners	2020	5548	16	204405	36.8	0.33	110
Five Corners	2015-2019	5495	19	157384	28.5	0.37	76.6
Floral Hills	2020	8583	20	432718	50.4	0.29	173.6
Floral Hills	2015-2019	8219	33.8	906184	111.2	1.15	96.4
Fobes	2020	4642	26	169679	36.6	0.4	90.7
Fobes	2015-2019	4535	24	152656	33.9	0.5	67.2
Frontier	2020	7536	20	1017295	135	1.25	107.9
Frontier	2015-2019	7245	20.4	218655	30.4	0.94	32.3
Gibson	2020	7020	15	27460	3.9	0.02	164.4
Gibson	2015-2019	6571	23.8	397677	60.7	0.89	68.3
Glenwood	2020	5627	14	61721	11	0.22	50.4
Glenwood	2015-2019	5542	18.8	193883	35.1	0.7	50
Goldbar	2020	2752	78	2808458	1020.5	3.39	301.2
Goldbar	2015-2019	2739	48.6	1180958	428.3	1.9	225.8
Granite Falls	2020	6881	135	3143154	456.8	2.81	162.3
Granite Falls	2015-2019	6508	98.2	1921628	290.7	1.88	154.7
Harbour Pointe	2020	5112	8	132066	25.8	0.33	77.3
Harbour Pointe	2015-2019	5058	5.6	48397	9.7	0.11	91.4
Hardeson	2020	0	0	0	0	0	0

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Hardeson	2015-2019	32	0.2	199	6.2	0.01	496.5
Hartford	2020	4142	66	1044305	252.1	1.06	238.5
Hartford	2015-2019	4171	54.8	479467	115.5	1	115.9
Hilton Lake	2020	6657	16	89309	13.4	0.37	36.4
Hilton Lake	2015-2019	6538	15	406654	62.2	0.68	91
Kellogg Marsh	2020	5341	15	125524	23.5	0.06	391
Kellogg Marsh	2015-2019	5263	13.8	159885	29.4	0.33	87.9
Lake Chaplain	2020	589	25	564159	957.8	3.33	287.3
Lake Chaplain	2015-2019	570	17.2	283072	498.9	5.46	91.3
Lake Goodwin	2020	5191	102	1088406	209.7	2.54	82.6
Lake Goodwin	2015-2019	5150	61	770279	148.9	1.28	116.6
Lake Serene	2020	6169	11	234595	38	0.62	61.1
Lake Serene	2015-2019	6036	14.6	81380	13.5	0.19	71.9
Lake Stevens	2020	7271	38	783977	107.8	0.83	130.2
Lake Stevens	2015-2019	6718	36.2	470798	68.1	0.56	121.7
Lynnwood	2020	4950	20	17060	3.4	0.04	87.9
Lynnwood	2015-2019	4960	24.2	147230	29.8	0.32	92.6
Maplewood	2020	4414	18	27285	6.2	0.07	91
Maplewood	2015-2019	4350	18.6	203208	47.1	0.44	106.9
Mariner	2020	5269	8	153374	29.1	0.88	33.1
Mariner	2015-2019	4874	10.2	50381	10.3	0.04	256.9
Martha Lake	2020	6234	22	186084	29.8	1.34	22.2
Martha Lake	2015-2019	5588	20.2	437745	76	0.77	98.2
Meadowdale	2020	4910	20	250818	51.1	1.05	48.7
Meadowdale	2015-2019	4876	20.4	142398	29.2	0.48	60.3
Mountlake	2020	6232	29	333550	53.5	0.67	80.4
Mountlake	2015-2019	6862	35.4	178920	25.4	0.45	56.2
Mukilteo	2020	4327	24	151927	35.1	0.84	41.9
Mukilteo	2015-2019	4307	12	154111	35.8	0.35	101.1
Murphy'S Corner	2020	4660	8	46234	9.9	0.3	33.3
Murphy'S Corner	2015-2019	4585	8.2	241157	52.6	0.55	95

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
North Alderwood	2020	740	3	43696	59	0.39	152.8
North Alderwood	2015-2019	731	1.4	17924	24.8	0.3	82.9
North Camano	2020	2950	34	264201	89.6	1.47	60.8
North Camano	2015-2019	2875	31.2	267816	93.7	0.83	113.5
North Creek	2020	7149	12	80967	11.3	0.09	131.7
North Creek	2015-2019	6956	12	149792	21.6	0.27	79.3
North Marysville	2020	2841	4	7515	2.6	0.07	38.7
North Marysville	2015-2019	2814	10	39582	14.1	0.18	78.6
North Mountain	2020	1896	69	705380	372	1.84	202.2
North Mountain	2015-2019	1918	54	1178834	613.8	3.88	158.2
North Stanwood	2020	6908	97	1397654	202.3	1.65	122.8
North Stanwood	2015-2019	6650	64.6	1334988	198.7	1.63	121.6
Norton Ave	2020	3069	3	1775	0.6	0	126.8
Norton Ave	2015-2019	3189	7	56572	17.8	0.23	79
Olivia Park	2020	4650	12	221607	47.7	0.63	75.7
Olivia Park	2015-2019	4585	14	188037	40.4	0.66	61.6
Oso	2020	438	14	20582	42	0.2	213.7
Oso	2015-2019	351	9.6	46600	131	1.8	72.8
Paine Field	2020	8602	18	452843	52.6	0.59	88.8
Paine Field	2015-2019	8569	17.2	225101	26.2	0.31	85.2
Park Ridge	2020	4852	26	296064	61	0.59	102.6
Park Ridge	2015-2019	4878	23.2	171672	34.6	0.32	109.8
Perrinville	2020	4521	31	350683	77.6	1.6	48.4
Perrinville	2015-2019	4369	18.6	156071	35.8	0.6	59.9
Picnic Point	2020	3779	30	623602	165	1.34	123
Picnic Point	2015-2019	3757	22.6	272850	72.5	0.53	136.7
Pinehurst	2020	6763	41	858217	126.9	1.04	121.8
Pinehurst	2015-2019	6758	29.4	303073	44.7	0.65	68.3
Polaris	2020	4067	2	758	0.2	0	151.6
Polaris	2015-2019	3927	10	189419	47.4	0.83	57
Portage	2020	2631	38	285859	108.7	2.11	51.5
Portage	2015-2019	2632	23.4	225565	85.2	0.93	91.7

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Quil Ceda	2020	2847	36	653032	229.4	3.14	73.1
Quil Ceda	2015-2019	2866	23.8	360912	123.5	0.86	143.8
Richmond Park	2020	3177	20	31311	9.9	0.05	189.8
Richmond Park	2015-2019	2979	20	242390	80.3	0.58	139.2
Silver Lake	2020	6165	16	614846	99.7	1.6	62.2
Silver Lake	2015-2019	6117	17.8	260509	42.6	0.47	90.9
Smokey Point	2020	4394	7	786096	178.9	1.6	111.8
Smokey Point	2015-2019	3662	10.8	102475	27.5	0.59	46.4
Snohomish	2020	3102	28	188158	60.7	0.63	97
Snohomish	2015-2019	3105	22.8	154930	49.8	0.87	57.5
South Camano	2020	3811	51	890209	233.6	2.06	113.6
South Camano	2015-2019	3714	47.8	1178489	316.3	1.97	160.2
Stimson Crossing	2020	1853	32	415956	224.5	3.18	70.5
Stimson Crossing	2015-2019	1912	24.8	276525	146.6	1.55	94.7
Sultan	2020	3025	40	1216737	402.2	3.41	118.1
Sultan	2015-2019	3476	43.4	841401	252.1	2.04	123.6
Sunset	2020	3968	57	913811	230.3	2.51	91.7
Sunset	2015-2019	3911	37.4	738454	188.5	1.97	95.6
Tenth Street	2020	4195	10	216675	51.7	0.74	70.1
Tenth Street	2015-2019	4149	12	217960	52.5	0.5	104.8
Thrashers Corner	2020	6812	12	73047	10.7	0.08	126.4
Thrashers Corner	2015-2019	6446	12.4	90350	13.8	0.25	55.6
Three Lakes	2020	4255	106	1464640	344.2	2.76	124.6
Three Lakes	2015-2019	4251	82	1250259	291.9	2.99	97.7
Tulalip	2020	2278	18	298705	131.1	1.6	82.1
Tulalip	2015-2019	2325	18.8	319893	136.4	1.13	121
Turners Corner	2020	2496	38	488245	195.6	1.3	151
Turners Corner	2015-2019	2613	39.8	288430	113.8	0.71	159.9
Village	2020	2115	24	234837	111	0.32	346.9
Village	2015-2019	2133	20.6	96536	44.9	0.43	103.3
Wallace River	2020	1384	17	279945	202.3	1.15	176.2

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Wallace River	2015-2019	884	12.6	73772	88.6	0.71	124.4
Waterfront	2020	3092	3	2423	0.8	0	220.3
Waterfront	2015-2019	3092	7.4	94081	29.9	0.46	64.6
West Monroe	2020	7455	44	407163	54.6	0.39	139.6
West Monroe	2015-2019	7110	35.2	320878	45	0.51	88
Westgate	2020	4234	17	389418	41.3	0.42	99.4
Westgate	2015-2019	4169	15	110520	24.9	0.19	133.9
Woods Creek	2020	5863	97	3985725	679.8	3.29	206.5
Woods Creek	2015-2019	5537	76	1545344	275	1.93	142.6
York	2020	5929	46	839649	141.3	3.23	43.7
York	2015-2019	5767	23.4	332821	57.7	0.92	62.8

Table A-2: Circuit Metrics

This table shows the circuit reliability metrics for 2020 and the previous five year average.

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
20th Ave	12-1493	2020	25	0	0	0	0	0
20th Ave	12-1493	2015-2019	29	0	0	0	0	0
20th Ave	12-1494	2020	7	0	0	0	0	0
20th Ave	12-1494	2015-2019	4	0.2	40	10	0.2	50
20th Ave	12-1495	2020	12	0	0	0	0	0
20th Ave	12-1495	2015-2019	18	1	1372	79.4	1.1	72.2
20th Ave	12-1496	2020	21	0	0	0	0	0
20th Ave	12-1496	2015-2019	10	1.2	5271	233.9	2.11	111
20th Ave	12-2723	2020	555	6	1853	3.1	0.09	35.6
20th Ave	12-2723	2015-2019	604	3	13907	23	0.62	37.3
20th Ave	12-2724	2020	243	0	0	0	0	0
20th Ave	12-2724	2015-2019	400	0.4	63	0.2	0	44.7
20th Ave	12-2725	2020	951	1	20225	20.1	1	20.1
20th Ave	12-2725	2015-2019	993	1.6	33249	34.2	0.44	77.4
20th Ave	12-2726	2020	370	2	43931	113.5	2.04	55.8
20th Ave	12-2726	2015-2019	403	1.2	36903	56.9	0.44	129.2
20th Ave	12-6026	2020	0	0	0	0	0	0
20th Ave	12-6026	2015-2019	0	0	0	0	0	0
52nd St	12-0183	2020	546	2	29379	47.4	1.01	47
52nd St	12-0183	2015-2019	656	3	19160	34	0.69	48.9
52nd St	12-0184	2020	1214	2	90002	70.3	0.16	430.6
52nd St	12-0184	2015-2019	1195	1.6	5909	5	0.02	296.6
52nd St	12-0185	2020	685	4	30758	42.7	0.26	163.6
52nd St	12-0185	2015-2019	750	5.2	131263	179.8	1.49	121.1
52nd St	12-0186	2020	884	3	12308	13.4	0.16	86.1
52nd St	12-0186	2015-2019	953	5.4	12554	13.5	0.27	49.4
Alderwood	12-0116	2020	1162	1	7440	12.6	0.02	620
Alderwood	12-0116	2015-2019	612	2.4	2675	4.1	0.02	165.4
Alderwood	12-0117	2020	1391	4	75357	53.2	1.31	40.7
Alderwood	12-0117	2015-2019	769	2.8	12766	15.2	0.27	56.6
Alderwood	12-0132	2020	701	2	2136	7	0.03	267
Alderwood	12-0132	2015-2019	1518	5.4	130544	83.9	0.88	95.6
Alderwood	12-0141	2020	850	5	31320	32.4	0.11	292.7
Alderwood	12-0141	2015-2019	908	3.4	24546	26.6	0.65	40.9
Ballinger	12-0258	2020	418	2	4824	10	0.05	219.3
Ballinger	12-0258	2015-2019	483	3.4	11729	25	0.4	62.1

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Ballinger	12-0259	2020	707	2	1463	2	0.01	243.8
Ballinger	12-0259	2015-2019	690	1.6	30925	43.7	0.34	130.2
Ballinger	12-0260	2020	1064	2	15073	13.6	0.03	430.7
Ballinger	12-0260	2015-2019	1111	5.6	24643	22.3	0.48	46.7
Ballinger	12-0261	2020	1319	5	82461	59.8	1.1	54.5
Ballinger	12-0261	2015-2019	1380	5.2	64935	46.8	0.23	201.5
Brier	12-0501	2020	1704	8	9850	5.5	0.1	56.6
Brier	12-0501	2015-2019	1803	5	72802	41.5	1	41.6
Brier	12-0502	2020	1008	5	67815	59	1.15	51.3
Brier	12-0502	2015-2019	1060	3.6	41651	37.6	0.27	139.2
Brier	12-0503	2020	1414	5	74964	51.1	3.03	16.8
Brier	12-0503	2015-2019	1463	6.6	318411	218.3	2.33	93.8
Brier	12-0504	2020	1409	5	34383	23.7	1.02	23.2
Brier	12-0504	2015-2019	1414	6.6	109654	77.3	0.53	146
Bunk Foss	12-4111	2020	731	3	26931	35.1	1	35.1
Bunk Foss	12-4111	2015-2019	783	4.6	41067	53.1	0.48	109.7
Bunk Foss	12-4112	2020	643	6	1485	2.2	0.03	82.5
Bunk Foss	12-4112	2015-2019	709	5.2	5101	7.6	0.41	18.8
Bunk Foss	12-4113	2020	438	5	161934	352	3.9	90.2
Bunk Foss	12-4113	2015-2019	485	3.8	14636	31.6	0.15	204.9
Bunk Foss	12-4114	2020	349	5	15872	43	1.14	37.8
Bunk Foss	12-4114	2015-2019	400	6.6	41932	115.5	1.48	78.1
Canyon Park	12-1093	2020	1022	5	3098	2.9	0.02	123.9
Canyon Park	12-1093	2015-2019	1200	6.6	18450	19.7	0.13	148.9
Canyon Park	12-1094	2020	1119	1	250	0.2	0	50
Canyon Park	12-1094	2015-2019	1206	4.8	11152	9.4	0.07	130.3
Canyon Park	12-1095	2020	1466	4	8260	5.5	0.06	89.8
Canyon Park	12-1095	2015-2019	1447	9	141687	97.6	1.2	81.2
Canyon Park	12-1096	2020	1071	1	13140	12	1	12
Canyon Park	12-1096	2015-2019	1033	4	99539	94.4	0.87	109.2
Canyon Park	12-3488	2020	340	0	0	0	0	0
Canyon Park	12-3488	2015-2019	115	1.2	5731	14.7	0.21	68.7
Cascade	12-2087	2020	1953	2	999	0.5	0.01	50
Cascade	12-2087	2015-2019	1349	1.4	2324	1.3	0.24	5.3
Cascade	12-2088	2020	2836	3	8206	2.8	0.01	200.1
Cascade	12-2088	2015-2019	3652	3.4	77914	27.2	0.35	78.1
Cascade	12-2089	2020	1780	0	0	0	0	0
Cascade	12-2089	2015-2019	1912	1	7113	3.9	0.03	122.2

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Cascade	12-2090	2020	2452	1	98	0	0	98
Cascade	12-2090	2015-2019	2895	3.8	92516	32.3	0.23	137.5
Casino	12-0308	2020	797	2	89021	94.4	1.35	69.9
Casino	12-0308	2015-2019	1046	3.4	4938	4.8	0.02	231.4
Casino	12-0309	2020	370	0	0	0	0	0
Casino	12-0309	2015-2019	394	1.2	29916	79.1	0.37	213
Casino	12-0310	2020	1118	2	4409	3.7	0.02	163.3
Casino	12-0310	2015-2019	1032	3.6	63536	53	0.19	278.5
Casino	12-0311	2020	1119	4	17158	13.6	0.06	214.5
Casino	12-0311	2015-2019	1223	2.4	160436	127.5	1.07	119.3
Cedar Valley	12-5372	2020	848	1	284	0.3	0	142
Cedar Valley	12-5372	2015-2019	848	0	0	0	0	0
Cedar Valley	12-5373	2020	902	2	94281	96.5	1.12	86
Cedar Valley	12-5373	2015-2019	902	0.8	2483	2.8	0.04	72.2
Cedar Valley	12-5374	2020	0	0	0	0	0	0
Cedar Valley	12-5374	2015-2019	0	0	0	0	0	0
Cedar Valley	12-5375	2020	5	0	0	0	0	0
Cedar Valley	12-5375	2015-2019	5	0.2	234	46.8	0.44	106.4
Cedar Valley	12-5376	2020	0	0	0	0	0	0
Cedar Valley	12-5376	2015-2019	0	0	0	0	0	0
Central Marysville	12-1419	2020	1083	3	38096	33.5	0.38	87.2
Central Marysville	12-1419	2015-2019	1191	2.2	2794	2.4	0.01	267.5
Central Marysville	12-1420	2020	1236	6	7453	5.8	0.05	111.2
Central Marysville	12-1420	2015-2019	1276	4	80234	62.3	0.21	295.7
Central Marysville	12-1421	2020	1567	2	576	0.4	0	96
Central Marysville	12-1421	2015-2019	1679	4.8	16888	10.6	0.06	170.2
Central Marysville	12-1422	2020	1164	6	5094	3.8	0.02	159.2
Central Marysville	12-1422	2015-2019	1285	4	13362	10.2	0.04	239
Clearview	12-0584	2020	748	22	392646	250.4	2.08	120.4
Clearview	12-0584	2015-2019	1958	5.6	100040	129.9	1.21	107.4
Clearview	12-0585	2020	1087	13	64748	58.3	0.33	177.4
Clearview	12-0585	2015-2019	1262	13.6	94136	81	0.83	97.7
Clearview	12-0586	2020	1523	9	43108	93.1	1.07	87.1
Clearview	12-0586	2015-2019	1679	23.4	251570	163.2	1.82	89.9
Clearview	12-0587	2020	1720	39	769003	467.8	4.11	113.8

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Clearview	12-0587	2015-2019	1791	31	702731	408.3	3.86	105.7
Delta	12-3653	2020	79	3	7099	83.5	1.08	77.2
Delta	12-3653	2015-2019	101	3.8	3677	47.4	0.51	92.8
Delta	12-3654	2020	9	0	0	0	0	0
Delta	12-3654	2015-2019	18	0	0	0	0	0
Delta	12-3655	2020	183	2	697	3.3	0.02	139.4
Delta	12-3655	2015-2019	212	1	137	0.7	0.01	62.5
Delta	12-3656	2020	668	2	208	0.3	0.01	29.7
Delta	12-3656	2015-2019	748	1.6	10440	15	0.49	30.7
Delta	12-3657	2020	0	0	0	0	0	0
Delta	12-3657	2015-2019	0	0	0	0	0	0
Eagle Creek	12-0986	2020	1074	3	2041	1.8	0.03	72.9
Eagle Creek	12-0986	2015-2019	1170	3.2	94189	84.9	1.41	60.4
Eagle Creek	12-0987	2020	657	3	9041	11.3	0.13	86.9
Eagle Creek	12-0987	2015-2019	628	1.4	14226	19.3	0.46	41.9
Eagle Creek	12-0988	2020	1511	37	644143	402.1	4.07	98.8
Eagle Creek	12-0988	2015-2019	1683	23	322596	209.9	2.29	91.6
Eagle Creek	12-0989	2020	904	5	129541	135.9	3.92	34.7
Eagle Creek	12-0989	2015-2019	982	3.4	13518	14.3	0.32	44.8
Eagle Creek	12-2617	2020	1485	41	1378823	908.9	8.96	101.5
Eagle Creek	12-2617	2015-2019	1593	31	468433	308.7	2.08	148.1
Eagle Creek	12-2618	2020	1003	34	262386	282.4	2.09	135.3
Eagle Creek	12-2618	2015-2019	1190	28	262163	240.8	2.07	116.2
Eagle Creek	12-2619	2020	1478	15	73795	47.9	0.25	193.7
Eagle Creek	12-2619	2015-2019	1516	12.4	131892	87.8	0.79	111.7
Eagle Creek	12-2620	2020	358	0	0	0	0	0
Eagle Creek	12-2620	2015-2019	412	1.2	21982	53.3	0.41	130
East Marysville	12-0002	2020	664	10	4651	6.8	0.06	113.4
East Marysville	12-0002	2015-2019	153	9.6	94706	133.2	0.74	181
East Marysville	12-0037	2020	1693	8	375757	215.1	3.04	70.7
East Marysville	12-0037	2015-2019	1613	5	53114	31.6	0.43	72.8
East Marysville	12-0038	2020	1768	4	125056	61.2	1.96	31.2
East Marysville	12-0038	2015-2019	1622	3.6	111443	70.3	0.71	99.2
East Marysville	12-0070	2020	1960	1	132	0.1	0	66
East Marysville	12-0070	2015-2019	1965	2.8	55589	27.7	0.25	109.5
East Marysville	12-0115	2020	1229	0	0	0	0	0
East Marysville	12-0115	2015-2019	1380	0.8	730	0.5	0	332
East Marysville	12-5203	2020	1434	2	1531	1	0	306.2

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
East Marysville	12-5203	2015-2019	1490	0.6	33601	22.6	0.44	51.5
East Marysville	12-5204	2020	1744	6	227634	125.6	1.27	98.9
East Marysville	12-5204	2015-2019	1710	3.2	126643	73.4	0.8	91.5
Edgecomb	12-4831	2020	186	3	119294	258.2	2.48	104.3
Edgecomb	12-4831	2015-2019	220	0.6	92	0.5	0	115.2
Edgecomb	12-4832	2020	1464	8	63966	42.1	1.01	41.5
Edgecomb	12-4832	2015-2019	1434	6.8	25420	17.5	0.46	38.1
Edgecomb	12-4833	2020	1051	1	364	0.3	0	364
Edgecomb	12-4833	2015-2019	1302	3.4	80036	59.7	0.46	128.7
Edgecomb	12-4834	2020	410	9	84849	199.6	2.2	90.8
Edgecomb	12-4834	2015-2019	483	9.2	97933	234.5	1.43	163.7
Esperance	12-0687	2020	1603	2	402	0.2	0	100.5
Esperance	12-0687	2015-2019	1655	4.4	9587	5.7	0.03	215.2
Esperance	12-0688	2020	1124	0	0	0	0	0
Esperance	12-0688	2015-2019	1184	4.8	84613	72.2	0.75	95.9
Esperance	12-0689	2020	1227	7	20450	16.3	0.13	127
Esperance	12-0689	2015-2019	1261	4.4	58082	46.4	0.53	86.9
Esperance	12-1597	2020	1842	2	121100	64.4	0.21	305.8
Esperance	12-1597	2015-2019	1603	5	8197	4.5	0.04	108.5
Everett	12-0100	2020	234	1	53	0.1	0	53
Everett	12-0100	2015-2019	404	1.6	5308	14.1	0.21	67.8
Everett	12-0101	2020	199	0	0	0	0	0
Everett	12-0101	2015-2019	219	2.2	39777	189.9	1.15	165.6
Everett	12-0112	2020	951	5	17076	17.5	0.12	151.1
Everett	12-0112	2015-2019	856	4.4	59797	64.5	0.7	92.1
Everett	12-0113	2020	345	1	368	1	0	368
Everett	12-0113	2015-2019	407	2.6	17132	45.5	0.86	53
Everett	12-0118	2020	1263	3	131621	98.5	2.01	49.1
Everett	12-0118	2015-2019	1152	2.4	76960	56.5	0.2	276.5
Everett	12-0119	2020	1073	0	0	0	0	0
Everett	12-0119	2015-2019	1155	2.2	3834	3.5	0.05	74.1
Everett	12-0121	2020	343	0	0	0	0	0
Everett	12-0121	2015-2019	228	1	15907	67.7	0.32	208.7
Everett	12-0122	2020	334	0	0	0	0	0
Everett	12-0122	2015-2019	426	1	31004	91.7	0.61	150.5
Everett	12-3700	2020	0	0	0	0	0	0
Everett	12-3700	2015-2019	0	0	0	0	0	0
Everett	12-3701	2020	0	0	0	0	0	0

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Everett	12-3701	2015-2019	0	0	0	0	0	0
Everett	12-3702	2020	25	0	0	0	0	0
Everett	12-3702	2015-2019	12	0	0	0	0	0
Fitzgerald	12-5508	2020	795	5	169067	208	2.71	76.6
Fitzgerald	12-5508	2015-2019	790	0.4	6957	8.7	0.21	41.9
Fitzgerald	12-5509	2020	6	0	0	0	0	0
Fitzgerald	12-5509	2015-2019	8	0	0	0	0	0
Fitzgerald	12-5510	2020	237	0	0	0	0	0
Fitzgerald	12-5510	2015-2019	203	0.2	91	0.8	0.2	4
Fitzgerald	12-5511	2020	4	0	0	0	0	0
Fitzgerald	12-5511	2015-2019	4	0	0	0	0	0
Five Corners	12-1282	2020	983	4	1233	1.2	0.01	176.1
Five Corners	12-1282	2015-2019	1076	4.4	8883	8.7	0.09	96.7
Five Corners	12-1283	2020	1757	7	196724	109.5	1.01	108.4
Five Corners	12-1283	2015-2019	1752	4.4	72052	41.1	0.63	65.3
Five Corners	12-1284	2020	869	0	0	0	0	0
Five Corners	12-1284	2015-2019	891	2.8	66167	74.2	0.89	83
Five Corners	12-1285	2020	1746	5	6448	3.6	0.02	179.1
Five Corners	12-1285	2015-2019	1787	7.4	10282	5.8	0.03	168.5
Floral Hills	12-2062	2020	1102	7	140957	124.9	1.14	109.5
Floral Hills	12-2062	2015-2019	1173	11	327221	286.9	2.63	109.2
Floral Hills	12-2063	2020	2804	3	609	0.2	0	121.8
Floral Hills	12-2063	2015-2019	2396	11.2	316762	124.8	1.18	105.8
Floral Hills	12-2064	2020	1692	4	40323	22.8	0.13	173.8
Floral Hills	12-2064	2015-2019	1612	6.6	189036	115.6	1.01	114.6
Floral Hills	12-2065	2020	2688	6	250829	89.8	0.35	258.9
Floral Hills	12-2065	2015-2019	2371	5	73165	27.3	0.64	42.6
Fobes	12-0398	2020	1818	11	12214	6.3	0.04	154.6
Fobes	12-0398	2015-2019	1824	7	14792	8	0.22	37
Fobes	12-0399	2020	848	6	5138	5.3	0.04	128.5
Fobes	12-0399	2015-2019	1019	5.4	43519	46.5	0.67	69.1
Fobes	12-0400	2020	1176	5	130330	107.9	1.01	106.3
Fobes	12-0400	2015-2019	1192	8.4	84258	71.4	1.02	69.9
Fobes	12-0401	2020	502	4	21997	42.5	1.02	41.9
Fobes	12-0401	2015-2019	551	3.2	10086	19.8	0.08	233.7
Frontier	12-0533	2020	1790	7	180593	97.6	1.03	94.7
Frontier	12-0533	2015-2019	1246	5.6	39911	25.2	0.46	54.6
Frontier	12-0534	2020	1439	4	144735	102.1	1.12	90.9

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Frontier	12-0534	2015-2019	1488	6	35951	24.8	1.21	20.5
Frontier	12-0535	2020	2561	4	428677	163.9	1	163.2
Frontier	12-0535	2015-2019	2528	4.4	35303	14.1	0.61	23.2
Frontier	12-0536	2020	1603	5	263290	159.9	2.01	79.6
Frontier	12-0536	2015-2019	1616	4.4	107491	65.9	1.67	39.5
Gibson	12-2897	2020	2791	5	18878	6.4	0.03	248.4
Gibson	12-2897	2015-2019	2640	9.8	213647	77.5	1.14	67.8
Gibson	12-2898	2020	1615	3	6856	3.9	0.04	95.2
Gibson	12-2898	2015-2019	1481	5.4	112938	75	1.04	72.4
Gibson	12-2899	2020	881	2	498	0.5	0	166
Gibson	12-2899	2015-2019	937	1.8	1041	1.1	0.2	5.3
Gibson	12-2900	2020	1136	5	1228	0.9	0.01	76.8
Gibson	12-2900	2015-2019	1319	6.8	70051	55.4	0.72	77
Glenwood	12-0592	2020	1075	6	58874	54.2	1.07	50.4
Glenwood	12-0592	2015-2019	1089	5.4	69022	63.8	0.62	103.3
Glenwood	12-0593	2020	1026	2	1716	1.6	0.04	42.9
Glenwood	12-0593	2015-2019	1051	5.2	22482	21.7	0.43	50.7
Glenwood	12-0594	2020	2433	6	1131	0.5	0.01	66.5
Glenwood	12-0594	2015-2019	2448	7.8	97487	40.1	1.11	36.2
Glenwood	12-0595	2020	760	0	0	0	0	0
Glenwood	12-0595	2015-2019	970	0.4	4891	5.7	0.09	62.8
Goldbar	12-0554	2020	1958	63	2671203	1338.9	4.43	302.5
Goldbar	12-0554	2015-2019	2094	35.2	1055249	526.3	2.17	242.4
Goldbar	12-0555	2020	718	15	137255	181.8	0.66	276.7
Goldbar	12-0555	2015-2019	780	13.4	125709	170.1	1.18	144.4
Granite Falls	12-0808	2020	537	21	470410	821	4.92	166.8
Granite Falls	12-0808	2015-2019	571	10	37132	66.7	0.34	197.5
Granite Falls	12-0809	2020	1212	17	333610	256	1.34	190.5
Granite Falls	12-0809	2015-2019	1354	16.8	376004	293.1	2.29	128.1
Granite Falls	12-0810	2020	1052	43	1215459	1128.6	8.37	134.9
Granite Falls	12-0810	2015-2019	1431	27	783065	670.5	3.78	177.4
Granite Falls	12-0811	2020	824	11	24874	28.8	0.13	228.2
Granite Falls	12-0811	2015-2019	900	6.6	38540	31.4	0.2	158.2
Granite Falls	12-4612	2020	276	3	2431	5.3	0.05	110.5
Granite Falls	12-4612	2015-2019	492	3.6	31877	66.1	0.5	133.3
Granite Falls	12-4613	2020	798	6	7540	8.4	0.06	130
Granite Falls	12-4613	2015-2019	661	8.6	71090	109.7	1.26	87.4
Granite Falls	12-4614	2020	294	3	7665	24.3	0.17	139.4

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Granite Falls	12-4614	2015-2019	80	1.6	6203	22.5	0.3	74.3
Granite Falls	12-4615	2020	1359	31	1081165	781.2	4	195.1
Granite Falls	12-4615	2015-2019	1367	23.8	577636	453.6	2.83	160.3
Harbour Pointe	12-2277	2020	765	1	269	0.2	0	53.8
Harbour Pointe	12-2277	2015-2019	1178	1.8	37126	46.1	0.44	105.3
Harbour Pointe	12-2278	2020	495	0	0	0	0	0
Harbour Pointe	12-2278	2015-2019	621	0.2	6760	10.9	0.06	178.8
Harbour Pointe	12-2279	2020	540	3	776	1.4	0.01	129.3
Harbour Pointe	12-2279	2015-2019	573	1.2	334	0.6	0	151.8
Harbour Pointe	12-2280	2020	571	1	121	0.2	0	121
Harbour Pointe	12-2280	2015-2019	629	1.2	2595	4.3	0.22	20
Harbour Pointe	12-4674	2020	460	2	120686	146.1	2	73.1
Harbour Pointe	12-4674	2015-2019	825	0.2	1069	1.3	0	334
Harbour Pointe	12-4675	2020	266	1	10214	31.2	0.13	232.1
Harbour Pointe	12-4675	2015-2019	327	0	0	0	0	0
Harbour Pointe	12-4676	2020	0	0	0	0	0	0
Harbour Pointe	12-4676	2015-2019	0	0	0	0	0	0
Harbour Pointe	12-4677	2020	672	0	0	0	0	0
Harbour Pointe	12-4677	2015-2019	861	1	513	0.6	0	132.2
Hardeson	12-4556	2020	0	0	0	0	0	0
Hardeson	12-4556	2015-2019	0	0	0	0	0	0
Hardeson	12-4557	2020	0	0	0	0	0	0
Hardeson	12-4557	2015-2019	1	0	0	0	0	0
Hardeson	12-4558	2020	9	0	0	0	0	0
Hardeson	12-4558	2015-2019	14	0	0	0	0	0
Hardeson	12-4559	2020	22	0	0	0	0	0
Hardeson	12-4559	2015-2019	29	0.2	199	9	0.02	496.5
Hartford	12-3117	2020	907	30	763975	794.2	3.71	214.3
Hartford	12-3117	2015-2019	964	22.8	241546	256.1	2.43	105.5
Hartford	12-3118	2020	336	7	79146	197.4	0.53	369.8
Hartford	12-3118	2015-2019	1001	6.2	49905	131.6	1.82	72.3
Hartford	12-3119	2020	792	10	84182	103.5	0.39	263.9
Hartford	12-3119	2015-2019	908	7.4	28712	35.8	0.09	406.3
Hartford	12-3120	2020	1268	12	38240	28.5	0.08	357.4
Hartford	12-3120	2015-2019	1897	16.4	150712	120.1	0.85	140.9
Hartford	12-3327	2020	605	7	78762	124.6	0.27	455.3
Hartford	12-3327	2015-2019	552	2	8593	14.5	0.11	137.7
Hilton Lake	12-0497	2020	1400	4	18752	13.6	0.07	203.8

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Hilton Lake	12-0497	2015-2019	1395	6.4	251806	179.1	1.65	108.8
Hilton Lake	12-0498	2020	767	0	0	0	0	0
Hilton Lake	12-0498	2015-2019	764	0.8	15881	20.2	0.41	49.8
Hilton Lake	12-0499	2020	2278	10	64247	27.5	0.14	191.8
Hilton Lake	12-0499	2015-2019	2240	4.2	63360	28	0.43	65
Hilton Lake	12-0500	2020	2025	2	6310	3	0.97	3.1
Hilton Lake	12-0500	2015-2019	2065	3.6	75608	36.6	0.42	87.7
Kellogg Marsh	12-0904	2020	1146	1	1065	0.9	0	213
Kellogg Marsh	12-0904	2015-2019	1156	1.6	1987	1.7	0.02	96.8
Kellogg Marsh	12-0905	2020	1996	14	124459	60.3	0.15	393.9
Kellogg Marsh	12-0905	2015-2019	2046	6.6	93950	43.3	0.69	63
Kellogg Marsh	12-0906	2020	1156	0	0	0	0	0
Kellogg Marsh	12-0906	2015-2019	1197	4	31366	26.7	0.08	315
Kellogg Marsh	12-0907	2020	871	0	0	0	0	0
Kellogg Marsh	12-0907	2015-2019	868	1.6	32581	36.9	0.26	140.6
Lake Chaplain	12-2034	2020	62	6	50182	512.1	4.04	126.7
Lake Chaplain	12-2034	2015-2019	99	2.2	31685	475.6	5.18	91.8
Lake Chaplain	12-2035	2020	2	1	27	9	1	9
Lake Chaplain	12-2035	2015-2019	1	0.4	915	907.8	16.1	56.4
Lake Chaplain	12-2036	2020	449	18	513950	1055.3	3.21	328.4
Lake Chaplain	12-2036	2015-2019	477	14.6	250472	534.2	5.85	91.2
Lake Goodwin	12-0379	2020	966	17	217778	217.8	3.29	66.3
Lake Goodwin	12-0379	2015-2019	1089	11.6	279129	271	1.33	203.8
Lake Goodwin	12-0380	2020	1206	20	232864	188.2	1.76	107
Lake Goodwin	12-0380	2015-2019	1254	16.4	158837	133.7	1.95	68.6
Lake Goodwin	12-0381	2020	960	12	298585	301.6	3.95	76.3
Lake Goodwin	12-0381	2015-2019	1090	6.8	100897	101.2	0.88	114.8
Lake Goodwin	12-0382	2020	887	21	149112	163.9	3.49	46.9
Lake Goodwin	12-0382	2015-2019	1006	9.4	105406	115.8	1.25	92.4
Lake Goodwin	12-0383	2020	1017	31	189270	179.3	0.6	299.8
Lake Goodwin	12-0383	2015-2019	1112	16.8	126010	123.2	0.84	145.8
Lake Serene	12-0337	2020	1208	4	63314	51.4	1.04	49.4
Lake Serene	12-0337	2015-2019	1216	3.8	27509	22.4	0.45	49.9
Lake Serene	12-0338	2020	1276	1	160	0.1	0	160
Lake Serene	12-0338	2015-2019	1193	1.4	1375	1.1	0.01	145.1
Lake Serene	12-0339	2020	930	2	25264	20.9	0.11	191.4
Lake Serene	12-0339	2015-2019	1204	2.6	1800	1.5	0.01	105.9
Lake Serene	12-0340	2020	2302	4	145857	61.4	1.02	60.1

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Lake Serene	12-0340	2015-2019	2393	6.8	50696	21.7	0.24	91.4
Lake Serene	12-5205	2020	0	0	0	0	0	0
Lake Serene	12-5205	2015-2019	0	0	0	0	0	0
Lake Stevens	12-0124	2020	1814	30	764744	413.6	3.18	130
Lake Stevens	12-0124	2015-2019	1892	23.6	418905	230.6	1.87	123.5
Lake Stevens	12-0125	2020	2430	4	6505	2.6	0.02	135.5
Lake Stevens	12-0125	2015-2019	2452	9	40361	11.9	0.14	87.9
Lake Stevens	12-0273	2020	591	2	840	1.2	0.01	140
Lake Stevens	12-0273	2015-2019	282	0.6	201	0.5	0	202.8
Lake Stevens	12-0274	2020	2062	2	11888	5.3	0.04	138.2
Lake Stevens	12-0274	2015-2019	1664	3	11331	5.8	0.04	135.5
Lake Stevens	12-4034	2020	0	0	0	0	0	0
Lake Stevens	12-4034	2015-2019	0	0	0	0	0	0
Lynnwood	12-0724	2020	1542	3	2318	1.4	0.02	66.2
Lynnwood	12-0724	2015-2019	1654	6	79024	50.8	0.48	106.1
Lynnwood	12-0725	2020	805	5	4604	5.6	0.03	209.3
Lynnwood	12-0725	2015-2019	857	7.6	30641	37.2	0.52	70.9
Lynnwood	12-0726	2020	816	2	1745	2	0.02	116.3
Lynnwood	12-0726	2015-2019	899	3.2	31977	37.3	0.4	93
Lynnwood	12-0727	2020	1259	9	8321	6.4	0.09	70.5
Lynnwood	12-0727	2015-2019	1307	7.2	5566	4.3	0.05	78.8
Lynnwood	12-4867	2020	245	1	72	0.2	0.01	18
Lynnwood	12-4867	2015-2019	306	0.2	21	0.1	0	35
Maplewood	12-0343	2020	1754	6	11356	6.4	0.06	114.7
Maplewood	12-0343	2015-2019	1380	4.4	135820	80.9	0.66	122
Maplewood	12-0344	2020	1026	2	1377	1.3	0.02	72.5
Maplewood	12-0344	2015-2019	1148	6.2	11226	10.5	0.1	107.7
Maplewood	12-0345	2020	761	2	1433	1.8	0.03	59.7
Maplewood	12-0345	2015-2019	758	4.4	31415	41.2	0.32	129.4
Maplewood	12-0346	2020	793	8	13119	16.2	0.2	83
Maplewood	12-0346	2015-2019	788	3.6	24746	31.1	0.54	57
Mariner	12-3346	2020	236	0	0	0	0	0
Mariner	12-3346	2015-2019	253	0	0	0	0	0
Mariner	12-3347	2020	1402	4	68134	42.5	1.07	39.8
Mariner	12-3347	2015-2019	1195	4.2	23339	19.2	0.04	485.8
Mariner	12-3348	2020	1245	2	83717	62.4	2.18	28.7
Mariner	12-3348	2015-2019	1342	2.8	18220	13.6	0.07	205.7
Mariner	12-3349	2020	613	1	515	0.7	0.01	103

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Mariner	12-3349	2015-2019	710	0.6	145	0.2	0	105.2
Mariner	12-3391	2020	1181	1	1008	0.7	0	252
Mariner	12-3391	2015-2019	1371	2.6	8677	7.1	0.04	171.9
Martha Lake	12-0073	2020	3430	7	48781	13.7	1.03	13.4
Martha Lake	12-0073	2015-2019	2364	8	275351	82.8	0.9	91.6
Martha Lake	12-0074	2020	19	0	0	0	0	0
Martha Lake	12-0074	2015-2019	27	0.4	577	23.4	0.4	58.5
Martha Lake	12-0251	2020	1054	9	39561	34.8	3.52	9.9
Martha Lake	12-0251	2015-2019	898	4.6	42441	41	0.82	50
Martha Lake	12-0466	2020	1454	6	97742	65.5	0.49	133.5
Martha Lake	12-0466	2015-2019	1326	7.2	119376	86.4	0.45	190.6
Martha Lake	12-5695	2020	0	0	0	0	0	0
Martha Lake	12-5695	2015-2019	0	0	0	0	0	0
Meadowdale	12-1837	2020	1822	6	80622	42.9	1.03	41.5
Meadowdale	12-1837	2015-2019	1791	7.2	24928	13.4	0.23	57.1
Meadowdale	12-1838	2020	1291	1	64435	49	1	49
Meadowdale	12-1838	2015-2019	1303	4.4	26896	20.7	0.46	45.2
Meadowdale	12-1839	2020	1059	10	64941	56.8	1.08	52.8
Meadowdale	12-1839	2015-2019	1170	5.8	40130	37.8	0.71	53.4
Meadowdale	12-1840	2020	553	3	40820	71.4	1.15	61.9
Meadowdale	12-1840	2015-2019	565	3	50444	89.3	1.02	87.7
Mountlake	12-0133	2020	1418	10	3850	2.4	0.03	70
Mountlake	12-0133	2015-2019	1394	7.2	7525	5.2	0.05	109.9
Mountlake	12-0134	2020	1584	0	0	0	0	0
Mountlake	12-0134	2015-2019	1754	7.6	56822	32.1	0.89	36.1
Mountlake	12-0135	2020	1644	6	122667	75	1.75	43
Mountlake	12-0135	2015-2019	1664	4.8	28159	14.6	0.05	282.6
Mountlake	12-0136	2020	2010	13	207033	101.8	0.61	167.4
Mountlake	12-0136	2015-2019	2031	15.8	86413	42.5	0.69	62.1
Mukilteo	12-0128	2020	1195	5	79655	64.6	2.05	31.5
Mukilteo	12-0128	2015-2019	1225	3.2	52349	42.9	0.3	141.1
Mukilteo	12-0129	2020	944	9	67350	70.2	1.1	63.7
Mukilteo	12-0129	2015-2019	965	3.4	34289	35.8	0.1	346.3
Mukilteo	12-0600	2020	1225	5	3775	3	0.01	251.7
Mukilteo	12-0600	2015-2019	1252	2.2	64548	51.1	0.7	72.9
Mukilteo	12-4523	2020	821	5	1147	1.3	0.03	44.1
Mukilteo	12-4523	2015-2019	848	3.2	2925	3.5	0.21	16.6
Murphy'S Corner	12-1748	2020	1794	0	0	0	0	0

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Murphy'S Corner	12-1748	2015-2019	1981	2.8	85347	43.4	0.54	80.9
Murphy'S Corner	12-1749	2020	1424	5	2494	1.7	0.01	226.7
Murphy'S Corner	12-1749	2015-2019	1300	2.8	150554	106.8	0.97	110.2
Murphy'S Corner	12-1750	2020	606	3	43740	63.9	2.01	31.8
Murphy'S Corner	12-1750	2015-2019	687	1.2	607	0.9	0	184.1
Murphy'S Corner	12-1751	2020	458	0	0	0	0	0
Murphy'S Corner	12-1751	2015-2019	549	1.4	4650	8.5	0.21	40.7
North Alderwood	12-0509	2020	387	3	43696	107.6	0.7	152.8
North Alderwood	12-0509	2015-2019	408	0.2	150	0	0	37
North Alderwood	12-0510	2020	167	0	0	0	0	0
North Alderwood	12-0510	2015-2019	180	0.2	56	0.3	0.01	47
North Alderwood	12-0511	2020	80	0	0	0	0	0
North Alderwood	12-0511	2015-2019	93	0	0	0	0	0
North Alderwood	12-0512	2020	46	0	0	0	0	0
North Alderwood	12-0512	2015-2019	52	0.8	17717	377.5	4.37	86.3
North Camano	12-0313	2020	891	11	41784	45.5	0.79	57.6
North Camano	12-0313	2015-2019	907	10.2	73049	81.7	1.23	66.6
North Camano	12-0314	2020	95	0	0	0	0	0
North Camano	12-0314	2015-2019	127	2.8	1193	11.6	0.07	158.8
North Camano	12-0315	2020	473	8	31611	63.5	1.02	62.3
North Camano	12-0315	2015-2019	269	8	96633	245.4	1.39	176.9
North Camano	12-0316	2020	1393	15	190806	133.7	2.18	61.3
North Camano	12-0316	2015-2019	1436	10.2	96941	68.2	0.5	135.9
North Creek	12-1410	2020	1681	4	9469	5.3	0.02	231
North Creek	12-1410	2015-2019	1764	3.2	53849	38.3	0.3	128.4
North Creek	12-1411	2020	1237	1	23748	18	0.18	101.9
North Creek	12-1411	2015-2019	1319	0.8	8936	6.8	0.05	137.9
North Creek	12-1412	2020	1551	5	18823	11.6	0.09	122.2
North Creek	12-1412	2015-2019	1462	4.8	83396	55.7	0.92	60.6
North Creek	12-1413	2020	1620	2	28927	17.1	0.11	154.7
North Creek	12-1413	2015-2019	1400	2.4	2760	1.7	0.02	106.8
North Creek	12-3733	2020	649	0	0	0	0	0

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
North Creek	12-3733	2015-2019	719	0.8	851	1.3	0	305.3
North Marysville	12-0142	2020	267	1	340	1.2	0.01	85
North Marysville	12-0142	2015-2019	294	0.6	544	2	0.01	229.2
North Marysville	12-0143	2020	745	0	0	0	0	0
North Marysville	12-0143	2015-2019	784	0.6	143	0.2	0	117.2
North Marysville	12-0144	2020	1044	1	6910	6.4	0.17	37.4
North Marysville	12-0144	2015-2019	1125	3	18027	17	0.24	69.4
North Marysville	12-0254	2020	634	2	265	0.4	0.01	53
North Marysville	12-0254	2015-2019	666	5.8	20868	32.4	0.37	86.8
North Mountain	12-2514	2020	1408	53	579740	402.3	1.73	233
North Mountain	12-2514	2015-2019	1568	38.6	987207	680	4.09	166.1
North Mountain	12-2515	2020	428	15	125378	277.4	2.21	125.6
North Mountain	12-2515	2015-2019	533	14.6	168732	362	2.64	137.2
North Mountain	12-2516	2020	0	1	262	131	1	131
North Mountain	12-2516	2015-2019	2	0.6	183	91.4	0.6	152.3
North Stanwood	12-0996	2020	206	1	207	0.9	0	207
North Stanwood	12-0996	2015-2019	279	5.6	22886	96.2	1.08	89.1
North Stanwood	12-0997	2020	658	9	33134	47.7	1.14	41.8
North Stanwood	12-0997	2015-2019	746	7.2	89076	132.9	1.68	79.2
North Stanwood	12-0998	2020	1704	26	378890	206.3	1.94	106.5
North Stanwood	12-0998	2015-2019	1661	11.2	269730	160.2	1.52	105.5
North Stanwood	12-0999	2020	1919	31	285287	143.2	1.42	100.6
North Stanwood	12-0999	2015-2019	2191	20.4	451777	225.1	2.33	96.6
North Stanwood	12-3204	2020	2074	30	700136	325.8	1.95	166.9
North Stanwood	12-3204	2015-2019	2017	20.2	501519	248.5	1.16	214.5
Norton Ave	12-0588	2020	75	0	0	0	0	0
Norton Ave	12-0588	2015-2019	74	0.8	564	7.5	0.22	34.4
Norton Ave	12-0589	2020	978	0	0	0	0	0
Norton Ave	12-0589	2015-2019	1030	2	46689	46.7	0.43	109.2
Norton Ave	12-0590	2020	1149	2	1690	1.5	0.01	130
Norton Ave	12-0590	2015-2019	1284	2.4	1867	1.6	0.22	7.2
Norton Ave	12-0591	2020	823	1	85	0.2	0	85
Norton Ave	12-0591	2015-2019	885	1.8	7452	8.8	0.02	453.8
Olivia Park	12-2576	2020	1388	1	62608	43	1	43
Olivia Park	12-2576	2015-2019	1429	2.2	42257	29.5	0.62	47.4

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Olivia Park	12-2577	2020	746	5	6687	8.5	0.08	111.4
Olivia Park	12-2577	2015-2019	812	5.6	52636	65.8	0.68	96.3
Olivia Park	12-2578	2020	889	3	22088	21.2	0.05	433.1
Olivia Park	12-2578	2015-2019	1051	2	42558	42.5	0.66	64.7
Olivia Park	12-2579	2020	1224	3	130224	95.1	0.99	95.7
Olivia Park	12-2579	2015-2019	1381	4.2	50587	36.7	0.7	52.7
Oso	12-1309	2020	195	9	8889	22.6	0.14	163
Oso	12-1309	2015-2019	233	5.4	26248	120.6	1.3	92.5
Oso	12-1310	2020	130	5	11693	84.1	0.32	259.8
Oso	12-1310	2015-2019	197	3.2	17140	67.7	0.34	199.4
Paine Field	12-0385	2020	242	1	92	0.3	0.01	46
Paine Field	12-0385	2015-2019	389	0.4	319	1.3	0	538.6
Paine Field	12-0386	2020	101	0	0	0	0	0
Paine Field	12-0386	2015-2019	108	0	0	0	0	0
Paine Field	12-0387	2020	1560	7	58641	35.9	1.03	34.8
Paine Field	12-0387	2015-2019	1671	5.8	18509	11.3	0.22	51.5
Paine Field	12-0388	2020	588	1	30674	49.2	1	49
Paine Field	12-0388	2015-2019	400	1.6	11769	19.4	0.07	288.5
Paine Field	12-1729	2020	1786	2	3995	2.1	0.02	99.9
Paine Field	12-1729	2015-2019	1881	3.4	53557	29.7	0.46	64.5
Paine Field	12-1730	2020	1442	5	214813	134	0.64	209.4
Paine Field	12-1730	2015-2019	1624	3	1290	0.8	0.01	107.9
Paine Field	12-1731	2020	2129	2	144628	61.9	0.74	84.2
Paine Field	12-1731	2015-2019	2322	3	139656	60.2	0.61	99.2
Paine Field	12-1732	2020	94	0	0	0	0	0
Paine Field	12-1732	2015-2019	144	0	0	0	0	0
Park Ridge	12-2319	2020	318	1	6720	18.5	0.44	42
Park Ridge	12-2319	2015-2019	910	2.2	22555	45.5	0.92	49.5
Park Ridge	12-2320	2020	776	4	13501	16.7	0.11	148.4
Park Ridge	12-2320	2015-2019	1090	4.6	44416	44.6	0.35	127.2
Park Ridge	12-2321	2020	1472	1	57603	36.4	0.07	548
Park Ridge	12-2321	2015-2019	1821	4.6	4141	2.4	0.02	99.7
Park Ridge	12-2322	2020	1013	16	114448	109.3	1.18	92.3
Park Ridge	12-2322	2015-2019	898	7.4	59311	58.8	0.47	125.7
Park Ridge	12-4183	2020	1021	4	103792	98.8	1.23	80.5
Park Ridge	12-4183	2015-2019	907	4.4	41250	45.3	0.31	147.7
Perrinville	12-0092	2020	664	10	91784	119.7	4.05	29.6
Perrinville	12-0092	2015-2019	747	3.6	82271	109	1.22	89

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Perrinville	12-0093	2020	1144	6	118865	100.9	1.28	79
Perrinville	12-0093	2015-2019	1194	6.4	61902	52.6	0.85	61.9
Perrinville	12-0126	2020	1448	8	70706	47.5	0.99	48.1
Perrinville	12-0126	2015-2019	1389	6.4	3895	2.7	0.04	64.8
Perrinville	12-0221	2020	925	7	69328	63.4	1.06	59.6
Perrinville	12-0221	2015-2019	1002	2.2	8004	8.1	0.61	13.3
Picnic Point	12-1414	2020	662	12	85012	125.8	1.42	88.6
Picnic Point	12-1414	2015-2019	701	7.6	179525	260.3	1.68	154.9
Picnic Point	12-1415	2020	1083	8	167231	144.4	2.26	64
Picnic Point	12-1415	2015-2019	1174	6	29883	26	0.39	66.9
Picnic Point	12-1416	2020	1377	9	368839	259.2	1.02	253.1
Picnic Point	12-1416	2015-2019	1357	6.8	2770	2	0.02	95.3
Picnic Point	12-1417	2020	506	1	2520	4.9	0.08	63
Picnic Point	12-1417	2015-2019	509	2.2	60672	117.6	0.7	167.2
Pinehurst	12-0147	2020	785	6	65993	82.6	1.1	75.2
Pinehurst	12-0147	2015-2019	829	3.4	10083	12.4	0.22	55.9
Pinehurst	12-0148	2020	1287	5	14533	11	0.25	45
Pinehurst	12-0148	2015-2019	1356	4.6	80392	60.6	0.67	90.4
Pinehurst	12-0149	2020	1394	11	567396	326.8	2.2	148.3
Pinehurst	12-0149	2015-2019	1766	5.4	32166	18.4	0.24	78.2
Pinehurst	12-0220	2020	1023	8	17352	16.4	0.08	201.8
Pinehurst	12-0220	2015-2019	1006	4.2	13424	12.8	0.04	293.1
Pinehurst	12-3350	2020	1823	11	192943	104.5	1.05	99.8
Pinehurst	12-3350	2015-2019	1888	11.8	167008	89.4	1.56	57.5
Polaris	12-4500	2020	473	0	0	0	0	0
Polaris	12-4500	2015-2019	124	1.6	29921	47.1	0.69	68.5
Polaris	12-4501	2020	1406	1	358	0.2	0	358
Polaris	12-4501	2015-2019	1422	3.8	36109	25.5	0.42	60.1
Polaris	12-4502	2020	1589	0	0	0	0	0
Polaris	12-4502	2015-2019	1938	4	115086	61.2	1.1	55.8
Polaris	12-4503	2020	504	1	400	0.5	0.01	100
Polaris	12-4503	2015-2019	8	0.4	8304	25.9	0.24	108.2
Portage	12-3502	2020	175	10	8082	41.9	8.67	4.8
Portage	12-3502	2015-2019	187	1.4	4805	27.4	0.45	61.4
Portage	12-3503	2020	260	4	3113	11.6	0.1	119.7
Portage	12-3503	2015-2019	261	2.6	30072	115.9	0.35	330.1
Portage	12-3504	2020	967	19	268455	270.1	2.66	101.5
Portage	12-3504	2015-2019	1115	16.2	165639	160.8	1.55	103.6

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Portage	12-3505	2020	656	5	6209	5.3	1.04	5.1
Portage	12-3505	2015-2019	1192	3.2	25050	21.8	0.59	37
Quil Ceda	12-3177	2020	289	0	0	0	0	0
Quil Ceda	12-3177	2015-2019	341	0.8	336	1	0.01	73.5
Quil Ceda	12-3178	2020	1307	30	644130	481.1	4.79	100.4
Quil Ceda	12-3178	2015-2019	1426	17.6	254172	183.5	1.15	159.4
Quil Ceda	12-3179	2020	19	0	0	0	0	0
Quil Ceda	12-3179	2015-2019	32	0.6	1185	45	0.55	81.4
Quil Ceda	12-3180	2020	1115	6	8902	7.8	2.2	3.5
Quil Ceda	12-3180	2015-2019	1228	4.8	105218	91.6	0.78	117.7
Richmond Park	12-0232	2020	797	6	25679	31.3	0.09	342.4
Richmond Park	12-0232	2015-2019	792	5.8	69309	85.3	0.84	101.3
Richmond Park	12-0233	2020	1072	8	2776	2.5	0.03	79.3
Richmond Park	12-0233	2015-2019	720	6.4	121300	112.4	0.68	165.9
Richmond Park	12-2048	2020	329	2	1000	1.9	0.03	66.7
Richmond Park	12-2048	2015-2019	361	2.4	17586	52.3	0.47	111.8
Richmond Park	12-5217	2020	738	4	1856	2.4	0.05	46.4
Richmond Park	12-5217	2015-2019	763	5.4	34195	45.3	0.23	198.3
Silver Lake	12-0239	2020	1647	3	130245	75.6	1.01	75.1
Silver Lake	12-0239	2015-2019	1597	2	23377	13.9	0.22	61.8
Silver Lake	12-0240	2020	1008	2	1072	1	0.01	134
Silver Lake	12-0240	2015-2019	1084	4.4	55071	54.2	0.65	83.5
Silver Lake	12-0253	2020	1684	8	340181	197.4	4.11	48
Silver Lake	12-0253	2015-2019	1623	9.6	178693	105.4	1.04	101.5
Silver Lake	12-0267	2020	699	0	0	0	0	0
Silver Lake	12-0267	2015-2019	829	1.2	795	1	0.03	40.6
Silver Lake	12-0290	2020	811	3	143348	168.6	1.24	135.5
Silver Lake	12-0290	2015-2019	849	0.6	2573	3	0.04	85.7
Smokey Point	12-1507	2020	363	0	0	0	0	0
Smokey Point	12-1507	2015-2019	419	2.2	11543	31.7	0.72	44
Smokey Point	12-1508	2020	728	1	630	0.7	0	315
Smokey Point	12-1508	2015-2019	722	0.8	14635	16.2	0.21	76.7
Smokey Point	12-1509	2020	1445	4	120579	70.3	1.09	64.6
Smokey Point	12-1509	2015-2019	1465	6	48851	34.8	0.9	38.6
Smokey Point	12-1510	2020	1171	0	0	0	0	0
Smokey Point	12-1510	2015-2019	384	1.8	27446	28.5	0.51	55.3
Smokey Point	12-5696	2020	19	0	0	0	0	0
Smokey Point	12-5696	2015-2019	16	0	0	0	0	0

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Smokey Point	12-5697	2020	0	0	0	0	0	0
Smokey Point	12-5697	2015-2019	0	0	0	0	0	0
Smokey Point	12-5698	2020	0	0	0	0	0	0
Smokey Point	12-5698	2015-2019	0	0	0	0	0	0
Smokey Point	12-5699	2020	0	0	0	0	0	0
Smokey Point	12-5699	2015-2019	0	0	0	0	0	0
Snohomish	12-0103	2020	477	1	45788	90.7	1	90.7
Snohomish	12-0103	2015-2019	504	1.8	9283	18.9	0.27	69.4
Snohomish	12-0104	2020	538	6	2645	4.8	0.03	188.9
Snohomish	12-0104	2015-2019	611	7.8	76895	135.7	2.15	63
Snohomish	12-0123	2020	1395	3	35371	24.6	0.13	186.2
Snohomish	12-0123	2015-2019	1534	4.6	2536	1.7	0.03	55.1
Snohomish	12-0151	2020	586	18	104354	172.5	2.03	84.8
Snohomish	12-0151	2015-2019	616	8.4	60021	100.2	1.86	53.9
South Camano	12-1530	2020	654	10	271008	398.5	3.58	111.4
South Camano	12-1530	2015-2019	597	11.4	171152	260.3	2.04	127.7
South Camano	12-1531	2020	457	3	50993	104.9	0.35	301.7
South Camano	12-1531	2015-2019	458	1.4	14118	30.7	0.52	59.3
South Camano	12-1532	2020	1558	19	357330	224.3	1.43	157.3
South Camano	12-1532	2015-2019	1575	14.8	391401	249.4	1.23	202.3
South Camano	12-1533	2020	1023	19	210878	200.6	2.82	71.2
South Camano	12-1533	2015-2019	1155	20.2	601818	582.1	3.72	156.6
Stimson Crossing	12-3090	2020	31	2	2616	59.5	1.07	55.7
Stimson Crossing	12-3090	2015-2019	47	0.8	619	14	0.36	39.2
Stimson Crossing	12-3091	2020	1259	21	182459	140.8	3.16	44.6
Stimson Crossing	12-3091	2015-2019	1454	17.8	216197	165.6	1.81	91.5
Stimson Crossing	12-3092	2020	234	4	215226	867.8	6.54	132.6
Stimson Crossing	12-3092	2015-2019	280	1.4	35824	135.9	1.72	79.2
Stimson Crossing	12-3093	2020	225	5	15655	59.5	0.53	111.8
Stimson Crossing	12-3093	2015-2019	330	4.8	23885	86.8	0.29	295.1
Sultan	12-1593	2020	552	6	167203	292.8	7.18	40.8
Sultan	12-1593	2015-2019	579	9	180314	325.4	2.74	118.9
Sultan	12-1594	2020	359	9	87597	232.4	0.67	349
Sultan	12-1594	2015-2019	379	8.2	207392	559.7	2.04	274.2
Sultan	12-1595	2020	1398	19	959828	671.2	4.16	161.5

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Sultan	12-1595	2015-2019	2093	22	389100	231.6	2.19	105.7
Sultan	12-1596	2020	616	3	1645	2.6	0.02	164.5
Sultan	12-1596	2015-2019	670	3	42061	65.7	0.46	143.8
Sultan	12-5004	2020	0	3	464	464	3	154.7
Sultan	12-5004	2015-2019	1	0.4	119	8.4	0.6	14
Sunset	12-5208	2020	1315	21	755925	561.2	4.73	118.5
Sunset	12-5208	2015-2019	1514	14.8	481656	367.7	3.95	93
Sunset	12-5209	2020	668	7	2630	3.8	0.04	105.2
Sunset	12-5209	2015-2019	722	7.8	106612	152.1	1.99	76.4
Sunset	12-5210	2020	524	9	12242	22.3	0.14	161.1
Sunset	12-5210	2015-2019	603	4.2	3299	5.9	0.04	140.7
Sunset	12-5211	2020	312	3	704	2.1	0.02	140.8
Sunset	12-5211	2015-2019	332	3	4426	14	0.05	291
Sunset	12-5212	2020	969	17	142310	137	3.35	40.9
Sunset	12-5212	2015-2019	1055	7.2	113240	107.3	0.43	251.3
Tenth Street	12-0298	2020	966	2	37714	37.1	1	37
Tenth Street	12-0298	2015-2019	1058	1.6	1463	1.5	0.01	123.5
Tenth Street	12-0299	2020	989	0	0	0	0	0
Tenth Street	12-0299	2015-2019	1088	2.6	1832	1.8	0.01	183.9
Tenth Street	12-0300	2020	1307	5	136258	95.5	0.95	100.3
Tenth Street	12-0300	2015-2019	1387	6.2	208142	154.5	1.42	109.1
Tenth Street	12-0301	2020	638	3	42703	60.7	1.01	59.9
Tenth Street	12-0301	2015-2019	763	1.6	6523	9.3	0.21	44.8
Tenth Street	12-0327	2020	0	0	0	0	0	0
Tenth Street	12-0327	2015-2019	0	0	0	0	0	0
Thrashers Corner	12-0275	2020	239	2	43474	131.3	1.01	130.2
Thrashers Corner	12-0275	2015-2019	390	0.4	8258	29.3	0.48	61.4
Thrashers Corner	12-0276	2020	1065	2	13253	11.8	0.11	112.3
Thrashers Corner	12-0276	2015-2019	1081	5	54451	50	0.78	64.3
Thrashers Corner	12-0277	2020	1640	3	7044	3.8	0.02	220.1
Thrashers Corner	12-0277	2015-2019	1871	0.6	53	0	0	37.6
Thrashers Corner	12-0278	2020	1337	2	2158	1.5	0.01	215.8
Thrashers Corner	12-0278	2015-2019	2250	2.4	11064	4.4	0.1	43.5
Thrashers Corner	12-3304	2020	0	0	0	0	0	0

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Thrashers Corner	12-3304	2015-2019	2	0	0	0	0	0
Thrashers Corner	12-3471	2020	65	1	7010	85.5	1	85.5
Thrashers Corner	12-3471	2015-2019	5	0.2	37	0.4	0.04	11
Thrashers Corner	12-3472	2020	1629	1	101	0.1	0	101
Thrashers Corner	12-3472	2015-2019	1463	3.4	16167	10.9	0.25	44.1
Thrashers Corner	12-3473	2020	23	1	7	0.2	0.04	7
Thrashers Corner	12-3473	2015-2019	37	0.4	320	11.4	0.41	28
Thrashers Corner	12-3474	2020	11	0	0	0	0	0
Thrashers Corner	12-3474	2015-2019	16	0	0	0	0	0
Three Lakes	12-1818	2020	752	22	510392	651	3.99	163
Three Lakes	12-1818	2015-2019	774	18.4	239835	318.1	1.77	179.8
Three Lakes	12-1819	2020	1143	16	101083	86.8	2.02	43
Three Lakes	12-1819	2015-2019	1234	15.2	262124	222.6	3.37	66
Three Lakes	12-1820	2020	1541	48	586357	373.7	1.56	239.3
Three Lakes	12-1820	2015-2019	1687	36.8	593497	363.2	3.55	102.3
Three Lakes	12-1821	2020	712	20	266808	363	5.2	69.8
Three Lakes	12-1821	2015-2019	806	11.6	154803	212.3	2.3	92.3
Tulalip	12-0505	2020	271	2	5190	19.1	0.19	101.8
Tulalip	12-0505	2015-2019	352	2.8	15619	52.4	0.31	171
Tulalip	12-0506	2020	391	1	214	0.5	0	107
Tulalip	12-0506	2015-2019	429	2.4	15445	38	0.81	47.1
Tulalip	12-0507	2020	1018	10	286658	274.3	3.39	81
Tulalip	12-0507	2015-2019	1065	8.8	227928	217.4	1.36	160.3
Tulalip	12-0508	2020	530	5	6643	11.9	0.08	144.4
Tulalip	12-0508	2015-2019	612	4.8	60901	104	1.42	73.4
Turners Corner	12-1428	2020	147	3	68228	426.4	8.58	49.7
Turners Corner	12-1428	2015-2019	176	2.8	3456	22.5	0.25	88.8
Turners Corner	12-1429	2020	574	8	2562	4.2	0.08	52.3
Turners Corner	12-1429	2015-2019	1101	9.2	67983	104.3	0.43	242.9
Turners Corner	12-1430	2020	825	13	44290	52.5	1.19	44.1
Turners Corner	12-1430	2015-2019	900	13.4	132811	158.7	1.13	140.8
Turners Corner	12-1431	2020	816	11	370949	443.2	0.9	493.3
Turners Corner	12-1431	2015-2019	882	13	83286	100.8	0.57	178.2
Turners Corner	12-4310	2020	40	3	2216	46.2	1.12	41
Turners Corner	12-4310	2015-2019	58	1.4	894	19.8	0.23	84.5

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Village	12-4304	2020	375	5	21347	52.8	0.32	165.5
Village	12-4304	2015-2019	425	2.4	20185	50.7	0.29	172.1
Village	12-4305	2020	1647	19	213490	126.3	0.32	389.6
Village	12-4305	2015-2019	1812	15.8	75923	44.1	0.47	93.5
Village	12-4306	2020	0	0	0	0	0	0
Village	12-4306	2015-2019	5	0.6	130	9.5	0.14	68
Village	12-4307	2020	11	0	0	0	0	0
Village	12-4307	2015-2019	18	0.6	298	9.3	0.22	42.7
Wallace River	12-4485	2020	394	7	191728	463.1	1.17	397
Wallace River	12-4485	2015-2019	463	9	38726	94.2	1.11	84.6
Wallace River	12-4486	2020	0	2	79	79	2	39.5
Wallace River	12-4486	2015-2019	1	0	0	0	0	0
Wallace River	12-4487	2020	873	8	88138	91.7	1.15	79.8
Wallace River	12-4487	2015-2019	149	3.6	35046	45.7	0.12	368.5
Waterfront	12-1842	2020	1048	0	0	0	0	0
Waterfront	12-1842	2015-2019	1104	2.2	80446	68.8	1.01	68
Waterfront	12-1843	2020	860	1	712	0.8	0.01	89
Waterfront	12-1843	2015-2019	924	0.4	261	0.3	0	72.5
Waterfront	12-1846	2020	397	1	211	0.5	0	211
Waterfront	12-1846	2015-2019	454	1.8	3354	7.5	0.28	26.9
Waterfront	12-1847	2020	593	1	1500	2.5	0	750
Waterfront	12-1847	2015-2019	637	3	10020	16.7	0.24	69
West Monroe	12-0631	2020	624	2	9209	14.1	0.17	84.5
West Monroe	12-0631	2015-2019	659	1.6	2957	4.6	0.21	22.1
West Monroe	12-0632	2020	1411	6	14299	9.6	0.05	178.7
West Monroe	12-0632	2015-2019	1430	4.2	24779	17.6	0.28	63.8
West Monroe	12-0633	2020	867	8	120717	125	1.52	82.2
West Monroe	12-0633	2015-2019	827	5.4	29807	38.9	0.25	156.1
West Monroe	12-0634	2020	320	8	116465	347.7	2.26	153.6
West Monroe	12-0634	2015-2019	376	6	48999	144.9	1.57	92.2
West Monroe	12-3360	2020	687	13	128852	181.2	0.25	711.9
West Monroe	12-3360	2015-2019	661	9.4	102146	155.7	2.46	63.3
West Monroe	12-3361	2020	975	0	0	0	0	0
West Monroe	12-3361	2015-2019	1023	1.6	22424	22.2	0.28	79.3
West Monroe	12-3362	2020	1304	4	17467	13	0.23	55.6
West Monroe	12-3362	2015-2019	1255	4.2	70989	54.5	0.34	161.3
West Monroe	12-3363	2020	780	3	154	0.2	0.01	30.8
West Monroe	12-3363	2015-2019	846	2.8	18778	24	0.07	348.5

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Westgate	12-0404	2020	778	5	148579	185.7	2	93
Westgate	12-0404	2015-2019	895	4.6	12034	13.4	0.04	306.7
Westgate	12-0405	2020	884	5	218577	4.4	0.02	187.2
Westgate	12-0405	2015-2019	1554	2.8	89731	71.6	0.69	103.3
Westgate	12-0406	2020	1406	2	4197	2.8	0.03	83.3
Westgate	12-0406	2015-2019	1292	4.2	6195	4.5	0.02	212
Westgate	12-0407	2020	970	5	18065	18.2	0.09	196.4
Westgate	12-0407	2015-2019	979	3.4	2559	2.6	0.01	199.8
Woods Creek	12-1808	2020	1856	37	2148458	1136.8	4.02	282.6
Woods Creek	12-1808	2015-2019	1968	29	640016	335.7	2.38	140.8
Woods Creek	12-1809	2020	1399	38	1331271	846.9	6.21	136.4
Woods Creek	12-1809	2015-2019	1480	25.2	432792	297	1.2	246.7
Woods Creek	12-1810	2020	1168	5	73707	60.2	0.46	129.8
Woods Creek	12-1810	2015-2019	907	8.4	254701	252.1	1.81	139.6
Woods Creek	12-1811	2020	1131	17	432289	370.4	1.18	314.2
Woods Creek	12-1811	2015-2019	1249	13.4	217835	186	2.31	80.5
York	12-5392	2020	1471	13	160186	102.7	3.11	33
York	12-5392	2015-2019	1516	5.4	55742	36.5	0.43	84.5
York	12-5393	2020	1801	6	245796	131.9	2.81	47
York	12-5393	2015-2019	1822	4.2	63908	35.2	0.81	43.4
York	12-5394	2020	1686	11	168539	96.1	2.04	47.2
York	12-5394	2015-2019	1637	3.6	43150	25.6	0.62	41.2

Appendix B

Historical Data: SAIDI, CAIDI, and SAIFI

No uplift factor was applied to these historical metrics.

Table B-1: SAIDI 1991 - 2020

Year	Distribution	Transmission	Overall	Excluded Outages	Overall (Everything)
1991	68.3	27.7	96	180	276
1992	95.3	5.5	101.4	82.3	183.7
1993	87.4	9.8	97.2	1136.2	1233.5
1994	60.2	41.5	101.7	9.2	110.9
1995	81.6	12.9	94.5	359.5	454
1996	52.1	8.5	60.6	60.7	121.1
1997	47.7	2.8	50.5	43.8	94.3
1998	47.9	24.3	72.2	40.4	112.6
1999	46.2	17.3	63.5	134.1	236.1
2000	52.5	3.1	55.6	147.3	219.4
2001	34.6	14.7	49.3	7.4	88.8
2002	32.4	21.8	54.2	25.5	89.8
2003	31.7	19.9	52.6	105.1	185.9
2004	35.9	4.2	40.1	237.8	287.2
2005	57.3	6.8	64.1	0	74.7
2006	50.6	17.7	68.3	567.2	684.2
2007	38.4	28.8	67.3	188.8	274.8
2008	41.6	8.4	50	33.8	97.2
2009	49.8	15.3	65.1	0	76.4
2010	69.1	10.9	79.9	34.2	114.1
2011	77.2	6.2	83.3	0	83.3
2012	63.2	8.4	71.6	44.2	115.9
2013	63.7	20.8	84.5	0	84.5
2014	90.3	21.8	112	116.9	228.9
2015	64.1	16.9	81	1312.1	1390.1
2016	57.5	2.1	59.6	77	136.6
2017	117.7	11.9	129.6	43.9	173.6
2018	86.9	5.4	92.4	172.5	264.9
2019	84.8	6.5	91.3	33.5	124.9
2020	107.1	16.5	123.6	139.1	262.6
5-Year Average (2015-201919)	80.6	8.6	89.2	51.3	140.5

Table B-2: CAIDI 1991 - 2020

Year	Distribution	Transmission	Overall	Excluded Outages	Overall (Everything)
1991	91.0	62.0	80.0	175.0	124.0
1992	100.7	31.6	90.1	235.0	128.0
1993	93.4	38.7	81.7	1001.9	530.7
1994	78.8	163.0	99.9	96.5	99.6
1995	89.9	68.0	86.1	197.7	155.7
1996	81.0	48.7	74.1	84.0	78.7
1997	78.6	23.6	69.5	117.0	85.7
1998	77.8	74.8	76.8	98.8	83.5
1999	73.3	198.0	88.5	155.2	107.9
2000	97.0	44.4	90.9	132.2	118.9
2001	66.5	57.1	63.4	56.2	63.5
2002	66.4	149.8	85.6	94.8	87.4
2003	88.8	88.9	88.8	107.4	106.8
2004	75.1	35.6	67.3	286.5	157.0
2005	83.6	42.5	75.8	0.0	76.5
2006	94.7	54.7	79.7	301.5	217.3
2007	76.2	164.6	99.0	220.9	158.5
2008	86.6	47.0	75.8	148.7	73.0
2009	86.8	51.9	75.0	0.0	74.1
2010	106.4	68.2	98.9	141.4	108.7
2011	112.7	40.6	99.6	0.0	99.6
2012	101.8	33.4	82.0	108.2	190.2
2013	104.3	95.7	102.0	0.0	102.0
2014	117.8	70.4	104.2	338.4	205.8
2015	100.3	79.0	94.9	699.4	509.2
2016	106.2	27.7	96.4	160.4	124.2
2017	98.0	51.7	90.7	168.8	102.1
2018	106	78.7	103.9	236.5	163.6
2019	108.2	86.6	106.3	230.3	124.3
2020	105.2	114.5	106.4	261.9	155.2
5-Year Average (2015-2019)	103.6	62.5	97.4	220.9	122.4

Table B-3: SAIFI 1991 - 2020

Year	Distribution	Transmission	Overall	Excluded Outages	Overall (Everything)
1991	0.75	0.45	1.20	1.03	2.23
1992	0.95	0.17	1.13	0.35	1.48
1993	0.94	0.26	1.19	1.13	2.32
1994	0.76	0.26	1.02	0.10	1.11
1995	0.91	0.19	1.10	1.82	2.92
1996	0.64	0.17	0.82	0.72	1.54
1997	0.61	0.12	0.73	0.37	1.10
1998	0.62	0.32	0.94	0.41	1.35
1999	0.63	0.09	0.72	0.86	2.19
2000	0.54	0.07	0.61	1.11	1.85
2001	0.26	0.52	0.78	0.13	1.40
2002	0.49	0.15	0.63	0.27	1.03
2003	0.37	0.22	0.59	0.98	1.74
2004	0.47	0.12	0.58	0.83	1.52
2005	0.69	0.16	0.85	0.00	0.98
2006	0.53	0.33	0.86	1.88	3.15
2007	0.50	0.18	0.68	1.19	2.13
2008	0.48	0.18	0.66	0.23	1.35
2009	0.57	0.30	0.87	0.00	1.03
2010	0.65	0.16	0.81	0.24	1.05
2011	0.68	0.15	0.84	0.00	0.84
2012	0.62	0.25	0.87	0.41	1.28
2013	0.61	0.22	0.83	0.00	0.83
2014	0.77	0.31	1.08	0.35	1.47
2015	0.64	0.21	0.85	1.88	2.73
2016	0.55	0.08	0.63	0.48	1.11
2017	1.20	0.23	1.43	0.26	1.70
2018	0.82	0.07	0.89	0.73	1.62
2019	0.78	0.08	0.86	0.15	1
2020	1.02	0.14	1.16	0.53	1.69
5-Year Average (2015-2019)	0.78	0.14	0.92	0.23	1.15