2021 Electric System Reliability Performance Report

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Executive Summary

This report describes the Snohomish County PUD's (District) electric system reliability from January 1, 2021, through December 31, 2021.

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 a 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 137.9 minutes (SAIDI) in 2021 during routine operation. This is higher than the adjusted five-year average of 104.5 minutes. The average length of time required to restore power after an outage was 106.7 minutes (CAIDI) in 2021 during routine operation. This is higher than the adjusted five-year average of 100.8 minutes. District customers lost power an average of 1.29 times (SAIFI) in 2021 during routine operation. This is higher than the adjusted five-year average of 1.04 interruptions.

There were six MEDs for the year, which occurred on January 12, January 13, January 14, February 12, October 24, and November 15.

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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 2021 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. At the District, MEDs typically occur on snow or wind related days, causing significant tree related outages. 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 2021 the SAIDI threshold to distinguish a day as MED was found to be 12.19.

Outage Data Collection

1.3 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.

1.4 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 are excluded from routine-operation statistics. MEDs will be included in their own category for record keeping.

2 System Reliability Statistics

2.1 Data for 2021

The tables below show the statistical data for outages in 2021, as well as average data for the five previous years. Refer to Section 1 for definitions of the terms SAIDI, CAIDI, and SAIFI.

The 2021 system SAIDI and SAIFI values were higher than the five-year averages. There were six MEDs in 2021. Outages that occurred during a MED, prearranged/planned outages, and outages caused by another utility were excluded from these numbers but are shown in their own row for reference.

Table 2-1: General Descriptive Data

Year	2021
System Customers	373,559
Area Served	2,200 square miles

Table 2-2: Outage Data for 2021

(Sustained Outage > 1 Minute)

	SAIDI	CAIDI	SAIFI	Customer Outages
Distribution	131.3	109.5	1.20	448,257
Transmission	6.5	71.0	0.09	34,270
Overall	137.9	106.7	1.29	482,527
Planned, MED, or External	505.0	530.1	0.95	355,872
Total	642.9	286.4	2.24	838,400

Table 2-3: Five-Year Average Annual Outage Data for the Period 2016-2020 (Non-Adjusted)

(Sustained Outage > 1 Minute)

	SAIDI	CAIDI	SAIFI	Customer Outages
Distribution	89.2	104.5	0.85	308,804
Transmission	8.5	68.8	0.12	44,685
Overall	97.8	100.0	0.98	353,489
Planned, MED, or External	79.1	233.8	0.34	121,867
Total	176.8	134.4	1.32	475,355

Table 3-4: Five-Year Average Annual Outage Data for the Period 2016-2020 adjusted for OMS increase

(Sustained Outage > 1 Minute)

	SAIDI	CAIDI	SAIFI	Customer Outages
Distribution	95.6	105.6	0.9	327,177
Transmission	8.9	68.0	0.13	47,284
Overall	104.5	100.9	1.04	374,461
Planned, MED, or External	79.1	233.8	0.34	121,885
Total	183.6	133.6	1.37	496,346

2.2 Effect of Major Event Days on the District

MEDs are days in which the daily system SAIDI exceeds 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. In 2021 the SAIDI threshold to distinguish a day as MED was found to be 12.19.

Table 3-5: 2021 Major Event Days

Date	SAIDI	SAIFI	CAIDI
2021-01-12	45.8	0.12	372
2021-01-13	283.7	0.41	692.6
2021-01-14	18.5	0.01	1278
2021-02-12	28.5	0.03	858.8
2021-10-24	38.8	0.15	265.4
2021-11-15	84.2	0.19	437.4

3 The Transmission System

3.1 Introduction

A transmission outage is the operation of a 230 kV or 115 kV protective device that opens a circuit switcher or power circuit breaker due to a faulted transmission circuit element.

3.2 Outages

Of the thirty-two transmission system operations in 2021:

- Seventeen resulted in sustained outages to District customers, which caused about thirty-eight million customer minutes of interruption (CMI). There were six more line operations and about twenty-three million more CMI than in 2020.

- The BPA Murray-Snohomish line outages on January 13, 2021 accounted for over fifteen million CMI, which is just under half of all transmission CMI for 2021.

- January 13, 2021, a major event day, accounted for about 1/3 of the outages and 80% of CMI in 2021. Excluding January 13, the 2021 outages would have accounted for less than half the transmission CMI of the previous year.

- Automatic switching schemes operated in eighteen of the transmission line operations, six of which were temporary and twelve were permanent faults. Of the twelve permananent faults where the line was auto-sectionalized, the total transmission CMI was reduced in eleven of the twelve cases. The permanent fault on the BPA Murray-Snohomish line on 1/13/21 is the one instance where the auto-sectionalizing scheme operated but did not affect the transmission CMI due to the nature of fault that occurred.

- About half of the outages were caused by felled trees and/or tree branches faulting the transmission line element. There were three human inadvertent trips and two human caused (external to the utility) trips.

Table 4-1 provides the cause and Transmission CMI for each transmission line or substation automatic outage during 2021.

Table 4-1: Transmission Outages

Outage Number	Date	Line or Device	Substation(s)	Cause	CMI
1	1/12/2021	Beverly Park-Swamp Creek Line	Polaris, Martha Lake - sustained; Mariner, Silver Lake - momentary	Tree	1,432,470
2	1/13/2021	East Arlington-Oso Line	Oso	Unknown	Momentary
3	1/13/2021	BPA Snohomish - Jackson (South)	Snohomish, Woods Creek, Sultan, Wallace River, West Monroe, Goldbar	Unknown	Momentary
4	1/13/2021	Stimson Crossing-East Arlington Line trip #1	Lake Goodwin – sustained; Portage - momentary	Tree	5,309,772
5	1/13/2021	Stimson Crossing-East Arlington Line trip #2 (line sectionalized)	Portage	Unknown	Momentary
6	1/13/2021	Delta-Stimson Crossing (via Village) Line	Village, Quilceda, Tulalip	Tree	1,540,953
7	1/13/2021	Stimson Crossing-Camano Line trip #1	Camano, South Camano, Sunset - sustained; North Stanwood - momentary	Tree	6,011,196
8	1/13/2021	Stimson Crossing-Camano Line trip #2 (line sectionalized prior)	North Stanwood	Tree	7,092
9	1/13/2021	Stimson Crossing-Camano Line trip #3 (line sectionalized prior)	North Stanwood	Tree	2,907,720
10	1/13/2021	BPA Murray-Snohomish Line trip #1	Granite Falls, Hartford - sustained; East Marysville, Frontier, Lake Stevens, Bunk Foss - momentary	Tree	964,634
11	1/13/2021	BPA Murray-Snohomish Line trip #2	Granite Falls, Hartford, East Marysville, Frontier, Lake Stevens, Bunk Foss – momentary, then sustained	Tree	14,509,907
12	2/12/2021	BPA Snohomish - Jackson (South)	Snohomish, Woods Creek, Sultan, Wallace River, West Monroe, Goldbar	Unknown	Momentary
13	2/13/2021	BPA Snohomish - Jackson (North)	Lake Chaplain, Three Lakes – momentary, then sustained	Tree	25,728
14	2/13/2021	Swamp Creek - Brightwater	Floral Hills, York, Turner's Corner	Unknown	Momentary
15	2/21/2021	Snoking-Brightwater	Parkridge	Tree	276,752
16	2/22/2021	Swamp Creek - Halls Lake	Alderwood – sustained; North Alderwood, Cedar Valley, Esperance – momentary;	Human (external)	320,336
17	4/19/2021	Paine Field- Halls Lake	Gibson, Meadowdale, Keelers- - sustained; Lake Serene - momentary	Car-pole accident	495,200
18	5/13/2021	Boeing-Paine Field Line	No tapped loads	Inadvertent trip during testing	N/A

Outage Number	Date	Line or Device	Substation(s)	Cause	CMI
19	5/16/2021	Beverly Park-Paine Field Line	Mukilteo, Harbour Pointe - sustained; Picnic Point, Casino - momentary	Failed insulator stack	661,990
20	6/5/2021	BPA Snohomish-Jackson North Loop	Three Lakes, Lake Chaplain	Unknown	Momentary
21	6/17/2021	Navy-Delta Line	Line Open ended, no load loss	Inadvertent trip during testing	N/A
22	9/26/2021	Lake Goodwin-North Stanwood Line	NA	Unknown	N/A
23	9/26/2021	Stimson Crossing-Camano Line	North Stanwood, Camano, South Camano, Sunset	Unknown	Momentary
24	10/2/2021	Beverly Park-Paine Field Line	Picnic Point, Casino, Mukilteo, Harbor Pointe	Unknown	Momentary
25	10/21/2021	BPA Snohomish-Jackson (North) (line sectionalized)	Lake Chaplain	Incorrectly transposed conductors	7,800
26	10/21/2021	Halls Lake-Snoking #2 Line	Mountlake Terrace, Canyon Park, Fitzgerald	Unknown	Momentary
27	10/24/2021	Halls Lake-Ballinger Line	Richmond Park - sustained; Westgate, Ballinger - momentary	Tree	2,853,810
28	10/24/2021	Boeing-Snohomish (via Paine Field Shoo-fly) Line	Olivia Park	Unknown	Momentary
29	11/15/2021	Lake Goodwin-North Stanwood Line	Sunset, Camano, South Camano – sustained; North Stanwood - momentary	Tree	7,002
30	11/15/2021	Stimson Crossing-Camano Line	North Stanwood, Camano, Sunset, South Camano	Tree	810,681
31	12/11/2021	East Arlington-Oso Line	Oso	Wind	Momentary
32	12/24/2021	Halls Lake-Snoking #2 Line	Mountlake Terrace, Canyon Park, Fitzgerald	Tree	Momentary

Transmission Outage Summaries:

1. **1/12/21 Beverly Park-Swamp Creek Line Trip:** The Beverly Park-Swamp Creek line sustained a permanent A-C fault due to a tree branch in the line during a wind event. The Mariner auto-sectionalizing scheme operated correctly to limited the outages at Silver Lake and Mariner substations to momentary. Polaris had a 139 minute outage and Martha Lake had a 136 minute outage.
2. **1/13/21 East Arlington-Oso Line Trip:** The East Arlington-Oso line experienced a temporary A-C fault during a wind storm. Both East Arlington breakers reclosed successfully and held. The cause of the fault was not determined. Oso substation experienced a momentary fault.
3. **1/13/21 BPA Snohomish-Jackson (South) Trip:** The line experienced a temporary A-G fault during a wind storm. All breakers reclosed successfully and held. Auto-sectionalzing at Sultan correctly operated. Momentary outages occurred at SNPD Snohomish, Woods Creek, Sultan, Wallace River, West Monroe and Goldbar substations.
4. **1/13/21 Stimson Crossing-East Arlington Line Trip #1**: The line first tripped due to a B-C fault due to a tree between Stimson and Portage. Portage Auto-Sectionaling 2 scheme restored the East Arlington-Portage line section. Portage experienced a momentary fault, while Lake Goodwin experienced a sustained outage.
5. **1/13/21 Stimson Crossing-East Arlington Line Trip #2:** The restored East Arlington-Portage line section of the Stimson Crossing-East Arlington line experienced a temporary A-B fault and successfully reclosed. Portage experienced a second momentary fault while the sustained outage to Lake Goodwin continued.
6. **1/13/21 Delta-Stimson Crossing line Trip:** The Delta-Stimson Crossing line sustained a permanent A-B fault due to a tree. At the time of the fault, the line was being fed in a radial configuration from Delta, as the Stimson breakers were open from the previous outages on the adjacent line positions: Stimson Crossing-East Arlingon and Stimson Crossing-Camano. Village, QuilCeda, and Tulalip substations experienced sustained outages.
7. **1/13/21 Stimson Crossing-Camano Line Trip #1:** The Stimson Crossing-Camano line tripped due to an A-C fault due to a tree 18 miles from Stimson. The North Stanwood Auto-sectionalizing (A/S) scheme isolated the North Stanwood-Camano section and restored the Stimson-North Stanwood line section and load at North Stanwood. North Stanwood experienced a momentary outage, while Camano, Sunset, and South Camano substations experienced sustained outages.
8. **1/13/21 Stimson Crossing-Camano Line Trip #2**: ECC attempted to test and restore Lake Goodwin via the Stimson Crossing-North Stanwood line section, which tripped upon closing the normally open line disconnect 4386C to Lake Goodwin at North Stanwood. 4386C was opened again and ECC put the Stimson Crossing-North Stanwood line section back into service. North Stanwood experienced a sustained outage.
9. **1/13/21 Stimson Crossing-Camano Line Trip #3**: The Stimson Crossing-North Stanwood line section tripped to lockout for an A-B fault caused by tree 3.8 miles from North Stanwood. Service was returned to North Stanwood first and then North Camano, Sunset, and South Camano were all restored about an hour later.
10. **1/13/21 BPA Murray-Snohomish Line Trip #1:** The BPA Murray-Snohomish line tripped due to a C-G fault located between Murray and East Marysville. The East Marysville Auto-sectionalizing scheme restored the Snohomish-East Marysville section. East Marysville, Frontier, Lake Stevens, and Bunk Foss experienced momentary outages, while Hartford and Granite Falls experienced sustained outages.
11. **1/13/21 BPA Murray-Snohomish Line Trip #2**: Sixteen minutes after the BPA Murray-Snohomish line was restored from an earlier line trip, a second C-G fault tripped the line out of service. The East Marysville Auto-sectionalizing scheme operated as designed, and initially the line was restored. About 15 seconds after restoration, the fault re-ignited, causing both terminals to trip to lockout. Following the momentary outage, Bunk Foss, Frontier, Lake Stevens, East Marysville, Granite Falls, and Hartford substations experienced sustained outages.
12. **2/12/21 BPA Snohomish-Jackson (South) Line Trip**: The BPA Snohomish-Jackson South Loop experienced a temporary B-C fault with breakers at Jackson and BPA Snohomish both successfully reclosing and the Sultan auto-sectionalizing scheme operating. SNPD Snohomish, West Monroe, Woods Creek, Sultan, Wallace River, and Gold Bar substations experienced momentary outages.

13. **2/13/21 BPA Snohomish-Jackson (North) Line Trip:** A tree fell into the BPA Snohomish-Jackson (North loop) line causing a permanent A-B fault on the line section between Lake Chaplain and Three Lakes. Autosectionalizing at Three Lakes and Lake Chaplain stations operated correctly to isolate the faulted section of line and returned service to both Lake Chaplain and Three Lake substations. Later that evening restoration was attempted to pick up the line section between Three Lakes and Lake Chaplain which resulted in re-igniting the fault. The Three Lakes switch was reopened and service was restored to Three Lakes load via BPA Snohomish six minutes later. The line was restored the next day.
14. **2/13/21 Swamp Creek-Brightwater Line Trip**: A temporary A-B fault occurred on the Swamp Creek-Brightwater during a snow storm. All breakers reclosed successfully. Floral Hills Auto-Transfer scheme successfully transferred load onto the Swamp Creek-Snoking line. ECC transferred the Floral Hills load back to Swamp Creek-Brightwater shortly after. Floral Hills, York, and Turner's Corner substations experienced momentary outages.
15. **2/21/21 BPA Snoking-Brightwater Line Trip**: A permanent A-C fault occurred on the line section between Parkridge and Brightwater due to a tree in the line. ECC opened Switch 4361 to restore Parkridge afer a 55 minute outage from BPA Snoking. The line was restored about 30 minutes later.
16. **2/22/21 Swamp Creek-Halls Lake Line Trip:** A man lift was raised into the transmission line, causing an A-G fault that evolved into an A-C-G fault. Auto-sectionalizing schemes at Cedar Valley and North Alderwood isolated the faulted line section correctly. Reclose initiate at Halls Lake did not have the Switch-Onto-Fault tripping included, canceling the intended second reclose from Halls Lake. Due to Halls Lake breakers remaining open, the fault location was mis-identified, and the fault was reignited during switching intended to restore service. This operation resulted in momentary outages at North Alderwood, Cedar Valley and Esperance. Alderwood remained out for 75 minutes.
17. **4/19/21 Paine Field-Halls Lake Line Trip:** A car-pole accident at Pole HL-LS 2/17 located 2.91 miles from Halls Lake between Halls Lake and Keelers caused a permanent B-G fault. The Lake Serene auto-sectionalizing scheme operated as designed to restore service to Lake Serene from Paine Field. Keelers (97 mins) and Meadowdale (100 mins) experienced extended sustained outages.
18. **5/13/21 Boeing-Paine Field Line Trip**: No load was lost as a result of inadvertently open-ending the line at Paine Field while performing testing on the Boeing-Paine Field primary relay at Boeing. A breaker failure transfer trip signal was inadvertently keyed to the relay at Paine Field during relay testing, resulting in a trip of PCB 1641.
19. **5/16/21 Beverly Park-Paine Field Line Trip**: An insulator stack failed, dropping the Beverly Park-Paine Field 115 kV line into the 12 kV underbuild causing a permanent A-G fault. The underbuild Picnic Point feeder PCB 12-1414 tripped. The Picnic Point auto-sectionalizing scheme operated as designed and the Beverly Park-Picnic Point line section was auto-restored. Casino and Picnic Point stations experienced a momentary outage. Paine Field PCB 1892 reclosing was disabled at the time and therefore the Paine Field-Harbour Pointe line section wasn't auto-restored even though the Harbour Point auto-sectionaling scheme operated as designed. Mukilteo and Harbour Point loads were out for a total of 70 minutes.
20. **6/5/21 BPA Snohomish-Jackson (North) Line Trip:** The BPA Snohomish-Jackson North Loop line experienced a temporary A-C line fault. All autosectionalizing and communication aided tripping worked correctly. Temporay outages to Lake Chaplain and Three Lakes resulted.
21. **6/17/21 Navy-Delta Line Trip**: The Navy-Delta 115 kV line was open ended inadvertently at Delta when the transfer trip scheme was re-enabled after incorrect setting changes were made to the Navy-Delta Line primary relay at Navy. The line was restored after the error was identified and the relay programming corrected. No outages resulted from this operation.
22. **9/26/21 Lake Goodwin-North Stanwood Line Trip:** A momentary B-G fault occurred 4.1 miles from Lake Goodwin. PCB 3015 tripped and reclosed as designed. There was no loss of load for this line trip.
23. **9/26/21 Stimson Crossing-Camano Line Trip**: The Stimson Crossing breakers tripped to clear a temporary A-C fault 20.5 miles from the station. The breakers tripped and reclosed as designed which resulted in momentary outages to North Stanwood, Camano, Sunset, and South Camano.
24. **10/2/21 Beverly Park-Paine Field Line Trip**: The Beverly Park breakers tripped to clear a temporary A-G fault 0.6 miles from Beverly Park. Both terminals tripped and reclosed as designed, which resulted in momentary outages to Mukilteo, Harbour Pointe, Picnic Point, and Casino.

25. **10/21/21 BPA Snohomish-Jackson** (North) **Line Trip**: The BPA Snohomish-Jackson North loop was sectionalized for a pole replacement project between Three Lakes and Lake Chaplain. Upon closing Lake Chaplain Switch 1851D, the wrongly transposed conductors caused a phase to phase fault, tripping out the Jackson terminal. Three Lakes remained in service as it was being fed radially from BPA Snohomish and the line was sectionalized. ECC restored service to Lake Chaplain via switching after a 13 minute outage.
26. **10/21/21 Halls Lake-Snoking No. 2 Line Trip:** A temporary three-phase fault approximately 1.0 mile from Halls Lake caused momentary outages to Mountlake Terrace, Canyon Park, and Fitzgerald substations. Both terminals tripped and reclosed as designed; the Mountlake Terrace auto-sectionalizing scheme operated as designed.
27. **10/24/21 Halls Lake-Ballinger Line Trip**: A tree fell into the line causing a permanent B-G fault approximately 1.6 miles from Halls Lake. The Ballinger auto-sectionalizing and Westgate auto-transfer schemes operated as designed to restore service at those stations but Richmond Park experienced an extended outage (857 mins).
28. **10/31/21 Boeing-BPA Snohomish** (via Paine Field Shoo fly) **Line Trip**: The Boeing-Paine Field line was shooflied to the Paine Field-Snohomish line to accommodate the Bank 1 transformer replacement project at Paine Field when a temporary A-C fault occurred during a wind storm. BPA Snohomish PCB B-470 reclosed, then tripped to lockout after 2.5 seconds when the fault re-ignited. However, Boeing PCB 1630 reclosed and held, restoring service at Olivia Park after a momentary outage. BPA Snohomish PCB B-470 was closed a few minutes later.
29. **11/15/21 Stimson Crossing-Camano Line Trip:** A tree fell into the Stimson Crossing-Camano line causing a permanent A-C fault approximately 23.9 miles from Stimson Crossing. The NorthStanwood auto-sectionalizing scheme operated as designed, restoring service at North Stanwood. Extended outages occurred at Camano (12 mins), Sunset (58 mins), and South Camano (141 mins) substations.
30. **11/15/21 Lake Goodwin-North Stanwood Line Trip**: Lake Goodwin PCB 3015 tripped to lockout while switching was underway to restore service to South Camano via the Lake Goodwin-North Stanwood line.
31. **12/11/21 East Arlington-Oso Line Trip**: A temporary B-C fault occurred approximately 2.1 miles from East Arlington during that day's wind storm event. Both East Arlington breakers tripped and reclosed successfully as designed, resulting in a momentary outage to Oso.
32. **12/24/21 Halls Lake-Snoking #2 Line Trip:** A falling tree caused a momentary A-C fault approximately 6.16 miles from Halls Lake and a permanent fault on the Canyon Park double-circuited 12.47 kV distribution underbuild. Both Snoking and Halls Lake terminals tripped and reclosed as designed and the Mountlake A/S scheme operated as designed. The 115 kV Line was restored automatically. Mountlake Terrace, Canyon Park, and Fitzgerald substations experienced a momentary outage while customers on the Canyon Park 12.47 kV feeders experienced extended outages due to the permanent fault on the distribution underbuild. The distribution feeder outage minutes are not included in the transmission outage minutes in Table 4-1.

4 The Distribution System

4.1 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 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.

4.2 System Performance

4.2.1 Outage Causes

Figures 5-1 and 5-2 show the count of distribution outages by cause for 2021 and the average for the five-year period of 2016-2020. In 2021, 2,782 distribution outages were recorded during routine operation, compared to the five-year average of 2,240 annual outages. The percentages shown in Figures 5-1 and 5-2 are percentages of the total number of outages in each period. The District started tracking planned outages in 2017.

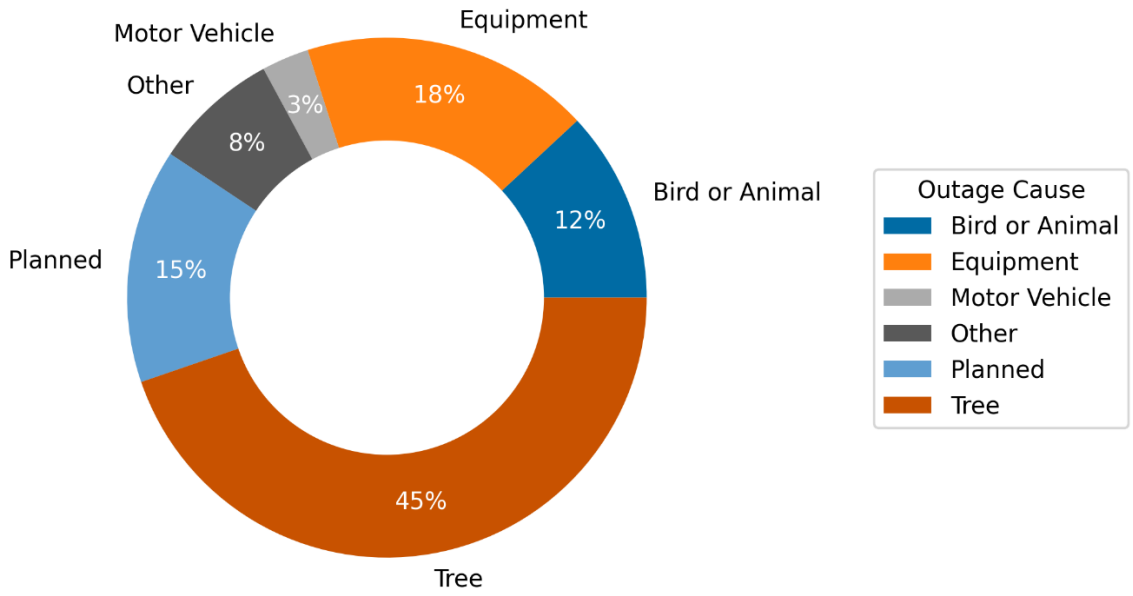

Figure 5-1: 2021 Distribution Outages by Cause

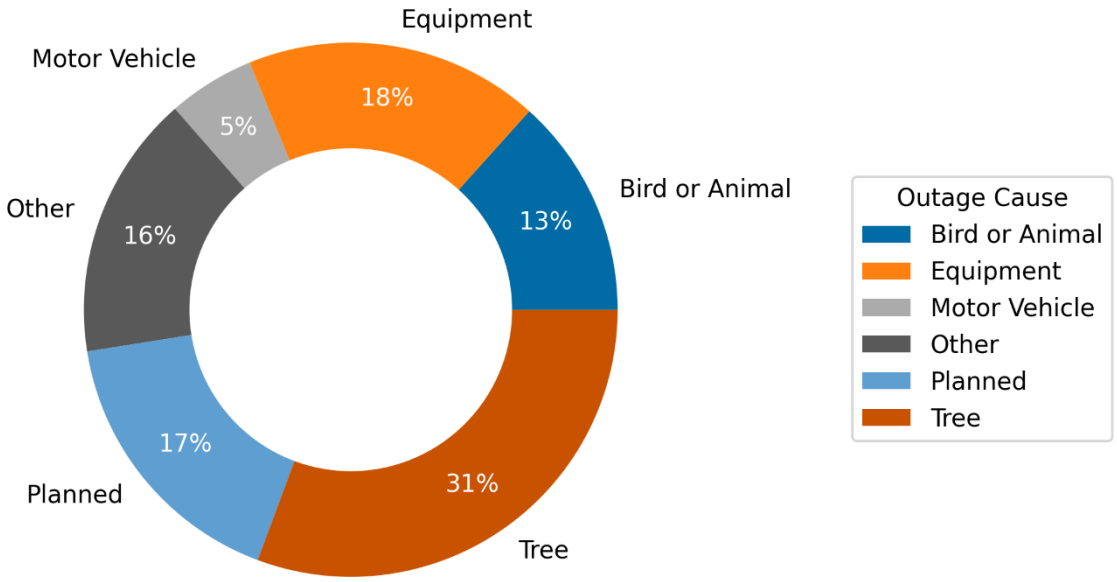

Figure 5-2: Five-Year Average Distribution Outages by Cause (2016-2020)

Figures 5-3 and 5-4 show the 2021 and five-year average percent of customer outage minutes by cause. District customers lost power for a combined total of 49,185,640 minutes in 2021 due to distribution outages, compared to the five-year average of 32,330,085 uplifted minutes. Both the number of outages and the customer minutes of outage are important parameters for planning effective outage impact reduction measures.

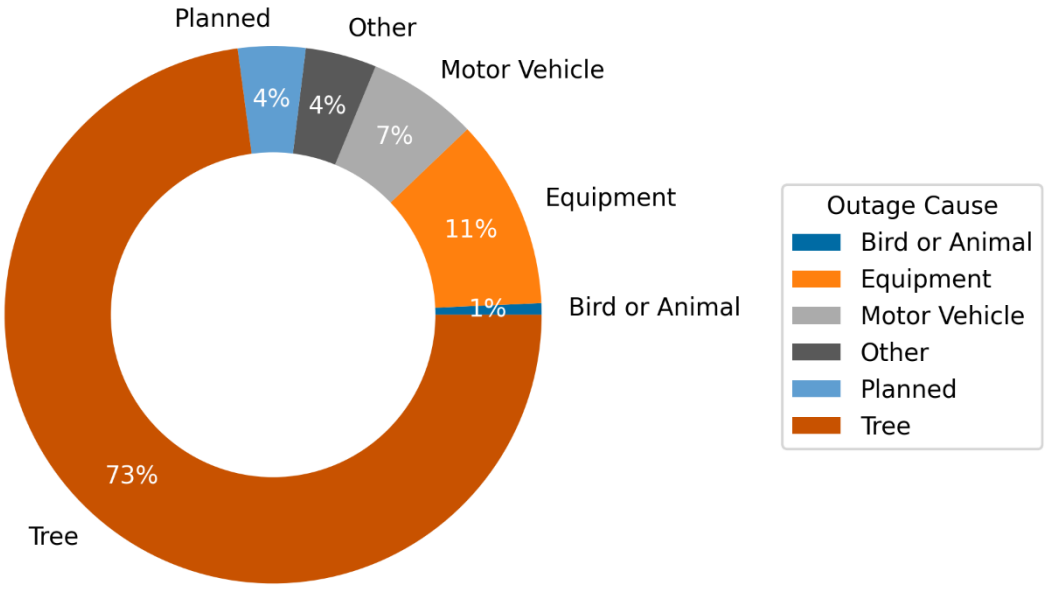

Figure 5-3: 2021 Distribution Outage Minutes by Cause

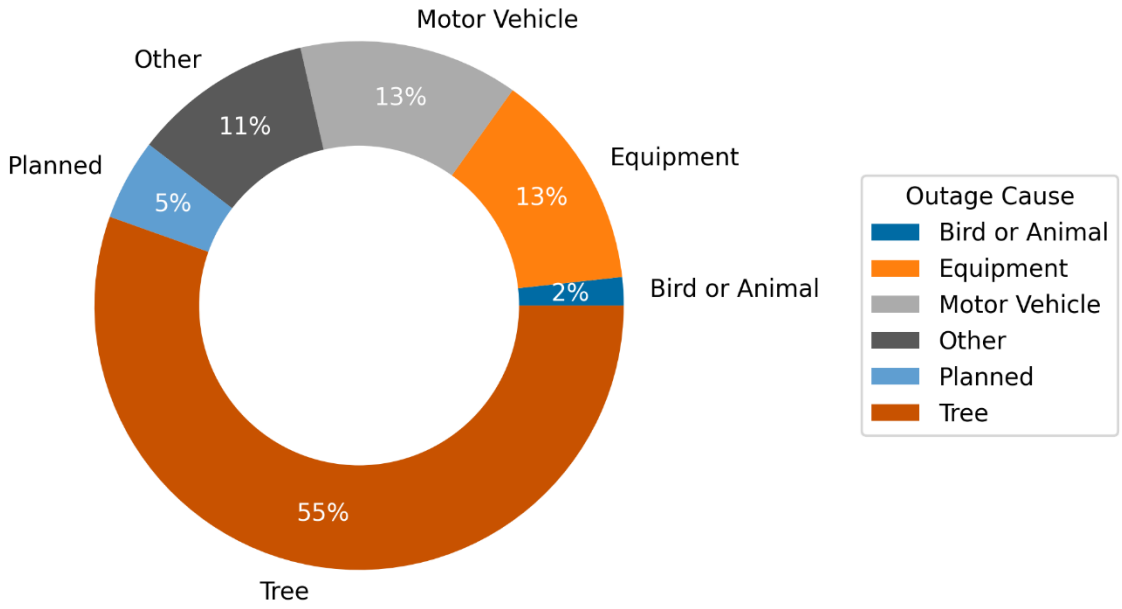

Figure 5-4: Five-Year Average Distribution Outage Minutes by Cause (2016-2020)

4.2.2 Explanation of Equipment Failure Category

Equipment failures may include any component of the distribution system, from primary overhead conductors, to fuses, transformers, insulators, and secondary service conductors. Figure 5-5 shows the number of recorded equipment failures by category during 2021. The ten most common types of equipment failure accounted for 587 outages in 2021. For comparison, Figure 5-6 shows the five-year average of the number of equipment failures for each category.

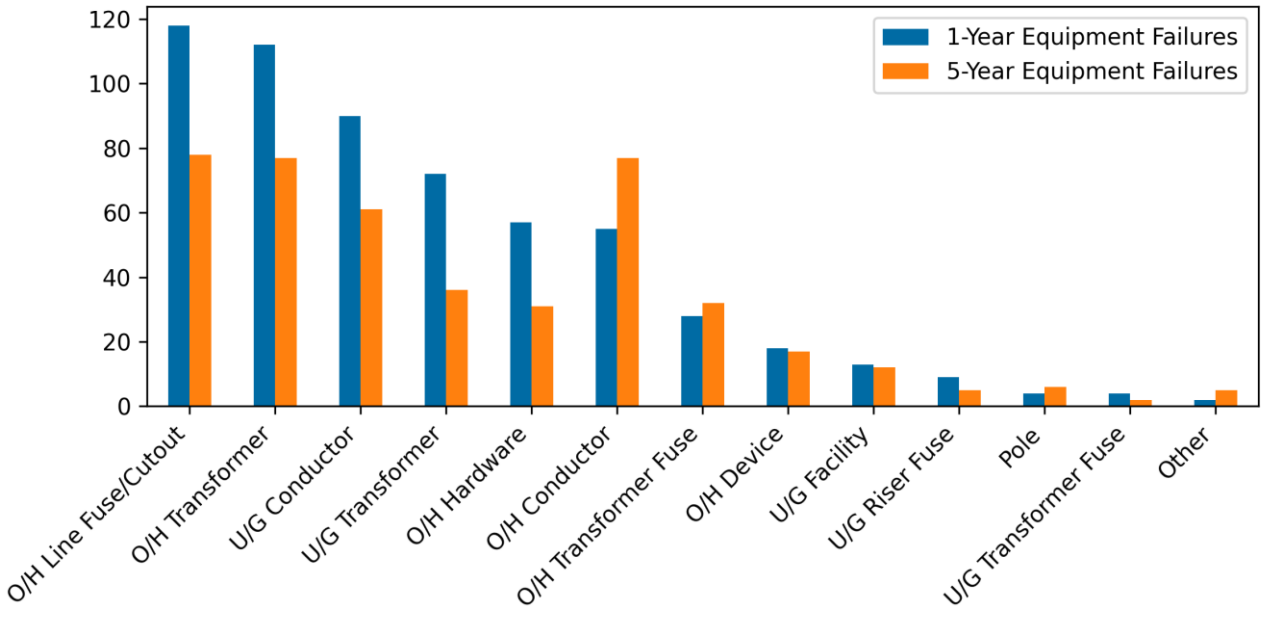

Figure 5-5: 2021 Equipment Failures

4.3 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 indicates 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
Urban (31)	7.1 miles	1,416	199	41.8	0.63
Suburban (171)	13.4 miles	1,211	90.3	49.9	0.72
Rural (114)	31.2 miles	846	24.5	242	2.1

4.4 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 the reliability of 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 4-1: Circuit Reliability Improvement Priority

Rank	Feeder	Substation	Length	SAIFI	SAIDI	Incident Count	Customers	Score
1	12-3503	Portage	6.9	19.0	88.0	19	270	9.4
2	12-1842	Waterfront	2.7	2.6	351.0	10	1166	8.1
3	12-0810	Granite Falls	39.5	10.4	2299.8	51	1084	7.7
4	12-5004	Sultan	8.2	5.0	714.0	5	1	6.7
5	12-4677	Harbour Pointe	6.9	1.0	817.0	1	860	6.6
6	12-5395	York	20.3	8.6	1020.1	12	777	6.3
7	12-2515	North Mountain	34.4	7.8	1816.7	38	458	6.0
8	12-1820	Three Lakes	79.7	11.3	1362.9	65	1780	5.7
9	12-0315	North Camano	22.8	6.0	1244.1	17	505	5.2
10	12-5211	Sunset	7.3	1.2	680.9	5	336	5.1
11	12-3653	Delta	11.6	3.1	828.0	10	86	4.8
12	12-0382	Lake Goodwin	19.0	6.4	728.1	21	912	4.4
13	12-1595	Sultan	37.0	6.1	843.9	32	1444	3.4
14	12-4615	Granite Falls	58.5	7.3	732.2	36	1389	3.3
15	12-1411	North Creek	9.1	1.0	555.0	1	1317	3.0
16	12-3177	Quil Ceda	3.9	2.0	203.0	2	327	3.0
17	12-3657	Delta	3.2	1.0	184.0	2	19	2.8
18	12-3117	Hartford	55.3	5.4	1111.6	38	971	2.8
19	12-5208	Sunset	40.9	5.4	784.2	37	1368	2.8
20	12-5209	Sunset	17.9	4.01	559.2	12	705	2.78

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 2021 and the previous five year average.

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
20th Ave	2021	2,488	3	2,293	0.9	0.01	91.7
20th Ave	2016-2020	2,451	10.4	120,550	49.3	0.99	49.8
52nd St	2021	3,550	18	104,360	29.4	0.25	117.7
52nd St	2016-2020	3,487	14.6	169,583	48.4	0.43	112.3
Alderwood	2021	3,271	4	41,413	12.7	0.3	41.9
Alderwood	2016-2020	4,129	14.8	191,382	46.4	0.63	73.4
Ballinger	2021	3,718	27	756,659	203.5	2.67	76.2
Ballinger	2016-2020	3,675	15.6	133,039	36.2	0.33	108.3
Brier	2021	5,906	24	915,298	155	1.34	115.6
Brier	2016-2020	5,774	24	482,305	83.6	1.33	63.1
Bunk Foss	2021	2,289	35	193,659	84.6	0.98	86.7
Bunk Foss	2016-2020	2,239	22.8	136,717	60.1	0.77	77.7
Canyon Park	2021	5,287	22	309,408	58.5	1.36	42.9
Canyon Park	2016-2020	5,037	22.8	246,068	49	0.53	92.4
Cascade	2021	10,204	9	14,032	1.4	0.01	189.6
Cascade	2016-2020	9,799	9.4	426,069	44.1	0.56	78.5
Casino	2021	3,785	18	166,721	44	0.54	81.2
Casino	2016-2020	3,838	9.8	256,855	67	0.43	156.1
Cedar Valley	2021	2,219	5	207,396	93.5	1.51	61.9
Cedar Valley	2016-2020	2,039	1.6	21,630	10.3	0.12	84.3
Central Marysville	2021	5,437	26	149,694	27.5	0.35	78.4
Central Marysville	2016-2020	5,341	16.2	122,466	22.6	0.1	228.3
Clearview	2021	4,815	105	1,399,045	290.6	3.68	79
Clearview	2016-2020	4,927	80.8	1,301,879	268.1	2.43	110.4
Delta	2021	1,157	14	75,073	64.9	0.25	258
Delta	2016-2020	1,014	7	15,698	15.6	0.4	39.1
Eagle Creek	2021	9,023	145	2,324,717	257.6	1.72	149.7
Eagle Creek	2016-2020	8,630	117	1,555,827	182.9	1.86	98.3

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
East Marysville	2021	11,503	35	308,851	26.8	0.1	281.5
East Marysville	2016-2020	10,766	28.6	584,292	54.4	0.63	86.8
Edgecomb	2021	3,830	17	154,814	40.4	0.46	88.8
Edgecomb	2016-2020	3,483	23.2	256,862	74	0.74	99.4
Esperance	2021	6,026	18	310,629	51.5	0.33	155.1
Esperance	2016-2020	5,888	18.2	134,239	22.7	0.22	101.9
Everett	2021	5,452	17	244,125	44.8	0.35	129.6
Everett	2016-2020	5,024	17.2	275,807	54.4	0.47	116.4
Fitzgerald	2021	1,116	6	56,841	50.9	1.05	48.3
Fitzgerald	2016-2020	1,060	1.6	40,862	37.7	0.59	64.2
Five Corners	2021	5,565	19	84,978	15.3	0.37	41.3
Five Corners	2016-2020	5,495	17.8	103,689	18.8	0.23	83
Floral Hills	2021	8,664	36	502,776	58	0.57	101.3
Floral Hills	2016-2020	8,307	32.8	897,597	109.3	0.91	120.6
Fobes	2021	4,675	32	249,311	53.3	0.56	96
Fobes	2016-2020	4,541	25.4	182,947	40.4	0.58	70
Frontier	2021	7,641	24	155,823	20.4	0.42	48.9
Frontier	2016-2020	7,319	22.8	385,325	52.1	0.96	54.5
Gibson	2021	7,219	31	162,300	22.5	0.56	40.4
Gibson	2016-2020	6,657	23	315,712	47.8	0.6	79.6
Glenwood	2021	5,619	29	279,465	49.7	0.84	58.9
Glenwood	2016-2020	5,554	20	200,342	36.2	0.74	48.9
Goldbar	2021	2,779	85	1,778,397	639.9	2.53	252.6
Goldbar	2016-2020	2,727	57.8	1,391,149	510.3	2.07	246.4
Granite Falls	2021	6,988	136	2,920,572	416	3.04	136.8
Granite Falls	2016-2020	6,550	113	2,098,963	316.9	2.04	155.6
Harbour Pointe	2021	5,113	7	277,961	54.4	1.14	47.6
Harbour Pointe	2016-2020	5,066	6.8	74,392	14.8	0.17	85.8
Hardeson	2021	0	0	0	0	0	0
Hardeson	2016-2020	32	0.2	199	6.2	0.01	496.5
Hartford	2021	4,338	74	1,176,723	271.3	1.58	171.7
Hartford	2016-2020	4,116	63	660,085	160	1.14	140.8
Hilton Lake	2021	6,700	23	722,084	107.8	2.23	48.4
Hilton Lake	2016-2020	6,563	16.4	372,601	56.9	0.69	82.3
Kellogg Marsh	2021	5,363	17	241,021	44.9	0.41	110.7
Kellogg Marsh	2016-2020	5,273	15.6	183,843	33.8	0.34	98.6
Lake Chaplain	2021	600	25	234,041	390.1	4.15	94
Lake Chaplain	2016-2020	571	19	322,367	565.4	5.33	106.1
Lake Goodwin	2021	5,252	111	1,663,412	316.7	2.68	118.4
Lake Goodwin	2016-2020	5,122	74.8	953,922	184.8	1.7	108.8
Lake Serene	2021	6,193	18	881,576	142.4	1.26	113.2
Lake Serene	2016-2020	6,053	14.4	102,563	16.9	0.22	75.6

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Lake Stevens	2021	7,634	41	1,025,630	134.4	1.27	106
Lake Stevens	2016-2020	6,844	41	589,155	83.7	0.7	119.5
Lynnwood	2021	4,879	23	72,026	14.8	0.08	175.2
Lynnwood	2016-2020	4,942	23.2	131,781	26.8	0.31	85.1
Maplewood	2021	4,414	22	31,869	7.2	0.02	354.1
Maplewood	2016-2020	4,397	19.6	160,615	36.6	0.34	107.4
Mariner	2021	5,367	9	90,570	16.9	0.18	95.9
Mariner	2016-2020	4,933	9.6	68,849	13.6	0.21	64.2
Martha Lake	2021	6,369	20	394,160	61.9	1.21	51.3
Martha Lake	2016-2020	5,744	22.8	447,012	76.6	0.99	77.5
Meadowdale	2021	4,951	21	102,848	20.8	0.27	77.4
Meadowdale	2016-2020	4,881	20.8	173,471	35.5	0.64	55.7
Mountlake	2021	6,316	32	424,919	67.3	0.44	152
Mountlake	2016-2020	6,761	36.8	173,781	25.7	0.35	72.6
Mukilteo	2021	4,344	13	124,763	28.7	0.56	51.1
Mukilteo	2016-2020	4,311	15.8	181,267	42.1	0.52	81
Murphy'S Corner	2021	4,692	7	4,402	0.9	0.01	157.2
Murphy'S Corner	2016-2020	4,606	8.6	184,739	40.1	0.45	88.2
North Alderwood	2021	1,076	2	141	0.1	0.01	15.7
North Alderwood	2016-2020	732	1.6	24,851	34.2	0.29	118.8
North Camano	2021	2,997	48	944,573	315.2	2.74	115
North Camano	2016-2020	2,901	34.4	243,966	84	0.91	92.7
North Creek	2021	7,199	7	160,161	22.2	0.15	143.6
North Creek	2016-2020	6,990	14	165,054	23.7	0.29	82.3
North Marysville	2021	2,859	8	8,731	3.1	0.02	185.8
North Marysville	2016-2020	2,810	10.2	38,902	13.9	0.19	73.6
North Mountain	2021	1,919	73	1,579,257	822.9	5.04	163.4
North Mountain	2016-2020	1,891	60.8	1,113,701	590.5	3.61	163.4
North Stanwood	2021	7,092	121	1,568,249	221.1	1.6	138.3
North Stanwood	2016-2020	6,687	77.2	1,391,597	207.2	1.66	124.8
Norton Ave	2021	3,116	5	7,965	2.6	0.01	248.9
Norton Ave	2016-2020	3,130	5.4	55,238	17.4	0.22	80.2
Olivia Park	2021	4,711	9	29,670	6.3	0.04	172.5
Olivia Park	2016-2020	4,574	13.6	86,443	18.8	0.38	49.5
Oso	2021	446	22	473,112	1060.8	3.23	328.8
Oso	2016-2020	368	10.8	44,000	121.8	1.76	69.1
Paine Field	2021	8,680	10	470,575	54.2	0.77	70.6
Paine Field	2016-2020	8,568	19.8	315,234	36.7	0.43	86.2
Park Ridge	2021	4,942	32	432,581	87.5	0.91	96.6
Park Ridge	2016-2020	4,692	23.6	175,555	37.1	0.36	101.8
Perrinville	2021	4,551	27	511,940	112.5	1.33	84.8
Perrinville	2016-2020	4,413	22	150,753	34	0.78	43.6

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Picnic Point	2021	3,791	23	124,320	32.8	0.26	125.1
Picnic Point	2016-2020	3,760	26	354,645	94.1	0.71	132.6
Pinehurst	2021	6,759	34	974,599	144.2	1.39	103.8
Pinehurst	2016-2020	6,745	34.2	396,722	58.8	0.76	77.7
Polaris	2021	4,074	7	60,515	14.9	0.03	432.2
Polaris	2016-2020	3,963	8.4	88,709	21.1	0.42	49.6
Portage	2021	2,591	45	645,038	249	3.8	65.5
Portage	2016-2020	2,612	27.2	216,178	82.9	1.14	72.8
Quil Ceda	2021	2,856	42	634,818	222.3	1.79	123.8
Quil Ceda	2016-2020	2,842	28.2	432,700	150.1	1.3	115.5
Richmond Park	2021	3,330	30	147,193	44.2	0.42	105.4
Richmond Park	2016-2020	3,051	21.6	243,674	80.4	0.58	139.6
Silver Lake	2021	6,185	16	74,715	12.1	0.06	194.1
Silver Lake	2016-2020	6,137	18.2	370,564	60.4	0.77	78.5
Smokey Point	2021	4,577	15	202,044	44.1	0.97	45.5
Smokey Point	2016-2020	3,790	11.4	259,351	63.2	0.91	69.3
Snohomish	2021	3,115	33	268,433	86.2	1.44	59.7
Snohomish	2016-2020	3,090	26.2	171,032	55.4	0.84	66.3
South Camano	2021	3,847	101	2,244,905	583.5	4.88	119.5
South Camano	2016-2020	3,722	52	1,178,107	316.1	2.05	154.1
Stimson Crossing	2021	1,860	42	1,111,973	597.8	4.84	123.6
Stimson Crossing	2016-2020	1,855	26	321,204	173.4	2.01	86.3
Sultan	2021	3,052	59	1,536,592	503.5	4.95	101.7
Sultan	2016-2020	3,336	42.8	908,101	285.5	2.3	124.3
Sunset	2021	4,005	80	2,001,486	499.7	3.14	159.1
Sunset	2016-2020	3,901	46.4	867,784	222.1	2.37	93.7
Tenth Street	2021	4,305	10	104,436	24.3	0.26	94.2
Tenth Street	2016-2020	4,145	13.2	260,834	62.7	0.65	97
Thrashers Corner	2021	6,854	17	1,440,633	210.2	0.81	258.7
Thrashers Corner	2016-2020	6,437	13.6	104,543	15.8	0.26	60
Three Lakes	2021	4,288	143	2,923,313	659	5.82	113.2
Three Lakes	2016-2020	4,215	91.2	1,258,233	297.8	2.96	100.5
Tulalip	2021	2,282	30	589,285	258.2	1.59	162.5
Tulalip	2016-2020	2,302	20.4	308,331	133.9	1.2	111.7
Turners Corner	2021	2,500	42	442,653	177.1	1.5	118.1
Turners Corner	2016-2020	2,533	42.6	350,177	141.4	0.88	161.1
Village	2021	2,125	21	412,542	190.1	3.26	58.3
Village	2016-2020	2,105	21.6	134,050	62.9	0.47	132.7
Wallace River	2021	1,572	22	162,594	103.4	0.17	623
Wallace River	2016-2020	1,048	13.8	122,576	117.5	0.75	155.7
Waterfront	2021	3,088	14	435,674	141.1	1.04	135.9
Waterfront	2016-2020	3,087	7.2	91,790	29.2	0.42	68.6

Substation	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
West Monroe	2021	7,666	41	196,981	25.7	0.14	189.6
West Monroe	2016-2020	7,189	39.2	366,749	50.9	0.48	105.1
Westgate	2021	4,238	21	469,021	110.7	1.09	101.5
Westgate	2016-2020	4,105	16.6	122,708	19.3	0.2	95.6
Woods Creek	2021	6,004	97	2,498,991	416.2	3.52	118.3
Woods Creek	2016-2020	5,598	88.4	2,231,620	391.4	2.35	166.6
York	2021	5,955	28	1,853,783	311.3	3.53	88.1
York	2016-2020	5,813	32.8	500,751	86	1.56	54.9

Table A-2: Circuit Metrics

This table shows the circuit reliability metrics for 2021 and the previous five year average.

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
20th Ave	12-1493	2021	29	0	0	0	0	0
20th Ave	12-1493	2016-2020	29	0	0	0	0	0
20th Ave	12-1494	2021	9	0	0	0	0	0
20th Ave	12-1494	2016-2020	4	0	0	0	0	0
20th Ave	12-1495	2021	17	0	0	0	0	0
20th Ave	12-1495	2016-2020	18	0.8	940	55.4	0.9	61.6
20th Ave	12-1496	2021	26	0	0	0	0	0
20th Ave	12-1496	2016-2020	11	1.2	5,271	233.9	2.11	111
20th Ave	12-2723	2021	598	2	1,962	3.3	0.04	81.8
20th Ave	12-2723	2016-2020	606	3.4	5,087	8.5	0.23	37.5
20th Ave	12-2724	2021	410	0	0	0	0	0
20th Ave	12-2724	2016-2020	404	0.4	63	0.2	0	44.7
20th Ave	12-2725	2021	1,007	0	0	0	0	0
20th Ave	12-2725	2016-2020	993	1.8	37,294	38.2	0.64	59.5
20th Ave	12-2726	2021	387	1	331	0.9	0	331
20th Ave	12-2726	2016-2020	402	2.6	45,363	78.8	0.84	94.2
20th Ave	12-6026	2021	0	0	0	0	0	0
20th Ave	12-6026	2016-2020	0	0	0	0	0	0
52nd St	12-0183	2021	620	1	4,830	7.8	0.03	230
52nd St	12-0183	2016-2020	609	3.2	24,984	43.3	0.9	48.4
52nd St	12-0184	2021	1,280	6	32,936	25.7	0.46	55.6
52nd St	12-0184	2016-2020	1,192	1.4	18,335	14.3	0.04	379.6
52nd St	12-0185	2021	720	5	59,791	82.8	0.33	250.2
52nd St	12-0185	2016-2020	754	4.8	119,444	164.5	1.2	136.8
52nd St	12-0186	2021	920	6	6,803	7.4	0.04	194.4
52nd St	12-0186	2016-2020	952	5.2	6,820	7.5	0.06	121.4
Alderwood	12-0116	2021	592	1	76	0.1	0	76
Alderwood	12-0116	2016-2020	616	2.4	4,037	6.4	0.03	245.1
Alderwood	12-0117	2021	1,417	0	0	0	0	0
Alderwood	12-0117	2016-2020	780	3	25,767	23.2	0.52	44.4
Alderwood	12-0132	2021	305	2	5,521	18.2	0.06	290.6
Alderwood	12-0132	2016-2020	1,525	5.2	130,802	85.2	0.88	96.8
Alderwood	12-0141	2021	968	1	35,816	37.1	1	37
Alderwood	12-0141	2016-2020	927	4.2	30,776	33	0.67	49.2
Ballinger	12-0258	2021	483	9	152,758	317.6	6.99	45.5
Ballinger	12-0258	2016-2020	484	3.2	7,877	17.1	0.18	95.4
Ballinger	12-0259	2021	718	4	162,955	227.6	3.62	62.9
Ballinger	12-0259	2016-2020	693	2	31,217	44.1	0.34	130.7
Ballinger	12-0260	2021	1,105	4	24,030	21.2	0.17	125.2

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Ballinger	12-0260	2016-2020	1,111	5	13,134	12	0.26	46
Ballinger	12-0261	2021	1,379	10	416,916	301.5	2.74	110.1
Ballinger	12-0261	2016-2020	1,383	5.4	80,811	58.3	0.45	129.7
Ballinger	12-5578	2021	0	0	0	0	0	0
Ballinger	12-5578	2016-2020	0	0	0	0	0	0
Brier	12-0501	2021	1,798	5	475,025	262	1.98	132.2
Brier	12-0501	2016-2020	1,823	6.6	74,772	42.6	1.02	41.9
Brier	12-0502	2021	1,149	4	949	0.8	0.01	63.3
Brier	12-0502	2016-2020	1,090	4.2	53,676	48	0.5	96.8
Brier	12-0503	2021	1,468	6	211,622	143.1	1.07	134.1
Brier	12-0503	2016-2020	1,479	6.4	238,296	164.2	2.68	61.4
Brier	12-0504	2021	1,449	9	227,702	156.1	1.88	83.2
Brier	12-0504	2016-2020	1,450	6.6	112,716	79.4	0.71	111.4
Bunk Foss	12-4111	2021	767	10	43,124	55.3	1.05	52.8
Bunk Foss	12-4111	2016-2020	778	5	46,365	60	0.68	87.8
Bunk Foss	12-4112	2021	668	6	22,633	33.5	0.97	34.5
Bunk Foss	12-4112	2016-2020	711	6.2	5,378	8.1	0.41	19.6
Bunk Foss	12-4113	2021	460	8	53,354	115.7	0.4	291.6
Bunk Foss	12-4113	2016-2020	487	4.2	41,307	90.2	0.89	101.9
Bunk Foss	12-4114	2021	369	11	74,548	202	1.57	129
Bunk Foss	12-4114	2016-2020	405	7.4	43,667	120.6	1.51	79.9
Canyon Park	12-1093	2021	1,085	6	102,531	89.2	1.05	85.2
Canyon Park	12-1093	2016-2020	1,230	6.4	18,460	19.7	0.13	147.8
Canyon Park	12-1094	2021	1,182	7	119,024	100.5	3.73	27
Canyon Park	12-1094	2016-2020	1,210	3.6	6,131	5.2	0.04	123.8
Canyon Park	12-1095	2021	1,490	5	86,995	57.4	1.05	54.8
Canyon Park	12-1095	2016-2020	1,447	8.8	143,158	98.6	1.21	81.2
Canyon Park	12-1096	2021	1,095	2	596	0.5	0	298
Canyon Park	12-1096	2016-2020	1,036	2.8	72,589	68.3	0.61	112.2
Canyon Park	12-3488	2021	345	2	262	0.8	0.01	131
Canyon Park	12-3488	2016-2020	115	1.2	5,731	14.7	0.21	68.7
Cascade	12-2087	2021	2,068	4	6,344	2.7	0.01	244
Cascade	12-2087	2016-2020	1,642	1.6	2,474	1.3	0.24	5.5
Cascade	12-2088	2021	2,923	5	7,688	2.6	0.02	160.2
Cascade	12-2088	2016-2020	3,822	3.2	77,797	27.3	0.35	78.3
Cascade	12-2089	2021	1,925	0	0	0	0	0
Cascade	12-2089	2016-2020	1,911	1	7,113	3.9	0.03	122.2
Cascade	12-2090	2021	2,920	0	0	0	0	0
Cascade	12-2090	2016-2020	2,894	3.4	88,929	31	0.23	136.4
Casino	12-0308	2021	943	5	118,931	126.7	2.04	62.1
Casino	12-0308	2016-2020	1,048	3.2	18,828	20	0.28	70.3
Casino	12-0309	2021	384	2	400	1	0.01	200

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Casino	12-0309	2016-2020	397	0.8	24,233	64.8	0.11	568.4
Casino	12-0310	2021	1,198	3	2,857	2.4	0.01	190.6
Casino	12-0310	2016-2020	1,215	3	63,365	52.9	0.19	285.4
Casino	12-0311	2021	1,259	8	44,533	35.3	0.1	368
Casino	12-0311	2016-2020	1,246	2.8	150,429	119.4	0.88	135.4
Cedar Valley	12-5372	2021	1,112	1	10,621	9.6	0.04	247
Cedar Valley	12-5372	2016-2020	980	0.2	57	0.1	0	142
Cedar Valley	12-5373	2021	977	2	65,610	66.1	1	65.9
Cedar Valley	12-5373	2016-2020	940	1.2	21,339	22.1	0.26	84
Cedar Valley	12-5374	2021	1	0	0	0	0	0
Cedar Valley	12-5374	2016-2020	0	0	0	0	0	0
Cedar Valley	12-5375	2021	12	1	334	2.3	0.01	334
Cedar Valley	12-5375	2016-2020	8	0.2	234	46.8	0.44	106.4
Cedar Valley	12-5376	2021	0	0	0	0	0	0
Cedar Valley	12-5376	2016-2020	0	0	0	0	0	0
Central Marysville	12-1419	2021	1,137	5	26,696	22.9	0.09	254.2
Central Marysville	12-1419	2016-2020	1,192	2.6	10,399	9.1	0.09	106.3
Central Marysville	12-1420	2021	1,291	5	6,879	5.1	0.05	100.7
Central Marysville	12-1420	2016-2020	1,287	5	81,668	63.4	0.22	287.5
Central Marysville	12-1421	2021	1,602	7	27,615	17.1	0.08	204.6
Central Marysville	12-1421	2016-2020	1,666	4.2	16,603	10.4	0.06	175.2
Central Marysville	12-1422	2021	1,336	9	88,504	65.7	1.19	55.3
Central Marysville	12-1422	2016-2020	1,286	4.4	13,796	10.5	0.05	233.6
Clearview	12-0584	2021	1,568	25	325,989	206.6	3.2	64.5
Clearview	12-0584	2016-2020	2,095	9.6	178,403	179.9	1.62	110.7
Clearview	12-0585	2021	1,111	19	30,909	27.7	0.09	309.1
Clearview	12-0585	2016-2020	1,260	14.4	76,075	68.1	0.42	160.5
Clearview	12-0586	2021	463	12	138,390	296.3	5.2	57
Clearview	12-0586	2016-2020	1,698	22.8	234,378	166.6	1.63	102.4
Clearview	12-0587	2021	1,644	49	903,757	546.7	6.13	89.2
Clearview	12-0587	2016-2020	1,801	34	813,023	477.7	4.38	109
Delta	12-3653	2021	85	10	71,205	828	3.1	266.7
Delta	12-3653	2016-2020	98	4.2	5,024	63.4	0.72	88.3
Delta	12-3654	2021	16	0	0	0	0	0
Delta	12-3654	2016-2020	18	0	0	0	0	0
Delta	12-3655	2021	210	2	372	1.8	0.03	62
Delta	12-3655	2016-2020	214	1.2	235	1.1	0.01	98
Delta	12-3656	2021	727	0	0	0	0	0
Delta	12-3656	2016-2020	751	1.6	10,439	15	0.49	30.6
Delta	12-3657	2021	0	2	3,496	184	0.95	194.2
Delta	12-3657	2016-2020	0	0	0	0	0	0
Eagle Creek	12-0986	2021	1,110	3	1,556	1.4	0.01	141.5

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Eagle Creek	12-0986	2016-2020	1,175	3.4	94,474	85.2	1.41	60.5
Eagle Creek	12-0987	2021	801	3	2,296	2.9	0.11	26.4
Eagle Creek	12-0987	2016-2020	632	2	16,034	21.5	0.49	44.3
Eagle Creek	12-0988	2021	1,602	40	468,133	287	1.61	178.1
Eagle Creek	12-0988	2016-2020	1,704	27.6	437,225	282	3.06	92.1
Eagle Creek	12-0989	2021	953	3	1,060	1.1	0.01	132.5
Eagle Creek	12-0989	2016-2020	983	4.4	39,426	41.5	1.1	37.6
Eagle Creek	12-2617	2021	1,517	40	1,074,706	703.3	4.58	153.7
Eagle Creek	12-2617	2016-2020	1,613	32.6	611,909	408.5	3.45	118.5
Eagle Creek	12-2618	2021	929	33	538,659	579.2	2.26	256.1
Eagle Creek	12-2618	2016-2020	1,203	32.2	254,643	247.5	2.04	121.3
Eagle Creek	12-2619	2021	1,539	23	238,307	145.1	2.25	64.5
Eagle Creek	12-2619	2016-2020	1,522	14	93,005	62.1	0.6	103.1
Eagle Creek	12-2620	2021	420	0	0	0	0	0
Eagle Creek	12-2620	2016-2020	412	0.8	9,112	22.1	0.2	109.3
East Marysville	12-0002	2021	688	16	267,703	388	1.09	357.4
East Marysville	12-0002	2016-2020	796	10.4	92,448	130.5	0.73	178.1
East Marysville	12-0037	2021	1,747	9	10,131	5.7	0.1	58.9
East Marysville	12-0037	2016-2020	1,648	6.2	127,383	74	1.03	71.5
East Marysville	12-0038	2021	2,043	5	26,775	12.2	0.07	168.4
East Marysville	12-0038	2016-2020	1,623	3.8	134,298	81.2	1.09	74.7
East Marysville	12-0070	2021	2,045	2	2,921	1.4	0.01	265.5
East Marysville	12-0070	2016-2020	1,992	2.8	28,515	14.1	0.2	69.5
East Marysville	12-0115	2021	1,379	0	0	0	0	0
East Marysville	12-0115	2016-2020	1,380	0.8	730	0.5	0	332
East Marysville	12-5203	2021	1,511	1	397	0.3	0	397
East Marysville	12-5203	2016-2020	1,489	1	33,907	22.8	0.44	51.9
East Marysville	12-5204	2021	1,813	2	924	0.5	0	184.8
East Marysville	12-5204	2016-2020	1,730	3.6	167,010	95.5	0.86	111.7
Edgecomb	12-4831	2021	462	0	0	0	0	0
Edgecomb	12-4831	2016-2020	220	1.2	23,951	52.1	0.5	104.4
Edgecomb	12-4832	2021	1,521	7	8,896	5.6	0.04	158.9
Edgecomb	12-4832	2016-2020	1,440	7.8	37,947	25.7	0.66	38.9
Edgecomb	12-4833	2021	1,346	3	66,124	49.1	1	49
Edgecomb	12-4833	2016-2020	1,351	3.6	80,108	59.8	0.46	128.7
Edgecomb	12-4834	2021	425	7	79,794	183.9	0.78	235.4
Edgecomb	12-4834	2016-2020	485	10.6	114,856	274.3	1.87	146.7
Esperance	12-0687	2021	1,653	2	64	0	0	32
Esperance	12-0687	2016-2020	1,686	4.2	5,381	3.2	0.01	226.3
Esperance	12-0688	2021	1,145	1	5,246	4.5	0.01	374.7
Esperance	12-0688	2016-2020	1,183	3.6	42,386	36.5	0.52	69.9
Esperance	12-0689	2021	1,254	10	294,429	224.1	1.49	150.1

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Esperance	12-0689	2016-2020	1,261	5.4	54,211	43.4	0.43	102
Esperance	12-1597	2021	1,881	5	10,890	5.7	0.01	418.8
Esperance	12-1597	2016-2020	1,600	5	32,261	17.3	0.08	208.3
Everett	12-0100	2021	377	0	0	0	0	0
Everett	12-0100	2016-2020	412	1.8	5,311	14.2	0.21	67.7
Everett	12-0101	2021	415	0	0	0	0	0
Everett	12-0101	2016-2020	220	2.2	39,777	189.9	1.15	165.6
Everett	12-0112	2021	973	10	206,642	211.9	1.32	160.7
Everett	12-0112	2016-2020	858	5.2	63,168	68	0.72	94.1
Everett	12-0113	2021	361	4	15,521	42.9	0.11	378.6
Everett	12-0113	2016-2020	408	1.4	14,016	37.8	0.58	64.8
Everett	12-0118	2021	1,336	0	0	0	0	0
Everett	12-0118	2016-2020	1,371	3	103,284	76.2	0.61	125.9
Everett	12-0119	2021	1,081	2	11,916	10.7	0.14	77.4
Everett	12-0119	2016-2020	1,162	1.6	3,339	3	0.04	70.2
Everett	12-0121	2021	396	0	0	0	0	0
Everett	12-0121	2016-2020	229	1	15,907	67.7	0.32	208.7
Everett	12-0122	2021	403	1	10,046	25	1	24.9
Everett	12-0122	2016-2020	425	1	31,004	91.7	0.61	150.5
Everett	12-3700	2021	0	0	0	0	0	0
Everett	12-3700	2016-2020	0	0	0	0	0	0
Everett	12-3701	2021	0	0	0	0	0	0
Everett	12-3701	2016-2020	0	0	0	0	0	0
Everett	12-3702	2021	30	0	0	0	0	0
Everett	12-3702	2016-2020	18	0	0	0	0	0
Fitzgerald	12-5508	2021	813	4	41,961	51.3	1.06	48.2
Fitzgerald	12-5508	2016-2020	794	1.4	40,771	50.2	0.75	67.1
Fitzgerald	12-5509	2021	8	0	0	0	0	0
Fitzgerald	12-5509	2016-2020	8	0	0	0	0	0
Fitzgerald	12-5510	2021	257	2	14,880	57.9	1.19	48.6
Fitzgerald	12-5510	2016-2020	214	0.2	91	0.8	0.2	4
Fitzgerald	12-5511	2021	7	0	0	0	0	0
Fitzgerald	12-5511	2016-2020	5	0	0	0	0	0
Five Corners	12-1282	2021	1,065	7	59,224	55.5	0.1	543.3
Five Corners	12-1282	2016-2020	1,080	4	7,194	7.1	0.08	93.6
Five Corners	12-1283	2021	1,796	3	4,834	2.7	0.03	98.7
Five Corners	12-1283	2016-2020	1,763	5.4	87,277	49.3	0.63	78.3
Five Corners	12-1284	2021	897	2	901	1	0.01	112.6
Five Corners	12-1284	2016-2020	892	1.4	468	0.5	0.01	83.6
Five Corners	12-1285	2021	1,786	7	20,019	11.2	1.06	10.6
Five Corners	12-1285	2016-2020	1,796	7	8,750	4.9	0.03	165.1
Floral Hills	12-2062	2021	1,129	10	238,519	209.6	3.19	65.6

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Floral Hills	12-2062	2016-2020	1,181	11	334,977	294.6	2.61	113
Floral Hills	12-2063	2021	2,888	9	177,261	61.2	0.18	346.9
Floral Hills	12-2063	2016-2020	2,480	9.6	258,731	101.4	0.46	218.9
Floral Hills	12-2064	2021	1,768	10	24,367	13.4	0.13	100.7
Floral Hills	12-2064	2016-2020	1,620	6.4	180,664	110.1	0.82	134.5
Floral Hills	12-2065	2021	2,792	7	62,629	22.3	0.2	108.9
Floral Hills	12-2065	2016-2020	2,654	5.8	123,224	45.2	0.71	63.7
Fobes	12-0398	2021	1,937	10	147,531	74.7	1.13	66.3
Fobes	12-0398	2016-2020	1,839	8	16,798	9	0.22	41.1
Fobes	12-0399	2021	961	6	22,367	23.4	0.08	279.6
Fobes	12-0399	2016-2020	1,024	6	44,428	47.4	0.68	69.8
Fobes	12-0400	2021	1,208	10	28,047	23	0.12	192.1
Fobes	12-0400	2016-2020	1,221	7.8	107,340	90.5	1.21	75
Fobes	12-0401	2021	517	6	51,366	99	0.28	351.8
Fobes	12-0401	2016-2020	556	3.6	14,381	28.1	0.29	98.6
Frontier	12-0533	2021	1,851	11	7,529	3.9	0.05	77.6
Frontier	12-0533	2016-2020	1,247	6.2	65,610	36.4	0.47	77.9
Frontier	12-0534	2021	1,418	6	13,703	9.6	1.01	9.6
Frontier	12-0534	2016-2020	1,503	6.8	64,898	45.2	1.43	31.6
Frontier	12-0535	2021	2,616	4	873	0.3	0	124.7
Frontier	12-0535	2016-2020	2,549	4.8	106,271	41	0.41	100.7
Frontier	12-0536	2021	1,647	3	133,718	79.6	0.98	80.9
Frontier	12-0536	2016-2020	1,625	5	148,546	90.7	1.85	49.1
Gibson	12-2897	2021	2,971	10	25,105	8.2	0.03	321.9
Gibson	12-2897	2016-2020	2,655	9.4	177,611	63.7	0.81	79
Gibson	12-2898	2021	1,738	14	119,011	65.8	2	33
Gibson	12-2898	2016-2020	1,496	5	72,411	47.7	0.41	115.2
Gibson	12-2899	2021	988	2	15,184	15.4	0.28	54.2
Gibson	12-2899	2016-2020	933	1.8	632	0.6	0.2	3.2
Gibson	12-2900	2021	1,304	5	3,000	2.2	0.04	58.8
Gibson	12-2900	2016-2020	1,319	6.8	65,057	51.6	0.7	73.8
Glenwood	12-0592	2021	1,087	4	70,394	63	0.97	65.2
Glenwood	12-0592	2016-2020	1,091	6.4	80,689	74.6	0.83	89.6
Glenwood	12-0593	2021	1,045	9	46,432	45.7	1.05	43.4
Glenwood	12-0593	2016-2020	1,051	5.4	21,259	20.5	0.43	48
Glenwood	12-0594	2021	2,512	15	157,249	62.6	1.03	60.7
Glenwood	12-0594	2016-2020	2,431	7.8	93,503	38.5	1.1	34.9
Glenwood	12-0595	2021	979	1	5,390	5.5	0.01	1078
Glenwood	12-0595	2016-2020	971	0.4	4,891	5.7	0.09	62.8
Goldbar	12-0554	2021	1,995	25	734,048	364.7	2.1	173.3
Goldbar	12-0554	2016-2020	2,090	42.2	1,251,864	632.5	2.39	265.1
Goldbar	12-0555	2021	755	2	2,844	3.7	0.02	237

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Goldbar	12-0555	2016-2020	787	15.6	139,285	188.8	1.25	151.5
Granite Falls	12-0808	2021	573	14	73,599	121.3	0.38	318.6
Granite Falls	12-0808	2016-2020	578	13.4	126,648	223	1.22	182.1
Granite Falls	12-0809	2021	1,303	19	425,786	324.8	3.18	102.1
Granite Falls	12-0809	2016-2020	1,367	18.4	334,317	265	2.05	129
Granite Falls	12-0810	2021	1,077	51	1,333,472	1217.8	5.42	224.8
Granite Falls	12-0810	2016-2020	1,445	31	814,915	750.1	5.02	149.5
Granite Falls	12-0811	2021	865	6	43,377	50	0.16	305.5
Granite Falls	12-0811	2016-2020	903	8	38,620	31.8	0.19	171.1
Granite Falls	12-4612	2021	458	2	1,964	4.3	0.02	245.5
Granite Falls	12-4612	2016-2020	492	3.8	12,471	26.8	0.43	62.4
Granite Falls	12-4613	2021	893	7	12,092	12.7	0.11	110.9
Granite Falls	12-4613	2016-2020	665	9.4	58,828	90.7	1.04	87.6
Granite Falls	12-4614	2021	316	1	71	0.2	0	71
Granite Falls	12-4614	2016-2020	80	2.2	7,736	27.4	0.34	81
Granite Falls	12-4615	2021	1,384	36	1,030,211	741.7	7.71	96.2
Granite Falls	12-4615	2016-2020	1,393	26.6	705,347	546.3	2.77	197.3
Harbour Pointe	12-2277	2021	1,274	2	109,182	85.7	2.58	33.3
Harbour Pointe	12-2277	2016-2020	1,286	2	37,179	46.1	0.44	105.2
Harbour Pointe	12-2278	2021	624	0	0	0	0	0
Harbour Pointe	12-2278	2016-2020	624	0.2	6,760	10.9	0.06	178.8
Harbour Pointe	12-2279	2021	561	2	1,428	0	0	0
Harbour Pointe	12-2279	2016-2020	576	1.6	413	0.7	0.01	147.4
Harbour Pointe	12-2280	2021	637	1	337	0.5	0	337
Harbour Pointe	12-2280	2016-2020	630	1.4	2,619	4.3	0.22	20.1
Harbour Pointe	12-4674	2021	826	1	2,478	0	0	0
Harbour Pointe	12-4674	2016-2020	826	0.6	25,206	30.5	0.4	75.6
Harbour Pointe	12-4675	2021	327	0	0	0	0	0
Harbour Pointe	12-4675	2016-2020	329	0.2	2,043	6.2	0.03	232.1
Harbour Pointe	12-4676	2021	0	0	0	0	0	0
Harbour Pointe	12-4676	2016-2020	0	0	0	0	0	0
Harbour Pointe	12-4677	2021	860	1	164,536	0	0	0
Harbour Pointe	12-4677	2016-2020	862	0.8	172	0.2	0	154.8
Hardeson	12-4556	2021	0	0	0	0	0	0
Hardeson	12-4556	2016-2020	0	0	0	0	0	0
Hardeson	12-4557	2021	5	0	0	0	0	0
Hardeson	12-4557	2016-2020	1	0	0	0	0	0
Hardeson	12-4558	2021	13	0	0	0	0	0
Hardeson	12-4558	2016-2020	14	0	0	0	0	0
Hardeson	12-4559	2021	28	0	0	0	0	0
Hardeson	12-4559	2016-2020	29	0.2	199	9	0.02	496.5
Hartford	12-3117	2021	962	38	1,079,377	1111.6	6.04	184.1

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Hartford	12-3117	2016-2020	978	26.6	367,871	387.9	2.83	137.3
Hartford	12-3118	2021	401	5	1,302	2.7	1.01	2.7
Hartford	12-3118	2016-2020	997	7.6	65,734	171.1	1.93	88.8
Hartford	12-3119	2021	813	9	31,192	38.1	0.23	166.8
Hartford	12-3119	2016-2020	920	8	45,008	56	0.16	342.4
Hartford	12-3120	2021	1,342	20	55,505	38.7	0.21	185.6
Hartford	12-3120	2016-2020	1,290	17.4	157,127	124.8	0.86	144.5
Hartford	12-3327	2021	632	2	9,347	14.8	0.03	424.9
Hartford	12-3327	2016-2020	583	3.4	24,345	39.4	0.16	246.2
Hilton Lake	12-0497	2021	1,381	5	88,704	64.4	1.05	61.5
Hilton Lake	12-0497	2016-2020	1,409	6.2	204,613	145.7	1.36	107
Hilton Lake	12-0498	2021	865	2	74,630	85.1	2	42.5
Hilton Lake	12-0498	2016-2020	777	0.8	15,881	20.2	0.41	49.8
Hilton Lake	12-0499	2021	2,336	10	386,739	165.1	2.29	72.2
Hilton Lake	12-0499	2016-2020	2,253	5.6	75,362	33.1	0.46	72.5
Hilton Lake	12-0500	2021	2,094	6	172,011	81.7	3.02	27.1
Hilton Lake	12-0500	2016-2020	2,075	3.8	76,745	37.2	0.61	60.9
Kellogg Marsh	12-0904	2021	1,170	4	64,433	55.1	0.45	121.8
Kellogg Marsh	12-0904	2016-2020	1,160	1.6	1,554	1.4	0.01	131.5
Kellogg Marsh	12-0905	2021	2,063	6	57,289	27.7	0.14	194.2
Kellogg Marsh	12-0905	2016-2020	2,091	9	118,695	55.3	0.72	77.1
Kellogg Marsh	12-0906	2021	1,184	6	110,947	93.9	1.12	84.2
Kellogg Marsh	12-0906	2016-2020	1,199	3.4	31,014	26.4	0.08	317.1
Kellogg Marsh	12-0907	2021	921	1	8,352	8.9	0.04	232
Kellogg Marsh	12-0907	2016-2020	867	1.6	32,581	36.9	0.26	140.6
Lake Chaplain	12-2034	2021	98	5	14,979	152.8	2.08	73.4
Lake Chaplain	12-2034	2016-2020	98	3	40,128	561.7	5.78	97.2
Lake Chaplain	12-2035	2021	3	0	0	0	0	0
Lake Chaplain	12-2035	2016-2020	1	0.6	920	909.6	16.3	55.8
Lake Chaplain	12-2036	2021	487	20	219,062	441.7	4.61	95.9
Lake Chaplain	12-2036	2016-2020	489	15.4	281,318	598.2	5.57	107.4
Lake Goodwin	12-0379	2021	1,000	22	254,436	251.7	1.7	148
Lake Goodwin	12-0379	2016-2020	1,091	12.4	318,136	310.3	1.97	157.4
Lake Goodwin	12-0380	2021	1,237	26	266,445	212.1	0.93	228.1
Lake Goodwin	12-0380	2016-2020	1,260	19.4	205,065	171.1	2.3	74.3
Lake Goodwin	12-0381	2021	990	20	144,145	144.4	2.16	66.8
Lake Goodwin	12-0381	2016-2020	1,093	8	140,766	143.4	1.46	98.1
Lake Goodwin	12-0382	2021	910	21	671,971	736.8	7.71	95.6
Lake Goodwin	12-0382	2016-2020	1,007	13	135,188	148.5	1.95	76.2
Lake Goodwin	12-0383	2021	1,055	22	326,415	303.6	1.84	164.9
Lake Goodwin	12-0383	2016-2020	1,132	21.8	154,608	150.9	0.76	198.6
Lake Serene	12-0337	2021	1,232	2	114,107	92.5	1	92.2

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Lake Serene	12-0337	2016-2020	1,232	3.8	16,374	13.4	0.23	58.1
Lake Serene	12-0338	2021	1,350	4	381,555	279.5	2.01	138.8
Lake Serene	12-0338	2016-2020	1,219	1	763	0.6	0	172.6
Lake Serene	12-0339	2021	1,207	8	50,317	41.4	1.14	36.5
Lake Serene	12-0339	2016-2020	1,211	3	6,852	5.7	0.04	157.3
Lake Serene	12-0340	2021	2,376	4	335,597	141.3	1.02	138.6
Lake Serene	12-0340	2016-2020	2,397	6.6	78,574	33.4	0.44	76.5
Lake Serene	12-5205	2021	0	0	0	0	0	0
Lake Serene	12-5205	2016-2020	0	0	0	0	0	0
Lake Stevens	12-0124	2021	1,849	28	1,009,102	541.9	5.11	106
Lake Stevens	12-0124	2016-2020	1,907	27.8	535,212	294.2	2.42	121.3
Lake Stevens	12-0125	2021	2,485	10	14,802	5.9	0.05	126.5
Lake Stevens	12-0125	2016-2020	2,490	9.4	41,596	12.4	0.14	89.3
Lake Stevens	12-0273	2021	683	2	476	0.5	0.01	59.5
Lake Stevens	12-0273	2016-2020	280	1	369	0.7	0	176.1
Lake Stevens	12-0274	2021	2,253	1	1,250	0.5	0.01	50
Lake Stevens	12-0274	2016-2020	1,752	2.8	11,978	5.9	0.04	130.5
Lake Stevens	12-4034	2021	0	0	0	0	0	0
Lake Stevens	12-4034	2016-2020	0	0	0	0	0	0
Lynnwood	12-0724	2021	1,622	2	5,013	3.4	0.03	128.5
Lynnwood	12-0724	2016-2020	1,655	6	78,728	50.6	0.47	106.6
Lynnwood	12-0725	2021	825	8	5,665	6.9	0.04	171.7
Lynnwood	12-0725	2016-2020	861	7.6	30,822	37.4	0.52	71.7
Lynnwood	12-0726	2021	866	2	3,468	4.1	0.04	108.4
Lynnwood	12-0726	2016-2020	899	2	16,150	19.7	0.36	54.7
Lynnwood	12-0727	2021	1,293	9	55,231	42.7	0.23	186.6
Lynnwood	12-0727	2016-2020	1,309	7.2	6,045	4.7	0.06	79.9
Lynnwood	12-4867	2021	339	2	2,649	7.8	0.03	240.8
Lynnwood	12-4867	2016-2020	309	0.4	35	0.1	0	26.7
Maplewood	12-0343	2021	1,778	5	4,034	2.3	0.01	224.1
Maplewood	12-0343	2016-2020	1,384	4.8	116,540	66.6	0.57	117.8
Maplewood	12-0344	2021	1,045	5	10,618	10.2	0.02	482.6
Maplewood	12-0344	2016-2020	1,148	6	11,361	10.6	0.1	106.7
Maplewood	12-0345	2021	778	10	16,421	21.1	0.06	349.4
Maplewood	12-0345	2016-2020	763	4.2	14,562	19.1	0.12	155.7
Maplewood	12-0346	2021	810	2	796	1	0	265.3
Maplewood	12-0346	2016-2020	789	4.6	18,153	22.6	0.38	59.1
Mariner	12-3346	2021	251	0	0	0	0	0
Mariner	12-3346	2016-2020	252	0	0	0	0	0
Mariner	12-3347	2021	1,604	8	90,519	53.5	0.56	96
Mariner	12-3347	2016-2020	1,194	4.4	26,752	19.2	0.25	77.6
Mariner	12-3348	2021	1,342	0	0	0	0	0

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Mariner	12-3348	2016-2020	1,347	2	33,267	24.8	0.5	50.1
Mariner	12-3349	2021	701	1	51	0.1	0	51
Mariner	12-3349	2016-2020	708	0.8	248	0.4	0	104.3
Mariner	12-3391	2021	1,380	0	0	0	0	0
Mariner	12-3391	2016-2020	1,402	2.4	8,582	7	0.04	178.3
Martha Lake	12-0073	2021	3,543	7	356,464	104.1	2.16	48.3
Martha Lake	12-0073	2016-2020	2,969	8.8	282,005	84.5	1.1	76.6
Martha Lake	12-0074	2021	101	3	12,311	84.3	1.4	60.1
Martha Lake	12-0074	2016-2020	27	0.4	577	23.4	0.4	58.5
Martha Lake	12-0251	2021	1,138	5	24,109	20.1	0.06	334.8
Martha Lake	12-0251	2016-2020	910	6	50,256	47.9	1.52	31.4
Martha Lake	12-0466	2021	1,493	5	1,276	0.9	0.01	75.1
Martha Lake	12-0466	2016-2020	1,337	7.6	114,173	81	0.35	230.5
Martha Lake	12-5695	2021	0	0	0	0	0	0
Martha Lake	12-5695	2016-2020	0	0	0	0	0	0
Meadowdale	12-1837	2021	1,879	4	3,439	1.8	0.02	95.5
Meadowdale	12-1837	2016-2020	1,833	6.6	37,315	19.9	0.43	46.7
Meadowdale	12-1838	2021	1,314	1	1,764	1.3	0.01	126
Meadowdale	12-1838	2016-2020	1,309	3.8	37,222	28.5	0.64	44.2
Meadowdale	12-1839	2021	1,143	7	2,609	2.3	0.02	96.6
Meadowdale	12-1839	2016-2020	1,170	7.4	52,973	49	0.92	53.2
Meadowdale	12-1840	2021	572	9	95,036	166.4	2.19	75.9
Meadowdale	12-1840	2016-2020	568	3	45,961	81.3	0.85	95.5
Mountlake	12-0133	2021	1,600	5	18,604	11.8	0.12	101.1
Mountlake	12-0133	2016-2020	1,411	8.2	7,547	5.1	0.05	105.8
Mountlake	12-0134	2021	977	4	44,806	45.8	1.02	45.1
Mountlake	12-0134	2016-2020	1,759	6.6	27,815	15.6	0.47	33.4
Mountlake	12-0135	2021	1,635	4	24,095	14	0.04	365.1
Mountlake	12-0135	2016-2020	1,665	5.8	52,363	29.4	0.4	73.4
Mountlake	12-0136	2021	2,033	19	337,414	165.9	0.76	217.4
Mountlake	12-0136	2016-2020	2,039	16.2	86,056	42.4	0.39	107.7
Mukilteo	12-0128	2021	1,233	2	77,058	62.5	1.26	49.7
Mukilteo	12-0128	2016-2020	1,227	4	68,152	55.8	0.71	78.1
Mukilteo	12-0129	2021	959	3	3,263	3.4	0.01	233.1
Mukilteo	12-0129	2016-2020	967	4.8	44,815	46.8	0.32	148.3
Mukilteo	12-0600	2021	1,278	7	6,470	5	0.01	462.1
Mukilteo	12-0600	2016-2020	1,290	3	65,203	51.6	0.7	73.5
Mukilteo	12-4523	2021	854	1	37,972	44.1	1	44
Mukilteo	12-4523	2016-2020	854	4	3,098	3.7	0.21	17.1
Murphy'S Corner	12-1748	2021	1,912	0	0	0	0	0
Murphy'S Corner	12-1748	2016-2020	1,982	2.2	24,421	12.7	0.23	55.4
Murphy'S Corner	12-1749	2021	1,502	5	4,272	2.8	0.02	170.9

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Murphy'S Corner	12-1749	2016-2020	1,299	3.4	150,611	106.8	0.97	110.2
Murphy'S Corner	12-1750	2021	684	1	44	0.1	0	44
Murphy'S Corner	12-1750	2016-2020	706	1.8	9,355	13.7	0.41	33.6
Murphy'S Corner	12-1751	2021	562	1	86	0.1	0	43
Murphy'S Corner	12-1751	2016-2020	551	1.2	352	0.7	0.01	83.9
North Alderwood	12-0509	2021	406	0	0	0	0	0
North Alderwood	12-0509	2016-2020	408	1	8,890	21.5	0.14	152.4
North Alderwood	12-0510	2021	181	2	141	0.8	0.05	15.7
North Alderwood	12-0510	2016-2020	182	0.2	56	0.3	0.01	47
North Alderwood	12-0511	2021	92	0	0	0	0	0
North Alderwood	12-0511	2016-2020	95	0	0	0	0	0
North Alderwood	12-0512	2021	58	0	0	0	0	0
North Alderwood	12-0512	2016-2020	57	0.4	15,905	345.7	3.22	107.5
North Camano	12-0313	2021	918	13	209,549	222	0.88	253.7
North Camano	12-0313	2016-2020	923	11.4	71,622	80.2	1.24	64.7
North Camano	12-0314	2021	104	2	1,261	11.9	0.06	210.2
North Camano	12-0314	2016-2020	127	2.8	1,193	11.6	0.07	158.8
North Camano	12-0315	2021	498	16	430,813	853.1	8.08	105.5
North Camano	12-0315	2016-2020	273	8.4	74,395	153.5	0.99	155.8
North Camano	12-0316	2021	1,427	17	302,950	210.4	2.29	91.8
North Camano	12-0316	2016-2020	1,451	11.8	96,755	68.6	0.74	93.1
North Creek	12-1410	2021	1,778	1	23,871	13.4	0.09	142.9
North Creek	12-1410	2016-2020	1,770	3.8	55,538	39.3	0.3	130
North Creek	12-1411	2021	1,317	1	61,714	0	0	0
North Creek	12-1411	2016-2020	1,320	1	13,685	10.4	0.08	122.9
North Creek	12-1412	2021	1,622	3	66,716	40.2	0.39	102
North Creek	12-1412	2016-2020	1,467	5.8	87,161	58.1	0.94	61.8
North Creek	12-1413	2021	1,694	2	7,860	4.6	0.04	131
North Creek	12-1413	2016-2020	1,641	2.6	7,820	4.7	0.03	137.7
North Creek	12-3733	2021	727	0	0	0	0	0
North Creek	12-3733	2016-2020	723	0.8	851	1.3	0	305.3
North Marysville	12-0142	2021	294	1	1,862	6.3	0.02	266
North Marysville	12-0142	2016-2020	292	0.8	612	2.3	0.01	195.3
North Marysville	12-0143	2021	803	0	0	0	0	0
North Marysville	12-0143	2016-2020	821	0.6	143	0.2	0	117.2
North Marysville	12-0144	2021	1,085	2	4,022	3.7	0.02	211.7
North Marysville	12-0144	2016-2020	1,123	3.2	19,409	18.3	0.28	65.5
North Marysville	12-0254	2021	662	5	2,847	4.2	0.03	135.6
North Marysville	12-0254	2016-2020	666	5.6	18,738	29.2	0.36	82.2
North Mountain	12-2514	2021	1,441	34	761,508	521.9	4.31	121.2
North Mountain	12-2514	2016-2020	1,573	44.2	938,545	655.8	3.75	175
North Mountain	12-2515	2021	452	38	749,161	1635.3	6.78	241.1

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
North Mountain	12-2515	2016-2020	535	16	152,332	339.9	2.61	130.2
North Mountain	12-2516	2021	2	0	0	0	0	0
North Mountain	12-2516	2016-2020	2	0.4	112	56	0.4	140
North Stanwood	12-0996	2021	241	8	19,352	79.6	0.7	114.5
North Stanwood	12-0996	2016-2020	285	5.2	19,867	85.6	0.94	91
North Stanwood	12-0997	2021	694	14	45,474	64.8	2.12	30.6
North Stanwood	12-0997	2016-2020	750	8.4	92,029	137.5	1.7	80.9
North Stanwood	12-0998	2021	1,837	22	485,019	247.8	2.42	102.4
North Stanwood	12-0998	2016-2020	1,675	15.8	321,265	187	1.71	109.1
North Stanwood	12-0999	2021	1,992	35	815,724	406.2	1.88	215.9
North Stanwood	12-0999	2016-2020	2,202	23.6	448,001	226.2	2.21	102.2
North Stanwood	12-3204	2021	2,149	42	202,680	93.3	0.54	174
North Stanwood	12-3204	2016-2020	2,050	24.2	510,435	249.7	1.2	207.6
Norton Ave	12-0588	2021	0	0	0	0	0	0
Norton Ave	12-0588	2016-2020	75	0	0	0	0	0
Norton Ave	12-0589	2021	920	1	67	0.1	0	67
Norton Ave	12-0589	2016-2020	1,046	1.6	46,002	46	0.42	109.8
Norton Ave	12-0590	2021	1,138	2	2,688	2.2	0.01	224
Norton Ave	12-0590	2016-2020	1,292	2.2	2,015	1.7	0.22	7.9
Norton Ave	12-0591	2021	513	2	5,210	5.6	0.02	274.2
Norton Ave	12-0591	2016-2020	889	1.6	7,220	8.5	0.02	501
Olivia Park	12-2576	2021	1,455	0	0	0	0	0
Olivia Park	12-2576	2016-2020	1,431	2	14,711	10.2	0.42	23.9
Olivia Park	12-2577	2021	785	4	27,953	35.5	0.2	179.2
Olivia Park	12-2577	2016-2020	816	5.8	15,212	20	0.3	67.6
Olivia Park	12-2578	2021	1,044	0	0	0	0	0
Olivia Park	12-2578	2016-2020	1,063	2.2	17,719	19.2	0.27	71.8
Olivia Park	12-2579	2021	1,369	5	1,717	1.2	0.01	107.3
Olivia Park	12-2579	2016-2020	1,386	3.6	38,801	28.4	0.49	57.6
Oso	12-1309	2021	296	15	85,820	282.3	2.46	114.9
Oso	12-1309	2016-2020	234	6.6	25,233	113.2	1.3	87
Oso	12-1310	2021	139	6	13,824	97.4	0.38	256
Oso	12-1310	2016-2020	148	4	15,555	58	0.25	229.4
Paine Field	12-0385	2021	271	1	86	0.3	0	86
Paine Field	12-0385	2016-2020	288	0.6	338	1.4	0	351.2
Paine Field	12-0386	2021	114	1	47	0.4	0.01	47
Paine Field	12-0386	2016-2020	109	0	0	0	0	0
Paine Field	12-0387	2021	1,632	1	72	0	0	72
Paine Field	12-0387	2016-2020	1,680	6.6	29,955	18.4	0.42	43.2
Paine Field	12-0388	2021	624	0	0	0	0	0
Paine Field	12-0388	2016-2020	645	1.8	17,904	29.2	0.27	109
Paine Field	12-1729	2021	1,875	2	35,813	19.1	0.07	257.6

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Paine Field	12-1729	2016-2020	1,884	3.8	54,356	30.1	0.46	64.8
Paine Field	12-1730	2021	1,603	4	433,570	270.8	4.07	66.5
Paine Field	12-1730	2016-2020	1,622	3.6	44,098	27.5	0.13	204.1
Paine Field	12-1731	2021	2,336	0	0	0	0	0
Paine Field	12-1731	2016-2020	2,323	3.4	168,581	72.6	0.75	96.3
Paine Field	12-1732	2021	145	1	987	6.9	0.02	329
Paine Field	12-1732	2016-2020	145	0	0	0	0	0
Park Ridge	12-2319	2021	363	2	16,437	44.4	0.99	44.8
Park Ridge	12-2319	2016-2020	943	2	12,444	37.1	0.77	48
Park Ridge	12-2320	2021	810	4	23,758	28.5	0.16	177.3
Park Ridge	12-2320	2016-2020	1,107	3.6	14,501	18.5	0.27	69.5
Park Ridge	12-2321	2021	1,581	4	252,375	158.1	1.03	154.3
Park Ridge	12-2321	2016-2020	1,868	3.2	13,473	8.5	0.03	328.5
Park Ridge	12-2322	2021	1,047	19	33,073	30.9	1.06	29
Park Ridge	12-2322	2016-2020	901	10.2	81,838	80.3	0.7	114.6
Park Ridge	12-4183	2021	1,051	3	106,938	100.1	1.12	89
Park Ridge	12-4183	2016-2020	900	4.6	53,300	55.4	0.52	106.9
Perrinville	12-0092	2021	767	5	137,254	178.7	2.05	87
Perrinville	12-0092	2016-2020	756	4.6	38,608	50.9	1.57	32.4
Perrinville	12-0093	2021	1,178	4	124,231	103.4	1.08	96.1
Perrinville	12-0093	2016-2020	1,204	7.2	73,784	62.9	0.91	69.3
Perrinville	12-0126	2021	1,487	11	186,905	125.6	1.36	92.4
Perrinville	12-0126	2016-2020	1,392	7	17,398	11.8	0.23	50.7
Perrinville	12-0221	2021	1,093	7	63,550	58.2	1.05	55.5
Perrinville	12-0221	2016-2020	1,005	3.2	20,964	19.9	0.82	24.3
Picnic Point	12-1414	2021	676	6	30,131	44.4	0.27	163.8
Picnic Point	12-1414	2016-2020	708	8.6	162,386	237.2	1.52	155.8
Picnic Point	12-1415	2021	1,158	6	8,122	7	0.03	238.9
Picnic Point	12-1415	2016-2020	1,175	7	54,654	47.5	0.82	57.8
Picnic Point	12-1416	2021	1,423	9	62,941	44.1	0.16	282.2
Picnic Point	12-1416	2016-2020	1,381	8	76,428	53.7	0.22	239.2
Picnic Point	12-1417	2021	516	2	23,126	44.7	1.07	41.8
Picnic Point	12-1417	2016-2020	512	2.4	61,176	118.6	0.72	165
Pinehurst	12-0147	2021	799	5	45,307	56.9	1.02	56
Pinehurst	12-0147	2016-2020	832	3.8	22,548	28	0.43	65
Pinehurst	12-0148	2021	1,316	3	2,079	1.6	0.11	15.1
Pinehurst	12-0148	2016-2020	1,354	5.2	39,795	30.7	0.49	62.1
Pinehurst	12-0149	2021	1,736	7	210,531	121	2.05	59
Pinehurst	12-0149	2016-2020	1,769	6.6	116,302	67.2	0.45	149.1
Pinehurst	12-0220	2021	1,060	6	3,345	3.1	0.03	115.3
Pinehurst	12-0220	2016-2020	1,008	5.4	16,693	15.9	0.06	269.5
Pinehurst	12-3350	2021	1,847	13	713,337	385.6	2.62	147.3

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Pinehurst	12-3350	2016-2020	1,931	13.2	201,385	108.1	1.75	61.7
Polaris	12-4500	2021	564	0	0	0	0	0
Polaris	12-4500	2016-2020	444	1.6	20,863	26.7	0.49	54.8
Polaris	12-4501	2021	1,441	5	55,139	38.3	0.09	424.1
Polaris	12-4501	2016-2020	1,420	3.2	8,028	5.7	0.22	25.8
Polaris	12-4502	2021	1,322	1	5,171	3.9	0.01	574.6
Polaris	12-4502	2016-2020	1,950	3	51,597	28.6	0.49	58
Polaris	12-4503	2021	741	1	205	0.3	0	205
Polaris	12-4503	2016-2020	8	0.6	8,220	5.6	0.04	138.8
Portage	12-3502	2021	193	3	6,761	32.8	3.02	10.9
Portage	12-3502	2016-2020	194	3.2	6,373	35.5	2.18	16.3
Portage	12-3503	2021	268	19	23,936	88.7	19.14	4.6
Portage	12-3503	2016-2020	261	3	26,559	102.4	0.27	376.8
Portage	12-3504	2021	994	20	521,382	544.8	3.21	169.9
Portage	12-3504	2016-2020	1,126	17.2	157,323	159.8	1.58	100.9
Portage	12-3505	2021	1,170	2	364	0.3	0.03	9.8
Portage	12-3505	2016-2020	1,194	3.8	25,923	22.5	0.79	28.4
Quil Ceda	12-3177	2021	327	2	2,269	0	0	0
Quil Ceda	12-3177	2016-2020	350	0.8	336	1	0.01	73.5
Quil Ceda	12-3178	2021	1,339	32	436,158	323.6	2.73	118.6
Quil Ceda	12-3178	2016-2020	1,424	21.2	325,652	239.4	1.71	139.9
Quil Ceda	12-3179	2021	33	0	0	0	0	0
Quil Ceda	12-3179	2016-2020	33	0.4	1,121	43.1	0.55	78.7
Quil Ceda	12-3180	2021	1,147	8	196,391	171.2	1.24	138.3
Quil Ceda	12-3180	2016-2020	1,232	5.8	105,591	92	1.22	75.7
Richmond Park	12-0232	2021	821	9	31,490	38.4	0.24	160.7
Richmond Park	12-0232	2016-2020	806	6.6	74,050	91	0.86	106
Richmond Park	12-0233	2021	1,097	13	57,011	51.7	0.53	96.8
Richmond Park	12-0233	2016-2020	722	7.6	121,475	112.4	0.68	165.2
Richmond Park	12-2048	2021	522	1	12,078	18.7	0.57	33
Richmond Park	12-2048	2016-2020	372	2.6	14,989	45.2	0.45	99.7
Richmond Park	12-5217	2021	764	7	46,614	62.2	0.33	190.3
Richmond Park	12-5217	2016-2020	767	4.8	33,160	44	0.21	205.2
Silver Lake	12-0239	2021	1,723	6	6,548	3.8	0.03	128.4
Silver Lake	12-0239	2016-2020	1,600	2.4	49,389	28.9	0.43	68.1
Silver Lake	12-0240	2021	1,036	3	34,003	32.8	0.12	283.4
Silver Lake	12-0240	2016-2020	1,084	4.2	53,678	52.9	0.64	83.2
Silver Lake	12-0253	2021	1,723	3	5,735	3.3	0.06	52.1
Silver Lake	12-0253	2016-2020	1,667	9.6	236,334	138.6	1.81	76.8
Silver Lake	12-0267	2021	830	3	28,011	33.7	0.12	272
Silver Lake	12-0267	2016-2020	841	1	554	0.7	0.02	33.7
Silver Lake	12-0290	2021	850	1	418	0.5	0	418

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Silver Lake	12-0290	2016-2020	851	1	30,610	36	0.28	130
Smokey Point	12-1507	2021	383	2	1,809	4.7	0.03	139.2
Smokey Point	12-1507	2016-2020	423	2	11,459	31.5	0.72	43.9
Smokey Point	12-1508	2021	909	2	7,431	8.2	0.08	99.1
Smokey Point	12-1508	2016-2020	840	0.6	14,517	16	0.21	76.5
Smokey Point	12-1509	2021	1,716	9	62,949	35.7	0.99	36
Smokey Point	12-1509	2016-2020	1,473	6.8	72,967	48.9	1.12	43.6
Smokey Point	12-1510	2021	1,348	2	129,855	103.1	2.07	49.8
Smokey Point	12-1510	2016-2020	392	1.6	27,430	28.4	0.51	55.3
Smokey Point	12-5696	2021	32	0	0	0	0	0
Smokey Point	12-5696	2016-2020	22	0	0	0	0	0
Smokey Point	12-5697	2021	0	0	0	0	0	0
Smokey Point	12-5697	2016-2020	0	0	0	0	0	0
Smokey Point	12-5698	2021	0	0	0	0	0	0
Smokey Point	12-5698	2016-2020	0	0	0	0	0	0
Smokey Point	12-5699	2021	0	0	0	0	0	0
Smokey Point	12-5699	2016-2020	0	0	0	0	0	0
Snohomish	12-0103	2021	505	4	102,288	203	4.46	45.5
Snohomish	12-0103	2016-2020	505	1.8	18,305	36.7	0.47	78.7
Snohomish	12-0104	2021	553	9	70,828	123.2	2.07	59.5
Snohomish	12-0104	2016-2020	620	8.4	57,929	105.2	1.41	74.8
Snohomish	12-0123	2021	1,438	6	2,178	1.5	0.02	99
Snohomish	12-0123	2016-2020	1,524	4.4	8,639	6	0.04	147.2
Snohomish	12-0151	2021	605	14	93,139	151.4	1.69	89.6
Snohomish	12-0151	2016-2020	627	11.4	79,962	133.2	2.24	59.5
South Camano	12-1530	2021	680	28	506,857	735.6	7.34	100.2
South Camano	12-1530	2016-2020	685	12.4	204,788	310	2.53	122.7
South Camano	12-1531	2021	486	3	72,444	146.6	1.84	79.9
South Camano	12-1531	2016-2020	462	1.8	18,705	39.6	0.39	101.8
South Camano	12-1532	2021	1,593	25	725,354	453.3	3.58	126.5
South Camano	12-1532	2016-2020	1,584	16.8	439,060	279.2	1.46	190.8
South Camano	12-1533	2021	1,051	44	909,874	855.9	3.23	265.2
South Camano	12-1533	2016-2020	1,074	21	515,555	502.6	3.41	147.5
Stimson Crossing	12-3090	2021	44	1	3,555	80.8	1.02	79
Stimson Crossing	12-3090	2016-2020	46	1	876	20.1	0.42	48.1
Stimson Crossing	12-3091	2021	1,296	31	673,099	516.6	4.77	108.3
Stimson Crossing	12-3091	2016-2020	1,470	17.8	235,147	181.8	2.21	82.1
Stimson Crossing	12-3092	2021	248	1	78,883	315.5	5.35	59
Stimson Crossing	12-3092	2016-2020	280	1.8	63,966	256.3	2.96	86.6
Stimson Crossing	12-3093	2021	263	8	19,383	74.3	0.25	293.7
Stimson Crossing	12-3093	2016-2020	329	5.4	21,214	81	0.35	230.7
Sultan	12-1593	2021	571	8	157,970	274.3	4.05	67.7

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Sultan	12-1593	2016-2020	582	8	159,436	290.6	3.66	79.4
Sultan	12-1594	2021	377	9	118,379	312.3	0.89	349.2
Sultan	12-1594	2016-2020	389	9.6	221,244	596.7	2.13	279.7
Sultan	12-1595	2021	1,430	32	1,218,933	844.1	8.15	103.6
Sultan	12-1595	2016-2020	2,110	20.6	471,077	313.7	2.49	125.9
Sultan	12-1596	2021	644	5	40,596	62.6	1.02	61.1
Sultan	12-1596	2016-2020	672	2.8	33,717	53.4	0.22	237.8
Sultan	12-5004	2021	1	5	714	0	0	0
Sultan	12-5004	2016-2020	1	1.6	211	101.2	1.2	84.3
Sunset	12-5208	2021	1,347	37	1,072,736	784.2	5.44	144.1
Sunset	12-5208	2016-2020	1,535	17.8	607,933	463.7	4.76	97.4
Sunset	12-5209	2021	700	11	370,288	525.2	3.01	174.3
Sunset	12-5209	2016-2020	732	8.4	91,174	131	1.69	77.5
Sunset	12-5210	2021	550	8	20,159	36.7	0.27	136.2
Sunset	12-5210	2016-2020	611	6	5,501	9.9	0.07	147.2
Sunset	12-5211	2021	329	5	228,767	680.9	2.21	308.3
Sunset	12-5211	2016-2020	334	3.6	4,567	14.5	0.05	282.1
Sunset	12-5212	2021	1,039	18	112,090	107.6	0.23	475
Sunset	12-5212	2016-2020	1,070	10.2	129,388	123.2	1.09	113.2
Tenth Street	12-0298	2021	1,016	0	0	0	0	0
Tenth Street	12-0298	2016-2020	1,081	2	9,005	8.9	0.21	41.9
Tenth Street	12-0299	2021	1,002	1	384	0.4	0	96
Tenth Street	12-0299	2016-2020	1,092	2.4	1,714	1.6	0.01	236
Tenth Street	12-0300	2021	1,427	6	68,004	43.6	0.25	171.3
Tenth Street	12-0300	2016-2020	1,391	6.8	235,279	173.5	1.6	108.1
Tenth Street	12-0301	2021	704	3	36,048	51.4	1.01	50.9
Tenth Street	12-0301	2016-2020	763	2	14,836	21.1	0.41	51.9
Tenth Street	12-0327	2021	0	0	0	0	0	0
Tenth Street	12-0327	2016-2020	0	0	0	0	0	0
Thrashers Corner	12-0275	2021	331	0	0	0	0	0
Thrashers Corner	12-0275	2016-2020	390	0.8	16,952	55.6	0.68	81.8
Thrashers Corner	12-0276	2021	1,123	4	4,390	3.9	0.02	209
Thrashers Corner	12-0276	2016-2020	1,106	4.8	56,757	52	0.8	65.3
Thrashers Corner	12-0277	2021	1,846	5	292,227	158.4	0.64	249.3
Thrashers Corner	12-0277	2016-2020	1,873	1	1,431	0.8	0	188.3
Thrashers Corner	12-0278	2021	1,466	2	1,100,211	742.4	2.3	322.4
Thrashers Corner	12-0278	2016-2020	2,392	2.6	11,478	4.7	0.1	45.8
Thrashers Corner	12-3304	2021	0	0	0	0	0	0
Thrashers Corner	12-3304	2016-2020	2	0	0	0	0	0
Thrashers Corner	12-3471	2021	82	2	38,014	475.2	11.31	42
Thrashers Corner	12-3471	2016-2020	5	0.4	1,439	17.5	0.24	73
Thrashers Corner	12-3472	2021	1,923	3	2,091	1.1	0	261.4

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Thrashers Corner	12-3472	2016-2020	1,459	3.4	16,165	10.9	0.25	44.1
Thrashers Corner	12-3473	2021	28	1	3,700	84.1	1.14	74
Thrashers Corner	12-3473	2016-2020	37	0.6	321	11.5	0.41	27.7
Thrashers Corner	12-3474	2021	12	0	0	0	0	0
Thrashers Corner	12-3474	2016-2020	16	0	0	0	0	0
Three Lakes	12-1818	2021	784	29	653,958	1015.5	3.42	297.1
Three Lakes	12-1818	2016-2020	782	20	319,624	419.8	2.44	172.4
Three Lakes	12-1819	2021	1,164	30	272,561	232.6	2.79	83.4
Three Lakes	12-1819	2016-2020	1,240	15.8	171,341	150.5	2.93	51.3
Three Lakes	12-1820	2021	1,569	65	1,803,203	958.3	9.97	96.1
Three Lakes	12-1820	2016-2020	1,697	41.4	595,536	370	3.38	109.3
Three Lakes	12-1821	2021	735	19	193,591	262	2.37	110.5
Three Lakes	12-1821	2016-2020	808	14	171,731	239.8	2.54	94.4
Tulalip	12-0505	2021	272	1	312	1.2	0.01	156
Tulalip	12-0505	2016-2020	368	2.6	13,235	46.9	0.31	149.4
Tulalip	12-0506	2021	401	7	2,358	5.9	0.02	294.8
Tulalip	12-0506	2016-2020	428	2	15,421	37.9	0.81	47
Tulalip	12-0507	2021	1,045	15	577,791	551.9	3.41	161.9
Tulalip	12-0507	2016-2020	1,068	10.4	244,597	234.2	1.6	146.5
Tulalip	12-0508	2021	559	7	8,824	15.8	0.09	183.8
Tulalip	12-0508	2016-2020	618	5.4	35,078	62.5	1.21	51.7
Turners Corner	12-1428	2021	160	1	83,214	507.4	7.57	67
Turners Corner	12-1428	2016-2020	177	3.4	17,102	107.7	1.97	54.7
Turners Corner	12-1429	2021	604	9	48,866	80.9	0.36	223.1
Turners Corner	12-1429	2016-2020	1,107	8.4	56,693	94.5	0.24	400.8
Turners Corner	12-1430	2021	843	12	81,271	96.4	0.32	303.2
Turners Corner	12-1430	2016-2020	906	14.6	128,428	154.6	1.32	116.8
Turners Corner	12-1431	2021	837	16	228,425	271.9	2.4	113.5
Turners Corner	12-1431	2016-2020	891	14.4	146,627	177.2	0.72	245
Turners Corner	12-4310	2021	48	4	877	19.5	0.16	125.3
Turners Corner	12-4310	2016-2020	58	1.8	1,327	28.8	0.46	63.3
Village	12-4304	2021	404	4	27,600	68.3	0.53	128.4
Village	12-4304	2016-2020	429	2.4	17,582	45.2	0.26	171.8
Village	12-4305	2021	1,691	16	384,918	221.5	3.95	56.1
Village	12-4305	2016-2020	1,817	17	116,057	67.9	0.53	128.6
Village	12-4306	2021	5	0	0	0	0	0
Village	12-4306	2016-2020	5	0.8	112	6	0.1	60
Village	12-4307	2021	16	1	24	1.6	0.27	6
Village	12-4307	2016-2020	17	1.4	298	9.3	0.22	42.7
Wallace River	12-4485	2021	414	10	124,810	300	0.42	713.2
Wallace River	12-4485	2016-2020	469	8.2	69,887	171.5	1.1	156.3
Wallace River	12-4486	2021	1	0	0	0	0	0

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Wallace River	12-4486	2016-2020	1	0.4	16	15.8	0.4	39.5
Wallace River	12-4487	2021	961	12	37,784	32.7	0.07	439.3
Wallace River	12-4487	2016-2020	156	5.2	52,673	64	0.35	181
Waterfront	12-1842	2021	1,169	10	409,450	351.2	2.64	132.9
Waterfront	12-1842	2016-2020	1,110	2.2	80,446	68.8	1.01	68
Waterfront	12-1843	2021	898	0	0	0	0	0
Waterfront	12-1843	2016-2020	935	0.6	403	0.4	0.01	77.7
Waterfront	12-1846	2021	409	2	24,305	59.3	0.27	219
Waterfront	12-1846	2016-2020	457	1.6	863	2.1	0.02	108
Waterfront	12-1847	2021	605	2	1,919	3.2	0.03	119.9
Waterfront	12-1847	2016-2020	636	2.8	10,078	16.8	0.24	70
West Monroe	12-0631	2021	651	3	635	1	0.01	70.6
West Monroe	12-0631	2016-2020	665	1.6	4,755	7.3	0.24	30.7
West Monroe	12-0632	2021	1,494	7	1,074	0.7	0.01	51.1
West Monroe	12-0632	2016-2020	1,436	5.4	27,639	19.5	0.29	68.1
West Monroe	12-0633	2021	966	7	1,569	1.5	0.02	82.6
West Monroe	12-0633	2016-2020	829	6.2	52,154	61.7	0.52	117.8
West Monroe	12-0634	2021	335	6	138,421	410.7	2.18	188.8
West Monroe	12-0634	2016-2020	377	7.4	63,713	191.7	1.82	105.5
West Monroe	12-3360	2021	711	14	53,128	73.9	0.32	234
West Monroe	12-3360	2016-2020	660	9.6	102,999	154.2	1.54	100.1
West Monroe	12-3361	2021	1,094	0	0	0	0	0
West Monroe	12-3361	2016-2020	1,025	1.6	22,424	22.2	0.28	79.3
West Monroe	12-3362	2021	1,341	1	1,235	0.9	0.01	65
West Monroe	12-3362	2016-2020	1,253	5	74,482	57.2	0.39	148.4
West Monroe	12-3363	2021	857	3	919	1.1	0.01	83.5
West Monroe	12-3363	2016-2020	853	2.4	18,583	23.8	0.06	374.5
Westgate	12-0404	2021	800	3	72,867	90.9	1.64	55.2
Westgate	12-0404	2016-2020	906	5.2	41,649	50.5	0.44	114.4
Westgate	12-0405	2021	989	6	31,725	31.9	0.23	139.8
Westgate	12-0405	2016-2020	1,559	3	68,241	30.7	0.5	61.8
Westgate	12-0406	2021	1,452	7	361,950	249.3	2.1	118.7
Westgate	12-0406	2016-2020	1,297	4.4	6,896	4.9	0.03	179
Westgate	12-0407	2021	993	5	2,479	2.5	0.03	99.2
Westgate	12-0407	2016-2020	979	4	5,923	6	0.03	198.7
Woods Creek	12-1808	2021	1,890	34	1,213,298	638.6	5.42	117.9
Woods Creek	12-1808	2016-2020	1,984	34.2	1,030,192	543.2	2.8	194.1
Woods Creek	12-1809	2021	1,572	28	394,189	241.8	2.72	88.9
Woods Creek	12-1809	2016-2020	1,488	30.4	662,118	441.6	2.4	183.8
Woods Creek	12-1810	2021	1,224	13	164,639	127.5	2.17	58.7
Woods Creek	12-1810	2016-2020	939	8.8	266,098	260.6	1.89	137.7
Woods Creek	12-1811	2021	1,167	22	726,865	616.5	3.05	202.3

Substation	Circuit	Period	Customers	Outages	CMI	SAIDI	SAIFI	CAIDI
Woods Creek	12-1811	2016-2020	1,255	15	273,213	235.3	2.14	109.8
York	12-5392	2021	1,560	5	83,158	53.2	1.06	50.1
York	12-5392	2016-2020	1,525	8	87,779	57.1	1.05	54.1
York	12-5393	2021	1,850	6	249,834	134.8	2.27	59.4
York	12-5393	2016-2020	1,827	5.6	113,067	61.6	1.37	44.8
York	12-5394	2021	1,754	5	728,051	414.4	4.03	102.7
York	12-5394	2016-2020	1,661	5.8	76,858	44.8	1.03	43.6
York	12-5395	2021	763	12	792,740	1020.3	10.4	98.1
York	12-5395	2016-2020	751	13.4	223,047	294.5	4.28	68.7

Appendix B

Historical Data: SAIDI, CAIDI, and SAIFI

No uplift factor was applied to these historical metrics.

Table B-1: SAIDI 1991 - 2021

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
2021	131.3	6.5	137.9	505	642.9
5-Year Average (2016-2020)	89.2	8.5	97.8	79.1	176.8

Table B-2: CAIDI 1991 - 2021

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
2021	109.5	71.0	106.7	530.1	286.4
5-Year Average (2016-2020)	104.5	68.8	100	233.8	134.4

Table B-3: SAIFI 1991 - 2021

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
2021	1.2	0.09	1.29	0.95	2.24
5-Year Average (2016-2020)	0.85	0.12	0.98	0.34	1.32