

City of Bellevue

2023 Electric System Reliability Review

September 19, 2024



Safety Moment - Electric Safety



- Look up and note the location of power lines before you begin.
- Keep ladders at least 10 feet away from overhead power lines.
- Even when working more than 10 feet away, make sure the ladder isn't positioned in a way that could fall into contact with power lines during set up or take down.

Introductions

Justin McConachie – Senior Municipal Liaison Manager

Fremont Aguinaldo – Regional System
Reliability Planner

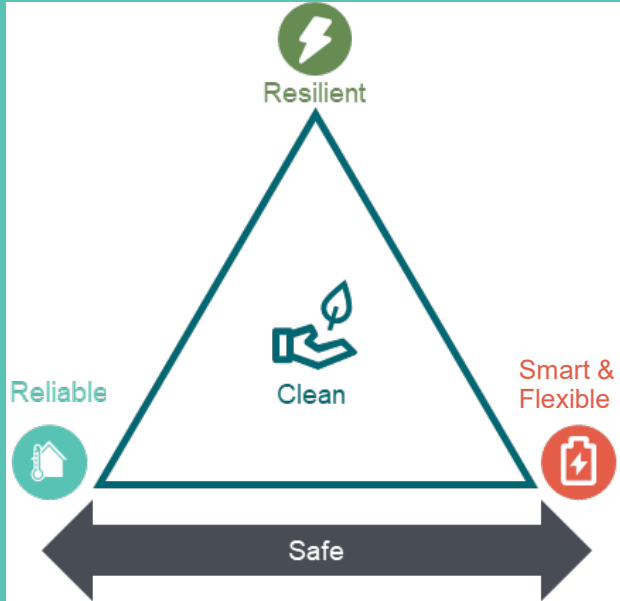
Ryan Yelle – Supervisor System Planning - Reliability

Workshop Purpose

2023 Electric System Performance Overview

- ◆ Overall performance review
- ◆ Reliability project completed and proposed
- ◆ Grid modernization / automation initiatives
- ◆ Information technology initiatives

PSE's Grid Modernization Vision



To meet PSE customer expectations, PSE needs a grid that is ...

SAFE:

Safety for the public, our workforce, and environment continues to be PSE's top priority.

RELIABLE:

To decrease the amount and impact of power outages. This involves identifying asset health, proactively anticipating and mitigating failures/outages, and performing targeted maintenance.

RESILIENT:

So our region recovers more quickly from extreme weather events and other emergencies.

SMART & FLEXIBLE:

Adding intelligence to the electric system allows for more automation and technology to save energy and improve customer experience.

CLEAN:

Enabling the rapid and equitable integration of distributed energy resources and other green technologies.

Overview

Reliability Reporting Metrics

SAIDI & SAIFI

PSE analyzes and reports on our electric system performance using two standard benchmarks of the electric utility industry, **SAIDI** and **SAIFI**.

- ◆ **SAIDI** – **S**ystem **A**verage **I**nterruption **D**uration **I**ndex
Total customer outage minutes / average total customer count
(Service Quality Index: 155 minutes)
- ◆ **SAIFI** – **S**ystem **A**verage **I**nterruption **F**requency **I**ndex
Total customers affected / average total customer count
(Service Quality Index: 1.2 outages)

Overview

Performance

5 Year History

Bellevue & PSE System

Bellevue performance compared to the PSE system performance for the past 5 years using the two standard benchmarks **SAIDI** and **SAIFI**

	SAIDI		SAIFI	
	BELLEVUE	PSE	BELLEVUE	PSE
2019	102.7	136.0	0.79	0.98
2020	93.0	165.0	0.92	1.24
2021	111.0	207.0	0.65	1.35
2022	58.2	181.0	0.37	1.06
2023	98.9	167.0	0.63	1.09

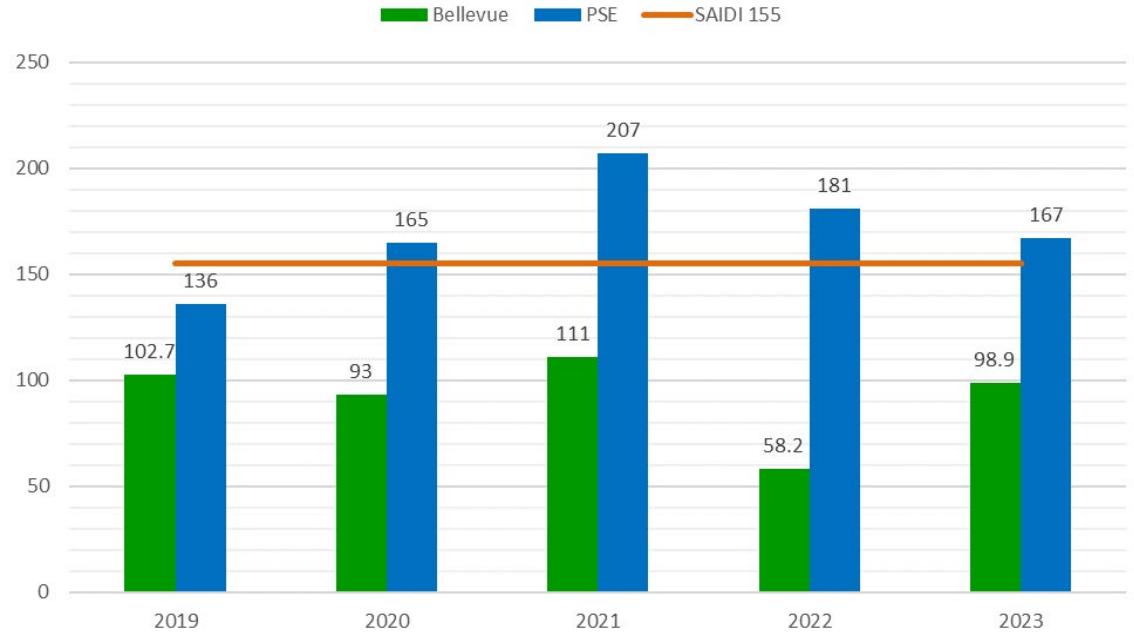
SAIDI in minutes per customer, calculated using the IEEE 1366 method
SAIFI in outage events per customer
(SAIDI and SAIFI data excludes Major Storms)

Overview

Performance Visualized

SAIDI

Bellevue **SAIDI** comparison to PSE Performance 2019-2023 (excluding storm events)

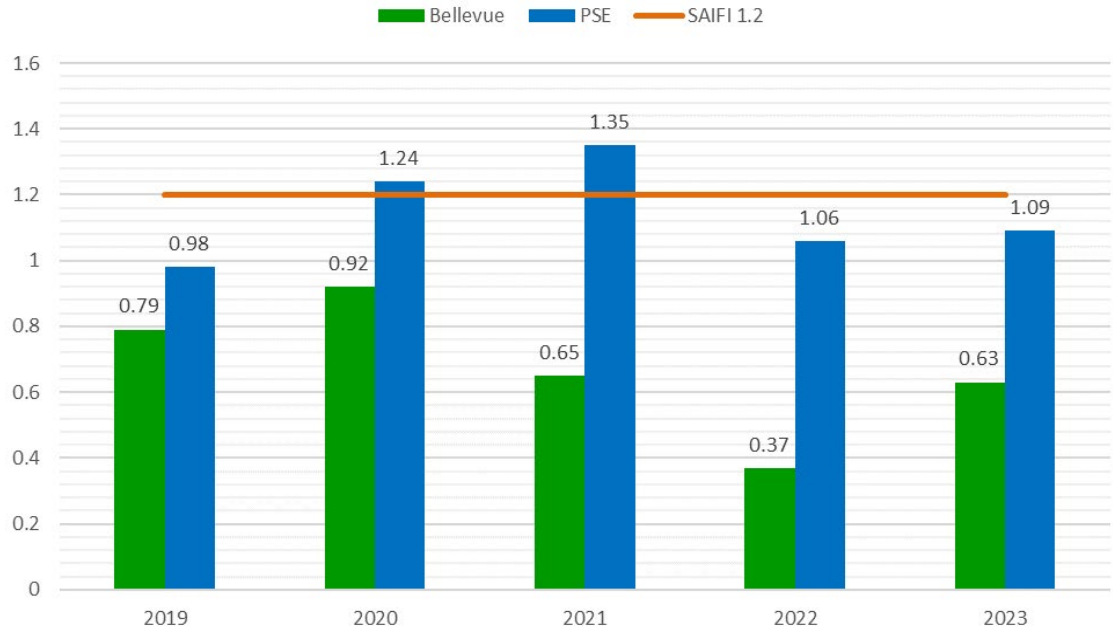


Overview

Performance Visualized

SAIFI

Bellevue **SAIFI** comparison to PSE Performance 2019-2023 (excluding storm events)



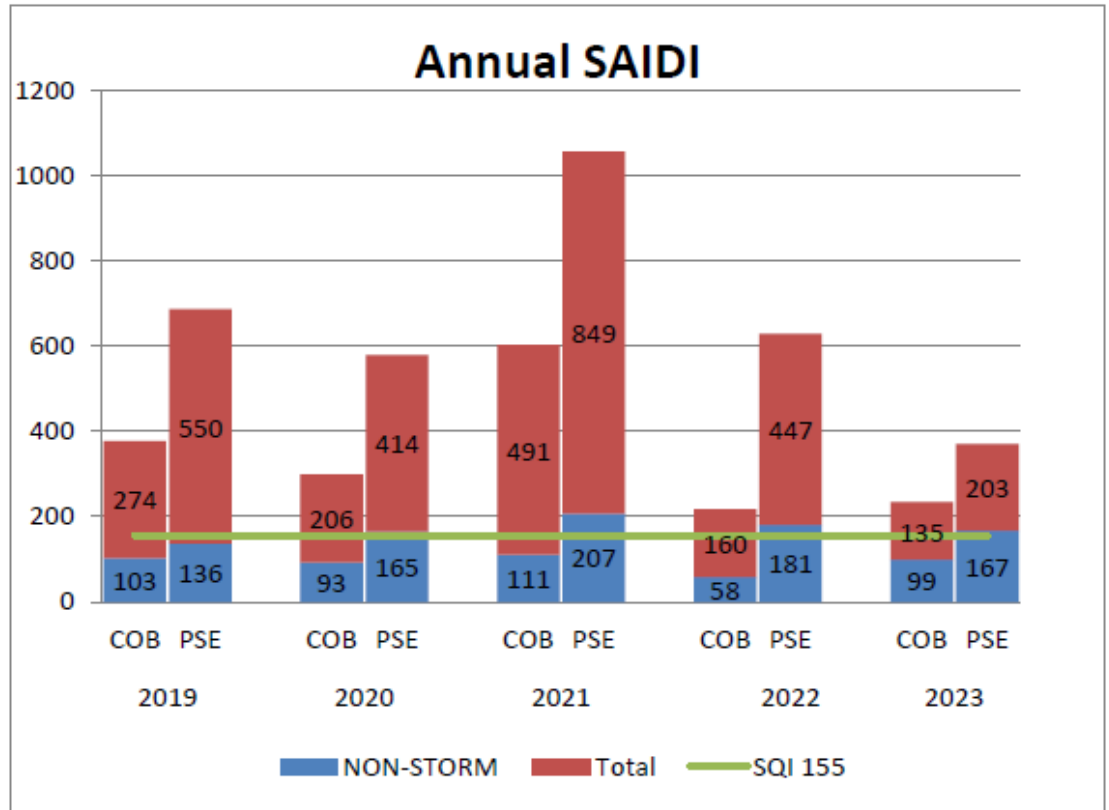
Overview

Performance

5 Year History

Bellevue & PSE System

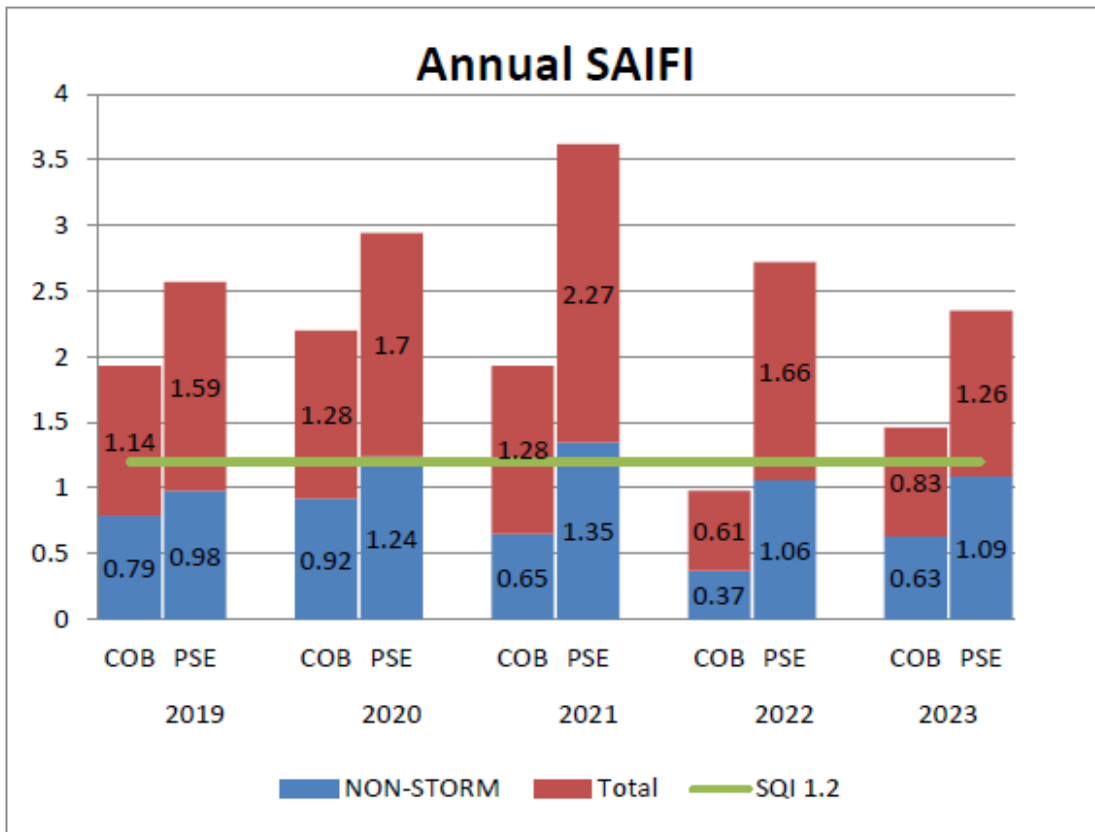
SAIDI



Values in minutes for all years calculated using IEEE 1366 method

Overview Performance 5 Year History

Bellevue & PSE System SAIFI



Values in outage events for all years

Overview Performance By Circuit

Circuits Exceeding Performance Metrics

Circuits Exceeding System SAIDI and/or SAIFI 2019 - 2023

Bellevue is served by 99 distribution circuits from 23 substations.

For 2023: 83% (82) circuits performed better than system average

17% (17) circuits performed below the system average

Excerpt from report:

CIRCUIT	Repeat Counts					Repeat Counts				
	2019	2020	2021	2022	2023	1	2	3	4	5
ARD-13							2			
ARD-15							2			
BTR-21							2			
BTR-22										5
BTR-23							2			
CEN-11						1				
CEN-25						1				
CLY-22						1				
CLY-23						1				
CLY-25						1				
CLY-26						1				
CLY-27						1				

Totals	40	26	22	13	17	30	26	9	1	1
	2019	2020	2021	2022	2023	45%	39%	13%	1%	1%

Overview

Bellevue Circuits Exceeding System Wide Performance in 2023

Bellevue circuits with SAIDI or SAIFI exceeding system wide figures in 2023

CIRCUITS THAT EXCEED 2023 PSE SYSTEM SAIDI AND/OR SAIFI		CIRCUITS THAT EXCEED 2023 PSE SYSTEM SAIDI AND/OR SAIFI		Actions & Projects Completed in 2023		Planned Actions & Projects	
CIRCUIT	SAIDI	CIRCUIT	SAIDI	SAIFI			
SYSTEM SAIDI = 156 PSE: SAIDI = 167 BELLEVUE: SAIDI = 155 SQI: SAIDI = 155 SAIFI = 1.20 PSE: SAIDI = 167 SAIFI = 1.09 BELLEVUE: SAIDI = 99 SAIFI = 0.63							
2023 Events Comments							
Actions & Projects Completed in 2023							
Planned Actions & Projects							
SOM-16	722.51	SOM-16	722.51	4.68			
SBE-22	381.07	SBE-22	381.07	2.00			
NOB-22	324.80	NOB-22	324.80	1.75			

- Figure exceeded Service Quality Index
- Figure exceeded system wide average
- Figure exceeding system wide average and Service Quality Index



Overview Performance By Circuit

Bellevue Circuits Performance in 2023

2023 PERFORMANCE FOR CIRCUITS SERVING BELLEVUE EXCLUDING STORM OUTAGES

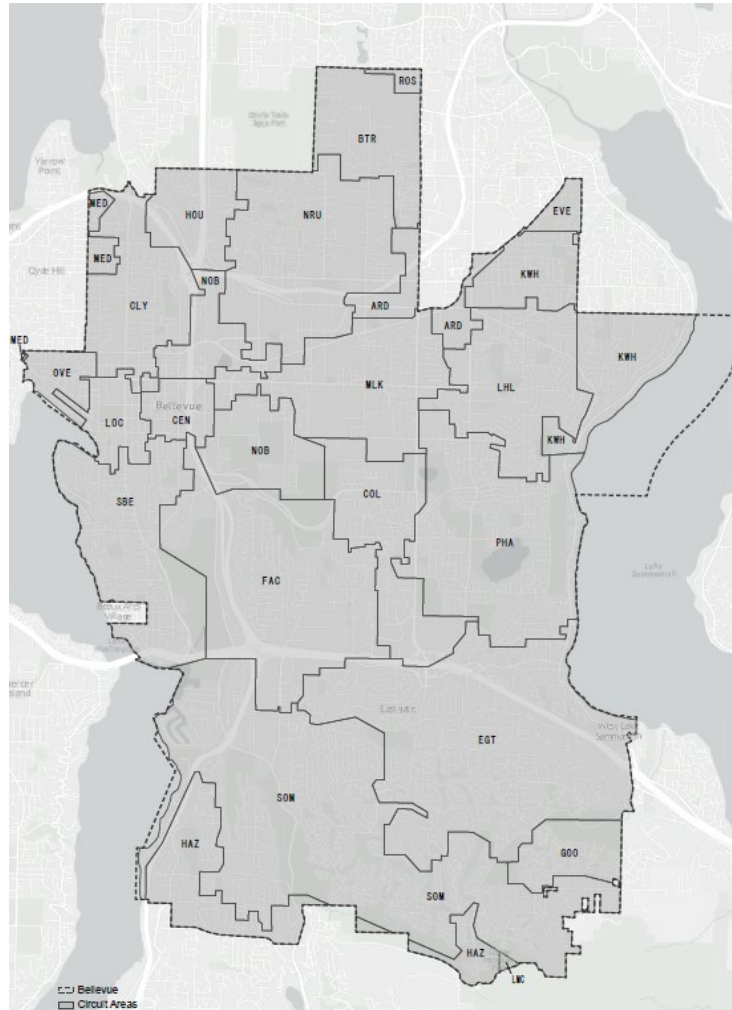
CIRCUIT	CUSTOMERS (METERS)	UNPLANNED OUTAGES ¹	OUTAGE MINUTES ¹	SAIDI ²	SAIFI ²
<i>2023 PSE Companywide performance figures</i>				167	1.09

Excerpt from report:

LOC-20	11	0	0	0.00	0.00
LOC-22	2,820	2	19,364	59.47	0.21
LOC-23	1,737	3	22,452	12.93	0.02
LOC-24	46	0	0	0.00	0.00
LOC-25	153	0	0	0.00	0.00
LOC-32	230	0	0	0.00	0.00
LOC-33	292	1	34	31.73	0.16
LOC-34	411	0	0	7.96	0.02 ⁵
LOC-35	21	0	0	0.00	0.00
MED-35	189	2	169	4.07	0.04
MED-36	680	6	10,113	21.13	0.09
MLK-12	429	4	59,316	140.38	1.16 ³
MLK-13	1,441	9	231,385	162.96	0.66 ³
MLK-15	1,625	6	234,679	154.24	0.36 ³
MLK-16	1,607	9	34,866	25.30	0.13 ³

- Figures exclude Major Event Day and Major Storm outages.
- SAIDI & SAIFI are 2023 single year figures calculated using the IEEE 1366
- Includes one circuit outage resulting from substation bank outage.
- Includes one circuit outage resulting from transmission line outage.
- SAIDI & SAIFI figures greater than zero reflect inclusion of scheduled outages (including customer requested outages).

Bellevue Substation Service Areas



Overview

2023 Performance

Bellevue Outages by Cause

We analyze and report outages by outage cause:

2023 OUTAGES FOR CIRCUITS SERVING BELLEVUE EXCLUDING STORM OUTAGES

BY CAUSE

CAUSE CODE	CAUSE DESCRIPTION	OUTAGES		OUTAGE MINUTES	
		COUNT	PERCENT	COUNT	PERCENT
AC	ACCIDENT	6	0.7%	146,374	1.7%
BA	BIRD OR ANIMAL	71	8.8%	120,491	1.4%
CE	CUSTOMER EQUIPMENT	5	0.6%	20,906	0.2%
CP	CAR/EQUIP ACCIDENT	11	1.4%	230,116	2.6%
DU	DIG UP UNDERGROUND	7	0.9%	12,136	0.1%
EF	EQUIPMENT FAILURE	402	49.9%	2,906,505	33.4%
FI	FAULTY INSTALLATION	1	0.1%	161	0.0%
LI	LIGHTNING	3	0.4%	9,968	0.1%
OE	OUTAGE WHILE WORKING	1	0.1%	34	0.0%
SO	SCHEDULED OUTAGE	170	21.1%	781,954	9.0%
TO	TREE - ON RIGHT OF WAY	1	0.1%	655	0.0%
TV	TREE - RIGHT OF WAY UNKNOWN	101	12.5%	4,346,747	49.9%
UN	UNKNOWN CAUSE	25	3.1%	133,367	1.5%
(blank)	BLANK	1	0.1%	515	0.0%
Totals		805	100%	8,709,929	100%

Overview

2023 Performance

Bellevue Outages by Equipment Involved

As well as by equipment involved:

BY EQUIPMENT

EQUIP CODE	EQUIPMENT DESCRIPTION	OUTAGES		OUTAGE MINUTES	
		COUNT	PERCENT	COUNT	PERCENT
ACE	ALL CUSTOMER EQUIPMENT	29	3.6%	376,063	4.3%
FSV	FUSES/SAVER	1	0.1%	890	0.0%
OAR	OVERHEAD ARRESTER	3	0.4%	18,179	0.2%
OCN	OVERHEAD SECONDARY CONNECTOR	12	1.5%	2,998	0.0%
OCO	OVERHEAD CONDUCTOR	51	6.3%	2,353,435	27.0%
OCR	OVERHEAD CROSSARM	9	1.1%	1,013,292	11.6%
OFC	OVERHEAD CUT-OUT	5	0.6%	5,709	0.1%
OFU	OVERHEAD LINE FUSE / FUSE LINK	59	7.3%	445,586	5.1%
OIN	OVERHEAD INSULATOR	6	0.7%	215,084	2.5%
OJU	OVERHEAD JUMPER WIRE	2	0.2%	324,213	3.7%
OMP	OVERHEAD METER POINT	2	0.2%	220	0.0%
OPI	OVERHEAD INSULATOR PIN	2	0.2%	3,507	0.0%
OPO	OVERHEAD POLE	55	6.8%	536,434	6.2%
OSV	OVERHEAD SERVICE	31	3.9%	36,947	0.4%
OSW	OVERHEAD SWITCH	14	1.7%	45,504	0.5%
OTF	OVERHEAD TRANSFORMER FUSE	70	8.7%	44,164	0.5%
OTR	OVERHEAD TRANSFORMER	40	5.0%	79,261	0.9%
PTF	PADMOUNT TRANSFORMER FUSE	1	0.1%	327	0.0%
SCB	POWER CIRCUIT BREAKER	3	0.4%	477,486	5.5%
UEL	UNDERGROUND ELBOW	30	3.7%	209,226	2.4%
UFJ	UNDERGROUND J-BOX	11	1.4%	147,455	1.7%
UGF	UNDERGROUND SUBMERSIBLE FUSE	6	0.7%	34,502	0.4%
UHH	UNDERGROUND HANDHOLE - SECONDARY	27	3.4%	7,053	0.1%
UMP	UNDERGROUND METER POINT	3	0.4%	261	0.0%
UOT	UNDERGROUND OUTDOOR TERMINATION	20	2.5%	153,895	1.8%
UPC	UNDERGROUND PRIMARY CABLE	103	12.8%	1,392,824	16.0%
UPS	UNDERGROUND PADMOUNT SWITCH	11	1.4%	187,897	2.2%
UPT	UNDERGROUND PADMOUNT TRANSFORMER	31	3.9%	192,404	2.2%
USC	UNDERGROUND SECONDARY CABLE	7	0.9%	3,432	0.0%
USE	UNDERGROUND SECONDARY CONNECTOR	1	0.1%	701	0.0%
USV	UNDERGROUND SERVICE	91	11.3%	109,054	1.3%
UTC	UNDERGROUND TERMINAL FUSE	3	0.4%	7,578	0.1%
UTF	UNDERGROUND TRANSFORMER FUSE	1	0.1%	10	0.0%
UTR	UNDERGROUND TRANSFORMER	41	5.1%	207,252	2.4%
(blank)	BLANK	24	3.0%	77,086	0.9%
Totals		805	100%	8,709,929	100%

Bellevue System

Reliability Projects Completed 2022-2023

PSE develops and constructs system improvement projects and maintains its system to address identified reliability needs. In 2022-2023 we completed:

- FuseSavers on Phantom Lake-16, Eastgate-27, and Eastgate-28
- Underground cable replacement projects on Factoria-12, Eastgate-28, Evergreen-23, and College-26
- Distribution Automation scheme that includes Houghton-25, North Bellevue-12, North Bellevue-24, Northup-25, and Northup-26
- A total of 8 projects were completed with a total investment of about \$4,000,000.

Bellevue System

Proposed Reliability Projects

PSE has identified and is working on these improvement projects for construction in the near future:

- SCADA capable circuit breakers in the Northrup substation
- Bridle Trails 22 overhead to underground conversion along 132nd Ave NE
- 8 FuseSaver projects
- 10 underground cable replacement projects engineered for 2024 construction
- Somerset -16 & 17, Eastgate-15, Hazelwood-13, and Eastgate-28 Distribution Automation
 - Eastgate-28 will be added in to the DA scheme
- 7 Bellevue circuits being evaluated for Distribution Automation to be built in 2027.

Bellevue System

Transmission System Improvements

Completed ...

- ◆ **Sammamish – Juanita 115kV line (12/2023)** - new 115 kV line from Sammamish substation to Juanita substation to relieve loading on the transmission lines feeding Moorland area.

In Construction ...

- ◆ **Energize Eastside 230kV (End of 2024)** – Upgrading transmission lines along an existing corridor and constructing a new transmission substation. Construction of the substation is complete and construction of the transmission lines between Richards Creek substation and Sammamish substation is underway, with completion anticipated in 2024.

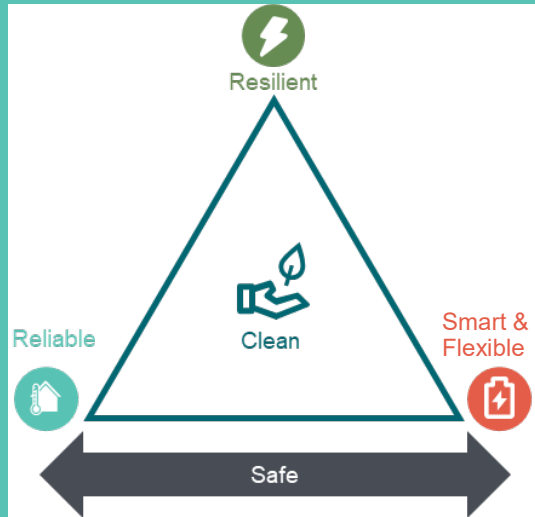
Bellevue System

Transmission System Improvements

Proposed ...

- ◆ **Vernell Substation (2028)** – New integrated 115kV transmission switching station and distribution substation to support Bellevue CBD and Spring District development. Proposed project will extend new 115 kV transmission from Vernell substation to Bellevue CBD (Lochleven substation or Clyde Hill substation) to improve transmission connectivity and reliability to Bellevue CBD.
- ◆ **Midlakes Substation (2027)** – Add 2nd 115-12.5 kV distribution bank at the Midlakes substation to relieve loading stress on substations feeding downtown Bellevue being caused by growing loads.
- ◆ **Richards Creek Substation (2028 or beyond)** - Add 2nd 230-115kV transformer at Richards Creek Substation to mitigate risk for overloads in specific system configurations.

PSE System Smart & Flexible Enhancements



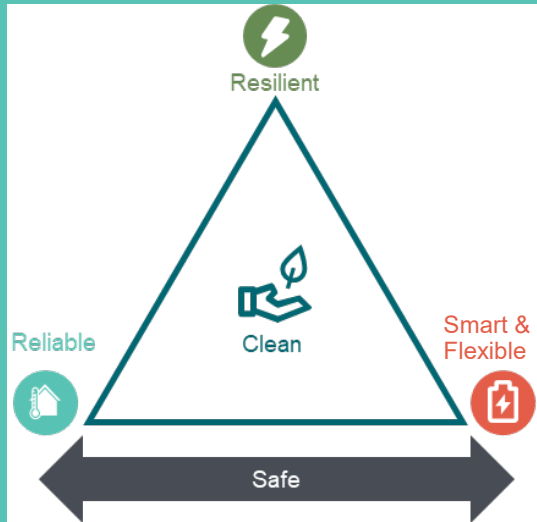
Foundational ...

- ◆ **Advanced Metering Infrastructure (AMI)** – Complete in Bellevue!

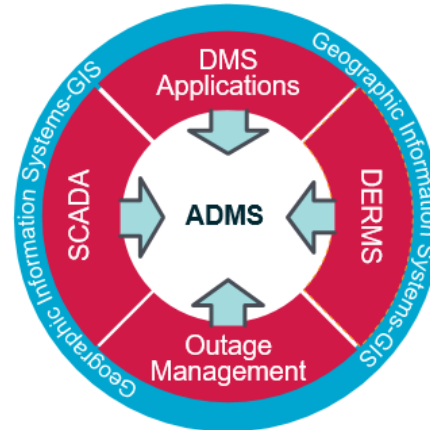
Automation ...

- ◆ **Distribution Automation (DA)** – To date we have implemented DA on 95 distribution feeders system wide. 18 DA projects are in engineering or construction in 2021 company wide, including projects in the City of Bellevue.
- ◆ **Distribution SCADA Switchgear** - 66 switches in the Bellevue CBD area get SCADA and EMS integration to allow monitoring and control of distribution system configuration to respond to system events in real time. 37 switch upgrades are complete. 5 more switches are expected to be upgraded by the end of 2022. These upgrades will facilitate future DA implementation in the CBD.

PSE System Smart & Flexible Enhancements



- ◆ Future (in progress) ...
Advanced Distribution Management System (ADMS)
Computer based decision support system used to supervise, manage and control real-time operation of the distribution system network.
- ◆ Implementation ongoing with full deployment expected in 2024.
- ◆ ADMS will replace our current outage management system (OMS) and Distribution Automation (DA) platforms.




DERMS: Distributed Energy Resources Management System

SCADA: Supervisory Control & Data Acquisition

Wrapping Up

Thank You for Attending

Questions & Discussion

A photograph of several wind turbines silhouetted against a sunset sky. The sun is low on the horizon, creating a warm orange and yellow glow. The turbines are scattered across a dark landscape. The image is framed with rounded corners and a white border.

2023 Electric System Reliability Review

Thank You for attending!

Additional Resources

- ◆ Energy Supply Procurement Information:
<https://www.pse.com/en/pages/energy-supply/acquiring-energy>
- ◆ Integrated Resource Plan:
<https://www.pse.com/irp>