City of Bellevue
2024 Electric System Reliability Review

Justin McConachie
Senior Municipal Liaison Manager

Ryan Yelle
Supervisor System Planning - Reliability

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PSE PUGET SOUND ENERGY

Safety Moment

Electric System Safety

Never approach downed utilities lines – they may be live

Stay at least 30 feet away from lines and anything in contact with them

Workshop Purpose

2024 Electric System Performance Overview

- PSE's reliability strategy
- Overall performance review
- System automation initiatives
- Reliability projects completed and proposed

PSE implements a comprehensive reliability strategy of actions and improvements in four areas

Asset Management	Improve reliability by hardening the grid against trees/vegetation and other risks, such as wildfire, by preventing or mitigating equipment failure through cost effective maintenance and replacement programs.
Vegetation Management	Reduce likelihood of trees/vegetation contacting and/or inflicting physical damage to the delivery system, including grid hardening measures such as overhead to underground conversion and tree trimming.
Restoration Services	Improve response and restoration times when outages occur through improved situational awareness, automation and operational efficiencies.
Metrics and Analytics	Monitor and assess system performance and identify areas of greatest concern.

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

SQI targets exclude Major Event Days (MED), or are non-MED.

Bellevue & PSE System 5-Year Performance History

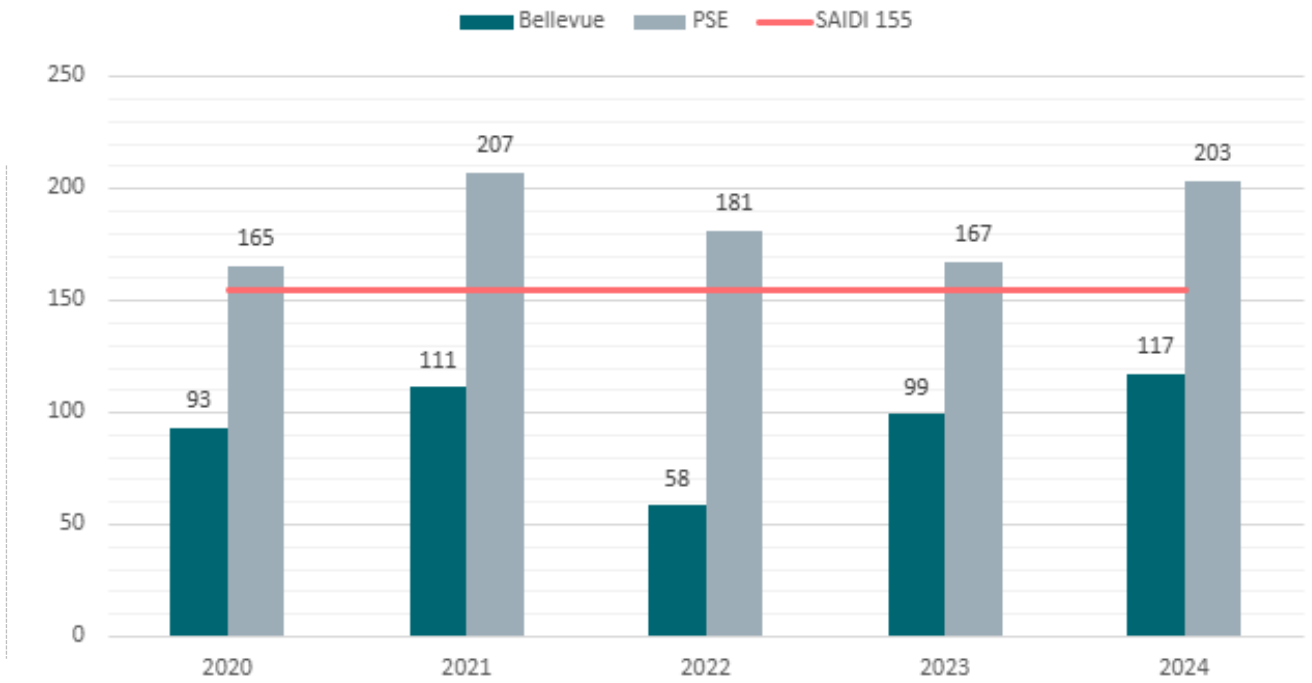
Bellevue performance compared to the PSE system performance for the past 5 years using the two standard benchmarks non-MED **SAIDI** and non-MED **SAIFI**

	SAIDI		SAIFI	
	BELLEVUE	PSE	BELLEVUE	PSE
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
2024	117.4	203.0	0.60	1.22

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

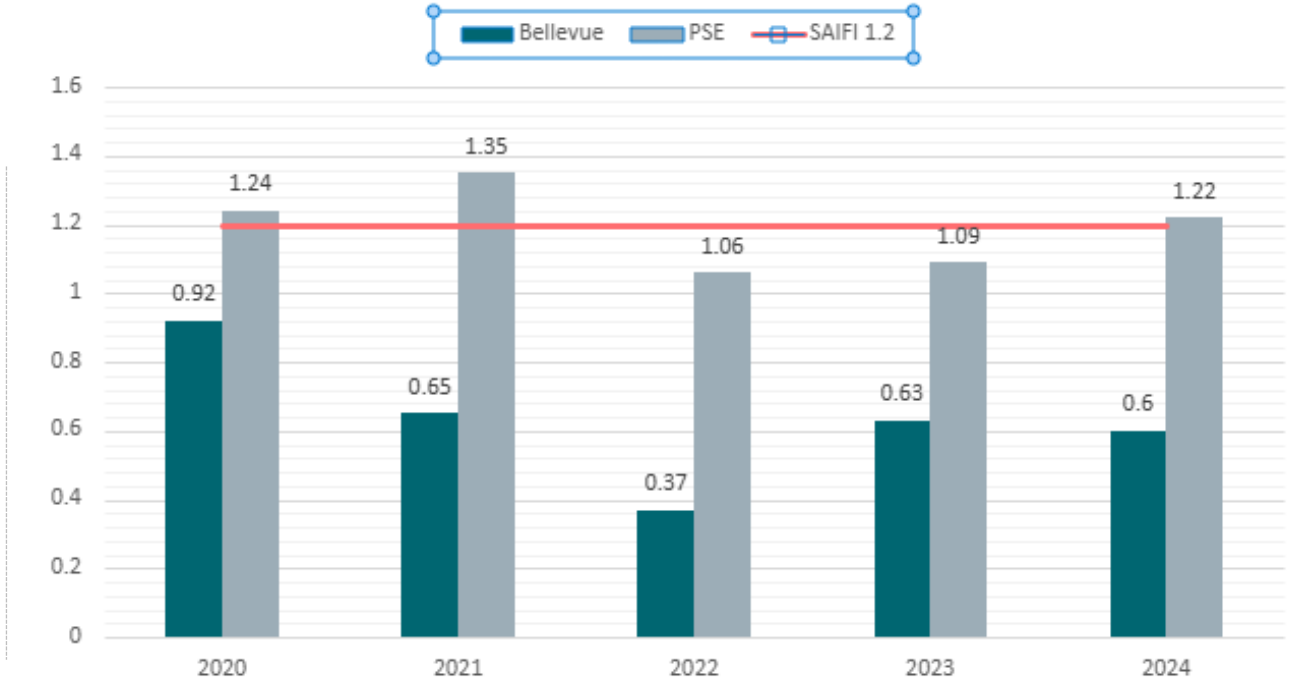
5-Year SAIDI Performance Visualized

Bellevue non-MED **SAIDI** comparison to PSE Performance 2020 - 2024 (excluding storm events)



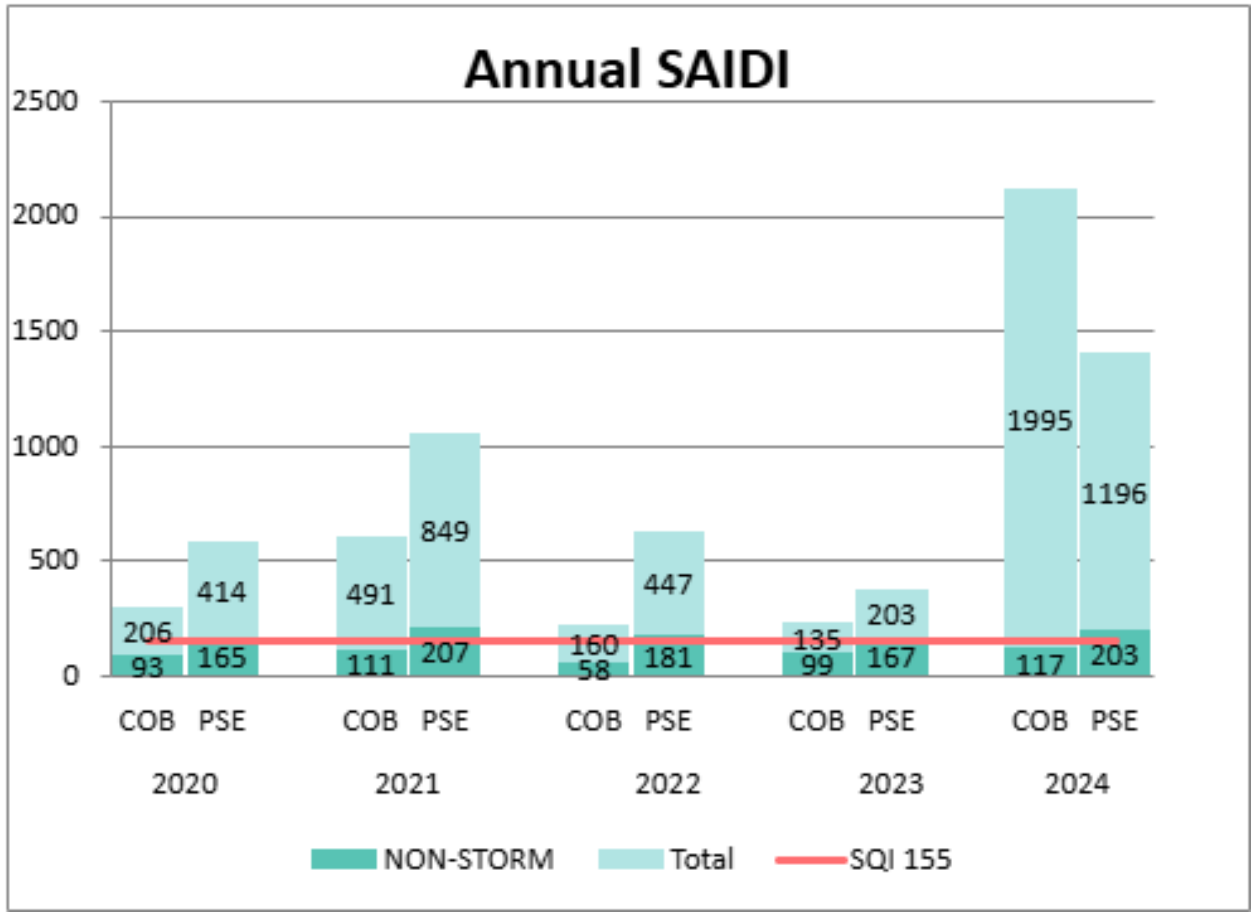
5-Year SAIFI Performance Visualized

Bellevue non-MED **SAIFI** comparison to PSE Performance 2020 - 2024 (excluding storm events)



5-Year SAIDI Performance Visualized

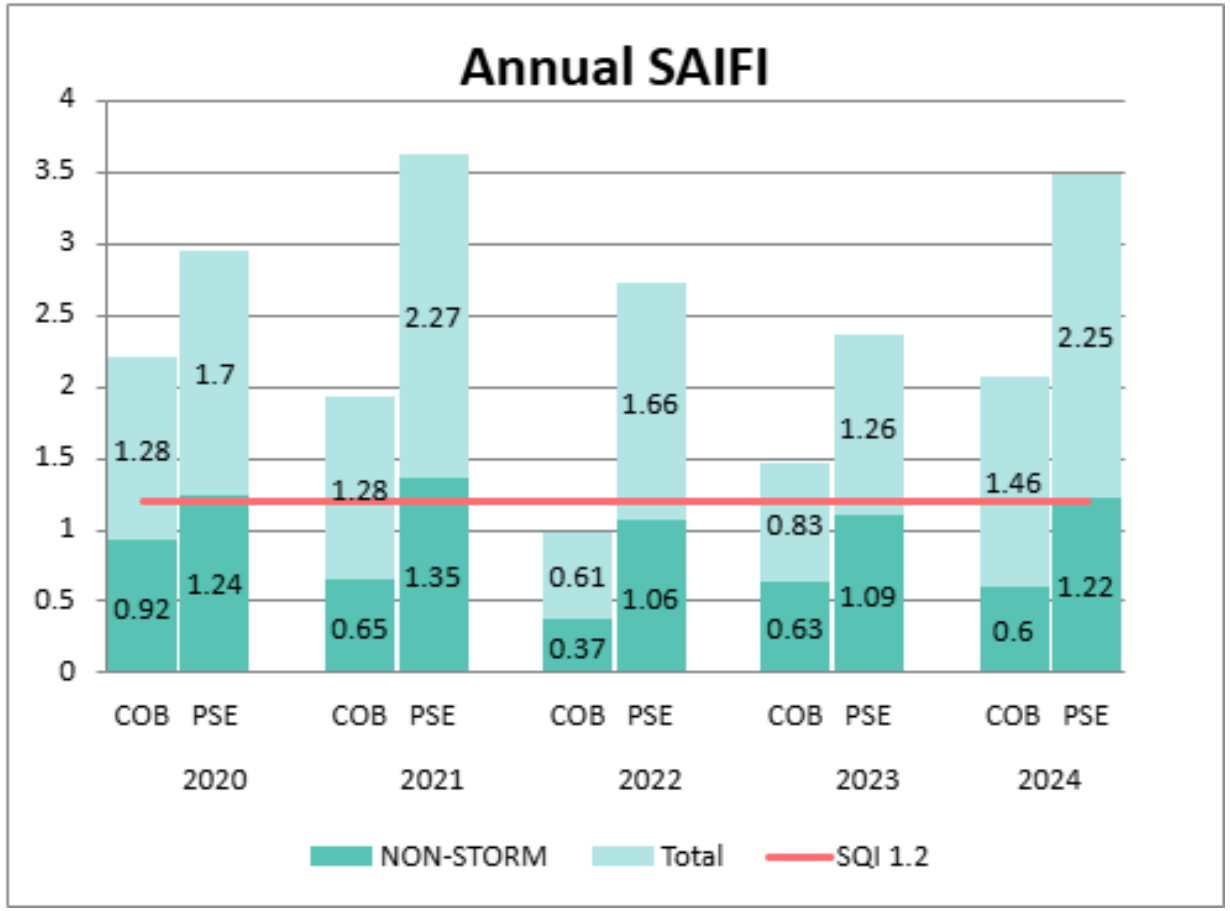
Bellevue non-MED and all-in **SAIDI** comparison to PSE Performance 2020 - 2024



Values in minutes for all years calculated using IEEE 1366 methodology

5-Year SAIFI Performance Visualized

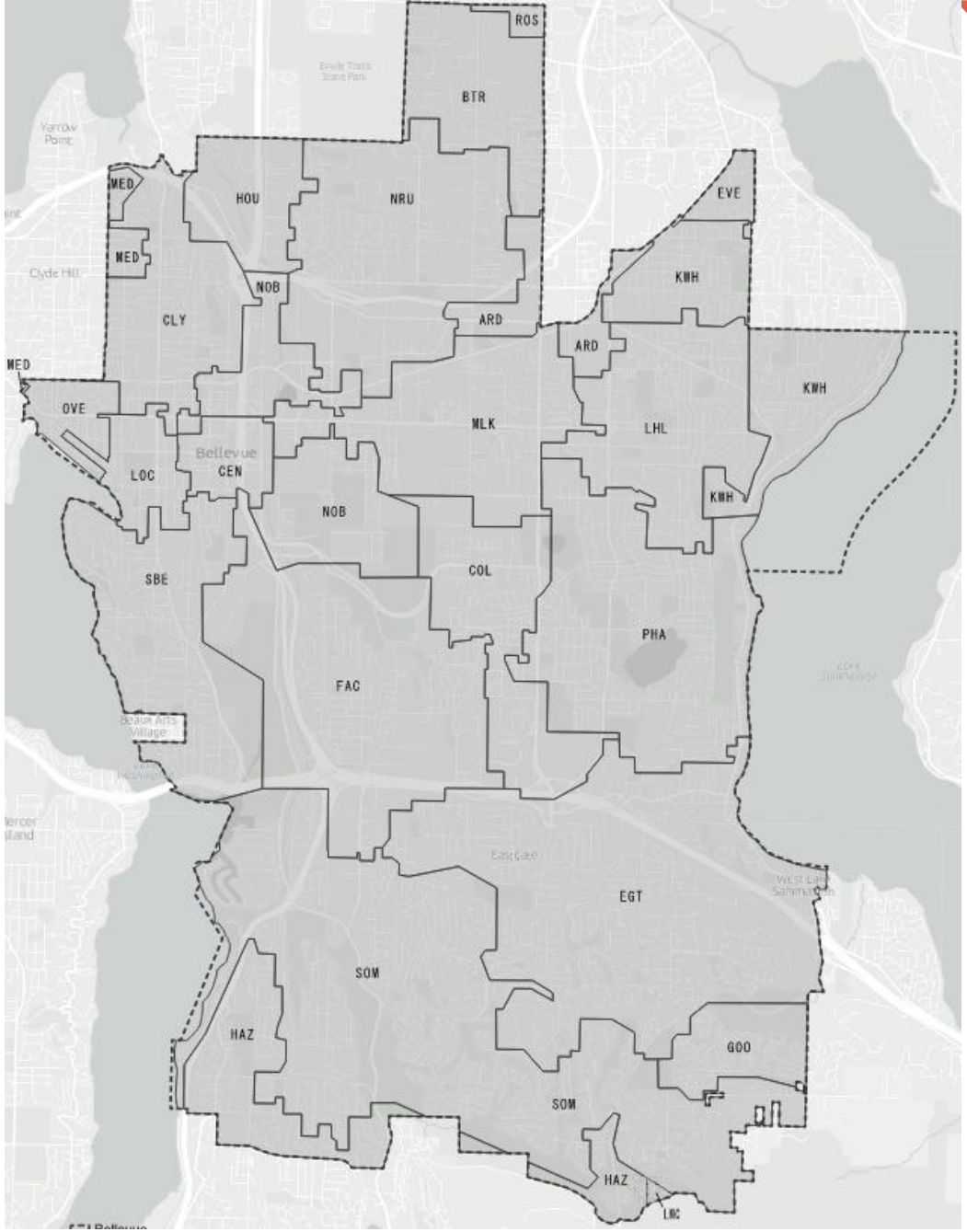
Bellevue non-MED and all-in **SAIFI** comparison to PSE Performance 2020 - 2024



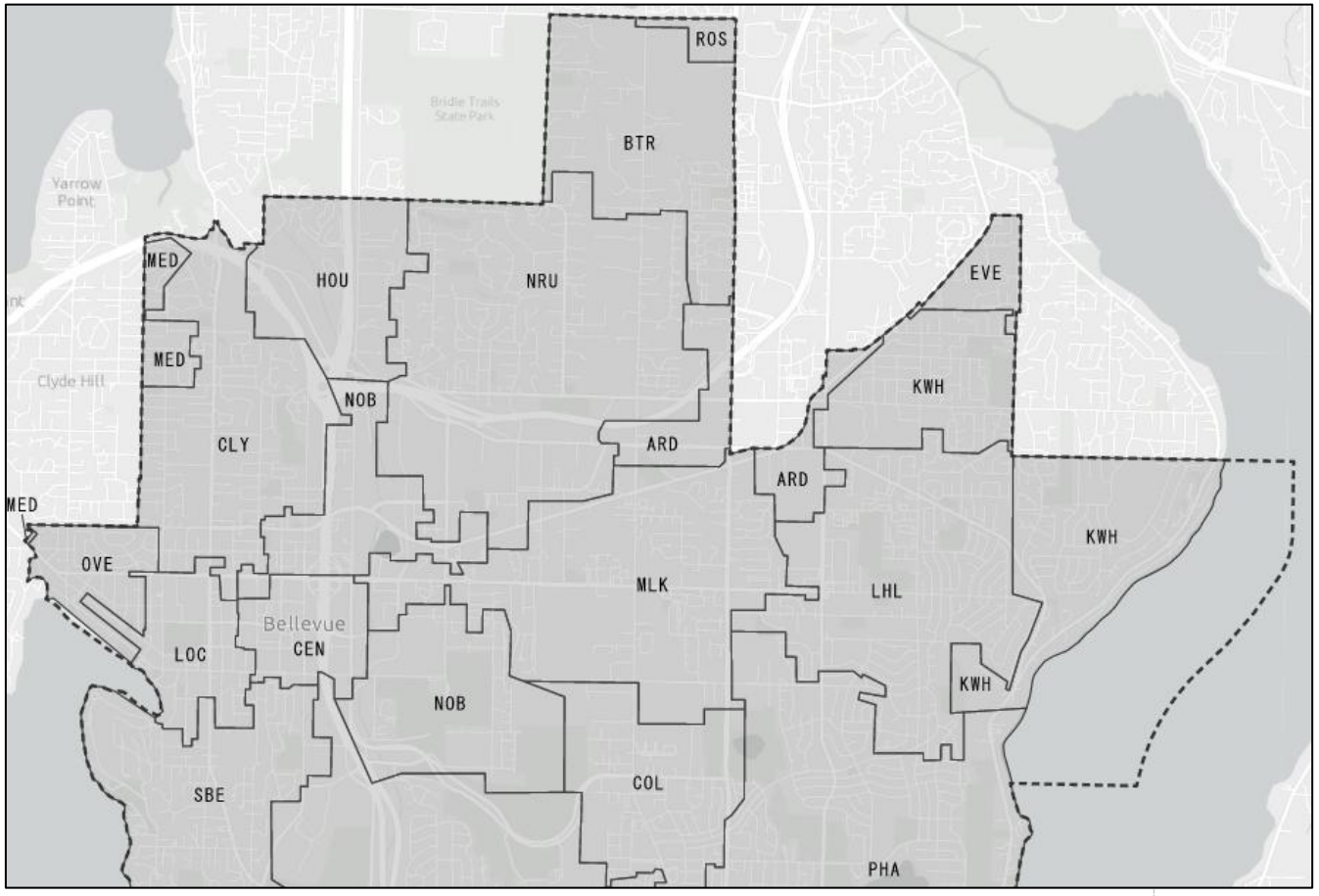
Values in minutes for all years calculated using IEEE 1366 method

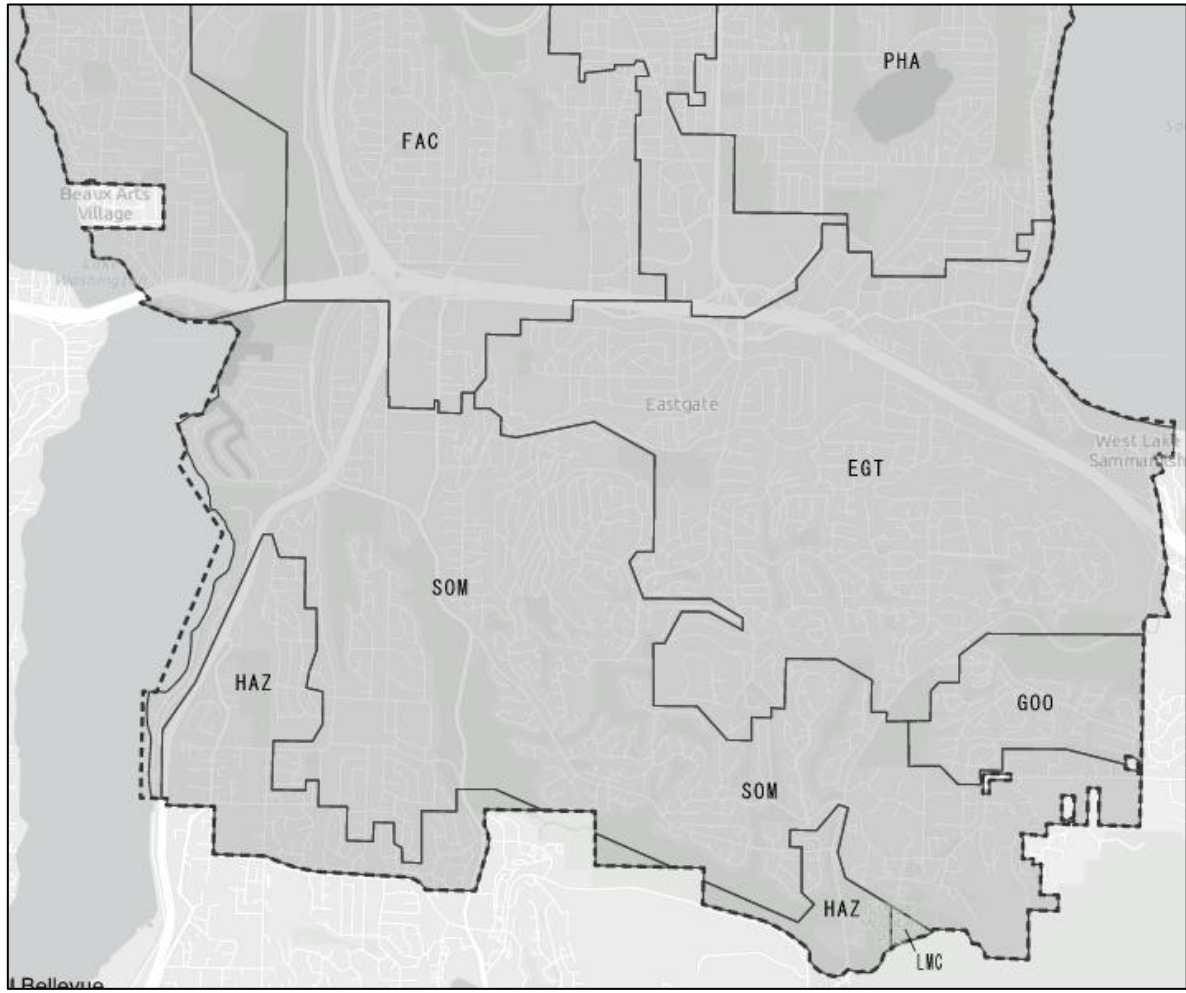
Bellevue Substation Service Areas

Bellevue's distribution circuits are served by 23 substations



Bellevue Substation Service Areas





Performance By Circuit – Circuits Exceeding Metrics 2020 - 2024

- Bellevue is served by 99 distribution circuits
- For 2024:
  - 85% (84) circuits performed better than SAIDI and/or SAIFI system average
  - 15% (15) circuits exceeded the SAIDI and/or SAIFI system average
  - 24% (24) circuits exceeded the Service Quality Index
- From 2020 – 2024:
  - 33 circuits exceeded the system wide average one of five years
  - 17 circuits exceeded the system wide average two of five years
  - 7 circuits exceeded the system wide average three of five years
  - 0 circuits exceeded the system wide average four of five years
  - 1 circuit exceeded the system wide average five of five years

CIRCUITS THAT EXCEED 2024 PSE SYSTEM SAIDI AND/OR SAIFI SQI: SAIDI = 155 SAIFI = 1.20 PSE: SAIDI = 203 SAIFI = 1.22 BELLEVUE: SAIDI = 117 SAIFI = 0.60		
CIRCUIT	SAIDI	SAIFI
Circuits with planned actions or investigations		
SOM-16	892.18	3.77
LOC-35	527.23	0.73
EGT-25	504.28	4.93
NOB-21	495.80	0.40
BTR-21	418.47	0.84
LHL-22	367.97	0.63
OVE-15	275.40	0.92
KWH-23	263.65	0.65
BTR-22	247.34	1.06
SOM-13	239.53	1.49
PHA-16	235.46	1.27
MED-36	232.75	0.86
LOC-24	229.04	1.88
HOU-23	223.37	1.73
SBE-26	184.14	0.53
NOB-12	177.33	1.16
HAZ-12	176.59	1.14
NRU-14	175.42	0.53
SOM-17	174.94	1.04
COL-23	173.06	0.42
SOM-15	172.66	1.01
FAC-24	158.37	0.34
EVE-23	156.53	0.53
HOU-25	152.7	1.61

Figure exceeded Service Quality Index

Figure exceeded system wide average

Figure exceeding system wide average and Service Qaulity Index

Bellevue Circuits Performance in 2024

The table lists out performance data for each distribution circuit serving Bellevue customers

2024 PERFORMANCE FOR CIRCUITS SERVING BELLEVUE
EXCLUDING STORM OUTAGES

CIRCUIT	CUSTOMERS (METERS)	UNPLANNED OUTAGES[1]	OUTAGE MINUTES[1]	SAIDI[2]	SAIFI[2]	
2024 PSE Companywide performance figures				*203*	*1.22*	
FAC-12	1,268	7	2,026	1.60	0.01	
FAC-13	551	1	256	1.19	0.02	
FAC-14	478	0	0	0.00	0.00	
FAC-21	98	0	0	3.51	0.05	
FAC-23	410	0	0	6.81	0.02	
FAC-24	87	1	13,778	158.37	0.34	
FAC-25	1,498	5	24,534	23.69	0.15	
GOO-13	2,269	8	225,748	99.69	1.04	
HAZ-12	3,367	21	590,556	176.59	1.14	3
HAZ-13	1,261	11	82,584	68.91	0.39	
HOU-23	1,188	11	265,362	223.37	1.73	3
HOU-25	649	12	98,683	152.66	1.61	3
KWH-22	1,257	8	42,230	45.72	0.22	
KWH-23	923	12	240,655	263.65	0.65	
KWH-25	1,664	21	31,789	19.20	0.11	
KWH-26	378	8	29,388	77.75	0.46	
LHL-22	1,017	13	373,489	367.97	0.63	
LHL-23	1,388	3	39,029	28.60	0.17	
LHL-25	2,523	11	56,778	33.70	0.12	
LHL-26	549	7	15,298	29.28	0.32	

Excerpt from report:

1 Figures exclude Major Event Day and Major Storm outages.

2 SAIDI & SAIFI are 2024 single year figures calculated using the IEEE 1366

3 Includes one circuit outage resulting from transmission line outage.

2024 Outage Cause & Equipment Type Analysis

We analyze and report outages by outage cause:

CAUSE CODE	CAUSE DESCRIPTION	OUTAGES COUNT	OUTAGES PERCENT	OUTAGE MINUTES COUNT	OUTAGE MINUTES PERCENT
AC	ACCIDENT	7	1.0%	18,962	0.2%
AV	ACCIDENT/VANDALISM NOT RESULTING IN DC	1	0.1%	898	0.0%
BA	BIRD OR ANIMAL	50	6.9%	246,230	2.4%
CE	CUSTOMER EQUIPMENT	1	0.1%	943	0.0%
CP	CAR/EQUIP ACCIDENT	6	0.8%	105,929	1.0%
CR	CUSTOMER REQUEST	1	0.1%	3,143	0.0%
DU	DIG UP UNDERGROUND	15	2.1%	88,325	0.9%
EF	EQUIPMENT FAILURE	297	41.0%	1,966,893	19.2%
FI	FAULTY INSTALLATION	7	1.0%	7,110	0.1%
LI	LIGHTNING	5	0.7%	4,981	0.0%
ND	NATURAL DISASTER	2	0.3%	2,829	0.0%
OD	OUTSIDE UTILITY SOURCE	1	0.1%	2,345	0.0%
OE	OUTAGE WHILE WORKING	1	0.1%	990	0.0%
SO	SCHEDULED OUTAGE	162	22.4%	570,310	5.6%
TV	TREE - RIGHT OF WAY UNKNOWN	141	19.5%	5,247,384	51.2%
UN	UNKNOWN CAUSE	24	3.3%	1,966,912	19.2%
VA	VANDALISM	3	0.4%	7332	0.1%
	Totals	724	100%	10,241,516	100%

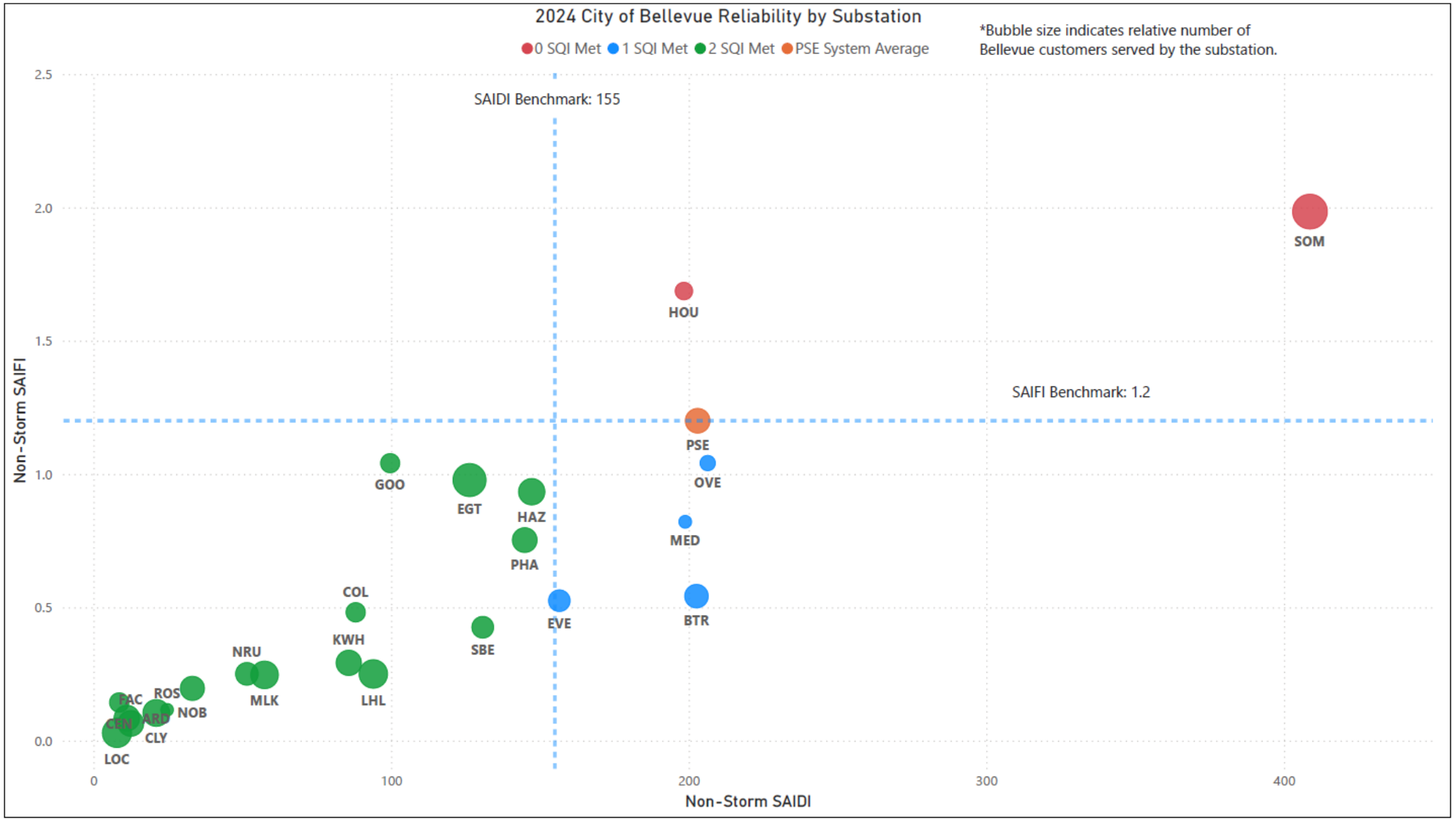
As well as by equipment involved:

EQUIP CODE	EQUIPMENT DESCRIPTION	OUTAGES COUNT	OUTAGES PERCENT	OUTAGE MINUTES COUNT	OUTAGE MINUTES PERCENT
ACE	ALL CUSTOMER EQUIPMENT	12	1.7%	16,612	0.2%
FSV	FUSESAVER	1	0.1%	15,050	0.1%
OAR	OVERHEAD ARRESTER	3	0.4%	209,220	2.0%
OCN	OVERHEAD SECONDARY CONNECTOR	12	1.7%	3,103	0.0%
OCO	OVERHEAD CONDUCTOR	96	13.3%	4,734,789	46.2%
OCR	OVERHEAD CROSSARM	12	1.7%	697,783	6.8%
OFC	OVERHEAD CUT-OUT	3	0.4%	67,301	0.7%
OFU	OVERHEAD LINE FUSE / FUSE LINK	29	4.0%	271,727	2.7%
OHR	OVERHEAD RECLOSER	2	0.3%	3,617	0.0%
OIN	OVERHEAD INSULATOR	19	2.6%	2,010,815	19.6%
OJU	OVERHEAD JUMPER WIRE	1	0.1%	14,955	0.1%
OMP	OVERHEAD METER POINT	4	0.6%	553	0.0%
OPO	OVERHEAD POLE	34	4.7%	242,707	2.4%
OSV	OVERHEAD SERVICE	33	4.6%	39,540	0.4%
OSW	OVERHEAD SWITCH	13	1.8%	79,053	0.8%
OTF	OVERHEAD TRANSFORMER FUSE	55	7.6%	43,491	0.4%
OTR	OVERHEAD TRANSFORMER	52	7.2%	134,978	1.3%
PMP	PADMOUNT METER POINT	1	0.1%	81	0.0%
SPT	STATION POWER TRANSFORMER	2	0.3%	91,706	0.9%
UEL	UNDERGROUND ELBOW	18	2.5%	195,962	1.9%
UFJ	UNDERGROUND J-BOX	12	1.7%	99,529	1.0%
UGF	UNDERGROUND SUBMERSIBLE FUSE	2	0.3%	12,360	0.1%
UGV	UNDERGROUND VAULT	3	0.4%	14,004	0.1%
UHH	UNDERGROUND HANDHOLE - SECONDARY	31	4.3%	22,557	0.2%
UMP	UNDERGROUND METER POINT	4	0.6%	975	0.0%
UOT	UNDERGROUND OUTDOOR TERMINATION	15	2.1%	93,284	0.9%
UPC	UNDERGROUND PRIMARY CABLE	72	9.9%	779,737	7.6%
UPS	UNDERGROUND PADMOUNT SWITCH	9	1.2%	119,216	1.2%
UPT	UNDERGROUND PADMOUNT TRANSFORMER	34	4.7%	90,552	0.9%
USC	UNDERGROUND SECONDARY CABLE	29	4.0%	25,670	0.3%
USV	UNDERGROUND SERVICE	80	11.0%	42,227	0.4%
UTR	UNDERGROUND TRANSFORMER	31	4.3%	68,362	0.7%
	Totals	724	100%	10,241,516	100%

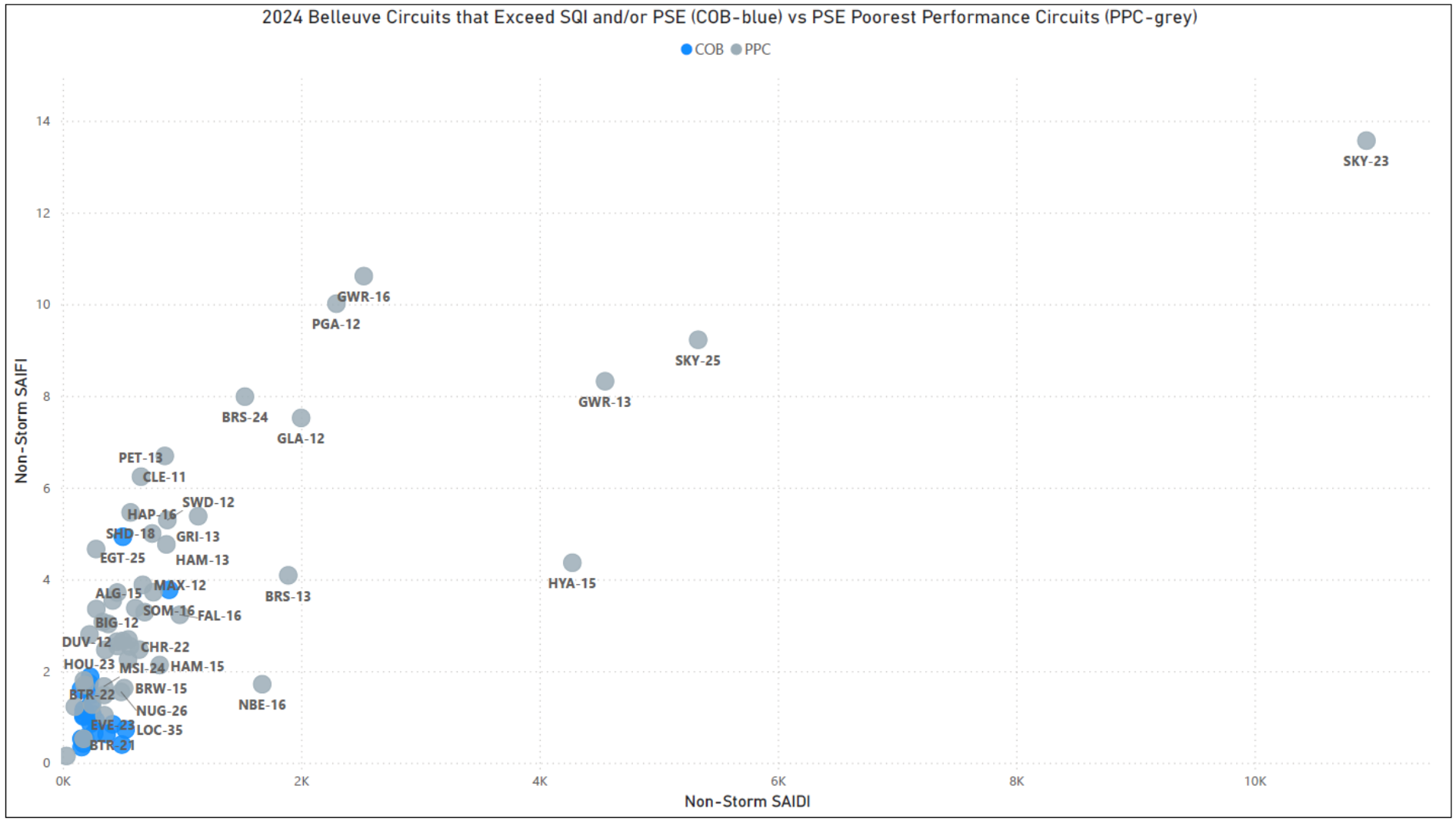
New Report Elements

- In last year's workshop PSE received feedback from Bellevue residents on suggested ways the data and report could further convey PSE's reliability performance.
  - Visual showing substation reliability performance
  - Graphics showing Bellevue circuit performance relative to system wide circuits
  - Circuit map
  - Project map – plot projects on a map of Bellevue
  - 5-year trends
  - Resiliency metrics given how high the all-in metrics are
- PSE has incorporated some of these recommendations and produced several new graphics in this year's report:
  - Plots showing SAIDI and SAIFI performance by Bellevue substation and Bellevue's underperforming circuits compared with PSE's poorest performing circuits
  - Graphs measuring SAIDI and SAIFI performance placement of Bellevue circuits within overall poorest performing circuits
  - SAIDI and SAIFI over the last 5 years by circuit to show trends over time

2024 Reliability Performance by Substation

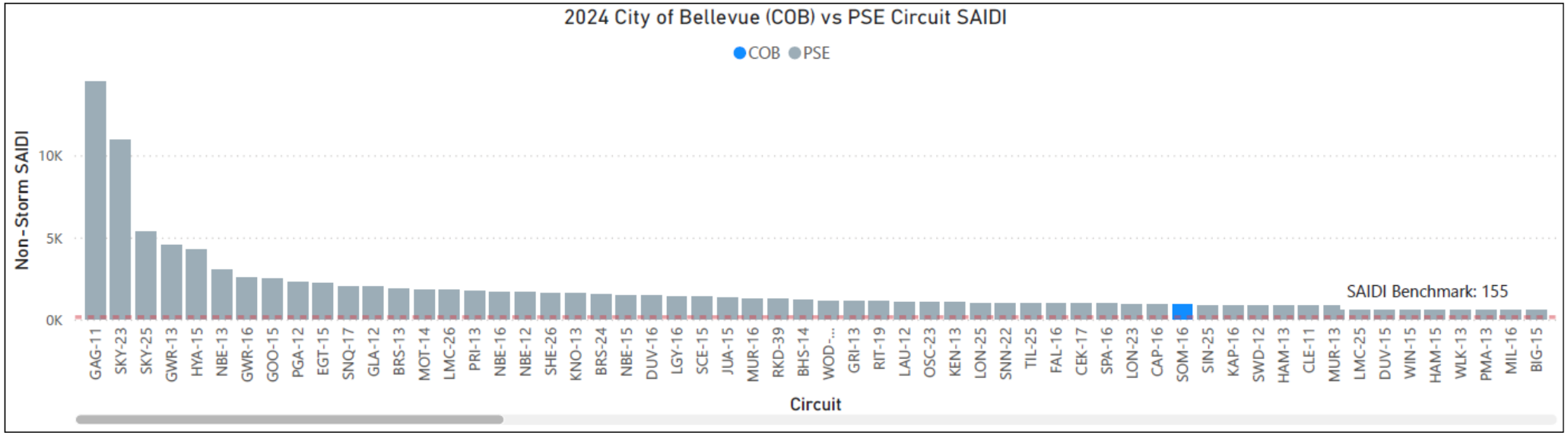


Bellevue Circuits Exceeding Performance Metrics vs PSE Poorest Performing Circuits in 2024



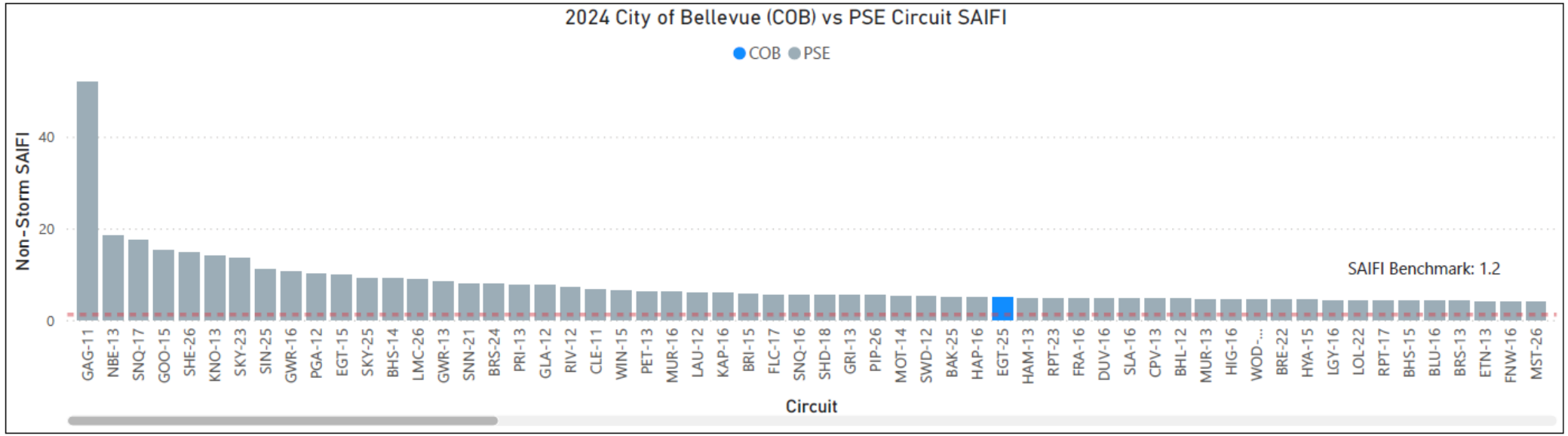
Bellevue Circuits within Overall PSE Circuits SAIDI Performance

Identifying Bellevue circuits measured within the overall poorest performing circuits in PSE's system for 2024 using the SAIDI performance benchmark.



Bellevue Circuits within Overall PSE Circuits SAIFI Performance

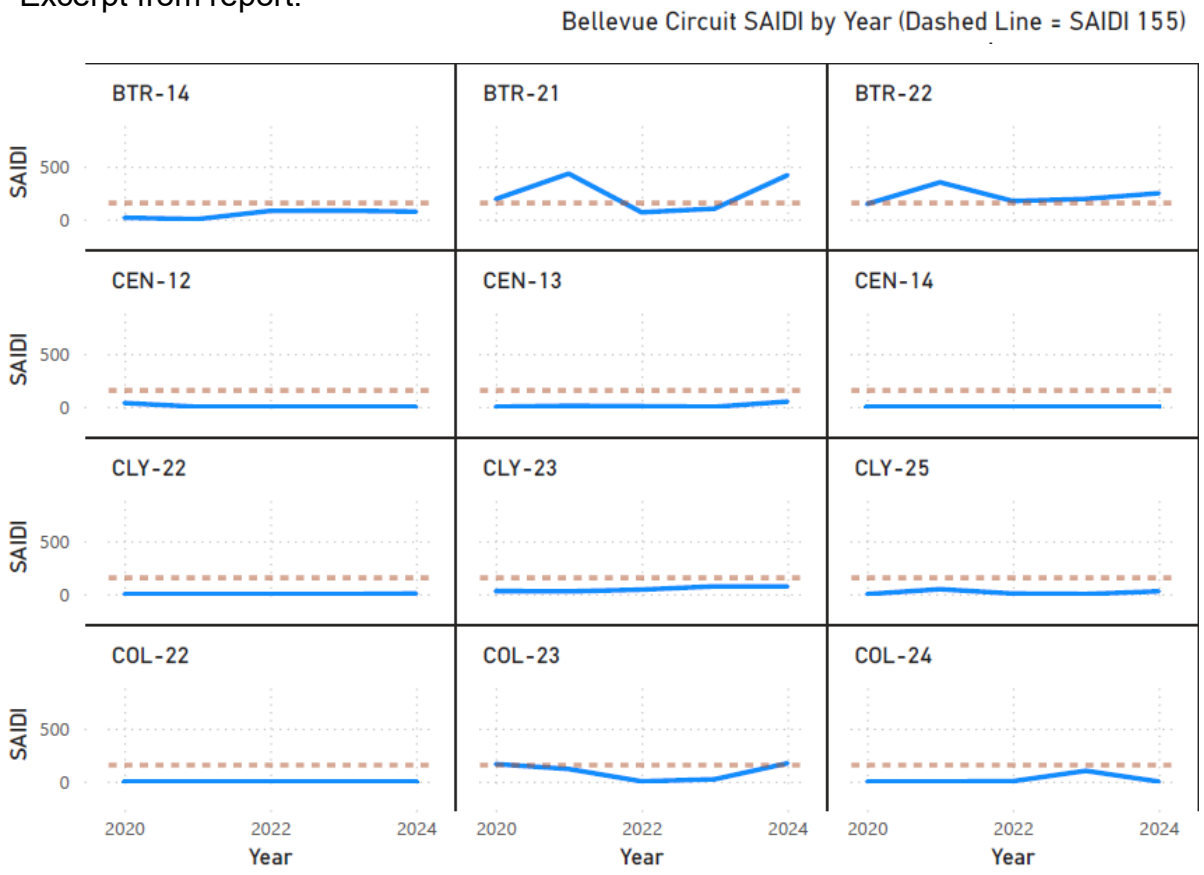
Identifying Bellevue circuits measured within the overall poorest performing circuits in PSE's system for 2024 using the SAIFI performance benchmark.



Bellevue Circuits Performance 2020 - 2024

Each circuit was graphed separately to show its SAIDI & SAIFI reliability performance from 2020 - 2024 relative to the SQI benchmark.

Excerpt from report:



Technologies to Improve Reliability

- **SCADA Reclosers**
  - *SCADA reclosers are installed for reliability, sectionalizing, and safety purposes on the distribution system. These specialized protective devices sectionalize and reduce the number of customers impacted by a permanent fault on the main line feeder.*
  - There are 12 SCADA reclosers on Bellevue circuits, each installed on a different circuit

- **Distribution Automation Fault Location, Isolation, and Service Restoration (DA-FLISR or DA)**

  DA automatically isolates faults on the distribution feeder system using circuit breakers and reclosers to restore power to the maximum number of customers as possible with automatic switching in less than 5 minutes
  - There are 9 Bellevue circuits that are part of existing DA schemes.

- **Substation SCADA Switchgear**

  This program adds supervisory control and data acquisition ("SCADA") capabilities to PSE's distribution circuits through substation equipment upgrades.
  - 28 Bellevue circuits currently have SCADA circuit breakers

- **Fusesavers**

  A Fusesaver is a single phase reclosing devices installed on laterals designed to clear temporary faults.
  - There are 14 Fusesavers installed on 13 Bellevue circuits.

Recently Completed Reliability Projects

PSE develops and constructs system improvement projects and maintains its system to address identified reliability needs. In 2024 we completed the following projects on Bellevue circuits:

- Fusesavers installed at 5 locations with one set each on EGT-11, KWH-22, KWH-23, NOB-24, and SOM-16
- One new DA scheme, on circuits EGT-12, SOM-13, HAZ-12
- Six cable remediation projects, on BTR-21, CLY-23, FAC-25, KWH-25, PHA-13, and SBE-26
- One Recloser, installed on SBE-22
- A total of 13 projects were completed with a total investment of $4.5M

Proposed Reliability Projects

PSE has identified projects to improve reliability in Bellevue and is working on these projects with planned construction dates between 2025 and 2028:

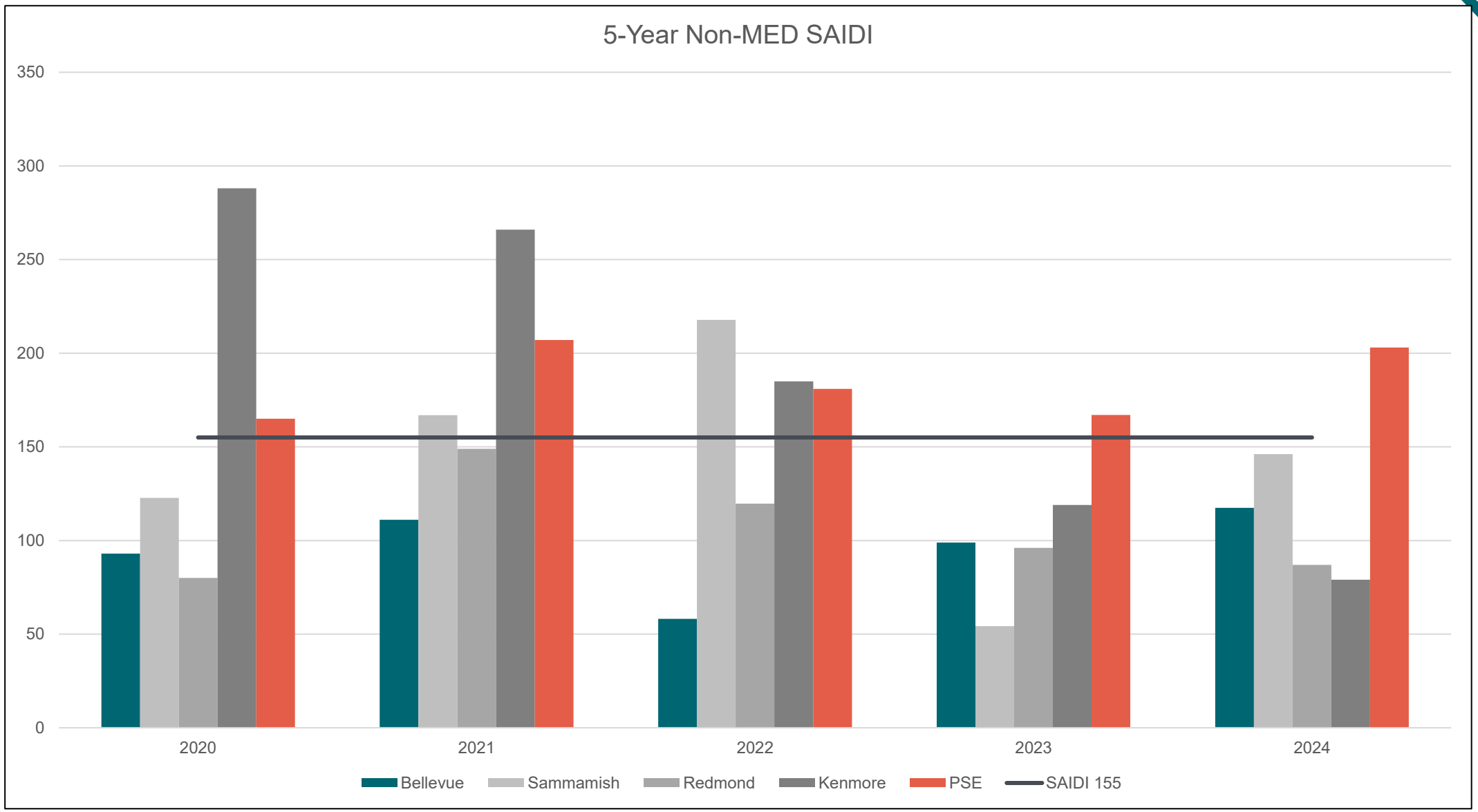
- Fusesavers at 18 locations across various circuits. KWH-25, HAZ-12 and LHL-22 each have two proposed locations.
- Underground conversion and feeder tie on BTR-22, improving reliability and operational flexibility
- 7 different feeder projects, touching 26 feeders, to shift load or create circuit ties to improve operational flexibility
- Three DA projects on 10 different circuits across 5 different substations
- 39 cable remediation projects across 21 circuits
- One recloser each on OVE-15 and FAC-13
- Two substation SCADA projects, one of FAC and the other on NRU
- A total of 71 projects are proposed with a total investment of $36.0M

Thank you for attending!

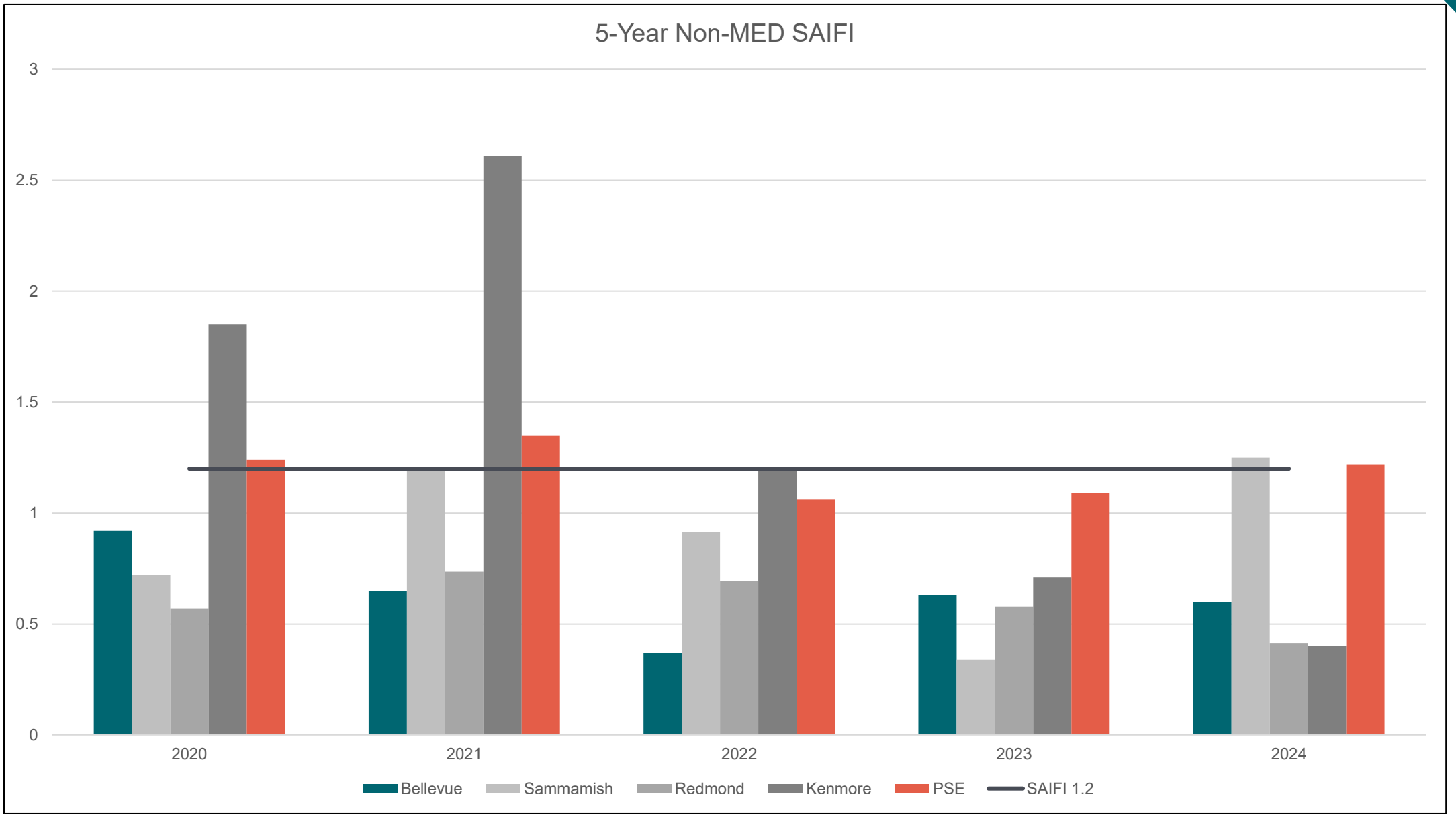
Questions & Discussion

Appendix

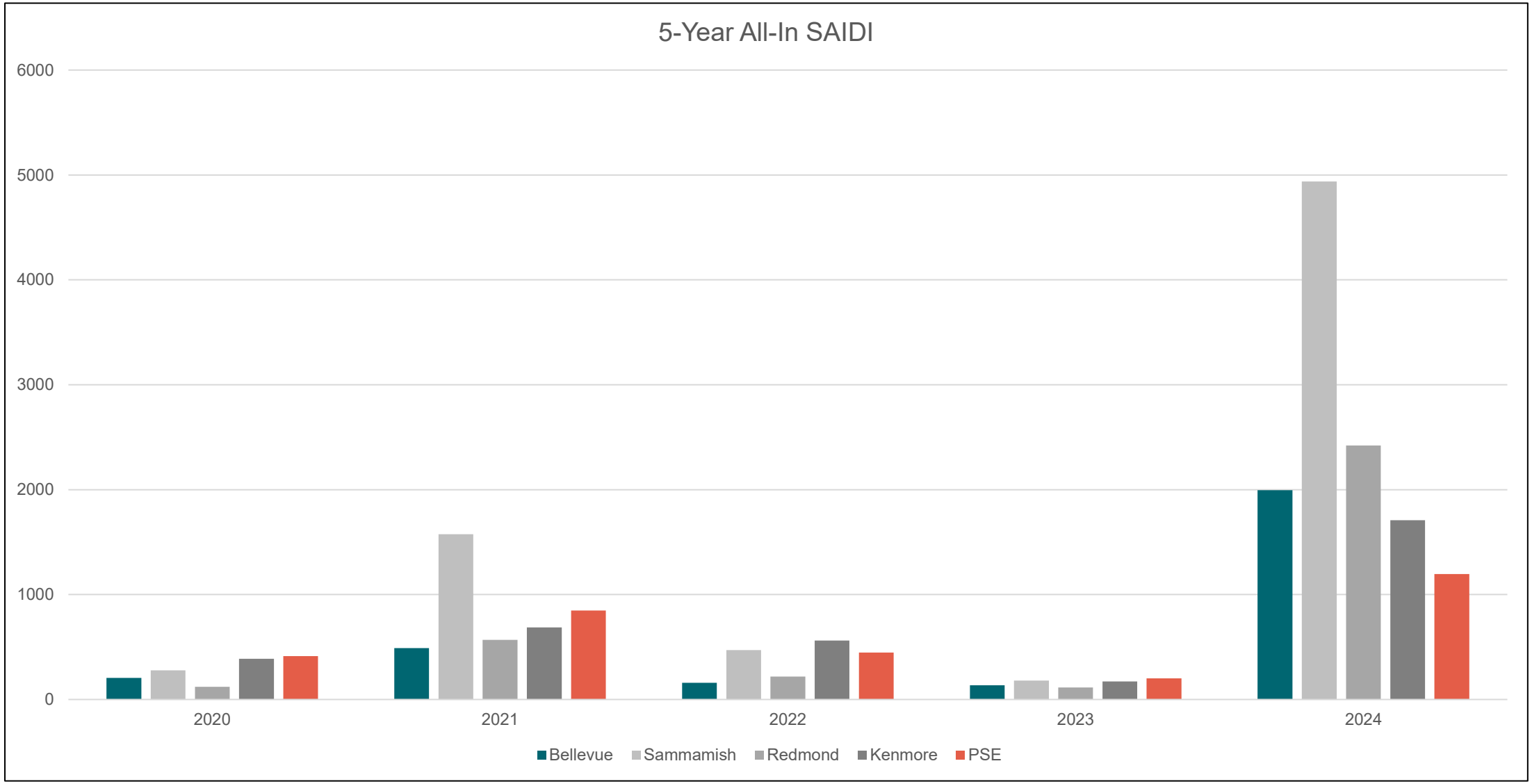
Similar City Comparison – Non-MED SAIDI



Similar City Comparison – Non-MED SAIFI



Similar City Comparison – All-In SAIDI



Similar City Comparison – All-In SAIFI