Introductions

- Andy Swayne – Municipal Liaison Manager
- Chris McVicker – Manager Electric System Planning
- Laura Feinstein – Manager Electric Distribution Planning
- Bill Foster – Distribution System Planner
- Rick Buell – Distribution System Engineering Specialist
- Carol Jaeger – Transmission System Planner
- Dennis Martin – Electric System Senior Engineer
- Keri Pravitz – Community Projects Manager
Workshop Purpose

• Provide an overview of PSE electrical system performance in 2014 and our report to the City

• Overall performance
  • Reliability projects completed and proposed
  • Areas addressed at past workshops – updates
  • Maintenance
  • Automation initiatives (smart grid)
  • Information technology initiatives
2014 Bellevue Reliability Overview

• Bellevue Performance & Comparison

**SYSTEM AVERAGE INTERRUPTION DURATION INDEX (SAIDI) &
SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX (SAIFI)
FIVE YEAR HISTORY**

SAIDI figures in minutes, all outages including storm
SAIFI figures in outage events, all non-storm outages

<table>
<thead>
<tr>
<th>Year</th>
<th>Bellevue (SAIDI)</th>
<th>PSE (SAIDI)</th>
<th>Bellevue (SAIFI)</th>
<th>PSE (SAIFI)</th>
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<tbody>
<tr>
<td>2010</td>
<td>91.1</td>
<td>287.0</td>
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<tr>
<td>2011</td>
<td>86.1</td>
<td>281.0</td>
<td>0.60</td>
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<td>2012</td>
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<td>2013</td>
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<td>247.0</td>
<td>0.41</td>
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<td>2014</td>
<td>160.2</td>
<td>312.0</td>
<td>0.60</td>
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PSE SAIDI figures for 2010 - 2014 are five year rolling average figures.
The 2010 - 2012 Bellevue SAIDI figures were calculated as single year figures.
The 2013 Bellevue SAIDI figure was calculated as a four year rolling average for years 2010 - 2013.
The 2014 Bellevue SAIDI figure was calculated as a five year rolling average for years 2010 - 2014.

**System Average Interruption Duration Index [SAIDI] SQI 320**
Total customer outage minutes / average total customer count

**System Average Interruption Frequency Index [SAIFI] SQI 1.3**
Total customers affected / average total customer count
2014 Bellevue Reliability Overview

- Distribution system serving Bellevue in 2014

95 distribution circuits serving Bellevue

70 circuits [74%] had performance better than our system wide average

24 circuits [25%] experienced no unplanned outages

25 circuits [26%] had SAIDI or SAIFI exceeding system wide average figures
2014 Bellevue Reliability Overview

- Circuits Exceeding System SAIDI and/or SAIFI 2010 – 2014

- 65 circuits exceeded system wide average performance ...
  - 43 (64%) once in five years
  - 13 (19%) twice in five years
  - 10 (15%) three times in five years
  - 1 (1%) four times in five years
2014 Bellevue Reliability Overview

- Bellevue circuit with SAIDI or SAIFI exceeding system wide figures

- 25 circuit had SAIDI or SAIFI exceeding system wide figures. 17 of these circuits have been addressed or require no corrective action. The remaining 8 circuits have improvement actions identified.
All but 6 circuits serving Bellevue had performance within the 1st quadrant.
All circuits serving the CBD were within the 1st quadrant.
Bellevue CBD Performance continues to be very good

• 24 circuits from 4 substations serve customers downtown

• 7 reliability circuits provide redundancy for downtown customers

• 2 unplanned outage events affected downtown customers in 2014

  - Center Substation Bank 1 (4 circuits) went out of service when a crow made contact with the distribution bus causing isolation of the transformer. *Animal barriers were installed on B phase bus elements to eliminate potential for reoccurrence.*

  - Center Circuit 25 experienced a circuit outage during a major storm. A tree limb contacted a portion of overhead feeder along the forested wetland area adjacent to 116th Ave NE between NE 2nd & Main Streets. *A tree wire project has been designed and is being prioritized for construction.*
Distribution Reliability Projects Completed in 2014

• Clyde Hill 23 recloser installation on 116th AVE NE (near Children’s)
• Replacement of two Mark 1 switches
• Tree wire retrofit project on Goodes Corner 13 (serves SE Bellevue)
• Hazelwood 12 recloser installations and sectionalizing switches (serves SW Bellevue)
• 10 cable replacement projects (various circuits – 12,000 circuit feet) including proactive replacements
• 11 SCADA switch installations in the CBD
Proposed Distribution Reliability Projects

- Mark 1 switch replacement in the Cherry Crest Neighborhood
- Replacement of four oil-filled switches at Bellevue Square
- Recloser installations on Eastgate 27, Factoria 13 & 25, Northrup 23 and South Bellevue 22 feeder circuits
- Tree wire retrofit projects on Lake Hills 22, Medina 36, Overlake 15 and South Bellevue 26
- Bridle Trails 22 feeder undergrounding west of 140th AVE NE
- CBD SCADA switch installation and future automation implementation (continuing)
- 1/0 cable replacements in Crossroads area (continuing)
- 33 cable replacement projects engineered for future construction (55,000 circuit feet)
- 24 cable replacement projects scoped for future engineering (40,000 circuit feet)
Distribution Areas Addressed At Prior Workshops

• Circuit Updates

  • Clyde Hill 26: The underground distribution system serving an area north of QFC is early 1960’s construction. *We continue to monitor the performance of this system; we have had no significant reliability issues in this area for the past few years.*

  • Eastgate 12: The feeder east of Lakemont around Cougar Mountain is radial. *A new distribution circuit from Goodes Corner (Issaquah) is planned to be underbuilt along an existing transmission line in 2015-2016 to provide a looped connection for EGT-12, HAZ-12 and SOM-13.*

  • Lake Hills 22: Overhead distribution in the area of NE 4th ST and 164th AVE NE is susceptible to tree cause outages. *Tree-wire retrofit projects along NE 4th ST and along 164th AVE NE are in construction and expected to be in service the end of 2015.*

  • Lake Hills 25: Some underground distribution cables in the Crossroads Mall vicinity have experienced high incidents of failure. *Cable replacement in this area begun in 2014 will likely extend into 2016 to accommodate scheduling of required outages for project construction.*
• **Circuit Updates (continued)**

  - **Northrup 25**: The Cherry Crest neighborhood north of NE 24\textsuperscript{th} ST is served by a direct-buried underground distribution system and a mark-1 switch. *We continue to monitor the performance of this system. There have been no additional cable issues, however the mark-1 switch has failed and replacement is expected to be complete by the end of this year.*

  - **South Bellevue 23**: The underground distribution system serving Bellefield Commercial Park has experienced mechanical subsidence and load growth. *A system reconstruction project is proceeding and it is expected to be completed by the end of 2015.*

  - **South Bellevue 25**: The distribution system along the south side of Meydenbauer Bay has been inspected and evaluated. *We continue to monitor the performance of this system. A tree-wire retrofit project has been deigned and the project is being prioritized for construction.*
Transmission System Improvements

• Recently Completed …
  • Ardmore Substation – New distribution substation with looped (redundant) 115kV transmission line (2013)
  • Lake Hills Tap 115kV – Extension to Ardmore Substation with automated transmission switching (2014)

• In Progress …
  • Lake Hills – Phantom Lake 115kV – New transmission line between existing substations to provide redundant (looped) transmission connection for three substations – currently permitting with planned construction 2016-2017
  • Lakeside 115 kV Switching Station Rebuild – Multi-year phased replacement and upgrade of control and operating equipment in the substation for enhanced automation and reliability – planned completion in 2017.
  • Energize Eastside 230kV – New 230kV transmission line(s) and new transmission station in Bellevue to provide increased system capacity and reliability for Bellevue and the greater Eastside – currently permitting with planned construction in 2017-2018

• On the Near Horizon …
  • Vernell Substation – New 115kV transmission switching station with local distribution substation for improved transmission system flexibility/reliability and new distribution system capacity to support Spring District development in 2020
Smart Grid Initiatives Including Automation

• FLISR (Fault Location, Isolation, Service Restoration) – Evaluated products in 2014. Initial implementation planned in 2015 with expansion to CBD after in the future.

• Remote Data Acquisition Devices (RDADs) – 60 units in place in Bellevue providing remote alert to detected feeder system faults.

• Distribution SCADA Switchgear – The current plan calls for retrofitting 66 switches in the CBD area to add SCADA and integrating them into the EMS so that the system operators can see the distribution system configuration and events in real time. As of December 2014 24 SCADA switches have be retrofitted and integrated. 8 more switches are planned for retrofit in 2015.

• Bellevue Urban Smart – Initiated a program to support downtown businesses in managing building energy use including combinations of behavioral and technology solutions to achieve energy savings.
• PSE implemented three new integrated systems in April 2013
  • Customer Information System
  • Geospatial Information System
  • Outage Management System
• All successful though still learning how best to use full capabilities
• Evaluating potential “next step” functionality enhancements

• And in 2014 … two additional enhancements
  • Tensing map display and query system (internal)
  • Outage Map – PSE.com and mobile apps (external)
Wrapping Up

Questions & Discussion