Monitoring Report
SD-4: Reliability

System Management & Nuclear Oversight Committee Report
February 11, 2020

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SD-4: Reliability

Generation and delivery systems must perform at a high level to provide reliable service to customer-owners. The Energy Delivery, Energy Production and Marketing, and Nuclear Business Units of OPPD contribute to reliable electric service to customer-owners.

- OPPD shall assure all customer energy requirements are met through the use of its generation resources and purchase power portfolio 100 percent of the time.
- OPPD shall achieve generation reliability by:
  - Maintaining baseload unit equivalent availability factor at or above 90% on a three-year rolling average; and
  - Maintaining unit availability above benchmark levels per industry measures such as the NERC GADS.
- OPPD shall achieve electric system reliability by:
  - Limiting the SAIDI to 90 minutes. This is the average outage duration per customer per year excluding declared major storms; and
  - Maintaining a reliable transmission and distribution system. This will be achieved through performing the necessary maintenance and upgrades in accordance with NERC standards.

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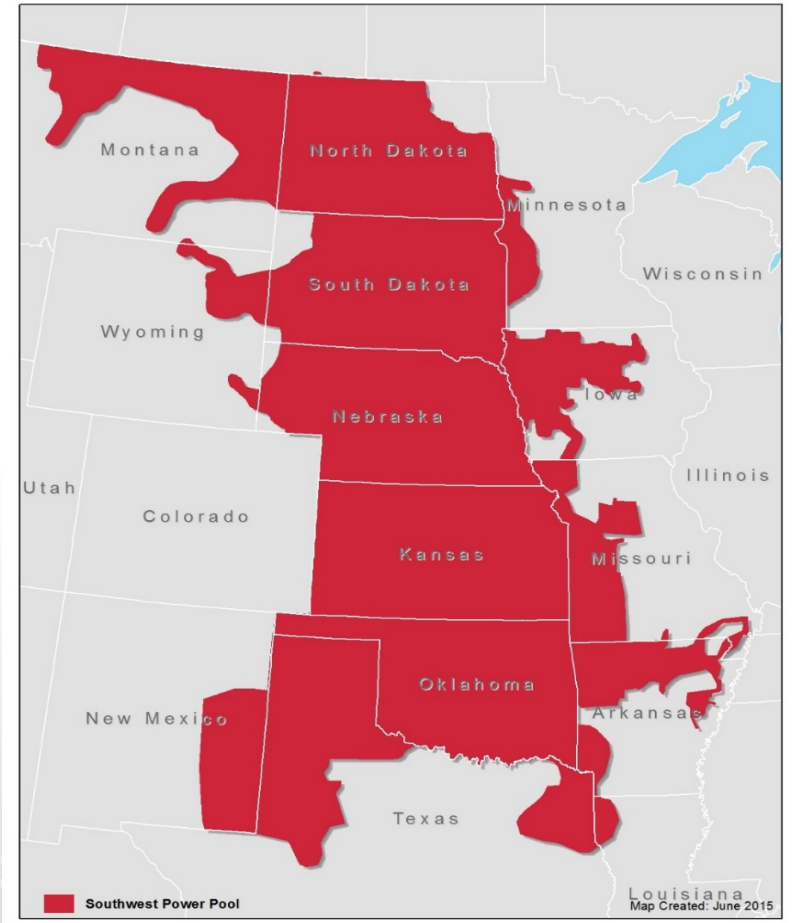
OPPD shall assure all customer requirements are met through the use of its generation resources and purchase power portfolio 100 percent of the time

- Resource planning assessments allow us to diligently plan for sufficient generation capacity/reliability in the future
- As required, OPPD plans for accredited generation resources that are 112% of expected peak load
- As necessary, transmission ‘reservations’ are in place to ensure firm delivery of electricity creating ‘right of way’ for electricity to get to OPPD load from OPPD resources
- The SPP integrated market provides OPPD with real time access to liquid power markets
- Generation (both owned and purchased) supply requirements met 100% of the time



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Generation Reliability Benchmarks

FERC

The Federal Energy Regulatory Commission (FERC) through the Energy Policy Act of 2005 established NERC as the “electric reliability organization” responsible for the reliability of the bulk power system

NERC

The North American Electric Reliability Corporation (NERC) is a not-for-profit regulatory authority whose mission is to assure the reliability of the bulk power system in North America. NERC subject to oversight by FERC and some Canadian regulating authorities.

GADS

The Generating Availability Data System (GADS) tracks reliability information from stations throughout the United States. As of January 1, 2013, GADS became a mandatory industry program for conventional generating units that are 20 MW and larger

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Generation Reliability Metric

Equivalent Availability Factor (EAF):

- Percentage of time a unit was available to generate over a total period of time. Outages and derates impact this factor.
- When a unit is available and capable of generating at full load for an entire month, then its monthly EAF would be 100%.
- OPPD's corporate EAF is megawatt weighted. Goals are established on a 12-month basis in support of the corporate 3-year target to normalize outages across the fleet.
- Target based on top quartile NERC/GADS benchmarking.

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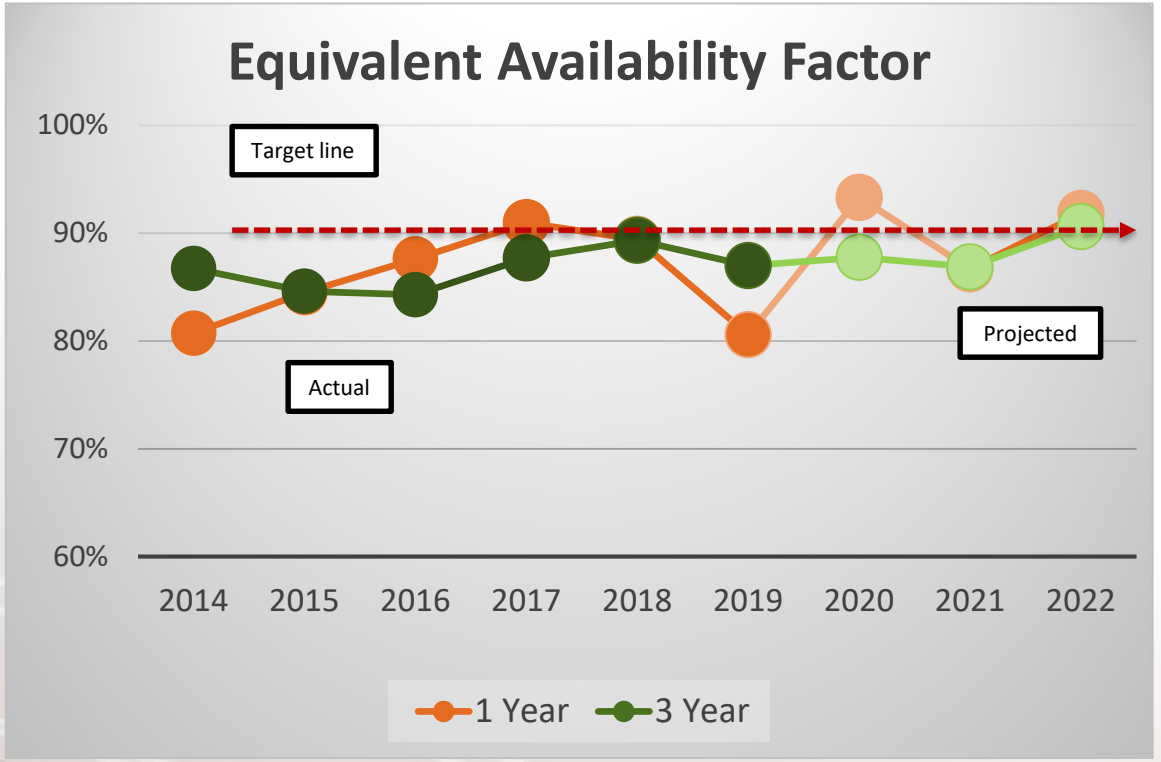
2019 Generation Performance

OPPD establishes a long term goal to achieve generation reliability by maintaining baseload unit equivalent availability factor at or above 90% on a three-year rolling average.

2019 year end was 87.0%

90% EAF represents top quartile of industry peers.



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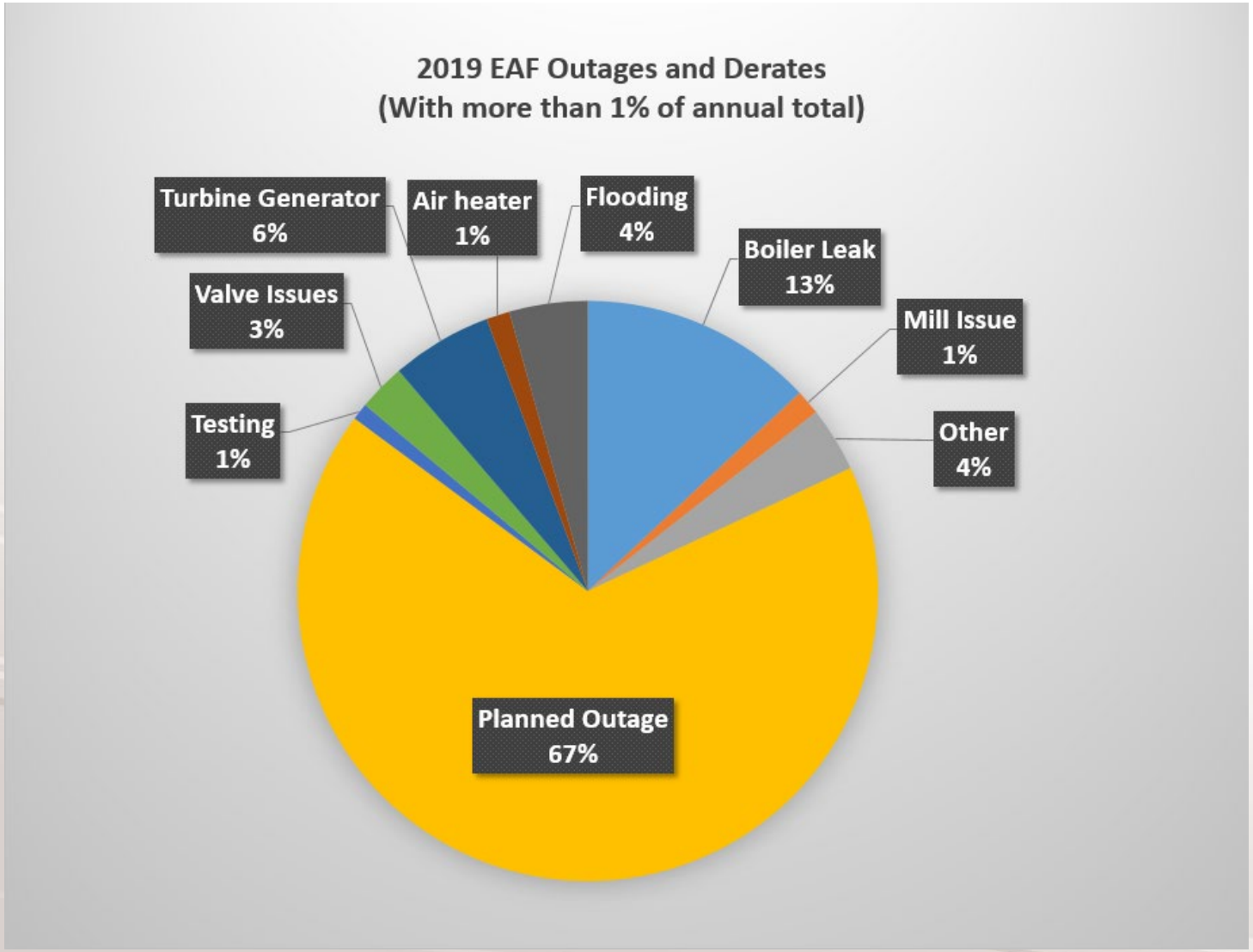
Generation Reliability Drivers



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Generation Reliability Programs

- Business Unit structure is focusing on reliability and aligning with Corporate Asset Management strategy
  - Systems and Programs Engineering Approach
  - Developing critical equipment list
  - Predictive maintenance program
  - Failure Analysis and Corrective-action Team (FACT) to address boiler reliability
  - Process Improvement Coordinators investigate apparent cause for various issues
- Outage Inspections
  - Nondestructive examinations on turbine and high energy piping
  - Boiler and critical equipment inspections
- Capital Projects
  - Evaluated and proposed based upon potential reliability impact

Engineer monitors vibrations on a generator exciter at North Omaha

Nondestructive testing of turbine diaphragms at Nebraska City

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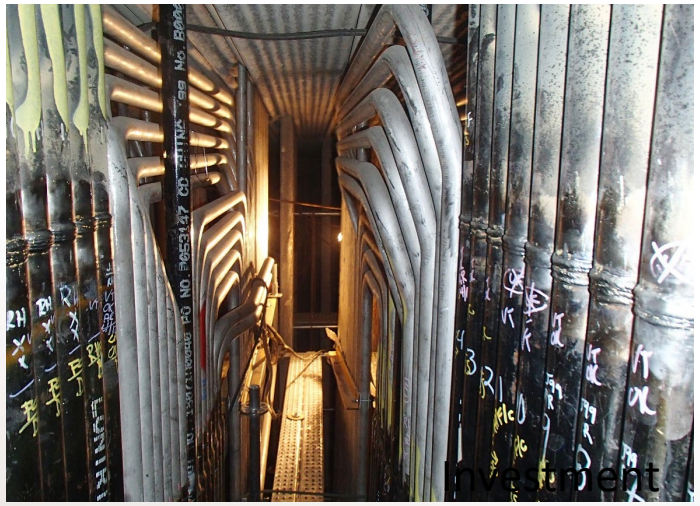
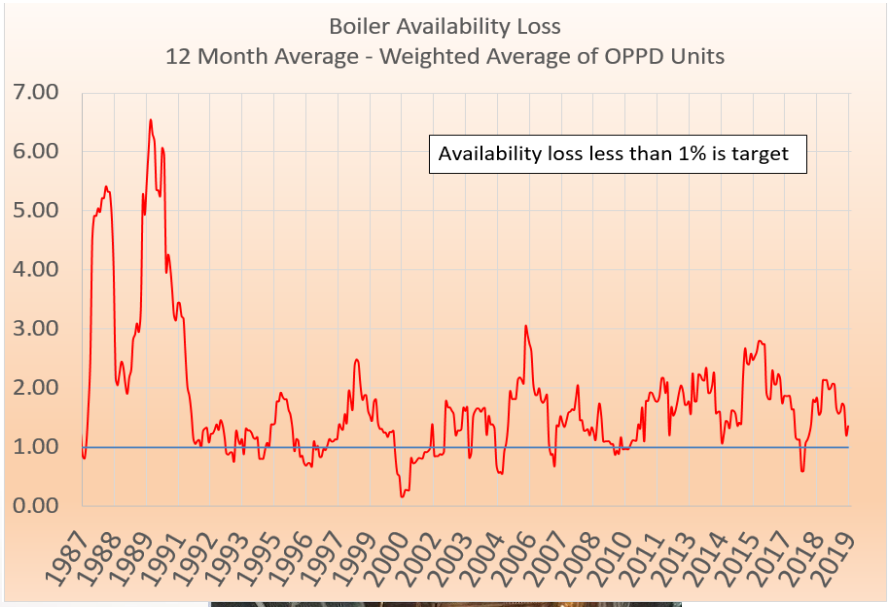
Reliability Implementation – Improved Boiler Performance



NC1 finishing superheat replacement



NC1 main steam header replacement

NC1 furnace slope replacement project

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System Reliability Metric

OPPD shall achieve electric system reliability by:

Limiting SAIDI to 90 minutes. This is the average outage duration per customer per year excluding declared major storms.

- SAIDI: System Average Interruption Duration Index
- A SAIDI of 90 minutes = 99.98% availability which will typically be first quartile
- Nationally recognized standard for measuring reliability

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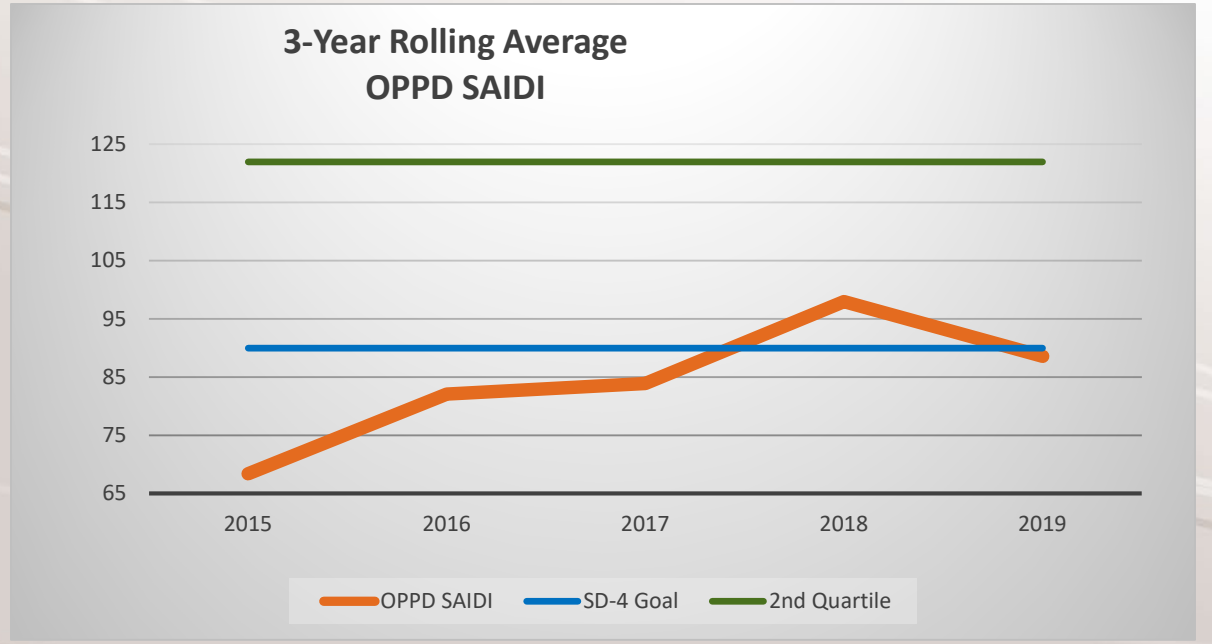
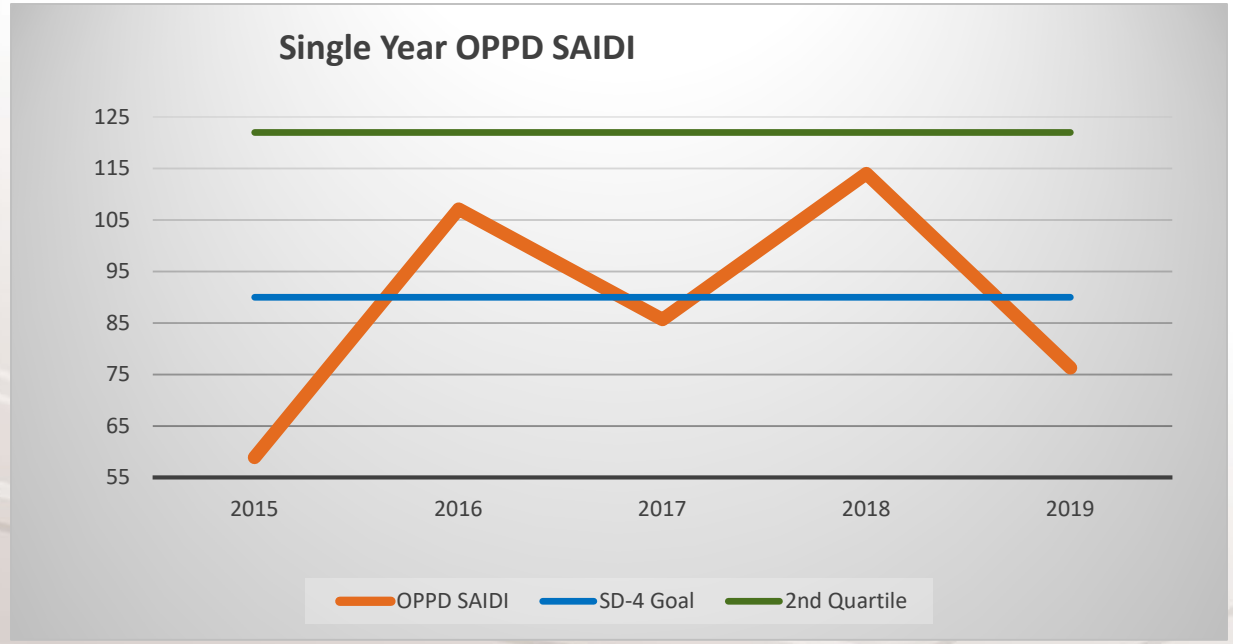
System Reliability Metric: SAIDI

SAIDI at the end of 2019 was 88.6 minutes

- The 90 minute threshold was exceeded in 2018 but in 2019 has trended towards target as we increased Vegetation Management and asset replacement activities

- OPPD SAIDI is reported as a 3-year rolling average to smooth out year to year volatility

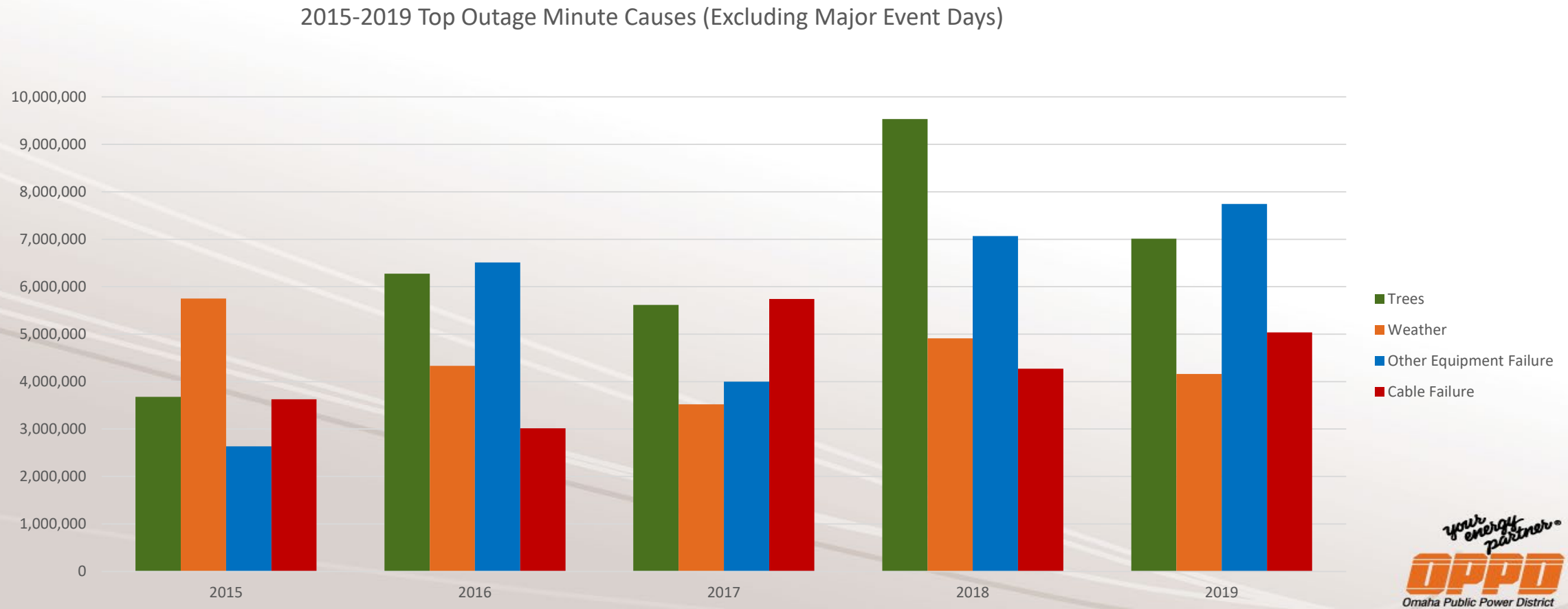




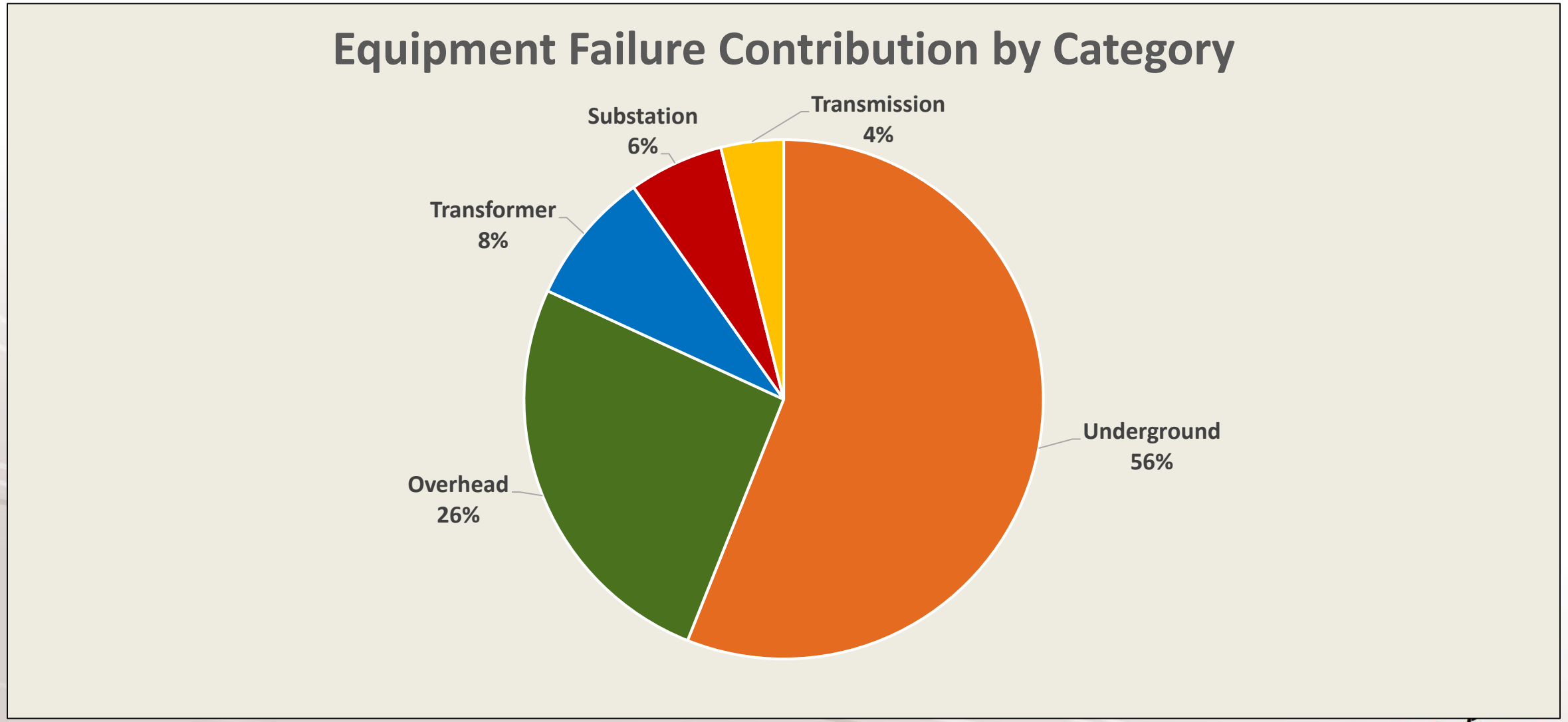
System Performance Drivers

2019 Outage Causes Excluding Major Events:

- Tree Events: 24%
- Equipment Failures: 27%
- Weather Events: 14%
- Cable Failure: 17%
- All Other Causes (wildlife, public intervention, etc…): 18%



Equipment Outage Minutes



*Does not include Major Event Days

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Reliability Improvement Programs

- A more aggressive Vegetation Management program was launched in 2019 with increased funding
- TDIP funding focus
  - Underground cable replacement
  - Wood poles evaluation and replacement
  - Downtown Network upgrades
  - Overhead conductor
- Power quality programs focus on addressing pocketed areas needing attention
- System Planning & Expansion continues to add new facilities to strengthen reliability

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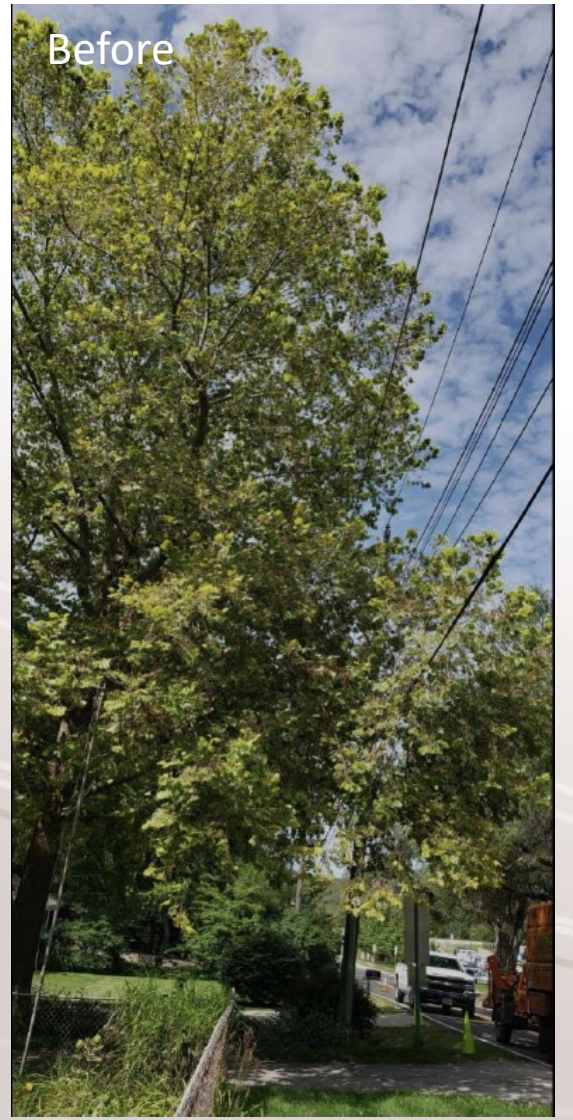
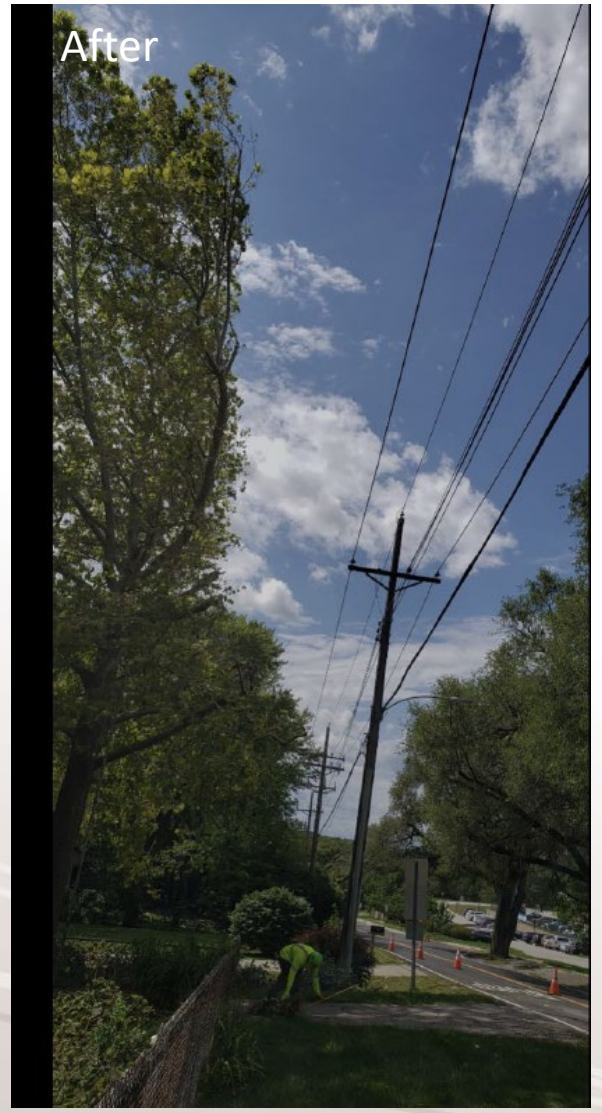
Vegetation Management





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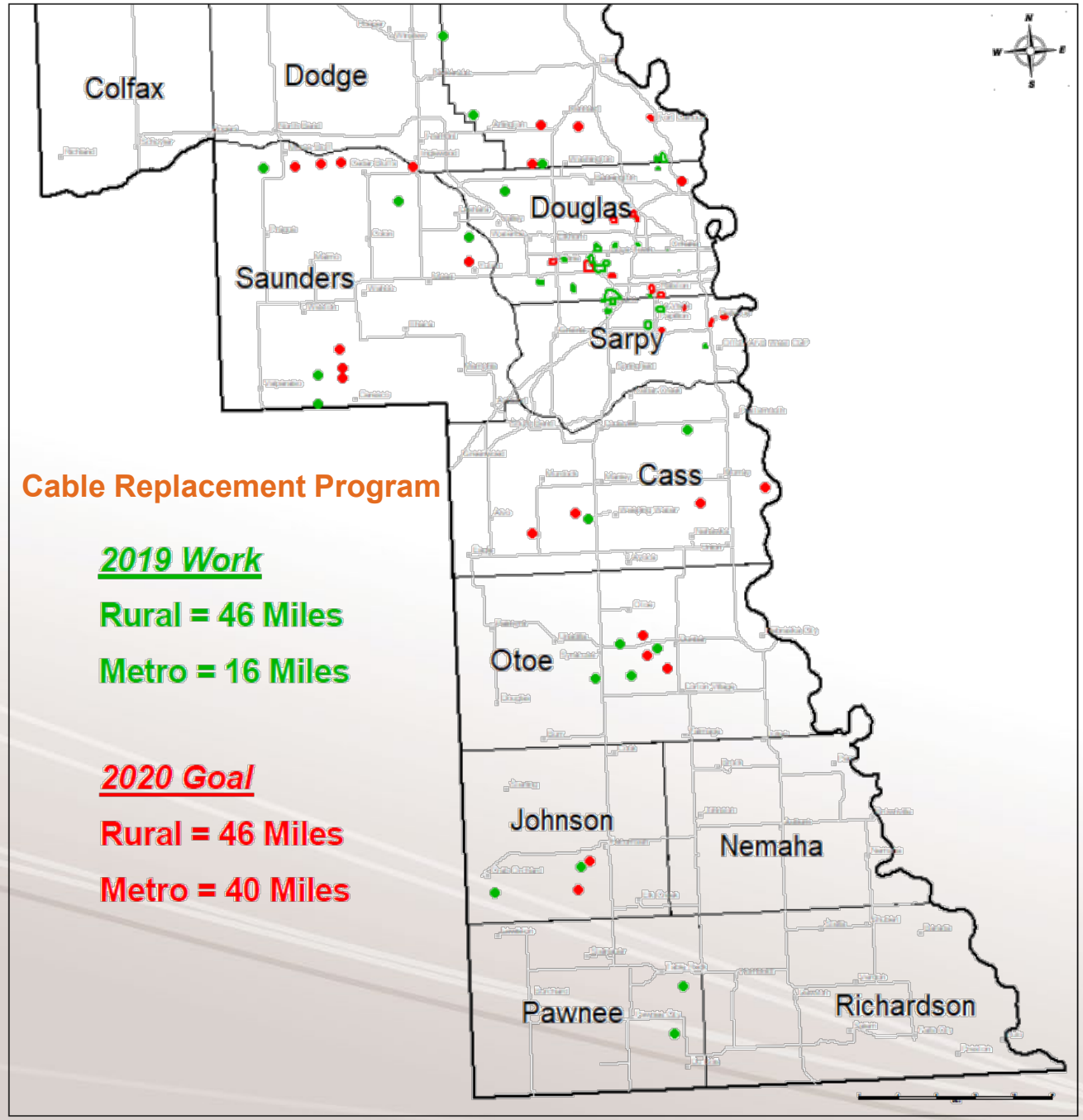

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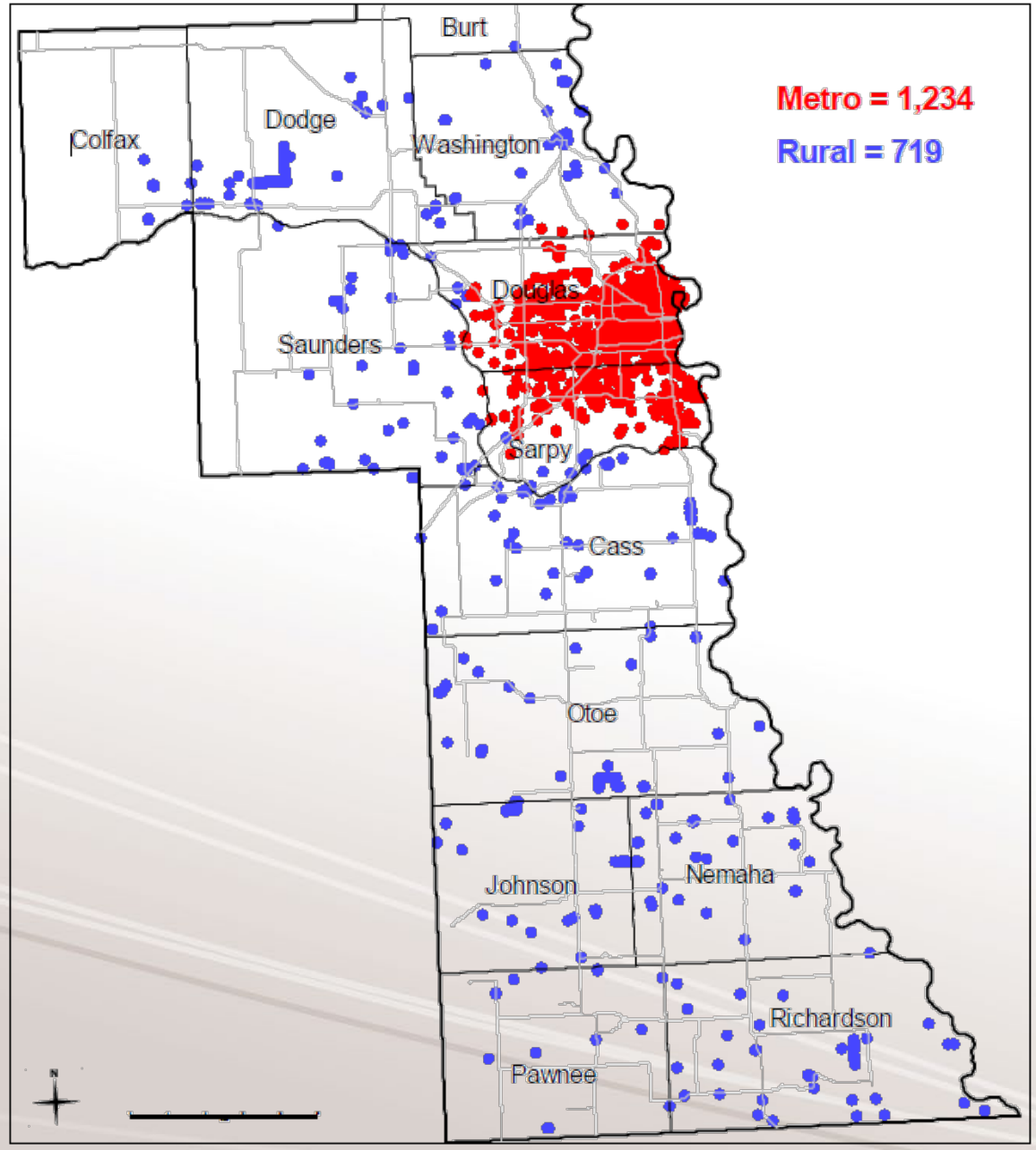
DISTRIBUTION POLES REPLACED IN 2019



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Smart Technology

- Northeast Omaha Distribution Automation
  - Real-time communication and control
  - System visualization
  - Self healing technology
  - Reduction of outage hours
- 2020 testing of smart reclosers in the northwest rural portion of the service territory
  - Targeting circuits that have experienced recent reliability challenges
  - Data will help identify outage locations faster for quicker response
  - Long circuits can be sectionalized

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Reliability Focus Circuits 2019-2020

- **North Bend**
  - Distribution circuit proactive maintenance
  - Smart line device additions
- **Near Colon**
  - Conductor replacement including some overhead to underground conversion
- **Mead/Yutan Area**
  - Adding air flow spoilers to limit galloping
  - Smart line device additions
- **Wahoo Area**
  - Rerouting conductors for enhanced reliability outside of Wahoo substation
- **SE Nebraska / Rulo Area**
  - Creating a new 12 mile circuit tie from Preston to Rulo, NE
  - Distribution circuit preventative maintenance
- **Miracle Hills Area**
  - Replacing cable
  - Rebuilding overhead to underground terminations
- **Harry Andersen Dr /Millard Area**
  - Created new tie and diversified large customer load to two different circuits
- **Downtown Omaha**
  - Replace underground equipment to allow for more flexibility
- **Pepperwood (Omaha)**
  - Replace underground cable

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Recommendation

The System Management and Nuclear Oversight Committee has reviewed and accepted this Monitoring Report for SD-4 and recommends that the Board find OPPD to be sufficiently in compliance with Board Policy SD-4.