Electric Service Reliability in Pennsylvania

2019

Pennsylvania Public Utility Commission

PENNSYLVANIA ELECTRIC RELIABILITY REPORT 2019

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Executive Summary

The Electricity Generation Customer Choice and Competition Act mandated the Pennsylvania Public Utility Commission (PUC or Commission) to ensure levels of reliability that existed prior to the restructuring of the electric utility industry continue in the new competitive markets.[1] In response to this mandate, the Commission adopted reporting requirements designed to ensure the continued safety, adequacy and reliability of the generation, transmission and distribution of electricity in the Commonwealth.[2] The PUC also established reliability benchmarks and standards to measure the performance of each electric distribution company (EDC).[3]

The benchmarks and standards established by the Commission are based on four reliability performance metrics adopted by the Institute of Electrical and Electronics Engineers (IEEE). Those metrics are:

- SAIFI: System average interruption frequency index or frequency of outages.
- CAIDI: Customer average interruption duration index or duration of outages.
- SAIDI: System average interruption duration index or frequency of sustained outages.
- MAIFI: Momentary average interruption frequency index or occurrences of momentary customer interruptions.

Given the uncertainty of weather and other events that affect reliability performance, the Commission has stated EDCs shall set goals to achieve benchmark performance in order to prepare for times when unforeseen circumstances may briefly and occasionally exceed benchmark performance.[4] In recognition of these unforeseen circumstances, the PUC set the performance standard as the threshold for those times when an EDC can briefly and occasionally exceed benchmark performance. An EDC that consistently fails to achieve benchmark performance is considered out of compliance with the performance regulations and may require a robust corrective action plan, re-organization of management objectives, and/or regulatory penalties.

As mandated, EDCs report reliability performance metrics[5] using both a rolling 12-month average and a rolling 3-year average. Appendix B provides a brief visual comparison summary of the EDCs' rolling 12-month reliability performance in each quarter for 2019, 2018, 2017, 2016, and 2015. More detailed analysis can be found in Section 4, *EDC Reliability Performance Data*. Appendix A provides the 2019 rolling 12-month and rolling 3-year reliability metrics for all EDCs. **Of note, only three of 11 EDCs achieved the standard performance metric in all three performance categories for the rolling 3-year average. For the rolling 12-months ending Dec. 31, 2019, only four of 11 EDCs achieved the standard performance metric, and only two of 11 EDCs achieved the benchmark metric in all three reliability performance categories.**

[1] Act of Dec. 3, 1996, P.L. 802, No. 138, 66 Pa. C.S. §§ 2801 et.seq.
[2] Docket No. L-00970120; 52 Pa. Code §§ 57.191-57.197.
[3] Docket No. M-00991220.
[4] Id. at 25.
[5] For an explanation of performance standards, see Section 2, page 2.

In addition to monitoring EDCs' reliability performance, the Commission established inspection and maintenance standards for electric transmission and distribution systems.[6] Biennial plans for the periodic inspection, maintenance, repair and replacement of facilities, designed to meet performance benchmarks and standards, were approved by the PUC's Bureau of Technical Utility Services (TUS).

Evaluation

In general, overall reliability performance of most EDCs in meeting benchmark performance metrics continued to be poor in 2019. The reliability performance and resilience of the overall Pennsylvania electrical distribution system is trending negative.[7] Electric reliability and resilience appears to be most challenged during storm activity which bring down off-right-of-way trees and limbs onto the distribution lines. If the weather pattern experienced in the past three years becomes the new norm, it appears many EDCs will continue to struggle to achieve sustained benchmark performance. It may be that changes are needed by EDCs to excel, continually improve, and develop new ideas that will achieve and sustain existing benchmark reliability performance metrics and strengthen grid resilience during extreme weather events. Vegetation management of off-right-of-way trees continues to cause major disruptions for customers during severe weather events.

Trees are the number one cause of outages and lost customer-minutes in Pennsylvania, as can be seen by the individual EDC performance details in Section 4, below. During major weather events trees also cause the most damage to the electrical distribution system causing about 1 billion customer-minutes of interruption in 2019, and about 2.7 billion customer-minutes of interruption in 2018. The EDCs are performing the necessary vegetation management on their right-of-way corridors. However, off-right-of-way trees are causing the majority of damage and road closures that that lead to significant customer-minute interruptions and negatively impacting Pennsylvania's distribution system reliability and resilience.

To address this overall negative reliability and resilience performance trend, EDCs continue to execute approved Long-Term Infrastructure Improvement Plans (LTIIPs).[8] EDCs are utilizing the LTIIPs to proactively accelerate replacement of degraded distribution system components and improve the resiliency of their distribution systems through storm hardening initiatives. There also has been an increase in tree trimming activity beyond historic levels for many EDCs. As seen in Section 4, below, the FirstEnergy Companies (Met-Ed, Penelec, Penn Power, and West Penn) all are working reliability corrective action plans through their LTIIPs. The other EDCs' LTIIPs all are directed at improving or maintaining improved reliability performance. These measures typically take two or more years before results can be measured in the reliability metrics. However,

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[6] Docket No. L-00040167.

[7] Resilience has many definitions, but commonly is understood to align generally with the definition in Presidential Policy Directive 21: "…the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents." https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil.

[8] The 8 EDCs with approved LTIIPs are Met-Ed, PECO, Penelec, Penn Power, PPL, West Penn, Duquesne Light, and UGI.

most EDCs with LTIIPs are several years into their LTIIPs and performance is still trending negatively.

Recommendations

Several recommendations still apply for this report as were recommended in our 2018 report.[9] The primary recommendations to address the negative trend in EDC reliability performance still applicable are:

- Possible legislative relief that will grant utility companies the authority to remove or trim danger trees that are off their existing right-of-way. Such relief could include granting EDCs the ability to trim, top-off, or remove trees that can potentially fall onto power conductors.

- EDCs and stakeholders should consider developing a long-term strategy to ensure only the "right-tree-in-the-right-place" is planted in close proximity to primary electrical conductors. The current distribution system in Pennsylvania is challenged by largely unmanaged off-right-of-way tree growth of various tree species that in many locations have grown higher and taller than adjacent power lines and could fall onto power lines during severe weather events. These types of trees would be considered the "wrong-tree-in-the-wrong-place," and a severe threat to the modern electric distribution system.

- Stakeholders should work together on removing dense/mature tree growth entangled in communication lines.[10]

- EDCs that belong to the North American Transmission Forum (NATF)[11] are strongly encouraged to apply the NATF program continual improvement quality tools, such as the principles of excellence (POE) benchmarking program and other NATF quality management improvement methods tools NATF offers to promote excellence to ensure vegetation management programs are effective and robust to sustain our modern-day electric distribution system.

    - EDCs can also apply the NATF-style programs to other common reliability issues, such as equipment failure, which is the other leading cause of customer interruptions.
    - Beginning in 2016 TUS has been in discussion with both EDCs and NATF to encourage a voluntary organic relationship to promote distribution system continual improvement and quality excellence. The purpose of the initiative is for the EDCs to voluntarily utilize a program like the NATF's mature and proven quality management improvement programs and methods in order to apply those and enhance the reliability and resilience of Pennsylvania's electric distribution system.

[9] The 2018 Pennsylvania Electric Reliability Report is available for download here: http://www.puc.pa.gov/General/publications_reports/pdf/Electric_Service_Reliability2018.pdf.

[10] Per the current edition of the National Electric Safety Code, communication facility owners are not required to trim vegetation away from communication facilities.

[11] https://www.natf.net/about/about-the-natf.

Need to Continually Improve

It has been recognized by TUS that most EDCs inconsistently achieving reliability benchmark performance and the future trend appears to be more negative. TUS staff is committed to working with EDCs to recognize and proactively make systemic changes in a way that will reduce the future impacts of climate change, aging infrastructure, grid modernization, tree/equipment failure outages, and security on the distribution system in a way that cannot be achieved by Commission rules alone. It is strongly recommended large Pennsylvania EDCs lead in development an independent organization after a successful NATF model.

Section 1 – Introduction

Purpose

The report discusses the reliability performance of EDCs operating under the Commission's jurisdiction, specifically focusing on the reliability of the electric distribution system.[12]

The data presented in this report comes from the quarterly and annual reliability reports submitted by EDCs pursuant to the Commission's regulations. This data focuses on customer power restoration duration (CAIDI), average customer outage duration (SAIDI), and frequency of outages (SAIFI).[13] From these measures, this report provides an overview of the Commonwealth's electric distribution reliability as well as individual analyses of the EDCs operating within Pennsylvania.

Background

The Electricity Generation Customer Choice and Competition Act mandates the Commission ensure the level of reliability that existed prior to the restructuring of the electric utility industry is maintained in the newly restructured markets. In response to this mandate, the Commission adopted reporting requirements designed to monitor continuing safety, adequacy, and reliability of generation, transmission, and distribution of electricity in the Commonwealth.

The Commission also established reliability benchmark and standard values to measure the performance of each EDC. Given the uncertainty of weather and other events that can affect reliability performance, the Commission has stated that EDCs should set goals to achieve consistent benchmark performance in order to prepare for times when unforeseen circumstances occasionally and briefly cause performance to exceed the benchmark threshold. As mandated, enforcement of the 3-year rolling average standard began with the utilities' filing of their 2006 annual reports. The 3-year performance standard only allows a deviation of 10% from the reliability index benchmark, as compared with the 20% or 35% deviations allowed by the 12-month performance standard.

The Commission set the performance standard as the occasional and brief maximum level an EDC can exceed the benchmark reliability performance value. Reliability performance values that are not considered in compliance require EDCs to provide an evaluation to the Commission that includes a Corrective Action Plan or a credible basis that would justify no corrective action is required. Reliability performance values that are not achieved during an assessment period will be followed up by the Commission. The inability of an EDC to achieve consistent compliance may result in an Order directing specific corrective actions.[14] Continuous noncompliance may trigger additional scrutiny and potential compliance enforcement actions by the Commission's prosecutorial staff in the Bureau of Investigation and Enforcement, including penalties and fines.[15]

[12] The high-voltage transmission system, nominally > 100 kV, is regulated by the Federal Energy Regulatory Commission (FERC). The electric distribution system is under the purview of the PUC.
[13] For more information on CAIDI and SAIFI, see Section 2.
[14] 52 Pa. Code § 57.197(a).
[15] 52 Pa. Code § 57.194(h)(1).

Section 2 –Reliability Performance Measures

Reliability Performance Metrics

The Commission's benchmarks and standards are based on four reliability performance metrics that have been adopted by the IEEE. The EDCs report metrics on a system-wide basis, rather than on a regional operating area basis. EDCs report the four reliability metrics on both a rolling 12-month average and a 3-year calendar year average:

1. **CAIDI** (Customer Average Interruption Duration Index): Measures average power restoration time (by minutes) for every customer who lost power during reporting period.
2. **SAIDI** (System Average Interruption Duration Index): Measures average outage duration time (by minutes) for every customer served during reporting period.
3. **SAIFI** (System Average Interruption Frequency Index): Measures average frequency of power interruptions for every customer served during reporting period.
4. **MAIFI** (Momentary Average Interruption Frequency Index): Measures average frequency of momentary (less than five minutes) interruptions for every customer served during reporting period.[16]

Additional information and data reported by EDCs:

- Average number of customers served.
- Number of sustained customer interruption minutes.
- Number of customers affected by service interruptions.
- Analysis of outage causes such as equipment failure, animal contact and contact with trees.[17]
- Reliability performance on the 5% of worst performing circuits and a corrective action plan to increase the reliability of these circuits.

Major Events

In order to analyze and set measurable goals for electric service reliability performance, outage data is separated into either normal or abnormal periods. Only outages during normal event periods are used in calculating the reliability metrics. The term "Major Event" is used to identify an abnormal event, such as a major storm, and is defined as either of the following:[18]

- An interruption of electric service resulting from conditions beyond the control of the EDC which affects at least 10 % of the customers in the EDC's service territory during the course of the event for a duration of five minutes or greater; or

[16] EDCs are required to report MAIFI data, provided the equipment capability is available to obtain relevant data. Only Met-Ed, PECO, Penelec, Penn Power and PPL report MAIFI.
[17] This information is collected and trended by EDCs to reduce customer outages and improve system reliability.
[18] *See* 52 Pa. Code § 57.192.

- An unscheduled interruption of electric service resulting from an action taken by an EDC to maintain the adequacy and security of the electrical system.

Outage data relating to Major Events are to be excluded from the calculation of reliability metrics. Prior to excluding major event data, an EDC is required to formally request to exclude those service interruptions for reporting purposes. The request must be accompanied by data that demonstrates why the service interruption qualifies as a major event exclusion.

Definitions: benchmark, standard, 12-month average, & 3-year average

The **benchmark** performance value represents the statistical average of the EDC's annual, system-wide, reliability performance index values for the five years from 1994-98. The benchmark value serves as an upper limit that EDCs should be consistently achieving to ensure reliability performance is considered satisfactory and acceptable.

The **standard** performance value represents an EDC's performance upper control limit established to allow EDCs to exceed the benchmark performance value occasionally and briefly. Both long-term (rolling 3-year) and short-term (rolling 12-month) performance standards have been established for each EDC based on individual EDC historical performance benchmarks. The performance standard limit allows an EDC to exceed a benchmark limit occasionally and briefly. However, consistently exceeding benchmark performance, or exceeding the standard limit is an indication that the EDC's performance is not satisfactory and requires additional scrutiny by the Commission.

The performance rolling **12-month average** is 120% of the benchmark for the large EDCs and 135% for the small EDCs.[19] A greater degree of short-term latitude for small EDCs recognizes that small EDCs have fewer customers and fewer circuits than large EDCs, potentially allowing a single event to have a more significant impact on the reliability performance of the small EDCs' distribution systems.

The performance rolling **3-year average** is 110% of the benchmark for all EDCs. This performance standard was set at 10% above the historical benchmark to ensure that the standard is no higher than the worst annual performance experienced during the years prior to the restructuring of the electric industry. The 3-year average performance is measured against the standard at the end of each calendar year. The rolling 3-year standard analysis contained in this report uses 2016, 2017 and 2018 calendar year data.

It is noted that a lower number for any index indicates better reliability performance; i.e., a lower frequency of outages or shorter outage duration. A higher number indicates worse performance.

Example: A large EDC's rolling 12-month **CAIDI benchmark** performance metric is 100 and associated **CAIDI standard** performance metric is 120 (which is 120% of benchmark). Evaluate an EDC's quarterly CAIDI score of 110, 90, and 140:

[19] Large EDCs currently include Duquesne Light, Met-Ed, Penelec, Penn Power, PECO, PPL and West Penn. Small EDCs include: UGI, Citizens', Pike County and Wellsboro.

CAIDI of 110 evaluation: Performance is above **benchmark**, but below **standard**, and may require additional review and action if the EDC is chronically above **benchmark** score and trending toward exceeding **standard**. Upon Commission review, the EDC may be required to develop a Corrective Action Plan (CAP) and **additional PUC oversight will be taken to monitor effectiveness until performance is below benchmark**. In addition, this may result in a referral to Investigation & Enforcement Bureau for further action.

CAIDI of 90 evaluation: Performance is considered excellent since CAIDI is below both **benchmark and standard**.

CAIDI of 140 evaluation: Performance is considered unacceptable since CAIDI is greater than both **benchmark and standard**. The EDC will be required to develop a Corrective Action Plan (CAP) and additional PUC oversight will be taken to monitor effectiveness until benchmark performance is achieved. In addition, may result in a referral to Investigation & Enforcement Bureau for further action.

If any EDC's reliability performance does not meet Commission regulations, the Commission may require a report discussing the reasons for not meeting the regulation and the corrective measures the company is taking to improve performance.[20] In addition, Commission staff may initiate an investigation to determine whether an EDC is providing reliable service.[21]

Benchmarks and standards for EDC reliability performance and actual reliability metrics for 2018 are located in Appendix A.

Inspection and Maintenance

EDCs are required to have a plan for periodic inspection and maintenance of poles, overhead conductors and cables, wires, transformers, switching devices, protective devices, regulators, capacitors, substations, and other facilities critical to maintaining an acceptable level of reliability.[22] The time intervals for such inspections are detailed in Table 1, below. The regulation also sets forth minimum inspection and maintenance intervals for vegetation management, poles, overhead lines, and substations.

Listed below are the most recently filed biennial inspection and maintenance (I&M) plans for the periodic inspection, maintenance, repair, and replacement of facilities:

- Filed in October 2019 (effective January 2021 through December 2022) for FirstEnergy (Met-Ed, Penelec, Penn Power and West Penn Power) and UGI.

- Filed in October 2018 (effective January 2020 through December 2021) for Duquesne Light, PECO, PPL, Citizens', Pike County and Wellsboro.

[20] *See* 52 Pa. Code § 57.195(g).
[21] *See* 52 Pa. Code § 57.197(a).
[22] *See* 52 Pa. Code § 57.198.

The plans are subject to acceptance or rejection by the Commission. Most EDCs proposed modifications to the standards for some programs or parts of programs. Appendix C describes the exemptions that were requested by the EDCs and provides a summary of the explained justification for said exemptions.[23]

Table 1 - Inspection and Maintenance Intervals

Program	Interval
Vegetation Management	4-6 years
Pole Inspections	10-12 years
Overhead Distribution Line Inspections	1-2 years
Overhead Transformer Inspections	1-2 years
Above-Ground Pad-Mounted Transformer Inspections	5 years
Below-Ground Transformer Inspections	8 years
Recloser Inspections	8 years
Substation Inspections	5 weeks

Section 3 – 2019 Outage Response Review

Overview

Tables 2A, 2B, and 2C, below, present a breakdown of reportable outage events (ROEs)[24] summarized for 2019 (52 events) as compared to 2018 (35 events), and 2017 (50 events).

Table 2D, details the number of ROEs from 1993 through 2019. Note the number of ROEs that occurred during the benchmark period from 1994 through 1998. This information is highlighted to show that EDCs are expected to provide service at a level equal to or better than that provided during the benchmark period, regardless of whether ROEs are increasing on an annual basis.

Table 2E details the number of customers affected by ROEs from 1993 through 2019. In 2019, a total of 1,988,188 customers were negatively affected by ROEs as compared to 2,548,905 in 2018, 1,309,960 customers in 2017, 779,512 customers in 2016, and 619,474 customers in 2015.

Note: The high level of customers affected in 2011, 2012, and 2014 are primarily due to a few high-impact events, such as Irene in 2011, Sandy in 2012, and Nika in 2014.

Table 2F, details the cumulative number of ROEs by EDC from 2010 through 2019.

[23] *See* 52 Pa. Code § 57.198(c).

[24] Service outages reports are required under 52 Pa. Code § 67.1. The reporting threshold for a 67.1 reportable outage event is 5 percent of total customers or 2,500 customers, whichever is less, for 6 or more consecutive hours. The reporting requirements are an initial phone call to the Commission when it is believed the threshold will be reached, followed by a written report 10 working days after the last customer is restored.

Table 2A –67.1 Reportable Outage Events Summary 2019

EDC	Date	Customers Affected	Cause
Citizens	4/15/2019	2,695	EF-1 tornado and trees
Duquesne	10/31/2019	15,087	Storm and trees
Duquesne	6/29/2019	12,139	Storm and trees
Duquesne	2/24/2019	140,183	storm and trees
Duquesne	5/29/2019	9,892	Storm and trees
Met-Ed	10/31/2019	21,407	Storm and trees
Met-Ed	11/27/2019	11,941	Storm and trees
Met-Ed	12/1/2019	31,854	Storm and trees
Met-Ed	2/24/2019	38,466	Storm and trees
Met-Ed	5/14/2019	4,303	Vehicle hit pole
Met-Ed	3/3/2019	13,773	Storm and trees
Met-Ed	5/29/2019	35,280	Storm and trees
PECO	10/16/2019	44,333	Storm and trees
PECO	10/31/2019	127,899	Storm and trees
PECO	2/24/2019	86,026	Storm and trees
PECO	4/26/2019	37,301	Storm and trees
PECO	5/29/2019	73,791	Storm and trees
PECO	6/29/2019	54,564	Storm and trees
PECO	7/17/2019	45,619	Storm and trees
PECO	7/2/2019	21,947	Storm and trees
PECO	7/22/2019	106,410	Storm and trees
Penelec	10/31/2019	64,619	Storm and trees
Penelec	12/1/2019	28,538	Storm and trees
Penelec	2/24/2019	106,374	Storm and trees
Penelec	5/29/2019	26,192	Storm and trees
Penelec	5/19/2019	11,066	Storm and trees
Penelec	7/19/2019	13,734	Storm and trees
Penelec	8/17/2019	48,429	Storm and trees
Penelec	4/19/2019	9,031	Storm and trees
Penelec	4/14/2019	31,221	Storm and trees
Penelec	1/1/2019	27,979	Storm and trees

Table 2A (cont'd) –67.1 Reportable Outage Events Summary-2019

EDC	Date	Customers Affected	Cause
Penn Power	2/24/2019	36,177	Storm and trees
PPL	11/27/2019	19,989	Storm and trees
PPL	2/24/2019	79,031	Storm and trees
PPL	4/14/2019	50,884	Storm and trees
PPL	5/19/2019	20,778	Storm and trees
PPL	5/29/2019	16,982	Storm and trees
PPL	6/28/2019	18,331	Storm and trees
PPL	7/21/2019	11,794	Storm and trees
PPL	10/16/2019	19,863	Storm and trees
PPL	10/31/2019	80,586	Storm and trees
PPL	12/1/2019	17,094	Storm and trees
UGI	4/15/2019	11,703	Storm and trees
UGI	8/15/2019	5,845	Storm and trees
West Penn	1/1/2019	14,036	Storm and trees
West Penn	10/22/2019	5,220	Equipment failure
West Penn	10/31/2019	27,274	Storm and trees
West Penn	11/27/2019	24,959	Storm and trees
West Penn	12/17/2019	7,214	Storm and trees
West Penn	2/24/2019	177,232	Storm and trees
West Penn	5/29/2019	26,194	Storm and trees
West Penn	6/29/2019	14,909	Storm and trees

Table 2B –67.1 Reportable Outage Events Summary-2018

EDC	Date	Customers Affected	Cause
Duquesne	11/15/2018	63,344	Rain, Snow, Sleet
Duquesne	7/4/2018	31,482	Thunderstorms and rain
Duquesne	9/9/2018	19,170	Heavy rain
Met-Ed	11/15/2018	30,893	Rain, Snow, Sleet
Met-Ed	3/2/2018	272,928	Heavy rain
Met-Ed	4/4/2018	13,784	Weather
Met-Ed	5/15/2018	111,902	Weather
Met-Ed	6/17/2018	2,601	Cascading trees
Met-Ed	8/17/2018	18,766	Thunderstorms and high winds
PECO	11/2/2018	44,737	Thunderstorms and high winds
PECO	3/7/2018	191,272	Weather
PECO	5/2/2018	603,697	Weather
PECO	7/22/2018	55,681	Thunderstorms and high winds
PECO	7/3/2018	59,019	Thunderstorms and high winds
PECO	11/16/2018	27,699	Thunderstorms and high winds
Penelec	3/2/2018	90,856	Snow and wind
Penelec	4/4/2018	74,192	Weather
Penelec	5/15/2018	15,307	Weather
Penelec	5/4/2018	16,369	Thunderstorms and high winds
Penn Power	3/2/2018	8,688	Weather
Penn Power	11/16/2018	43,919	Thunderstorms and high winds
Pike	3/3/2018	2,101	Snow and wind
PPL	4/5/2018	51,721	Wind
PPL	4/15/2018	13,953	Rain and wind
PPL	7/23/2018	35,402	Rain and wind
PPL	3/2/2018	261,341	Wind
PPL	5/15/2018	121,963	Rain and wind
PPL	11/15/2018	15,673	Thunderstorms and high winds
West Penn	10/20/2018	9,424	Rain and wind
West Penn	3/2/2018	21,196	Weather
West Penn	4/4/2018	35,435	Weather
West Penn	5/15/2018	23,143	Weather
West Penn	5/4/2018	7,176	Thunderstorms and high winds
West Penn	5/15/2018	23,143	Weather
West Penn	11/15/2018	75,322	Thunderstorms and high winds

Table 2C –67.1 Reportable Outage Events Summary-2017

EDC	Date	Customers Affected	Cause
Duquesne	2/12/2017	19,735	Rain and high winds
Duquesne	3/1/2017	12,406	Thunderstorms and high winds
Duquesne	5/1/2017	47,548	Thunderstorms and high winds
Duquesne	6/13/2017	25,809	Thunderstorms and high winds
Duquesne	8/4/2017	20,799	Thunderstorms and heavy rain
Duquesne	11/19/2017	11,126	High winds- mesovortices
Met-Ed	2/12/2017	29,409	High winds
Met-Ed	2/25/2017	34,202	Thunderstorms and high winds
Met-Ed	3/1/2017	12,147	Thunderstorms and high winds
Met-Ed	3/10/2017	6,686	Suspected failed insulator on 34.5 kV line
Met-Ed	6/19/2017	27,711	Thunderstorms and high winds
Met-Ed	9/5/2017	47,610	Thunderstorms and heavy rain
Met-Ed	10/29/2017	18,315	High winds
PECO	1/23/2017	76,899	Rain and high winds
PECO	3/7/2017	39,124	Substation fire
PECO	6/21/2017	42,293	Thunderstorms and high winds
Penelec	2/12/2017	25,562	High winds
Penelec	3/1/2017	29,326	Thunderstorms and high winds
Penelec	3/8/2017	34,764	Thunderstorms and high winds
Penelec	5/1/2017	102,198	Thunderstorms and high winds
Penelec	5/5/2017	12,668	NYSEG 115 kV line failure
Penelec	6/18/2017	39,736	Thunderstorms and high winds
Penelec	7/20/2017	12,268	Thunderstorms and high winds
Penelec	8/4/2017	14,163	Thunderstorms and heavy rain
Penelec	8/19/2017	25,674	Thunderstorms and heavy rain
Penelec	11/5/2017	16,641	Thunderstorms and heavy rain
Penn Power	3/8/2017	16,557	Thunderstorms and high winds
Penn Power	5/1/2071	11,249	Thunderstorms and high winds
PPL	2/12/2017	19,429	High winds
PPL	2/25/2017	22,239	High winds
PPL	3/1/2017	12,649	Thunderstorms and high winds
PPL	3/27/2017	8,972	Transmission line crossarm failed during storm
PPL	5/1/2017	25,741	Thunderstorms and high winds
PPL	5/5/2017	16,343	Thunderstorms and high winds
PPL	9/5/2017	14,895	Thunderstorms and heavy rain
PPL	10/29/2017	36,521	High winds
PPL	11/19/2017	9,613	High winds
PPL	7/20/2017	7,530	Thunderstorms and high winds
Wellsboro	5/6/2017	6,341	Failed substation bus insulator
West Penn	2/8/2017	13,802	Snow and wind
West Penn	2/12/2017	27,067	High winds
West Penn	3/1/2017	33,836	Thunderstorms and high winds
West Penn	3/8/2017	28,404	Thunderstorms and high winds
West Penn	5/1/2017	77,458	Thunderstorms and high winds
West Penn	6/23/2017	18,595	Thunderstorms and high winds
West Penn	7/28/2017	19,901	Thunderstorms and heavy rain
West Penn	8/4/2017	41,924	Thunderstorms and high winds
West Penn	8/19/2017	10,773	Thunderstorms and heavy rain
West Penn	8/22/2017	25,888	Thunderstorms and heavy rain
West Penn	11/18/2017	19,414	High winds

Table 2D – Total 67.1 Reportable Events for EDCs 1993-2019

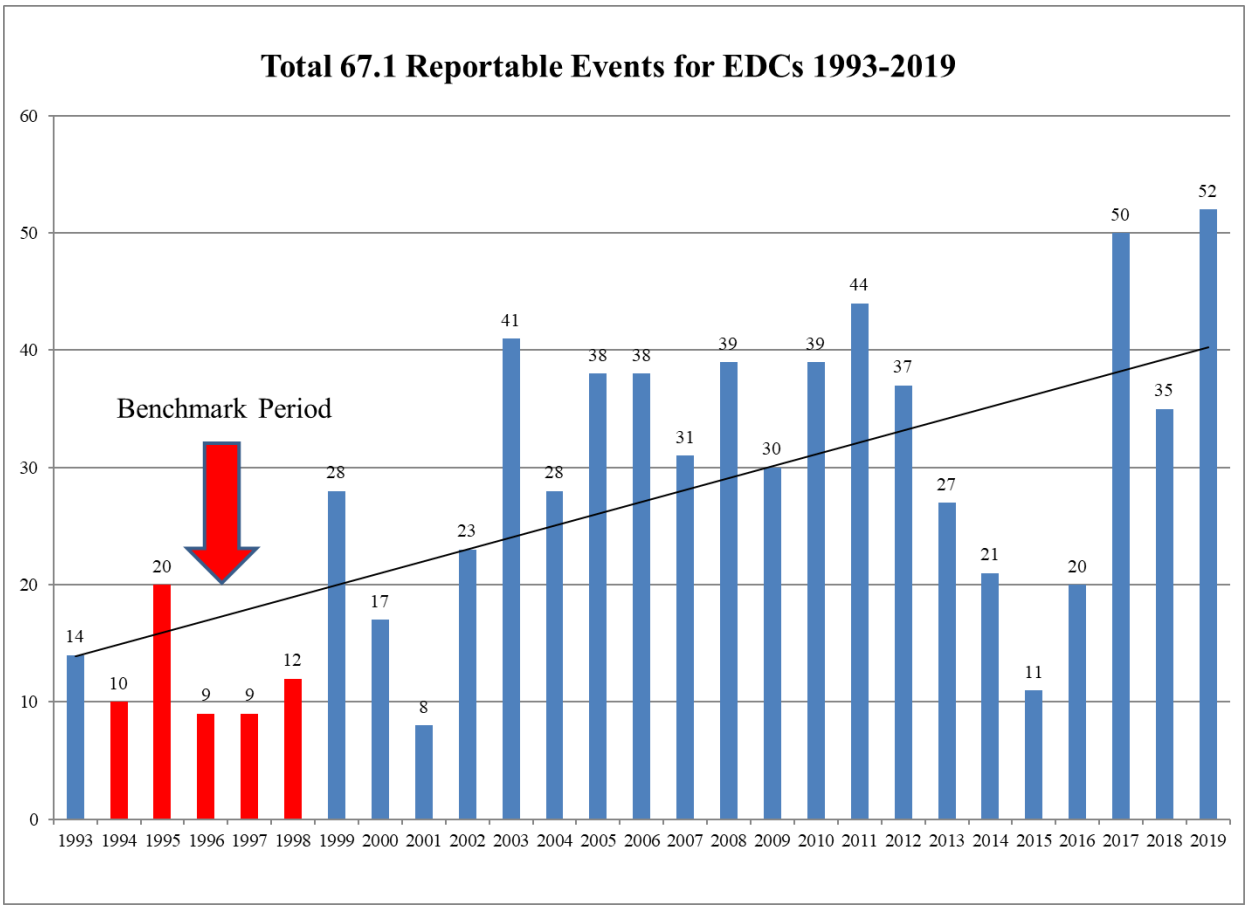


Table 2E – Total Customers Affected by 67.1 Reportable Events 1993-2019

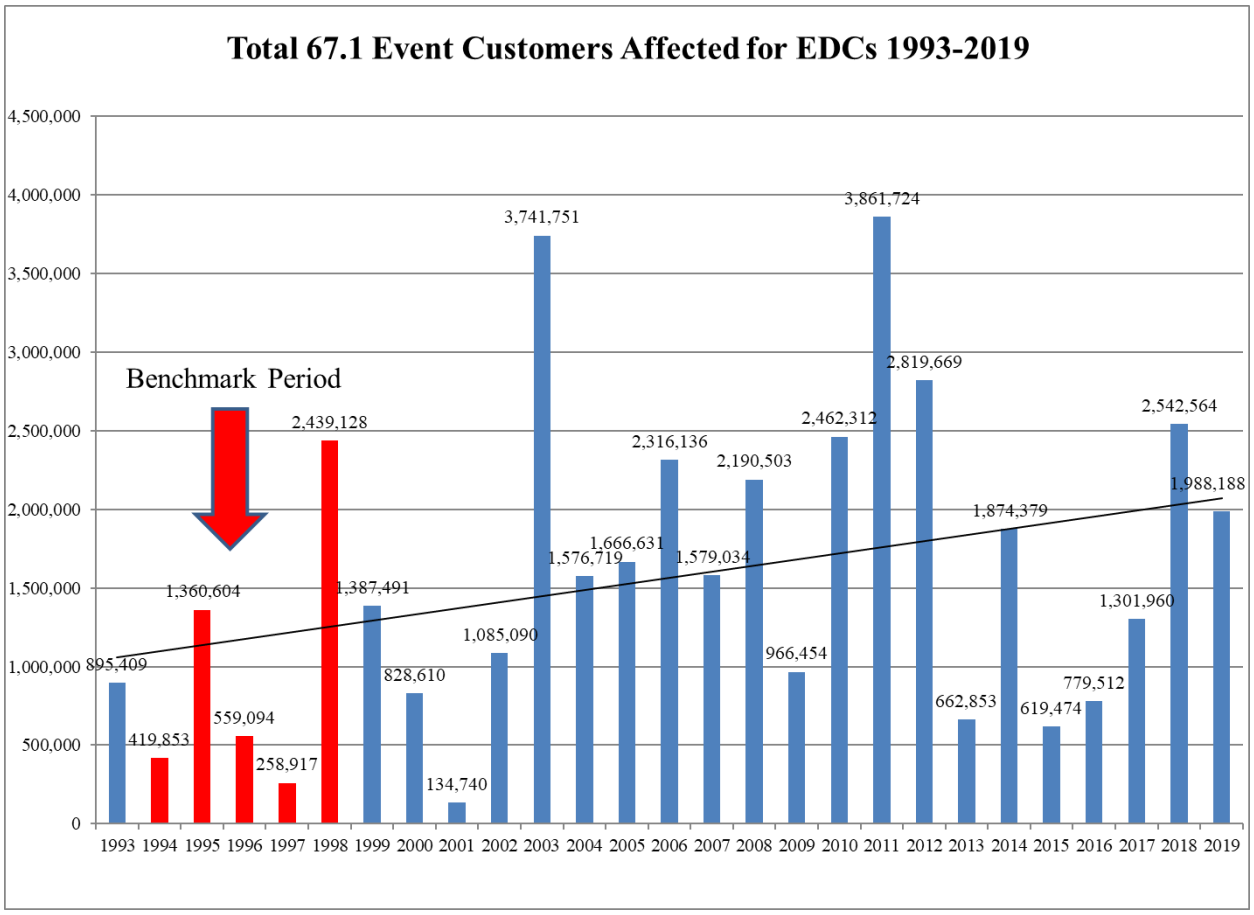
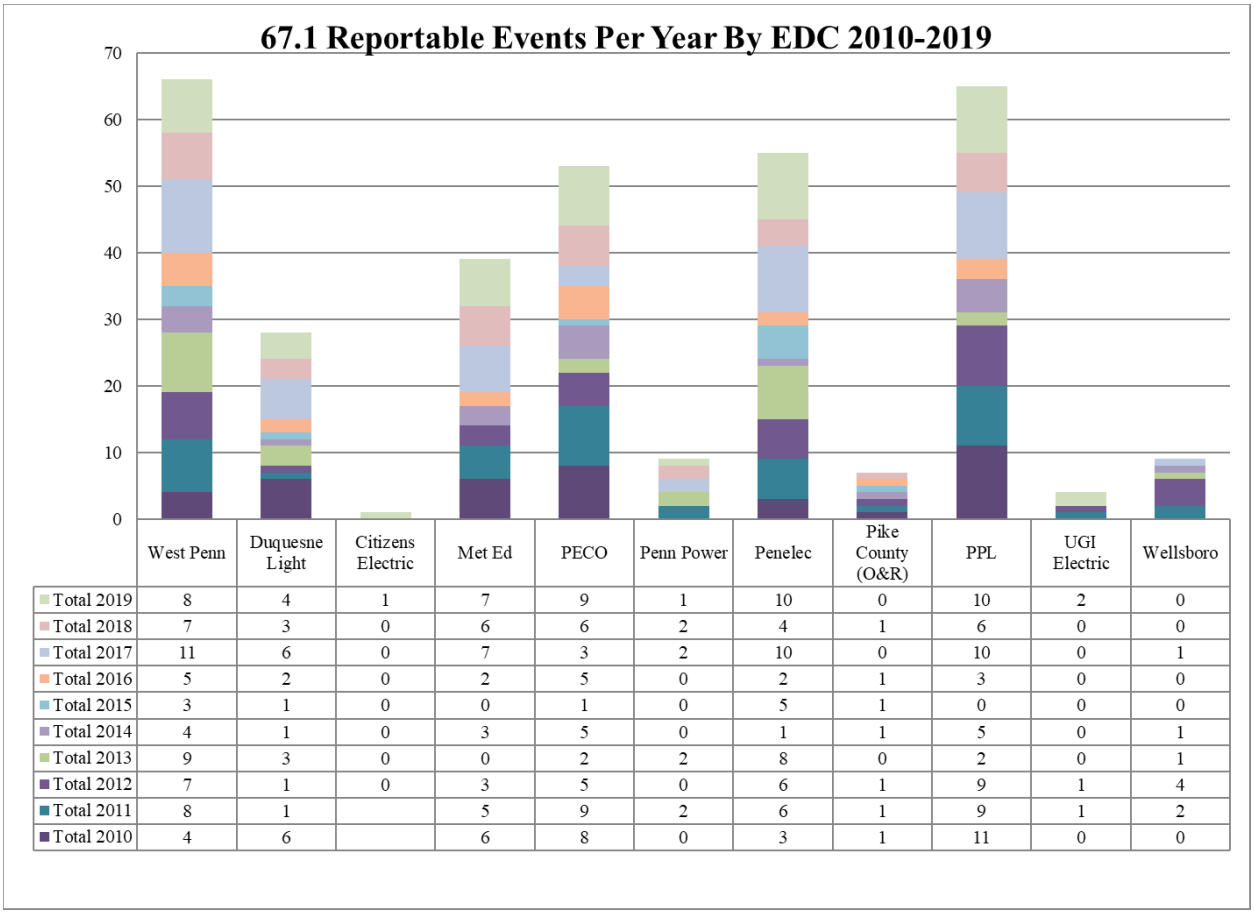


Table 2F –67.1 Reportable Events by EDC 2010-2019



	West Penn	Duquesne Light	Citizens Electric	Met Ed	PECO	Penn Power	Penelec	Pike County (O&R)	PPL	UGI Electric	Wellsboro
Total 2019	8	4	1	7	9	1	10	0	10	2	0
Total 2018	7	3	0	6	6	2	4	1	6	0	0
Total 2017	11	6	0	7	3	2	10	0	10	0	1
Total 2016	5	2	0	2	5	0	2	1	3	0	0
Total 2015	3	1	0	0	1	0	5	1	0	0	0
Total 2014	4	1	0	3	5	0	1	1	5	0	1
Total 2013	9	3	0	0	2	2	8	0	2	0	1
Total 2012	7	1	0	3	5	0	6	1	9	1	4
Total 2011	8	1		5	9	2	6	1	9	1	2
Total 2010	4	6		6	8	0	3	1	11	0	0

Major Outage Exclusion Events

In 2019 as in 2018, the resilience of Pennsylvania's electrical system was challenged with a substantial amount of severe storm activity. Pennsylvania customers were adversely affected with about **1.0 billion customer-minutes-interrupted** due to major storm events in 2019 as compared to 2.7 billion customer-minutes lost to major storm events in 2018. In 2019, there were 23 Major Event exclusion requests filed as compared with 29 in 2018, 13 in 2017, and 11 in 2016. Note that Major Events are excludable from EDC's reliability indices and the additional 1.0 billion customer-minutes-interrupted is not added to the reliability metrics.

Major Events for 2019, 2018, 2017, and 2016 are shown below in Tables 3A, 3B, 3C, and 3D. In 2019, there were about 1.0 billion customers-minutes interrupted due to Major Events as compared to 2.7 billion customers-minutes interrupted in 2018, 135 million customers-minutes interrupted in 2017, and 6 million customers-minutes interrupted in 2016.

Table 3A – 2019 Major Events

EDC	Date	Customers Affected	Cause	Total Customer Minutes Interrupted
Citizens	1/8/2019	1,811	vehicle hit pole	278,001
Citizens	4/15/2019	2,695	Wind and trees	757,999
Citizens	5/29/2019	1,379	Wind and trees	65,664
Citizens	6/26/2019	868	Wind and trees	65,679
Citizens	9/11/2019	1,114	Wind and trees	112,647
Duquesne	2/24/2019	140,183	Winter storm	772,081,564
Penelec	2/24/2019	106,374	Winter storm	28,827,618
Penelec	10/31/2019	64,234	Wind and trees	18,082,778
Penn Power	2/24/2019	36,177	Winter storm	20,219,291
Pike	2/25/2019	2,434	Winter storm	429,968
UGI	4/15/2019	11,703	Thunderstorm and wind	5,791,636
Wellsboro	2/24/2019	2,057	Winter storm	457,081
Wellsboro	4/3/2019	709	Wind and trees	123,425
Wellsboro	4/15/2019	707	Wind and trees	20,562
Wellsboro	6/14/2019	1,505	Vehicle hit pole	474,529
Wellsboro	7/19/2019	2,132	Wind and trees	312,340
Wellsboro	8/11/2019	750	Lightening	163,320
Wellsboro	9/21/2019	1,150	Equipment failure	148,741
Wellsboro	10/9/2019	6,343	Transmission breaker trip	266,406
Wellsboro	10/28/2019	6,343	Equipment failure	507,440
Wellsboro	10/31/2019	2,485	Wind and trees	472,432
Wellsboro	12/2/2019	3,315	Ice and trees	970,233
West Penn	2/24/2019	177,232	Winter storm	151,122,575
	Totals	**573,700**	**Totals**	**1,001,751,929**

Table 3B – 2018 Major Events

EDC	Date	Customers Affected	Cause	Total Customer Minutes Interrupted
Citizens	3/2/2018	1,541	Winter Storm Riley	84,788
Citizens	5/15/2018	2,535	Rain and Wind	259,570
Citizens	7/21/2018	1,026	Ash Tree	94,797
Citizens	8/4/2018	1,022	Ash Tree	77,216
Citizens	9/10/2018	2,172	12 kV Bus Raccoon Fault	293,140
Citizens	11/15/2018	7,003	Snow and Ice	838,839
Duquesne	11/15/2018	63,344	Winter Storm Avery	106,227,566
Met-Ed	1/23/2018	408	Flood Waters	669,120
Met-Ed	3/2/2018	273,398	Winter Storm Riley	580,726,537
Met-Ed	5/15/2018	111,894	Thunderstorm and Winds	79,685,165
Met-Ed	7/21/2018	62,511	Excessive Rain	9,869,127
PECO	3/2/2018	603,697	Winter Storm Riley	746,216,384
PECO	3/7/2018	191,272	Winter Storm Quinn	115,649,601
Penelec	1/12/2018	187	Flood Waters	230,799
Penelec	3/1/2018	76,703	Winter Storm Riley	24,639,302
Penelec	8/13/2018	2,863	Flood Waters	3,444,136
Penelec	4/3/2018	62,262	Rain and Wind	13,104,058
Penn Power	1/18/2018	2,456	Proactive Low Voltage Interruption	2,988,702
Penn Power	6/23/2018	24,867	Conductor Fault	312,737
Penn Power	11/15/2018	43,919	Winter Storm Avery	42,702,369
Pike	3/2/2018	2,101	Winter Storm Riley/Quinn	422,777,649
Pike	9/6/2018	2,680	Orange & Rockland Lightning Strike	1,628,082
PPL	3/2/2018	261,341	Winter Storm Riley/Quinn	355,173,459
Wellsboro	7/22/2018	6,433	Fallen Tree (Penelec 34.5 issue)	1,627,549
Wellsboro	12/1/2018	947	34.5 kV FirstEnergy line disruption	143,803
West Penn	2/15/2018	2,947	Flood Waters	1,602,386
West Penn	6/20/2018	1,122	Flood Waters	4,012,943
West Penn	9/8/2018	72,408	Rain and Wind	19,429,879
West Penn	11/15/2018	75,322	Winter Storm Avery	126,314,611
	Totals	**1,960,381**	**Totals**	**2,660,824,314**

Table 3C – 2017 Major Events

EDC	Date	Customers Affected	Cause	Total Customer Minutes Interrupted
Citizens	5/27/2017	1,015	Squirrel	77,248
Citizens	7/3/2017	1,411	Squirrel	84,660
Citizens	7/4/2017	1,411	Squirrel	126,990
Citizens	9/30/2017	6,995	Wind	83,832
Penelec	5/1/2017	95,607	Rain and high winds	74,396,630
Penelec	7/23/2017	1,111	Flood waters	513,839
Penn Power	3/8/2017	16,557	Snow and wind	5,402,116
Penn Power	11/5/2017	19,298	Thunder Storm and wind	3,493,432
Pike	2/13/2017	786	Snow and wind	55,432
Wellsboro	5/6/2017	6,341	Substation bus insulator failure	1,166,744
West Penn	5/1/2017	77,458	Thunderstorms and high winds	45,309,142
West Penn	6/23/2017	1,665	Flood waters	1,745,883
West Penn	7/28/2017	3,748	Flood waters	2,568,850
	Totals	**233,403**	**Totals**	**135,024,798**

Table 3D – 2016 Major Events

EDC	Date	Customers Affected	Cause	Total Customer Minutes Interrupted
Citizens	3/30/2016	1,409	Three phase polymer insulator failed	132,895
Citizens	11/8/2016	1,008	homeowner cut down tree into line	41,468
Citizens	11/19/2016	1,833	Rain and high winds	248,388
Penelec	11/2/2016	1,794	Flash Flood near Ralston	1,804,107
Pike County	2/16/2016	1,795	Mylar baloons caught in power line	10,770
Pike County	2/24/2016	1,067	Rain and high winds	185,055
Pike County	8/13/2016	627	Rain and high winds	474,908
Pike County	9/19/2016	2,518	Motor vehicle hit utility pole	1,476,882
Wellsboro	4/3/2016	2,015	Rain and high winds	362,700
Wellsboro	8/8/2016	897	Bear in conductors	56,511
Wellsboro	12/26/2016	6,097	Transmission line failure	1,195,012
	Totals	**21,060**	**Totals**	**5,988,696**

Review of Long-Duration Outage Events

While there were no long-duration outage events (those with outages lasting 6 or more days) in 2019, some high-impact events included:

- A windstorm on Feb. 24, 2019 caused over 663,000 customer outages in the service territories of 7 EDCs. Most customers were restored within the first 48 hours and the last customer was restored on March 1, 2019.
- A storm with heavy rain and high wind on Oct. 31, 2019 caused over 336,000 customer outages in the service territories of 6 EDCs. Most customers were restored in the first 48 hours and the last customer was restored on Nov. 5, 2019.

Section 4 –EDC Reliability Performance Data

Statewide Summary

Rolling 12-month Benchmark Performance Compliance

The 2019 end of year reliability data for **12-month CAIDI, SADI, and SAIFI Benchmark performance compliance** submitted by the 11 EDCs indicates:

- Four EDCs achieved the **CAIDI Benchmark**, while seven EDCs failed to achieve the CAIDI benchmark (Figure 1).
- Three EDCs achieved the **SAIDI Benchmark**, while eight EDCs failed to achieve the SAIDI benchmark (Figure 2).
- Five EDCs achieved the **SAIFI Benchmark**, while six EDCs failed to achieve the SAIFI benchmark (Figure 3).

Figure 1 – 2019 CAIDI Comparison (percent above or below benchmark)

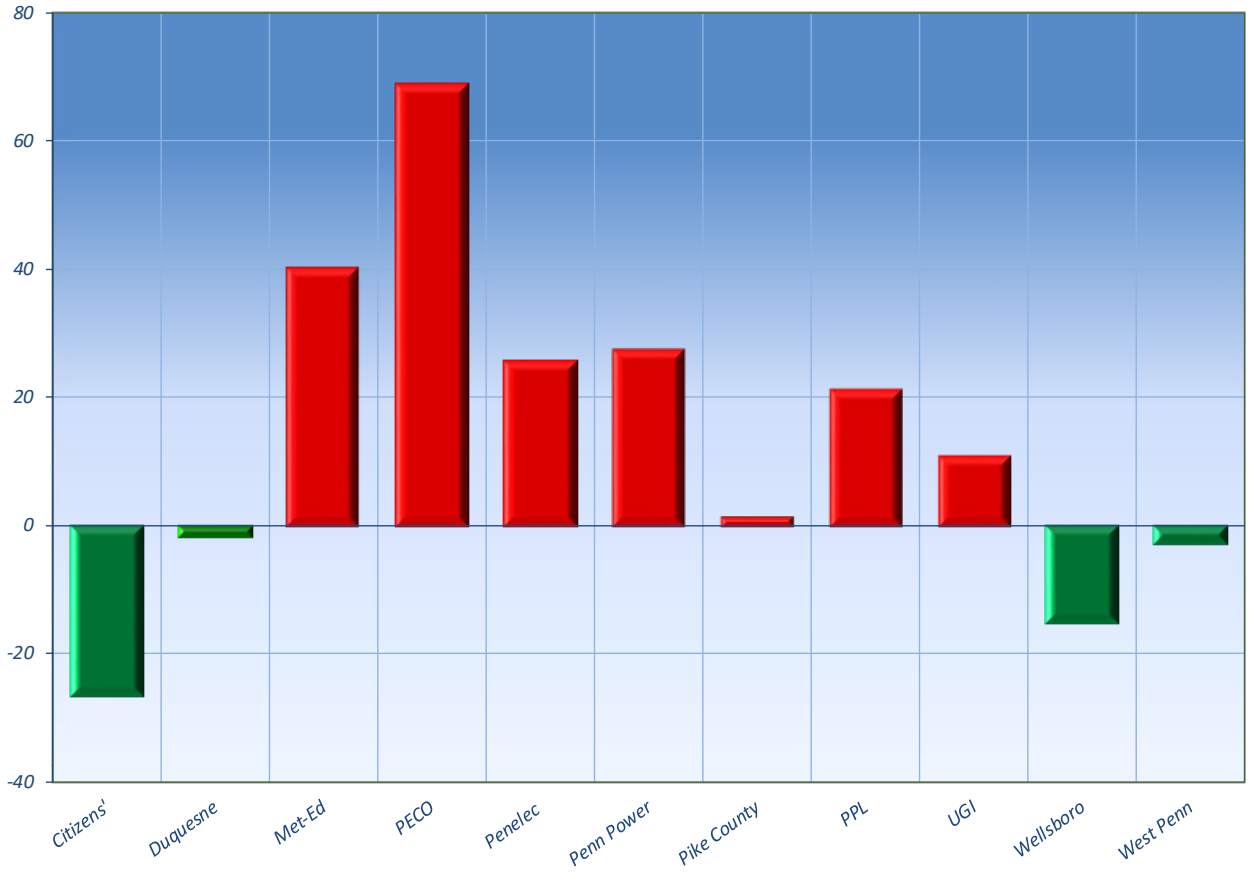


Figure 2 – 2019 SAIDI Comparison (percent above or below benchmark)

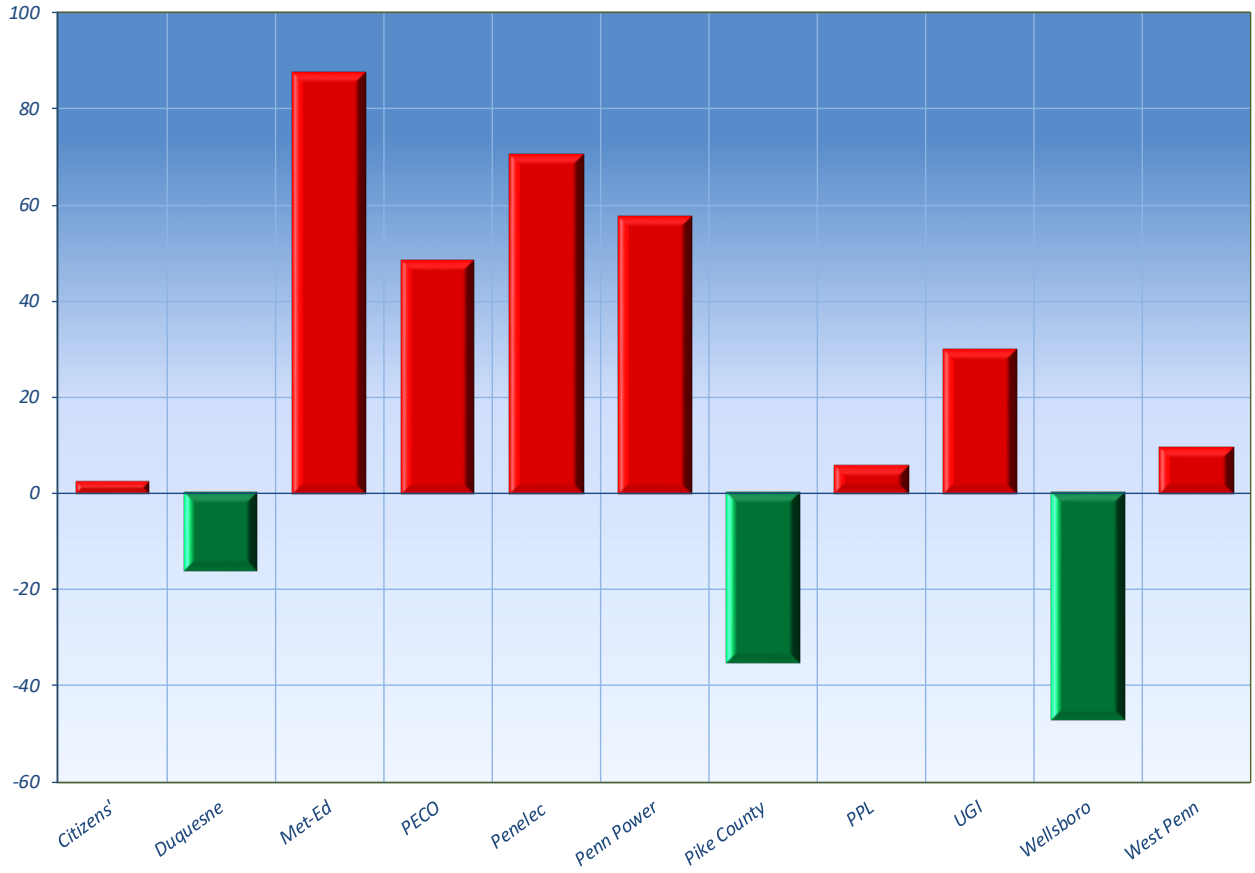
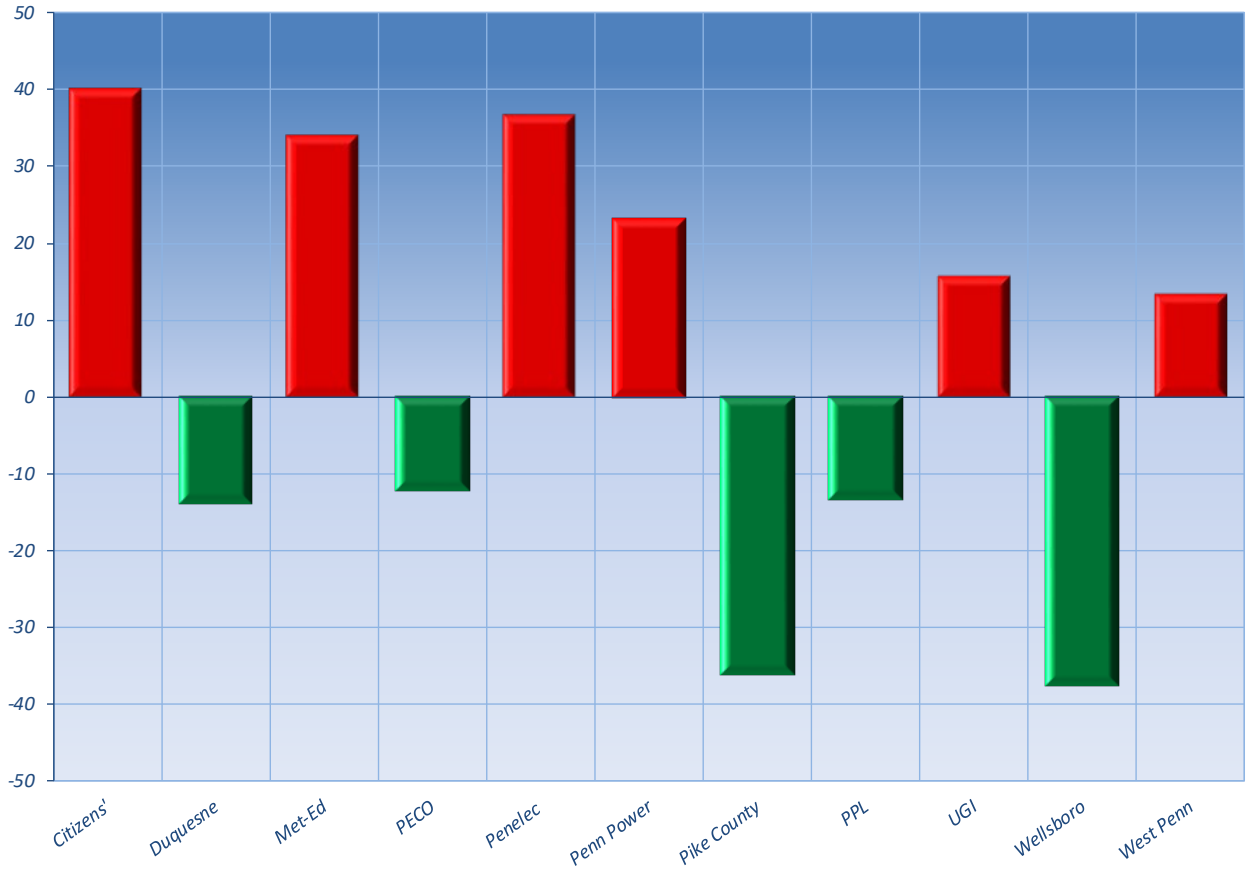


Figure 3 – 2019 SAIFI Comparison (percent above or below benchmark)



Rolling 3-year Average (2017-2019) Performance Compliance

Appendix A provides the 2019 results for the 12-month average and 3-year average reliability performance metrics for individual EDCs.

Six EDCs (Met-Ed, PECO, Penelec, Penn Power, Pike County, and PPL) failed to meet the rolling 3-year **CAIDI performance standard**.

Four EDCs (Citizens, Met-Ed, Penelec, and West Penn) failed to meet the rolling 3-year **SAIFI performance standard**.

Four EDCs (Citizens, Met-Ed, Penelec, and Penn Power) failed to meet the rolling 3-year **SAIDI performance standard**.

Utility-Specific Performance Data

The Commission compares reliability metrics on a quarterly basis, using data obtained for the preceding 12 months. This periodic assessment determines the status of electric service reliability on an ongoing basis and is instrumental in identifying negative trends. The 3-year average performance is measured at the end of each calendar year, using the average of the past 3 end-year

metrics, as indicated in Appendix A. The following sections provide a detailed description of the 11 EDCs' individual reliability performance on a rolling 12-month and 3-year average basis.

Duquesne Light Company

Duquesne has a service territory of about 817 square miles with a well-developed distribution system serving about 590,000 customers.

In 2019, Duquesne experienced 7.3 million kilovolt-amps (kVA) customer interruptions and 772 million kVA-minutes of customer-minutes interrupted as compared to: 6.1 million kilovolt-amps (kVA) customer interruptions and 647 million kVA-minutes of customer-minutes interrupted in 2018; 7.1 million kVA of customer interruptions and 813 million kVA-minutes of customer-minutes interrupted in 2017; and 5 million kVA of customer interruptions and 497 million kVA-minutes of customer-minutes interrupted in 2016. (Note these numbers exclude major events)

Duquesne experienced 1 Major Event on February 2019 where Duquesne customers experienced a loss of 784 million kVA-minutes of customer-minutes interrupted not included in the total above.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Remained at 106 minutes in 2019; achieved benchmark by 2%.

3-year average: Increased from 107 minutes in 2018 to 109 minutes in 2019; achieved standard by 8%.

SAIDI

Rolling 12-month: Increased from 89 minutes in 2018 to 106 minutes in 2019; achieved benchmark by 16%.

3-year average: Increased from 90 minutes in 2018 to 102 minutes in 2019; achieved standard by 33%.

SAIFI

Rolling 12-month: Increased from 0.84 outages in 2018 to 1.01 outages in 2019; achieved benchmark by 14%.

3-year average: Increased from 0.84 outages in 2018 to 0.94 outages in 2019; achieved standard by 27%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 4 and 5. During the past 3 years, Duquesne's CAIDI performance has been somewhat inconsistent, but it is trending positively below benchmark, as seen in Figure 4. It appears CAIDI performance has improved in 2019 and management should continue to work to sustain the trend line below the "green" benchmark performance upper-control-limit-line

Beginning in December 2004, Duquesne's SAIFI Benchmark performance trend has been positive, as shown in Figure 5. This positive performance trend, below the benchmark performance upper-

control-limit-line, has been sustained since 2004 by Duquesne, and is considered under control. Duquesne is considered an excellent SAIFI Benchmark Performer.

Outage Causes

Figure 6 shows the reported 2019 outage-cause categories, as a percentage, for the following three distinct performance metrics: KVA Minutes Interrupted, KVA Interrupted, and Number of Incidents. Trees were the top cause of outages and customer-minutes interrupted. Over 35% of outages are caused by trees, which includes the following: trees falling, trees in contact with distribution system, and tree damage during storms.

Figure 7 shows the historical trend of the top three main outage causes. Trees and equipment failure are the 2 most frequent outage causes that are significantly negatively affecting Duquesne's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

Duquesne continues its reliability management work programs and resilience storm hardening activities. Duquesne has an enhanced rights-of-way vegetation management maintenance program that is designed to reduce outages and to continue targeting off-right-of-way danger trees.

Duquesne has a total of 1,144 automatic 3-phase sectionalizers and reclosers on its 23 kV distribution circuits, which is an increase of 34 devices. The devices help to further minimize the impact of power outages to customers by dividing each circuit into distinct load blocks of approximately 250-600 customers each.

Sectionalizers and reclosers used on Duquesne's 23kV distribution system are continuously monitored over a wireless network to its centralized Distribution Operations Center (DOC). Circuit problems are immediately annunciated at the DOC where operators quickly take action to relieve overloads or isolate faults and reroute power to customers on non-faulted load blocks. Generally, when an outage occurs, DOC operators have the actual fault isolated from the rest of the circuit and all downstream customers are restored within 5 minutes. This automation and remote monitoring also help operators pinpoint the actual faulted load block so field crews can be directed to the failure location more quickly in order to begin repairs.

Duquesne has integrated a new MAXIMO work management system that provides higher precision tracking and reporting of asset and financial information. The platform enhances Duquesne's ability to collect more granular location and equipment failure data.

In late spring 2018, Duquesne began utilizing a software package called CYME v8.1 CYMDIST ("CYMDIST"). With CYMDIST, planning engineers can perform several types of analysis on balanced or unbalanced 3-phase, 2-phase, and single-phase systems that are operated in radial, looped, or meshed configurations. From a reliability standpoint, Duquesne notes it has been used to correct phase imbalance, better coordinate fusing, identify overloaded equipment, and alleviate voltage concerns across the 4 kV and 23 kV distribution systems.

Duquesne is also installing new capacitor control boxes that allow for additional information to be remotely monitored and additional setpoints to be used to better increase effectiveness.

Duquesne is currently in the process of updating all remotely monitored devices from a 3G network to a 4G network. This has increased the communication reliability to its remotely monitored devices.

Duquesne completed various capacity projects in 2019 that upgraded lines, transformers, and substation infrastructure. Duquesne has also committed to the installation of an outage management system (OMS) that in the future will provide customers with more accurate restoration information and improve storm restoration execution. Duquesne also utilizes Infrared Inspection on 20% of distribution circuits each year.

Duquesne is a participant in the Spare Transformer Equipment Program (STEP) program managed by Edison Electric Institute (EEI). Additionally, in 2018, Duquesne committed to participate in the Regional Equipment Sharing for Transmission Outage Restoration or RESTORE program, which establishes a proactive approach to providing critical equipment for utilities that need additional resources during disaster recovery and does not replace existing programs or agreements already in place.

Conclusion

Trees and Equipment failures are the top two outage causes that substantially negatively affect electrical reliability to Duquesne customers. In 2019, as well as 2018, trees and equipment failure outage causes contributed to over 60% of the total lost customer-minutes interrupted (Duquesne uses kVA- minutes interrupted) and does not include any lost customer-minutes caused by Major Events.

Trees continue to be a chronic problem for Duquesne, as well as every EDC in Pennsylvania. There needs to be a drastic change to the status quo as it relates to addressing the off-right-of-way tree problems in Pennsylvania since they are becoming more of a challenge to the electrical distribution system reliability and safety especially as Pennsylvania is experiencing more severe weather events.

Figure 4 Duquesne CAIDI (minutes)

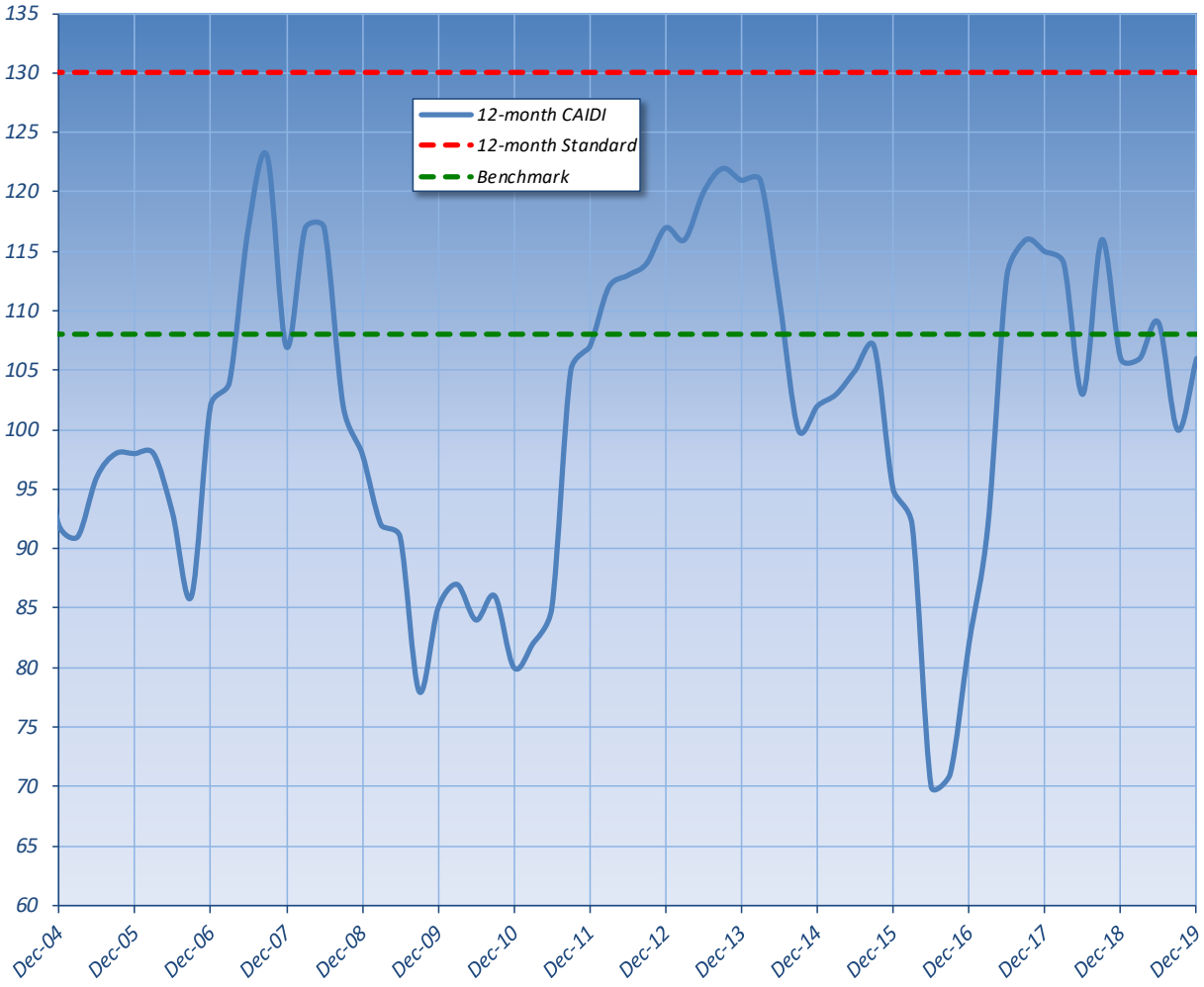


***Figure 5 Duquesne SAIFI (Interruptions Per Cus*tomers)**

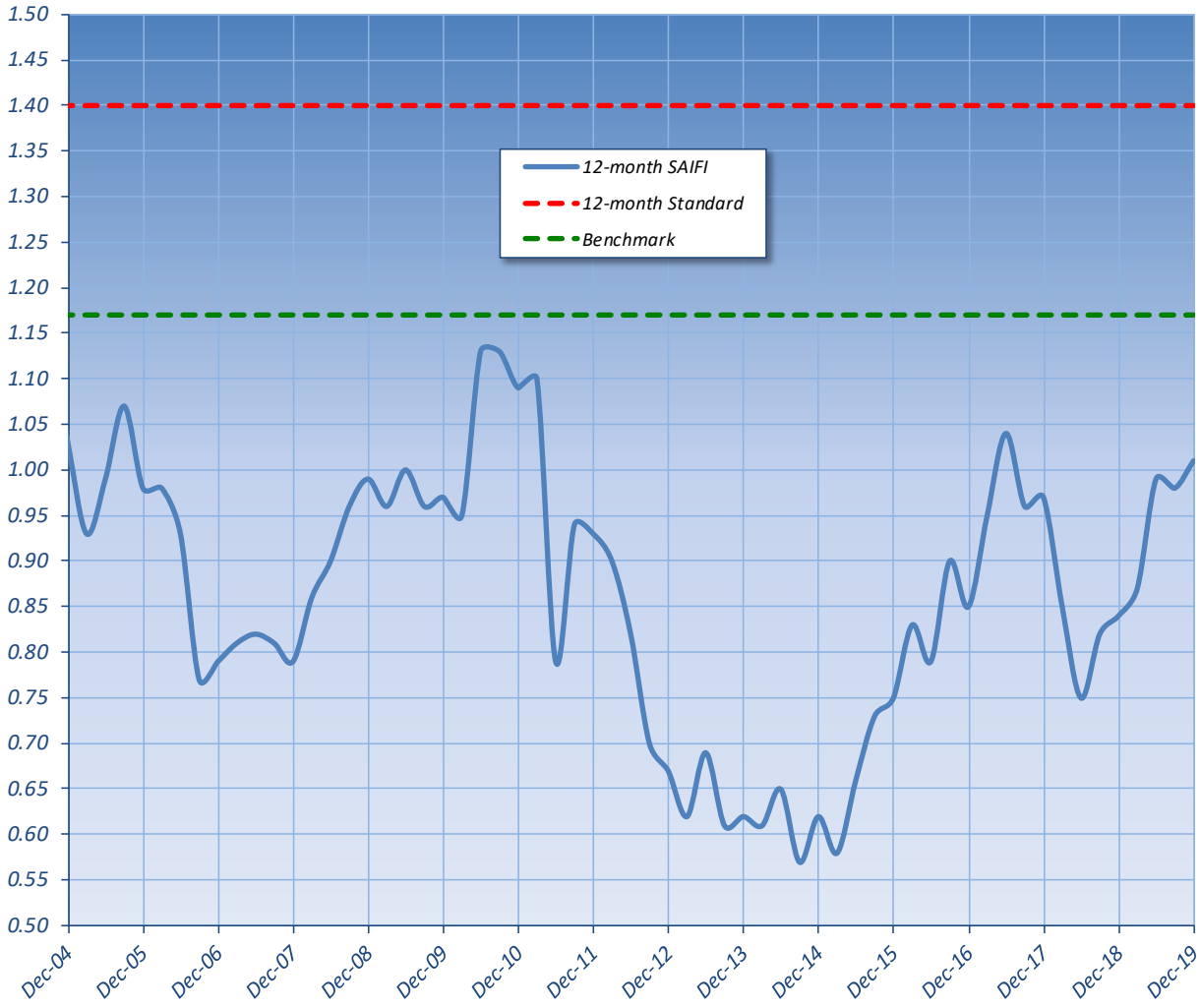


Figure 6 Duquesne Outage Causes (percent of total outages)

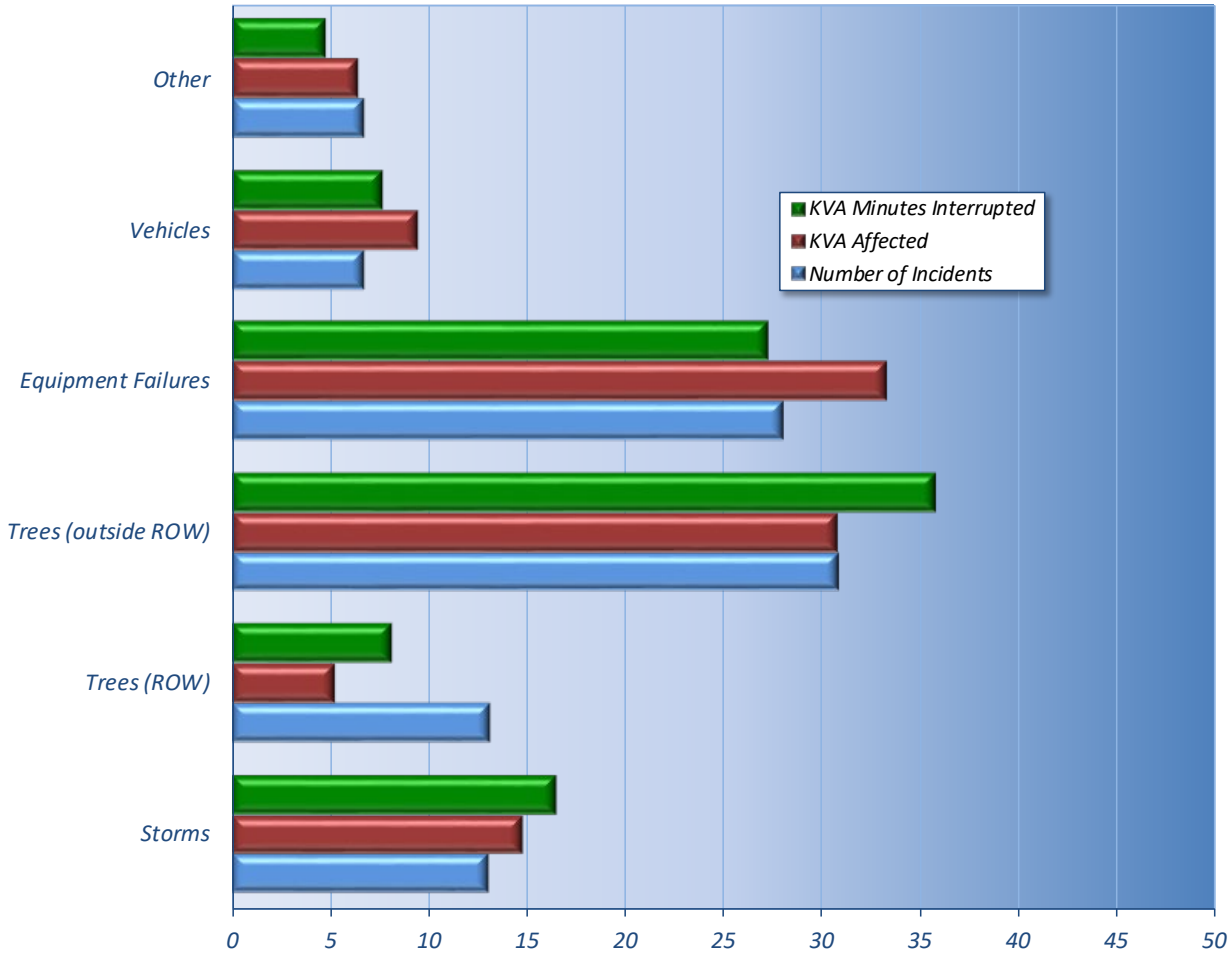
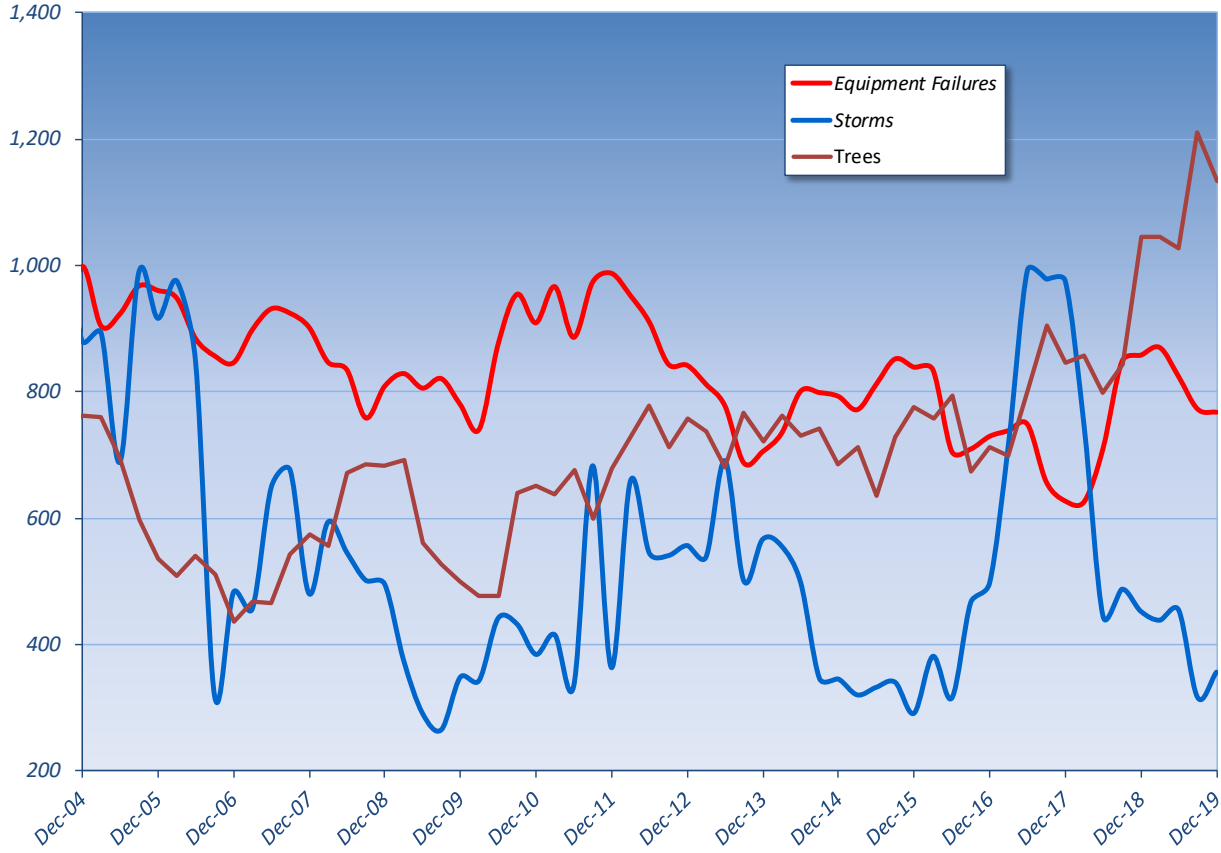


Figure 7 Duquesne Outage Tracking (number of incidents)



PECO Energy Company

PECO has a service territory of about 2,100 square miles that serves a well-developed distribution system serving about 1.7 million customers.

In 2019, PECO experienced 1.80 million customer interruptions and 341 million customer-minutes interrupted as compared to: 1.59 million customers interruptions and 174.6 million customer-minutes interrupted in 2018, 1.35 million customer interruptions and 134.0 million customer-minutes interrupted in 2017; and 1.62 million customer interruptions and 171.6 million customer-minutes interrupted in 2016. (Note these numbers exclude major events.)

PECO did not experience a Major Event in 2019.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 110 minutes in 2018 to 189 minutes in 2019; failed to achieve benchmark by 69%.

3-year average: Increased from 105 minutes in 2018 to 133 minutes in 2019; failed to achieve standard by 8%.

SAIDI

Rolling 12-month: Increased from 106 minutes in 2018 to 205 minutes in 2019; failed to achieve benchmark by 49%.

3-year average: Increased from 98 minutes in 2018 to 131 minutes in 2019; achieved standard by 22%.

SAIFI

Rolling 12-month: Increased from 0.97 outages in 2018 to 1.08 outages in 2019; achieved benchmark by 12%.

3-year average: Increased from 0.93 outages in 2018 to 0.96 outages in 2019; achieved standard by 29%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 8 and 9. Beginning in December 2012, PECO's CAIDI Benchmark performance trend has been positive, as shown to be below the "green" benchmark performance upper-control-limit-line. This positive performance trend, below the benchmark performance upper-control-limit-line, has been consistently sustained by PECO until 2019, when PECO's CAIDI performance spiked upward and is far above standard.

Beginning with December 2012, PECO's SAIFI Benchmark performance trend has been positive, as shown on the chart to be below the "green" benchmark performance upper-control-limit-line. This positive performance trend, below the benchmark performance upper-control-limit-line, has been consistently achieved by PECO, and is considered under-control. PECO is considered an excellent SAIFI Benchmark Performer.

Outage Causes

Figure 10 shows the reported 2019 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Equipment failure was the top cause of outages and customer-minutes interrupted. The most frequent outage cause is equipment failure, which is about 42% of outage causes, followed by tree related (includes vegetation in-growth and vegetation broken/uprooted) outages at about 30%.

Figure 11 shows historical trend of the top three main outage causes. Equipment failure and trees are the two most frequent outage causes that are significantly negatively affecting PECO's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

In 2019, PECO continued storm hardening activities through infrastructure improvements and enhanced vegetation management. In areas impacted by high incidences of vegetation-related outages PECO installed more than 62 miles of tree resistant wire as compared to 52 miles of tree resistant wire in 2018, and 45 miles in 2017. PECO also removed more than 12,000 priority trees as compared to 4,500 priority trees in 2018, and 3,000 priority trees in 2017, which should enhance system performance and reduce service interruptions.

Through Distribution Automation, PECO installed more than 600 3-phase reclosers in automated loop schemes in Bucks, Chester, Delaware, Montgomery, Philadelphia, and York counties in 2019, bringing the total to 2,616 reclosers. These reclosers reduce the number of customers affected by outages and automatically restore service to sections of circuits where repairs are not needed.

PECO's Long-Term Infrastructure Improvement Plan (LTIIP), or "System 2020" plan, was approved by the Commission on Oct 22, 2015.[25] Under the System 2020 Plan, PECO will spend an additional $274 million through 2020 on system resiliency and storm hardening system improvements. These investments are in three key areas: storm hardening and resiliency measures; accelerated cable replacements; and the acceleration of a plan to retire building substations and to upgrade the distribution facilities supplied by those substations. Accelerated spending in the replacement of aging infrastructure should, over time, reduce the number of outages caused by equipment failure.

Conclusion

Trees and Equipment failures are the top two outage causes that substantially negatively affect electrical reliability to PECO customers. In 2019, trees and equipment failure outage causes contributed to over 82% of the total lost customer-minutes as compared to 72% in 2018.

PECO experienced over 20 reportable storms in 2019 and 34 million customer-minutes interrupted**.** It appears the frequency of weather events are negatively affecting PECO's overall reliability and resilience performance, which is especially noticeable in PECO's CAIDI metric spike.

PECO has sustained CAIDI and SAIFI benchmark performance beginning in 2011 and 2006, respectively, and is considered an excellent SAIFI benchmark performer. However, in 2019 CAIDI performance has spiked above benchmark and standard and requires management attention.

[25] Order entered on Oct 22, 2015, at Docket No. P-2015-2471423.

Figure 8 PECO CAIDI (minutes)

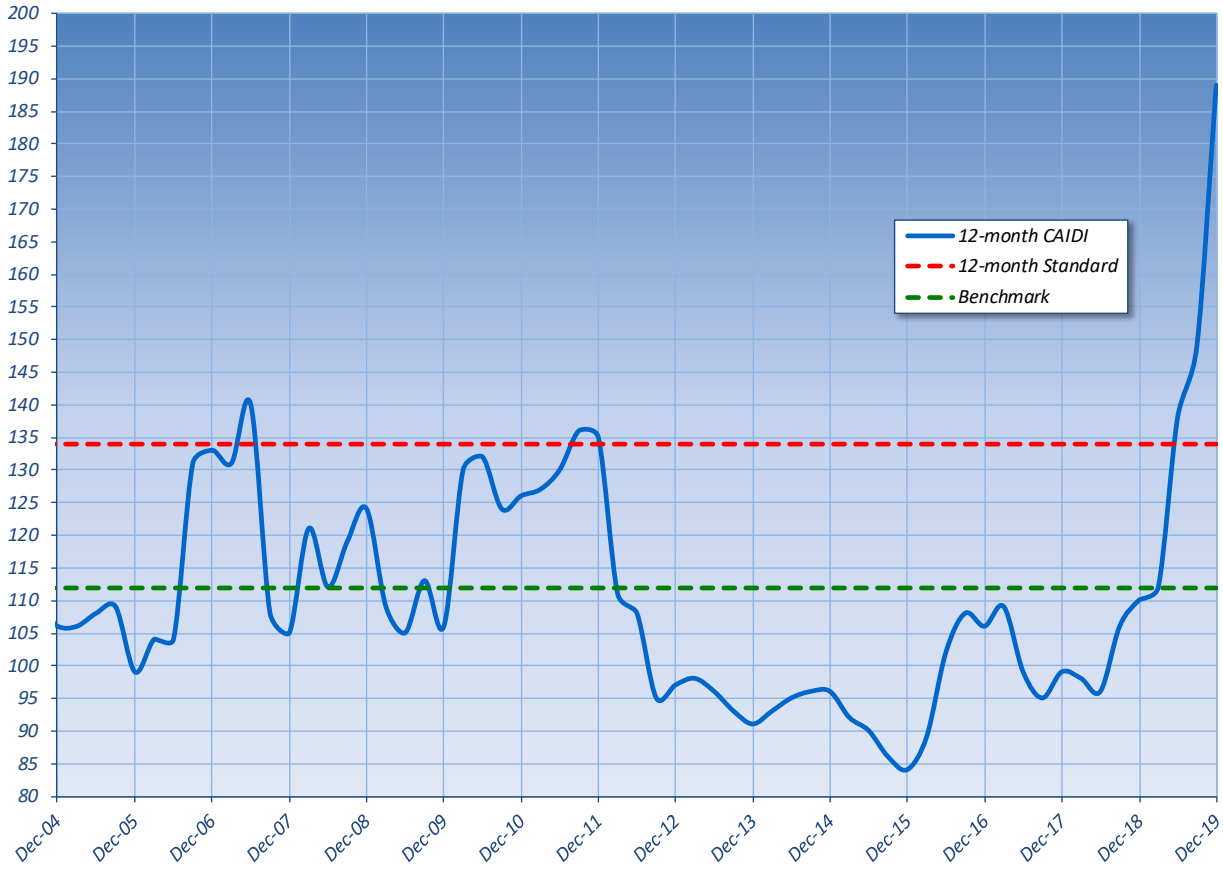


Figure 9 PECO SAIFI (interruptions per customer)

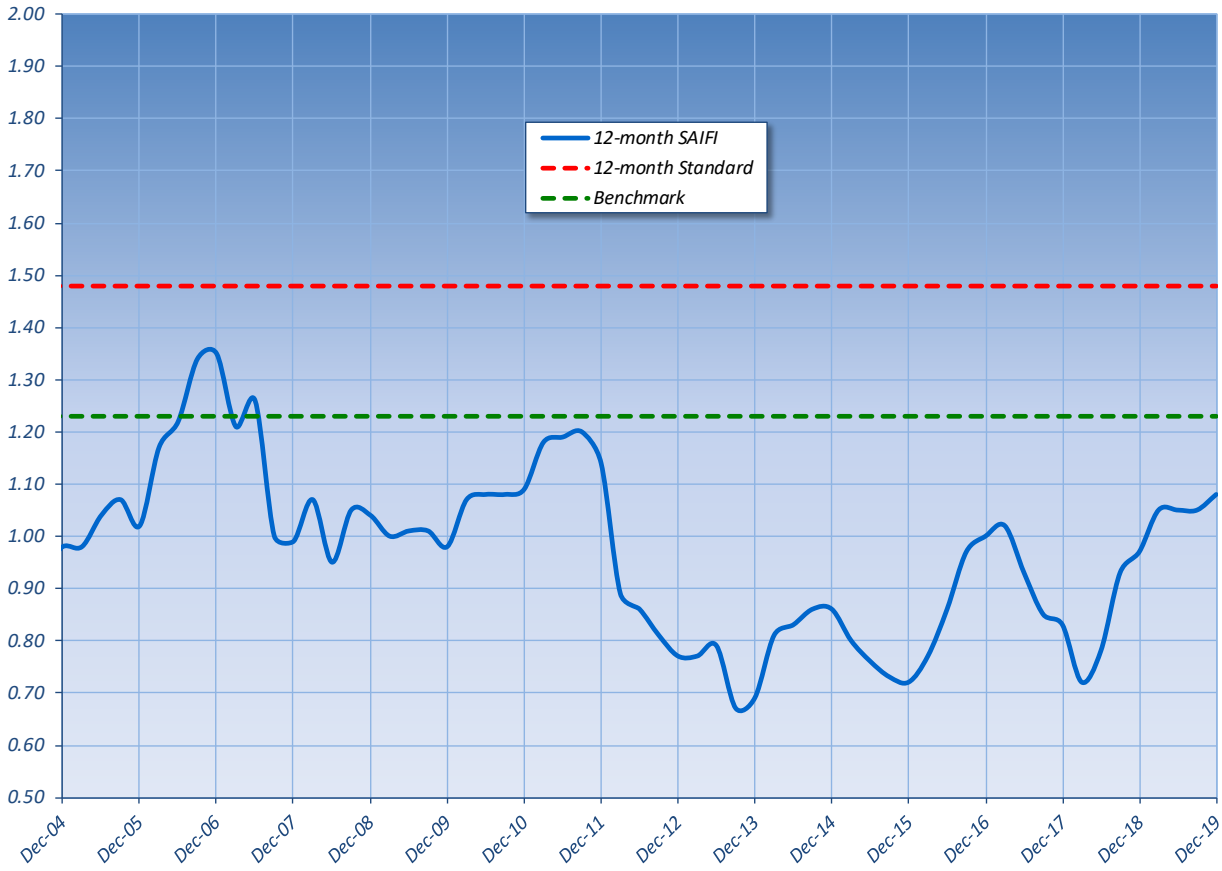


Figure 10 PECO Outage Causes (percent of total outages)

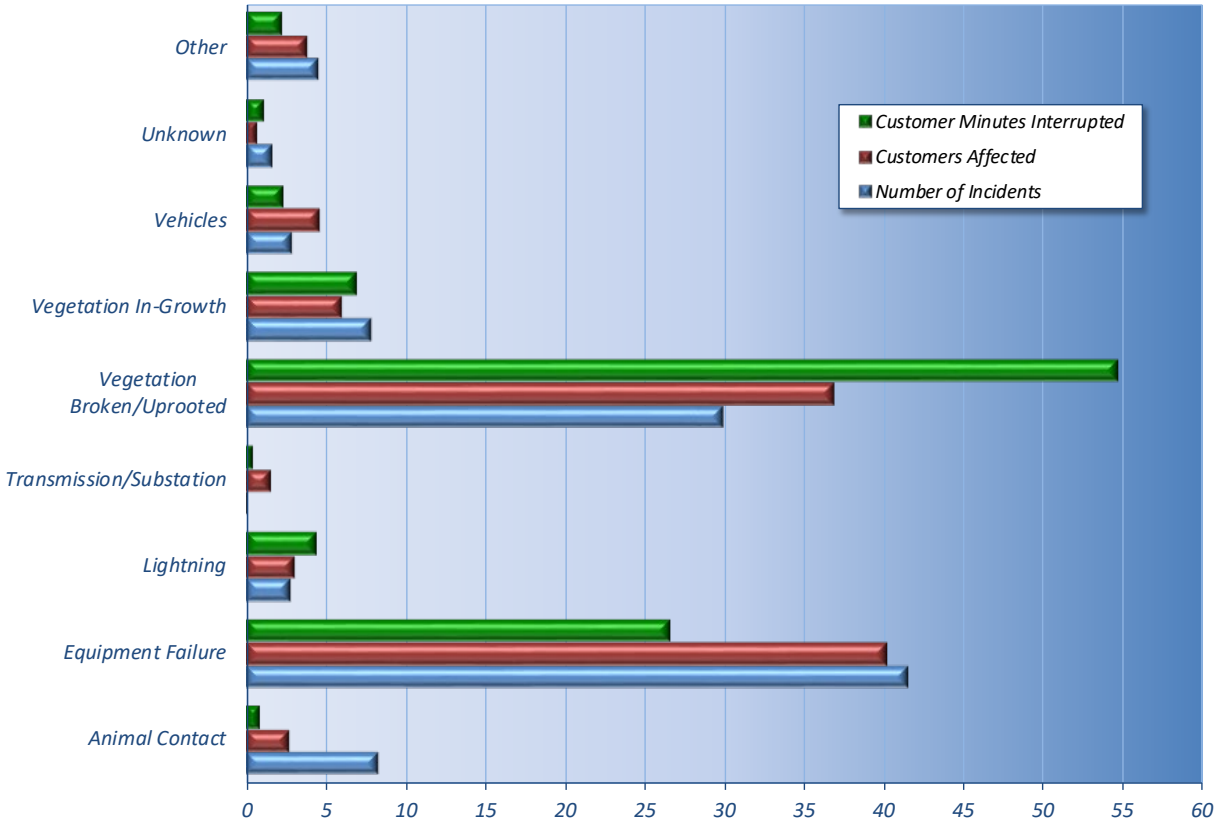
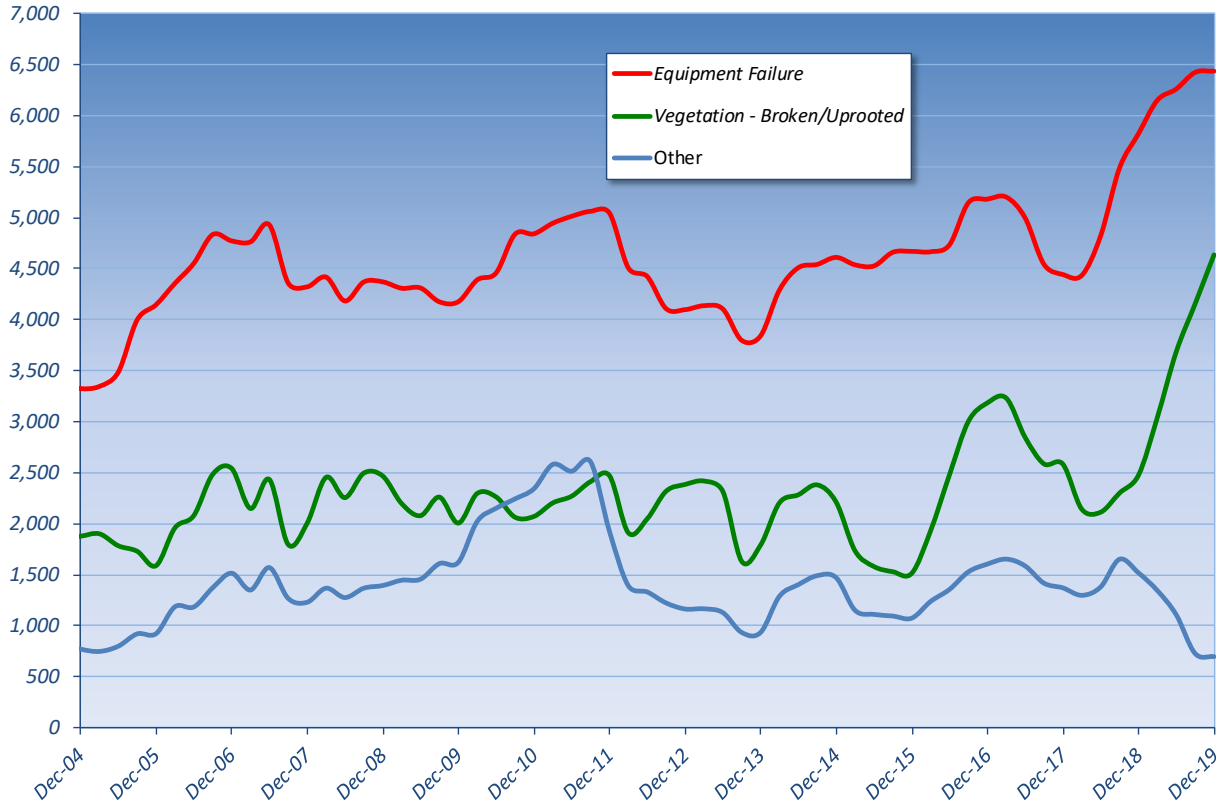


Figure 11 PECO Outage Tracking (number of incidents)



PPL Electric Utilities Corporation

PPL has a service territory of about 10,000 square miles and serves 1.4 million customers.

In 2019, PPL experienced 1.2 million customers interruptions and 213.9 million customer-minutes interrupted as compared to: 1.2 million customers interruptions and 201.5 million customer-minutes interrupted in 2018; 1 million customer interruptions and 147.2 million customer-minutes interrupted in 2017; and 1.1 million customer interruptions and 132.9 million customer-minutes interrupted in 2016. (Note these numbers exclude major events.)

PPL did not experience a Major Event in 2019.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 168 minutes in 2018 to 176 minutes in 2019; failed to achieve benchmark by 21%.

3-year average: Increased from 145 minutes in 2018 to 163 minutes in 2019; failed achieve standard by 2%.

SAIDI

Rolling 12-month: Increased from 141 minutes in 2018 to 150 minutes in 2019; failed to achieve benchmark by 6%.

3-year average: Increased from 113 minutes in 2018 to 132 minutes in 2019; achieved standard by 23%.

SAIFI

Rolling 12-month: Increased from 0.84 outages in 2018 to 0.85 outages in 2019; achieved benchmark by 13%.

3-year average: Increased from 0.78 outages in 2018 to 0.80 outages in 2019; achieved standard by 26%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 12 and 13. Beginning in 2004, PPL's CAIDI performance trend has been erratic, and is currently above both benchmark and standard upper-control-limit-lines. It appears more management attention is needed to address the inconsistent CAIDI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Beginning in December 2013, PPL's SAIFI Benchmark performance trend has been positive, as shown on the chart to be below the "green" benchmark performance upper-control-limit-line. This positive performance trend, below the benchmark performance upper-control-limit-line, has been consistently sustained by PPL, and is considered under control. PPL is considered an excellent SAIFI Benchmark Performer.

Outage Causes

Figure 14 shows the reported 2018 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees were the top cause of outages and customer-minutes interrupted. Over 41% of outages are caused by trees, and 30% are caused by equipment failure.

Figure 15 shows the historical trend of the top three main outage causes. Trees and equipment failure are the 2 most frequent outage causes that are significantly negatively affecting PPL's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

PPL notes that its vegetation management program uses industry best practices to improve the reliability of the electric transmission and distribution systems by preventing outages from vegetation located on easements and rights-of-way (ROW) and minimizing outages from vegetation adjacent to the ROW. Trees are a leading cause of storm-related power outages, so vegetation management is critical to keeping the system reliable.

In 2019, PPL removed 38,000 hazard trees, which PPL noted was about four times more than its historical average. Ash trees accounted for 37% of removals on the transmission and distribution

systems. PPL is hoping to mitigate the impact of the emerald ash borer by aggressively targeting ash trees for removal as part of its comprehensive hazard tree program.

PPL continues to perform an annual aerial LiDAR inspection to monitor and evaluate the clearance of vegetation from the transmission system and guide its maintenance program. The company is beginning its second year capturing aerial LiDAR information on a selection of distribution lines in 2020. PPL notes this industry-leading approach will help to identify and prioritize trimming scope more quickly. PPL noted that this is also a foundational element for future efforts to automate existing processes as this data integrates with the company's current vegetation work management software.

PPL's infrared (IR) line inspections continue to be a routine part of maintenance to identify potential equipment failures that cannot be detected from visual inspections. PPL Electric's IR inspection process is programmatically applied to all multi-phase lines adjacent to roadways on a 2-year cycle.

In addition to its core maintenance programs, PPL has continued working on initiatives to better understand risk and to predict where future vegetation outages are most likely to occur. PPL notes the objective of these initiatives is to understand what variables have the most influence on failures so trees with those observed conditions can be removed before they cause outages. In 2019, PPL removed about 650 trees on 69 kV lines based on analytical data.

PPL's storm hardening focus continues to be around vegetation management, asset and line reliability performance, and smart grid technology. Beginning in 2019, PPL began installing Trip Saver reclosers on single-phase taps which have begun to reduce permanent and momentary outages for transient faults. These devices are being installed on targeted lines with higher permanent and momentary outage histories. In addition, PPL continues to address distribution pole performance through pole replacement and remediation programs along with changes to its pole sizes and crossarm attachments such as with the use of fiber crossarms.

PPL also is using steel poles at highway, railroad, and river crossings to harden these critical locations. Stronger poles are now used in locations where heavier equipment is installed, and remote service kits are installed to improve restoration times for residential customers in rural areas. Between the substation and the first protective device, poles are being replaced rather than being reinforced in order to strengthen the most impactful areas of the system. In addition, spacer cable is being specified in areas with high tree exposure.

PPL continues to replace existing 3-phase hydraulic reclosers with communication-enabled vacuum circuit reclosers. This allows for remote operation of these devices, as well as remote monitoring to facilitate the move toward condition-based maintenance. These devices help reduce the number of customers interrupted by an outage.

PPL also continues to replace existing 3-phase hydraulic reclosers with communication-enabled vacuum circuit reclosers. This allows for remote operation of these devices, as well as remote monitoring to facilitate the move toward condition-based-maintenance. These devices play a crucial role in reducing the number of customers interrupted by an outage.

In 2019, PPL introduced two new types of single-phase reclosing devices onto its system in order to enhance sectionalizing on single-phase taps where previously reclosing coordination or sectionalizing could not be achieved. PPL notes the first type of these devices is able to remotely communicate with the company's centralized distribution management system (DMS), and to date 375 of these devices have been installed. The other type of single-phase recloser offers a more cost and time effective way to quickly open more locations to reclosing and sectionalizing than ever before. PPL Electric has installed a total of 174 of these devices.

PPL notes its investment in technologies such as its DMS software solution that provides system operators real-time situational awareness of how the system is performing, and its fault isolation and servicer restoration (FISR) technology that identifies faulted sections and quickly develops an optimized restoration plan and automatically executes that plan, in combination with its smart grid devices has dramatically improved the ability to quickly restore customers. PPL notes these technologies resulted in approximately 18 million minutes of avoided permanent interruptions from Jan. 1, 2020 through April 30, 2020.

In 2019, PPL installed its first battery energy storage system (BESS). This project provides improved reliability to customers on sections of remote single-phase conductor that have seen a significant number of outages over a rolling 12 months. The battery storage system is a redundant power source designed to keep customers in-service until repairs can be completed. The system was used twice in 2020 to power customers while restoration was in process.

Conclusion

Trees and Equipment failures are the top two outage causes that substantially negatively affect electrical reliability to PPL customers. In 2019, tree-related outages contributed to almost 75% of the total lost customer-minutes.

PPL's CAIDI performance continues to be erratic and has been trending negatively above both standard and benchmark performance in 2018 and 2019. Management attention is required to sustain CAIDI performance below the "green" benchmark performance upper-control-limit-line. PPL has sustained SAIFI benchmark since 2012 and is considered an excellent SAIFI benchmark performer.

Figure 12 PPL CAIDI (minutes)

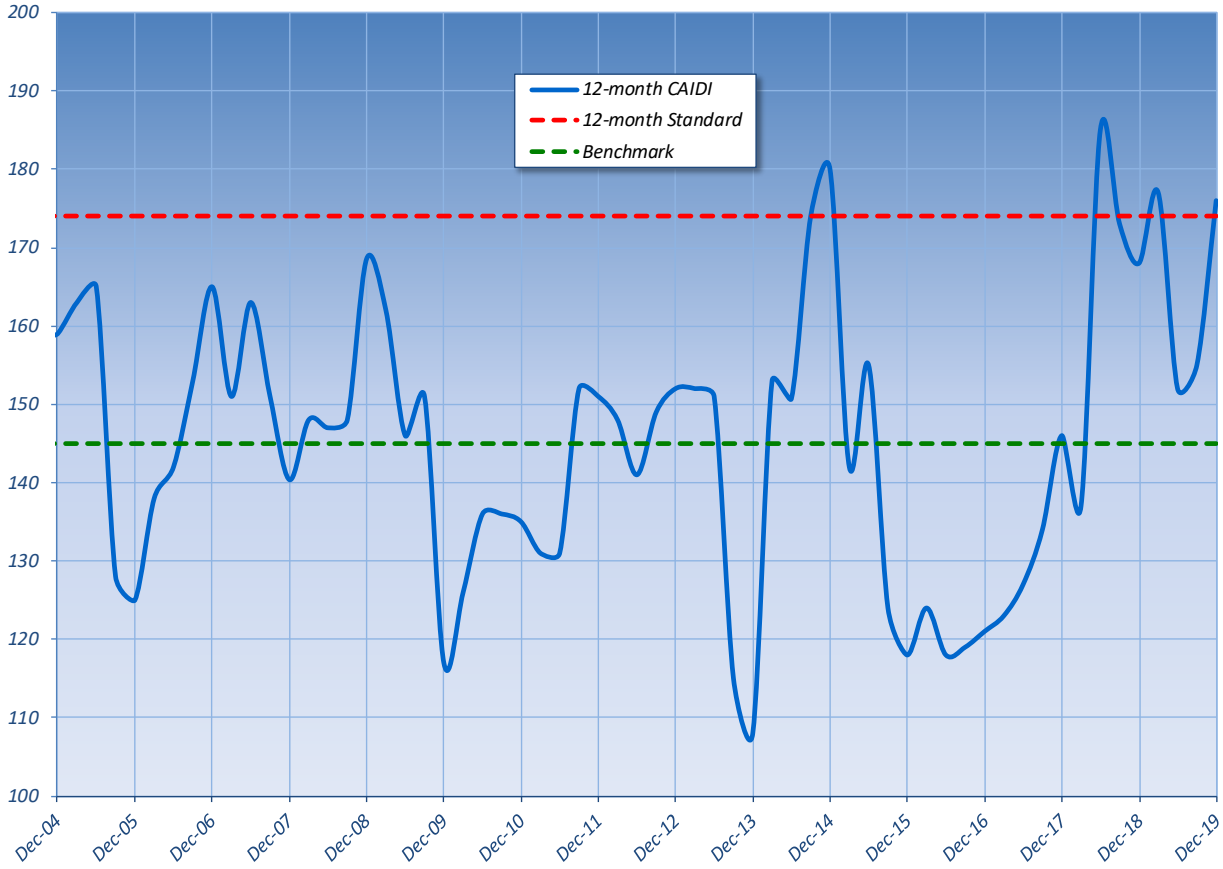


Figure 13 PPL SAIFI (interruptions per customer)

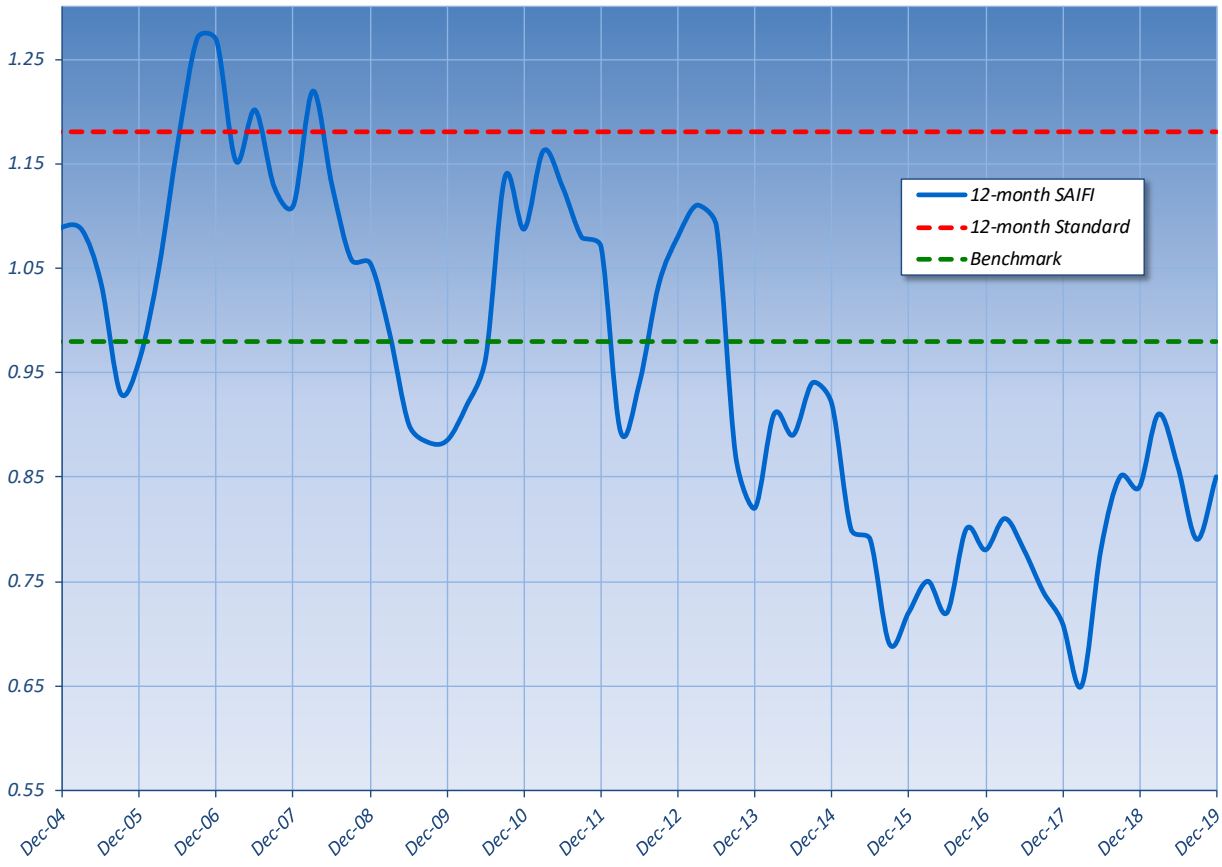


Figure 14 PPL Outage Causes (percent of total outages)

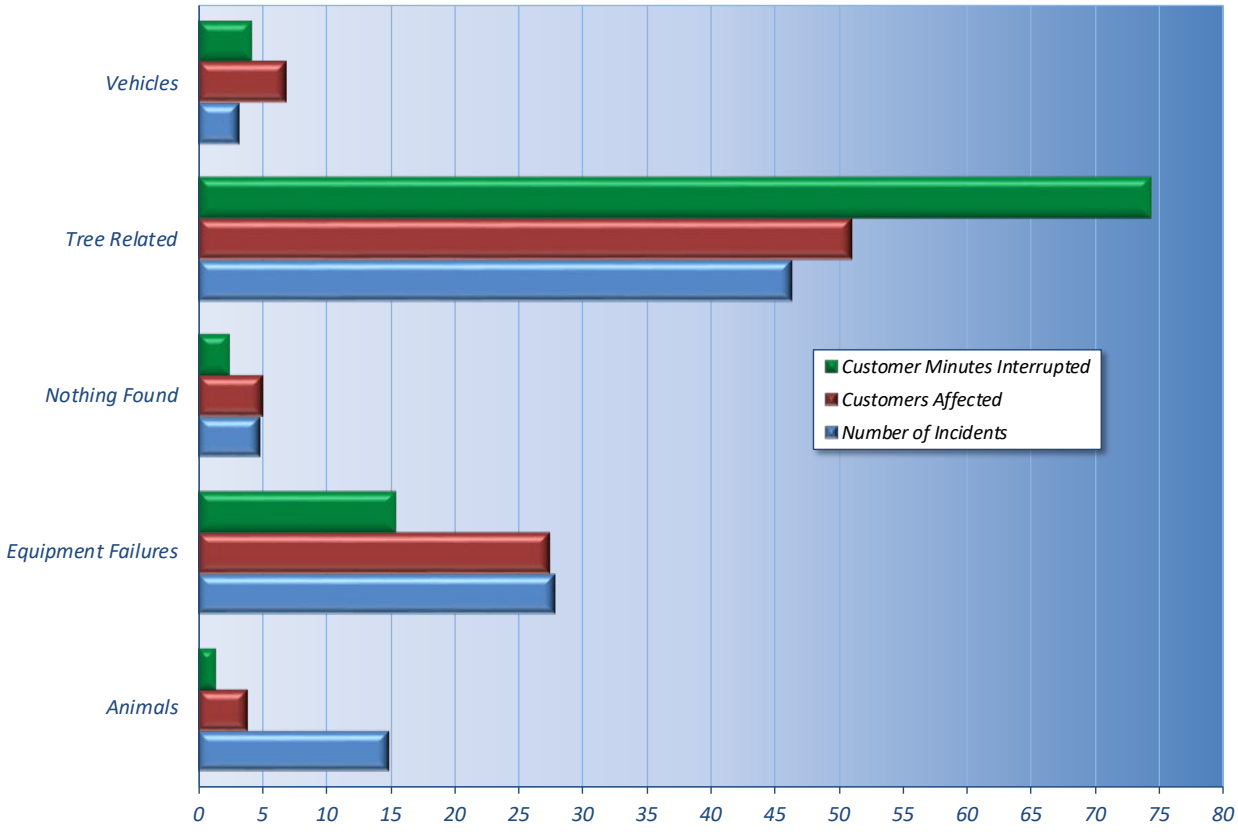
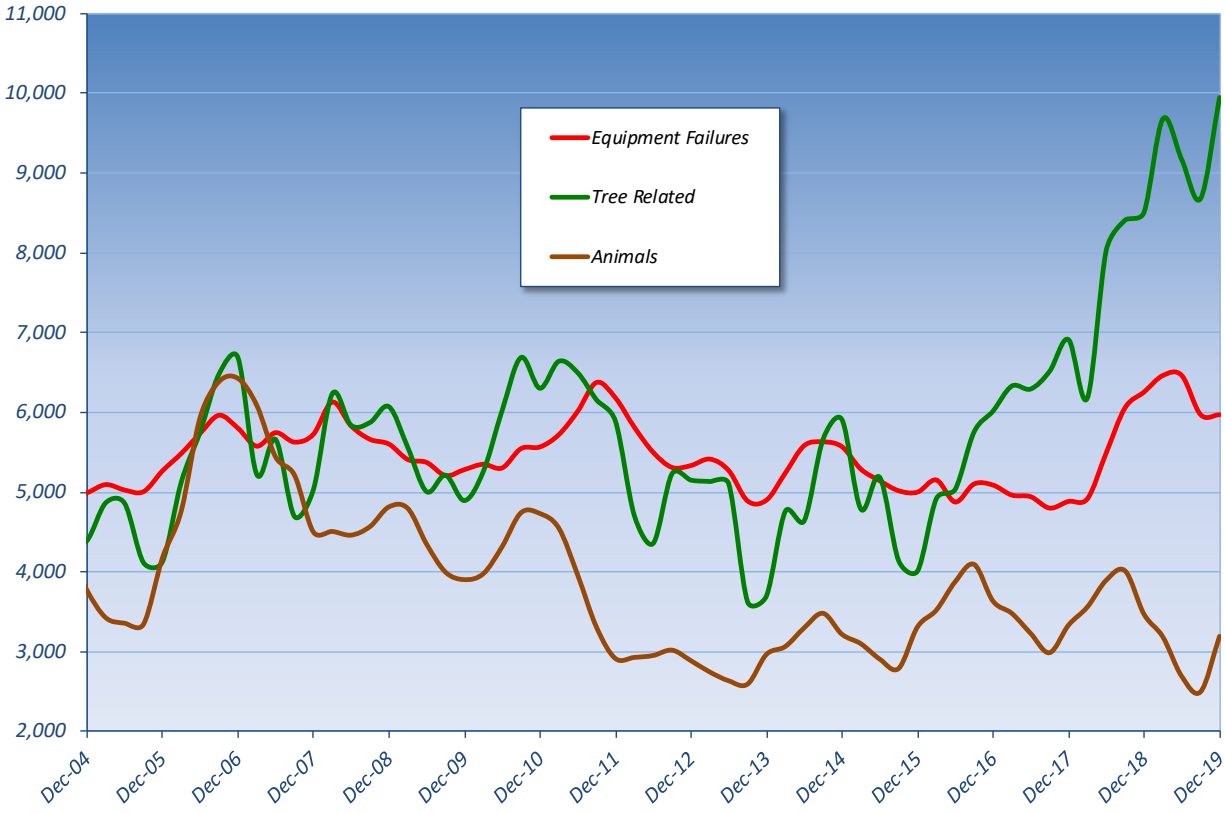


Figure 15 PPL Outage Tracking (number of incidents)



Metropolitan Edison Company

Met-Ed has a service territory of about 3,300 square miles that serves about 554,500 customers.

In 2019, Met-Ed experienced 874,452 customers interruptions and 143.3 million customer-minutes interrupted as compared to: 713,881 customers interruptions and 92.8 million customer-minutes interrupted in 2018; 827,461 customer interruptions and 121.9 million customer-minutes interrupted in 2017; and 804,947 customer interruptions and 99.6 million customer-minutes interrupted in 2016.

Met-Ed did not experience any Major Events in 2019.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 130 minutes in 2018 to 164 minutes in 2019; failed to achieve benchmark by 40%.

3-year average: Increased slightly from 134 minutes in 2018 to 147 minutes in 2019; failed to achieve standard by 14%.

SAIDI

Rolling 12-month: Increased from 165 minutes in 2018 to 253 minutes in 2019; failed to achieve benchmark by 87%.

3-year average: Increased from 187 minutes in 2018 to 212 minutes in 2019; failed to achieve standard by 30%.

SAIFI

Rolling 12-month: Increased from 1.27 outages in 2018 to 1.54 outages in 2019; failed to achieve benchmark by 34%.

3-year average: Increased from 1.39 outages in 2018 to 1.43 outages in 2019; failed to achieve standard by 12%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown on Figures 16 and 17. Beginning in 2004, Met-Ed 's CAIDI performance trend has been erratic, and from 2013 to present has been trending negative. In several 12-month rolling quarters in 2017 and 2018, CAIDI performance has spiked above both benchmark and standard upper-control-limit-lines. It appears the CAIDI performance trend is outside of acceptable tolerances, and more management attention is needed to address the inconsistent CAIDI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Beginning in 2004, Met-Ed 's SAIFI performance trend has been consistently outside of acceptable tolerances. From 2007 onward, the overall trend has been continually negative, except for a brief period in 2013-2014 when Met-Ed's performance was positive and below the "green" benchmark performance upper-control-limit-line. More management attention is needed to address the inconsistent SAIFI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 18 shows the top reported 2019 outage-cause categories, as a percentage, for the following 3 distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Equipment failure (which includes line failure) and trees (which includes all 4 tree sub-categories of which 2 are not shown) were the top cause of outages, customers affected, and customer-minutes interrupted. About 70% of Customer Minutes Interrupted is caused by equipment failure and trees.

Figure 19 shows the historical trend of the top 5 main outage causes. Trees and equipment failure are the 2 most frequent causes of power outages that are significantly negatively affecting Met-Ed's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

In 2016, Met-Ed started to execute its Long-Term Infrastructure Improvement Plan (LTIIP). This plan includes expenditures and programs designed to accelerate repairment, improvement or replacement of aging infrastructure in order to adequately maintain and improve the efficiency, safety, adequacy, and reliability of the distribution system. On Jan. 18, 2019, Met-Ed filed a

Petition for Approval of Modification of its LTIIP in order to increase overall spending in the 2019 program year. The Petition was approved, as filed, on May 23, 2019.[26] On Aug. 30, 2019, Met-Ed, along with the other FirstEnergy Companies (Penelec, Penn Power, and West Penn) filed petitions for second LTIIPs for the years 2020 through 2024. The petitions were approved on Jan. 16, 2020.[27]

The PUC has also been performing extra monitoring of Met-Ed's work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.[28] Met-Ed's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

Met-Ed notes it employs various programs to strengthen the durability and flexibility of the electric system. Methods to improve the efficiency, adequacy, and reliability of the distribution system are a continual focus. Met-Ed notes that it utilizes core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Routine cycle tree trimming that removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes off right-of-way priority trees.

- Enhanced tree trimming that complements the routine cycle tree trimming by removing healthy limbs overhanging primary conductors on areas where it is determined to be beneficial.

- In response to damage caused by the Emerald Ash Borer, a program to proactively remove Ash Trees off right-of-way was implemented.

- Post-storm circuit patrols that target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

- The Customers Experiencing Multiple Interruptions ("CEMI") program is aimed to reduce frequent or repeated outages for affected clusters of customers or frequently operated devices.

- Load forecasting and distribution planning is used to estimate future substation and circuit loading based upon historical load data and the planning criteria guidelines are then used to provide a consistent approach for planning the safe, reliable, orderly, and economic expansion of the distribution system.

[26] Docket No. P-2015-2508942

[27] *See Petition of Metropolitan Edison Company for Approval of its Long-Term Infrastructure Improvement Plan* at Docket No. P-2019-3012618.

[28] Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

- Circuit protection practices are aimed at achieving safety and security for the public and employees, maximizing service reliability to customers, minimizing damage to distribution equipment, and establishing a consistent process and set of application standards for distribution circuit protection.

- Fuse installation continues to reduce the scope of outages. Fuses and other protective devices are being installed on circuits selected based on overall performance as well as protection needs.

- Circuit ties and loops continue to be built between radial sections of circuits. When ties and loops are available, circuits can be switched during outages to enable faster service restoration. Met-Ed installed seven circuit ties and loops in 2019 as compared to three circuit ties and loops in 2018, and 4 circuit ties and loops in 2017.

- Met-Ed notes Line Rehabilitation continues to strengthen the electrical system. Met-Ed notes it performs targeted circuit rehabilitation in Zone 1 and Zone 2 areas, focusing on circuits having a high rate of equipment and line failure and animal-caused outages.[29] Equipment that may be replaced includes crossarms, capacitors, insulators, lightning arresters and connectors. Met-Ed completed the rehabilitation on 16 circuits in 2018 and 14 circuits in 2018.

- Supervisory control and data acquisition (SCADA) devices are replacing existing gang operated air brake switches, disconnect switches, and hydraulically operated circuit reclosers on the Met-Ed distribution system. SCADA controlled switches allow for remote operation to restore service to customers when an outage occurs. Remote switching eliminates the need to dispatch crews to manually operate the switches, resulting in fewer customers affected and reduced outage duration. Met-Ed installed 171 SCADA devices in 2019 as compared to 106 SCADA devices in 2018, and 28 SCADA devices in 2017.

Conclusion

Trees and Equipment failures are the top two outage causes that substantially negatively affect electrical reliability to Met-Ed customers. In 2019, the trees and equipment failure outage causes contributed to almost 70% of the total lost customer-minutes and did not include any lost customer-minutes caused by Major Events.

Beginning in 2004, Met-Ed's CAIDI and SAIFI benchmark performance has been inconsistent and frequently out-of-control. Met-Ed's overall CAIDI and SAIFI performance trend is troubling, both CAIDI and SAIFI are trending above standard and benchmark performance upper-control-limit-lines. Continued management attention is needed to bring Met-Ed's failing reliability performance back into control and to sustain the trend line below the "green" benchmark performance upper-control-limit-line. The Commission expects to see significant improvement in reliability for the FirstEnergy Companies beginning in 2020.

[29] Zone 1 is defined as the portion of the circuit from the substation breaker to the first protective device. Zone 2 is defined as the 3-phase conductor and devices after the first protective device.

Figure 16 Met-Ed CAIDI (minutes)

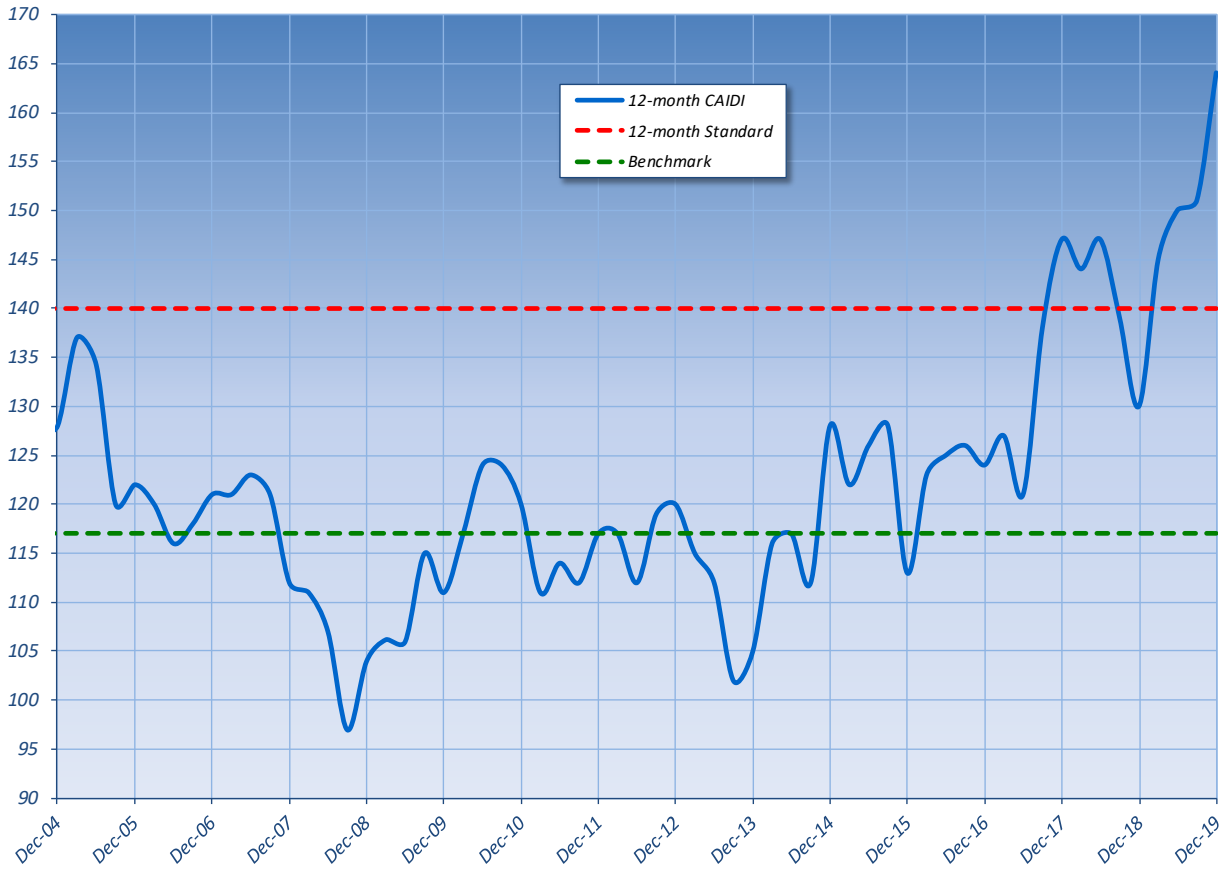


Figure 17 Met-Ed SAIFI (interruptions per customer)

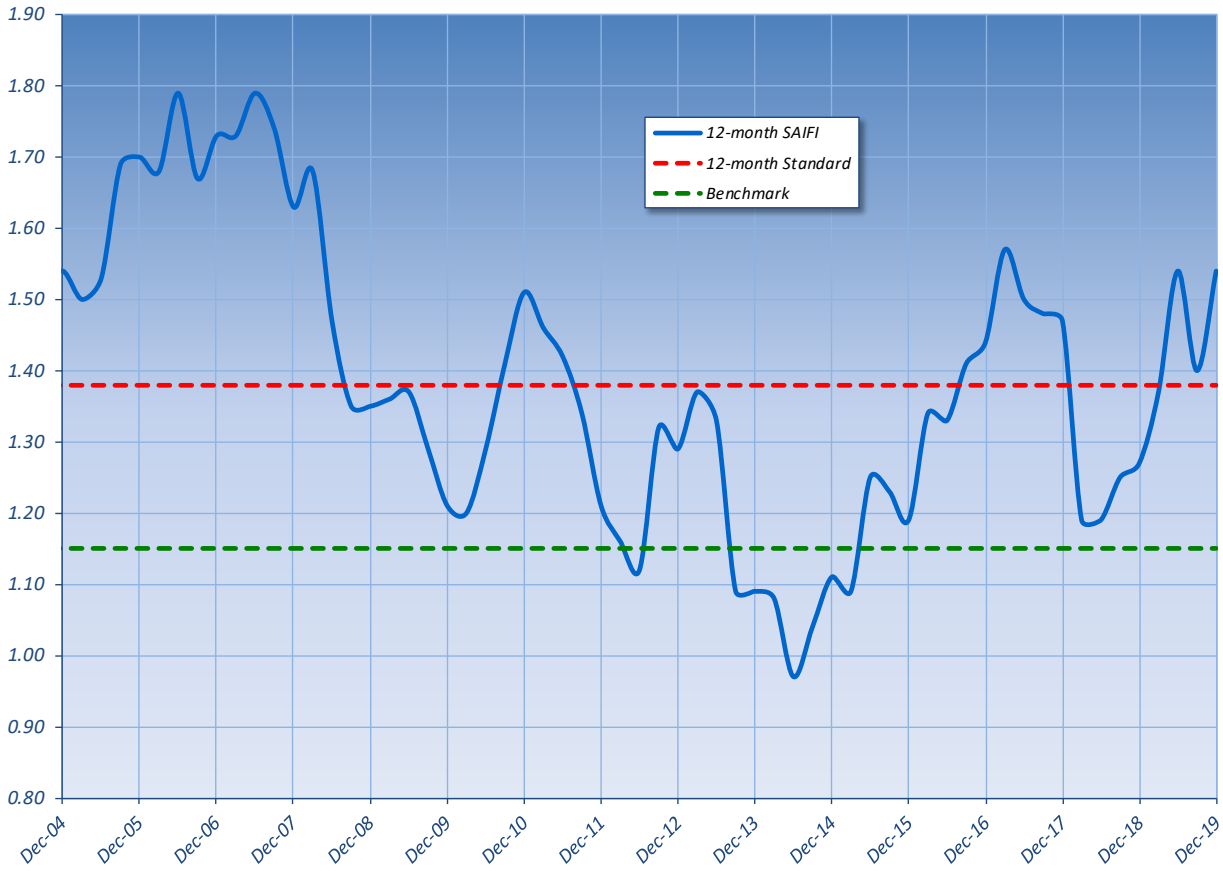


Figure 18 Met-Ed Outage Causes (percent of total outages)

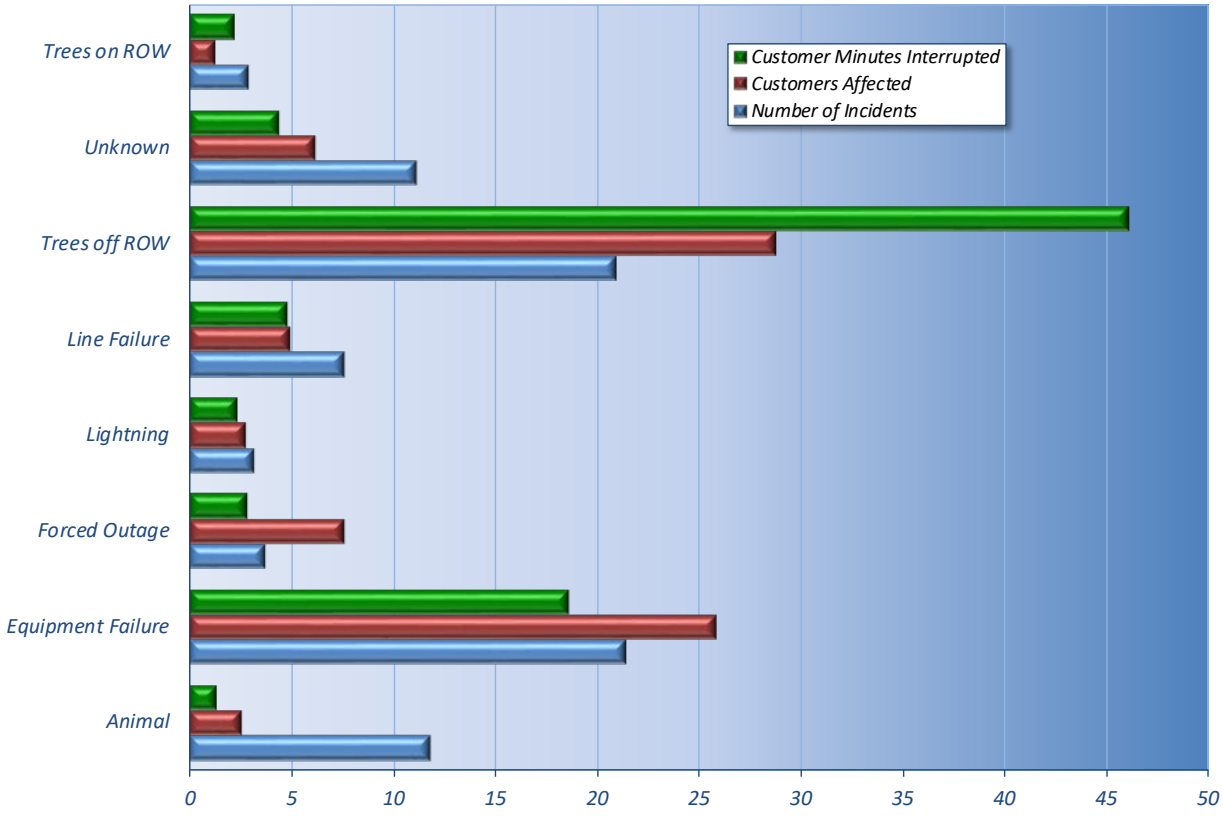
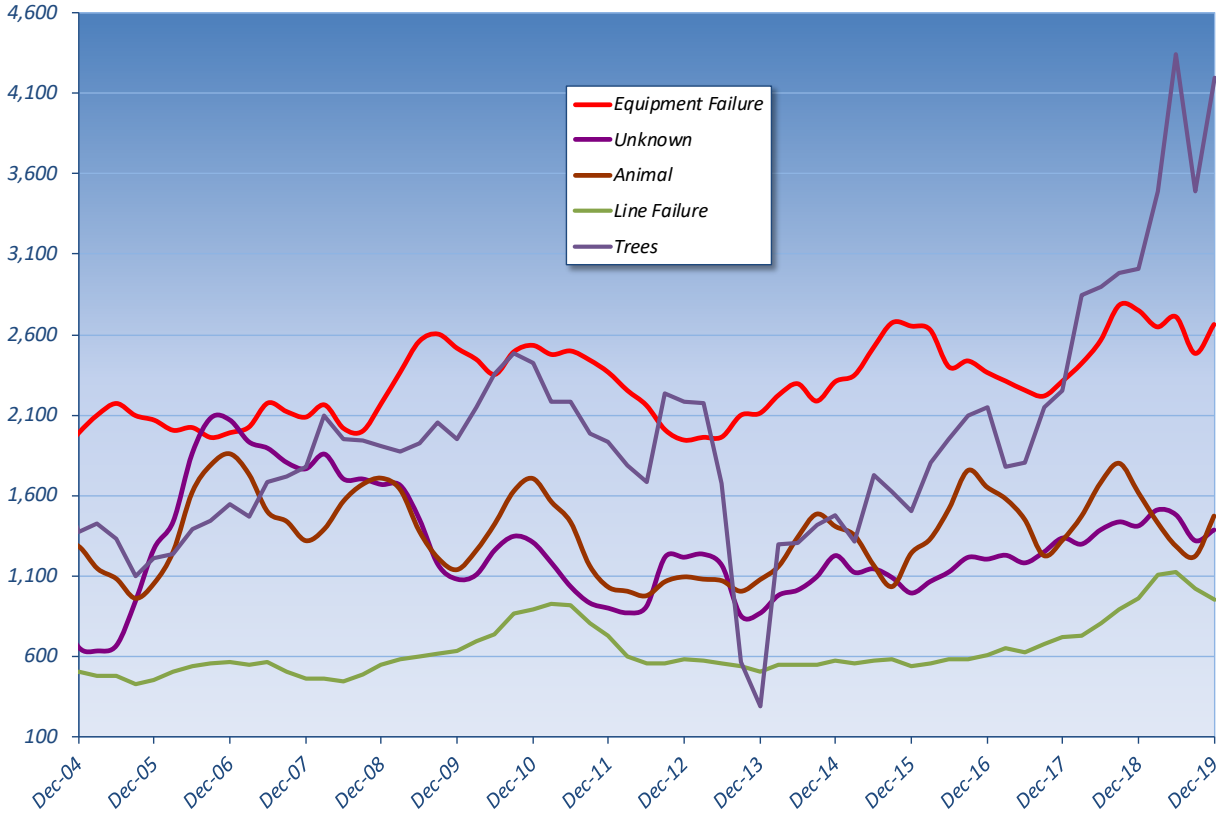


Figure 19 Met-Ed Outage Tracking (number of incidents)



Pennsylvania Electric Company

Penelec has a service territory of about 17,600 square miles serving 582,000 customers.

In 2019, Penelec experienced 995,121 customers interruptions and 146.1 million customer-minutes interrupted as compared to 992,756 customers interruptions and 113.1 million customer-minutes interrupted in 2018; 1 million customer interruptions and 138.5 million customer-minutes interrupted in 2017, and 833,315 customer interruptions and 99.6 million customer-minutes interrupted in 2016.

Penelec experienced 2 Major Events in 2019 where Penelec customers experienced a loss of 46,910,396 customer-minutes interrupted not included in the total above.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 114 minutes in 2018 to 147 minutes in 2019; failed to achieve benchmark by 26%.

3-year average: Increased from 124 minutes in 2018 to 133 minutes in 2019; failed to achieve standard by 3%.

SAIDI

Rolling 12-month: Increased from 195 minutes in 2018 to 252 minutes in 2019; failed to achieve benchmark by 70%.

3-year average: Increased from 202 minutes in 2018 to 229 minutes in 2019; failed to achieve standard by 28%.

SAIFI

Rolling 12-month: Increased from 1.71 outages in 2018 to 1.72 outages in 2019; failed to achieve benchmark by 37%.

3-year average: Increased from 1.62 outages in 2018 to 1.72 outages in 2019; failed to achieve standard by 24%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 20 and 21. Beginning in 2004, Penelec's CAIDI performance trend has been inconsistent and frequently out of control In 2019, Penelec's CAIDI was above the benchmark performance upper-control-limit-line. It appears CAIDI performance requires more management attention to address the inconsistent performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Beginning in 2004, Penelec's SAIFI performance trend has been inconsistent and frequently outside of acceptable tolerances. From 2004 through 2019, the overall trend has been continually trending negative. The last three years Met-Ed was above both the benchmark and standard performance upper-control-limit-lines. It appears Penelec's overall SAIFI performance trend is outside of acceptable limits, and more management attention is needed to address the inconsistent SAIFI performance and to sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 22 shows the top reported 2019 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Equipment failure (which includes line failure) and trees (which includes all 4 tree sub-categories of which 2 are not shown) were the top cause of outages, customers affected, and customer-minutes interrupted. Almost 70% of customer minutes interrupted was caused by equipment failure and trees.

Figure 23 shows the historical trend of the top five main outage causes. Equipment failure and trees and are the two most frequent outage-causes that are significantly negatively affecting Penelec's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

In 2016, Penelec started to execute its Long-Term Infrastructure Improvement Plan (LTIIP). The LTIIP included expenditures and programs designed to accelerate repairment, improvement or replacement of aging infrastructure in order to adequately maintain and improve the efficiency, safety, adequacy, and reliability of the distribution system. On Jan. 18, 2019, Penelec filed a

Petition for Approval of Modification of its Long-Term Infrastructure Improvement Plan in order to increase overall spending in the 2019 program year. The Petition was approved, as filed, on May 23, 2019.[30] On Aug. 30, 2019, Penelec, along with the other FirstEnergy Companies (Met-Ed, Penn Power, and West Penn) filed petitions for second LTIIPs for the years 2020 through 2024. The petitions were approved on Jan. 16, 2020.[31]

The PUC has also been performing extra monitoring of Penelec's work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.[32] Penelec's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

Penelec employs various programs to strengthen the durability and flexibility of the electric system. Penelec notes methods to improve the efficiency, adequacy, and reliability of the distribution system are a continual focus. Penelec utilizes core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Routine cycle tree trimming that removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes off right-of-way priority trees.

- Enhanced tree trimming that complements the routine cycle tree trimming by removing healthy limbs overhanging primary conductors on areas where it is determined to be beneficial.

- In response to damage caused by the Emerald Ash Borer, a program to proactively remove Ash Trees off right-of-way was implemented.

- Post-storm circuit patrols that target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

- After each significant storm event, Penelec conducts post-storm review meetings to identify and disseminate lessons learned which are used to improve the emergency response plan.

- Customers Experiencing Multiple Interruptions ("CEMI") program is aimed to reduce frequent or repeated outages for affected clusters of customers or frequently operated devices.

[30] Docket No. P-2015-2508936.
[31] *See Petition of Pennsylvania Electric Company for Approval of its Long-Term Infrastructure Improvement Plan* at Docket No. P-2019-3012615.
[32] Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

- Load forecasting and distribution planning is used to estimate future substation and circuit loading based upon historical load data and the planning criteria guidelines are then used to provide a consistent approach for planning the safe, reliable, orderly, and economic expansion of the distribution system.

- Circuit protection practices are aimed at achieving safety and security for the public and employees, maximizing service reliability to customers, minimizing damage to distribution equipment, and establishing a consistent process and set of application standards for distribution circuit protection. Penelec began installing Tripsavers in late 2019 and plans to have 400 completed in 2020.

- To reduce the scope of outages, fuse protection and coordination recommendations on the 34.5 kV system will be constructed and implemented based on full circuit coordination studies.

- Circuit ties and loops continue to be built between radial sections of circuits. When ties and loops are available, circuits can be switched during outages to enable faster service restoration. Penelec completed a circuit tie and loop project in 2019, which was started in 2018 and 1 circuit tie and loop project in 2017.

- Line Rehabilitation continues to strengthen the electrical system, Penelec performs targeted circuit rehabilitation in Zone 1 and Zone 2 areas, focusing on circuits having a high rate of equipment and line failure and animal-caused outages. Equipment that may be replaced includes crossarms, capacitors, insulators, lightning arresters and connectors. Penelec completed the rehabilitation on 14 circuits in 2019 as compared to 12 circuits in 2018.

- Supervisory control and data acquisition (SCADA) devices are being installed where circuit conditions and system performance warrant. SCADA controlled switches allows for remote operation to restore service to customers when an outage occurs. Remote switching eliminates the need to dispatch crews to manually operate the switches, resulting in fewer customers affected and reduced outage duration. Penelec installed 8 SCADA devices in 2019 as compared to 11 SCADA devices in 2018, and 21 SCADA devices in 2017.

- Advanced protective devices such as electronically controlled reclosers and switches with modernized communication are being installed to allow for additional protection coordination. Advanced protective devices were installed on 9 circuits in 2019 as compared to 13 circuits in 2018, and 2 circuits in 2017.

Conclusion

Trees and Equipment failures are the top two outage causes that substantially negatively affect electrical reliability to Penelec customers. In 2019, trees and equipment failure outage causes contributed to over 70% of the total lost customer-minutes and does not include any lost customer-minutes caused by Major Events.

Beginning in 2004, Penelec's CADI and SAIFI benchmark performance has been erratic and frequently outside of acceptable tolerances and Penelec has achieved CAIDI benchmark

performance less than 18% of the time, and SAIFI benchmark performance less than 5% of the time. Penelec through its RIP will need to address the inconsistent CAIDI and SAIFI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line. The Commission expects to see significant improvement in reliability for the FirstEnergy Companies beginning in 2020.

It should also be noted that Major Events had a significant negative impact on Penelec's customers and are not reflected in CAIDI and SAIFI performance metrics.

Figure 20 Penelec CAIDI (minutes)

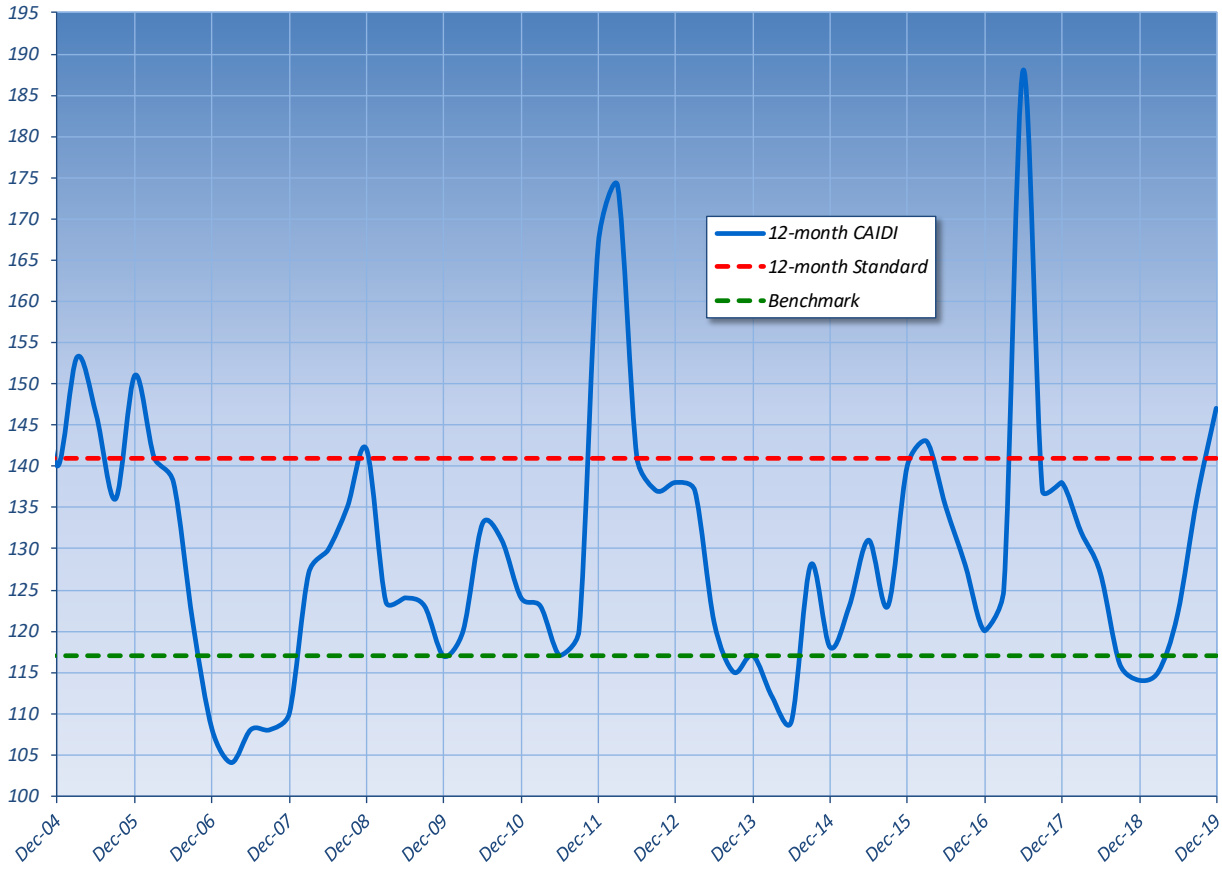


Figure 21 Penelec SAIFI (interruptions per customer)

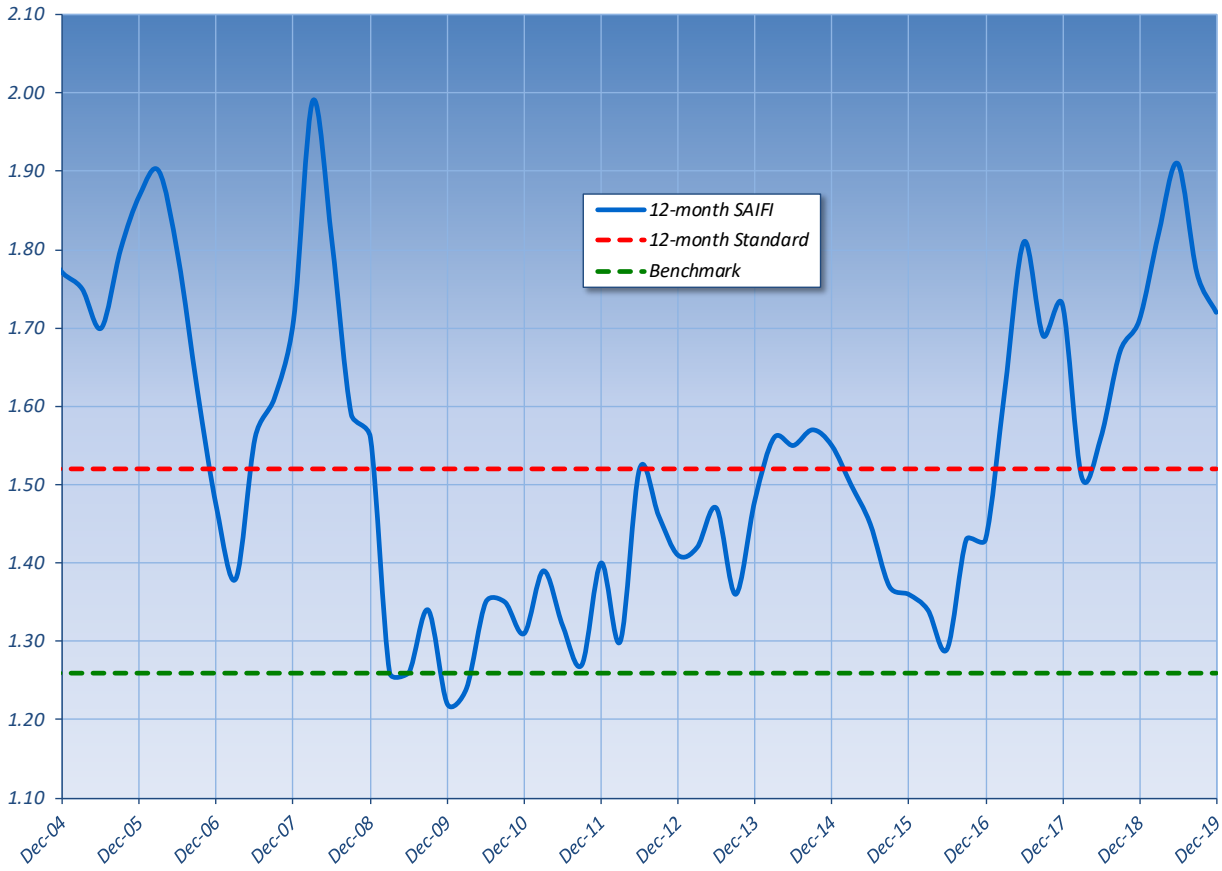


Figure 22 Penelec Outage Causes (percent of total outages)

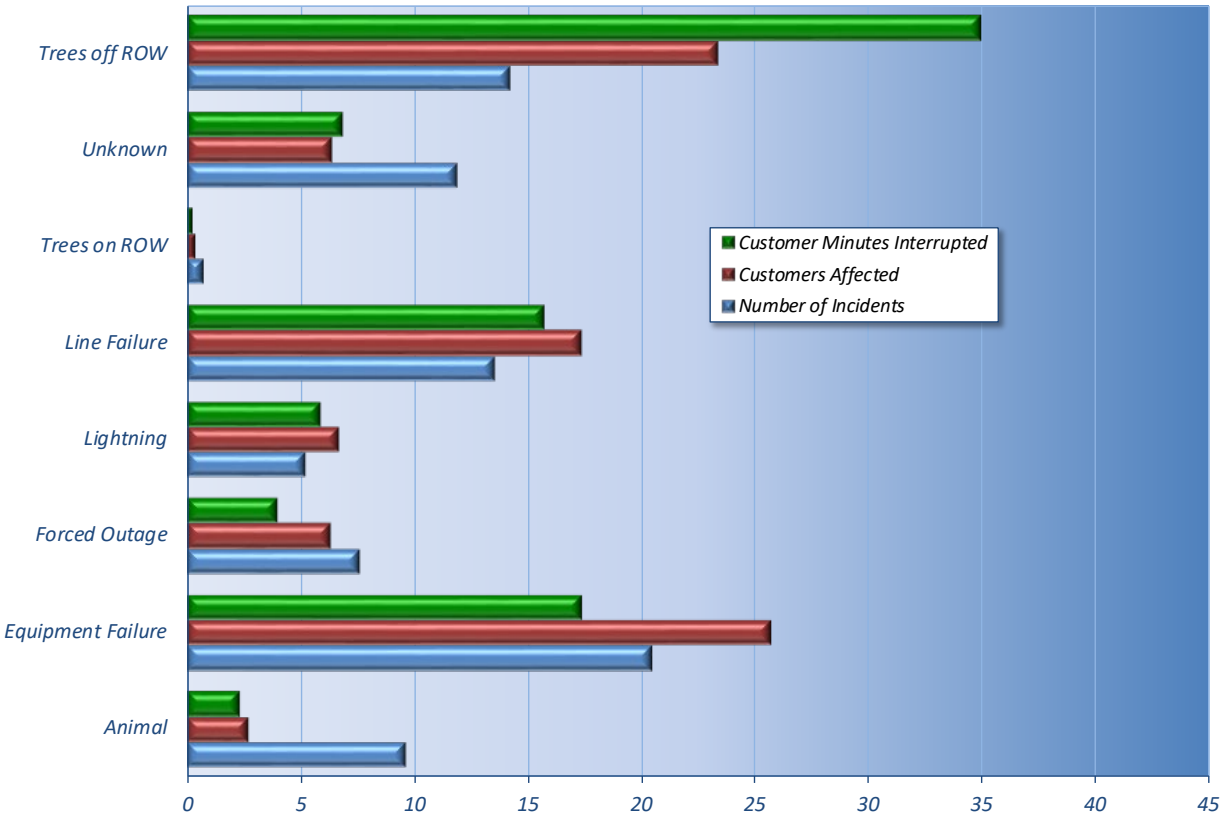
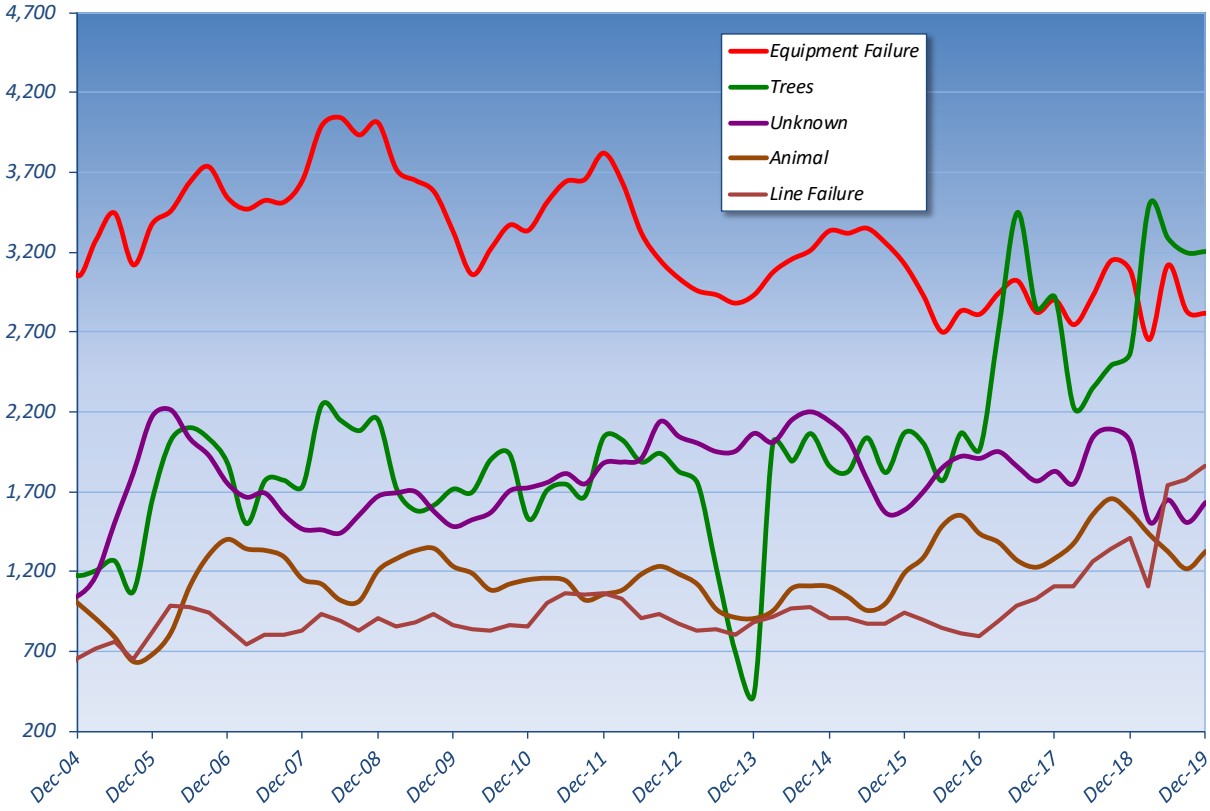


Figure 23 Penelec Outage Tracking (number of incidents)



Pennsylvania Power Company

Penn Power has a service territory of about 1,100 square miles that serves primarily 159,500 customers.

In 2019, Penn Power experienced 226,745 customer interruptions and 29.2 million customer-minutes interrupted in 2019 as compared to: 180,247 customer interruptions and 113.1 million customer-minutes interrupted in 2018; 173,036 customer interruptions and 26 million customer-minutes interrupted in 2017; and 176,968 customer interruptions and 24.9 million customer-minutes interrupted in 2016.

Penn Power experienced one Major Event where Penn Power customers experienced a loss of 20,219,291 customer-minutes interrupted not included in the total above.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 138 minutes in 2018 to 129 minutes in 2019; and failed to achieve benchmark by 28%.

3-year average: Increased from 128 minutes in 2018 to 139 minutes in 2019; and failed to achieve standard by 25%.

SAIDI

Rolling 12-month: Increased from 152 minutes in 2018 to 178 minutes in 2019; and failed to achieve benchmark by 58%.

3-year average: Increased from 139 minutes in 2018 to 163 minutes in 2019; and failed to achieve standard by 20%.

SAIFI

Rolling 12-month: Increased from 1.10 outages in 2018 to 1.38 outages in 2019; and failed to achieve benchmark by 23%.

3-year average: Increased from 1.08 outages in 2018 to 1.18 outages in 2019; and achieved standard by 4%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 24 and 25. Beginning in 2004, Penn Power's CAIDI performance trend has been inconsistent and frequently outside of acceptable tolerances. In the 12-month rolling quarters ending in December 2017, 2018, and now 2019, CAIDI has been exceeding the "red" standard performance upper-control-limit-line. More management attention is required to address the inconsistent CAIDI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Beginning in 2012, Penn Power's SAIFI performance trend has been inconsistent. Penn Power's 2019 rolling 12-month SAIFI performance is above the upper-control-limit-line and is considered out of control. More management attention is needed to address the inconsistent SAIFI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 26 shows the top reported 2019 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Equipment failure (which includes line failure) and trees (which includes all four tree sub-categories of which 2 are not shown) were the top cause of outages, customers affected, and customer-minutes interrupted. Over 50% of outages are caused by trees and 20% are caused by equipment failure.

Figure 27 shows historical trend of the top 4 main outage causes. Trees and equipment failure are the two most frequent causes of power outages. Equipment failure and trees and are the two most frequent outage-causes that are significantly negatively affecting Penn Power's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

In 2016, Penn Power started to execute its Long-Term Infrastructure Improvement Plan (LTIIP). This plan included expenditures and programs designed to accelerate repairment, improvement or replacement of aging infrastructure in order to adequately maintain and improve the efficiency, safety, adequacy, and reliability of the distribution system. On Jan. 18, 2019, Penn Power filed a

Petition for Approval of Modification of its LTIIP in order to increase overall spending in the 2019 program year. The Petition was approved, as filed, on May 23, 2019.[33] On Aug. 30, 2019, Penn Power, along with the other FirstEnergy Companies (Met-Ed, Penelec, and West Penn) filed petitions for second LTIIPs for the years 2020 through 2024. The petitions were approved on Jan. 16, 2020.[34]

The PUC has also been performing extra monitoring of Penn Power's work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.[35] Penn Power's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

Penn Power employs various programs to strengthen the durability and flexibility of the electric system. Penn Power noted that methods to improve the efficiency, adequacy, and reliability of the distribution system are a continual focus. Penn Power utilizes core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Routine cycle tree trimming that removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes off right-of-way priority trees.

- Enhanced tree trimming that complements the routine cycle tree trimming by removing healthy limbs overhanging primary conductors on areas where it is determined to be beneficial.

- In response to damage caused by the Emerald Ash Borer, a program to proactively remove Ash Trees off right-of-way was implemented.

- Post-storm circuit patrols that target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

- After each significant storm event, Penn Power conducts post-storm review meetings to identify and disseminate lessons learned which are used to improve the emergency response plan.

- From storm review action items identified as a result of 2018 and early 2019 restoration events, Penn Power will implement the following changes:

    - Leverage available reports to identify workers on property.

[33] Docket No. P-2015-2508931.

[34] *See Petition of Pennsylvania Power Company for Approval of its Long-Term Infrastructure Improvement Plan* at Docket No. P-2019-3012614.

[35] Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

  - Stagger crews to prevent crews from extending past 16 hours.
  - Send severe weather notifications to crews potentially affected by inclement weather.

- The Customers Experiencing Multiple Interruptions ("CEMI") program is aimed to reduce frequent or repeated outages for affected clusters of customers or frequently operated devices.

- Load forecasting and distribution planning is used to estimate future substation and circuit loading based upon historical load data and the planning criteria guidelines are then used to provide a consistent approach for planning the safe, reliable, orderly, and economic expansion of the distribution system.

- Circuit protection practices are aimed at achieving safety and security for the public and employees, maximizing service reliability to customers, minimizing damage to distribution equipment, and establishing a consistent process and set of application standards for distribution circuit protection.

- Circuit ties and loops continue to be built between radial sections of circuits. When ties and loops are available, circuits can be switched during outages to enable faster service restoration. Penn Power installed 14 circuit ties and loops in 2018 as compared to 10 circuit ties and loops in 2017.

- Smaller, aging overhead conductors are being replaced to improve energy efficiency, increase capacity, and improve operational flexibility. Penn Power replaced 10 miles of overhead conductor in 2018 as compared to 4.3 miles in 2017.

- Supervisory control and data acquisition (SCADA) devices are being installed where circuit conditions and system performance warrant. SCADA controlled switches allows for remote operation to restore service to customers when an outage occurs. Remote switching eliminates the need to dispatch crews to manually operate the switches, resulting in fewer customers affected and reduced outage duration. Penn Power installed 35 SCADA switches in 2018 as compared to 14 SCADA switches in 2017.

- Advanced protective devices such as electronically controlled reclosers and switches with modernized communication are being installed to allow for additional protection coordination. Advanced protective devices were installed on 13 circuits in 2018 as compared to two circuits in 2017.

- Penn Power is also improving line sectionalizing capability by installing switches and fuses on unprotected overhead circuits to allow an outage fault to be more quickly isolated and power restored. In addition, poles, reclosers, cutouts, arresters, fault indicators and animal guards may be replaced or installed to ensure proper line sectionalizing. Penn Power improved line sectionalizing capability on 13 circuits in 2018 as compared to 6 circuits in 2017.

- Substation circuit breakers, station transformers, and other substation equipment, such as insulators, switches, buses, arresters, and conductors that are obsolete or in poor condition

are being replaced with new equipment. Proactively replacing older equipment increases substation reliability and reduces the occurrence of equipment failure. Penn Power replaced 25 pieces of equipment in 2018 as compared to 33 pieces of equipment in 2017.

Conclusion

Trees and Equipment failures are the top two outage causes that substantially negatively affect electrical reliability to Penn Power customers. In 2019, trees and equipment failure outage causes contributed to over 60% of the total lost customer-minutes and does not include any lost customer-minutes caused by Major Events.

Beginning in 2004, Penn Power's CAIDI and SAIFI benchmark performance has been inconsistent, and Penn Power has achieved CAIDI benchmark performance less than 13% of the time, and SAIFI benchmark performance less than 47% of the time. Penn Power through its RIP will need to address the inconsistent CAIDI and SAIFI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line. The Commission expects to see significant improvement in reliability for the FirstEnergy Companies beginning in 2020

It should also be noted that a Major Event had a significant negative impact on Penn Power's customers that are not reflected in CAIDI and SAIFI performance metrics.

Figure 24 Penn Power CAIDI (minutes)

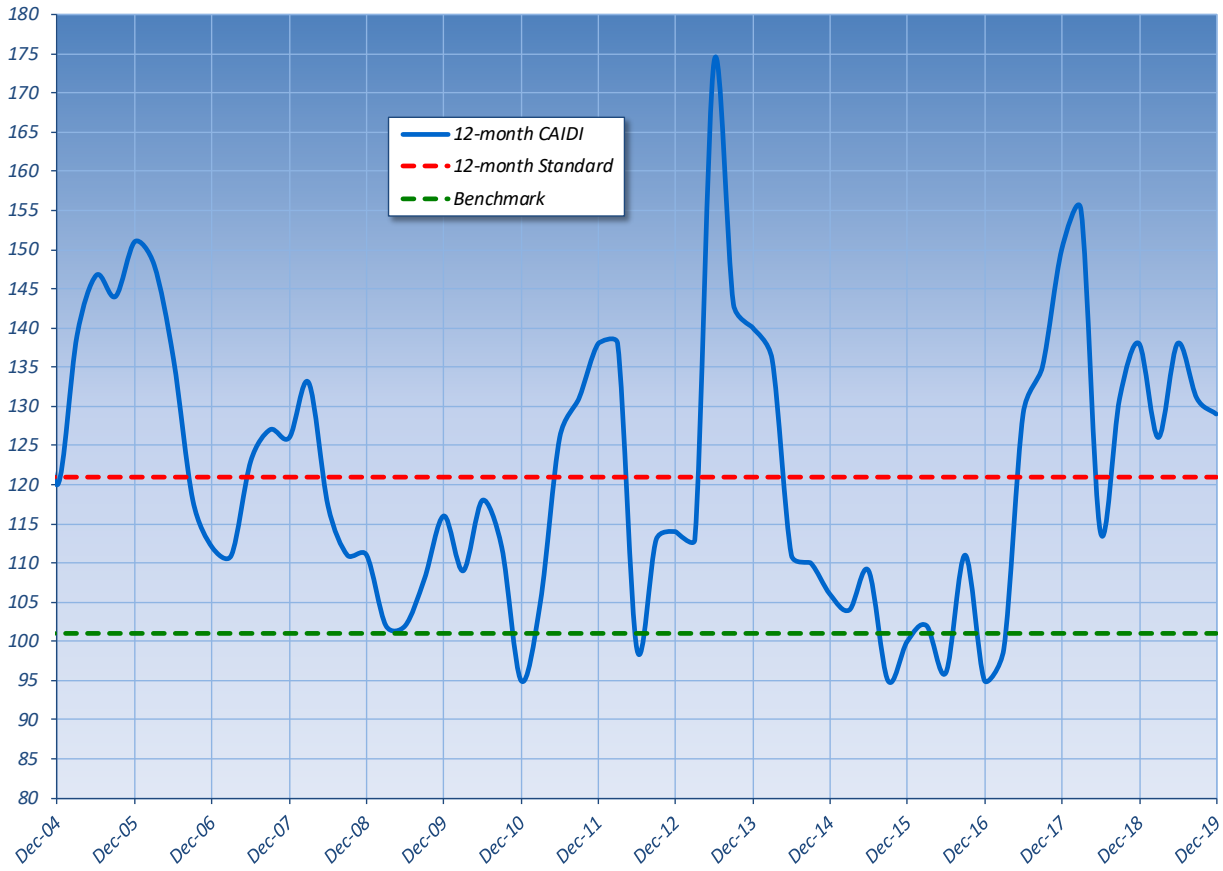


Figure 25 Penn Power SAIFI (interruptions per customer)

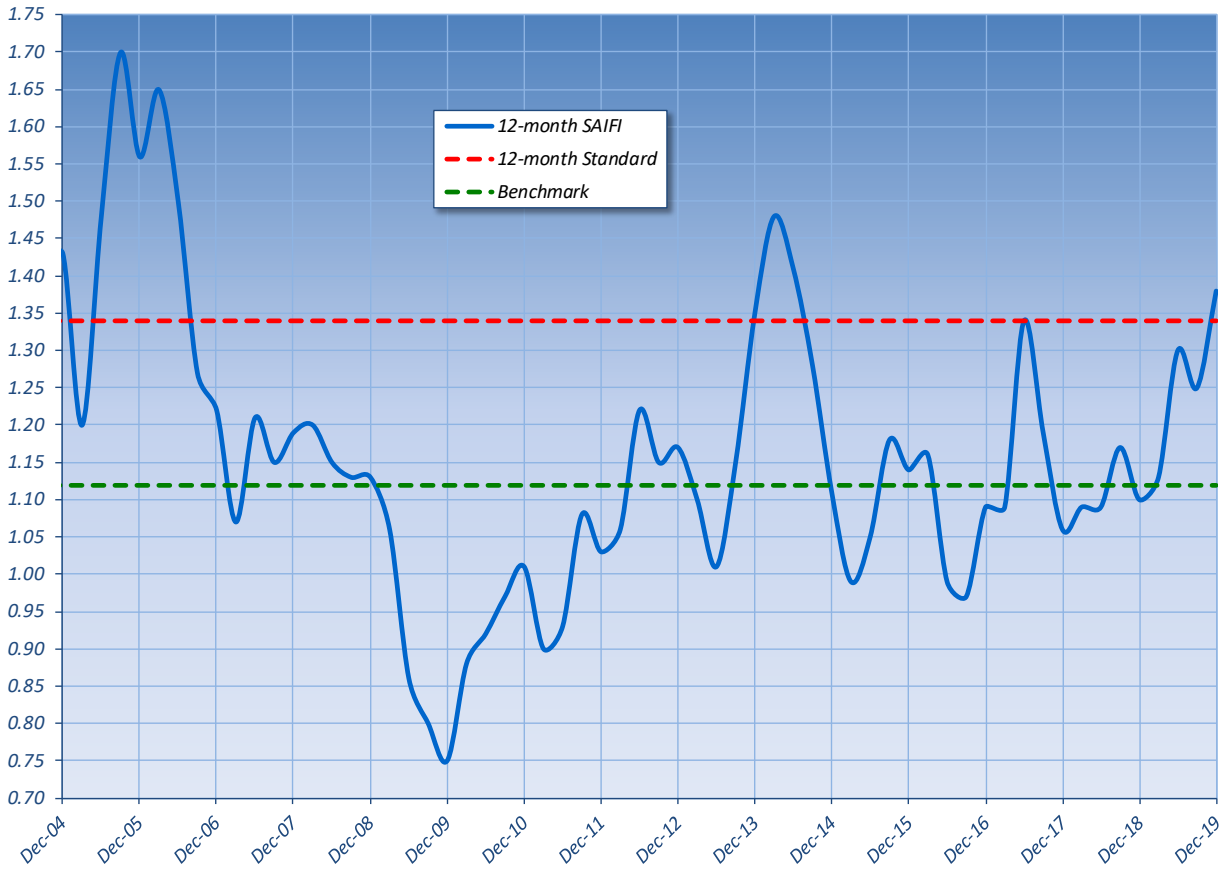


Figure 26 Penn Power Outage Causes (percent of total outages)

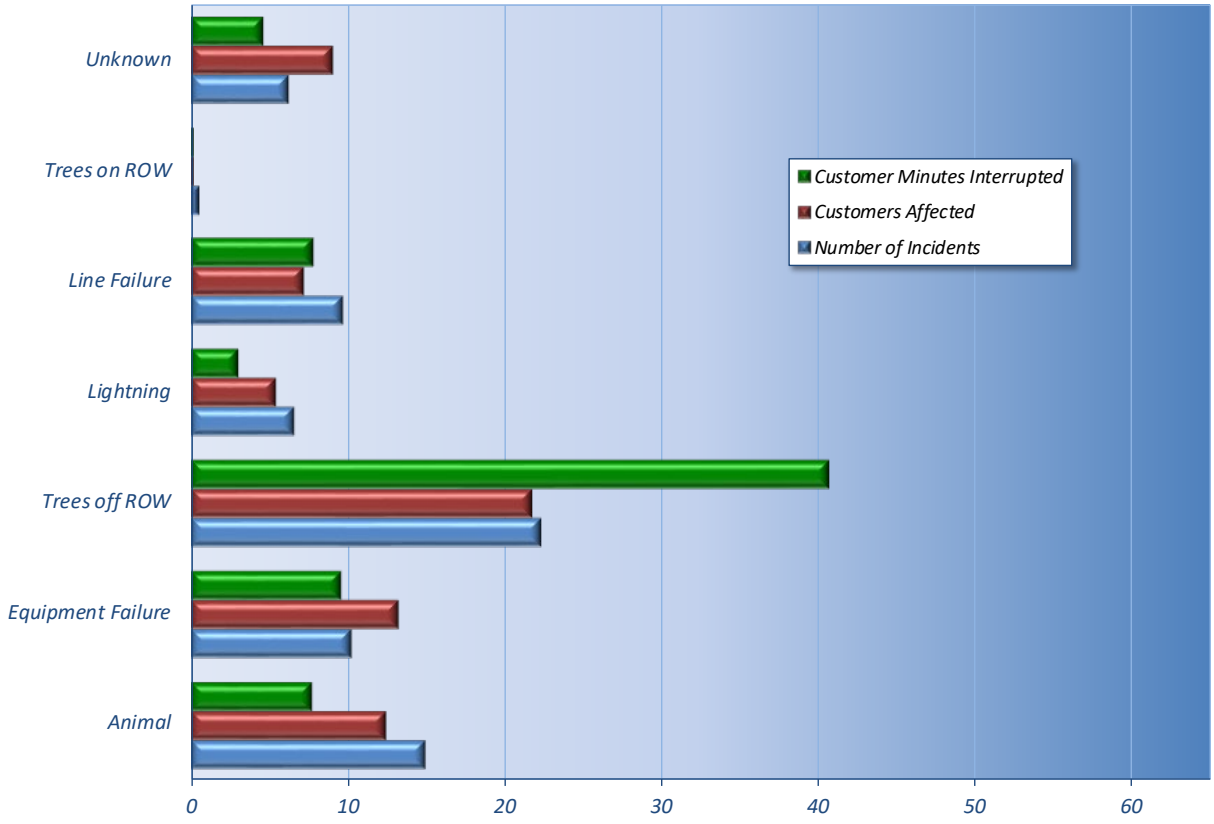
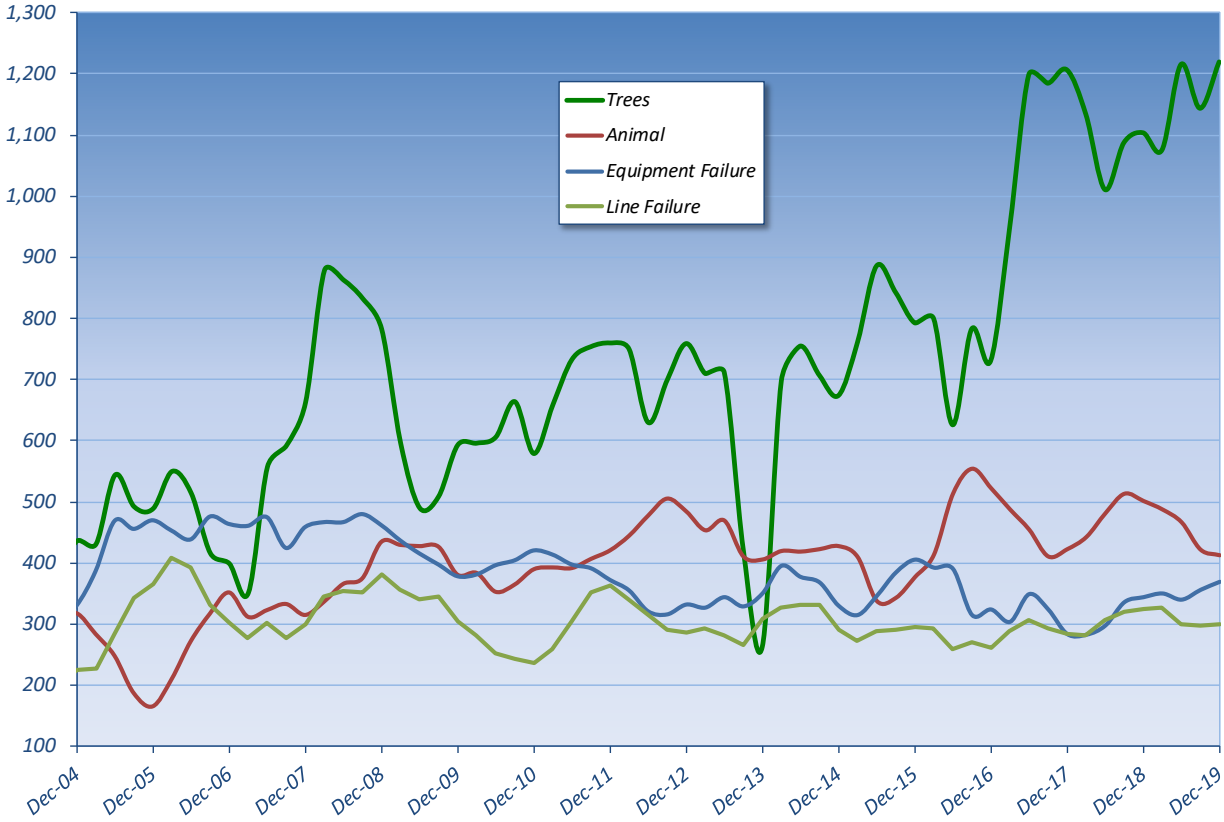


Figure 27 Penn Power Outage Tracking (number of incidents)



West Penn Power Company

West Penn has a service territory of about 10,400 square miles and serves about 710,000 customers.

In 2019, West Penn experienced 851,338 customer interruptions and 140.3 million customer-minutes interrupted as compared to: 844,298 customer interruptions and 136.3 million customer-minutes interrupted in 2018; 919,673 customer interruptions and 152.7 million customer-minutes interrupted in 2017; and 772,206 customer interruptions and 113.1 million customer-minutes interrupted in 2016.

West Penn experienced 1 Major Event in 2019 which had an additional 151,122,575 customer minutes interrupted not included in the total above.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 171 minutes in 2018 to 165 minutes in 2019; achieved benchmark by 3%.

3-year average: Increased from 161 minutes in 2018 to 167 minutes in 2019; achieved standard by 11%.

SAIDI

Rolling 12-month: Decreased from 209 minutes in 2018 to 196 minutes in 2019; failed to achieve benchmark by 10%.

3-year average: Increased from 194 minutes in 2018 to 206 minutes in 2019; achieved standard by 5%.

SAIFI

Rolling 12-month: Decreased from 1.22 outages in 2018 to 1.19 outages in 2019; failed to achieve benchmark by 13%.

3-year average: Increased from 1.20 outages in 2018 to 1.23 outages in 2019; failed to achieve standard by 6%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 28 and 29. West Penn's CAIDI performance trend has historically been erratic. However, from 2014 through part of 2019 has been good and has been positively below the "green" benchmark performance upper-control-limit-line. The last CAIDI data point is slightly negatively above the "green" benchmark performance upper-control-limit-line. West Penn's CAIDI performance is considered to be approaching a CAIDI benchmark performer provided this positive trend continues and is sustained.

Beginning in 2004, West Penn's SAIFI performance trend has been chronically outside of acceptable tolerances. From 2010 through 2019, the overall trend has been continually trending negative above the "green" benchmark performance upper-control-limit-line, however SAIFI performance has been improving. West Penn needs to ensure management attention continues to address the inconsistent SAIFI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 30 shows the top reported 2019 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Equipment failure (which includes line failure) and trees (which includes all four tree sub-categories of which two are not shown) were the top cause of outages, customers affected, and customer-minutes interrupted. About 50% of customer interrupted minutes are caused by trees and 27% are caused by equipment failure.

Figure 31 shows historical trend of the top three main outage causes. Equipment failure and trees are the two most frequent outage-causes that are significantly negatively affecting West Penn's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

In 2016, West Penn started to execute its Long-Term Infrastructure Improvement Plan (LTIIP). This plan included expenditures and programs designed to accelerate repairment, improvement or replacement of aging infrastructure in order to adequately maintain and improve the efficiency, safety, adequacy, and reliability of the distribution system. On Jan. 18, 2019, West Penn filed a

Petition for Approval of Modification of its Long-Term Infrastructure Improvement Plan in order to increase overall spending in the 2019 program year. The Petition was approved, as filed, on May 23, 2019.[36] On Aug. 30, 2019, West Penn, along with the other FirstEnergy Companies (Met-Ed, Penelec, and Penn Power) filed petitions for second LTIIPs for the years 2020 through 2024. The petitions were approved on January 16, 2020.[37]

The PUC has also been performing extra monitoring of West Penn's work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.[38] West Penn's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP. The Commission expects to see significant improvement in reliability for the FirstEnergy Companies beginning in 2020.

West Penn employs various programs to strengthen the durability and flexibility of the electric system. Methods to improve the efficiency, adequacy, and reliability of the distribution system are a continual focus. West Penn utilizes core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Routine cycle tree trimming that removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes off right-of-way priority trees.

- Enhanced tree trimming that complements the routine cycle tree trimming by removing healthy limbs overhanging primary conductors on areas where it is determined to be beneficial.

- In response to damage caused by the Emerald Ash Borer, West Penn implemented a program to proactively remove Ash Trees off right-of-way.

- Post-storm circuit patrols that target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

- After each significant storm event, West Penn conducts post-storm review meetings to identify and disseminate lessons learned which are used to improve the emergency response plan.

- The Customers Experiencing Multiple Interruptions ("CEMI") program is aimed to reduce frequent or repeated outages for affected clusters of customers or frequently operated devices. West Penn completed 31 CEMI projects in 2019.

[36] Docket No. P-2015-2508948.
[37] *See Petition of West Penn Power Company for Approval of its Long-Term Infrastructure Improvement Plan* at Docket No. P-2019-3012617.
[38] Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

- Load forecasting and distribution planning is used to estimate future substation and circuit loading based upon historical load data. The planning criteria guidelines are then used to provide a consistent approach for planning the safe, reliable, orderly, and economic expansion of the distribution system.

- Circuit protection practices are aimed at achieving safety and security for the public and employees, maximizing service reliability to customers, minimizing damage to distribution equipment, and establishing a consistent process and set of application standards for distribution circuit protection.

- Line Rehabilitation continues to strengthen the electrical system, West Penn performs targeted circuit rehabilitation in Zone 1 and Zone 2 areas, focusing on circuits having a high rate of equipment and line failure and animal-caused outages. Equipment that may be replaced includes crossarms, capacitors, insulators, lightning arresters, and connectors. West Penn completed the rehabilitation on 43 circuits in 2019 as compared to 36 circuits in 2018, and 44 circuits in 2017.

- Supervisory control and data acquisition (SCADA) devices are being installed where circuit conditions and system performance warrant. SCADA controlled reclosers and switches and automatic switch modernization will provide enhanced sectionalizing for larger blocks of customers at the substation level. Remote switching eliminates the need to dispatch crews to manually operate the switches, resulting in fewer customers affected and reduced outage duration. West Penn installed 70 reclosers or switches in 2019 as compared to 51 SCADA reclosers or switches in 2018, and 72 SCADA switches in 2017.

- Substation circuit breakers, station transformers, and other substation equipment, such as insulators, switches, buses, arresters, and conductors that are obsolete or in poor condition are being replaced with new equipment. West Penn notes that proactively replacing older equipment increases substation reliability and reduces the occurrence of equipment failure. West Penn replaced 244 pieces of equipment in 2019 as compared to 62 pieces of equipment in 2018, and 69 pieces of equipment in 2017.

Conclusion

Trees and Equipment failures are the top 2 outage causes that substantially negatively affect electrical reliability to West Penn customers. In 2019, the trees and equipment failure outage causes contributed to over 64% of the total lost customer-minutes and does not include any lost customer-minutes caused by Major Events.

Beginning in 2004, West Penn's CAIDI and SAIFI benchmark performance has been inconsistent and frequently outside of acceptable tolerances. West Penn has achieved CAIDI benchmark performance less than 45% of the time and SAIFI benchmark performance 15% of the time. From 2014 through 2019, West Penn's CAIDI has achieved benchmark performance. However, West Penn's SAIFI performance continues to need more management attention to sustain the trend line below the "green" benchmark performance upper-control-limit-line. The Commission expects to see significant improvement in reliability for the FirstEnergy Companies beginning in 2020

It should also be noted that a Major Event had a significant negative impact on West Penn's customers that is not reflected in CAIDI and SAIFI performance metrics.

Figure 28 West Penn CAIDI (minutes)

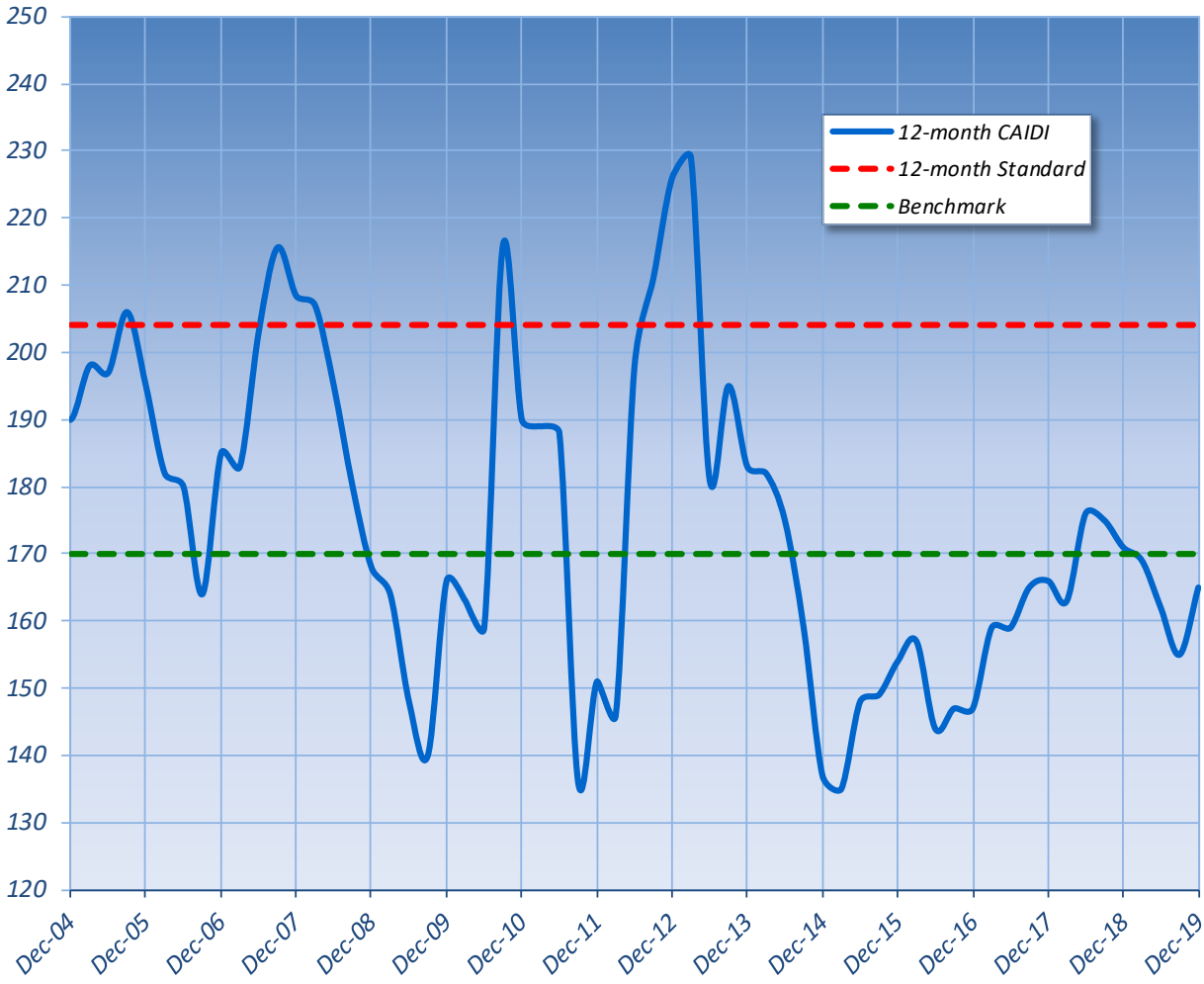


Figure 29 West Penn SAIFI (interruptions per customer)

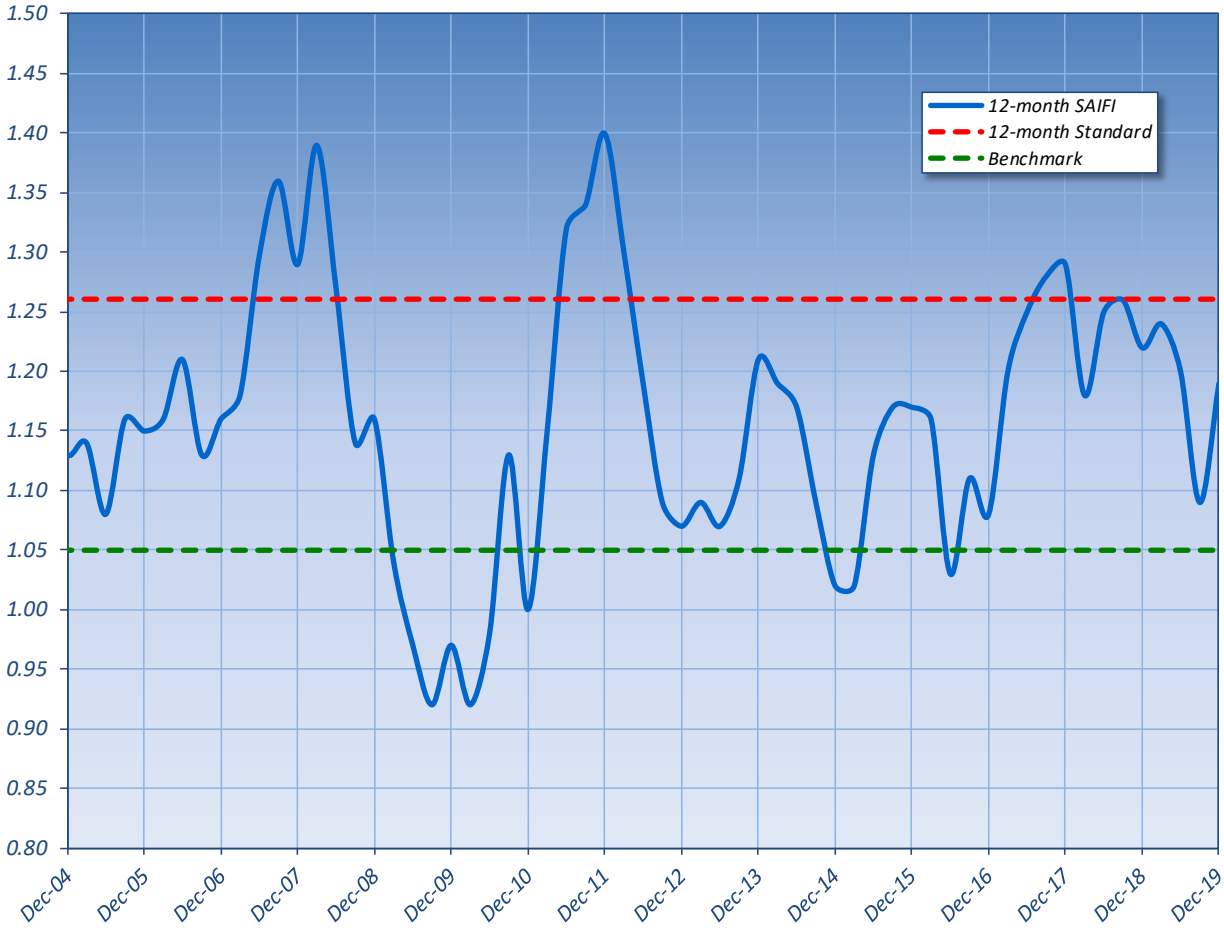


Figure 30 West Penn Outage Causes (percent of total outages)

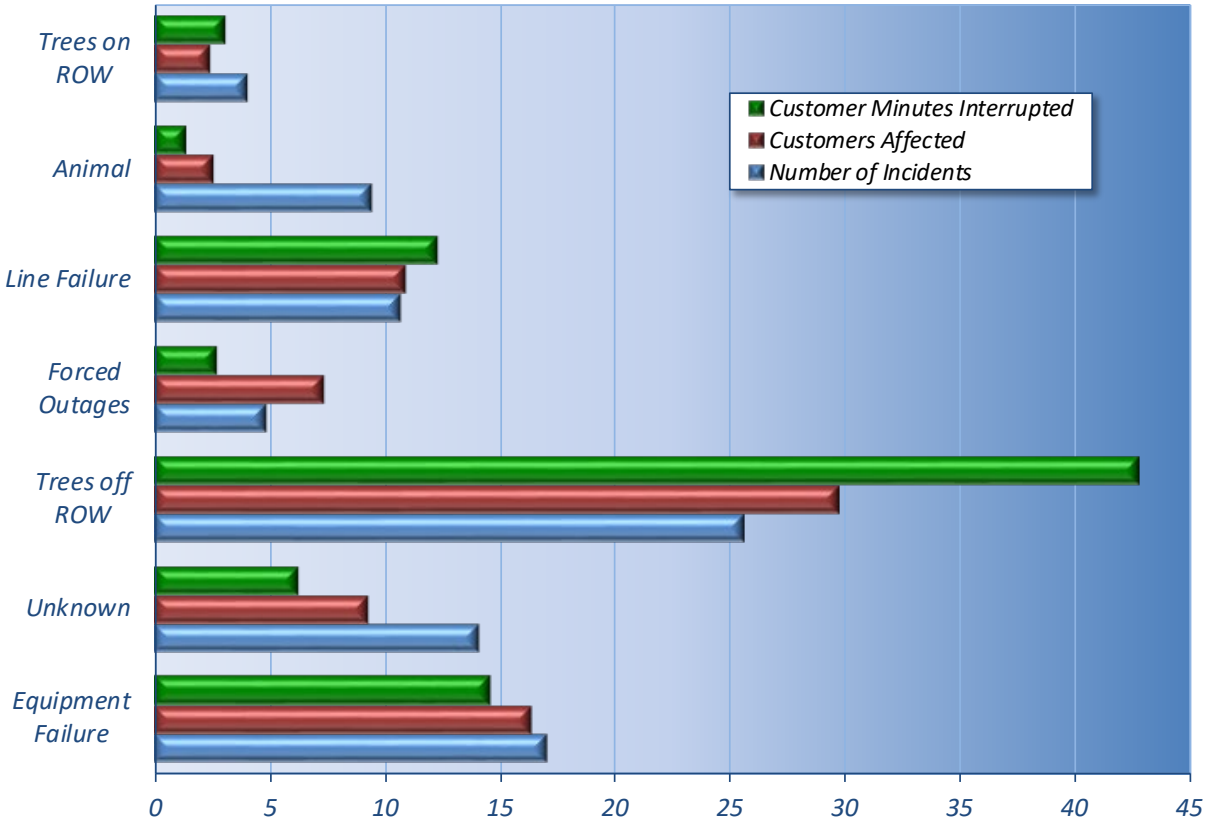
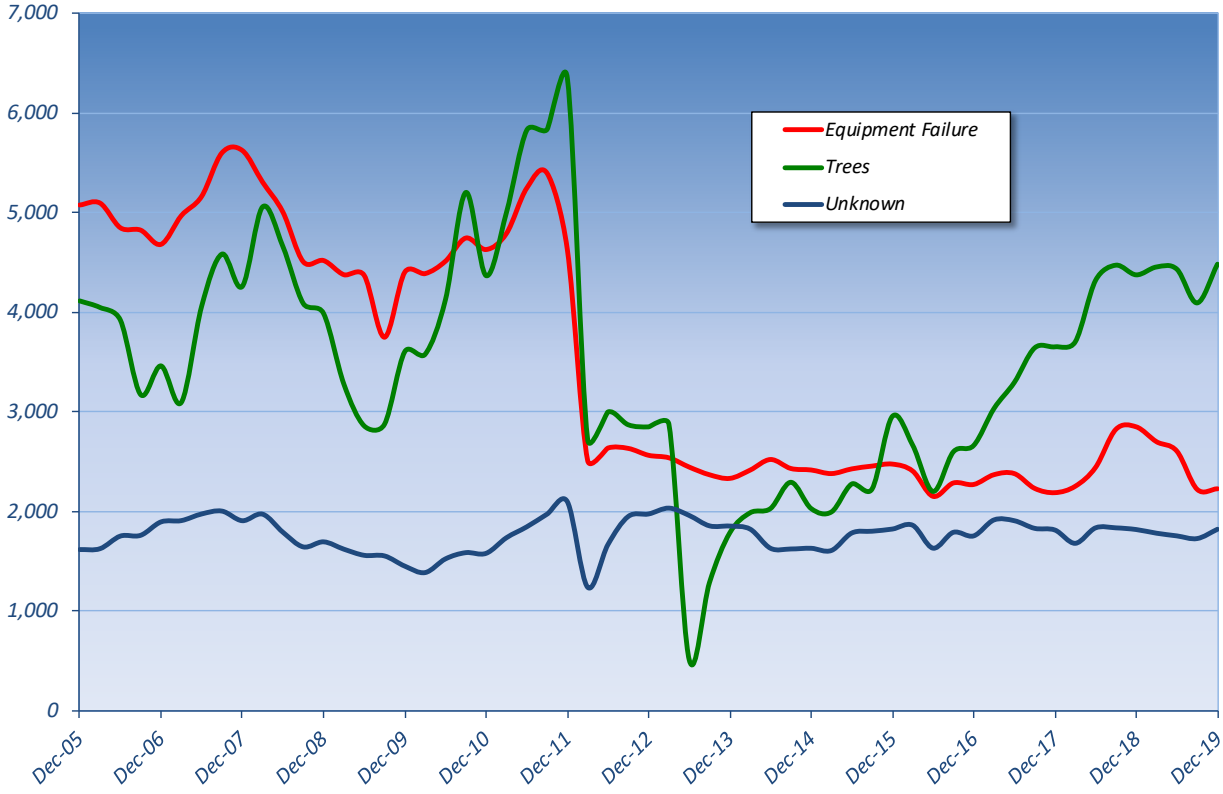


Figure 31 West Penn Outage Tracking (number of incidents)



Citizens' Electric Company

Citizens' has an operating service area of about 41 square miles with about 6,963 customers. The electric system consists of 1 distribution substation and 9 distribution feeder lines.

In 2019, Citizens' experienced 1,969 customers interruptions and 151,592 customer-minutes interrupted as compared to 1,449 customers interruptions and 109,478 customer-minutes interrupted in 2018, 3,180 customer interruptions and 588,067 customer-minutes interrupted in 2017, and 1,787 customer interruptions and 192,235 customer-minutes interrupted in 2016.

Citizens' experienced five Major Events in 2019 and an additional 1.3 million customer-minutes interrupted not included in the total above.

CAIDI/SAIDI/SAIFI Evaluation[39]

CAIDI

Rolling 12-month: Increased from 76 minutes in 2018 to 77 minutes in 2019; achieved benchmark by 27%.

3-year average: Decreased from 123 minutes in 2018 to 113 minutes in 2019; achieved standard by 2%.

SAIDI

Rolling 12-month: Increased from 16 minutes in 2018 to 22 minutes in 2019; failed to achieve benchmark by 2%.

3-year average: Decreased from 43 minutes in 2018 to 41 minutes in 2019; failed to achieve standard by 62%.

SAIFI

Rolling 12-month: Increased from 0.21 outages in 2018 to 0.28 outages in 2019; failed to achieve benchmark by 40%.

3-year average: Remained unchanged at 0.31 outages in 2018; failed to achieve standard by 42%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 32 and 33. Beginning in 2004, Citizens' CAIDI performance has been overall positive approximately 80% of the time. Citizens' CAIDI performance is currently good and below the "green" benchmark performance upper-control-limit-line. It appears the Citizens' CAIDI performance trend is now in a positive direction. However, more management attention is needed to ensure consistent CAIDI performance is now sustained below the "green" benchmark performance upper-control-limit-line.

Beginning in 2004, Citizens' SAIFI performance has been overall positive about 25% of the time. From the 4th quarter 2014 through the 4th quarter 2019, Citizens' SAIFI performance has been inconsistent and frequently above the "green" benchmark performance upper-control-limit-line. More management attention is needed to ensure consistent SAIFI performance is sustained below the "green" benchmark performance upper-control-limit-line. Based on the tighter indices calculated at the time of the benchmark period, Citizens' performance is still considered outside of upper control limit for benchmark performance, but still better than all other EDCs.

Outage Causes

Figure 34 shows the reported 2019 outage-cause categories, as a percentage, for the following 3 distinct performance metrics: Customer-minutes Interrupted; Customers Affected; and Number of Incidents. Weather, equipment failure, and trees (including tree sub-categories) were the top causes of customer-minutes interrupted, and number of customers affected. Equipment failure and trees (including tree sub-categories) caused the most number of incidents.

[39] Smaller CAIDI, SAIFI, and SAIDI benchmark values are typical for companies with fewer customers. While Citizens' did not achieve benchmark for SAIFI and SAIDI in 2019, its SAIFI and SAIDI values for 2019 are still lower than that of all other EDCs.

Figure 35 shows the historical trend of the top 5 main outage causes. Trees and equipment failure are the two most frequent outage-causes that are significantly negatively affecting Citizens' distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

Beginning in 2012, Citizens' has been investing increasing resources to identify and remove off-right-of-way hazard trees. A primary focus has been the continuing impact from the Emerald Ash Borer. Citizens' has committed additional resources to identify, prioritize and remove significant threats to reliability from hazard trees during 2019.

Citizens' notes that exceptionally wet conditions beginning in 2018 began to cause apparently healthy trees to topple in saturated, destabilized soil. As that weather pattern continued, a combination of unstable soil and accelerated root decay have developed into a trend of tree-related outages. In response, the Company has focused additional trimming efforts in areas prone to saturation or unstable soil, such as side-banks and natural drainage routes. Additional tree removals and clearing in these areas will mitigate many potential outages.

Citizens' experienced one of its most impactful storms on record in April 2019 as an EF-1 Tornado and associated severe winds, rain and hail hit its service territory. While the volume of customers affected and distribution of the damage was some of the worst in Citizens' history, the duration of the event from the first reported outage to the last restoration was under 36 hours.

Citizens' started a major reliability project in 2019 that will continue in 2020 and seeks to improve sectionalizing and isolating capabilities for a line-section that impacts over 1,000 customers (nearly 15% of Citizens' total customer base). The project will allow 3 line-sections with a history of tree and weather-related outages to be completely isolated, restoring all customers prior to making repairs.

Citizens' experienced typical outages from spring wind, summer thunderstorms and winter snows in 2019. No significant tropical systems impacted the area. However, the tornado mentioned above did impact Citizens' significantly and Citizens' notes the following:

- In April of 2019, an EF-1 tornado, accompanied by straight-line wind and down-draft phenomena affected Citizens' territory, with the tornado taking a path directly across the center. Based on total customers affected, this event is the second most impactful on record for the Company. Two key opportunities were gained from the event and, additionally, several earlier initiatives were proved effective.

- Lessons Learned/Key Opportunities:

    - The 'No Outage' process was cumbersome in large volumes and caused temporary loss of 'No Outage' tickets. This deficiency will be explored with the outage management system (OMS) vendor and reviewed with dispatch employees resolved.

  - Foreign crews showed interest in utilizing the Company outage restoration app. Citizens' and its affiliates are exploring use of app when crossing company boundaries and this may be expanded to include any mutual aid crew in the future.

- Notable Successes:

  - AppSuite: Outage restoration AppSuite allowed management and crew chiefs to be immediately notified and assess an outage situation remotely, and allowed most linemen to be aware of the extent of outages prior to being called in.

  - Capacity Additions/Tie Strengthening: Projects to improve transfer capabilities were deployed. This allows Citizens' to transfer some customers to an alternate feed and isolate a line for repairs with the least number of customers impacted.

  - Affiliate Company Mutual Aid: Citizens' affiliates under C&T Enterprises have significant geographic diversity. During an April storm system, two of four affiliates were heavily damaged, however were still able to draw mutual aid from the other two affiliates.

Citizens' continues to identify and replace equipment known to be failure prone; namely specific vintages of porcelain arrestors and cutouts. All new cutouts use polymer-based insulators.

Infrared inspections are performed on all 3-phase primary overhead line sections each year and all single-phase line sections on a 3-year cycle.

Conclusion

Trees and Equipment failures are the top three outage causes that substantially negatively affect electrical reliability to Citizens' customers. In 2019, trees and equipment failure outage causes contributed to over 56% of the total lost customer-minutes.

Citizens' has the best CAIDI and SAIFI performance of any Pennsylvania EDC which is commendable.

It should also be noted that Major Events had a significant negative impact on Citizens' customers that is not reflected in CAIDI and SAIFI performance metrics.

Figure 32 Citizens' CAIDI (minutes)

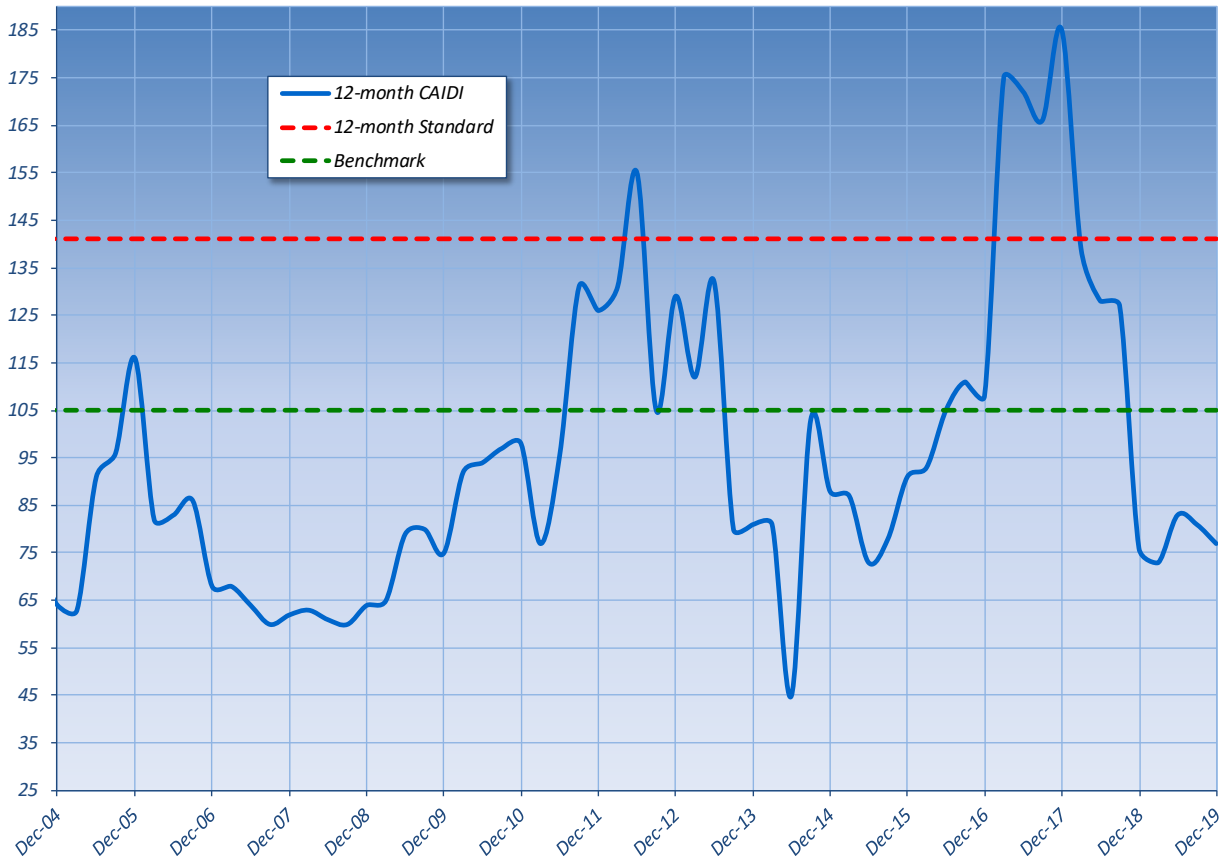


Figure 33 Citizens' SAIFI (interruptions per customer)

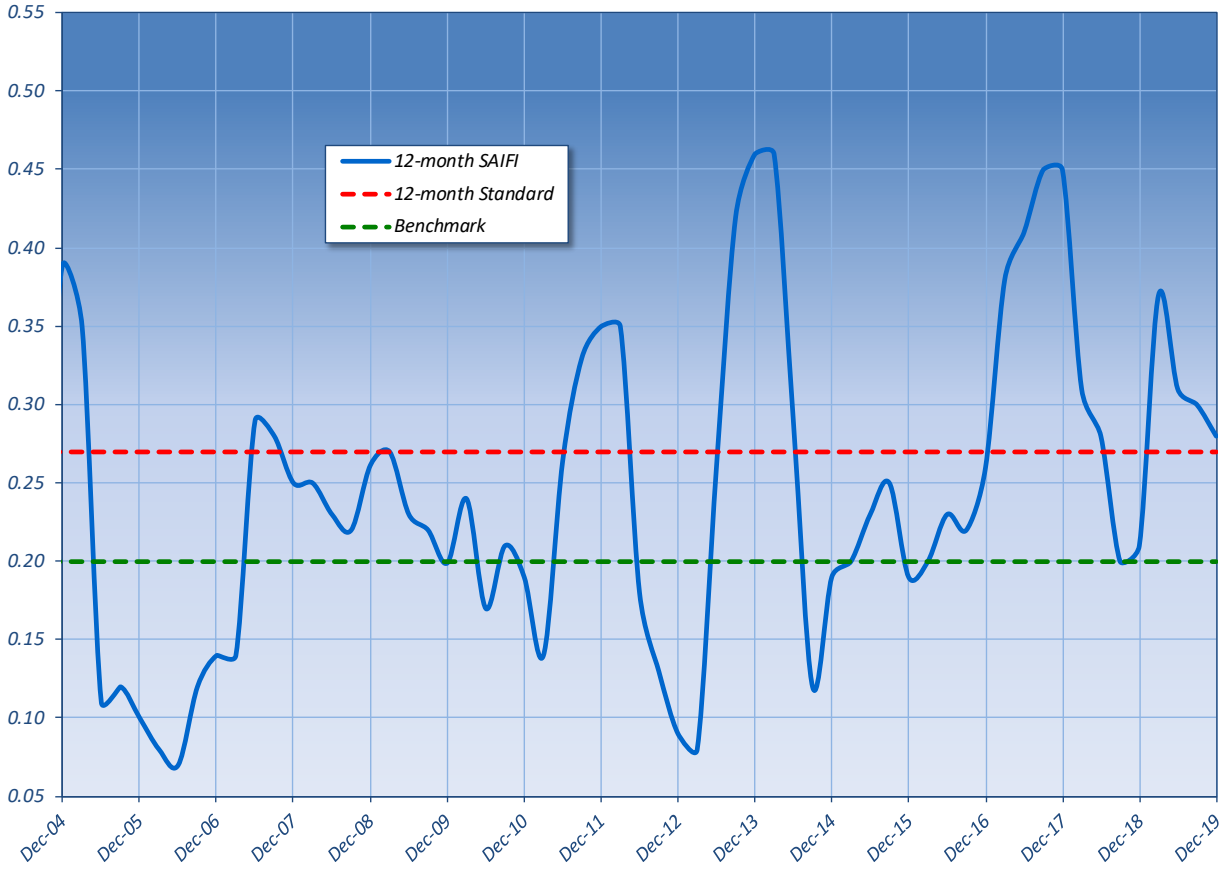


Figure 34 Citizens' Outage Causes (percent of total outages)

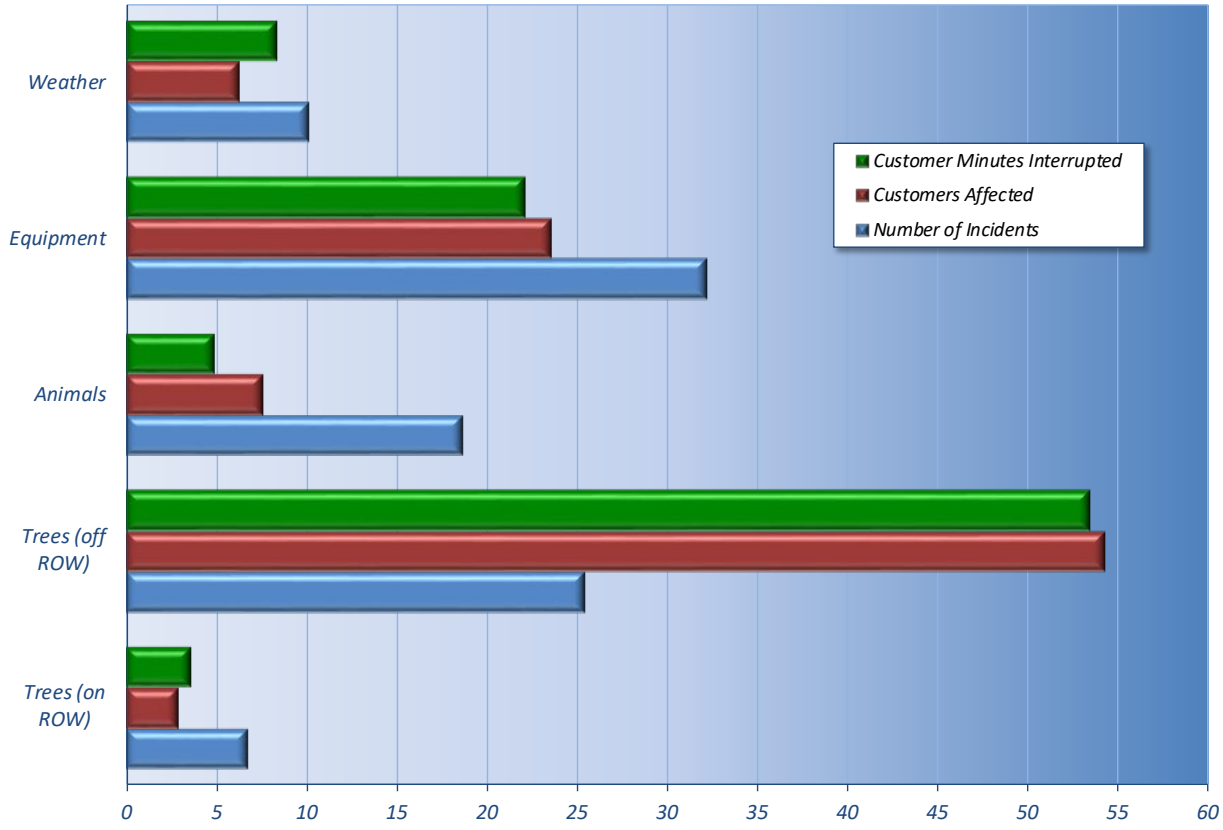
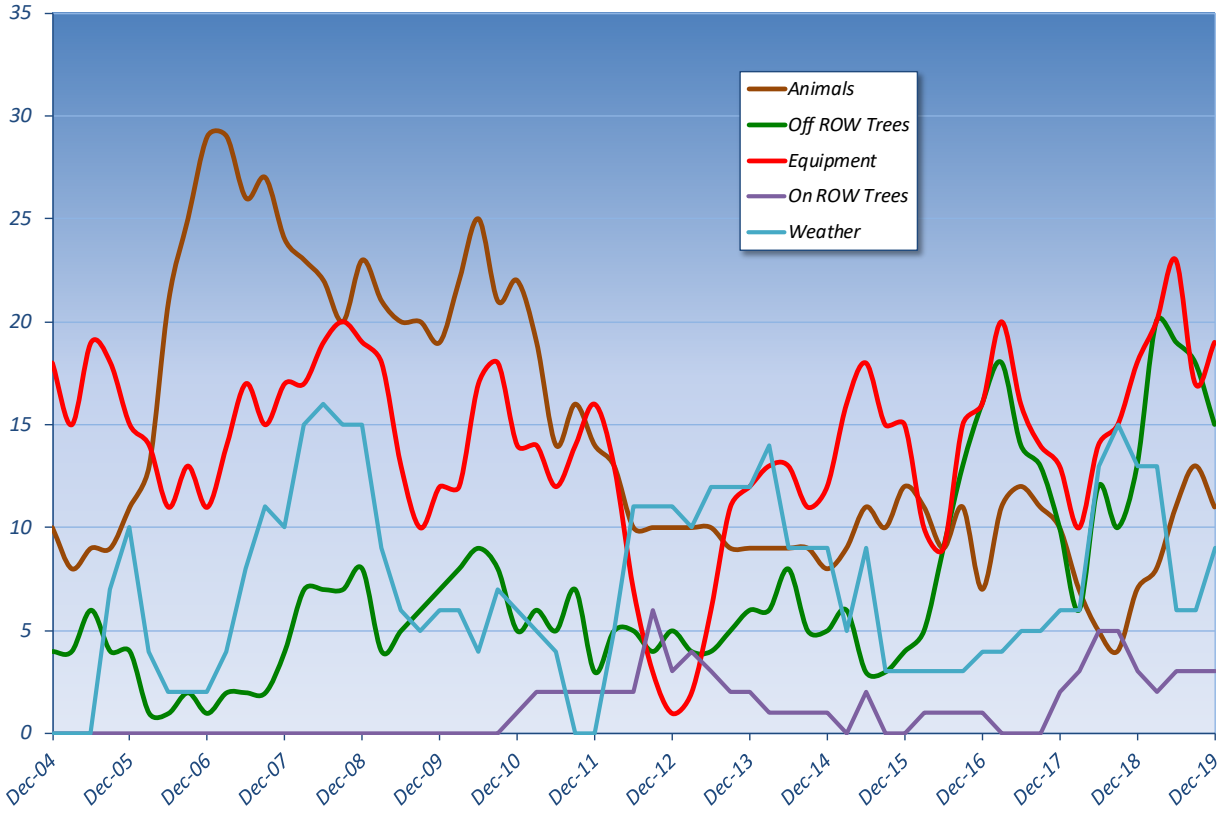


Figure 35 Citizens' Outage Tracking (number of incidents)



Pike County Light & Power Company

Pike has a relatively small operating service area of approximately 44 square miles with about 4,800 customers. Pike is primarily fed from two 34.5-kilovolt (kV) feeders supplied from New York substations, and the eastern portion of Pike service territory is fed by two 13.2 kV feeders from the Matamoras Substation.

In 2019, Pike experienced 1,870 customer interruptions and 331,335 customer-minutes interrupted as compared to: 4,057 customer interruptions and 872,312 customer-minutes interrupted in 2018; 4,648 customer interruptions and 475,003 customer-minutes interrupted in 2017; and 1,735 customer interruptions and 394,826 customer-minutes interrupted in 2016.

Pike experienced one major event that resulted in 429,968 customer interrupted minutes not included in the total above

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 236 minutes in 2018 to 177 minutes in 2019; and failed to achieve benchmark by 2%.

3-year average: Decreased from 216 minutes in 2018 to 199 minutes in 2019; and failed to achieve standard by 4%.

SAIDI

Rolling 12-month: Decreased from 200 minutes in 2018 to 69 minutes in 2019; achieved benchmark by 35%.

3-year average: Decreased from 130 minutes in 2018 to 124 minutes in 2019; achieved standard by 4%.

SAIFI

Rolling 12-month: Decreased from 0.85 outages in 2018 to 0.39 outages in 2019; achieved benchmark by 36%.

3-year average: Unchanged at 0.59 outages in 2019; achieved standard by 12%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 36 and 37. From 2004 through 2019, Pike's CAIDI performance has been positive less than 40% of the time. In general Pike's performance has been poor and frequently above the "green" benchmark performance upper-control-limit-line. However, Pike's fourth quarter CAIDI is only slightly above benchmark. More management attention is needed to ensure consistent CAIDI performance is sustained below the "green" benchmark performance upper-control-limit-line.

From 2004 through 2018, Pike's SAIFI performance trend has been overall positive less than 50% of the time. Pike's 2019 SAIFI has been positively below the "green" benchmark performance upper-control-limit-line. More management attention is needed to ensure consistent SAIFI performance is sustained below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 38 shows the top reported 2019 outage-cause categories, as a percentage, for the following 3 distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees and equipment failure were the top cause of outages, customers affected, and customer-minutes interrupted. About 40% of outages are caused by trees and 15% are caused by equipment failure.

Figure 39 shows the historical trend of the top three main outage causes. Trees and Equipment failure are the two most frequent outage-causes that are significantly negatively affecting Pike's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

Pike has continued the usage of a smart fault indicators ("SFI"). In addition, Pike has pole top reclosers and substation devices that are monitored and controlled by Pike's SCADA System as of June 2018.

Pike's infrared inspection will be scheduled for completion in the summer 2021 period.

In 2019, approximately 1,000 poles were inspected resulting in approximately 60 poles to be replaced in 2020.

As part of recommendations of the Commission in its 2019 post-storm report for winter storms Riley and Quinn, one specific recommendation to Pike was to consider a Long-Term Infrastructure Improvement Plan, (LTIIP) to make accelerated storm hardening and system improvements. Pike notes that it plans to file an LTIIP in 2020.

Conclusion

Trees and Equipment failures are the top two outage causes that substantially negatively affect electrical reliability to Pike customers. In 2019, the trees and equipment failure outage causes contributed to over 52% of the total lost customer-minutes.

From 2004 through 2018, Pike's CAIDI and SAIFI benchmark performance has been inconsistent and frequently outside of acceptable tolerances. Pike has achieved CAIDI benchmark performance 38% of the time and SAIFI benchmark performance 45% of the time. In 2019, Pike has improved both CAIDI and SAIFI performance. However, more management attention is needed in the future to sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Figure 36 Pike County CAIDI (minutes)

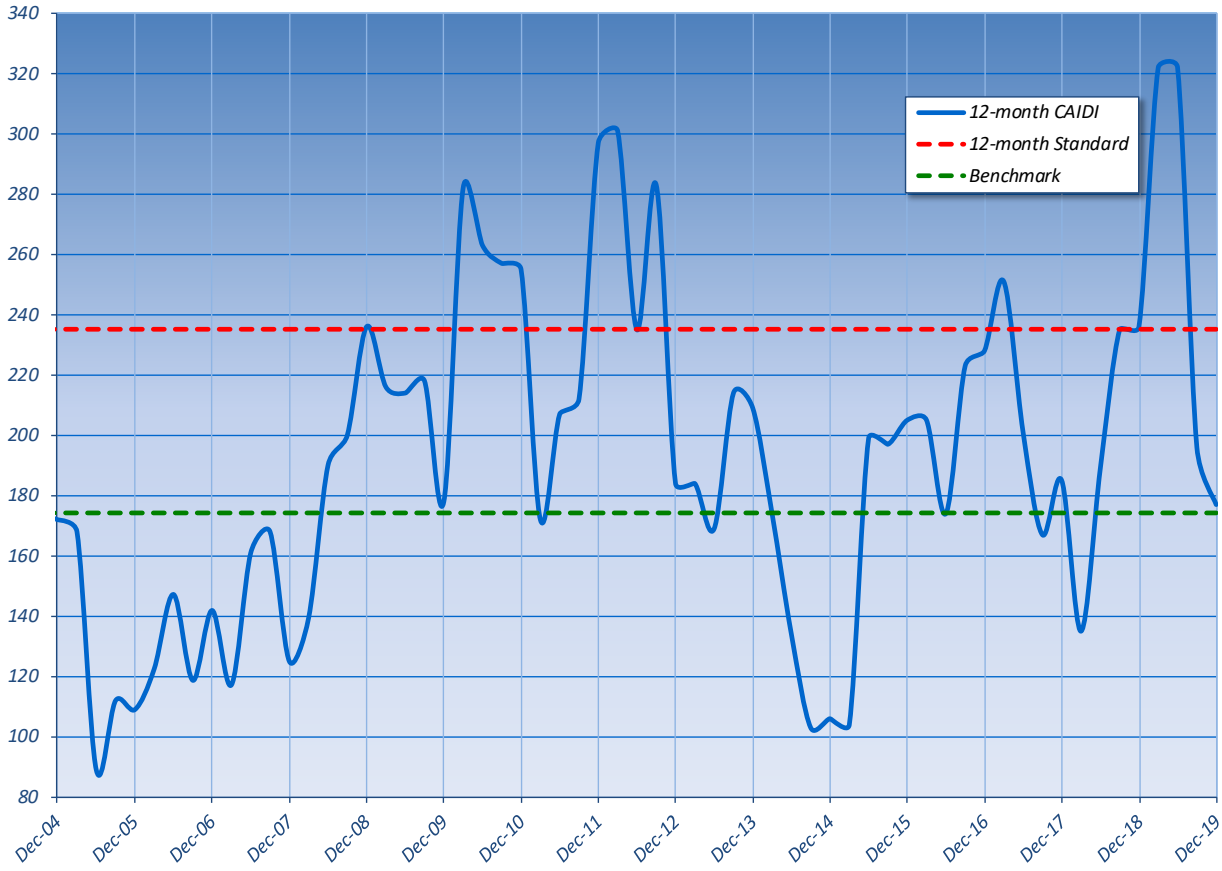


Figure 37 Pike County SAIFI (interruptions per customer)

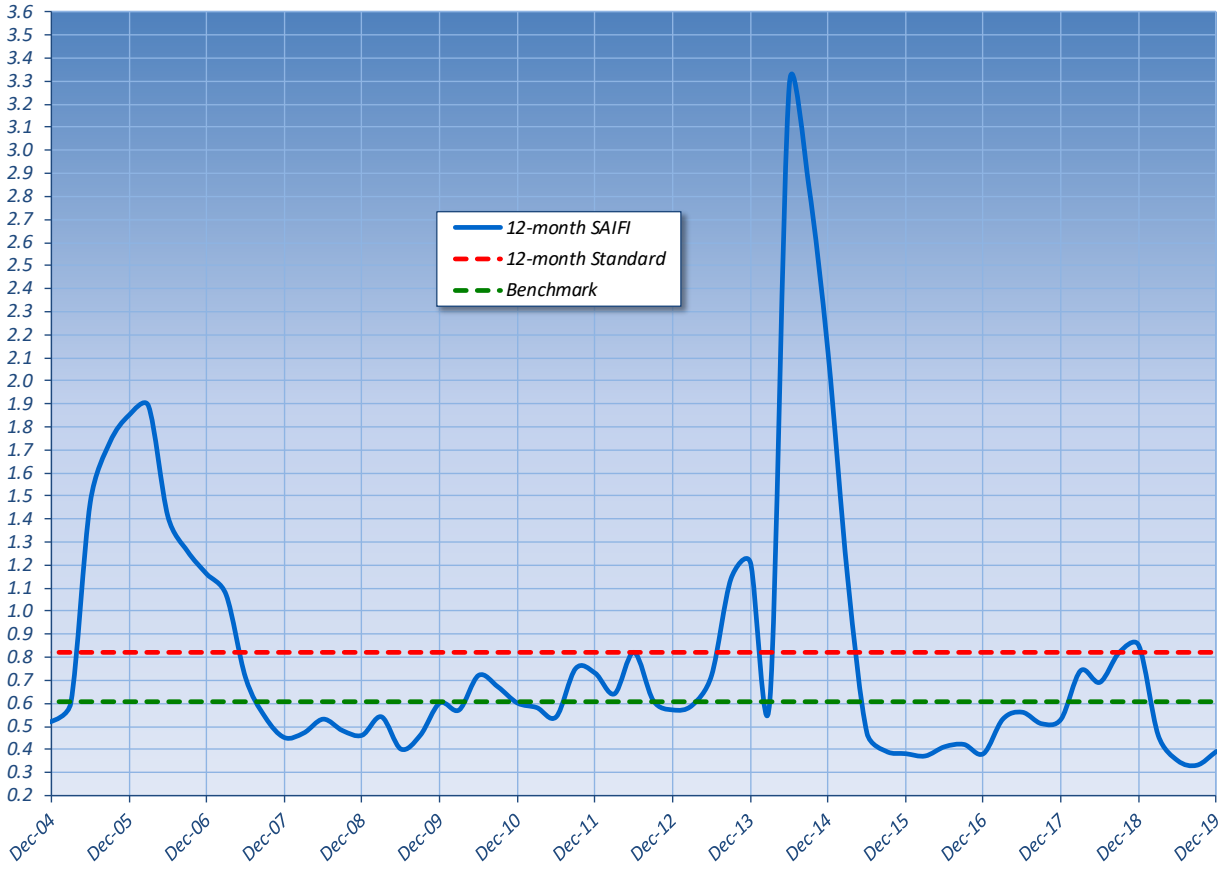


Figure 38 Pike County Outage Causes (percent of total outages)

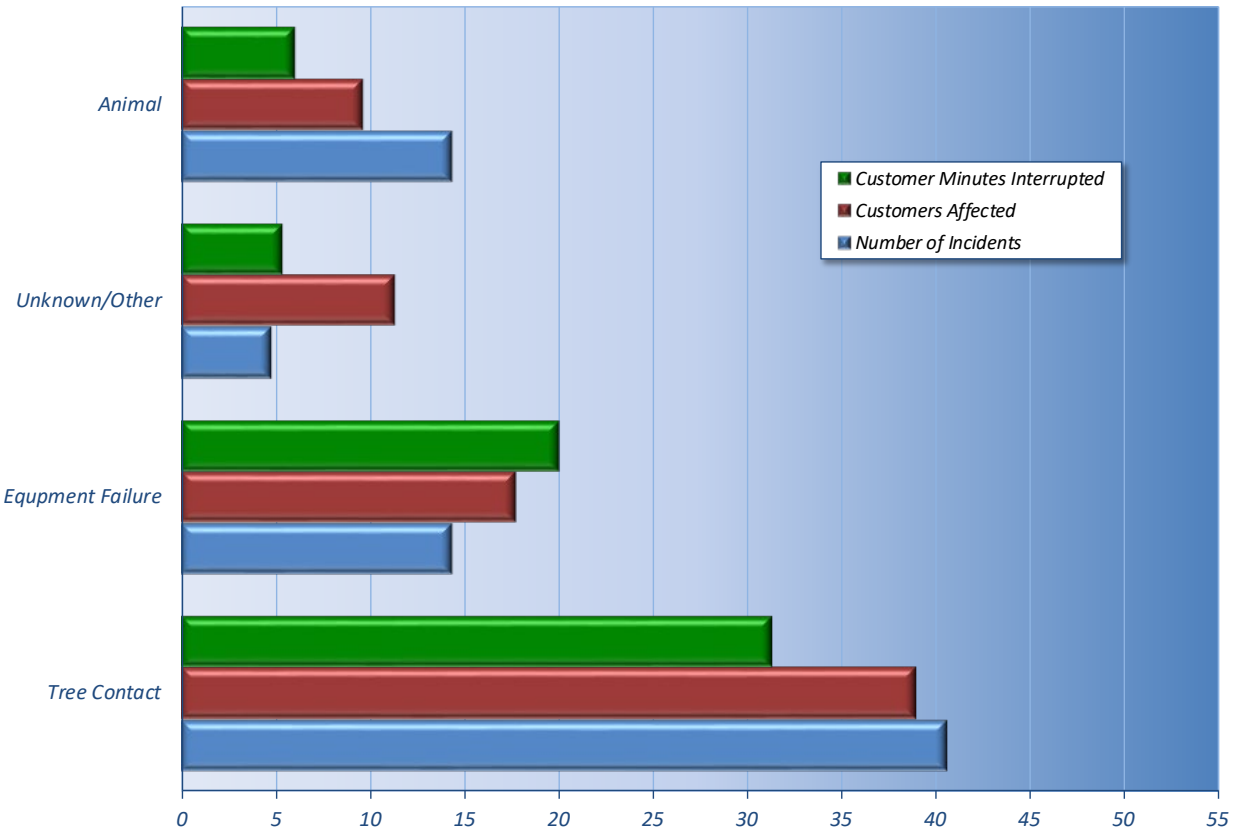
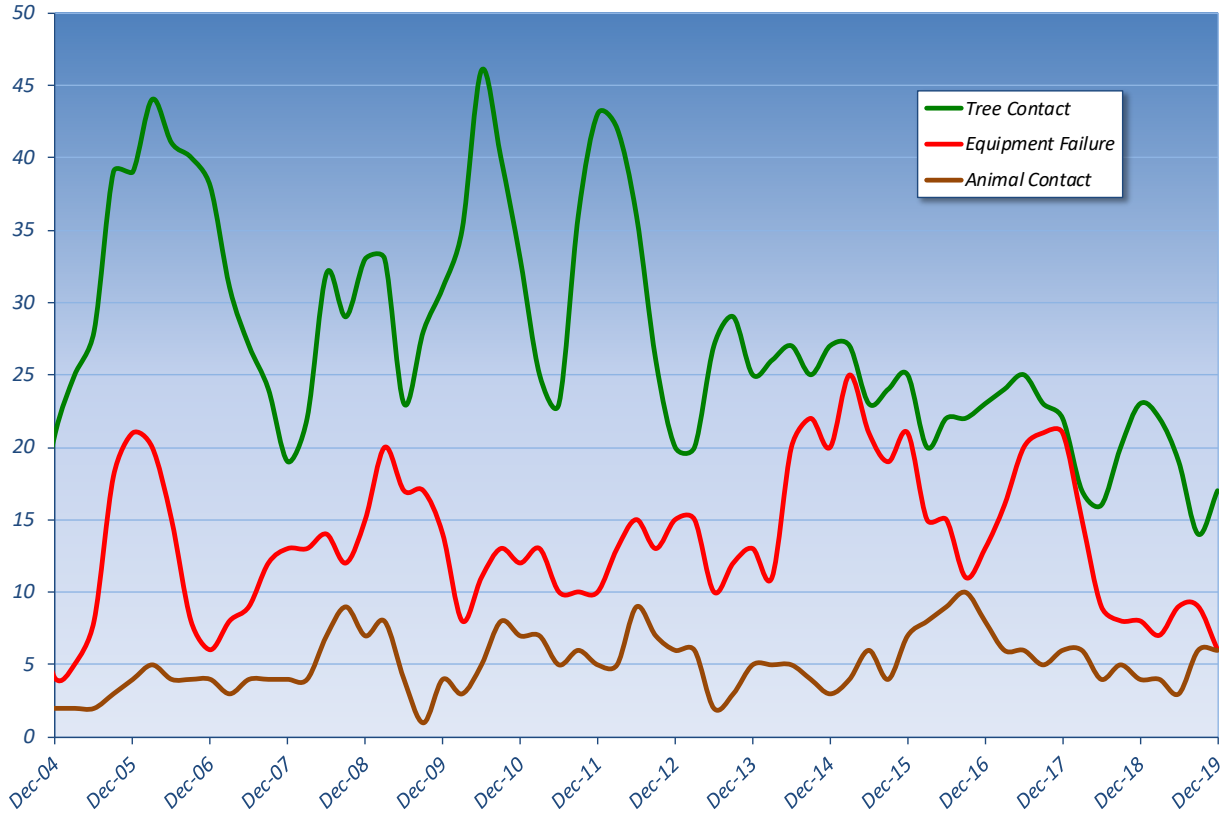


Figure 39 Pike County Outage Tracking (number of incidents)



UGI Utilities Inc.

UGI has a service territory of about 410 square miles and serves about 61,200 customers.

In 2019, UGI experienced 59,946 customer interruptions and 11.3 million customer-minutes interrupted as compared to: 31,305 customer interruptions and 4.1 million customer-minutes interrupted in 2018; 31,395 customer interruptions and 4.1 million customer-minutes interrupted in 2017; and 38,909 customer interruptions and 4.9 million customer-minutes interrupted in 2016.

UGI experienced one Major Event in 2019 totaling 5.8 million customer minutes interrupted not included in the total above .

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 178 minutes in 2018 to 188 minutes in 2019; failed to achieve benchmark by 11%.

3-year average: Increased from 145 minutes in 2018 to 166 minutes in 2019; achieved standard by 11%.

SAIDI

Rolling 12-month: Decreased from 213 minutes in 2018 to 182 minutes in 2019; failed to achieve benchmark by 30%.

3-year average: Increased from 118 minutes in 2018 to 153 minutes in 2019; achieved standard by 10%.

SAIFI

Rolling 12-month: Decreased from 1.19 outages in 2018 to 0.96 outages in 2019; failed to achieve benchmark by 16%.

3-year average: Increased from 0.77 outages in 2018 to 0.88 outages in 2019; achieved standard by 3%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 40 and 41. During the past 2 years UGI CAIDI performance has failed to attain benchmark performance, as shown on the chart to be above the "green" benchmark performance upper-control-limit-line. More management attention is needed to ensure CAIDI performance is again being sustained below the "green" benchmark performance upper-control-limit-line.

During the past two years, UGI's SAIFI performance has been inconsistent, as shown on the chart to be above the "green" benchmark performance upper-control-limit-line. However, UGI's SAIFI performance from 2004 up to that time was below the benchmark performance upper-control-limit-line. Prior to 2018, UGI was a consistent SAIFI Benchmark Performer. More management attention is needed to ensure SAIFI performance is again being sustained below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 42 shows the reported 2019 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees and equipment failure were the top cause of outages, while weather was the cause of the most customer-minutes interrupted. Over 50% of outages were caused by trees and equipment failure.

Figure 43 shows historical trend of the top three main outage causes. Trees and Weather are the two most frequent outage-causes that are significantly negatively affecting UGI's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

UGI notes that in order to bolster its existing Danger Tree Mitigation Program, it added vegetation clearance resources in 2019 to address the vegetation issue caused by the Emerald Ash Borers devastation of Pennsylvania's ash trees. The Danger Tree Mitigation Program identifies and addresses mainly off right-of-way trees that pose a threat to transmission and distribution facilities. In addition, UGI continues the practice of "ground to sky" trimming on multi-phase circuits and on single-phase lines where appropriate. UGI intends to investigate hiring additional contractor resources to target areas.

UGI notes that its initiatives for storm hardening are designed primarily to reduce the number of outage events caused by vegetation. Outside of its Vegetation Management Program, several initiatives are ongoing to mitigate such risks.

UGI has continued its practice of using class 2 or class 3 wood poles when replacing or installing new poles on its distribution system. On its transmission system, UGI notes that steel, class 1 or class 2 poles are standard for replacement or new structures.

UGI continues to complete a variety of reliability-based projects. This includes a Primary Line Relocations Program focused on moving distribution lines from troublesome off-road locations to road-side rights-of-way. UGI notes that relocating the lines to roadside enables quicker patrolling as well as making repairs quicker and safer because mechanized aerial equipment can be used as opposed to climbing the poles to do repair work.

Three projects specifically targeting troublesome locations were completed in fiscal year (FY) 2019 and FY 2020. In the first relocation, UGI removed 1,700 feet of overhead primary through backyard and swampy right of way construction and installed it underground along the road right of way. The high tree density in this region justified the underground installation. The second relocation moved 3-phase primary from side yard construction to road right of way. UGI notes the additional benefits of this project were the relocation of one 3-phase switch to road right-of-way and the reconfiguring of two feeders & tie points. In the third project UGI removed 650 feet of 3-phase primary from side-yard construction.

In FY 2019, UGI completed its initial survey of every distribution feeder and has initiated the next phase of its Line Segmentation Program. This phase will survey feeders based on its reliability performance and install devices to further segment its lines increasing reliability. The program focuses on identifying locations to install fuses, disconnects, and other devices to limit the number of customers affected when line damage occurs and enable field personnel to restore service to customers on unaffected line segments through switching before repairs are made. In FY 2020, UGI notes it expects to add 23 fuse installations, one solid blade disconnect, and one single-phase recloser.

UGI has also initiated a 66 kV air-break motorization program. This program is designed to motorize key 66 kV air-breaks providing control from UGI's Control Center. In FY 2020, four 66 kV Motor-operated Air-Breaks were installed and added to the transmission supervisory control and data acquisition (SCADA) system. UGI will continue to study and identify additional devices going forward.

UGI has initiated a distribution SCADA (DSCADA) program. In FY 2019, UGI installed a new DSCADA that will leverage its growing number of distribution automation devices and substation data concentrators. UGI will continue adding existing devices and new devices to the DSCADA. The benefit of this program is to provide greater visibility to the status of the distribution system and provide control from UGI's Control Center.

Conclusion

Trees and Weather are the top two outage causes that substantially negatively affect electrical reliability to UGI customers. In 2019, trees and weather outage causes contributed to over 67 % of the total lost customer-minutes.

UGI has sustained CAIDI and SAIFI benchmark performance until 2018. Since 2018, and continuing into 2019, UGI has negatively trended above the "green" benchmark performance upper-control-limit-line and is currently considered out of control. More management attention is needed to address the CAIDI and SAIFI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Figure 40 UGI CAIDI (minutes)

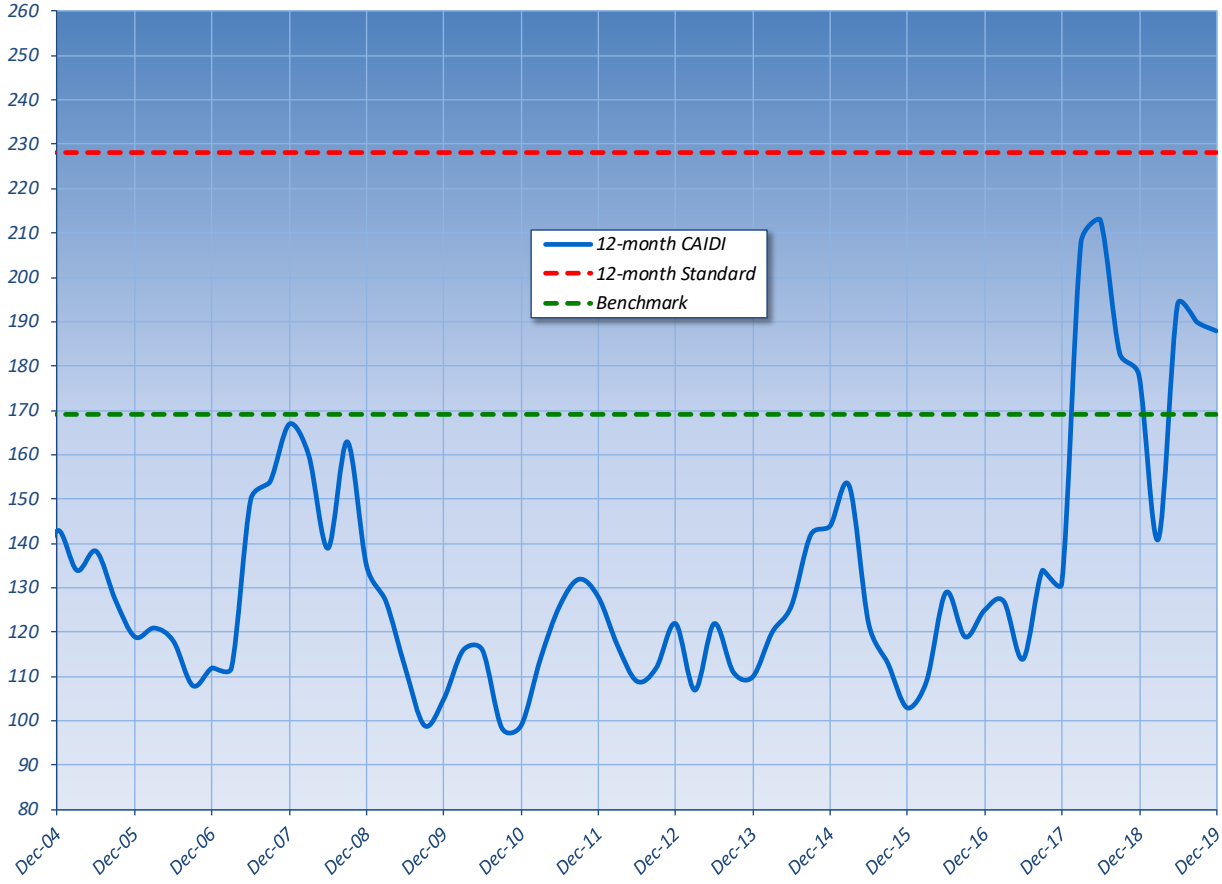


Figure 41 UGI SAIFI (interruptions per customer)

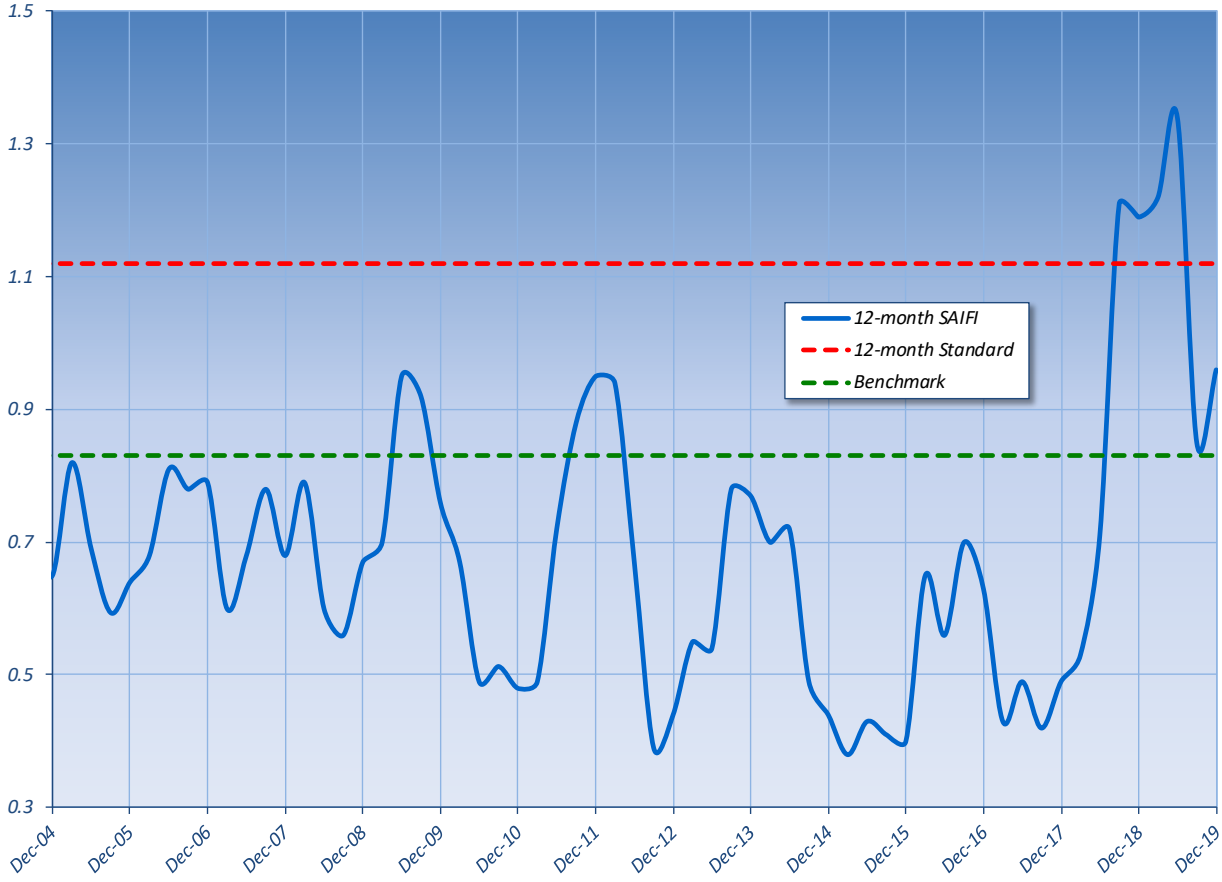


Figure 42 UGI Outage Causes (percent of total outages)

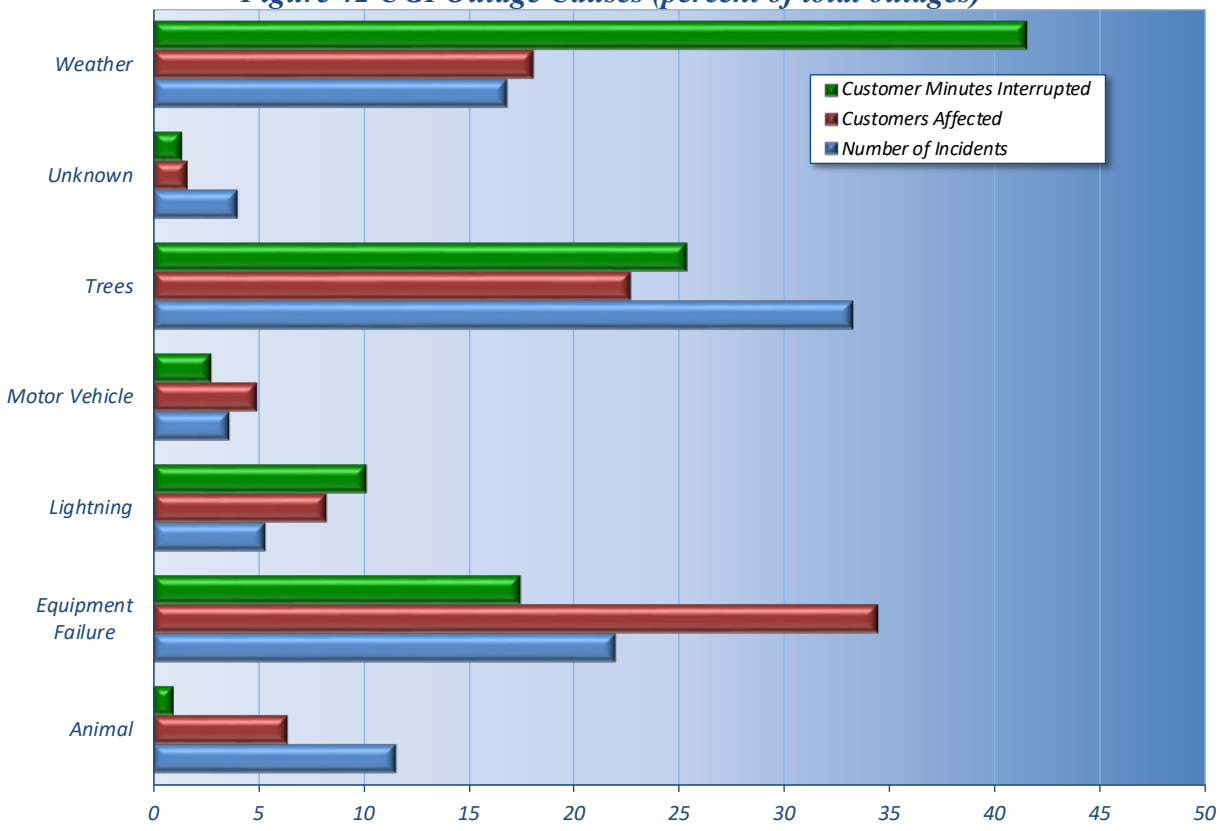
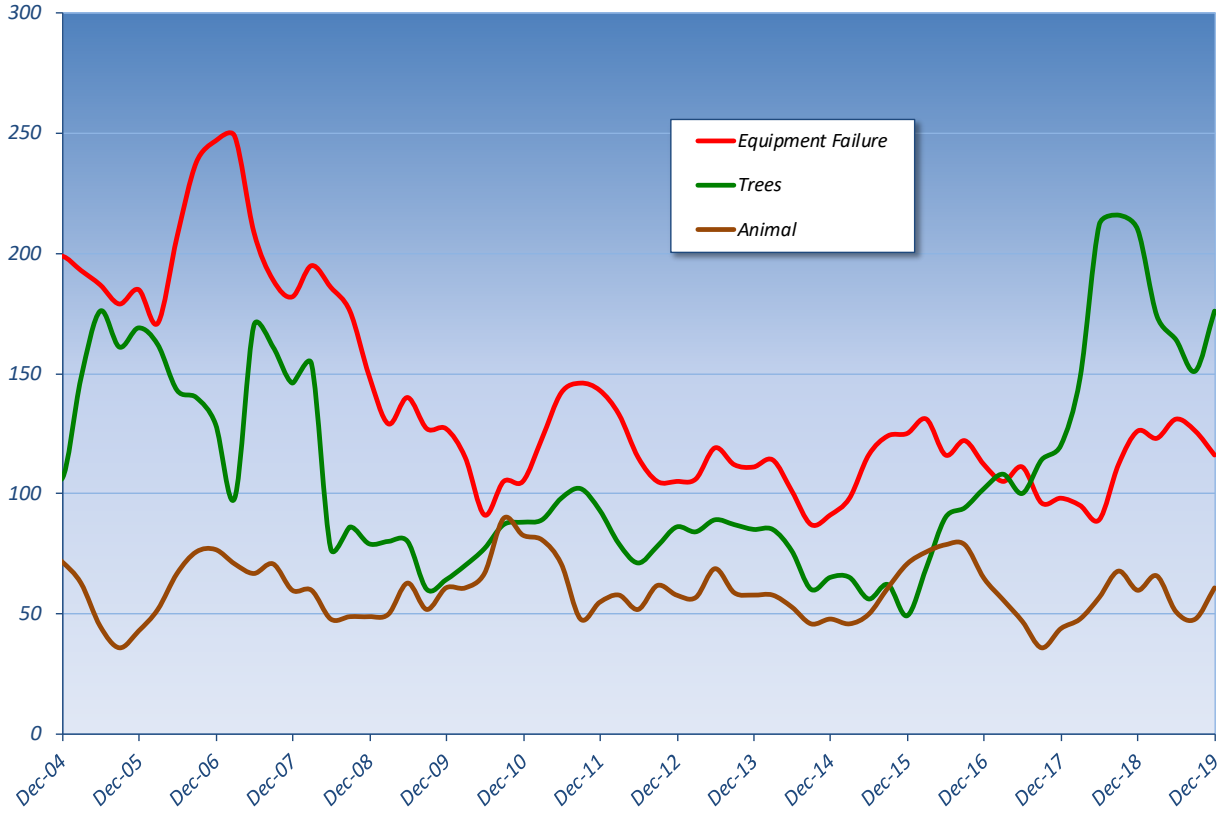


Figure 43 UGI Outage Tracking (number of incidents)



Wellsboro Electric Company

Wellsboro has a service territory of about 178 square miles and serves about 6,341 customers.

In 2019, Wellsboro experienced 4,815 customer interruptions and 0.5 million customer-minutes interrupted as compared to: 8,565 customer interruptions and 1.1 million customer-minutes interrupted in 2018; 6,816 customer interruptions and 0.3 million customer-minutes interrupted in 2017; and 10,138 customer interruptions and 1.1 million customer-minutes interrupted in 2016.

In addition to the above customer minutes interrupted, Wellsboro experienced 11 Major Events in 2019 totaling approximately 4 million customer-minutes interrupted not included in the total above.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 131 minutes in 2018 to 105 minutes in 2019; achieved benchmark by 15%

3-year average: Increased from 105 minutes in 2018 to 109 minutes in 2019; achieved standard by 20%.

SAIDI

Rolling 12-month: Decreased from 178 minutes in 2018 to 81 minutes in 2019; achieved benchmark by 47%.

3-year average: Decreased from 149 minutes in 2018 to 119 minutes in 2019; achieved standard by 36%.

SAIFI

Rolling 12-month: Decreased from 1.36 outages in 2018 to 0.77 outages in 2019; achieved benchmark by 37%.

3-year average: Decreased from 1.43 outages in 2018 to 1.07 outages in 2019; achieved standard by 21%.

CAIDI and SAIFI Performance

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 44 and 45. Wellsboro's CAIDI performance is currently in control as shown on the chart to be below the "green" benchmark performance upper-control-limit-line. However, prior CAIDI performance from 2004 through 2017 was below the benchmark performance upper-control-limit-line. Prior to 2018, Wellsboro was a consistent CAIDI Benchmark Performer. Wellsboro appears to be recovering, but more management attention is needed to ensure CAIDI performance is again being sustained below the "green" benchmark performance upper-control-limit-line.

Beginning in 2004, Wellsboro's SAIFI performance trend has been overall positive about 50% of the time. Recently, beginning in 2015, Wellsboro's SAIFI performance has been inconsistent. However, Wellsboro's 2019 SAIFI is currently below the "green" benchmark performance upper-control-limit-line and considered under control. More management attention is needed to ensure consistent SAIFI performance is sustained below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 46 shows the reported 2019 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees (combined off and on ROW) and equipment failure were the top cause of outages, customers affected, and customer-minutes interrupted. About 53% of the customer minutes interrupted are caused by trees and equipment failure.

Figure 47 shows the historical trend of the top three main outage causes. Trees and animals are the two most frequent outage-causes. Tree outages are significantly negatively affecting Wellsboro's distribution system reliability and resilience, as well as every EDC in Pennsylvania.

General Reliability

Wellsboro notes its goal of a completely automated metering system was completed in 2019. Wellsboro's system is 100% automated and it replaced Turtle meters (daily usage data availability) with Aclara meters (hourly usage data availability). Wellsboro completed a geographic information system (GIS) project in the Fall of 2018 that provided a substantial improvement to

the mapping detail. The mapping data was used to synchronize with Wellsboro's customer information system (CIS) data which has increased the outage management system (OMS) system accuracy and the prediction of outages.

Wellsboro notes it continues to add new technology with AppSuite now being used for inspection of distribution system as well as mapping for the outside crews. The inspection processes were implemented in 2020 for transformers (OH and UG) and line inspections will be incorporated during the 1st quarter 2020. Wellsboro noted that a key outcome will be to identify porcelain items (cutouts, arrestors, and dead-end bells). Wellsboro notes this will enable it to place a firm number on the porcelain material that remain to be replaced on the system.

Conclusion

Trees and equipment failure are the top two outage causes that substantially negatively affect electrical reliability to Wellsboro customers. In 2019, trees and equipment failure caused over 53% of the total lost customer-minutes.

Wellsboro has sustained CAIDI benchmark performance from 2004 through 2017, and is considered an excellent CAIDI benchmark performer. However, Wellsboro failed to achieve CAIDI benchmark performance in 2018, but in 2019 CAIDI benchmark performance was attained. More management attention is needed to sustain CAIDI performance below the "green" benchmark performance upper-control-limit-line.

Beginning in 2015, Wellsboro's SAIFI performance has been inconsistent and frequently above the "green" benchmark performance upper-control-limit-line. In 2019, Wellsboro's SAIFI performance is now below benchmark. More management attention is needed to ensure consistent SAIFI performance is sustained below the "green" benchmark performance upper-control-limit-line.

Figure 44 Wellsboro CAIDI (minutes)

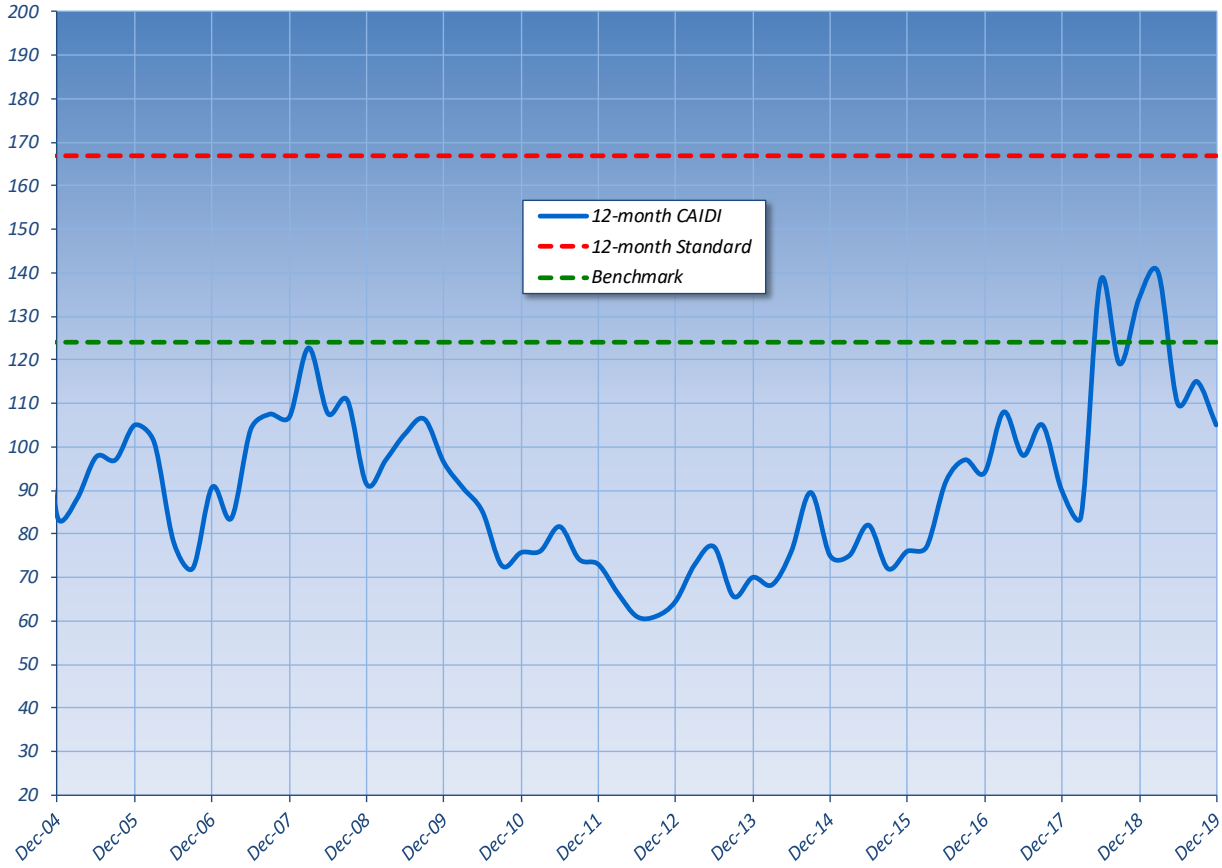


Figure 45 Wellsboro SAIFI (interruptions per customer)

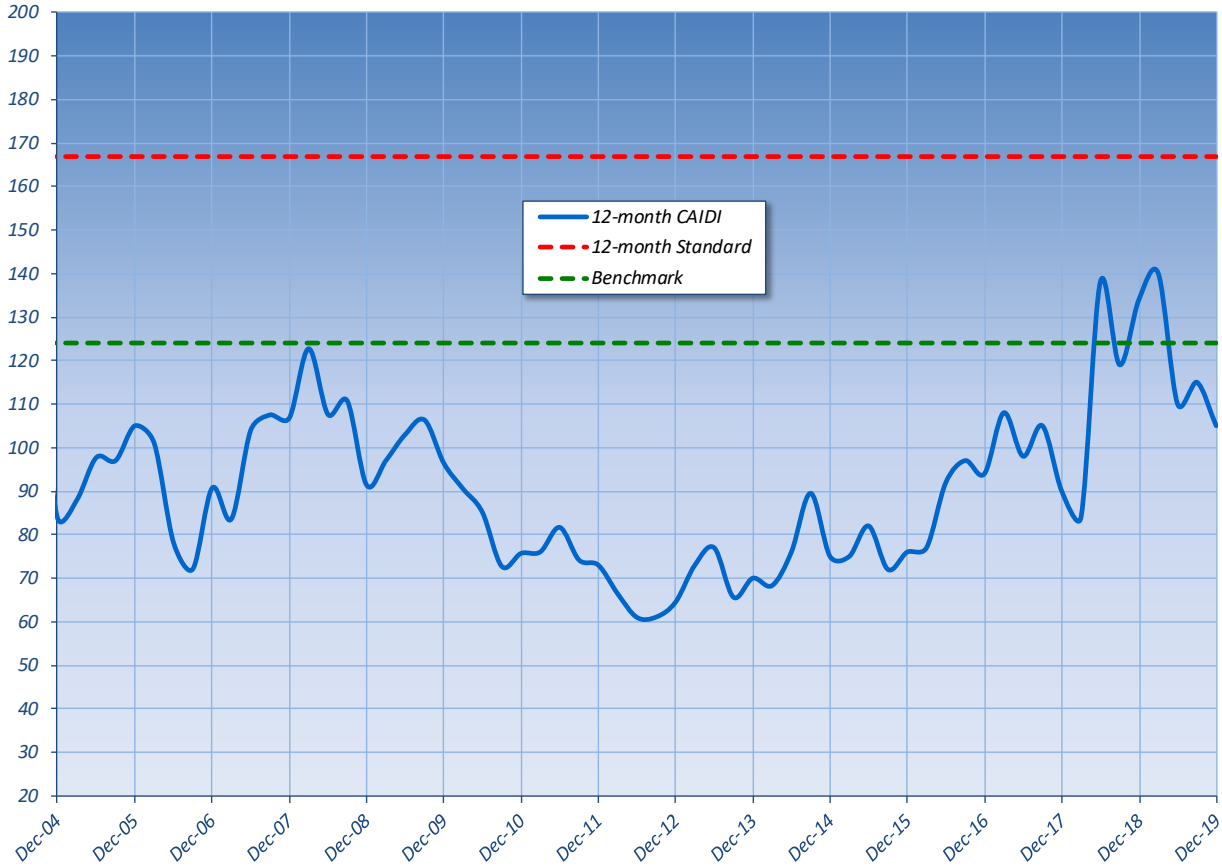


Figure 46 Wellsboro Outage Causes (percent of total outages)

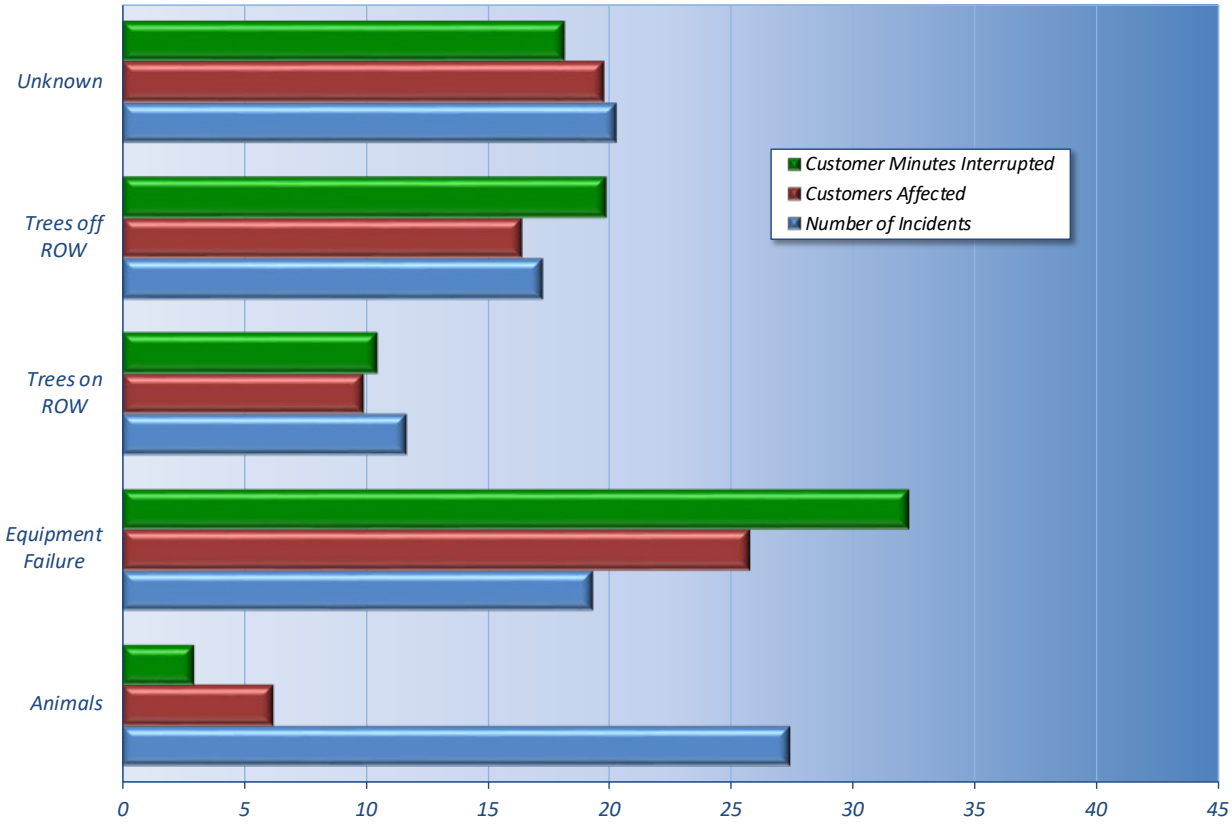
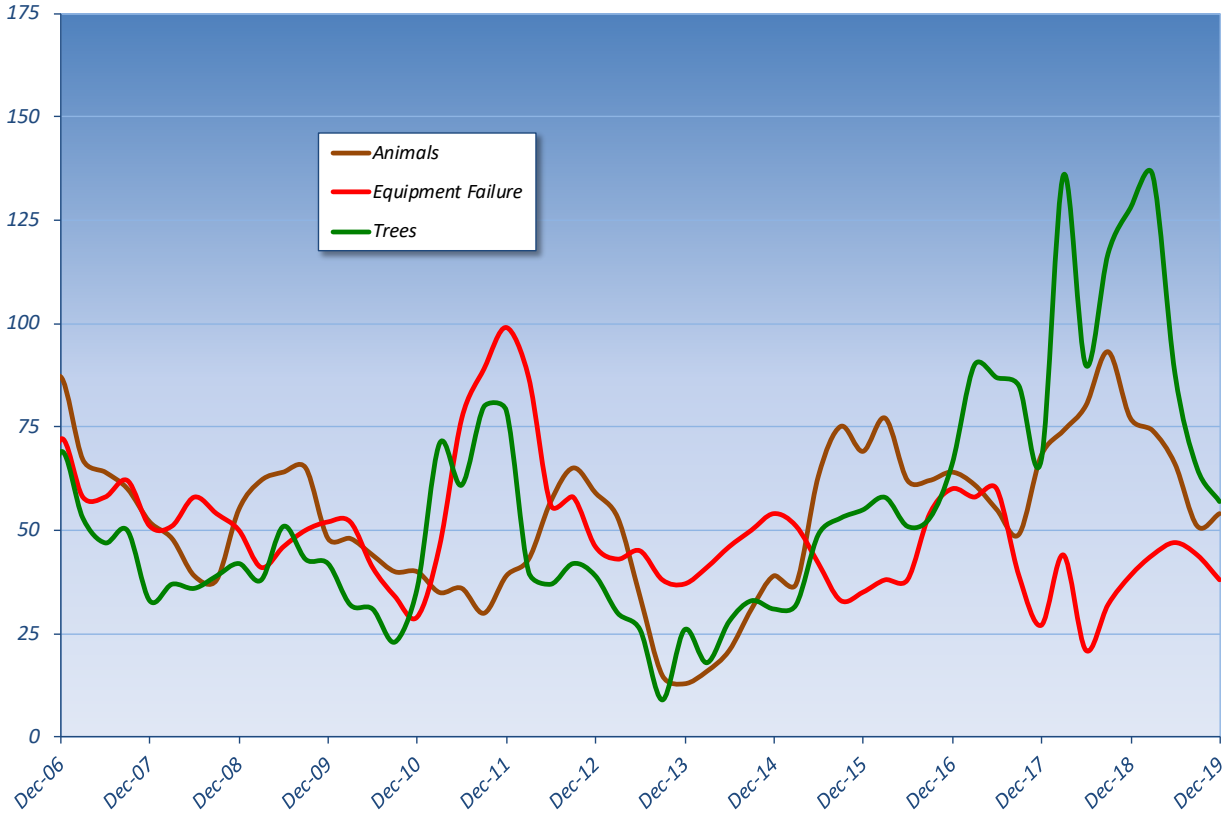


Figure 47 Wellsboro Outage Tracking (number of incidents)



Section 5 – Conclusion

Severe weather in Pennsylvania was challenging to both electrical reliability and resilience in 2019. The overall EDC reliability performance scorecards show Pennsylvania reliability performance regressing from 2015 through 2019. In addition to its normal reliability reviews with EDCs, TUS in this report has made several recommendations to help address the continuing poor reliability performance – see the Executive Summary.

In 2019, **all 11 Pennsylvania EDCs failed** to achieve benchmark in all 4 rolling 12-month quarters for all performance indices. Also, 4 of 11 EDCs (Met-Ed, Penelec, Penn Power, and UGI) failed to achieve benchmark **for all performance indices** at the end of 2019.

In general, the ability for EDCs to achieve and sustain benchmark CAIDI and SAIFI performance has been difficult from 2004 through 2019. Duquesne and Wellsboro are the only EDCs that achieved benchmark at the end of 2019 in all three indices.

In 2019, there were 23 Major Events filed by EDCs that amounted to about 1 billion customer-minutes interrupted as compared to: 29 Major Events filed and about 2.7 billion customer-minutes interrupted in 2018; and 13 Major Events filed and 135 million customer-minutes interrupted in 2017. This is a remarkable number of customer-minutes interrupted in both 2018 and 2019 that were not included in the reliability statistics due to qualifying as Major Events.

As noted in Section 3, in 2019, there were a total of 52 reportable outage events (ROEs) that affected approximately 1.9 million customers as compared to: 35 reportable events that affected approximately 2.5 million customers in 2018; and 50 reportable events that affected approximately 1.3 million customers in 2017. Table 2E in Section 3 details the number of customers affected by ROEs from 1993 through 2019. During severe weather events when the resilience of the distribution system is challenged, the 2 top outage causes (trees and equipment failure) are the biggest disrupter of electric power to customers.

Electric reliability in Pennsylvania will continue to be vulnerable to severe weather events due to overgrown off-right-of-way trees and trees along roadways that cause road closures and major obstacles when restoring power after a severe weather event. EDCs should continue to invest in upgrading infrastructure and utilize tools such as the distribution system improvement charge (DSIC) and long-term infrastructure improvement plans (LTIIPs).[40]

[40] See 66 Pa. C.S. § 1353.

Appendix A – Electric Reliability Metrics

12-Month Average Electric Reliability Indices for 2019

Customer Average Interruption Duration Index (CAIDI)- min/yr/cust				% Above (+) or	% Above (+) or
EDC	Dec-19	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	77	105	141	-26.7	-45.4
Duquesne Light	106	108	130	-1.9	-18.5
Met-Ed (FE)	164	117	140	40.2	17.1
PECO	189	112	134	68.8	41.0
Penelec (FE)	147	117	141	25.6	4.3
Penn Power (FE)	129	101	121	27.7	6.6
Pike County	177	174	235	1.7	-24.7
PPL	176	145	174	21.4	1.1
UGI	188	169	228	11.2	-17.5
Wellsboro	105	124	167	-15.3	-37.1
West Penn (FE)	165	170	204	-2.9	-19.1
System Average Interruption Frequency Index (SAIFI)- outages/yr/cust				% Above (+) or	% Above (+) or
EDC	Dec-19	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	0.28	0.20	0.27	40.0	3.7
Duquesne Light	1.01	1.17	1.40	-13.7	-27.9
Met-Ed (FE)	1.54	1.15	1.38	33.9	11.6
PECO	1.08	1.23	1.48	-12.2	-27.0
Penelec (FE)	1.72	1.26	1.52	36.5	13.2
Penn Power (FE)	1.38	1.12	1.34	23.2	3.0
Pike County	0.39	0.61	0.82	-36.1	-52.4
PPL	0.85	0.98	1.18	-13.3	-28.0
UGI	0.96	0.83	1.12	15.7	-14.3
Wellsboro	0.77	1.23	1.66	-37.4	-53.6
West Penn (FE)	1.19	1.05	1.26	13.3	-5.6
System Average Interruption Duration Index (SAIDI)- min/yr/cust				% Above (+) or	% Above (+) or
EDC	Dec-19	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	22	21	38	2.4	-43.4
Duquesne Light	106	126	182	-15.9	-41.8
Met-Ed (FE)	253	135	194	87.4	30.4
PECO	205	138	198	48.6	3.5
Penelec (FE)	252	148	213	70.3	18.3
Penn Power (FE)	178	113	162	57.5	9.9
Pike County	69	106	194	-34.9	-64.4
PPL	150	142	205	5.6	-26.8
UGI	182	140	256	30.0	-28.9
Wellsboro	81	153	278	-47.1	-70.9
West Penn (FE)	196	179	257	9.5	-23.7

Note: ***GREEN*** *= better than benchmark;* ***RED*** *= worse than standard;* ***BLACK*** *= between benchmark and standard.*

Three-Year Average Electric Reliability Indices for 2017-2019

Customer Average Interruption Duration Index (CAIDI)-min/yr/cust				*3-Year*	*3-Year*	*% Above (+) or*
EDC	*2017*	*2018*	*2019*	*Average*	*Standard*	*Below (-) Standard*
Citizens'	*185*	*76*	*77*	*113*	*115*	*-2.0*
Duquesne Light	*115*	*106*	*106*	*109*	*119*	*-8.4*
Met-Ed (FE)	*147*	*130*	*164*	*147*	*129*	*14.0*
PECO	*99*	*110*	*189*	*133*	*123*	*7.9*
Penelec (FE)	*138*	*114*	*147*	*133*	*129*	*3.1*
Penn Power (FE)	*150*	*138*	*129*	*139*	*111*	*25.2*
Pike County	*185*	*236*	*177*	*199*	*192*	*3.8*
PPL	*146*	*168*	*176*	*163*	*160*	*2.1*
UGI	*131*	*178*	*188*	*166*	*186*	*-10.9*
Wellsboro	*90*	*131*	*105*	*109*	*136*	*-20.1*
West Penn (FE)	*166*	*171*	*165*	*167*	*187*	*-10.5*
System Average Interruption Frequency Index (SAIFI)-outages/yr/cust				*3-Year*	*3-Year*	*% Above (+) or*
EDC	*2017*	*2018*	*2019*	*Average*	*Standard*	*Below (-) Standard*
Citizens'	*0.45*	*0.21*	*0.28*	*0.31*	*0.22*	*42.4*
Duquesne Light	*0.98*	*0.84*	*1.01*	*0.94*	*1.29*	*-26.9*
Met-Ed (FE)	*1.47*	*1.27*	*1.54*	*1.43*	*1.27*	*12.3*
PECO	*0.83*	*0.97*	*1.08*	*0.96*	*1.35*	*-28.9*
Penelec (FE)	*1.73*	*1.71*	*1.72*	*1.72*	*1.39*	*23.7*
Penn Power (FE)	*1.06*	*1.10*	*1.38*	*1.18*	*1.23*	*-4.1*
Pike County	*0.53*	*0.85*	*0.39*	*0.59*	*0.67*	*-11.9*
PPL	*0.71*	*0.84*	*0.85*	*0.80*	*1.08*	*-25.9*
UGI	*0.49*	*1.19*	*0.96*	*0.88*	*0.91*	*-3.3*
Wellsboro	*1.08*	*1.36*	*0.77*	*1.07*	*1.35*	*-20.7*
West Penn (FE)	*1.29*	*1.22*	*1.19*	*1.23*	*1.16*	*6.3*
System Average Interruption Duration Index (SAIDI)-min/yr/cust				*3-Year*	*3-Year*	*% Above (+) or*
EDC	*2017*	*2018*	*2019*	*Average*	*Standard*	*Below (-) Standard*
Citizens'	*84*	*16*	*22*	*41*	*25*	*62.0*
Duquesne Light	*112*	*89*	*106*	*102*	*153*	*-33.1*
Met-Ed (FE)	*217*	*165*	*253*	*212*	*163*	*29.9*
PECO	*82*	*106*	*205*	*131*	*167*	*-21.6*
Penelec (FE)	*239*	*195*	*252*	*229*	*179*	*27.7*
Penn Power (FE)	*160*	*152*	*178*	*163*	*136*	*20.1*
Pike County	*102*	*200*	*69*	*124*	*129*	*-4.1*
PPL	*104*	*141*	*150*	*132*	*172*	*-23.4*
UGI	*64*	*213*	*182*	*153*	*170*	*-10.0*
Wellsboro	*97*	*178*	*81*	*119*	*185*	*-35.9*
West Penn (FE)	*214*	*209*	*196*	*206*	*217*	*-4.9*

*Note: **GREEN** = better than standard; **RED** = worse than standard.*

Appendix B – Reliability Performance Scorecard Results 2015-2019

2019 EDC Performance Scorecard

Metrics achieved **GREEN** | Benchmark Metrics not achieved **YELLOW** | Standard Metrics not achieved **RED**

		Rolling 12-Month									
		Benchmark Score					Standard Score				
EDCs	[1]Metrics	[2]BM	Q1	Q2	Q3	Q4	[3]STD	Q1	Q2	Q3	Q4
Large EDCs											
Duquesne Light	CAIDI	108	106	109	100	106	130	106	109	100	106
	SAIDI	126	92	107	98	106	182	92	107	98	106
	SAIFI	1.17	0.87	0.99	0.98	1.01	1.40	0.87	0.99	0.98	1.01
PECO	CAIDI	112	112	138	149	189	134	112	138	149	189
	SAIDI	138	117	145	156	205	198	117	145	156	205
	SAIFI	1.23	1.05	1.05	1.05	1.08	1.48	1.05	1.05	1.05	1.08
PPL	CAIDI	145	177	152	155	176	174	177	152	155	176
	SAIDI	142	161	131	123	150	205	161	131	123	150
	SAIFI	0.98	0.91	0.86	0.79	0.85	1.18	0.91	0.86	0.79	0.85
Met-Ed (FirstEnergy)	CAIDI	117	145	150	151	164	140	145	150	151	164
	SAIDI	135	200	230	211	253	194	200	230	211	253
	SAIFI	1.15	1.37	1.54	1.40	1.54	1.38	1.37	1.54	1.40	1.54
Penelec (FirstEnergy)	CAIDI	117	115	122	136	147	141	115	122	136	147
	SAIDI	148	209	233	241	252	213	209	233	241	252
	SAIFI	1.26	1.82	1.91	1.77	1.72	1.52	1.82	1.91	1.77	1.72
Penn Power (FirstEnergy)	CAIDI	101	126	138	131	129	121	126	138	131	129
	SAIDI	113	143	179	163	178	162	143	179	163	178
	SAIFI	1.12	1.13	1.30	1.25	1.38	1.34	1.13	1.30	1.25	1.38
West Penn (FirstEnergy)	CAIDI	170	169	162	155	165	204	169	162	155	165
	SAIDI	179	209	195	169	196	257	209	195	169	196
	SAIFI	1.05	1.24	1.20	1.09	1.19	1.26	1.24	1.20	1.09	1.19
Small EDCs											
Citizens'	CAIDI	105	73.1	82.7	80.5	77	141	73.1	82.7	80.5	77
	SAIDI	21	26.9	25.3	24.3	21.5	38	26.9	25.3	24.3	21.5
	SAIFI	0.20	0.37	0.31	0.30	0.28	0.27	0.37	0.31	0.30	0.28
Pike County	CAIDI	174	322	322	196	177	235	322	322	196	177
	SAIDI	106	148	114	64	69	194	148	114	64	69
	SAIFI	0.61	0.46	0.35	0.33	0.39	0.82	0.46	0.35	0.33	0.39
UGI	CAIDI	169	141	149	190	188	228	141	149	190	188
	SAIDI	140	172	166	161	182	256	172	166	161	182
	SAIFI	0.83	1.22	1.11	0.85	0.96	1.12	1.22	1.11	0.85	0.96
Wellsboro	CAIDI	124	140	110	115	105	167	140	110	115	105
	SAIDI	153	197	128	107	81	278	197	128	107	81
	SAIFI	1.23	1.41	1.17	0.93	0.77	1.66	1.41	1.17	0.93	0.77

[1]CAIDI	(Customer Average Interruption Duration Index) - Measures average power restoration time (minutes) for every customer who lost power during this year.
SAIDI	(System Average Interruption Duration Index) - Measures average outage duration time (minutes) for every customer served during this year.
SAIFI	(System Average Interruption Frequency Index) - Measures average frequency of power interruptions for every customer served during this year.
[2]BM	(Benchmark) - EDC's attained performance baseline score prior to electric restructuring. Calculated by averaging historical performance metrics over the five-year period directly prior to electric restructuring (1994 to 1998).
[3]STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multipling BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.

2018 EDC Performance Scorecard

Metrics achieved **GREEN** Benchmark Metrics not achieved **YELLOW** Standard Metrics not achieved **RED**

		Rolling 12-Month									
		Benchmark Score					Standard Score				
EDCs	[1]Metrics	[2]BM	Q1	Q2	Q3	Q4	[3]STD	Q1	Q2	Q3	Q4
Large EDCs											
Duquesne Light	CAIDI	108	114	103	116	106	130	114	103	116	106
	SAIDI	126	97	77	95	89	182	97	77	95	89
	SAIFI	1.17	0.85	0.75	0.82	0.84	1.40	0.85	0.75	0.82	0.84
PECO	CAIDI	112	98	96	106	110	134	98	96	106	110
	SAIDI	138	70	75	98	106	198	70	75	98	106
	SAIFI	1.23	0.72	0.78	0.93	0.97	1.48	0.72	0.78	0.93	0.97
PPL	CAIDI	145	137	185	173	168	174	137	185	173	168
	SAIDI	142	90	145	146	141	205	90	145	146	141
	SAIFI	0.98	0.65	0.78	0.85	0.84	1.18	0.65	0.78	0.85	0.84
Met-Ed (FirstEnergy)	CAIDI	117	144	147	139	130	140	144	147	139	130
	SAIDI	135	171	175	173	165	194	171	175	173	165
	SAIFI	1.15	1.19	1.19	1.25	1.27	1.38	1.19	1.19	1.25	1.27
Penelec (FirstEnergy)	CAIDI	117	132	127	116	114	141	132	127	116	114
	SAIDI	148	199	198	194	195	213	199	198	194	195
	SAIFI	1.26	1.51	1.56	1.67	1.71	1.52	1.51	1.56	1.67	1.71
Penn Power (FirstEnergy)	CAIDI	101	155	114	131	138	121	155	114	131	138
	SAIDI	113	170	124	154	152	162	170	124	154	152
	SAIFI	1.12	1.09	1.09	1.17	1.10	1.34	1.09	1.09	1.17	1.10
West Penn (FirstEnergy)	CAIDI	170	163	176	175	171	204	163	176	175	171
	SAIDI	179	191	219	219	209	257	191	219	219	209
	SAIFI	1.05	1.18	1.25	1.26	1.22	1.26	1.18	1.25	1.26	1.22
Small EDCs											
Citizens'	CAIDI	105	139	128	127	76	141	139	128	127	76
	SAIDI	21	43	36	26	16	38	43	36	26	16
	SAIFI	0.20	0.31	0.28	0.20	0.21	0.27	0.31	0.28	0.20	0.21
Pike County	CAIDI	174	135	189	235	236	235	135	189	235	236
	SAIDI	106	100	129	195	200	194	100	129	195	200
	SAIFI	0.61	0.74	0.69	0.82	0.85	0.82	0.74	0.69	0.82	0.85
UGI	CAIDI	169	208	213	183	178	228	208	213	183	178
	SAIDI	140	109	150	221	213	256	109	150	221	213
	SAIFI	0.83	0.53	0.71	1.21	1.19	1.12	0.53	0.71	1.21	1.19
Wellsboro	CAIDI	124	84	138	119	131	167	84	138	119	131
	SAIDI	153	76	162	172	178	278	76	162	172	178
	SAIFI	1.23	0.91	1.17	1.45	1.36	1.66	0.91	1.17	1.45	1.36

[1]CAIDI	(Customer Average Interruption Duration Index) - Measures average power restoration time (minutes) for every customer who lost power during this year.
SAIDI	(System Average Interruption Duration Index) - Measures average outage duration time (minutes) for every customer served during this year.
SAIFI	(System Average Interruption Frequency Index) - Measures average frequency of power interruptions for every customer served during this year.
[2]BM	(Benchmark) - EDC's attained performance baseline score prior to electric restructuring. Calculated by averaging historical performance metrics over the five-year period directly prior to electric restructuring (1994 to 1998).
[3]STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multipling BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.

2017 EDC Performance Scorecard

Metrics achieved **GREEN** Benchmark Metrics not achieved **YELLOW** Standard Metrics not achieved **RED**

		Rolling 12-Month									
		Benchmark Score					Standard Score				
EDCs	[1]Metrics	[2]BM	Q1	Q2	Q3	Q4	[3]STD	Q1	Q2	Q3	Q4
Large EDCs											
Duquesne Light	CAIDI	108	92	113	116	115	130	92	113	116	115
	SAIDI	126	87	117	111	112	182	87	117	111	112
	SAIFI	1.17	0.95	1.04	0.96	0.98	1.40	0.95	1.04	0.96	0.98
PECO	CAIDI	112	109	99	95	99	134	109	99	95	99
	SAIDI	138	111	92	80	82	198	111	92	80	82
	SAIFI	1.23	1.02	0.93	0.85	0.83	1.48	1.02	0.93	0.85	0.83
PPL	CAIDI	145	123	127	134	146	174	123	127	134	146
	SAIDI	142	99	98	99	104	205	99	98	99	104
	SAIFI	0.98	0.81	0.78	0.74	0.71	1.18	0.81	0.78	0.74	0.71
Met-Ed (FirstEnergy)	CAIDI	117	127	121	138	147	140	127	121	138	147
	SAIDI	135	199	181	205	217	194	199	181	205	217
	SAIFI	1.15	1.57	1.50	1.48	1.47	1.38	1.57	1.50	1.48	1.47
Penelec (FirstEnergy)	CAIDI	117	125	188	137	138	141	125	188	137	138
	SAIDI	148	202	340	232	239	213	202	340	232	239
	SAIFI	1.26	1.62	1.81	1.69	1.73	1.52	1.62	1.81	1.69	1.73
Penn Power (FirstEnergy)	CAIDI	101	99	129	135	150	121	99	129	135	150
	SAIDI	113	108	173	161	160	162	108	173	161	160
	SAIFI	1.12	1.09	1.34	1.19	1.06	1.34	1.09	1.34	1.19	1.06
West Penn (FirstEnergy)	CAIDI	170	159	159	165	166	204	159	159	165	166
	SAIDI	179	191	198	211	214	257	191	198	211	214
	SAIFI	1.05	1.20	1.25	1.28	1.29	1.26	1.20	1.25	1.28	1.29
Small EDCs											
Citizens'	CAIDI	105	175	172	166	185	141	175	172	166	185
	SAIDI	21	67	70	74	84	38	67	70	74	84
	SAIFI	0.20	0.38	0.41	0.45	0.45	0.27	0.38	0.41	0.45	0.45
Pike County	CAIDI	174	251	201	167	185	235	251	201	167	185
	SAIDI	106	134	113	84	102	194	134	113	84	102
	SAIFI	0.61	0.53	0.56	0.51	0.53	0.82	0.53	0.56	0.51	0.53
UGI	CAIDI	169	127	114	134	131	228	127	114	134	131
	SAIDI	140	55	56	57	64	256	55	56	57	64
	SAIFI	0.83	0.43	0.49	0.42	0.49	1.12	0.43	0.49	0.42	0.49
Wellsboro	CAIDI	124	108	98	105	90	167	108	98	105	90
	SAIDI	153	203	175	143	97	278	203	175	143	97
	SAIFI	1.23	1.88	1.78	1.35	1.08	1.66	1.88	1.78	1.35	1.08

[1]CAIDI	(Customer Average Interruption Duration Index) - Measures average power restoration time (minutes) for every customer who lost power during this year.
SAIDI	(System Average Interruption Duration Index) - Measures average outage duration time (minutes) for every customer served during this year.
SAIFI	(System Average Interruption Frequency Index) - Measures average frequency of power interruptions for every customer served during this year.
[2]BM	(Benchmark) - EDC's attained performance baseline score prior to electric restructuring. Calculated by averaging historical performance metrics over the five-year period directly prior to electric restructuring (1994 to 1998).
[3]STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multipling BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.

2016 EDC Performance Scorecard

Metrics achieved **GREEN** Benchmark Metrics not achieved **YELLOW** Standard Metrics not achieved **RED**

		Rolling 12-Month									
		Benchmark Score					Standard Score				
EDCs	[1]Metrics	[2]BM	Q1	Q2	Q3	Q4	[3]STD	Q1	Q2	Q3	Q4
Large EDCs											
Duquesne Light	CAIDI	108	92	70	71	100	130	92	70	71	100
	SAIDI	126	76	55	64	69	182	76	55	64	69
	SAIFI	1.17	0.83	0.79	0.90	0.69	1.40	0.83	0.79	0.90	0.69
PECO	CAIDI	112	89	102	108	106	134	89	102	108	106
	SAIDI	138	68	88	103	106	198	68	88	103	106
	SAIFI	1.23	0.77	0.86	0.97	1.00	1.48	0.77	0.86	0.97	1.00
PPL	CAIDI	145	124	118	119	121	174	124	118	119	121
	SAIDI	142	92	85	95	94	205	92	85	95	94
	SAIFI	0.98	0.75	0.72	0.80	0.78	1.18	0.75	0.72	0.80	0.78
Met-Ed (FirstEnergy)	CAIDI	117	123	125	126	124	140	123	125	126	124
	SAIDI	135	164	166	178	178	194	164	166	178	178
	SAIFI	1.15	1.34	1.33	1.41	1.44	1.38	1.34	1.33	1.41	1.44
Penelec (FirstEnergy)	CAIDI	117	143	135	128	120	141	143	135	128	120
	SAIDI	148	192	175	183	171	213	192	175	183	171
	SAIFI	1.26	1.34	1.29	1.43	1.43	1.52	1.34	1.29	1.43	1.43
Penn Power (FirstEnergy)	CAIDI	101	102	96	111	95	121	102	96	111	95
	SAIDI	113	118	95	107	104	162	118	95	107	104
	SAIFI	1.12	1.16	0.99	0.97	1.09	1.34	1.16	0.99	0.97	1.09
West Penn (FirstEnergy)	CAIDI	170	157	144	147	147	204	157	144	147	147
	SAIDI	179	183	148	163	159	257	183	148	163	159
	SAIFI	1.05	1.16	1.03	1.11	1.08	1.26	1.16	1.03	1.11	1.08
Small EDCs											
Citizens'	CAIDI	105	93	105	111	108	141	93	105	111	108
	SAIDI	21	19	25	24	28	38	19	25	24	28
	SAIFI	0.20	0.20	0.23	0.22	0.26	0.27	0.20	0.23	0.22	0.26
Pike County	CAIDI	174	205	174	223	228	235	205	174	223	228
	SAIDI	106	75	71	95	87	194	75	71	95	87
	SAIFI	0.61	0.37	0.41	0.42	0.38	0.82	0.37	0.41	0.42	0.38
UGI	CAIDI	169	109	129	119	125	228	109	129	119	125
	SAIDI	140	71	73	84	78	256	71	73	84	78
	SAIFI	0.83	0.65	0.56	0.70	0.63	1.12	0.65	0.56	0.70	0.63
Wellsboro	CAIDI	124	77	92	97	94	167	77	92	97	94
	SAIDI	153	86	96	113	172	278	86	96	113	172
	SAIFI	1.23	1.12	1.05	1.16	1.84	1.66	1.12	1.05	1.16	1.84

[1]CAIDI	(Customer Average Interruption Duration Index) - Measures average power restoration time (minutes) for every customer who lost power during this year.
SAIDI	(System Average Interruption Duration Index) - Measures average outage duration time (minutes) for every customer served during this year.
SAIFI	(System Average Interruption Frequency Index) - Measures average frequency of power interruptions for every customer served during this year.
[2]BM	(Benchmark) - EDC's attained performance baseline score prior to electric restructuring. Calculated by averaging historical performance metrics over the five-year period directly prior to electric restructuring (1994 to 1998).
[3]STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multipling BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.

2015 EDC Performance Scorecard

Metrics achieved **GREEN** Benchmark Metrics not achieved **YELLOW** Standard Metrics not achieved **RED**

		Rolling 12-Month									
		Benchmark Score					Standard Score				
EDCs	[1]Metrics	[2]BM	Q1	Q2	Q3	Q4	[3]STD	Q1	Q2	Q3	Q4
Large EDCs											
Duquesne Light	CAIDI	108	103	105	107	103	130	103	105	107	103
	SAIDI	126	60	69	78	71	182	60	69	78	71
	SAIFI	1.17	0.58	0.66	0.73	0.69	1.40	0.58	0.66	0.73	0.69
PECO	CAIDI	112	92	90	86	84	134	92	90	86	84
	SAIDI	138	73	69	63	61	198	73	69	63	61
	SAIFI	1.23	0.80	0.76	0.73	0.72	1.48	0.80	0.76	0.73	0.72
PPL	CAIDI	145	142	**155**	124	118	174	142	155	124	118
	SAIDI	142	114	122	86	84	205	114	122	86	84
	SAIFI	0.98	0.80	0.79	0.69	0.72	1.18	0.80	0.79	0.69	0.72
Met-Ed (FirstEnergy)	CAIDI	117	**122**	**126**	**128**	113	140	122	126	128	113
	SAIDI	135	133	**158**	**158**	**136**	194	133	158	158	136
	SAIFI	1.15	1.09	**1.25**	**1.23**	**1.19**	1.38	1.09	1.25	1.23	1.19
Penelec (FirstEnergy)	CAIDI	117	**123**	**131**	**123**	**140**	141	123	131	123	140
	SAIDI	148	**185**	**190**	**168**	**191**	213	185	190	168	191
	SAIFI	1.26	**1.50**	**1.45**	**1.37**	**1.36**	1.52	1.50	1.45	1.37	1.36
Penn Power (FirstEnergy)	CAIDI	101	**104**	**109**	95	100	121	104	109	95	100
	SAIDI	113	103	**114**	112	**114**	162	103	114	112	114
	SAIFI	1.12	0.99	1.05	**1.18**	**1.14**	1.34	0.99	1.05	1.18	1.14
West Penn (FirstEnergy)	CAIDI	170	135	148	149	154	204	135	148	149	154
	SAIDI	179	138	168	175	179	257	138	168	175	179
	SAIFI	1.05	1.02	**1.13**	**1.17**	**1.17**	1.26	1.02	1.13	1.17	1.17
Small EDCs											
Citizens'	CAIDI	105	87	73	78	91	141	87	73	78	91
	SAIDI	21	17	17	20	18	38	17	17	20	18
	SAIFI	0.20	0.20	**0.23**	**0.25**	0.19	0.27	0.20	0.23	0.25	0.19
Pike County	CAIDI	174	104	**199**	**197**	**205**	235	104	199	197	205
	SAIDI	106	**119**	93	77	78	194	119	93	77	78
	SAIFI	0.61	**1.15**	0.47	0.39	0.38	0.82	**1.15**	0.47	0.39	0.38
UGI	CAIDI	169	153	122	113	103	228	153	122	113	103
	SAIDI	140	59	52	47	41	256	59	52	47	41
	SAIFI	0.83	0.38	0.43	0.41	0.40	1.12	0.38	0.43	0.41	0.40
Wellsboro	CAIDI	124	75	82	72	76	167	75	82	72	76
	SAIDI	153	54	80	82	81	278	54	80	82	81
	SAIFI	1.23	0.72	0.97	1.14	1.06	1.66	0.72	0.97	1.14	1.06

[1]CAIDI	(Customer Average Interruption Duration Index) - Measures average power restoration time (minutes) for every customer who lost power during this year.
SAIDI	(System Average Interruption Duration Index) - Measures average outage duration time (minutes) for every customer served during this year.
SAIFI	(System Average Interruption Frequency Index) - Measures average frequency of power interruptions for every customer served during this year.
[2]BM	(Benchmark) - EDC's attained performance baseline score prior to electric restructuring. Calculated by averaging historical performance metrics over the five-year period directly prior to electric restructuring (1994 to 1998).
[3]STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multipling BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.

Appendix C – Modifications to Inspection and Maintenance Intervals

Modifications to Inspection and Maintenance (I&M) Intervals (Group 1) Submitted October 2019, effective Jan. 1, 2021-Dec. 31, 2022

Company	Exemption Requested	Justification
FirstEnergy companies: Penelec, Penn Power, Met-Ed, and West Penn Power	Pole loading calculations	Approved previously in the Jan. 1, 2013-Dec. 31, 2014 I&M Plan.
FirstEnergy companies: Penelec, Penn Power, Met-Ed, and West Penn Power	Distribution overhead line inspections – 5 years rather than 1 to 2-year cycle	Approved previously in the Jan. 1, 2013-Dec. 31, 2014 I&M Plan.
FirstEnergy companies: Penelec, Penn Power, Met-Ed, and West Penn Power	Overhead transformer inspections – 5 years rather than 1 to 2-year cycle	Approved previously in the Jan. 1, 2013-Dec. 31, 2014 I&M Plan.

Modifications to Inspection and Maintenance Intervals (Group 2) Submitted October 2018, effective Jan. 1, 2020-Dec. 31, 2021

Company	Exemption Requested	Justification
Citizens'	Pole loading calculations	Approved previously in the Jan. 1, 2012-Dec.31, 2013 I&M Plan.
Duquesne	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
Duquesne	Overhead line inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
Duquesne	Overhead transformer inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
Duquesne	Above-ground pad-mounted transformers	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
PECO	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
Pike County	Pole loading calculations	Approved previously in the Jan. 1, 2012-Dec.31, 2013 I&M Plan
PPL	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
PPL	Overhead line inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
PPL	Overhead transformer inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
PPL	Pad mounted transformer inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
PPL	Recloser inspections	Approved previously in the Jan. 1, 2014- Dec. 31, 2015 I&M Plan
PPL	Substation inspections	Provisional approved in the Jan. 1, 2017- Dec. 31, 2018 I&M Plan (docket M-2009-2094773)
Wellsboro	Pole loading calculations	Approved previously in the Jan. 1, 2012-Dec.31, 2013 I&M Plan

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