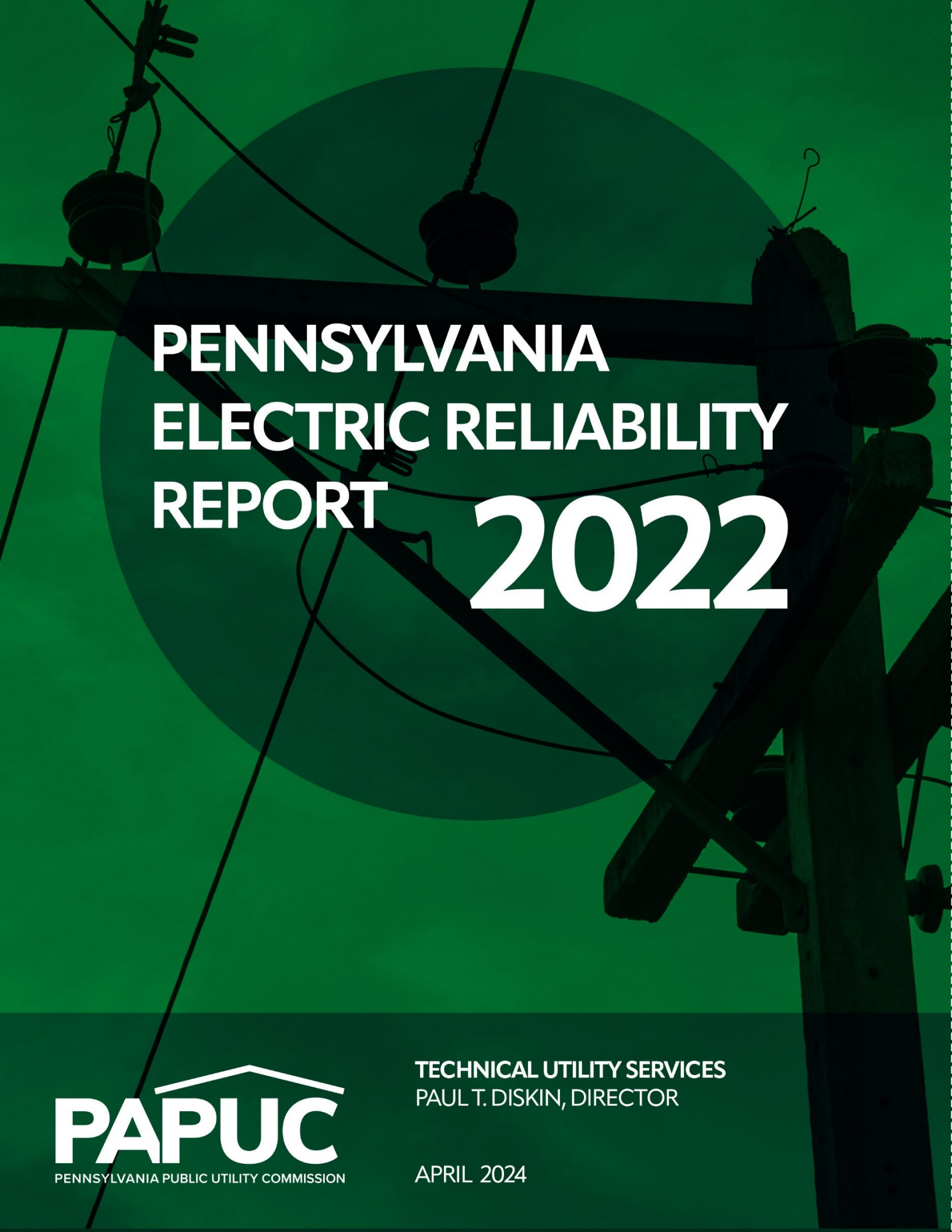

PENNSYLVANIA ELECTRIC RELIABILITY REPORT 2022

PAPUC
PENNSYLVANIA PUBLIC UTILITY COMMISSION

TECHNICAL UTILITY SERVICES
PAUL T. DISKIN, DIRECTOR

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Executive Summary

The Electricity Generation Customer Choice and Competition Act mandated the Pennsylvania Public Utility Commission (PUC or Commission) 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 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.[5]

As mandated, EDCs report reliability performance metrics[6] 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 2016 through 2022. More detailed analysis can be found in Section 4, *EDC Reliability Performance Data*. Appendix A provides the 2022 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.

[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] *See, Amended Reliability Benchmarks and Standards for the Electric Distribution Companies*, Order entered May 11, 2004, at Docket No. M-00991220.
[4] *Id.* at 24.
[5] *Id*. at 25.
[6] For an explanation of performance standards, see Section 2, page 2.

31, 2022, only five of 11 EDCs achieved the standard performance metric, and only two of 11 EDCs achieved the benchmark metric, in all three reliability performance categories.

In addition to monitoring EDCs' reliability performance, the Commission established inspection and maintenance standards for electric transmission and distribution systems.[7] 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 declined in some important areas. The EDCs struggled in achieving benchmark and standard performance for the average number of outages experienced by customers, or SAIFI.[8] As seen in Appendix B, only three of the 11 EDCs achieved benchmark for SAIFI in all four rolling 12-month quarters of 2022, and only four of the 11 EDCs achieved benchmark for SAIFI in all four rolling 12-month quarters of 2021. Six EDCs achieved benchmarks for SAIFI in all four rolling 12-month quarters in 2020. Out of all 11 EDCs, only two (Duquesne and PPL)[9] have been consistently achieving benchmark for SAIFI in all rolling 12-month quarters for the past six years (2017 through 2022). Of the 11 EDCs, only three (Duquesne, PECO, and PPL) have been achieving standard performance for SAIFI consistently for the past six calendar years (2017 through 2022).

Of note, the three large EDCs that have expended the most capital through their Long-Term Infrastructure Investment Plans (LTIIPs) have been the most consistent in achieving benchmark SAIFI performance the past three years.[10] Duquesne and PPL have achieved the SAIFI benchmark for all four rolling 12-month quarters each of the past three years. PECO achieved the SAIFI benchmark for all of the rolling 12-month quarters for the past three years with the exception of the 3rd Quarter of 2021 when Philadelphia and surrounding areas experienced the effects of Hurricane Ida. Wellsboro has also achieved benchmark SAIFI performance consistently in the same time period with the exception of the 2nd Quarter of 2022.

It is hoped that 2023 will see the beginning of improving performance as TUS views SAIFI as the more important metric to focus on improving as it relates directly to the number of service outages experienced by a customer.

As EDCs introduce more distribution automation into their systems, CAIDI will most likely increase. This occurs because of the elimination of non-faulted line sections and their automatic restoration to service by distribution automation systems, *i.e.*, less customers are impacted by any one service outage event. While sectionalizing may reduce the number of customers impacted by

[7] *See, Revision of 52 Pa. Code Chapter 57 Pertaining to Adding Inspection, Maintenance, Repair, and Replacement Standards for Electric Distribution Companies*, Order entered May 22, 2008, at Docket No. L-00040167.
[8] *See,* Section 2, below, for an explanation of SAIFI and all other reliability metrics.
[9] Note that PECO achieved benchmark for all but one rolling 12-month quarter from 2017 through 2022.
[10] The large EDCs are Duquesne Light, Met-Ed, Penelec, Penn Power, PECO, PPL and West Penn. The Small EDCs are UGI, Citizens', Pike County and Wellsboro.

an outage, it could possibly lead to increased CAIDI as the outages may be of longer duration as those outages could not be restored by automated means. The Commission finds that in this regard, the CAIDI metric is becoming more realistic of the customer's experienced interruption duration, rather than a general average as determined by aggregate data. The two factors that affect CAIDI are response times and repair times. EDCs will be expected to improve worsening CAIDI, but reducing service outages from occurring in the first place is crucial to improving reliability performance.

Possibly a more significant issue is that most of the EDCs, large and small, have shown no improvement in reliability as evidenced by the increasing number of service interruption events. Over the past eight years, all but three of the EDCs (Citizens', Penn Power, and Wellsboro) have shown increasing numbers of service interruption events. In terms of the number of customers impacted by those interruption events, Citizens', PECO, and Penn Power have lower numbers of customers interrupted in 2022 than were interrupted during 2015. Met-Ed, Penelec and West Penn have not met SAIDI benchmark SAIFI in any rolling 12-month quarter in 2021 and 2022. PPL is currently meeting the SAIFI benchmark metric, but is still experiencing increased numbers of customers interrupted, increased customer minutes interrupted (CMI) and increased numbers of outage events.

As noted in last year's report,[11] electric reliability and resilience[12] appears to be most challenged during storm activity that brings down off-right-of-way (OROW) trees, and overhanging limbs from canopy trees above the clearing zones within the right-of-way (ROW) onto the distribution lines. Many of those trees and limbs are still standing dead vegetation from the ravages of the Emerald Ash Borer and other pests which have attacked the state woodlands. EDCs are continuing to struggle to achieve sustained benchmark performance. This is the direct result of vegetation management policies, programs, and storm activity. Storm activity acts upon the vulnerability of weakened trees in the overhanging canopy, and OROW. Since 2015 and continuing throughout 2022, vegetation is the number one cause of outages and lost customer-minutes in Pennsylvania. This issue has increased sharply and can be seen in the individual EDC performance details in Section 4 below and for all Pennsylvania EDCs in Section 5 below.

Reliability Collaborative

Based on the findings of the PUC's reliability report released on Sept. 16, 2020, and the reliability performance in the first two quarters of 2020, TUS issued an informal data request to the EDCs and the Energy Association of Pennsylvania (EAP) that generally focused on what EDCs believed the challenges were to consistently meet the reliability benchmarks. TUS then held an informal discussion on Oct. 16, 2020, with the EDCs and EAP about the responses to the data request.

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[11] *The Electric Service Reliability in Pennsylvania 2021* report is available for download here: https://www.puc.pa.gov/media/2053/2021-electric-reliability-report_final.pdf.

[12] 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.

For the Commission to more fully inform any subsequent electric reliability policies or actions pursuant to those issues, the Commission, via a Secretarial Letter served on June 3, 2021, initiated an Electric Reliability Collaborative (ERC), and invited the EDCs, EAP and Statutory Advocates to participate.[13]

The ERC focused on reviewing the electric distribution reliability regulations, with particular attention to the calculation of the reliability performance metrics and also discussed exploring whether options such as performance-based rates tied to reliability metrics may lead to improved reliability performance at a reasonable cost, developing an understanding of the customer experience with electric reliability in Pennsylvania, and exploring how the Commission, EDCs, and other stakeholders can work together to lessen the impact of OROW trees on electric reliability.

The first meeting of the ERC was held on July 21, 2021, subsequent meetings occurred on Sept. 10, 2021, Feb. 11, 2022, April 8, 2022, April 20, 2023, and the latest being April 28, 2023. Meeting points of discussion included electric reliability in general, OROW trees, consideration of the IEEE 2.5 beta method for calculation of the reliability statistics, approaches on the IEEE 2.5 beta in other states, and regulatory and procedural considerations of any proposed change to reliability statistical methodologies in Pennsylvania.[14] Pennsylvania EDCs have forwarded their positions about utilizing IEEE 2.5 beta methodology as it applies to improving the reliability of Pennsylvania's electric distribution system. TUS is preparing its recommendations to the Commission for consideration on next steps to be taken as the reliability review process moves forward.

[13] The Secretarial Letter was served on June 3, 2021, at Docket No. M-2021-3024513.
[14] The IEEE methodologies utilized by the EDCs are found at IEEE 1366-2012, *IEEE Guide for Electric Power Distribution Reliability Indices*.

Section 1 – Introduction

Purpose

This report discusses the reliability performance of EDCs operating under the Commission's jurisdiction, specifically focusing on the reliability of the electric distribution system.[15]

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).[16] 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.[17] 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. [18]

The Commission also established reliability benchmark and standard values to measure the performance of each EDC.[19] 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.[20] 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

[15] 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.
[16] For more information on CAIDI, SAIDI and SAIFI, see Section 2.
[17] 66 Pa.C.S. § 2802(3).
[18] 52 Pa. Code § 57.195.
[19] 52 Pa. Code §§ 57.191-57.198.
[20] See Amended Reliability Benchmarks and Standards for the Electric Distribution Companies, Order entered May 11, 2004, at Docket No. M-00991220, at 24

may result in an Order directing specific corrective actions.[21] 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.[22]

Section 2 –Reliability Performance Measures

Reliability Performance Metrics

The Commission's benchmarks and standards are based on 4 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 5 minutes) interruptions for every customer served during reporting period.[23]

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.[24]
- Reliability performance on the 5% of worst performing circuits and a corrective action plan to increase the reliability of these circuits.

Major Events

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

[21] 52 Pa. Code § 57.197(a).
[22] 52 Pa. Code § 57.194(h)(1).
[23] 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.
[24] This information is collected and trended by EDCs to reduce customer outages and improve system reliability.

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:[25]

- 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
- 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 5 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.[26] 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 2020, 2021 and 2022 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.

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[25] *See*, 52 Pa. Code § 57.192.

[26] The large EDCs are Duquesne Light, Met-Ed, Penelec, Penn Power, PECO, PPL and West Penn. The Small EDCs are UGI, Citizens', Pike County and Wellsboro.

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:

CAIDI of 110 evaluations: 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 the Bureau of Investigation & Enforcement (BIE) for further action.

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

CAIDI of 140 evaluations: 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 BIE 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.[27] In addition, Commission staff may initiate an investigation to determine whether an EDC is providing reliable service.[28]

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.[29] 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 2022 (effective January 2024 through December 2025) for Duquesne, PECO, PPL, Citizens', Pike, and Wellsboro.

[27] *See*, 52 Pa. Code § 57.195(g).
[28] *See*, 52 Pa. Code § 57.197(a).
[29] *See*, 52 Pa. Code § 57.198.

- Filed in October 2021 (effective January 2023 through December 2024) for FirstEnergy (Met-Ed, Penelec, Penn Power and West Penn) and UGI.

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.[30]

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 – 2022 Outage Response Review

Overview

Tables 2A, 2B, 2C and 2D below, present a breakdown of reportable outage events (ROEs)[31] summarized for 2022 (42 events) as compared to 2021 (63 events), 2020 (46 events), and 2019 (52 events).

Table 2E below, details the number of ROEs from 1994 through 2022. Note the number of ROEs that occurred during the benchmark period from 1994 through 1998, as compared to the number that occurred in each of the past 4 years and in the period 2003 through 2012. Some of the increase in ROEs could be due to aging infrastructure that is impacted by weather, but ROEs appear to be increasing in frequency for all EDCs, including those that have strong infrastructure improvement plans, as shown in Table 2G, below. 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 2F below details the number of customers affected by ROEs from 1994 through 2022. In 2022, a total of 1,396,669 of customers were negatively affected by ROEs as compared to 1,964,501 customers in 2021; 2,431,842 in 2020; and 1,988,188 in 2019.

[30] *See*, 52 Pa. Code § 57.198(c).

[31] 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.

Note: The high level of customers affected in 2011, 2012, 2014, and 2018 are primarily due to a few high-impact events, such as Irene in 2011, Sandy in 2012, Nika in 2014, and Riley/Quinn in 2018.

Table 2G below, details the cumulative number of ROEs by EDC from 2012 through 2022.

Table 2A –67.1 Reportable Outage Events Summary 2022

EDC	Date	Customers Affected	Cause
DLC	2/3/22	18,911	Winter Storm Landon w/rain, snow, ice
DLC	3/7/22	13,147	High winds
DLC	5/3/22	9,562	Severe storms, heavy rain, high winds
DLC	6/22/22	25,374	Severe storms, high winds, heavy rains
DLC	7/23/22	53,935	Severe storms, high winds, heavy rains
DLC	8/29/22	10,993	Severe storms with high winds
DLC	12/23/22	36,790	Winter Storm Elliott
Met-Ed	1/16/22	15,030	Winter storm with high winds and wet snow
Met-Ed	2/17/22	48,143	Winter storm with rain, snow, and high winds
Met-Ed	3/7/22	13,538	High winds, rain
Met-Ed	3/12/22	35,704	Winter storm with rain, snow, and high winds
Met-Ed	12/23/22	65,662	Winter Storm Elliott
PECO	2/18/22	57,871	High winds, rain, and lightning
PECO	5/6/22	28,053	Severe storms, heavy rain, high winds
PECO	12/23/22	65,562	Winter Storm Elliott
Penelec	2/17/22	17,266	Winter storm with rain, snow, and high winds
Penelec	3/7/22	40,903	High winds, sleet, rain
Penelec	4/19/22	48,934	Winter storm with rain, wet snow and high winds
Penelec	5/21/22	10,900	Severe storms, heavy rain, high winds

Table 2A(cont'd) –67.1 Reportable Outage Events Summary 2022

EDC	Date	Customers Affected	Cause
Penelec	7/22/22	51,707	Severe storms, high winds, heavy rains
Penelec	8/4/22	25,556	Severe storms with high winds
Penelec	12/22/22	50,105	Winter Storm Elliott
Penn Power	5/21/22	24,536	Severe storms, heavy rain, high winds
PPL	1/16/22	15,354	Winter storm with high winds
PPL	2/17/22	44,699	Winter storm with rain, snow, and high winds
PPL	3/7/22	33,332	High wind and rain event
PPL	4/18/22	20,441	Winter storm with rain, wet snow and high winds
PPL	7/12/22	9,732	Scattered severe storms
PPL	7/24/22	13,728	Severe storms, high winds, heavy rains
PPL	11/30/22	24,686	High wind and heavy rain event
PPL	12/15/22	34,985	Winter storm with ice and high winds
PPL	12/22/22	75,372	Winter Storm Elliott
West Penn	2/3/22	36,402	Winter Storm Landon w/rain, snow, ice
West Penn	2/17/22	34,040	Winter storm with rain, snow, and high winds
West Penn	3/7/22	41,793	Cold front with storms, rain, and high winds
West Penn	5/3/22	56,066	Severe storms, heavy rain, high winds
West Penn	6/16/22	29,695	Severe storms with high winds
West Penn	6/22/22	39,810	Severe storms, high winds, heavy rains
West Penn	7/23/22	49,879	Severe storms, high winds, heavy rains
West Penn	11/27/22	9,795	Severe storms, high winds, heavy rains
West Penn	12/15/22	11,486	Winter storm with ice and high winds
West Penn	12/23/22	47,192	Winter storm Elliott
TOTAL	**42**	**1,396,669**	

Table 2B –67.1 Reportable Outage Events Summary 2021

EDC	Date	Customers Affected	Cause
DLC	3/26/21	14,163	Cold front w/high winds & rain
DLC	6/13/21	51,762	Severe storms, lightning, high winds
DLC	7/7/21	30,312	Severe storms, high winds, heavy rains
DLC	7/13/21	10,945	Severe storms, high winds, heavy rains
DLC	8/12/21	51,904	Severe storms & high winds
DLC	8/29/21	22,389	Severe storms & high winds
DLC	10/21/21	3,928	Severe storms & tornadoes
DLC	12/11/21	12,310	Severe storms & high winds
Met-Ed	3/26/21	19,515	Cold front w/high winds & rain
Met-Ed	4/30/21	25,280	High wind event
Met-Ed	5/26/21	14,731	Severe storms, lightning, high winds
Met-Ed	6/21/21	25,398	Severe storms, lightning, high winds
Met-Ed	7/6/21	34,472	Stalled cold front & severe storms
Met-Ed	7/28/21	9,840	High winds, heavy rain, lightning
Met-Ed	8/10/21	32,810	Severe storms & high winds
Met-Ed	9/1/21	61,317	Hurricane Ida remnants
Met-Ed	10/29/21	17,199	Heavy rains, lightning, & high winds
Met-Ed	12/6/21	15,425	High winds and heavy rains
Met-Ed	12/11/21	10,005	Severe storms & high winds
Met-Ed	12/21/21	5,331	Transformer tap changer failure
PECO	7/17/21	28,299	High winds, heavy rain, lightning
PECO	7/21/21	92,950	High winds, heavy rain, lightning
PECO	7/29/21	11,417	High winds, heavy rain, lightning
PECO	9/1/21	164,989	Hurricane Ida remnants
PECO	10/29/21	43,755	Heavy rains, lightning, & high winds
Penelec	1/1/21	11,873	Freezing rain & ice
Penelec	3/26/21	54,784	Cold front w/high winds & rain
Penelec	4/30/21	38,925	High wind event
Penelec	6/29/21	23,146	Severe storms, lightning, high winds
Penelec	7/6/21	61,821	Stalled cold front & severe storms
Penelec	7/11/21	18,417	Severe storms, high winds, heavy rains
Penelec	7/12/21	42,137	Severe storms, high winds, heavy rains
Penelec	7/16/21	22,729	Severe storms, high winds, heavy rains
Penelec	8/11/21	29,544	Severe storms & high winds
Penelec	8/29/21	10,225	Severe storms & high winds
Penelec	12/11/21	29,855	Severe storms & high winds
Penelec	1/3/21	13,135	Heavy, wet snow
Penn Power	3/26/21	18,666	Cold front w/high winds & rain

Table 2B (cont'd) –67.1 Reportable Outage Events Summary 2021

EDC	Date	Customers Affected	Cause
PPL	2/15/21	8,903	Ice, sleet, snow, wind
PPL	3/1/21	18,979	High wind event
PPL	3/26/21	53,349	High wind event
PPL	4/28/21	11,508	Wind and rain
PPL	4/30/21	35,108	High wind event
PPL	7/6/21	38,367	Stalled cold front & severe storms
PPL	7/11/21	17,598	Severe storms, high winds, heavy rains
PPL	7/17/21	23,347	High winds, heavy rain, lightning
PPL	8/11/21	44,493	Severe storms
PPL	9/1/21	84,647	Hurricane Ida remnants
PPL	9/13/21	27,847	Severe storms, lightning, high winds
PPL	9/22/21	22,659	Long duration high winds and rains
PPL	10/29/21	25,097	Heavy rains, lightning, & high winds
PPL	12/6/21	19,656	High wind event
PPL	12/11/21	28,444	High wind event
UGI	8/12/21	10,182	Severe storms & high winds
West Penn	3/26/21	25,997	Cold front w/high winds & rain
West Penn	6/14/21	15,028	Heavy rains & high winds
West Penn	6/21/21	44,428	Severe storms, lightning, high winds
West Penn	6/30/21	29,816	Severe storms, lightning, high winds
West Penn	7/7/21	39,810	Severe storms, high winds, heavy rains
West Penn	7/16/21	21,144	Severe storms, high winds, heavy rains
West Penn	8/11/21	84,048	Severe storms & high winds
West Penn	9/1/21	19,401	Hurricane Ida remnants
West Penn	12/11/21	28,942	Severe storms & high winds
TOTALS	**63**	**1,964,501**	

Table 2C –67.1 Reportable Outage Events Summary 2020

EDC	Date	Customers Affected	Cause
Duquesne	4/8/20	60,383	Severe thunderstorms, high winds
Duquesne	6/10/20	15,403	Severe thunderstorms, high winds
Duquesne	7/10//20	22,463	Severe thunderstorms, high winds
Duquesne	8/27/20	49,383	Severe thunderstorms, high winds
Duquesne	11/15/20	41,224	High winds and heavy rains
Met-Ed	4/9/20	35,145	Severe thunderstorms, high winds
Met-Ed	6/3/20	88,597	Severe thunderstorms (Derecho)

Table 2C (cont'd)–67.1 Reportable Outage Events Summary 2020

EDC	Date	Customers Affected	Cause
Met-Ed	7/22/20	32,732	Severe thunderstorms (high winds)
Met-Ed	8/4/20	101,559	Tropical storm Isaias
Met-Ed	8/28/20	16,986	Severe thunderstorms, high winds
Met-Ed	11/1/20	27,210	Cold front, windstorm, heavy rains
Met-Ed	11/15/20	33,816	High winds and heavy rains
Met-Ed	12/24/20	6,863	High winds, freezing rain, heavy rains
PECO	6/3/20	456,480	Severe thunderstorms (Derecho)
PECO	8/4/20	404,363	Tropical storm Isaias
PECO	8/7/20	50,996	Severe thunderstorms
PECO	8/28/20	27,895	Severe thunderstorms, lightning, winds
PECO	11/15/20	33,293	High winds and heavy rains
PECO	12/24/20	85,772	High winds and heavy rains
Penelec	1/12/20	14,816	Storms, strong winds and heavy rain
Penelec	4/7/20	24,599	Severe thunderstorms, high winds
Penelec	4/17/20	13,629	Wet, heavy snowstorm
Penelec	8/27/20	48,298	Severe thunderstorms, lightning, winds
Penelec	9/7/20	21,571	Severe thunderstorms
Penelec	11/1/20	29,112	Cold front, windstorm, heavy rains
Penelec	11/15/20	90,058	High winds and heavy rains
Penn Power	6/10/20	10,405	Severe thunderstorms (high winds)
Penn Power	11/15/20	10,599	High winds and heavy rains
Pike	12/25/20	1,871	High winds and rains (fallen tree damage)
PPL	4/9/20	38,010	Windstorm
PPL	4/13/20	49,065	Rain and high winds
PPL	6/3/20	14,479	Severe thunderstorms (Derecho)
PPL	8/4/20	71,624	Tropical storm Isaias
PPL	8/27/20	33,216	Severe thunderstorms, lightning, winds
PPL	11/1/20	42,194	Cold front, windstorm, heavy rains
PPL	11/15/20	33,109	High winds and heavy rains
PPL	12/24/20	30,248	High winds and heavy rains
West Penn	1/11/20	14,996	Storms, strong winds and heavy rain
West Penn	3/29/20	18,524	Storms, strong winds and heavy rain
West Penn	4/8/20	59,885	Severe thunderstorms, tornadic activity
West Penn	6/10/20	27,342	Severe thunderstorms (high winds)
West Penn	7/10/20	18,790	Severe thunderstorms (high winds)
West Penn	8/27/20	44,469	Severe thunderstorms, lightning, winds

Table 2C (cont'd) –67.1 Reportable Outage Events Summary 2020

EDC	Date	Customers Affected	Cause
West Penn	9/30/20	4,361	Failed insulator caused fire
West Penn	11/15/20	60,268	High winds and heavy rains
West Penn	11/1/20	15,741	Cold front, windstorm, heavy rains
TOTALS	**47**	**2,431,842**	

Table 2D –67.1 Reportable Outage Events Summary 2019

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

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

EDC	Date	Customers Affected	Cause
Penelec	4/14/19	31,221	Storm and trees
Penelec	1/1/19	27,979	Storm and trees
Penn Power	2/24/19	36,177	Storm and trees
PPL	11/27/19	19,989	Storm and trees
PPL	2/24/19	79,031	Storm and trees
PPL	4/14/19	50,884	Storm and trees
PPL	5/19/19	20,778	Storm and trees
PPL	5/29/19	16,982	Storm and trees
PPL	6/28/19	18,331	Storm and trees
PPL	7/21/19	11,794	Storm and trees
PPL	10/16/19	19,863	Storm and trees
PPL	10/31/19	80,586	Storm and trees
PPL	12/1/19	17,094	Storm and trees
UGI	4/15/19	11,703	Storm and trees
UGI	8/15/19	5,845	Storm and trees
West Penn	1/1/19	14,036	Storm and trees
West Penn	10/22/19	5,220	Equipment failure
West Penn	10/31/19	27,274	Storm and trees
West Penn	11/27/19	24,959	Storm and trees
West Penn	12/17/19	7,214	Storm and trees
West Penn	2/24/19	177,232	Storm and trees
West Penn	5/29/19	26,194	Storm and trees
West Penn	6/29/19	14,909	Storm and trees
TOTALS	**52**	**1,988,188**	

Table 2E – Total 67.1 Reportable Events for EDCs 1994-2022

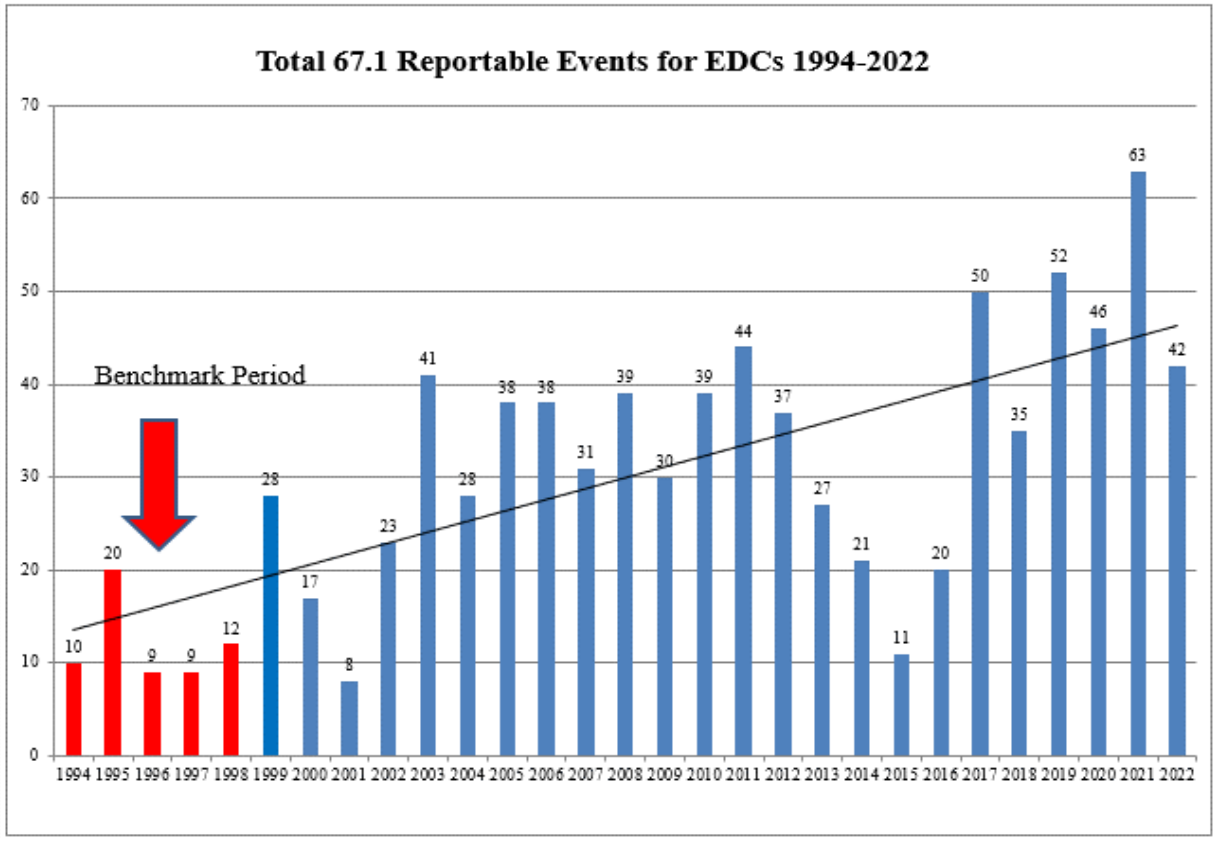


Table 2F – Total Customers Affected by 67.1 Reportable Events 1994-2022

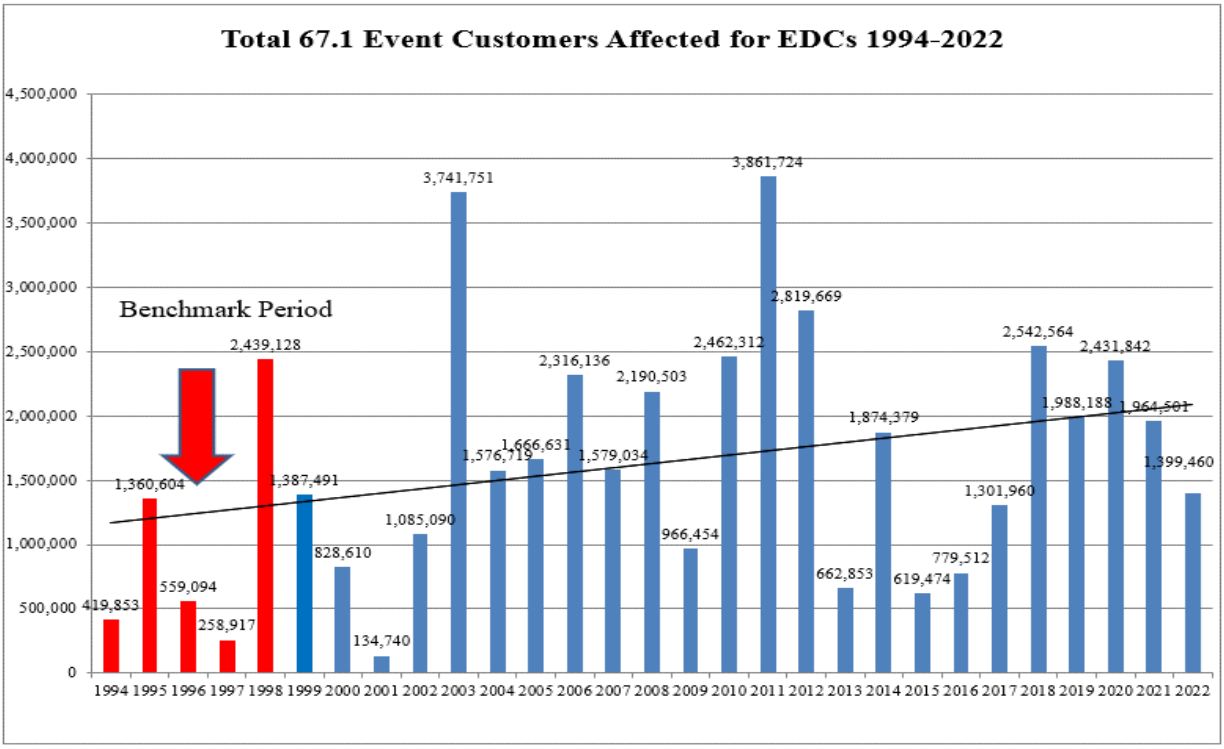
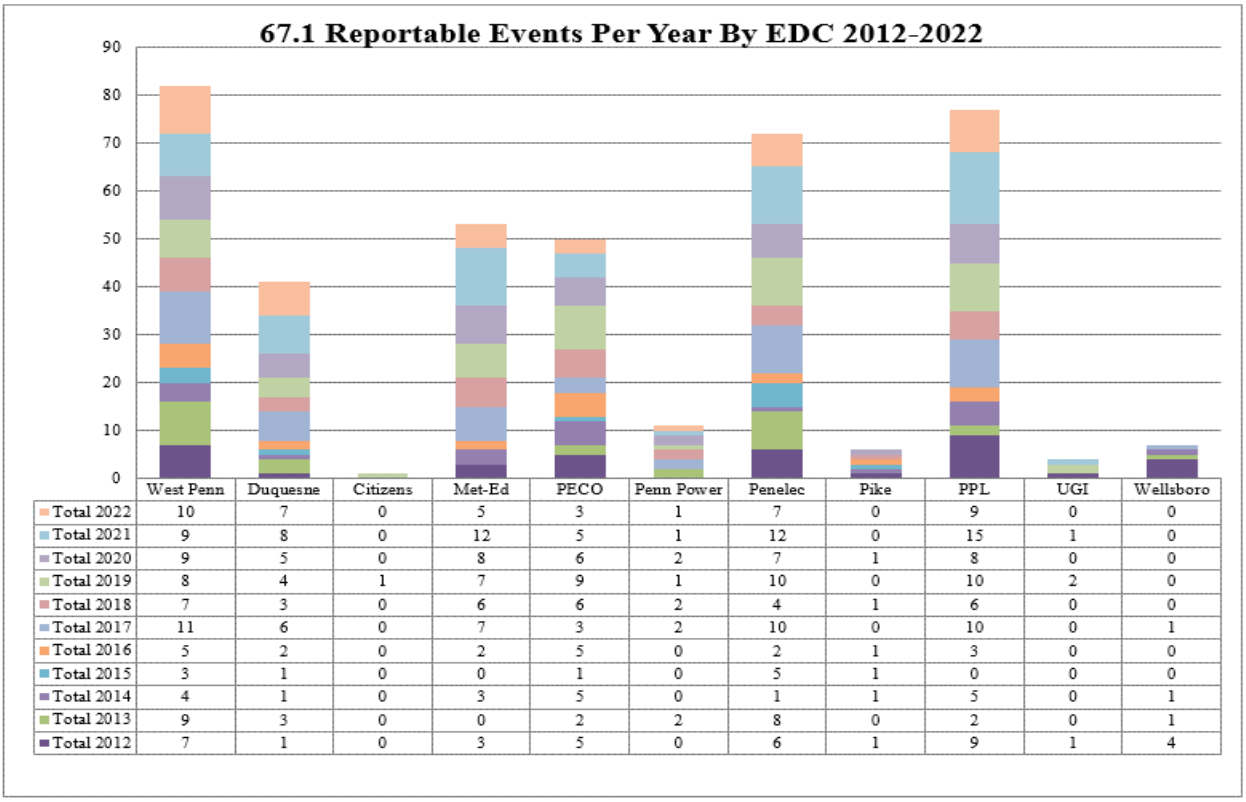


Table 2G –67.1 Reportable Events by EDC 2012-2022



	West Penn	Duquesne	Citizens	Met-Ed	PECO	Penn Power	Penelec	Pike	PPL	UGI	Wellsboro
Total 2022	10	7	0	5	3	1	7	0	9	0	0
Total 2021	9	8	0	12	5	1	12	0	15	1	0
Total 2020	9	5	0	8	6	2	7	1	8	0	0
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

Major Events

In 2022, the resilience of Pennsylvania's electrical system was challenged with a substantial amount of severe storm activity as evidenced by the number of ROEs. Pennsylvania customers were adversely affected in 2022 with approximately 113,738 customers impacted by Major Events in 2022 as compared to 177,115 customers impacted in 2021 and 1,259,593 customers in 2020. In 2022, there were 15 Major Event exclusion requests approved as compared to 22 in 2021, 29 in 2020, 23 in 2019 and 29 in 2018. Note that Major Events are excludable from EDC's reliability indices and the additional customer outages and customer-minutes-interrupted are not added to the reliability metrics.

Major Events for 2022, 2021, 2020, 2019 and 2018, are shown below in Tables 3A, 3B, 3C, 3D, and 3E, respectively.

Table 3A – 2022 Major Events

EDC	Date	Customers Affected	Cause	Total Customer Minutes Interrupted
Met Ed	12/23/2022	65,662	Winter Storm Elliot	33,801,371
Penn Power	5/21/2022	24,536	Weather	20,138,249
Pike	6/18/2022	2,157	Human Error	204,807
Pike	6/23/2022	2,157	Vehicle	195,437
Pike	9/5/2022	1,847	Weather & Equipment	251,192
Pike	9/12/2022	4,757	Vehicle	3,820,796
Wellsboro	3/7/2022	735	Weather - Winds	148,068
Wellsboro	4/19/2022	1,239	Weather - Snow	157,284
Wellsboro	7/21/2022	1,731	Off ROW Tree	156,360
Wellsboro	7/22/2022	815	Animal Contact	51,535
Wellsboro	8/4/2022	743	Weather - Winds	64,283
Wellsboro	8/30/2022	755	Off ROW Tree	120,334
Wellsboro	9/24/2022	1,716	Off ROW Tree	237,208
Wellsboro	9/26/2022	2,338	Weather - Winds	466,925
Wellsboro	12/23/2022	2,550	Weather - Winds	467,185
15	**Totals**	**113,738**	**Totals**	**60,281,034**

Table 3B – 2021 Major Events

EDC	Date	Customers Affected	Cause	Total Customer Minutes Interrupted
Citizens	2/16/2021	875	Equipment	87,019
Citizens	3/1/2021	760	Equipment	87,159
Citizens	4/11/2021	1,460	Vehicle	100,570
Citizens	4/30/2021	880	Off ROW Tree	71,076
Citizens	6/30/2021	3,009	Weather	431,161
Citizens	8/18/2021	1,038	Off ROW Tree	81,734
Citizens	8/20/2021	883	Off ROW Tree	15,320
Penn Power	3/26/2021	18,666	Weather	3,505,479
Penelec	7/6/2021	61,821	Weather	22,747,624
Met Ed	9/1/2021	61,317	Weather	30,016,178
Pike	1/18/2021	2,367	Equipment	91,507
Pike	5/18/2021	1,847	Equipment	119,432
UGI	8/12/2021	10,182	Weather	unreported
Wellsboro	3/26/2021	730	Weather	88,585
Wellsboro	6/29/2021	713	Lightning	178,177
Wellsboro	7/7/2021	2,086	Weather	713,228
Wellsboro	10/16/2021	1,729	Off ROW Tree	218,920
Wellsboro	10/26/2021	757	Off ROW Tree	51,614
Wellsboro	10/27/2021	647	Equipment	18,957
Wellsboro	11/11/2021	1,815	Weather	191,336
Wellsboro	12/11/2021	2,885	Weather	1,871,841
Wellsboro	12/16/2021	648	Equipment	11,912
22	**Totals**	**177,115**	**Totals**	**60,698,829**

Table 3C – 2020 Major Events

EDC	Date	Customers Affected	Cause	Total Customer Minutes Interrupted
Citizens	1/24/220	1,020	Storm	43,584
Citizens	7/8/2020	2,463	Storm	441,304
Citizens	8/27/2020	2,070	Storm	532,190
Citizens	9/30/2020	1,326	Tree limb	149,992
Citizens	11/15/2020	1,326	Animal	116,984
Duquesne	4/8/2020	60,383	Storm	297,908,154
Met-Ed	6/3/2020	88,597	Storm	unreported
Met-Ed	8/4/2020	101,559	Storm	63,898,614
PECO	6/3/2020	456,480	Storm	unreported
PECO	8/4/2020	404,363	Storm	unreported
Penelec	11/15/2020	90,058	Storm	44,332,143
Pike	3/16/2020	1,882	Loss of Source feed	54,578
Pike	5/29/2020	2,670	Failed cross arm	480,600
Pike	8/4/2020	525	Storm	432,199
Pike	11/23/2020	2,371	Equipment failure	1,990,054
Pike	12/25/2020	1,871	Off-right-of-way tree	678,727
UGI	11/23/2020	10,665	Equipment failure	unreported
Wellsboro	4/21/2020	1,515	Storm	229,923
Wellsboro	5/9/2020	6,203	Loss of Source feed	379,807
Wellsboro	5/28/2020	1,705	Tree	99,572
Wellsboro	6/18/2020	1,515	Unknown fault	30,931
Wellsboro	6/27/2020	767	Splice failure	145,257
Wellsboro	7/30/2020	1,515	Circuit fault	36,915
Wellsboro	8/4/2020	6,302	Loss of Source feed	701,937
Wellsboro	8/8/2020	6,301	Loss of Source feed	451,056
Wellsboro	8/19/2020	1,041	Bird into arrestor	89,232
Wellsboro	8/23/2020	869	Animal	104,898
Wellsboro	10/15/2020	1,517	Off-right-of-way tree	83,237
Wellsboro	10/21/2020	714	Equipment failure	68,508
29	**Totals**	**1,259,593**	**Totals**	**413,480,396**

Table 3D – 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	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	Loss of Source feed	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
23	**Totals**	**573,700**	**Totals**	**1,001,751,929**

Table 3E – 2018 Major Events

EDC	Date	Customers	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 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	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	Voltage Control	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	422,777,649
Pike	9/6/2018	2,680	Supply Failure	1,628,082
PPL	3/2/2018	261,341	Winter Storm Riley	355,173,459
Wellsboro	7/22/2018	6,433	Supply Failure	1,627,549
Wellsboro	12/1/2018	947	Supply Failure	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
29	**Totals**	**1,960,381**	**Totals**	**2,660,824,314**

Review of Long-Duration Outage Events

There were no long duration electric outage events (those with outages lasting six or more days) in 2022.

Section 4 –EDC Reliability Performance Data

Statewide Summary

Rolling 12-month Benchmark Performance Compliance

The 2022 end-of-year reliability data for **12-month CAIDI, SAIDI, and SAIFI Benchmark performance compliance** submitted by the 11 EDCs indicates:

- Four EDCs achieved the **CAIDI Benchmark**, while seven of the EDCs failed to achieve the CAIDI benchmark (Figure 1 below).
- Only five EDCs achieved the **SAIDI Benchmark**, while six EDCs failed to achieve the SAIDI benchmark (Figure 2 below).
- Six EDCs achieved the **SAIFI Benchmark**, while five EDCs failed to achieve the SAIFI benchmark (Figure 3 below).

Figure 1 – 2022 CAIDI Comparison (percent above or below benchmark)

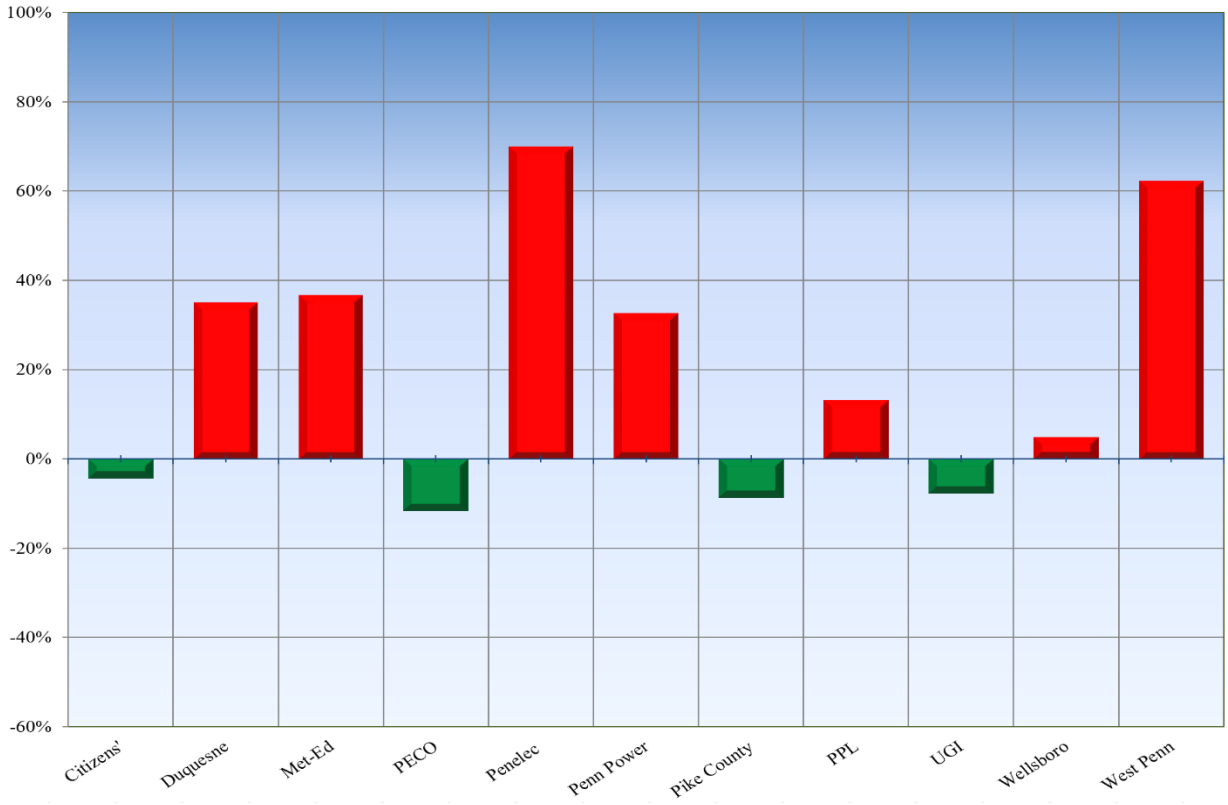


Figure 2 – 2022 SAIDI Comparison (percent above or below benchmark)

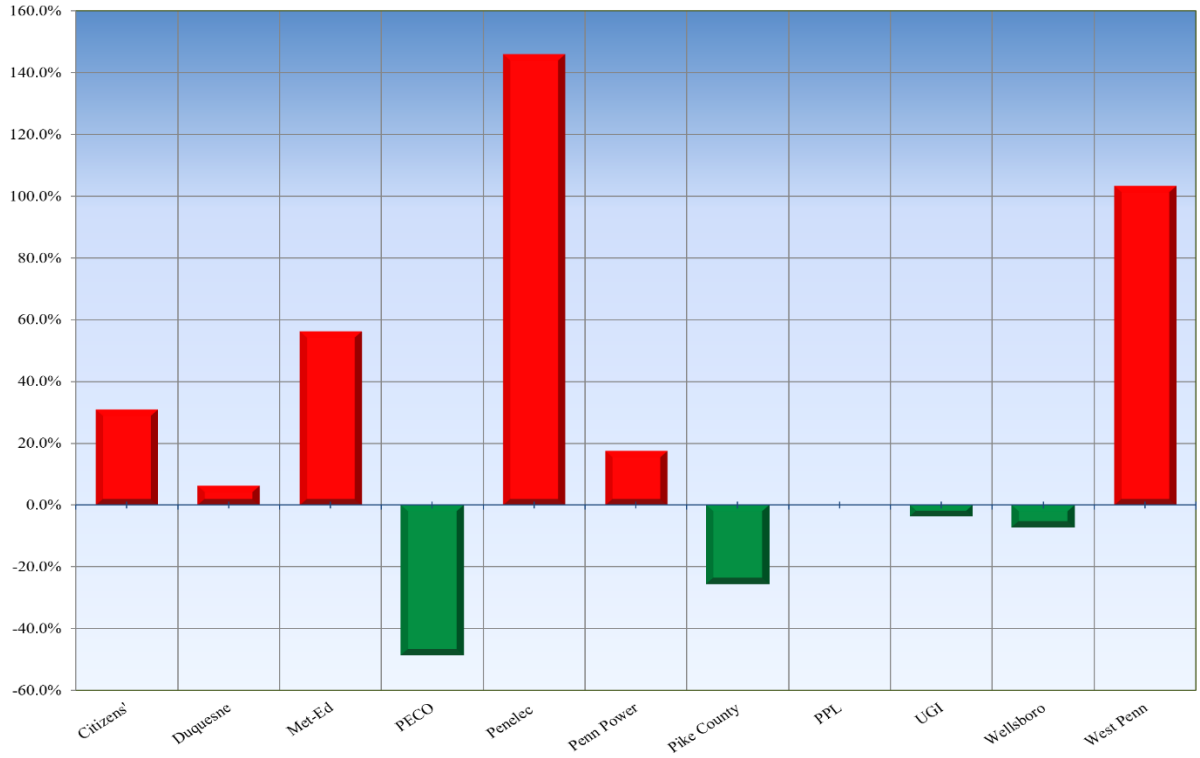


Figure 3 – 2022 SAIFI Comparison (percent above or below benchmark)

Rolling 3-year Average (2020-2022) Performance Compliance

Appendix A provides the 2022 results for the 12-month average and 3-year average reliability performance metrics for individual EDCs.

Seven EDCs (Duquesne Light, Met-Ed, PECO, Penelec, Penn Power, PPL, and West Penn) failed to meet the rolling 3-year **CAIDI performance standard**.

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

Four EDCs (Met-Ed, Penelec, Penn Power, and West Penn) 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.

This year the Commission has included three additional figures in each of the EDC's individual evaluations. The three additional figures show the overall number of customers interrupted for each year from 2015 through 2022, the customer minutes of interruption (CMI) for the years 2015 through 2022, and the number of outage incidents (incidents of occurrence) for the years 2015 through 2022. The Commission notes that these figures are vital in the actual evaluation of EDC customer service performance.

Citizens' Electric Company

Citizens' Electric Company (Citizens') has an operating service area of about 41 square miles with about 7,116 customers. The electric system consists of one distribution substation and nine distribution feeder lines.

In 2022, Citizen's experienced 1,947 customer interruptions and 195,608 CMI, as compared to: 1,926 customer interruptions and 181,274 CMI in 2021; 561 customer interruptions and 48,645 CMI in 2020; 1,982 customer interruptions and 154,257 CMI in 2019; 1,449 customer interruptions and 109,478 CMI in 2018.

Citizens' did not experience any Major Events in 2022.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 94 minutes in 2021 to 101 minutes in 2022; achieved benchmark by 4.3%.

3-year average: Increased from 86 minutes in 2021 to 94 minutes in 2022; achieved standard by 18.3%.

SAIDI

Rolling 12-month: Increased from 26 minutes in 2021 to 27.5 minutes in 2022; failed to achieve benchmark by 31%.

3-year average: Increased from 18 minutes in 2021 to 20 minutes in 2022; achieved standard by 19.9%.

SAIFI

Rolling 12-month: Remained at 0.27 outages in 2022; failed to achieve benchmark by 35%.

3-year average: Increased from 0.21 outages in 2021 to 0.27 outages in 2022; achieved standard by 6.1%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 4 and 5. Beginning in 2004, Citizens' CAIDI performance has been overall positive for most years.[29] 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 continue CAIDI performance below the "green" benchmark performance upper-control-limit-line. The Commission finds this is indicative of consistently good response and restoration times.

Beginning in 2004, Citizens' SAIFI performance has been inconsistent. From the 4th quarter 2011 through the 4th quarter 2019, Citizens' SAIFI performance has frequently been above the "green" benchmark performance upper-control-limit-line. Citizens' SAIFI performance in 2020 was excellent and well below the benchmark. However, 2021 was more challenging for Citizens' in meeting SAIFI benchmark. Beginning in 2020, SAIFI has been trending upward past benchmark and has exceeded the 12-month standard during 2022. More management attention is needed to ensure consistent SAIFI performance is sustained below the "green" benchmark performance upper control-limit-line.

[29] Smaller CAIDI, SAIFI, and SAIDI benchmark values are typical for companies with fewer customers. While Citizens' did not achieve benchmark for SAIDI in 2022, its SAIDI value for 2022 is still lower than that of all other EDCs. The same can be said about Citizen's SAIFI metrics.

Outage Causes

Figure 6 below, shows the top five reported 2022 outage-cause categories, as a percentage, for the following three distinct performance metrics: CMI; Customers Affected; and Number of Incidents. OROW trees, Animals, and Vehicle were the top causes for number of customers affected. The OROW trees and Vehicle causes were the largest contributors to CMI.

Figure 7 below shows the historical trend of the top three main outage causes. OROW trees, Vehicles, and Animals are the three most frequent outage-causes that are significantly negatively affecting Citizens' distribution system reliability and resilience. Trees are the most frequent cause of EDC customer outages in Pennsylvania.

General Reliability

Citizens' noted that its customers enjoyed a year of reliable service in 2022. Citizens' reported that, overall, the 2022/2023 storm season was relatively mild in Citizens' service area, noting that 25% of all customers affected and minutes interrupted for the year were the result of a single outage event in December. This highlights the volatile nature of reliability measurements for small EDCs, but also the substantial impact even a single event can have on their reliability metrics. This event demonstrates the critical nature of each outage response in maintaining a positive experience and strong reliability for small EDC customers.

Citizens' noted that its 2022 year-end reliability indices, though up slightly from 2021, remain strong, with all reportable metrics within the PUC standard for the Company. The Commission notes that Citizens' reliability indices, except for 4th quarter 2022 SAIFI, were all within the 12-month standard.

Citizens' appears to have continued its commitment to a responsible vegetation management program. However, as witnessed by all of Pennsylvania's EDCs, even compliant vegetation management is not enough to stem the effects of OROW trees damaged or killed by pests such as the emerald ash borer. Citizens' along with the other EDCs must aggressively pursue cooperation with customers to trim and remove OROW trees that endanger the lines.

Conclusion

Citizens' CAIDI remained mostly below benchmark except for the 2nd quarter of 2022 and CAIDI has remained below the 12-month standard. Citizens' SAIFI has significantly declined over the past year and continues to show signs of erratic performance. SAIDI performance has deteriorated over the past 12 months and is above benchmark and passed 12-month Standard level during the 4th quarter of 2022. During 2022, Citizens' has seen increases in all levels of reliability indices. Citizens' should continue to refine its processes and methods to improve this performance.

The Commission recommends continued and increased efforts in vegetation management and emphasis on response times.

The Commission recognizes that, overall, Citizen's appears to be making improvements as witnessed by the data shown below.

As can be seen in Figures 8 and 9 below, the number of Citizens' customers interrupted annually is on a downward trend as is CMI. Figure 10 below, however, shows an upward trend in the number of outage incidents.

Figure 4 - Citizens' CAIDI (minutes)

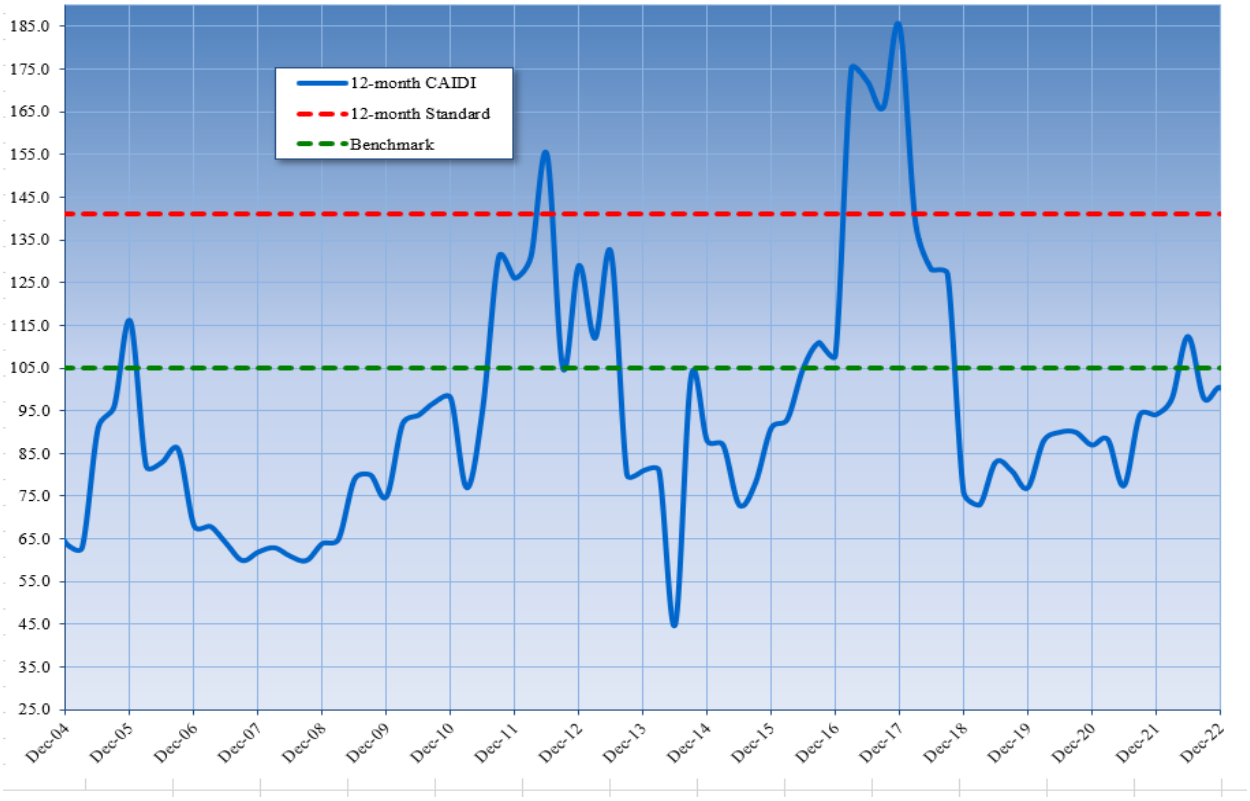


Figure 5 - Citizens' SAIFI (interruptions per customer)

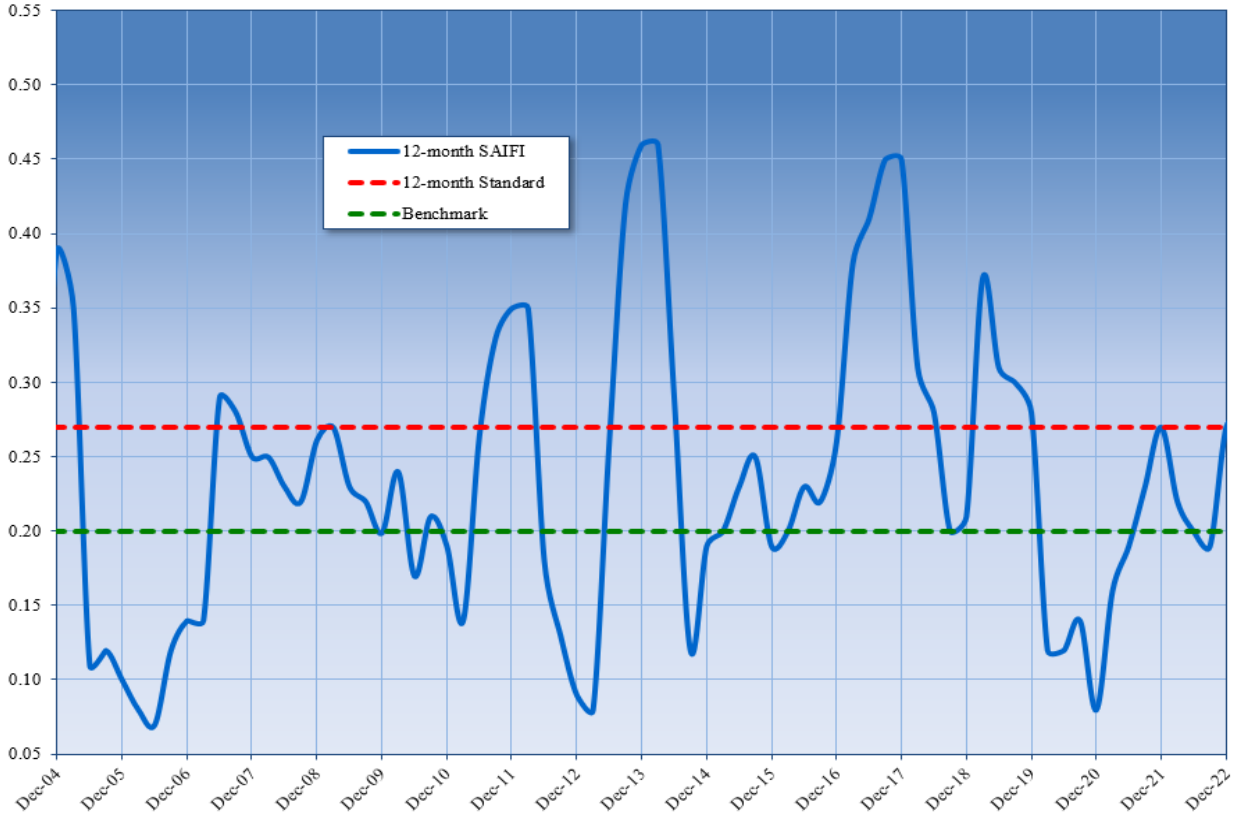


Figure 6 - Citizens' Outage Causes (percent of total outages)

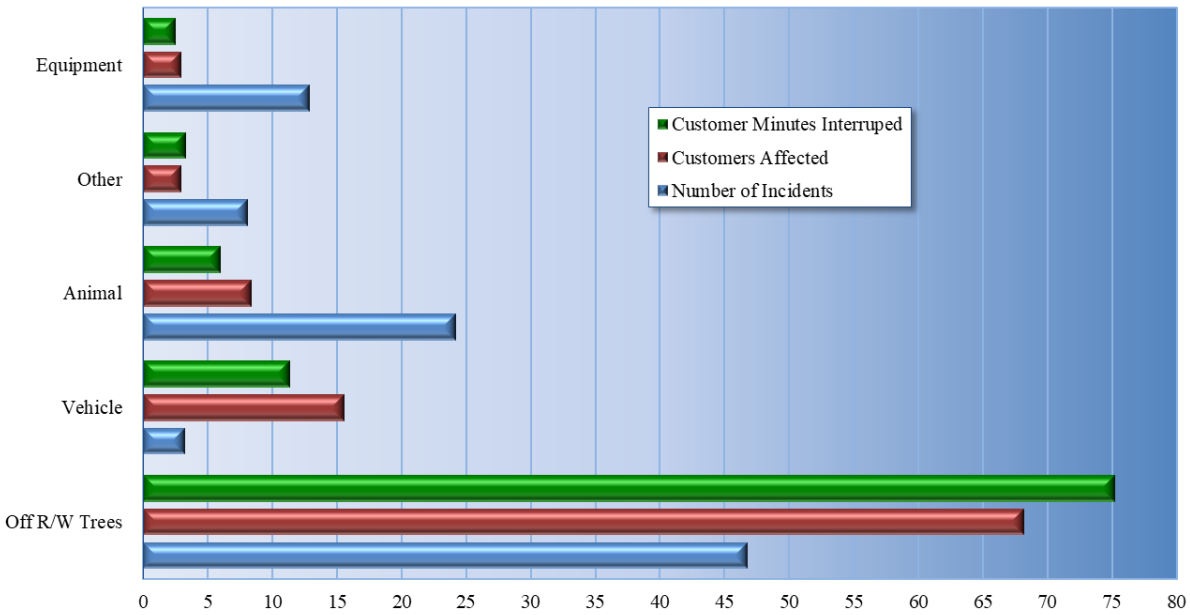


Figure 7 - Citizens' Outage Cause Tracking (number of incidents)

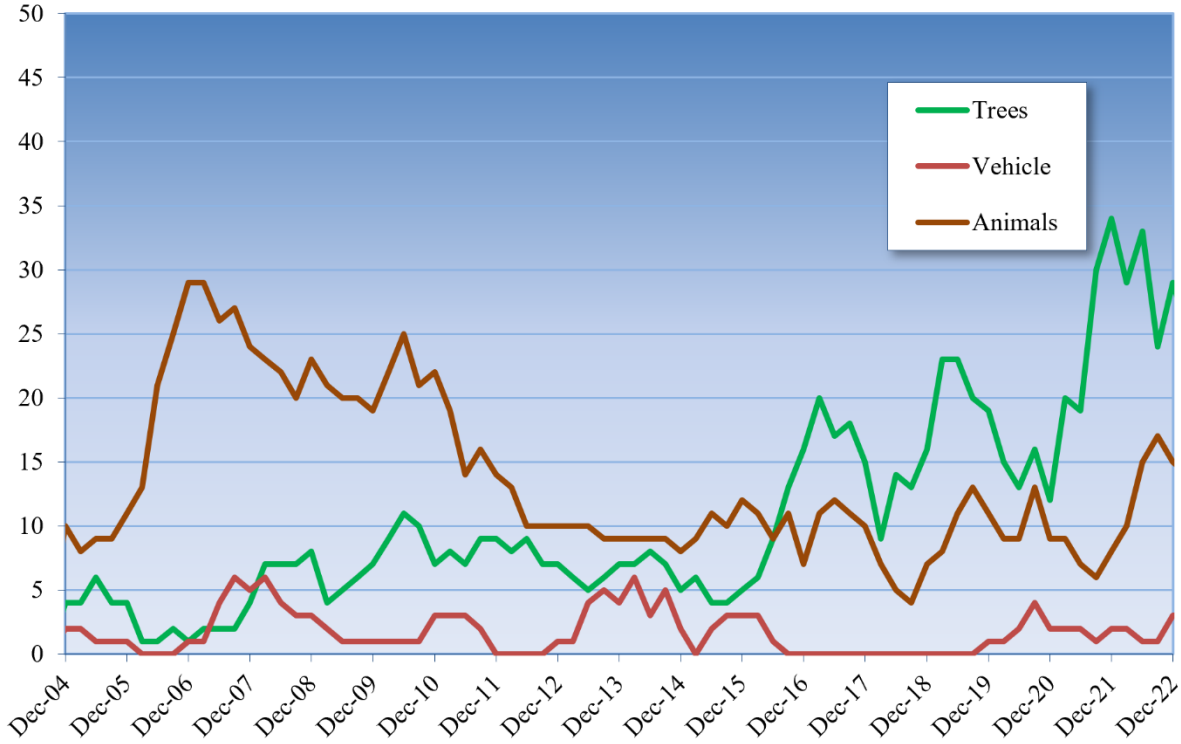


Figure 8 - Citizens' Outage Tracking (number of Customers Interrupted)

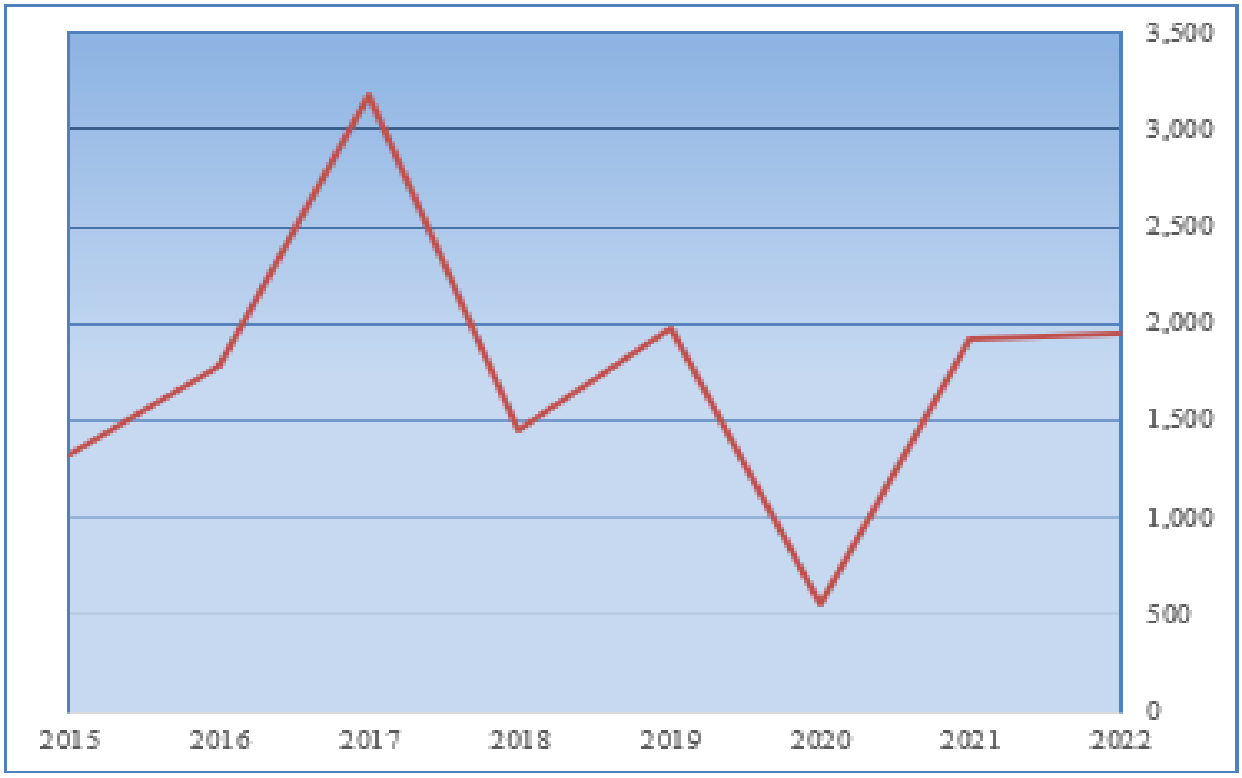


Figure 9 - Citizens' Outage Tracking (Customer-Minutes of Interruptions, or CMI)

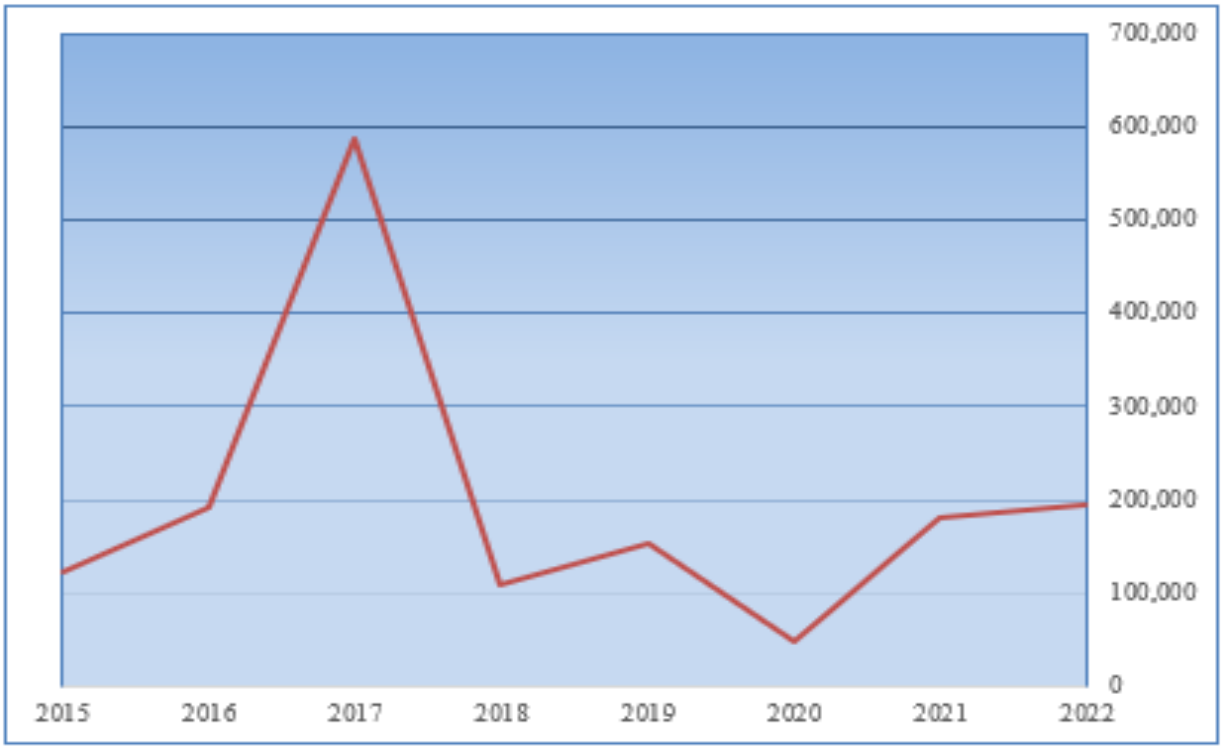
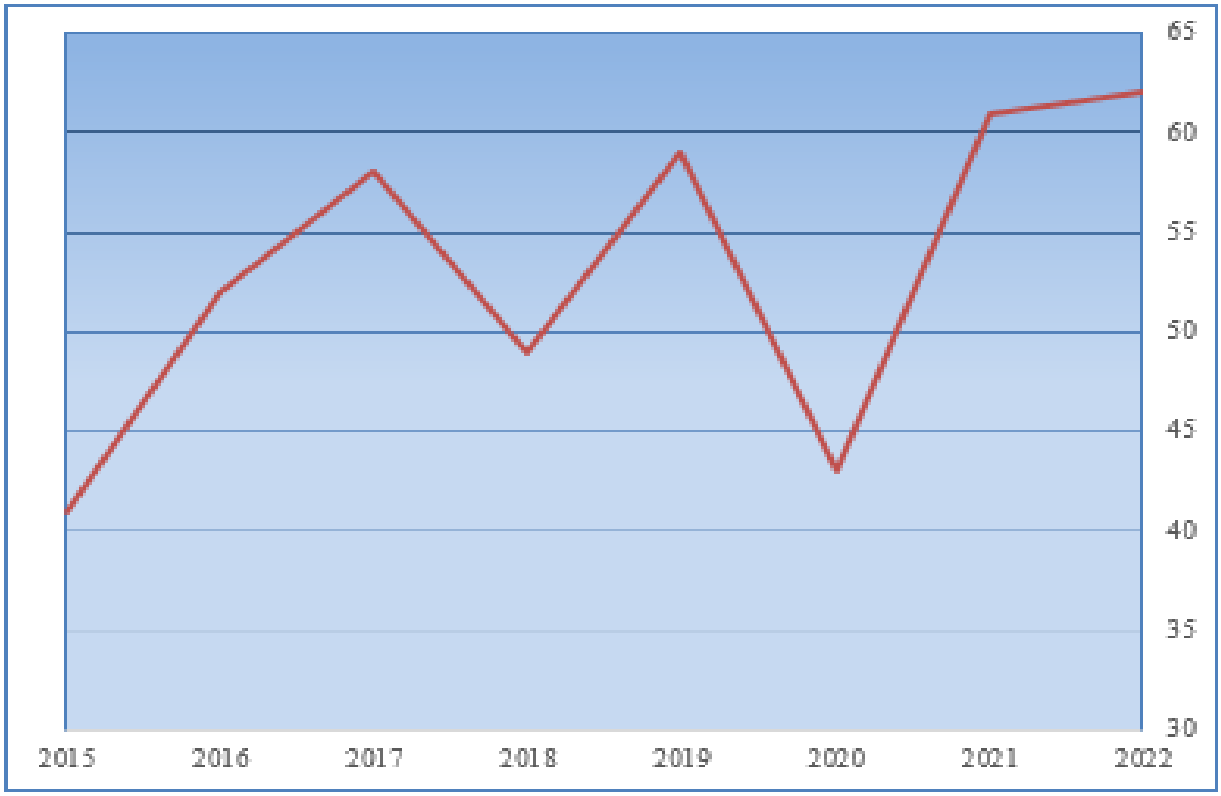


Figure 10 - Citizens' Outage Tracking (number of interruptions annually)



Duquesne Light Company

Duquesne Light Company (Duquesne) has a service territory of about 817 square miles with a well-developed distribution system serving about 609,522 customers.

In 2022, Duquesne experienced 7.3 million kilovolt-amps (kVA) of customer interruptions and 1,060 million kVA-minutes of CMI as compared to: 7.3 million kVA customer interruptions and 1,355 million kVA-minutes of CMI in 2021; 6.5 million kVA customer interruptions and 857 million kVA-minutes of CMI in 2020; 7.3 million kVA customer interruptions and 772 million kVA-minutes of CMI in 2019; and 6.1 million kVA customer interruptions and 647 million kVA-minutes of CMI in 2018.

Duquesne did not experience any Major Events during 2022.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 187 minutes in 2021 to 146 minutes in 2022; failed to achieve benchmark by 35.2%.

3-year average: Increased from 142 minutes in 2021 to 155 minutes in 2022; failed to achieve standard by 30.3%.

SAIDI

Rolling 12-month: Decreased from 173 minutes in 2021 to 134 minutes in 2022; failed to achieve benchmark by 6.3%.

3-year average: Increased from 130 minutes in 2021 to 139 minutes in 2022; achieved standard by 8.9%

SAIFI

Rolling 12-month: Decreased from 0.93 outages in 2021 to 0.92 outages in 2022; achieved benchmark by 21.4%.

3-year average: Decreased from 0.93 outages in 2021 to 0.90 outages in 2022; achieved standard by 30.5%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 11 and 12 below. Duquesne's CAIDI performance had improved during 2018 and 2019, as seen in Figure 11, but has significantly declined from 2020 through 2022. Management should place significant emphasis upon achieving CAIDI results at or below the "green" benchmark performance upper-control-limit-line for CAIDI. CAIDI is an important factor in gauging an EDC's response times to interruptions and thus will affect customer satisfaction in that area.

Beginning in 2004 and continuing through 2022, Duquesne's annual SAIFI benchmark performance trend has generally been positive, as shown in Figure 12. This positive performance trend, below the benchmark performance upper-control-limit-line, had been sustained since 2004 by Duquesne, and is considered under control. Duquesne is considered an excellent SAIFI benchmark performer. The Commission commends Duquesne for that accomplishment and encourages use of distribution system automation systems (smart grid systems).

Outage Causes

Figure 13 below shows the top five reported 2022 outage-cause categories reported by Duquesne, 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 CMI. Over 26% of outages are caused by OROW trees.

Figure 14 below shows the historical trend of the top three main outage causes. Trees and equipment failures are the two most frequent outage causes that are negatively affecting Duquesne's distribution system reliability and resilience, as well as almost every EDC in Pennsylvania. Duquesne should continue to aggressively pursue cooperation with customers in removal of OROW vegetation that endangers distribution circuits. The reported outage-cause category of "Storms" should be reconsidered and eliminated to spread outages among more defined areas such as vegetation or equipment failures and such, as it can be said that the category of "Storms" only reveals other system deficiencies, such as equipment failure and vegetation trimming deficiencies.

General Reliability

Duquesne completed its initial LTIIP in December 2022.[32] Duquesne' Second LTIIP was approved on Nov. 10, 2022,[33] and spans the time period from Jan. 1, 2023, through Dec. 31, 2028.

Duquesne notes the following specific programs, procedures, and ongoing maintenance activities supporting its reliability efforts:

- A Distribution Overhead Line Inspection Program, which includes infrared inspections, that systematically identifies circuit problems for remedial action in advance of failure.

- Vegetation Management Maintenance Programs with the goal of reducing tree and branch failures through proactive pruning and removal to manage proper clearances. Duquesne Light finds that this program will help reduce the frequency of outages by addressing targeted tree failure conditions that typically result in physical damage to our facilities.

[32] *See, Petition of Duquesne Light Company for Approval of its Long-Term Infrastructure Improvement Plan,* Order entered April 20, 2017, at Docket No. P-2016-2540046.
[33] *See, Petition of Duquesne Light Company for Approval of its Second Long-Term Infrastructure Improvement Plan,* Order entered November 10, 2022, at Docket No. P-2022-3032805.

- An all pulse-reclosing protection technology has been implemented on some 23kV circuits. This technology eliminates traditional "hard reclosing," thereby making it easier and faster to conduct repairs and restore circuits to normal operation, enabling customers to be restored more quickly. This technology also reduces stress and damage on the entire circuit since the breaker is no longer required to trip, also contributing to the reduction in momentary outages to customers.

- Line maintenance work of various types is regularly performed in order to maintain distribution plant. This work includes replacement of cross arms, arrestors, insulators, and other equipment on the overhead system as well as inspections and remedial work on the underground system.

- Storm Preparedness Training is conducted each year and Storm Review Meetings are held following major events. These meetings focus on the successes and challenges of the most recent emergency service restoration effort. Service restoration process improvements are made as needed to improve response time and effectiveness during the next restoration effort.

Conclusion

Trees and Equipment Failures are the top two outage causes that substantially negatively affect electrical reliability to Duquesne customers and contributed to over 62% of the total lost CMI (Duquesne uses kVA-minutes interrupted) in 2022.

Trees, and especially OROW trees, continue to be a chronic problem for Duquesne, as well as every EDC in Pennsylvania. The Commission recommends continued and increased efforts in vegetation management and emphasis on response times.

The Commission recognizes that Duquesne's service appears to be declining as witnessed by the data shown below. As can be seen in Figure 15 below, the number of connected kVA interrupted annually is on an upward trend. As shown in Figure 16 below, the kVA-minutes interrupted are also trending upward. Figure 17 below shows an overall increase in actual interruption events. Figure 18 below is included to indicate a growth in the number of customers served. Because Duquesne records its service indicators in kVA rather than customers individually, it is difficult to measure actual impact upon customers. However, the trends in kVA should equivocate to the impacts upon customers.

Figure 11 - Duquesne CAIDI (minutes)

Figure 12 - Duquesne SAIFI (interruptions per customer)

Figure 13 - Duquesne Outage Causes (percent of total outages)

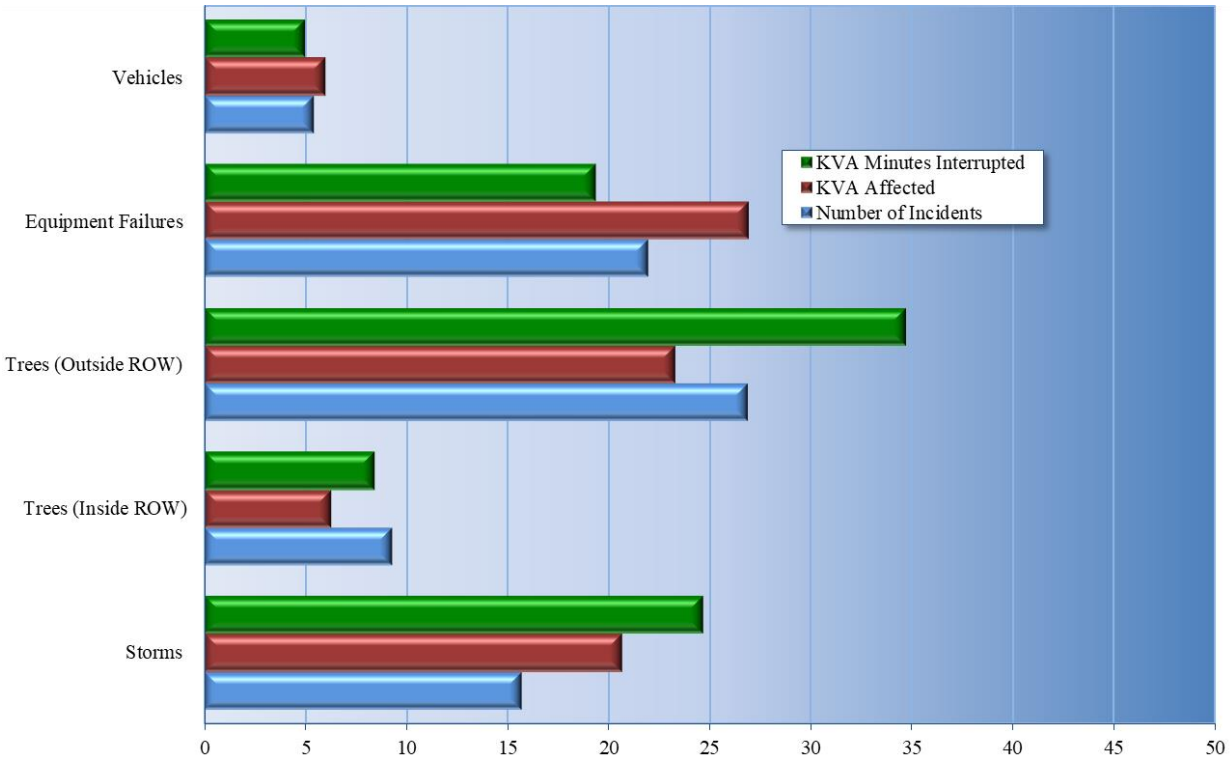


Figure 14 - Duquesne Outage Tracking (number of incidents)

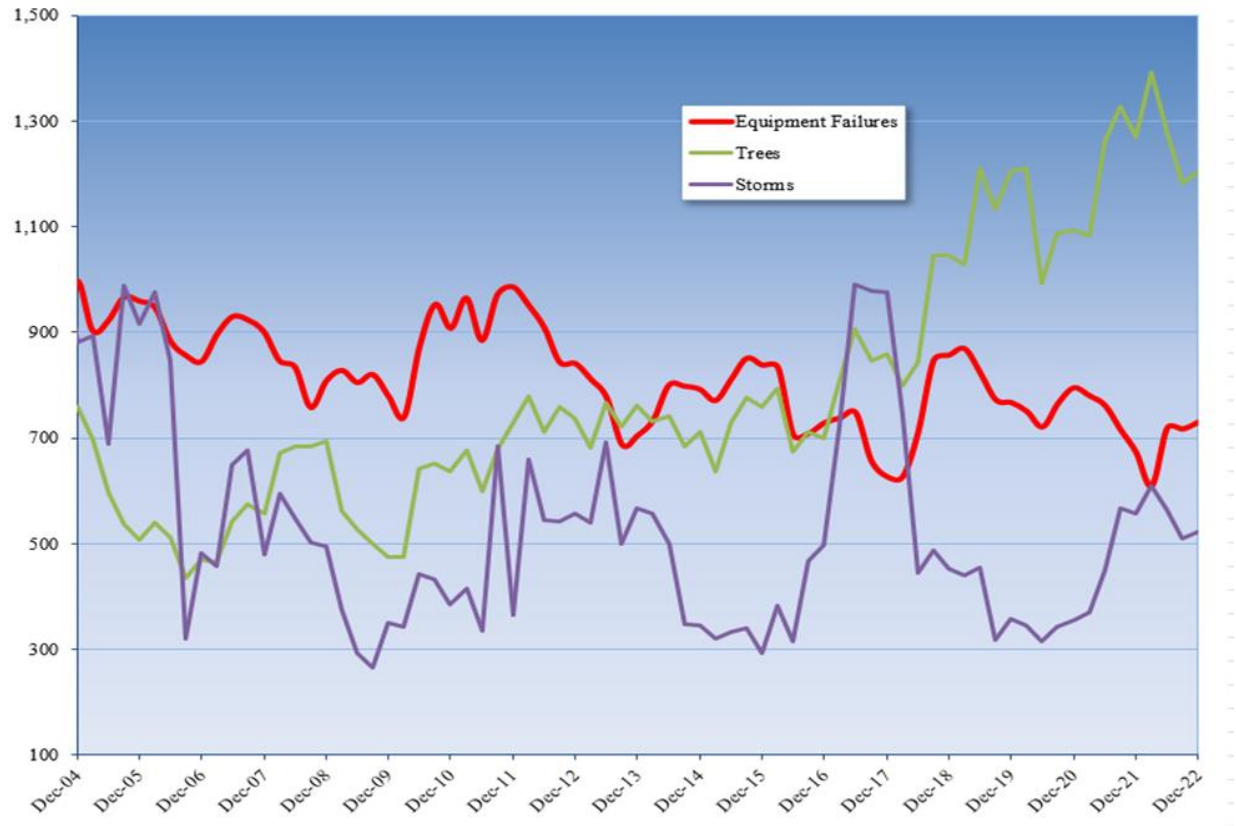


Figure 15 - Duquesne Outage Tracking (number of KVA Interrupted)

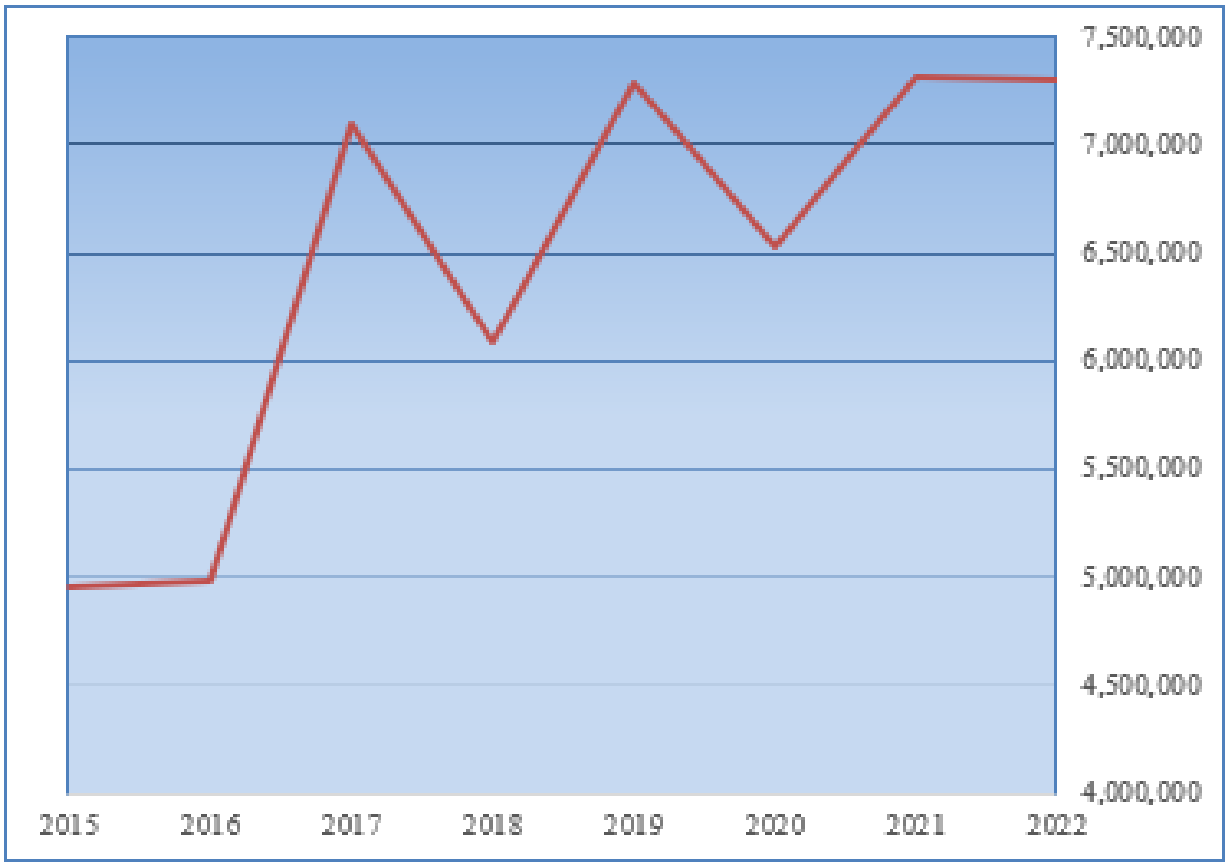


Figure 16 - Duquesne Outage Tracking (KVA-Minutes of Interruptions, or CMI)

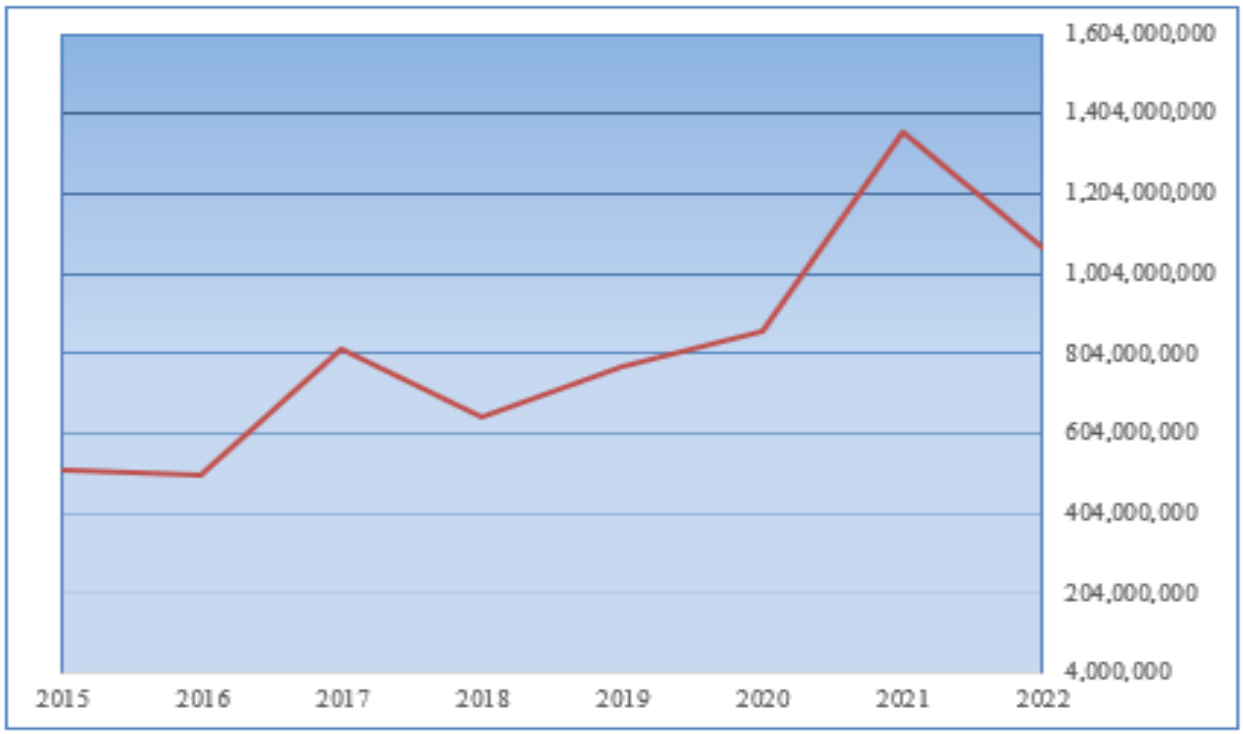


Figure 17 - Duquesne Outage Tracking (number of interruptions annually)

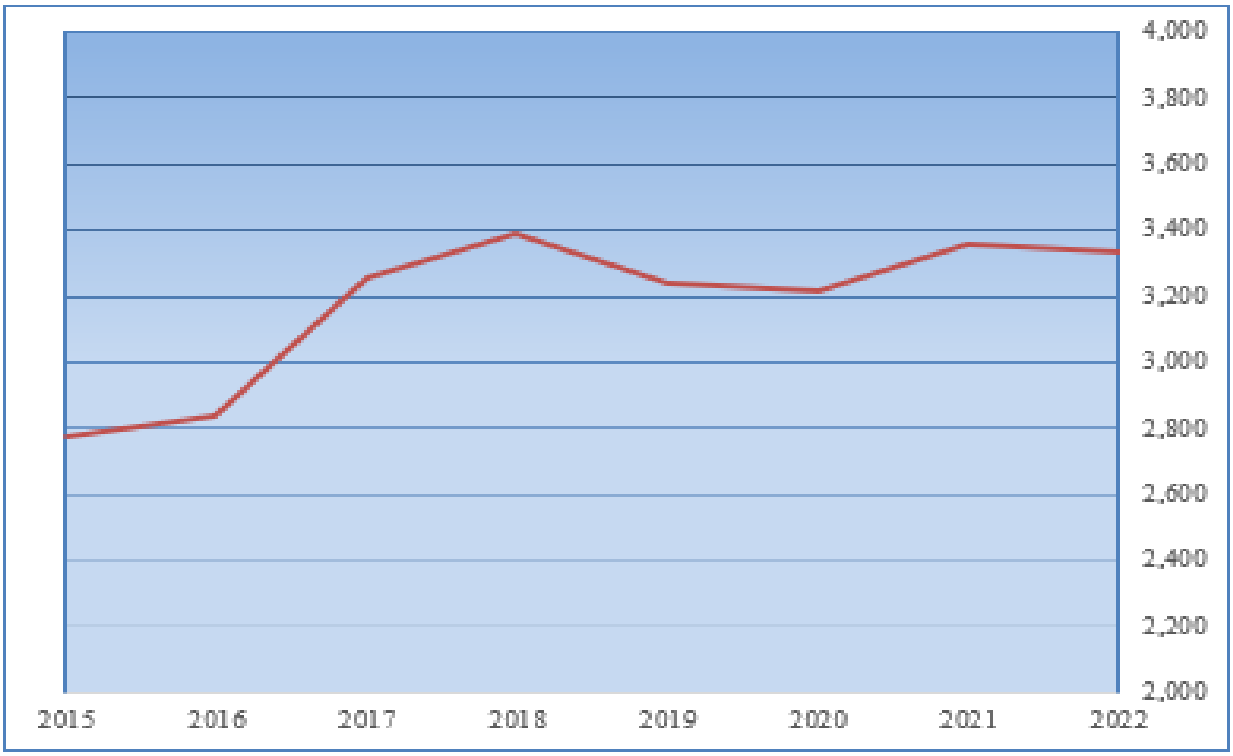
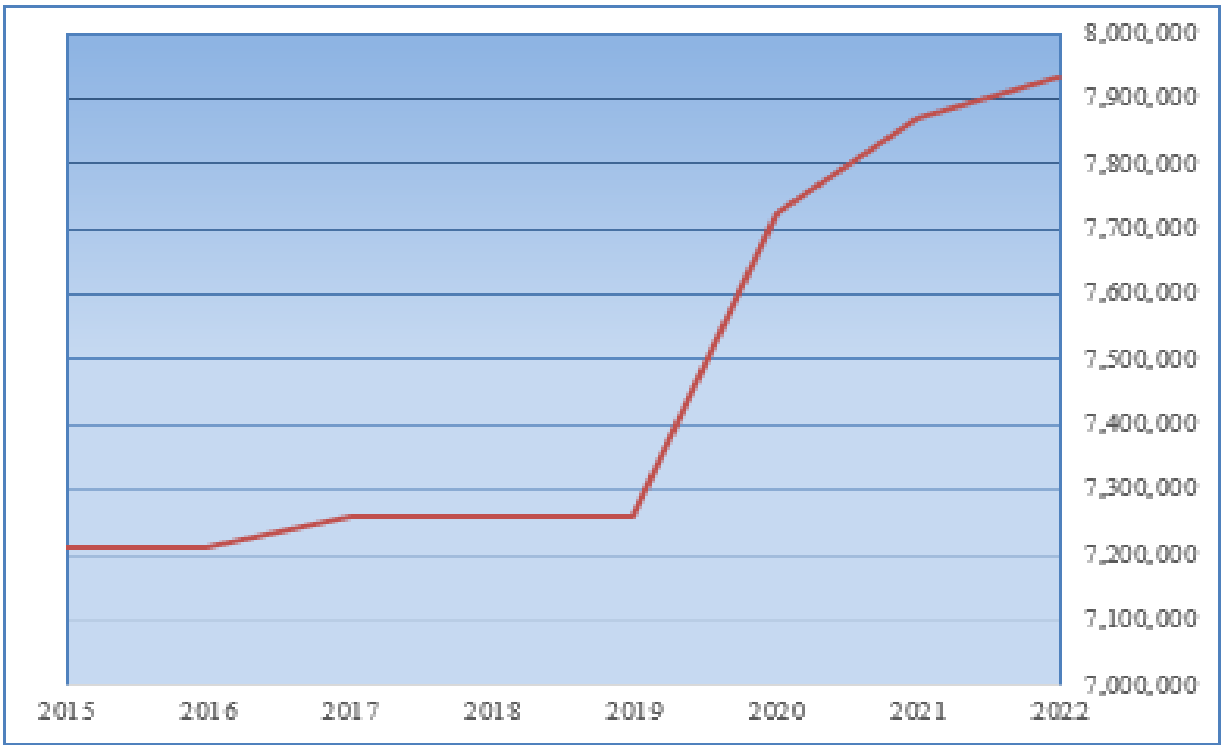


Figure 18 - Duquesne kVA Served (may reflect the number of customers served)



Metropolitan Edison Company

Metropolitan Edison Company (Met-Ed) has a service territory of about 3,300 square miles that serves about 586,829 customers.

In 2022, Met-Ed experienced 760,672 customer interruptions and 121.8 million CMI as compared to: 772,644 customer interruptions and 133.4 million CMI in 2021; 724,138 customer interruptions and 108.4 million CMI in 2020; 874,452 customer interruptions and 143.3 million CMI in 2019; 713,881 customer interruptions and 92.8 million CMI in 2018.

Met-Ed experienced a Major Event on Dec. 23, 2022. The Major Event impacted over 65,662 customers, which is not reflected in the totals above.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 173 minutes in 2021 to 160 minutes in 2022; failed to achieve benchmark by 36.8%.

3-year average: Decreased from 162 minutes in 2021 to 161 minutes in 2022; failed to achieve standard by 24.8%.

SAIDI

Rolling 12-month: Decreased from 233 minutes in 2021 to 211 minutes in 2022; failed to achieve benchmark by 56.3%.

3-year average: Decreased from 225 minutes in 2021 to 211 minutes in 2022; failed to achieve standard by 29.7%.

SAIFI

Rolling 12-month: Decreased from 1.35 outages in 2021 to 1.32 outages in 2022; failed to achieve benchmark by 14.8%.

3-year average: Decreased from 1.39 outages in 2021 to 1.31 outages in 2022; failed to achieve standard by 3.4%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 19 and 20 below. Beginning in 2004, Met-Ed's CAIDI performance trend has been erratic, and from 2013 to present has been trending upward. Met-Ed's 2022 rolling 12-month CAIDI is above both the benchmark and standard upper-control-limit-lines. While CAIDI performance has improved somewhat since 2021, it remains outside of acceptable tolerances, and more management attention is needed to address the recent poor CAIDI performance and return the trend line below the "green" benchmark performance upper-control-limit-line. Vegetation control may improve repair times by reducing larger and more damaging foliage contacts and overhanging canopy trees and limbs including off right of way trees.

Beginning in 2004, Met-Ed 's SAIFI performance, see Figure 20 below, has been erratic and frequently above the benchmark. From 2007 onward, the overall trend has been continually above benchmark, 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. As of December 2022, SAIFI remained below the "red" standard performance upper-control limit-line, but still above the benchmark measure. By all measures this shows the continuation of unacceptable performance.

Outage Causes

Figure 21 below, shows the top five reported outage cause categories in 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. OROW trees and equipment failure (which includes line failure) were the top causes of outages, customers affected, and customer minutes interrupted. Approximately 67% of customer minutes interrupted was caused by trees and equipment failure.

Figure 22 below, shows the historical trend of the top five main outage causes. Trees and equipment failure are the two 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 LTIIP. This plan includes expenditures and programs designed to accelerate repairment, improvement or replacement of aging infrastructure 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 to increase overall spending in the 2019 program year. The Petition was approved, as filed, by Commission Order entered on May 23, 2019.[34] On Aug. 30, 2019, Met-Ed, along with the other FirstEnergy Companies (Penelec, Penn Power, and West Penn), filed a petition for a second LTIIP for the years 2020 through 2024. The petition was approved by Commission Order entered on Jan. 16, 2020.[35]

The PUC has also been performing extra monitoring of Met-Ed's work management system and Reliability Improvement Plan (RIP) beginning in 2015 because of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.[36] Met-Ed's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

[34] *See, Petition of Metropolitan Edison Company for Approval of Modification of its Long-Term Infrastructure Improvement Plan,* at Docket No. P-2015-2508942.
[35] *See, Petition of Metropolitan Edison Company for Approval of its Long-Term Infrastructure Improvement Plan,* at Docket No. P-2019-3012618.
[36] Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994

The FirstEnergy Companies note that they utilize core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Inspection and Maintenance (I&M): FirstEnergy notes that its Distribution Inspection & Maintenance Practices are designed to assist in determining the need for, and prioritization of, the repair or replacement of distribution system components and facilities.

- Resistograph Technology: FirstEnergy avers that since 2021 the Companies have been using Resistograph technology. Utility poles showing incipient decay or poles that are thirty-five years old or older will be inspected by the use of a Resistograph. The Resistograph is a sophisticated electronically controlled drill that provides increased accuracy, when compared to manual drilling, in measuring the relative density of wood in timber structures. Driven by a drill motor, a long, thin needle is inserted into the wood pole in order to assess its density, structural integrity, and shell thickness.

- Vegetation Management: FirstEnergy notes that routine cycle tree trimming 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. FirstEnergy notes that they are limited in their ability to legally address all forms of OROW tree management. However, priority OROW trees are identified when significantly encroaching the corridor and removed when customer consent is obtained or easement rights permit. FirstEnergy notes that portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. Portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. FirstEnergy avers that in response to damage caused by the Emerald Ash Borer, a program to proactively remove ash trees OROW was implemented. Post-storm circuit patrols target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead to a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

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

- Load Forecasting and Distribution Planning: FirstEnergy notes that the load forecasting application 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: FirstEnergy 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.

- LTIIP: The FirstEnergy Companies began to execute their respective LTIIP programs in 2016. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. Met-Ed's current LTIIP includes initiatives and expenditures within these two focus areas that are designed to maximize sustained reliability over the long-term.

The FirstEnergy Companies note that in addition to the reliability programs above, the FirstEnergy Companies also utilize various strategies to efficiently respond to customer and equipment outages. These include, but are not limited to:

- Minimizing Outage Impact: The Companies incorporate design philosophies that support grid operation resulting in maximized reliability. These philosophies include instantaneous breaker tripping on select circuits, circuit sectionalizing devices, and remote device operation (such as supervisory control and data acquisition) to minimize the impact of an outage when possible.

- Storm Exercises: Each FirstEnergy Company performs an annual storm exercise. FirstEnergy notes that a well-designed exercise provides a low-risk environment to test and validate capabilities, familiarize personnel with plans, procedures, roles, and responsibilities, and foster meaningful interaction and communication across internal and external organizations.

- Summer Readiness: FirstEnergy notes that Summer is the time when most electric utilities experience the highest system loads and most damaging storms. In order to prepare for this period of the year, the FirstEnergy Companies perform summer readiness activities such as capacitor inspections, substation inspections, transmission system reliability and capability review, and post-storm reviews to identify and disseminate lessons learned after significant events.

- Smart Meters: The FirstEnergy Companies have completed mass deployment of smart meters to customers across Pennsylvania. First Energy notes that smart meter installation is a step toward a more modernized electric system that will enable automated meter readings. Smart meters also assist during outage restoration periods, especially when there are a significant number of single customer outages, by allowing the FirstEnergy Companies to ping the meter to determine if a customer's service has been restored.

- Incident Command System (ICS): The FirstEnergy Companies are beginning to utilize a more formalized ICS structure, which is designed to enable effective and efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organization. By expanding the use of ICS, FirstEnergy notes that its incident response ability is improved, and reliability is enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

Proposed Solutions – Met-Ed

To address outages caused by trees, Met-Ed performs cycle-based tree trimming and enhanced tree trimming in select locations. Enhanced tree trimming removes healthy limbs overhanging primary

conductors. Met-Ed is limited in its ability to legally address all forms of OROW tree management. However, Met-Ed is legally permitted to identify priority OROW trees that are dead, dying, diseased, leaning, and significantly encroaching the corridor and remove those trees when customer consent is obtained or easement rights permit. Met-Ed is very active in pursuing this option, where available. Trees identified as a potential cause of a future outage are removed to prevent an interruption of electrical service to Met-Ed's customers. Met-Ed continues its program to mitigate trees subject to damage from the Emerald Ash Borer.

To reduce the likelihood of equipment failure outages, Met-Ed follows I&M programs that set forth schedules for regular inspections of distribution and substation facilities. These programs are geared towards specific components such as capacitors, poles, circuits, transformers, radio-controlled switches, substations, and reclosers. Equipment identified is repaired or replaced as appropriate.

Conclusion

Trees and Equipment Failure are the top two outage causes that substantially negatively affect electrical reliability to Met-Ed's customers. In 2022, the trees and equipment failure outage causes continue to contribute to over 67% of the total CMI 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 performance trend is troubling, with a continuing trend above Benchmark and Standard performance upper-control-limit-lines. Met-Ed has not achieved benchmark performance for SAIFI sinch 2014. The Commission recommends that increased 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 improvement in reliability for the FirstEnergy Companies in 2023 and 2024.

The Commission recommends increased efforts in vegetation management and emphasis on response times.

The Commission recognizes that, overall, Met-Ed's reliability performance is declining as witnessed by the data shown below. As can be seen in Figure 23 below, the number of Met-Ed customers interrupted annually is on an upward trend. As shown in Figure 24 below, CMI is also trending upward. Figure 25 below shows a significant increase in the number of interruption events since 2015.

Figure 19 - Met-Ed CAIDI (minutes)

Figure 20- Met-Ed SAIFI (interruptions per customer)

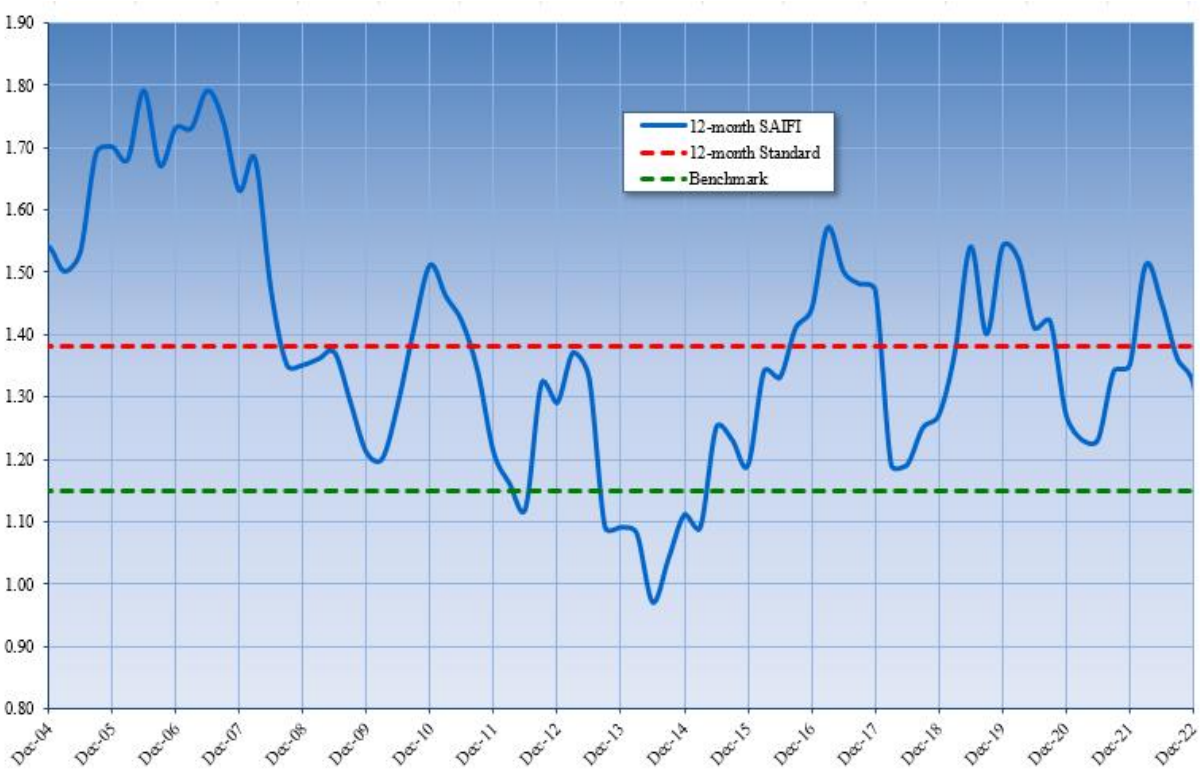


Figure 21 - Met-Ed Causes (percent of total outages)

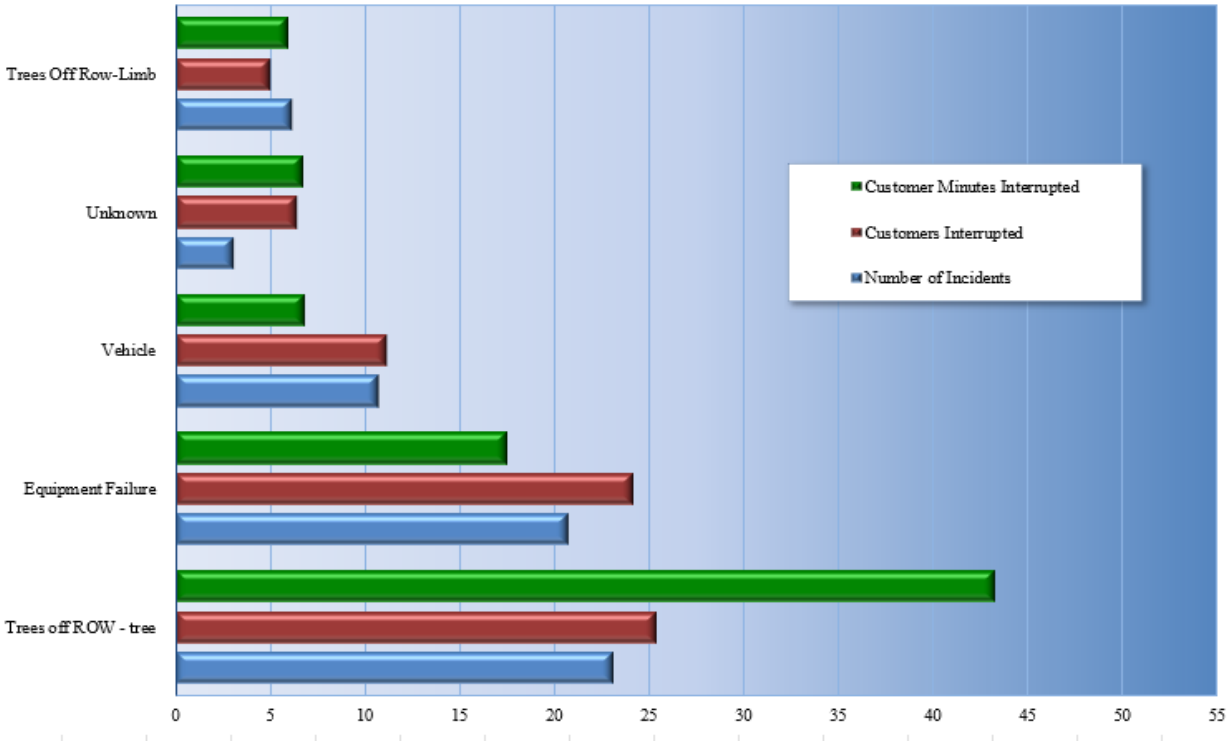


Figure 22 - Met-Ed Outage Tracking (number of incidents)

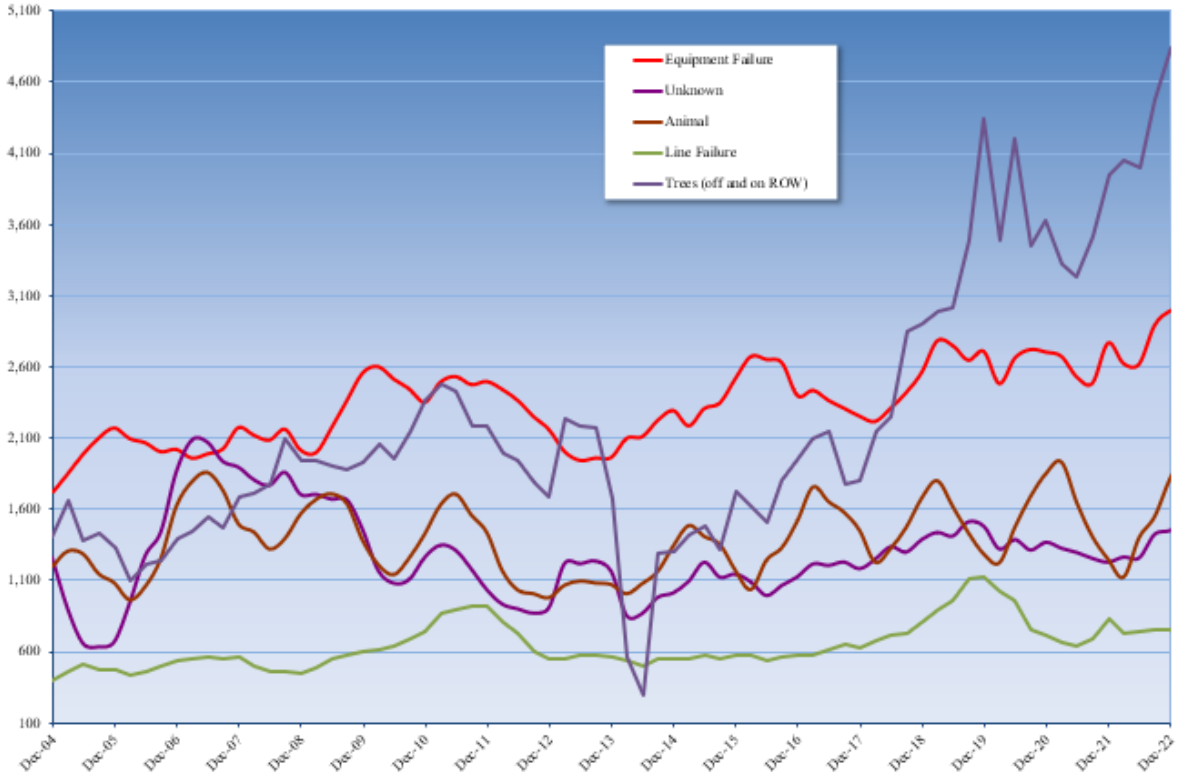


Figure 23 – Met-Ed Outage Tracking (number of customers interrupted)

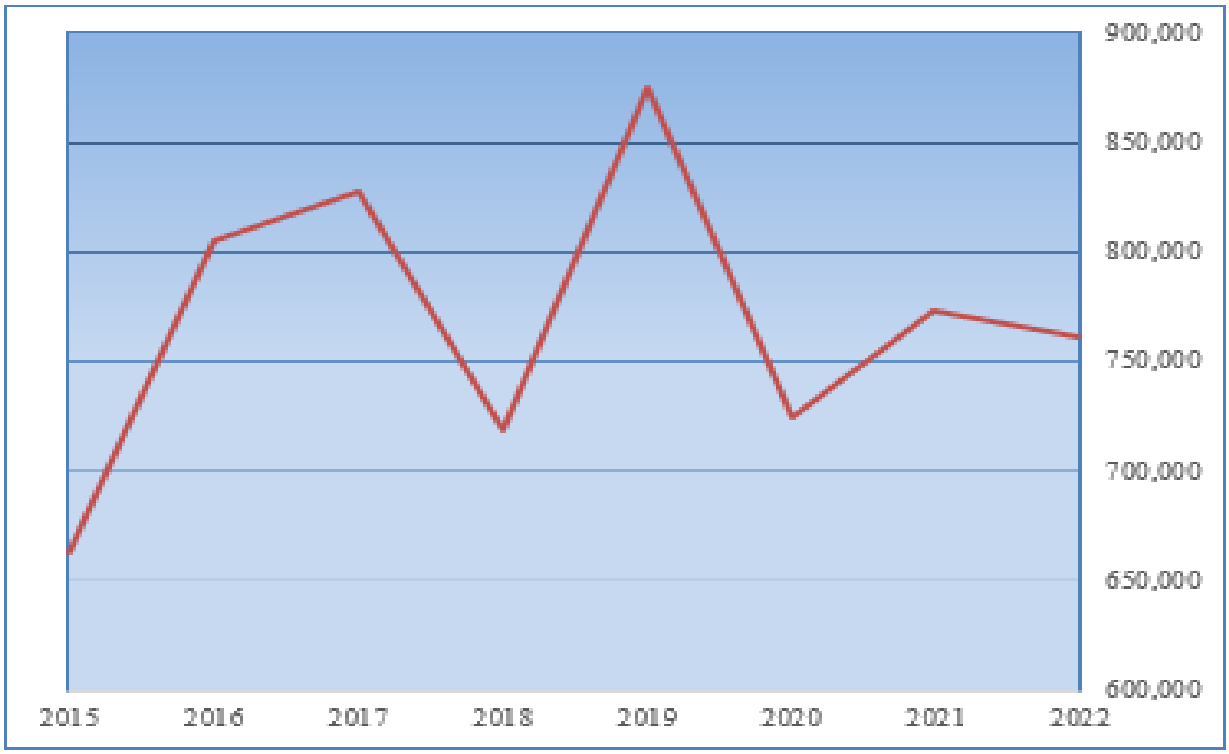


Figure 24 – Met-Ed Outage Tracking (Customer-Minutes of Interruptions, or CMI)

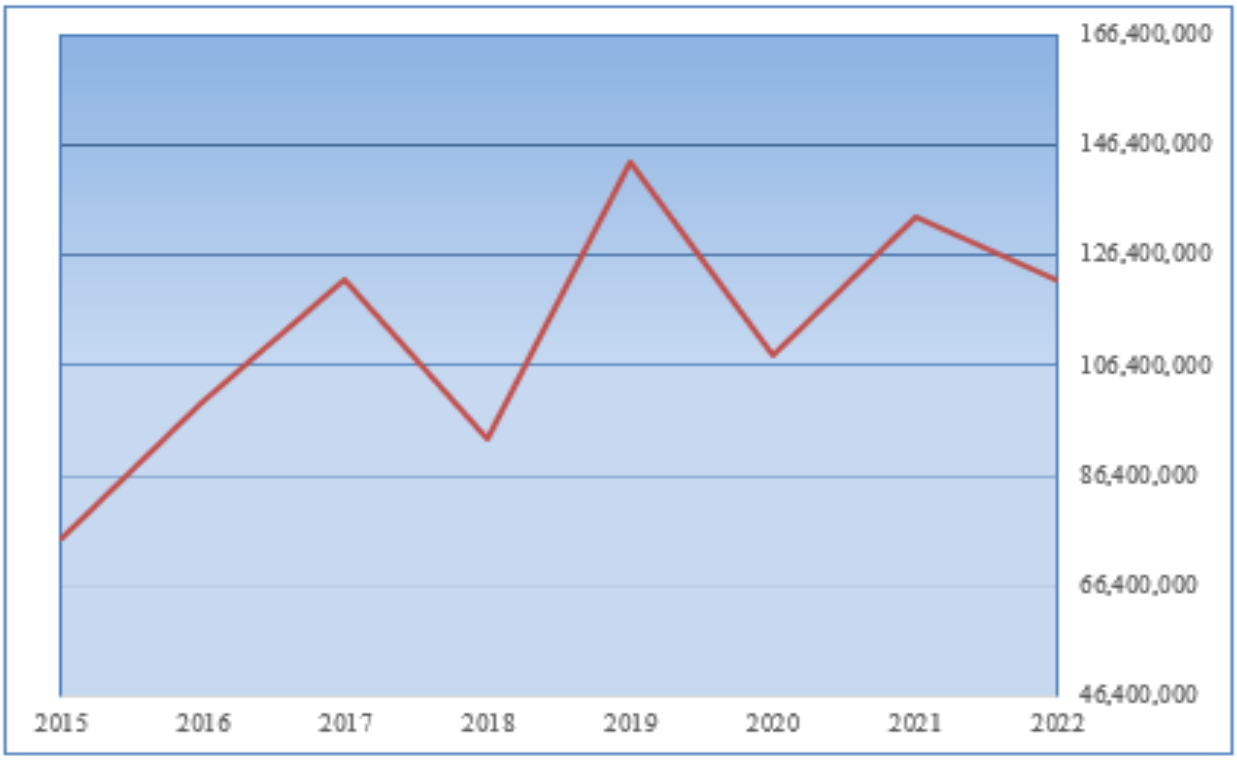
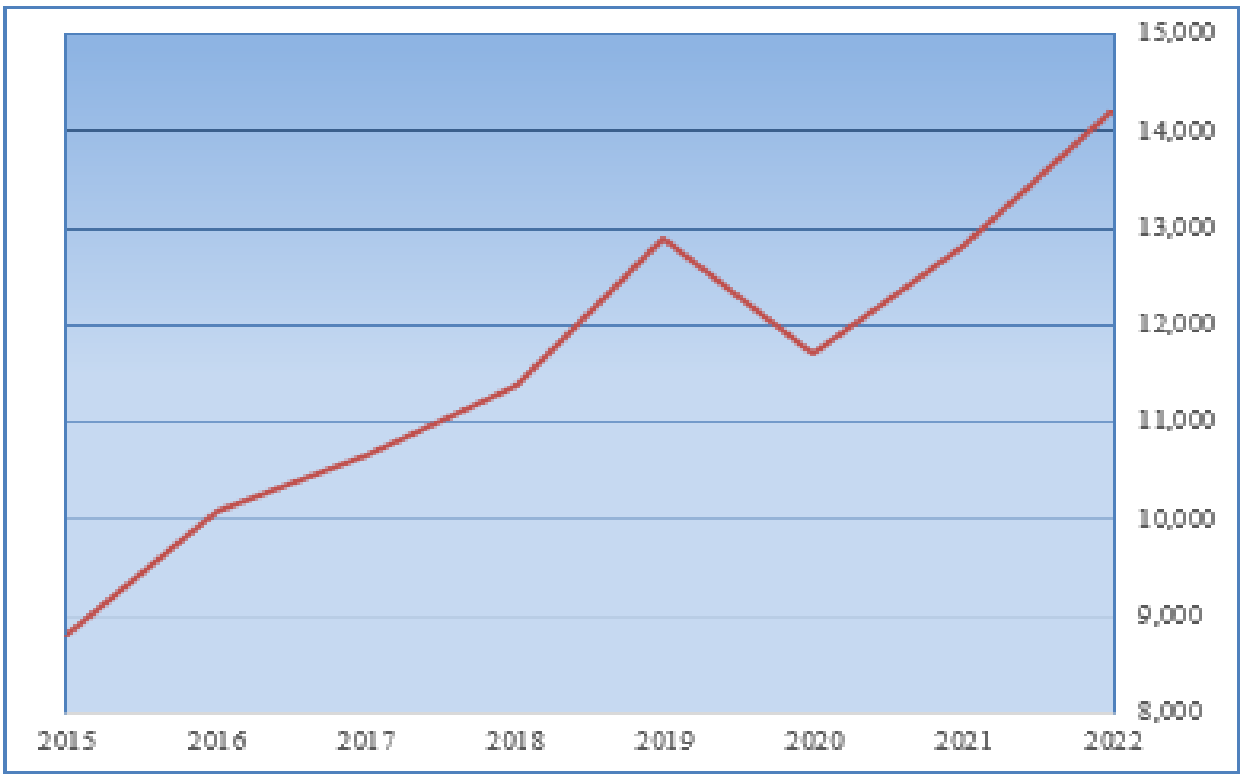


Figure 25 – Met-Ed Outage Tracking (number of interruptions annually)



PECO Energy Company

PECO Energy Company (PECO) has a service territory of about 2,000 square miles that serves a well-developed distribution system serving about 1.68 million customers.

In 2022, PECO experienced 1.2 million customer interruptions and 119 million CMI as compared to: 1.48 million customer interruptions and 275 million CMI in 2021; 1.51 million customer interruptions and 203 million CMI in 2020; 1.80 million customer interruptions and 341 million CMI in 2019; and 1.59 million customers interruptions and 174.6 million CMI in 2018.

PECO experienced no Major Events in 2022.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 187 minutes in 2021 to 99 minutes in 2022; achieved benchmark by 11.6%.

3-year average: Decreased from 170 minutes in 2021 to 140 minutes in 2022; failed to achieve standard by 14.1%.

SAIDI

Rolling 12-month: Decreased from 164 minutes in 2021 to 71 minutes in 2022; achieved benchmark by 48.6%.

3-year average: Decreased from 164 minutes in 2021 to 119 minutes in 2022; achieved standard by 28.7%.

SAIFI

Rolling 12-month: Decreased from 0.88 outages in 2021 to 0.71 outages in 2022; achieved benchmark by 42.3%.

3-year average: Decreased from 0.95 outages in 2021 to 0.83 outages in 2022; achieved standard by 38.5%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 26 and 27 below. 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 far above standard. PECO's CAIDI performance in 2020 was significantly better, but still slightly above the rolling 12-month Standard, and far above the rolling 12-month Benchmark. The CAIDI performance was significantly worse in 2020, much of which could be attributed to the effects of Hurricane Ida. During 2022, PECO's CAIDI improved greatly to a level well below Benchmark level. Management should continue to work on improving PECO's CAIDI performance in 2023 to maintain current performance levels.

Beginning in December 2012, PECO's SAIFI benchmark performance trend has been positive, as shown below on Figure 27. 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 28 below shows the reported 2022 outage-cause categories, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Tree-related issues (this includes vegetation in-growth and vegetation broken/uprooted) were the top cause of CMI and tied with equipment failure for the number of incidents. In terms of customers affected, the leading cause was equipment failure at approximately 38% and the second leading cause was tree-related issues at approximately 37%.

Figure 29 below, shows historical trend of the top three main outage causes. Equipment failure and Vegetation Broken/Uprooted (i.e., tree-related) are the two most frequent outage causes that are significantly and negatively affecting PECO's distribution system reliability and resilience, as well as nearly every EDC in Pennsylvania.

General Reliability

PECO notes that the total storm interruptions in 2019 and 2020 were elevated and that the remnants of Hurricane Ida negatively impacted CAIDI in 2021. As part of its reliability program, PECO notes that it has a well-managed vegetation management program to address tree-related issues through protecting the electric facilities while respecting the beauty and environmental importance of the vegetation. In response to invasive insects that cause ash tree deaths, PECO notes that it has increased its rate of removal of ash trees under a dedicated mitigation program.

PECO notes that it completed the execution of its System 2020 LTIIP, with additional capital investments to construct reliability-related improvements over the period 2016 through 2020 focused on storm hardening and resiliency, cable replacements, and substation retirements with related distribution system upgrades.[37] PECO notes that it is increasing and enhancing these investments in its 2021-2025 LTIIP II.[38] PECO also notes that it increased its investment in replacement of overhead components and infrastructure and underground cable, and in adding reclosers to its distribution system in the years 2018 through 2022.

PECO notes that it also continues to install and upgrade the latest proven and cost-effective technology in support of reliability and safe, efficient operations. Examples include computers in the vehicles of field workers, smart electronic meters with communications and diagnostic capabilities, electronically controlled switching, and communication equipment to automatically reroute power around problem areas, a new geographic information system (GIS), and a state-of the-art central distribution system management computer system.

Conclusion

Vegetation-related, Equipment Failures and Transmission/Substation problems are the top three outage causes that substantially negatively affect electrical reliability to PECO customers. In 2022, Vegetation and Equipment Failure outage causes contributed to over 83% of the total CMI as compared to 66% in 2021.

PECO experienced over 24 ROEs from 2018 through 2021, which appear to have negatively impacted CAIDI. PECO has sustained SAIFI benchmark performance and is considered an excellent SAIFI benchmark performer. CAIDI performance returned to below Benchmark levels during 2022. TUS finds that PECO, like many of the Pennsylvania EDCs, should re-examine and potentially increase efforts to manage vegetation.

The Commission recommends continued and increased LTIIP efforts to improve equipment and reduce equipment caused interruptions. PECO should continue or increase vegetation management and increase emphasis on response times.

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[37] *See, Petition of PECO Energy Company for Approval of their Electric Long-Term Infrastructure Improvement Plan,* Order entered Oct. 22, 2015, at Docket No. P-2015-2471423.

[38] *See, Petition of PECO Energy Company for Approval of its Second Long-Term Infrastructure Improvement Plan for its Electric Operations,* Order entered Nov. 19, 2020, at Docket No. P-2020-3020974.

The Commission recognizes that, overall, PECO's service to its customers is improving and currently registers as one of the best efforts by an EDC in Pennsylvania. PECO's improvement and current efforts can be witnessed by the data shown below.

As can be seen in Figure 30 below, the number of PECO customers interrupted annually is trending downward. As shown in Figure 31 below, CMI is also trending downward and has improved over the past six years. Figure 32 below shows an overall reduction in actual interruption events. PECO's number of interruptions is less than in the past four years. The Commission recognizes this as a positive achievement and recommends that PECO's efforts continue.

Figure 26 - PECO CAIDI (minutes)

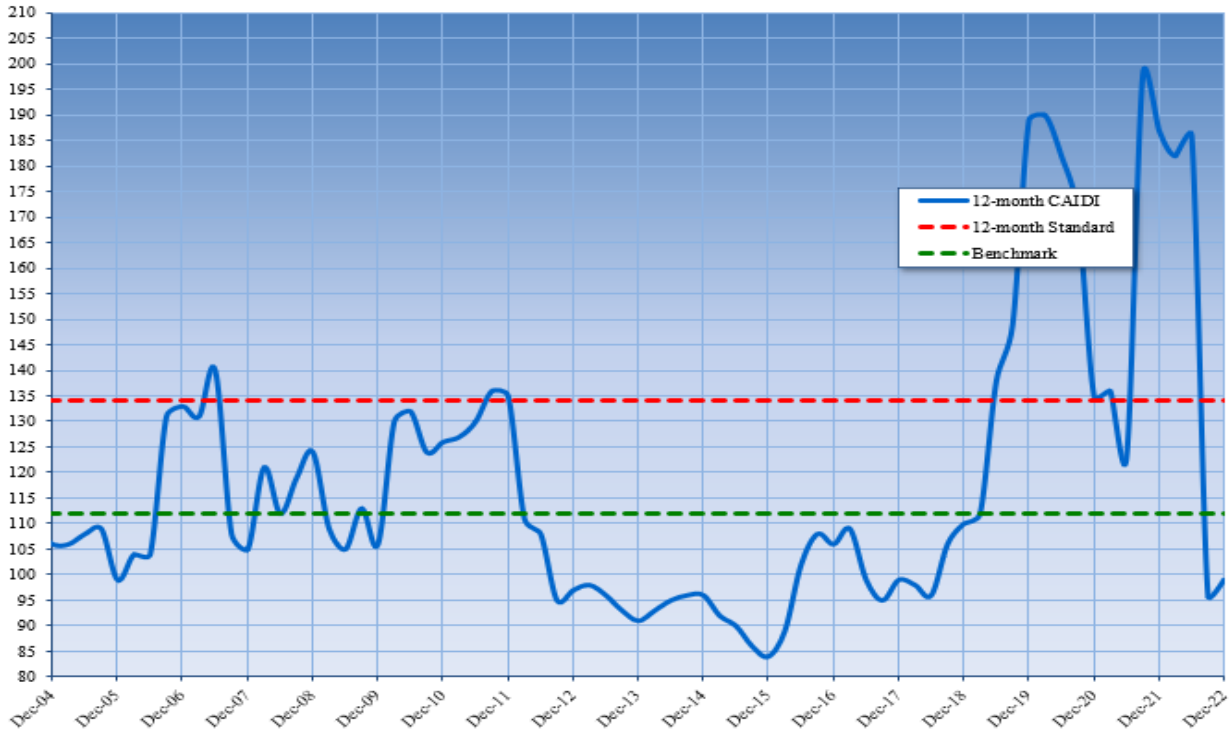


Figure 27- PECO SAIFI (interruptions per customer)

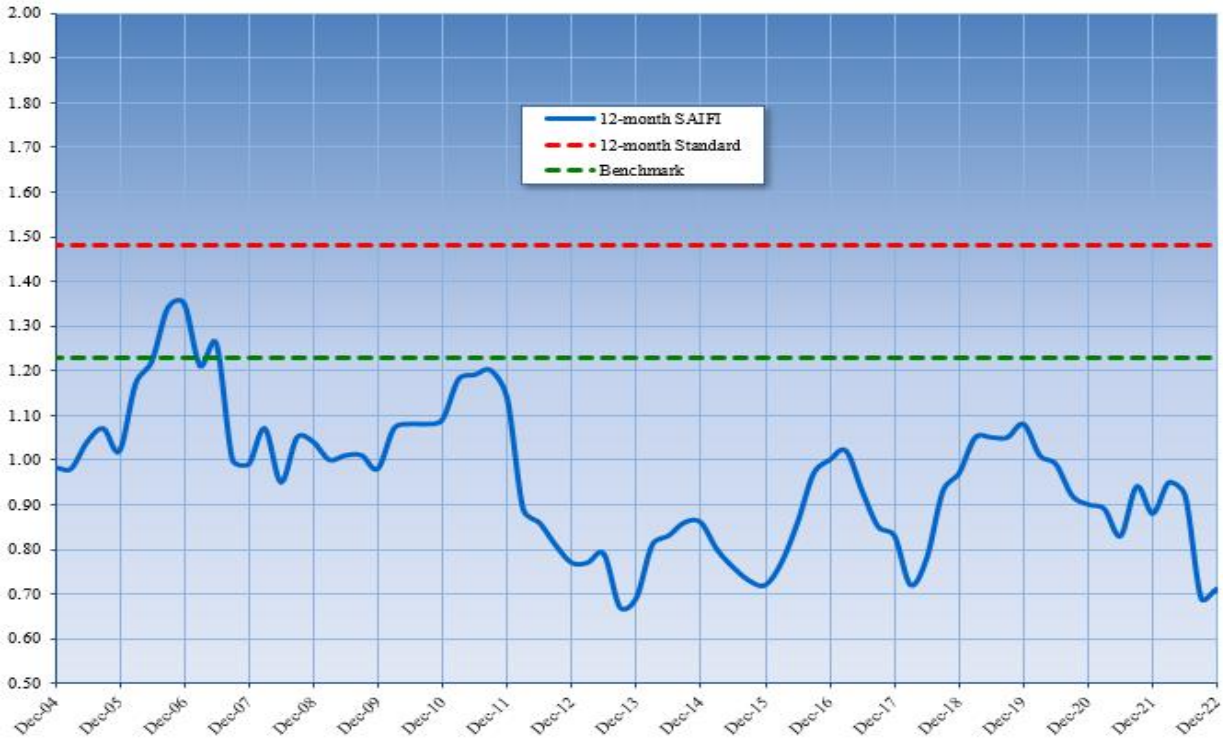


Figure 28- PECO Outage Causes (percent of total outages)

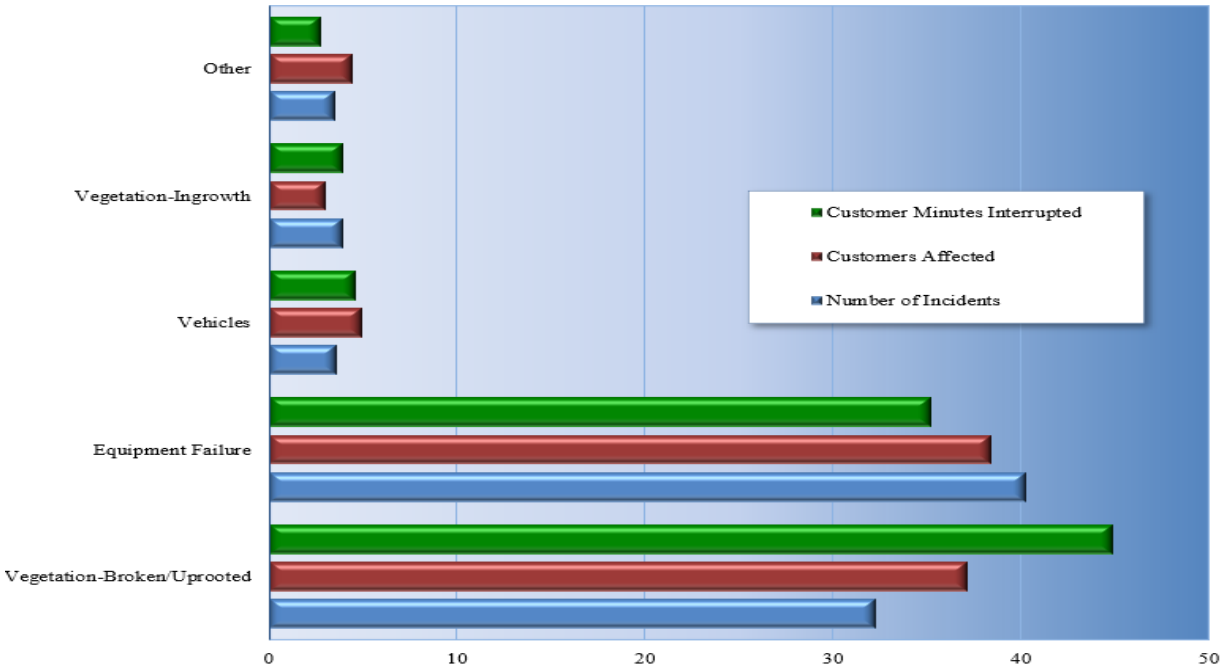


Figure 29- PECO Outage Tracking (number of incidents)

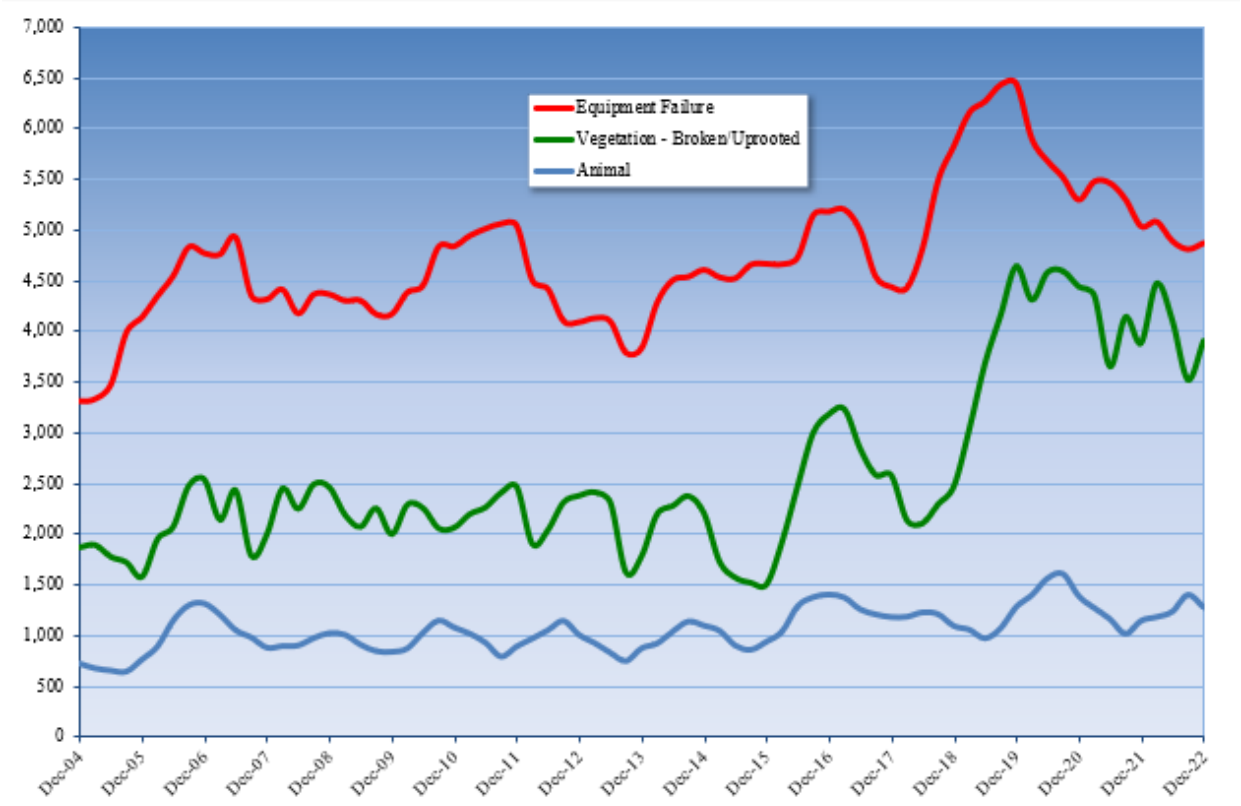


Figure 30 – PECO Outage Tracking (number of Customers Interrupted)

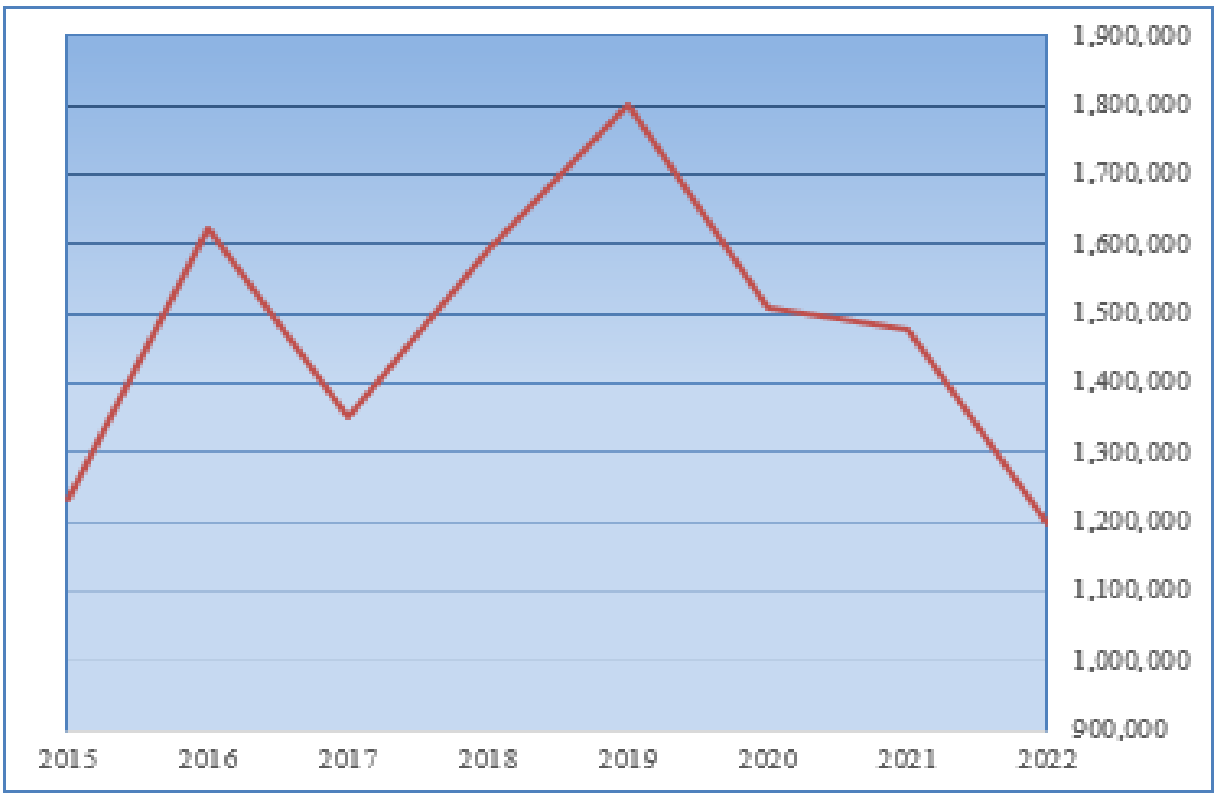


Figure 31 – PECO Outage Tracking (Customer-Minutes of Interruptions, or CMI)

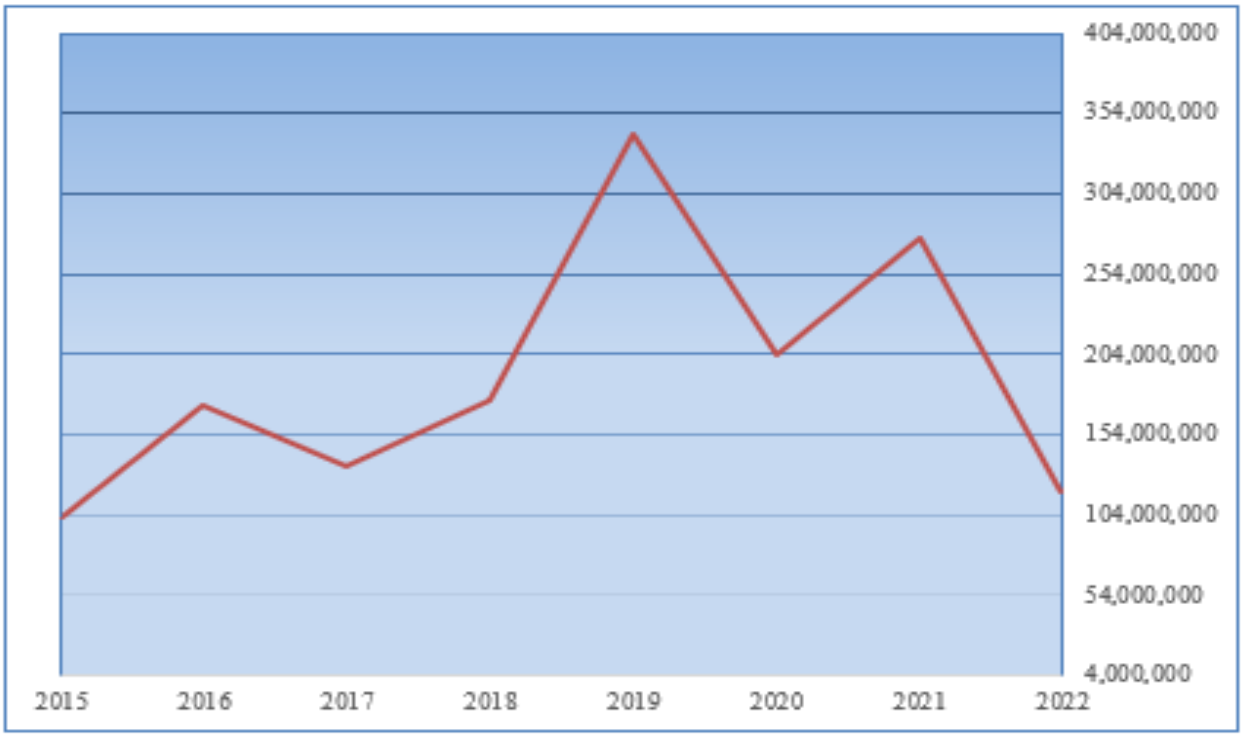
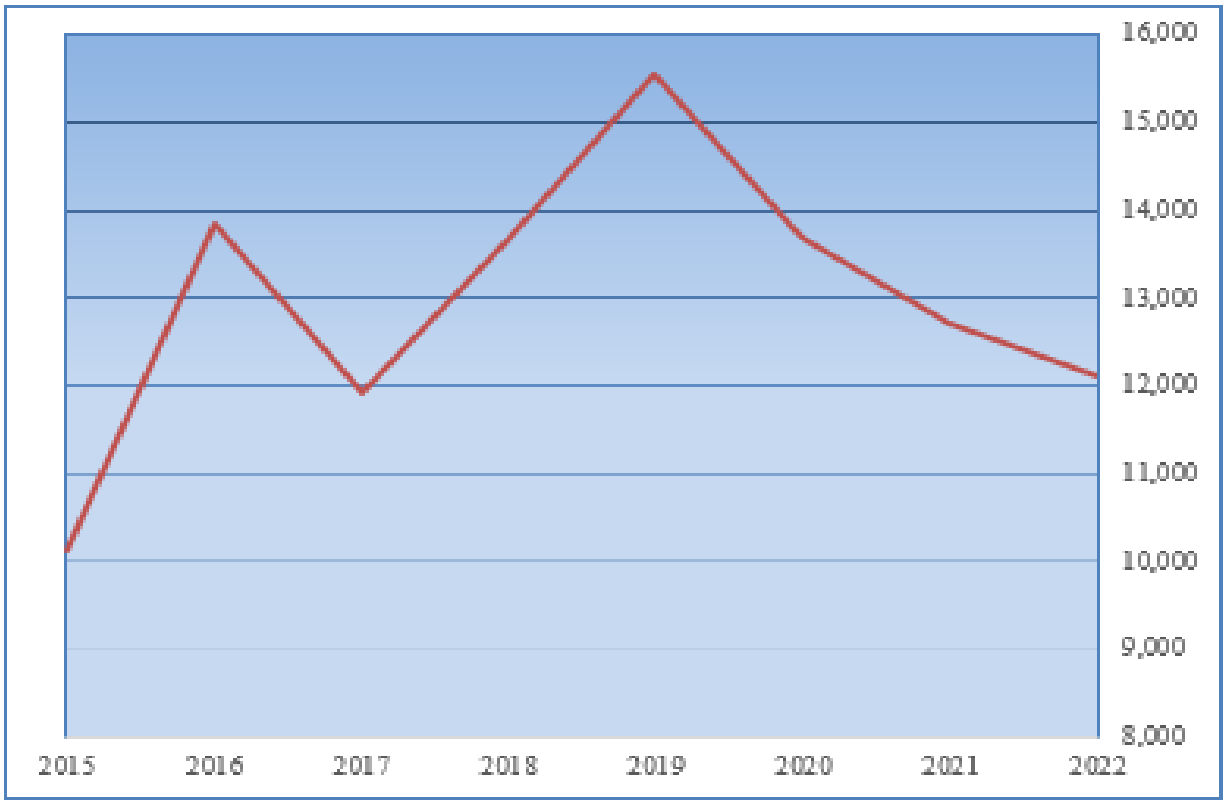


Figure 32 – PECO Outage Tracking (number of interruptions annually)



Pennsylvania Electric Company

Pennsylvania Electric Company (Penelec) has a service territory of about 17,600 square miles serving approximately 588,463 customers.

In 2022, Penelec experienced 1,062,923 interruptions and 211.1 million CMI as compared to: 1,065,004 customer interruptions and 160.5 million CMI in 2021; 914,716 customer interruptions and 124.1 million CMI in 2020; 995,121 customer interruptions and 146.1 million CMI in 2019; and 992,756 customer interruptions and 113.1 million CMI in 2018.

Penelec experienced no Major Events during 2022.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 141 minutes in 2021 to 199 minutes in 2022; failed to achieve benchmark by 70.1%.

3-year average: Increased from 141 minutes in 2021 to 162 minutes in 2022; failed to achieve standard by 25.6%.

SAIDI

Rolling 12-month: Increased from 277 minutes in 2021 to 364 minutes in 2022; failed to achieve benchmark by 145.9%

3-year average: Increased from 248 minutes in 2021 to 285 minutes in 2022; failed to achieve standard by 59.2%.

SAIFI

Rolling 12-month: Decreased from 1.84 outages in 2021 to 1.83 outages in 2022; failed to achieve benchmark by 45.2%.

3-year average: Increased from 1.71 outages in 2021 to 1.75 outages in 2022; failed to achieve standard by 25.9%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 33 and 34. Beginning in 2004, Penelec's CAIDI performance trend has been inconsistent and frequently out of control. In 2021, Penelec's rolling 12-month CAIDI increased to just at the standard performance upper-control-limit-line. Penelec's CAIDI has soared to 199 at the end of 2022, which is the highest level ever experienced since the reporting period began in 2004. With CAIDI performance at this level, Penelec is required to assert more management attention to address the inconsistent performance and return CAIDI performance trend line to below the "green" benchmark performance upper-control-limit-line. Improved response times and shortened repair times will prove essential to maintaining CAIDI at or below the benchmark level. It is believed that management must focus upon improving CAIDI. The Commission expects improved response and repair times and thus improved CAIDI values.

Beginning in 2004, Penelec's SAIFI performance trend has been inconsistent and frequently outside of acceptable tolerances. From 2008 through 2022, the overall trend has been continually trending negative. For the last six calendar years, Penelec's SAIFI was above both the benchmark and standard performance upper-control-limit-lines. Penelec's overall SAIFI performance trend is outside of acceptable limits. Management must direct more attention to the poor SAIFI performance and work to move the trend line to a point below the "green" benchmark performance upper-control-limit-line. Focus upon automatic sectionalizing, auto transfer and smart grid may well prove to move and maintain SAIFI below the benchmark. Improved vegetation management is also a key to improving service reliability.

Outage Causes

Figure 35 below, shows the top five reported outage-cause categories in 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Trees OROW, Ice and Equipment Failure were the leading causes of CMI. Trees OROW and Equipment Failure were the leading causes of the number of outage incidents. The Commission is concerned by Penelec's outage cause category of Ice. This category may include damage done by both trees OROW and those within the ROW as well as weakness in equipment. FirstEnergy should consider re-categorizing the outages causes currently categorized as Ice. Generally, weather -related causes like ice, wind, snow, or rain, generally act upon an inherent system deficiency such as vegetation in ROW, vegetation just OROW, weakened poles, weakened crossarms, loose or broken brackets, and other system equipment.

Figure 36 below, shows the historical trend of the top five 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 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, by Commission Order entered on May 23, 2019.[39] On Aug. 30, 2019, Penelec, along with the other FirstEnergy Companies (Met-Ed, Penn Power, and West Penn) filed a petition for a second LTIIP for the years 2020 through 2024. The petition was approved by Commission Order entered on Jan. 16, 2020.[40]

The PUC also has been performing extra monitoring of Penelec's work management system and RIP beginning in 2015 because of a Commission Motion regarding FirstEnergy's Implementation

[39] *See, Petition of Pennsylvania Electric Company for Approval of Modification of its Long-Term Infrastructure Improvement Plan*, at Docket No. P-2015-2508936.
[40] *See, Petition of Pennsylvania Electric Company for Approval of its Long-Term Infrastructure Improvement Plan,* at Docket No. P-2019-3012615.

Plan to the findings of the Commission's Focused Management and Operations Audit.[41] Penelec's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

The FirstEnergy Companies note that they utilize core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Inspection and Maintenance (I&M): FirstEnergy notes that its Distribution Inspection & Maintenance Practices are designed to assist in determining the need for, and prioritization of, the repair or replacement of distribution system components and facilities.

- Resistograph Technology: FirstEnergy avers that since 2021 the Companies have been using Resistograph technology. Poles showing incipient decay or poles that are thirty-five years old or older will be inspected by the use of a Resistograph. The Resistograph is a sophisticated electronically controlled drill that provides increased accuracy, when compared to manual drilling, in measuring the relative density of wood in timber structures. Driven by a drill motor, a long, thin needle is inserted into the wood pole in order to assess its density, structural integrity, and shell thickness.

- Vegetation Management: FirstEnergy notes that routine cycle tree trimming 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. FirstEnergy Notes that they are limited in their ability to legally address all forms of OROW tree management. However, priority OROW trees are identified when significantly encroaching the corridor and removed when customer consent is obtained or easement rights permit. FirstEnergy notes that portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. Portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. FirstEnergy avers that in response to damage caused by the Emerald Ash Borer, a program to proactively remove ash trees OROW was implemented. Post-storm circuit patrols target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead to a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

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

- Load Forecasting and Distribution Planning: FirstEnergy notes that the load forecasting application is used to estimate future substation and circuit loading based upon historical

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

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: FirstEnergy 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.

- LTIIP: The FirstEnergy Companies began to execute their respective LTIIP programs in 2016. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. Penelec's current LTIIP includes initiatives and expenditures within these two focus areas that are designed to maximize sustained reliability over the long term.

The FirstEnergy Companies note that in addition to the reliability programs above, the FirstEnergy Companies also utilize various strategies to efficiently respond to customer and equipment outages. These include, but are not limited to:

- Minimizing Outage Impact: The Companies incorporate design philosophies that support grid operation resulting in maximized reliability. These philosophies include instantaneous breaker tripping on select circuits, circuit sectionalizing devices, and remote device operation (such as supervisory control and data acquisition) to minimize the impact of an outage when possible.

- Storm Exercises: Each FirstEnergy Company performs an annual storm exercise. A well-designed exercise provides a low-risk environment to test and validate capabilities, familiarize personnel with plans, procedures, roles, and responsibilities, and foster meaningful interaction and communication across internal and external organizations.

- Summer Readiness: FirstEnergy notes that Summer is the time when most electric utilities experience the highest system loads and most damaging storms. In order to prepare for this period of the year, the FirstEnergy Companies perform summer readiness activities such as capacitor inspections, substation inspections, transmission system reliability and capability review, and post-storm reviews to identify and disseminate lessons learned after significant events.

- Smart Meters: The FirstEnergy Companies have completed mass deployment of smart meters to customers across Pennsylvania. FirstEnergy notes that smart meter installation is a step toward a more modernized electric system that will enable automated meter readings. Smart meters also assist during outage restoration periods, especially when there are a significant number of single customer outages, by allowing the FirstEnergy Companies to ping the meter to determine if a customer's service has been restored.

- Incident Command System (ICS): The FirstEnergy Companies are beginning to utilize a more formalized ICS structure, which is designed to enable effective and efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organization. By expanding the use of ICS, FirstEnergy notes that incident response ability is improved, and reliability is

enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

Proposed Solutions – Penelec

Penelec analyzes its outage data to develop solutions for improving reliability. Penelec has identified the top outage causes for the rolling 12-month period ending Dec. 31, 2022, and the associated actions designed to address these outage causes.

To reduce outages caused by trees, Penelec performs cycle-based tree trimming which removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes OROW priority trees. Penelec is limited in its ability to legally address all forms of OROW tree management. However, Penelec is legally permitted to identify priority OROW trees that are dead, dying, diseased, leaning, and significantly encroaching the corridor and remove those trees when customer consent is obtained or easement rights permit. Penelec is very active in pursuing this option, where available. Trees identified as a potential cause of a future outage are removed to prevent an interruption of electrical service to Penelec's customers. In response to damage caused by the Emerald Ash Borer, a program to proactively remove ash trees OROW was completed in 2019. Beyond 2019, any additional ash trees are addressed under Penelec's hazardous tree maintenance process.

To reduce the likelihood of outages caused by equipment and line failure, Penelec follows I&M programs that set forth schedules for regular inspections of distribution and substation facilities. These programs are geared towards specific components such as capacitors, poles, circuits, transformers, radio-controlled switches, substations, and reclosers. Equipment identified is repaired or replaced as appropriate.

Conclusion

Trees and Equipment Failure are the top two outage causes that negatively affect electrical reliability to Penelec customers. In 2022, trees and equipment failure outage causes contributed to over 52% of the total CMI.

Beginning in 2004, Penelec's CADI and SAIFI benchmark performance has been erratic and frequently outside of acceptable tolerances. Reliability metrics at these current levels are unacceptable and Penelec through its RIP and LTIIP needs 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 improvement in reliability for the FirstEnergy Companies in 2023 and 2024.

The Commission recommends increased efforts in vegetation management, increased utilization of LTIIP process, and emphasis on improving response times.

The Commission recognizes that, overall, Penelec reliability performance is declining as witnessed by the data shown below. As can be seen in Figure 37 below, the number of Penelec customers interrupted annually continues to trend upward. As shown in Figure 38 below, CMI is also trending upward. Figure 39 below shows a significant increase in the number of interruption events.

Figure 33 - Penelec CAIDI (minutes)

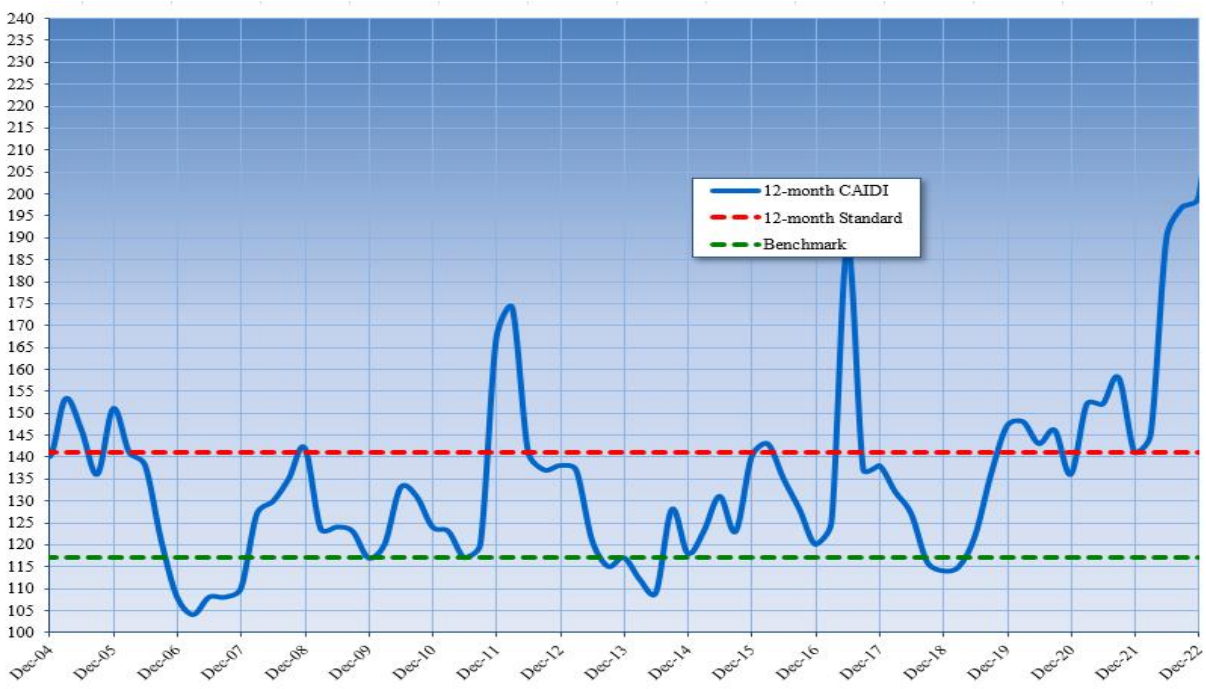


Figure 34 - Penelec SAIFI (interruptions per customer)

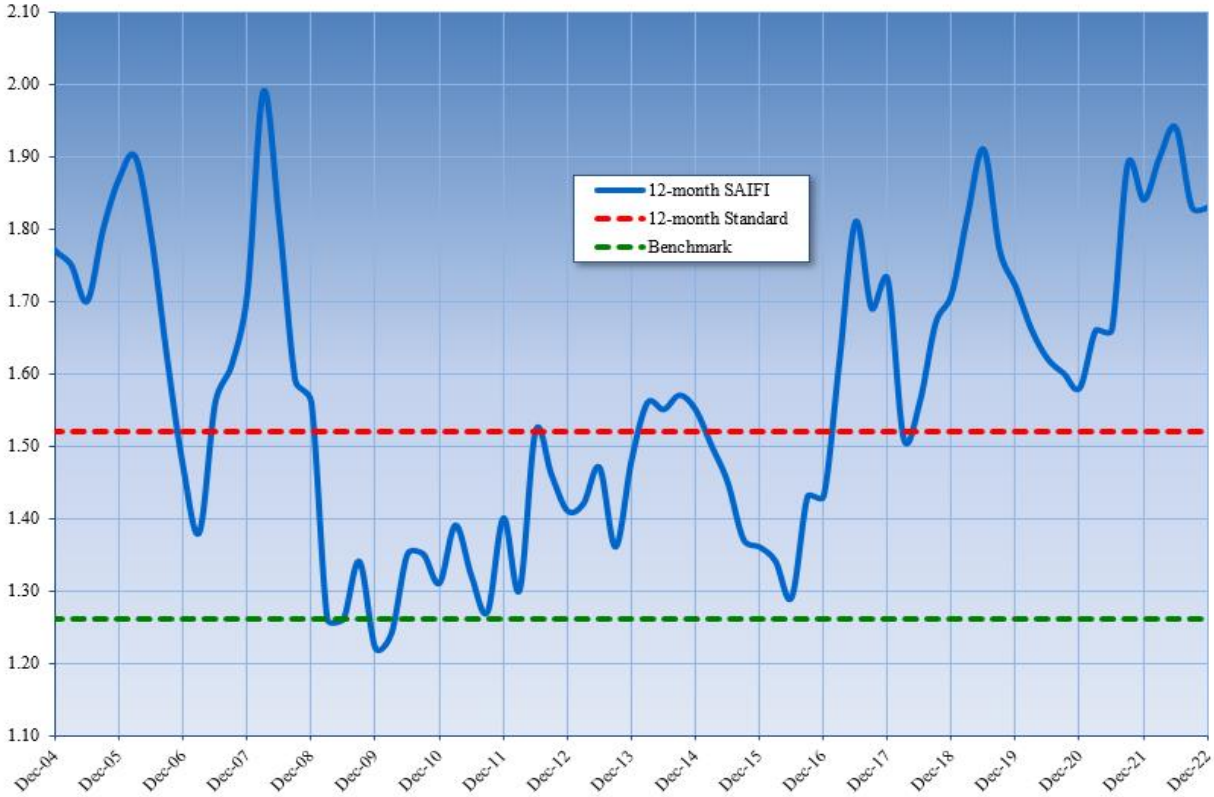


Figure 35- Penelec Outage Causes (percent of total outages)

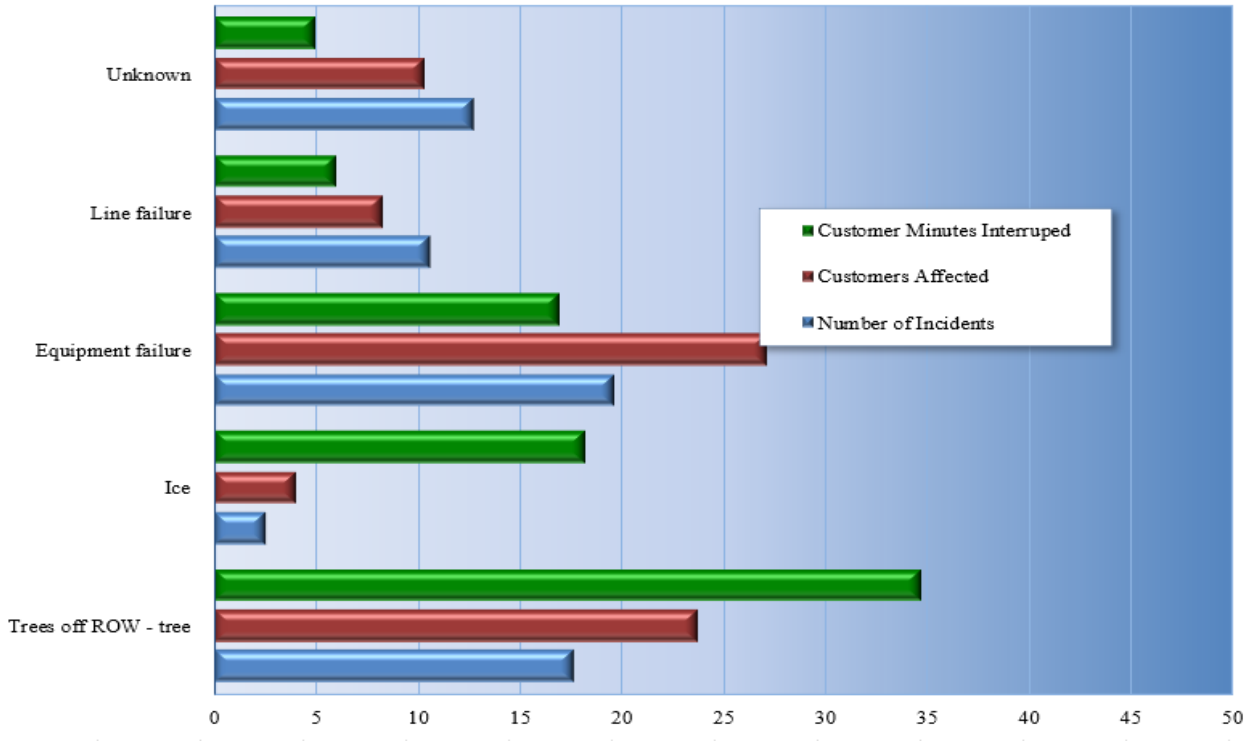


Figure 36-Penelec Outage Tracking (number of incidents)

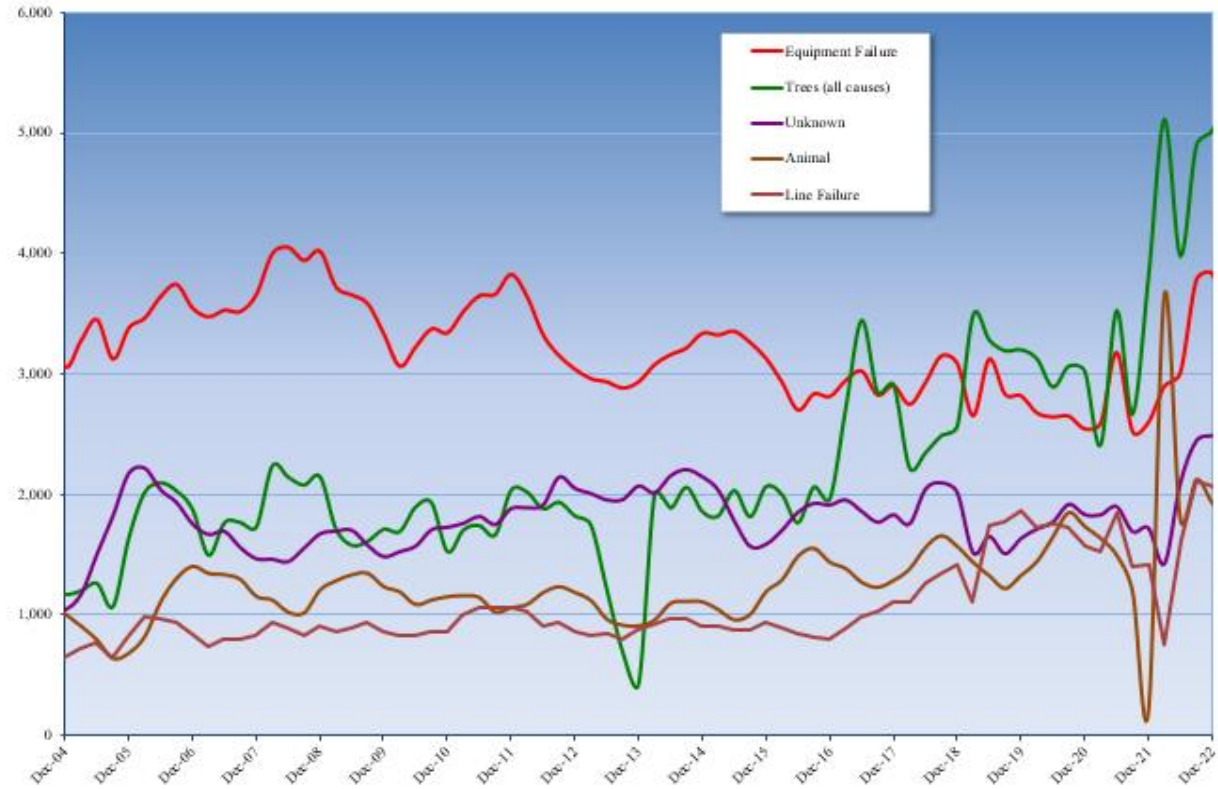


Figure 37 – Penelec Outage Tracking (number of Customers Interrupted)

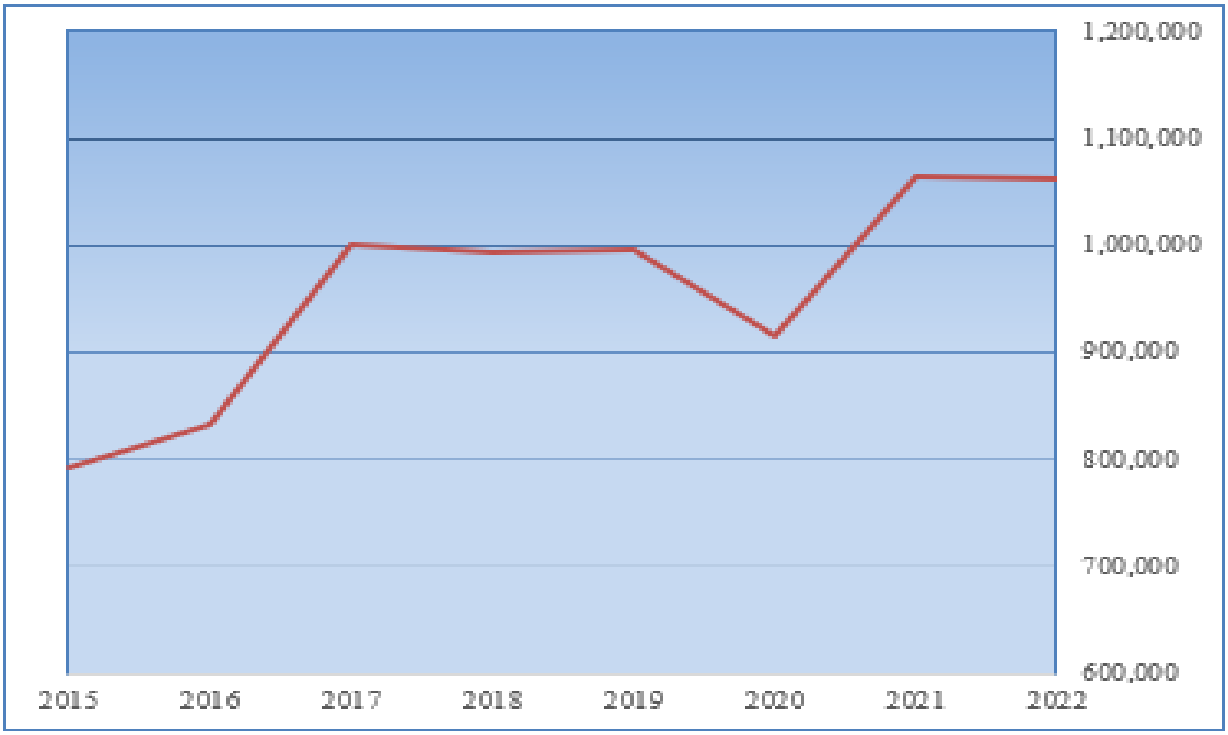


Figure 38 – Penelec Outage Tracking (Customer-Minutes of Interruptions, or CMI)

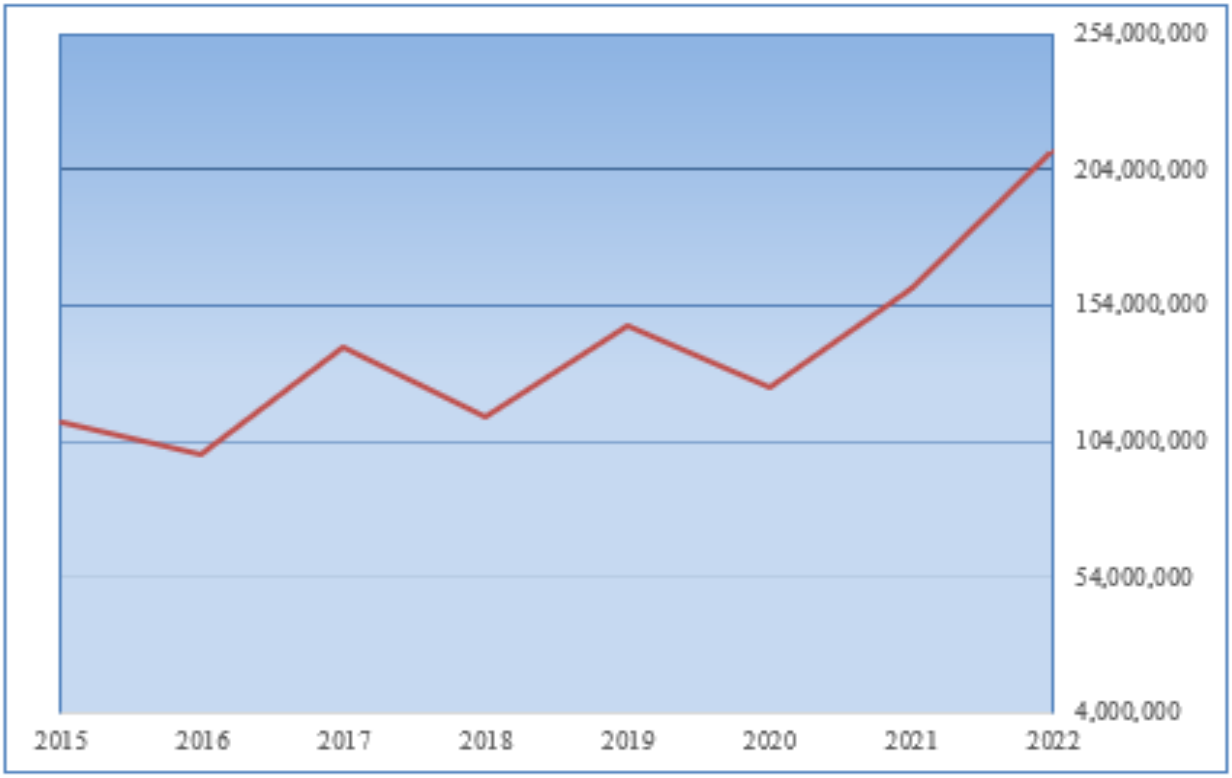
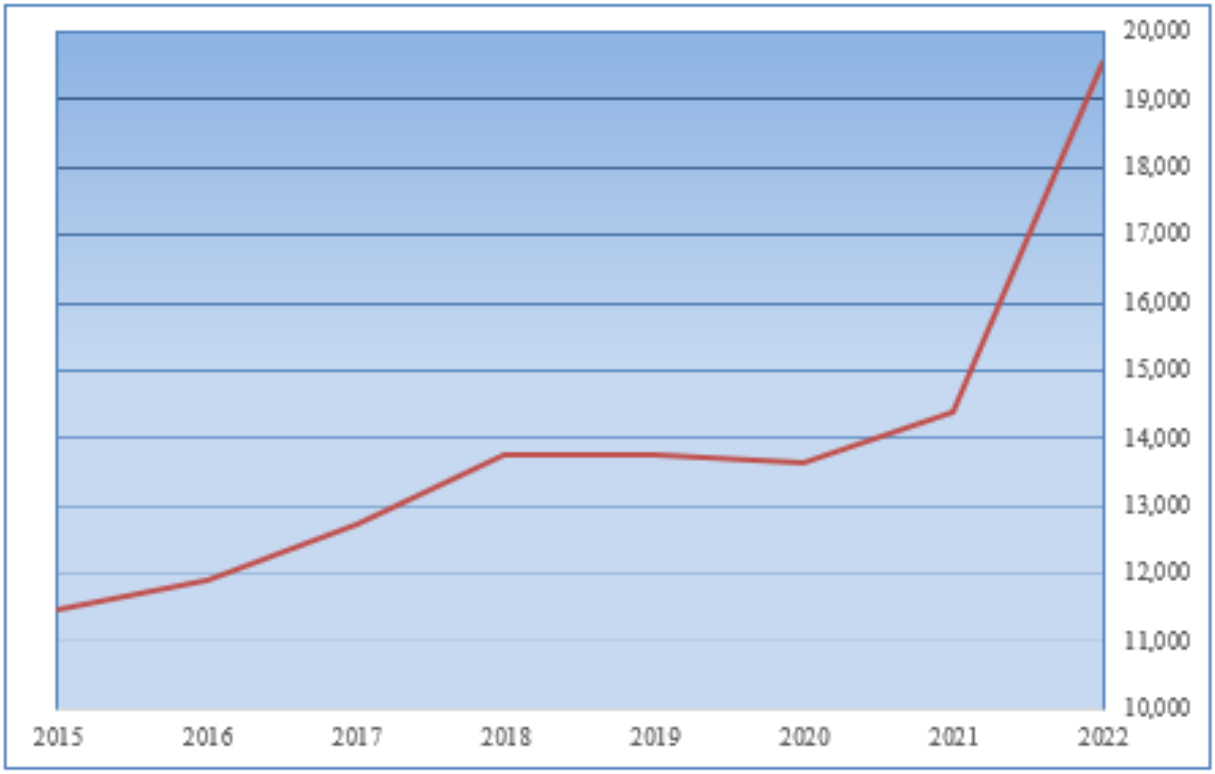


Figure 39 – Penelec Outage Tracking (number of interruptions annually)



Pennsylvania Power Company

Pennsylvania Power Company (Penn Power) has a service territory of about 1,100 square miles that serves approximately 170,695 customers.

In 2022, Penn Power experienced 166,749 customer interruptions and 22.3 million CMI as compared to: 166,681 customer interruptions and 21.6 million CMI in 2021; 159,907 customer interruptions and 29.6 million CMI in 2020; 226,745 customer interruptions and 29.2 million CMI in 2019; and 180,247 customer interruptions and 113.1 million CMI in 2018.

Penn Power experienced one Major Event on May 21, 2022, due to severe weather. This Major Event impacted over 24,536 customers, which is not reflected in the total above.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 129 minutes in 2021 to 134 minutes in 2021; failed to achieve benchmark by 32.7%.

3-year average: Increased from 148 minutes in 2021 to 149 minutes in 2022; failed to achieve standard by 34.5%.

SAIDI

Rolling 12-month: Increased from 129 minutes in 2021 to 133 minutes in 2022; failed to achieve benchmark by 17.7%.

3-year average: Decreased from 162 minutes in 2021 to 147 minutes in 2022; failed to achieve standard by 8.1%.

SAIFI

Rolling 12-month: Decreased from 1.00 outages in 2021 to 0.99 outages in 2022; achieved benchmark by 11.6%.

3-year average: Decreased from 1.12 outages in 2021 to 0.99 outages in 2022; achieved standard by 19.8%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 40 and 41. Beginning in 2004, Penn Power's CAIDI performance trend has been inconsistent and frequently outside of acceptable tolerances. Penn Power's annual rolling 12-month CAIDI has been exceeding the "red" standard performance upper-control-limit-line for the past five years. CAIDI performance is currently above the 12-month benchmark and standard performance levels. The Commission expects more management attention to address the inconsistent performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line. Improved response times and shortened repair times may well prove essential to maintaining CAIDI at or below the benchmark level. It is suggested that management focus upon improving these aspects of Penn Power's operations.

Penn Power's SAIFI performance for 2022 was erratic, but ultimately finished at a level below the benchmark upper-control-limit-line. This erratic performance indicates there is a strong need for management attention to ensure consistent SAIFI performance is sustained thus ensuring the trend line remains below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 42 below, shows the top outage cause categories in 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Trees OROW, Equipment Failure, and Line Failure were the leading cause of outages and CMI. Over 47% of customer minutes interrupted were caused by trees and equipment failures.

Figure 43 below shows the historical trend of the top four outage causes. Trees, Line and Equipment Failures, and Ice are the three most frequent causes of power outages for Penn Power. Most EDCs have equipment failure and trees as the two most frequent outage-causes.

General Reliability

In 2016, Penn Power started to execute its 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 to increase overall spending in the 2019 program year. The Petition was approved, as filed, by Commission Order entered on May 23, 2019.[42] On Aug. 30, 2019, Penn Power, along with the other FirstEnergy Companies (Met-Ed, Penelec, and West Penn) filed a petition for a second LTIIP for the years 2020 through 2024. The petition was approved by Commission Order entered on Jan. 16, 2020.[43]

The PUC has also been performing extra monitoring of Penn Power's work management system and 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.[44] Penn Power's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

The FirstEnergy Companies note they utilize core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Inspection and Maintenance (I&M): FirstEnergy notes that the Distribution Inspection & Maintenance Practices1 are designed to assist in determining the need for, and prioritization of, the repair or replacement of distribution system components and facilities.

- Resistograph Technology: FirstEnergy avers that since 2021 the Companies have been using Resistograph technology. Poles showing incipient decay or poles that are thirty-five years old or older will be inspected by the use of a Resistograph. The Resistograph is a sophisticated electronically controlled drill that provides increased accuracy, when compared to manual drilling, in measuring the relative density of wood in timber structures. Driven by a drill motor, a long, thin needle is inserted into the wood pole in order to assess its density, structural integrity, and shell thickness.

- Vegetation Management: FirstEnergy notes that routine cycle tree trimming 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. FirstEnergy notes that they are limited in their ability to legally address all forms of OROW tree management. However, priority OROW trees are identified when significantly encroaching the corridor and removed when

[42] *See Petition of Pennsylvania Power Company for Approval of Modification of its Long-Term Infrastructure Improvement Plan*, at Docket No. P-2015-2508931.
[43] See Petition of Pennsylvania Power Company for Approval of its Long-Term Infrastructure Improvement Plan at Docket No. P-2019-3012614.
[44] Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

customer consent is obtained or easement rights permit. FirstEnergy notes that portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. Portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. FirstEnergy avers that in response to damage caused by the Emerald Ash Borer, a program to proactively remove ash trees OROW was implemented. Post-storm circuit patrols target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead to a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

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

- Load Forecasting and Distribution Planning: FirstEnergy notes that the load forecasting application 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: FirstEnergy 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.

- LTIIP: The FirstEnergy Companies first began to execute their respective LTIIP programs in 2016. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. Penn Power's current LTIIP includes initiatives and expenditures within these two focus areas that are designed to maximize sustained reliability over the long-term.

The FirstEnergy Companies note that in addition to the reliability programs above, the FirstEnergy Companies also utilize various strategies to efficiently respond to customer and equipment outages. These include, but are not limited to:

- Minimizing Outage Impact: The Companies incorporate design philosophies that support grid operation resulting in maximized reliability. These philosophies include instantaneous breaker tripping on select circuits, circuit sectionalizing devices, and remote device operation (such as supervisory control and data acquisition) to minimize the impact of an outage when possible.

- Storm Exercises: Each FirstEnergy Company performs an annual storm exercise. A well-designed exercise provides a low-risk environment to test and validate capabilities, familiarize personnel with plans, procedures, roles, and responsibilities, and foster meaningful interaction and communication across internal and external organizations.

- Summer Readiness: FirstEnergy notes that Summer is the time when most electric utilities experience the highest system loads and most damaging storms. In order to prepare for this period of the year, the FirstEnergy Companies perform summer readiness activities such as capacitor inspections, substation inspections, transmission system reliability and capability review, and post-storm reviews to identify and disseminate lessons learned after significant events.

- Smart Meters: The FirstEnergy Companies have completed mass deployment of smart meters to customers across Pennsylvania. FirstEnergy notes that smart meter installation is a step toward a more modernized electric system that will enable automated meter readings. Smart meters also assist during outage restoration periods, especially when there are a significant number of single customer outages, by allowing the FirstEnergy Companies to ping the meter to determine if a customer's service has been restored.

- Incident Command System (ICS): The FirstEnergy Companies are beginning to utilize a more formalized ICS structure, which is designed to enable effective and efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organization. By expanding the use of ICS, FirstEnergy notes that its incident response ability is improved, and reliability is enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

Proposed Solutions – Penn Power

Penn Power analyzes its outage data to develop solutions for improving reliability. Penn Power has identified the top outage causes for the rolling 12-month period ending December 31, 2022, and the associated actions designed to address these outage causes. To address outages caused by trees, Penn Power performs tree trimming which removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes OROW priority trees. Penn Power is limited in its ability to legally address all forms of OROW tree management. However, Penn Power is legally permitted to identify priority OROW trees that are dead, dying, diseased, leaning, and significantly encroaching the corridor and remove those trees when customer consent is obtained or easement rights permit. Penn Power is very active in pursuing this option, where available. Trees identified as a potential cause of a future outage are removed to prevent an interruption of electrical service to Penn Power's customers. In addition, Penn Power performs enhanced trimming to circuits that experience high CMI due to vegetation, which removes limbs overhanging primary conductors.

To reduce the likelihood of outages caused by equipment and line failure outages, Penn Power follows I&M programs that set forth schedules for regular inspections of distribution facilities. These programs are geared towards specific components such as capacitors, poles, circuits, transformers, and reclosers. Equipment identified is repaired or replaced as appropriate.

Conclusion

Trees OROW and Equipment Failure are the top two outage causes that substantially negatively affect electrical reliability to Penn Power customers. Trees OROW and Equipment Failure outage causes contributed to over 45% of the total CMI.

Beginning in 2004, Penn Power's CAIDI and SAIFI benchmark performance has been inconsistent. Penn Power through its RIP and LTIIP will need to address the inconsistent CAIDI performance to reduce outage lengths and SAIFI performance to sustain the trend line below the "green" benchmark performance upper-control-limit-line. The Commission recommends continued and increased efforts in vegetation management and emphasis on response times. The Commission expects to see improvement in reliability for the FirstEnergy Companies in 2023 and 2024.

The Commission recognizes that, overall, Penn Power's reliability performance struggles most with the duration of outages. While fewer customers are being interrupted annually, customers are out of service longer and possibly more frequently. As can be seen in Figure 44 below, the number of Penn Power's customers interrupted annually is trending downward. However, as shown in Figure 45 below, CMI is trending upward over recent years. Figure 46 below shows an overall and steady increase in actual interruption events. This figure might well be improved by increased and effective use of LTIIP funding.

Figure 40- Penn Power CAIDI (minutes)

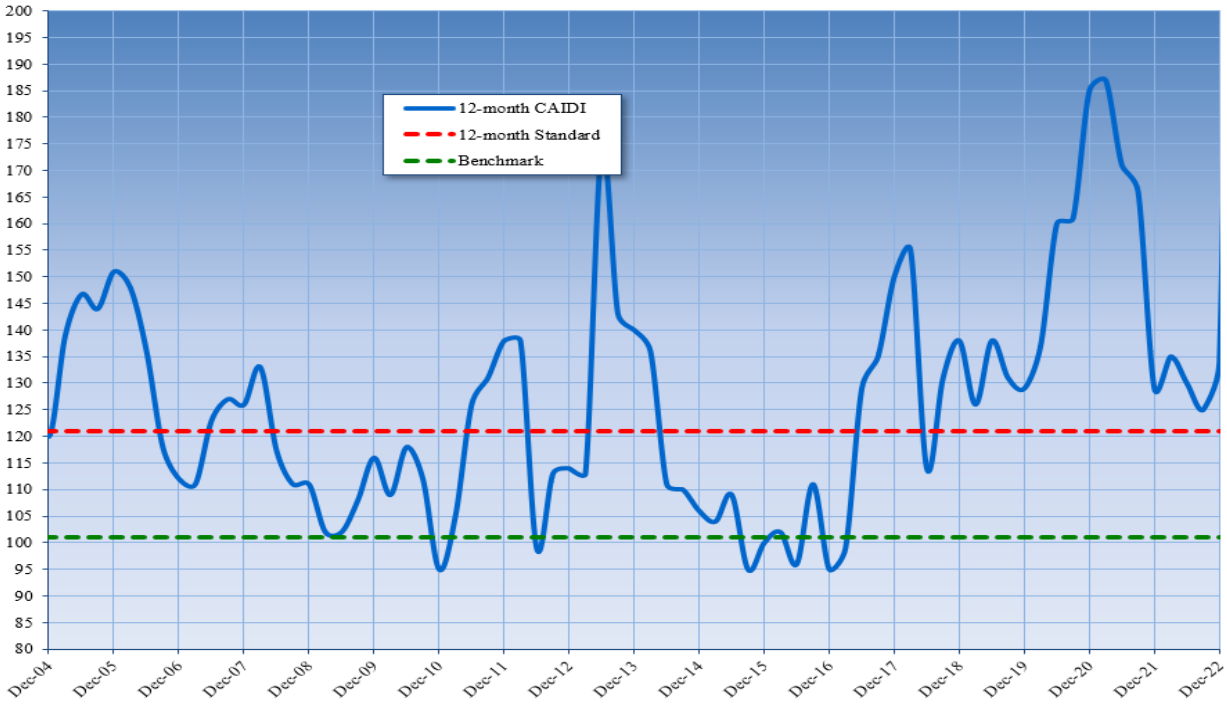


Figure 41 - Penn Power SAIFI (interruptions per customer)

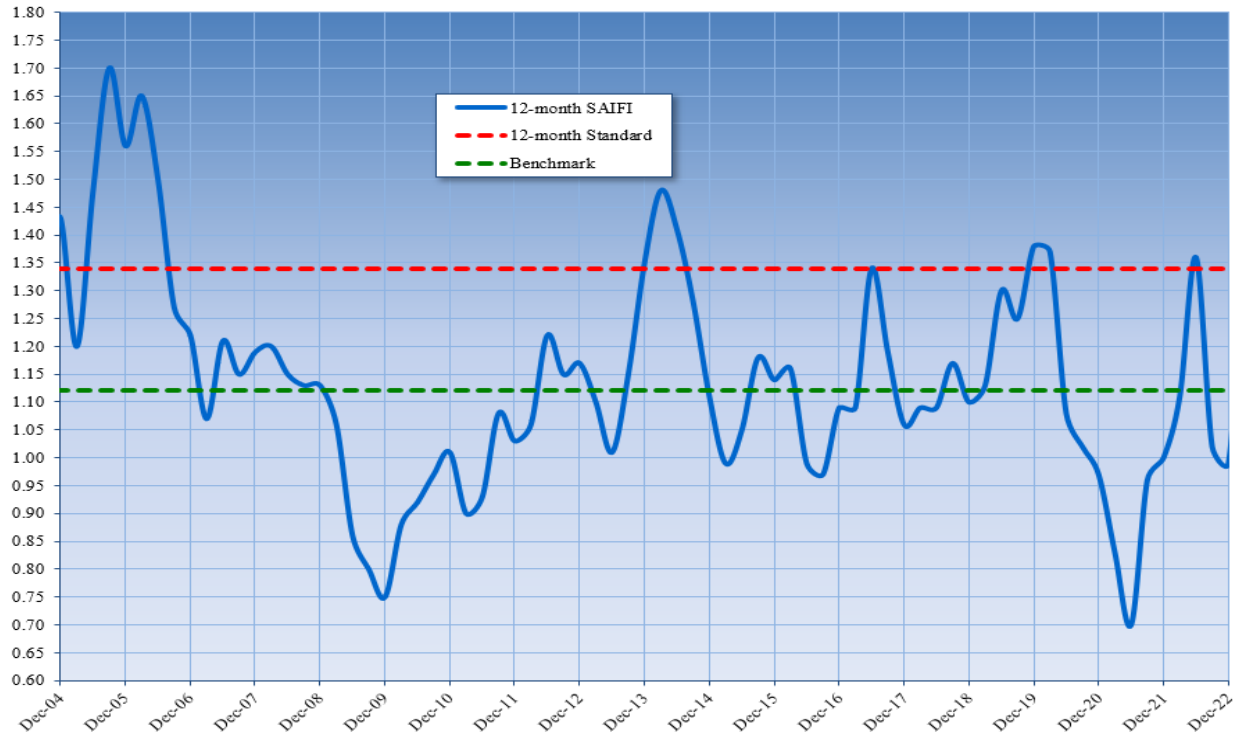


Figure 42 - Penn Power Outage Causes (percent of total outages)

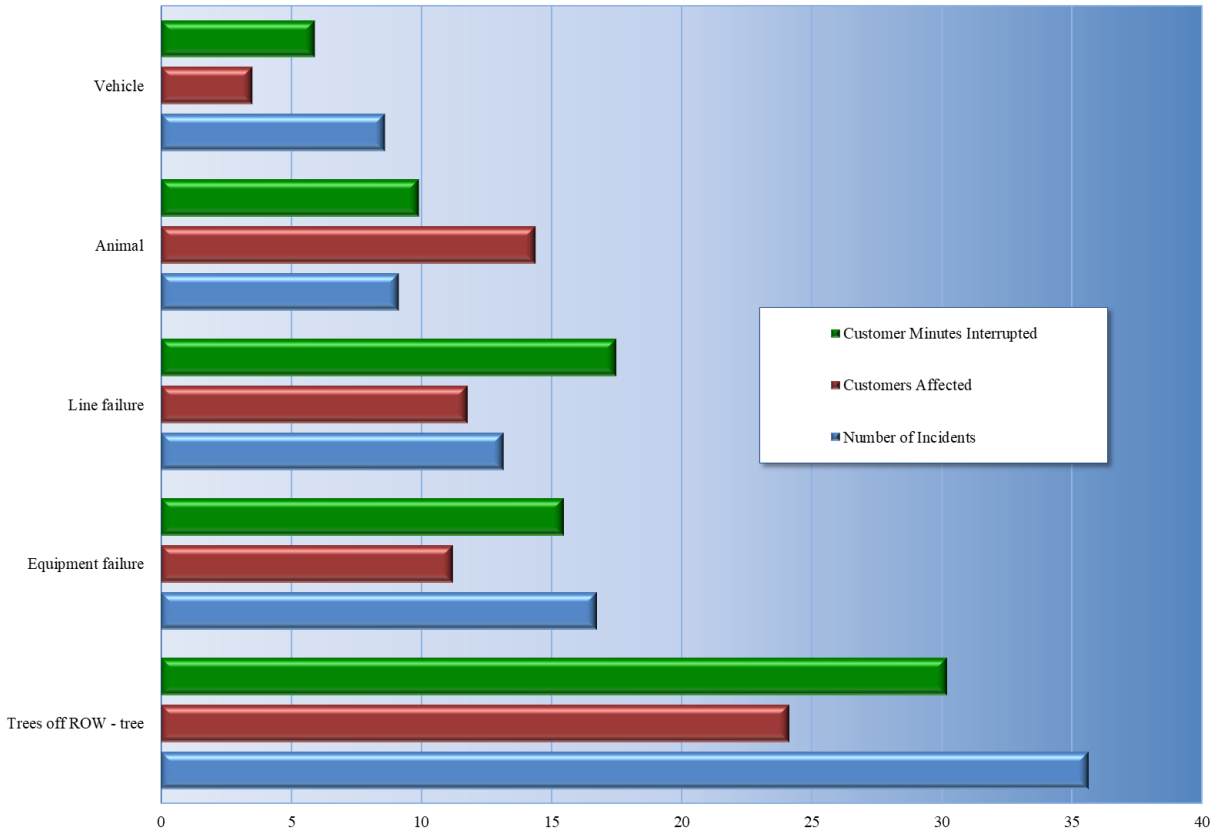


Figure 43- Penn Power Outage Tracking (number of incidents)

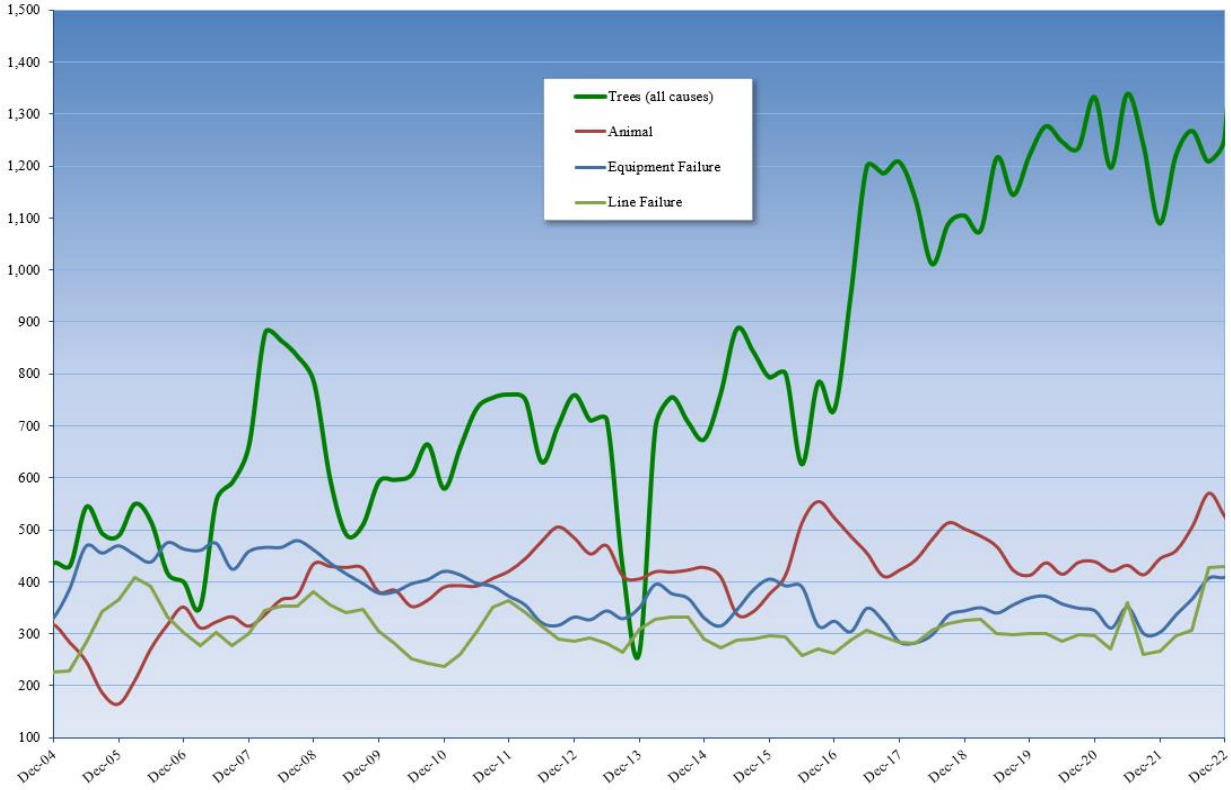


Figure 44 – Penn Power Outage Tracking (number of Customers Interrupted)

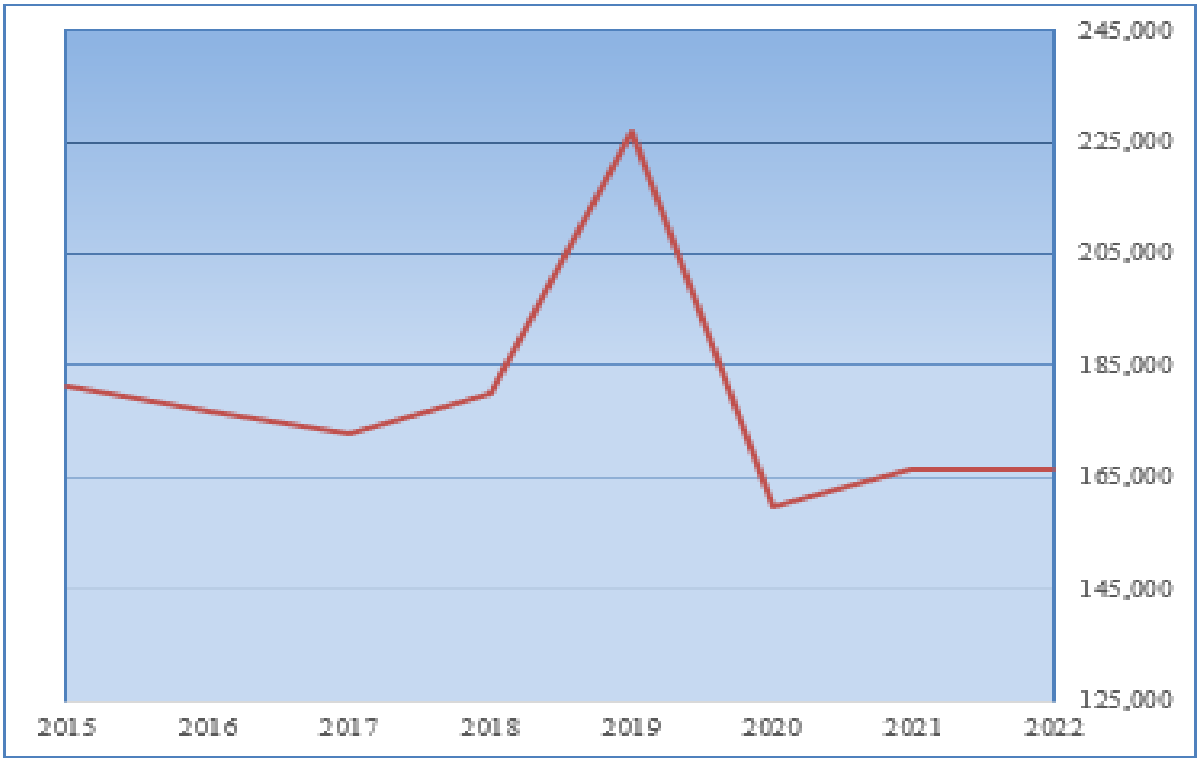


Figure 45 – Penn Power Outage Tracking (Customer-Minutes of Interruptions CMI)

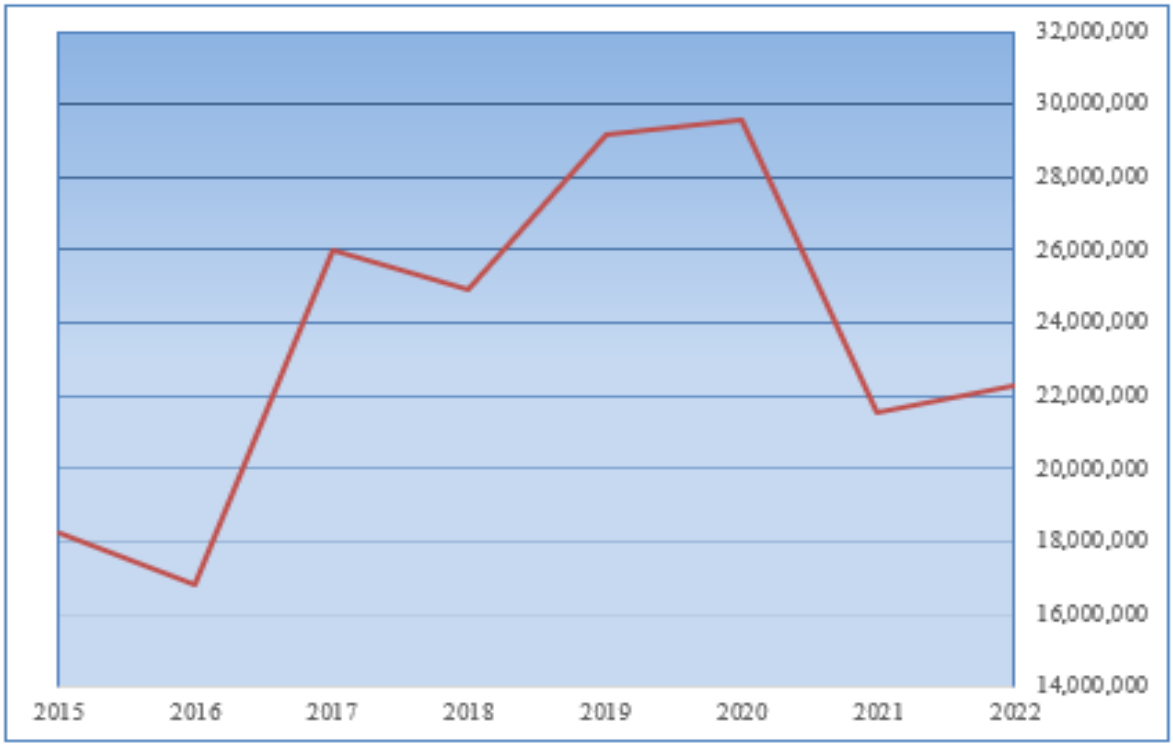
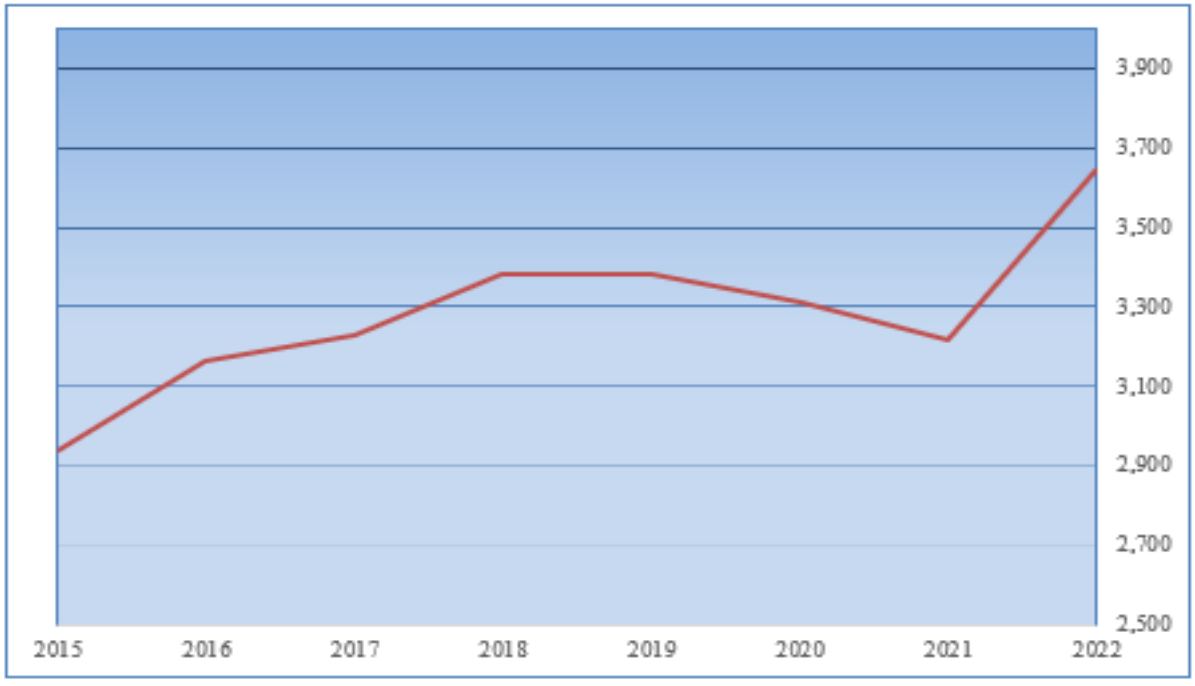


Figure 46 – Penn Power Outage Tracking (number of interruptions annually)



Pike County Light & Power Company

Pike County Light & Power Company (Pike) has a relatively small operating service area of approximately 44 square miles with about 5,302 customers. The Pike service territory is primarily fed from two 34.5 kV feeders that originate from Orange and Rockland Utilities (ORU). The Borough of Matamoras is served by two 13.2 kV feeders from a substation with backup tie capability to distribution circuitry from ORU. The substation is normally fed by a 34.5 kV feed from ORU circuit 116-2-34, with backup service being provided by ORU 34.5 kV circuit 116-434 through an automatic transfer scheme at the substation. The western portion of the Pike service territory is supplied by a radial feed from the ORU circuit 116-4-34.

In 2022, Pike experienced 2,646 customer interruptions and 420,975 CMI, as compared to: 6,890 customer interruptions and 1,058,853 CMI in 2021; 2,356 customer interruptions and 432,428 CMI in 2020: 1,870 customer interruptions and 331,335 CMI in 2019; and 4,057 customer interruptions and 872,312 CMI in 2018.

Pike experienced four Major Events on the dates listed below with a total of 10,918 customer interruptions and a total of 4,472,232 customer minutes of interruption, not included in the total above.

- June 18, 2022
- June 23, 2022
- September 5, 2022
- September 12, 2022

CAIDI/SAIDI/SAIFI EVALUATION

CAIDI

Rolling 12-month: Increased from 153 minutes in 2021 to 159 minutes in 2022; achieved benchmark by 8.6%.

3-year average: Decreased from 171 minutes in 2021 to 165 minutes in 2022, achieved standard by 13.9%.

SAIDI

Rolling 12-month: Decreased from 216 minutes in 2021 to 79 minutes in 2022; achieved benchmark by 25.5%.

3-year average: Increased from 123 minutes in 2021 to 126 minutes in 2022; achieved standard by 2.3%.

SAIFI

Rolling 12-month: Decreased from 1.40 outages in 2021 to 0.50 outages in 2022; achieved benchmark by 18.0%.

3-year average: Increased from 0.75 outages in 2021 to 0.78 outages in 2022; failed to achieve standard by 16.9%.

CAIDI/SAIDI/SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 47 and 48 below. From 2004 through 2019, Pike's CAIDI performance has been erratic and frequently above the "green" benchmark performance upper-control-limit-line and "red" 12-month standard. Pike's CAIDI performance has improved during late 2019 as it returned to benchmark levels, and during 2020, 2021, and 2022 it remained near or even below the benchmark. More management attention is needed to ensure consistent CAIDI performance is sustained below the "green" benchmark performance upper-control-limit-line. The Commission views CAIDI as an important indication of an EDCs ability to respond to, repair and return to service customers that are experiencing an electric service outage.

Pike's SAIFI performance trend has been overall positive during the years of 2015 through 2022. However, in 2017 and 2021, Pike's SAIFI exceeded the 12-month standard. Significant management attention is needed to maintain SAIFI performance below the "green" benchmark performance upper-control-limit-line. The Commission generally views SAIFI performance as an indicator of an EDC's system hardening and outage resistance. Coupled with the weather conditions experienced, it demonstrates the ability to withstand outages.

Outage Causes

Figure 49 below shows the top five reported outage cause categories in 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Tree Contact and Equipment Failure created the greatest number of incidents. Approximately 30% of outages and 56% of customer minutes interrupted are caused by Equipment Failure and Tree Contact, respectively.

Figure 50 below shows the historical trend of the top four main outage causes. Tree Contact 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 most every EDC in Pennsylvania.

General Reliability

Pike notes that in 2022, and as it has generally been historically, most outages, customers affected, and customer-minutes of interruption were the result of vegetation contacts. Pike reports that it prioritizes and aggressively removes danger trees within utility ROW zones and works with individual customers and municipalities to remove those that that exist outside of the Company's ROW areas. Pike states that it has also focused its reliability efforts on pole inspections and defective pole replacements. Pike notes that in 2022 it inspected over 880 poles.

Conclusion

From 2019 through 2022, Pike had improved CAIDI performance. However, Pike did exceed the 12-month standard level for SAIFI in 2021. It is expected that Pike will direct more management attention to SAIFI and maintain levels below the "green" benchmark performance upper-control-limit-line. Consistent management attention is needed in the future to sustain the

CAIDI trend line below the "green" benchmark performance upper control-limit-line. The Commission recommends continued and increased efforts in vegetation management and use of LTIIP funding to improve system hardening and resiliency.

The Commission recognizes that, overall, Pike appears to be treading water in maintaining service reliability, as witnessed by the data shown below. Pike is demonstrating effort and SAIFI has generally been at or below benchmark with exception of 2021.

As can be seen in Figure 51 below, the number of Pike's customers interrupted annually is on a very slight upward trend. As shown in Figures 52 and 53 below, CMI and actual interruption events are generally maintaining their level with the exceptions of 2018 and 2021.

Figure 47- Pike County CAIDI (minutes)

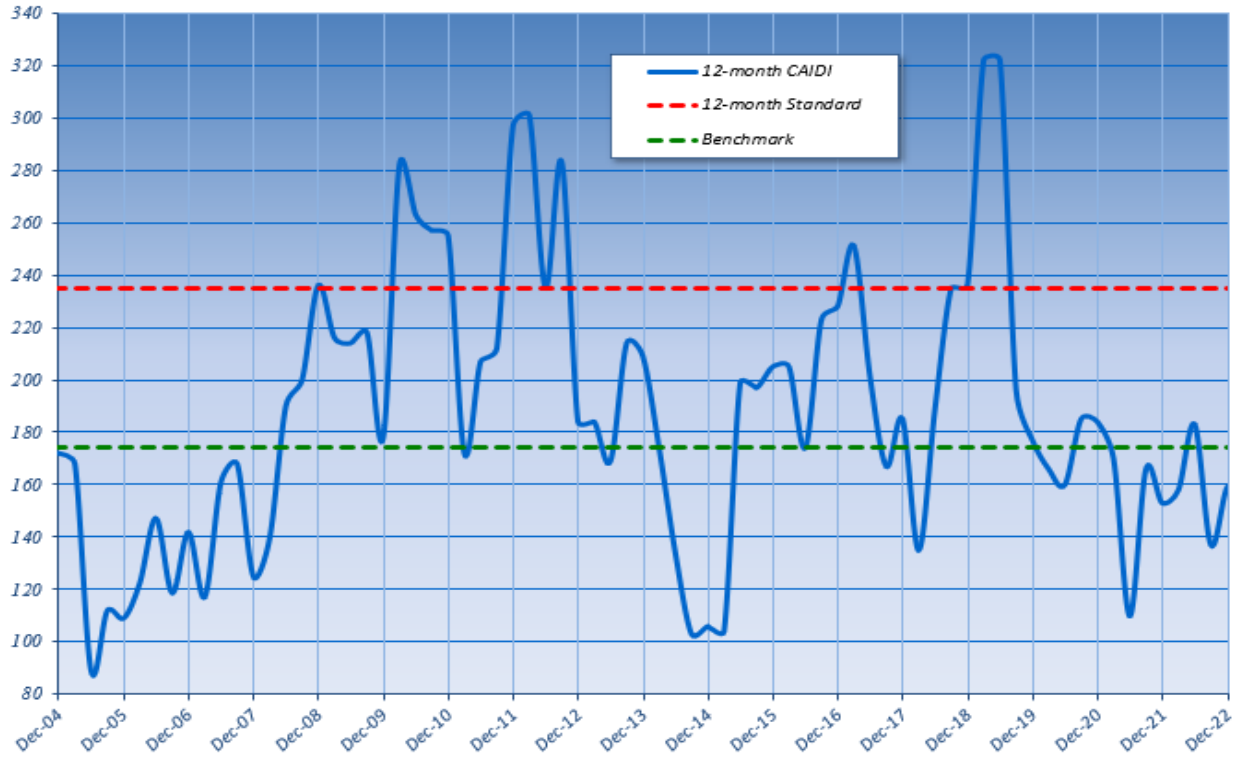


Figure 48- Pike County SAIFI (interruptions per customer)

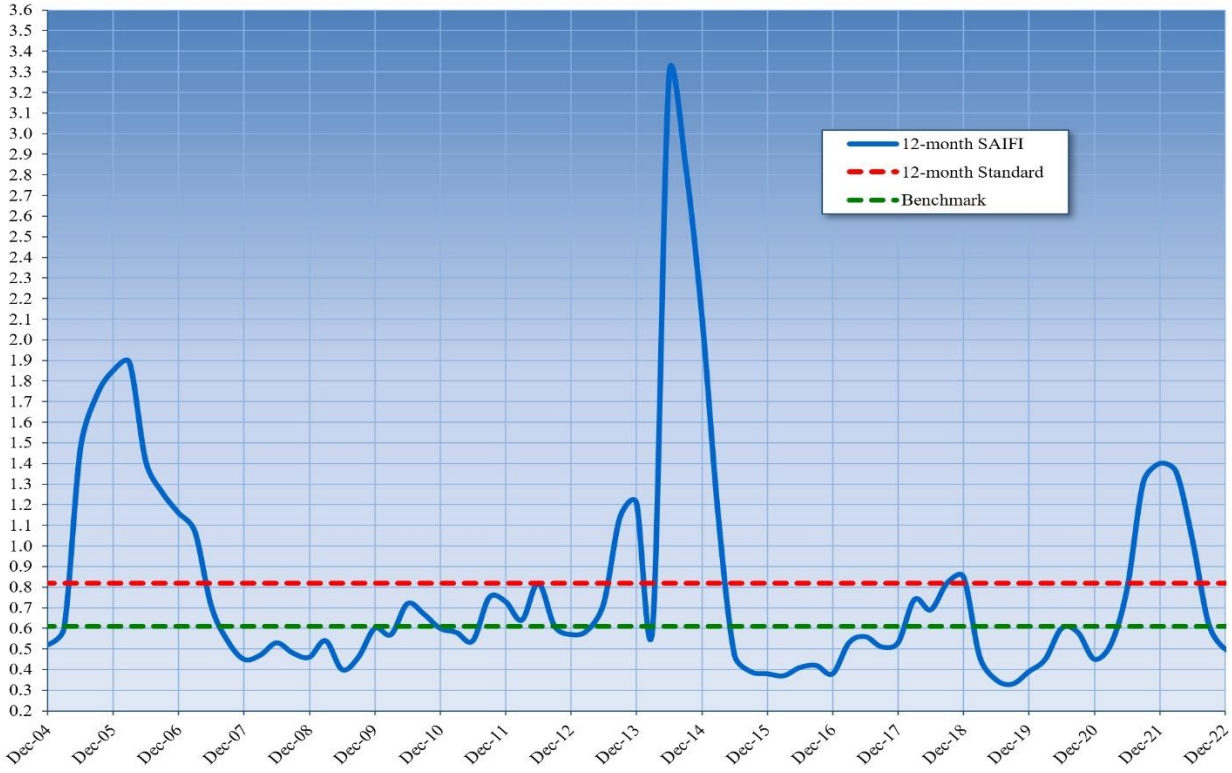


Figure 49- Pike County Outage Causes (percent of total outages)

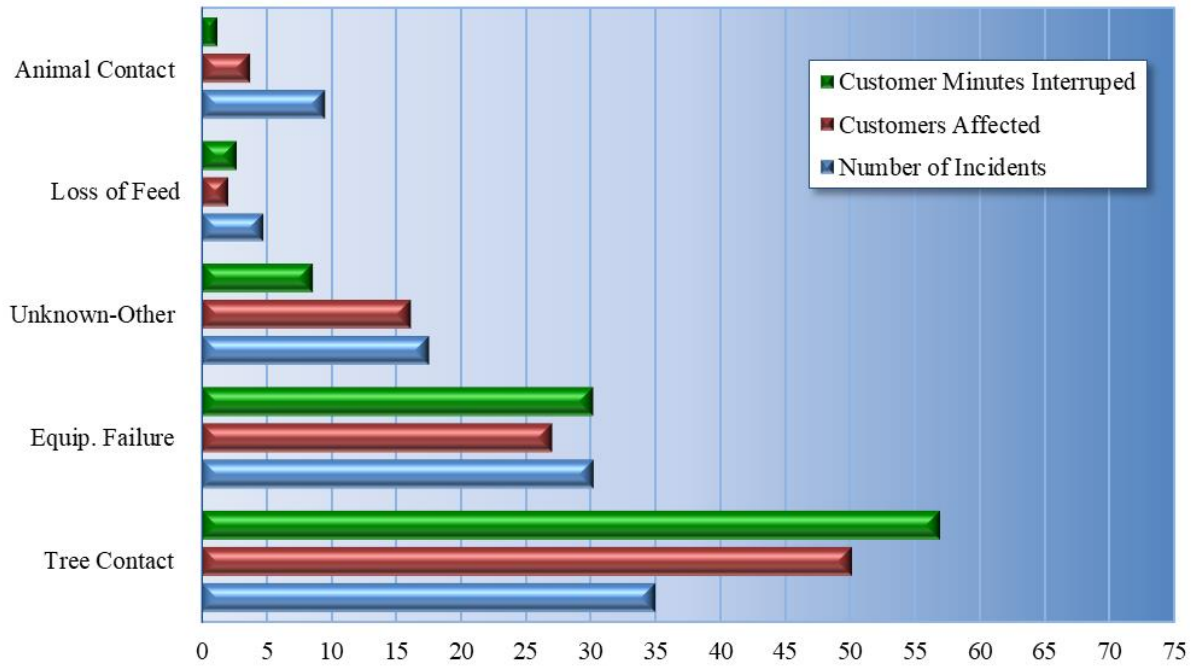


Figure 50 - Pike County Outage Tracking (number of incidents)

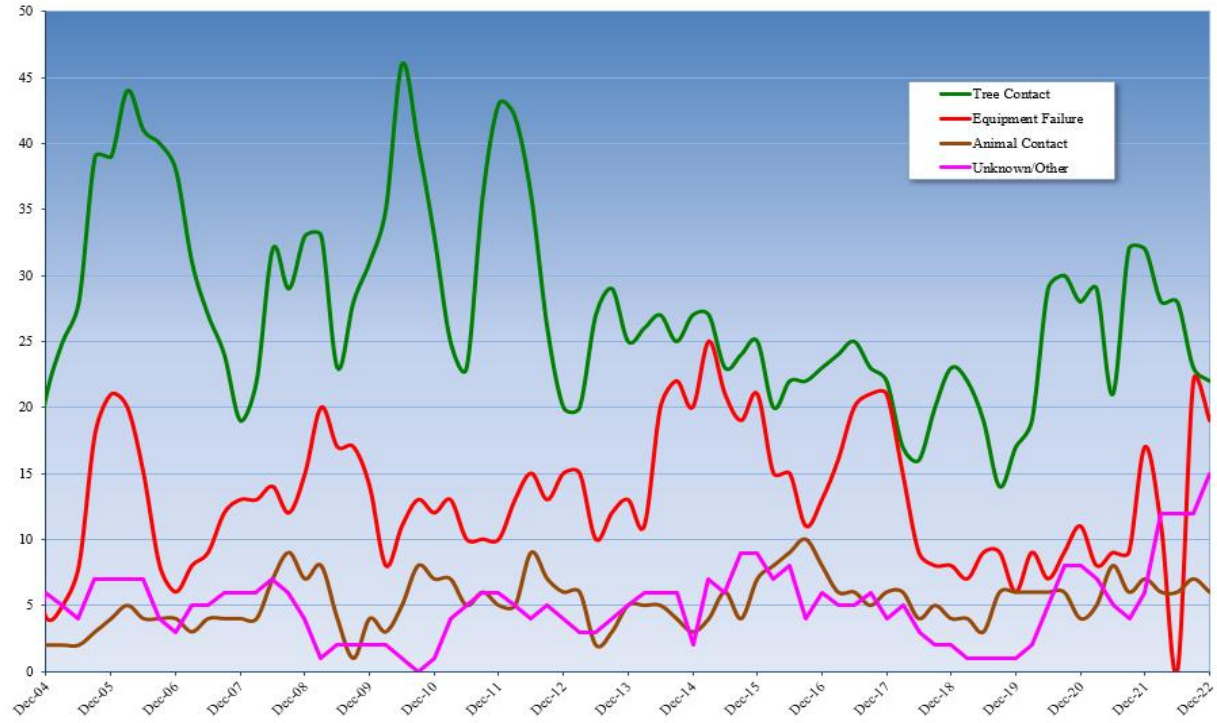


Figure 51 – Pike County Outage Tracking (number of Customers Interrupted)

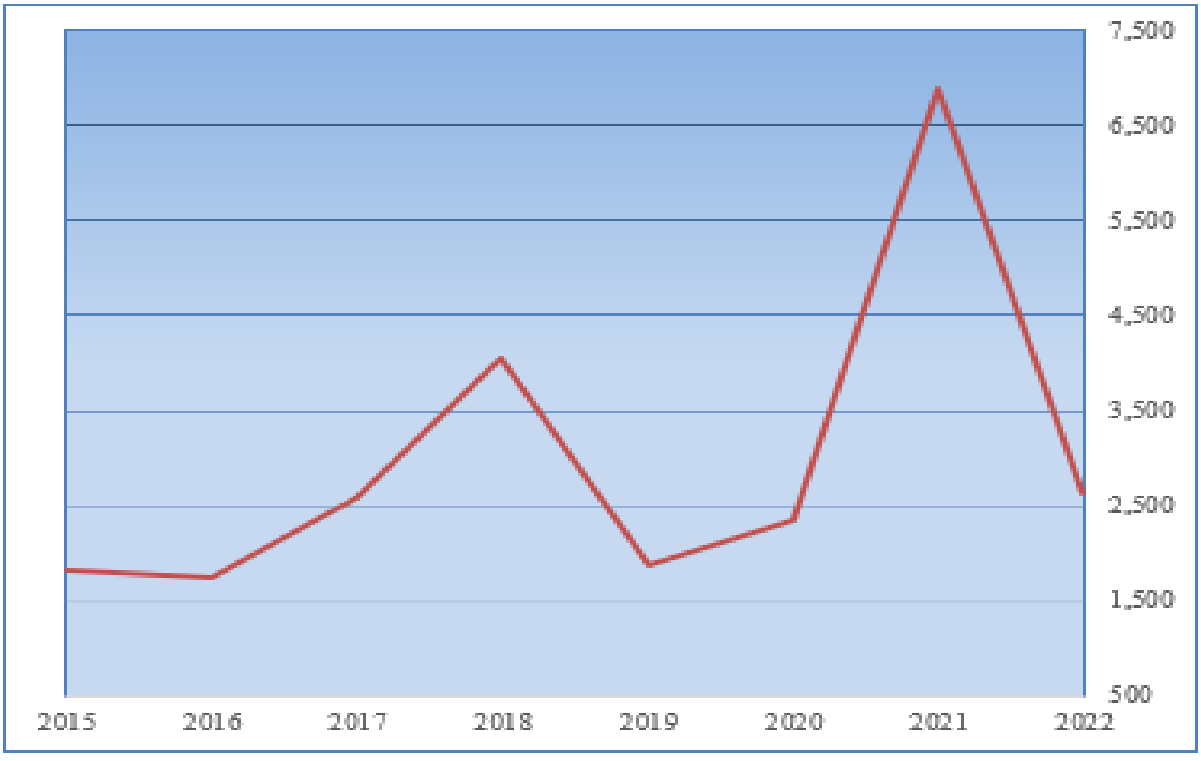


Figure 52 – Pike County Outage Tracking (Customer-Minutes of Interruptions CMI)

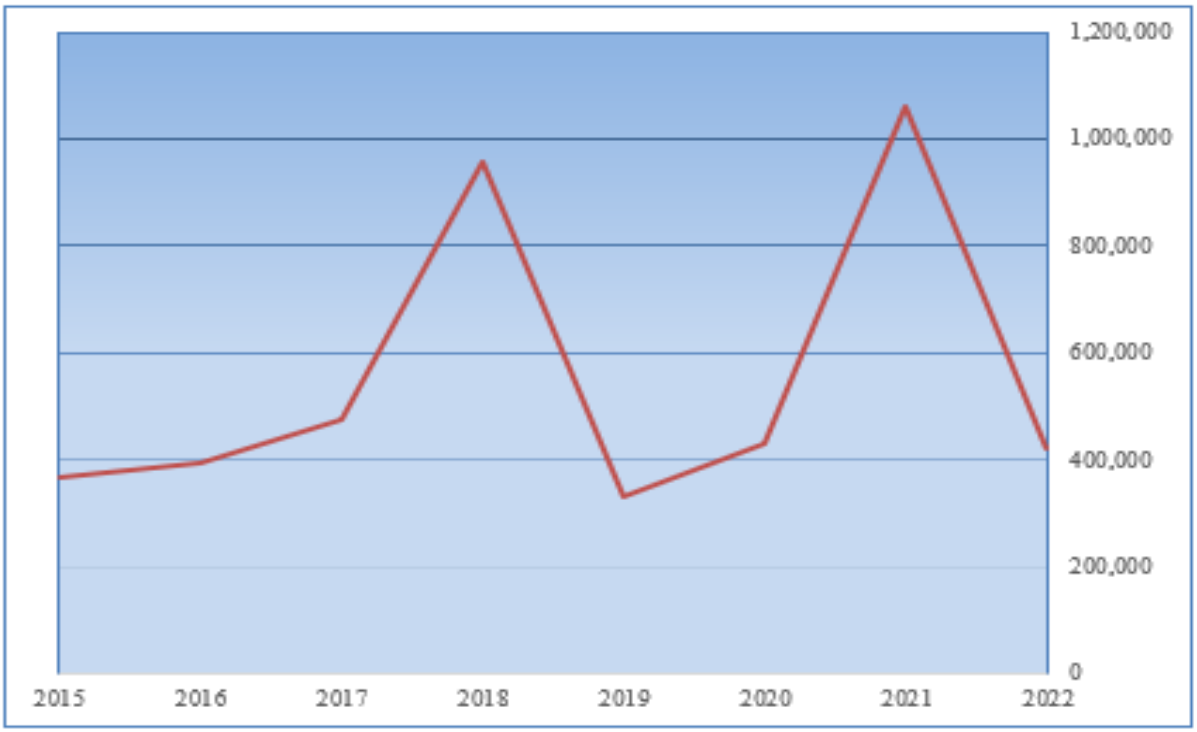
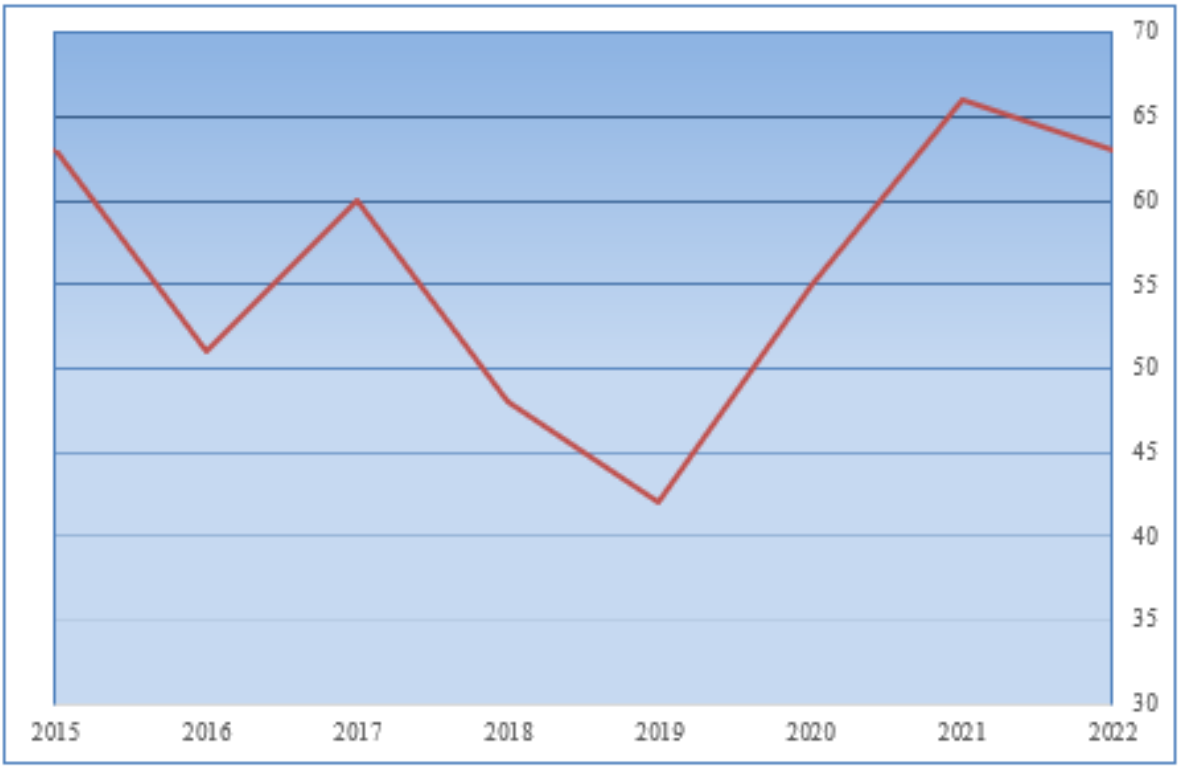


Figure 53 – Pike County Outage Tracking (number of interruptions annually)



PPL Electric Utilities Corporation

PPL Electric Utilities Corporation (PPL) has a service territory of about 10,000 square miles and serves approximately 1.45 million customers.

In 2022, PPL experienced 1.3 million customer interruptions and 206.4 million CMI as compared to: 1.2 million customers interruptions and 245.4 million CMI in 2021; 1.2 million customers interruptions and 166.4 million customer-minutes in 2020; 1.2 million customer interruptions and 213.9 million CMI in 2019; and 1.2 million customer interruptions and 201.5 million CMI in 2018.

PPL did not experience a Major Event in 2022.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 187 minutes in 2021 to 164 minutes in 2022; failed to achieve benchmark by 13.1%.

3-year average: Decreased from 167 minutes in 2021 to 163 minutes in 2022; failed to achieve standard by 1.7%.

SAIDI

Rolling 12-month: Decreased from 170 minutes in 2021 to 142 minutes in 2022; achieved benchmark.

3-year average: Increased from 145 minutes in 2021 to 143 minutes in 2022; achieved standard by 17.1%.

SAIFI

Rolling 12-month: Decreased from 0.91 outages in 2021 to 0.87 outages in 2022; achieved benchmark by 11.2%.

3-year average: Decreased from 0.91 outages in 2021 to 0.87 outages in 2022; achieved standard by 19.1%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 54 and 55 below. Beginning in 2004, PPL's CAIDI performance trend has generally been below standard and sometimes below benchmark. However, CAIDI performance beginning in 2017 has been erratic. PPL's CAIDI for 2021 was 187, which surpassed both the benchmark and standard upper-control-limit lines. CAIDI performance improved some in 2022, but remains above the benchmark measure. Management should intensify its efforts to improve CAIDI performance and return performance to levels consistently below the "green" benchmark performance upper-control-limit line. The Commission views CAIDI as an indicator of an EDC's ability to respond to, repair and return to service customers following an outage. It is understood that with the improved system automation that the CAIDI metric will show increases. However,

the very use of system automation by an EDC tends to make CAIDI a more valuable indicator of customer outage times and hence actual response to customer interruptions.

Beginning in December 2013, PPL's SAIFI benchmark performance trend has been positive, as shown in Figure 55 below. 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. This trend is also indicative of PPL's increasing use of system automation (Smart Grid) devices.

Outage Causes

Figure 56 below shows the top five reported outage cause categories in 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Trees were the top cause of outages and customer minutes interrupted. Approximately 70% of CMI is caused by trees and approximately 17% of CMI is caused by equipment failure. The Commission notes a concern with the sharp increase in tree-related outages for PPL from 2015 to present. The Commission is concerned that possible reductions, or insufficient increases, in vegetation management expenditures may be responsible for this increase in tree-related issues. Management should review the present efforts and strategies to evaluate effectiveness. The Commission also recognizes that changes in precipitation levels will affect vegetation growth and hence increase the numbers of outages.

Figure 57 below shows the historical trend of the top three main outage causes. Tree Related and Equipment Failures are the two 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 rolling 12-month SAIFI at the end of 2022 was 0.87, which was an improvement from its performance in 2021. PPL notes its ongoing focus around preventing customer interruptions through system automation, vegetation management and asset performance continues to directly support overall strong reliability results.

PPL states that it continues to drive high levels of reliability performance through programs such as:

- Commitment to providing safe, reliable, affordable service to PPL's customers.
- A strategic vegetation management program.
- Continued strategic investment in distribution automation technology such as:
    - Multi and single-phase Smart Grid Initiative.
    - Increased leverage of our Automated Distribution Management System (ADMS).

  - Full implementation of Fault Isolation and System Restoration (FISR) technology automatically restoring more than 1.6 million customers since 2015.

- Strategic data-driven reliability investments including asset replacement, and system improvements that include storm hardening standards.

- An increased focus on remediating momentary outages before they become permanent outages.

- Continued focus on outage response improvements.

- Moving to data-driven, condition-based maintenance programs

PPL notes that the 2022 results were achieved in a year of near record storm frequency and intensity. PPL notes that in 2022 it saw 36 total storms, which is the second most on record in terms of PUC storm cases and third most for PUC Storm customers interrupted.

In terms of CAIDI performance, PPL notes that with 2022 storms nearing record storm frequency and magnitude, along with automated systems preventing and converting outages to momentary interruptions, higher CAIDI values are not unexpected. However, PPL notes that is has several initiatives that it continues to evaluate as it looks to improve CAIDI. Some of these strategic areas include:

- Optimizing resource planning and scheduling.

- Setting Restore vs. Repair strategy early on in storm response.

- Resource Strategy/Optimization.

- Resource scheduling and prearranging resource availability.

- Leveraging data technology to isolate impact and dispatching of resources needed to address outages.

CAIDI performance has been erratic beginning in 2013. Since 2013, rolling 12-month CAIDI has swung from well below benchmark to well above standard. PPL's calendar-year CAIDI for 2021 was 13 minutes above the standard and for 2022 was 19 minutes above the benchmark The Commission posits that there are two aspects to this CAIDI issue. Primarily, as introduction of more system automation (Smart Grid) decreases the numbers of customers interrupted, CAIDI will by nature increase. Secondly, and possibly equally as an important outcome from this automation, is the increased accuracy of the CAIDI metric. That is to say that the CAIDI metric is becoming more realistic of the customer's experienced interruption duration, rather than a general average as determined by aggregate data. With that aspect in mind, the reduction of CAIDI will indicate better service in the form of more timely response to outages, reduction of repair times and hence the overall reduction of average outages.

Conclusion

Tree Related and Equipment Failures are the top two outage causes that negatively affect electrical reliability to PPL customers. PPL's CAIDI performance in 2022 was above benchmark. Management attention is required to move CAIDI performance below the "green" benchmark performance upper-control-limit line. CAIDI is a measure of customer restoration and can be improved by decreased response and repair times.

SAIFI is a measure of outage frequency and PPL has sustained SAIFI benchmark since 2012 and is considered an excellent SAIFI benchmark performer. This is very indicative of the results the Commission would expect from a company such as PPL that has been a leader in implementing advanced technology such as Smart Grid and other forms of system automation.

The Commission recommends continued and increased efforts in vegetation management, equipment replacement and improvement under LTIIP, and a continuing emphasis on improving response times.

The Commission recognizes, overall, that PPL's reliability is beginning to decline as witnessed by the data shown in figures below. As can be seen in Figure 58 below, the number of PPL customers interrupted annually is on a sharp trend upward. As shown in Figures 59 and 60 below, since 2015 CMI and the number of customer interruption events are both significantly increasing year-over-year.

Figure 54- PPL CAIDI (minutes)

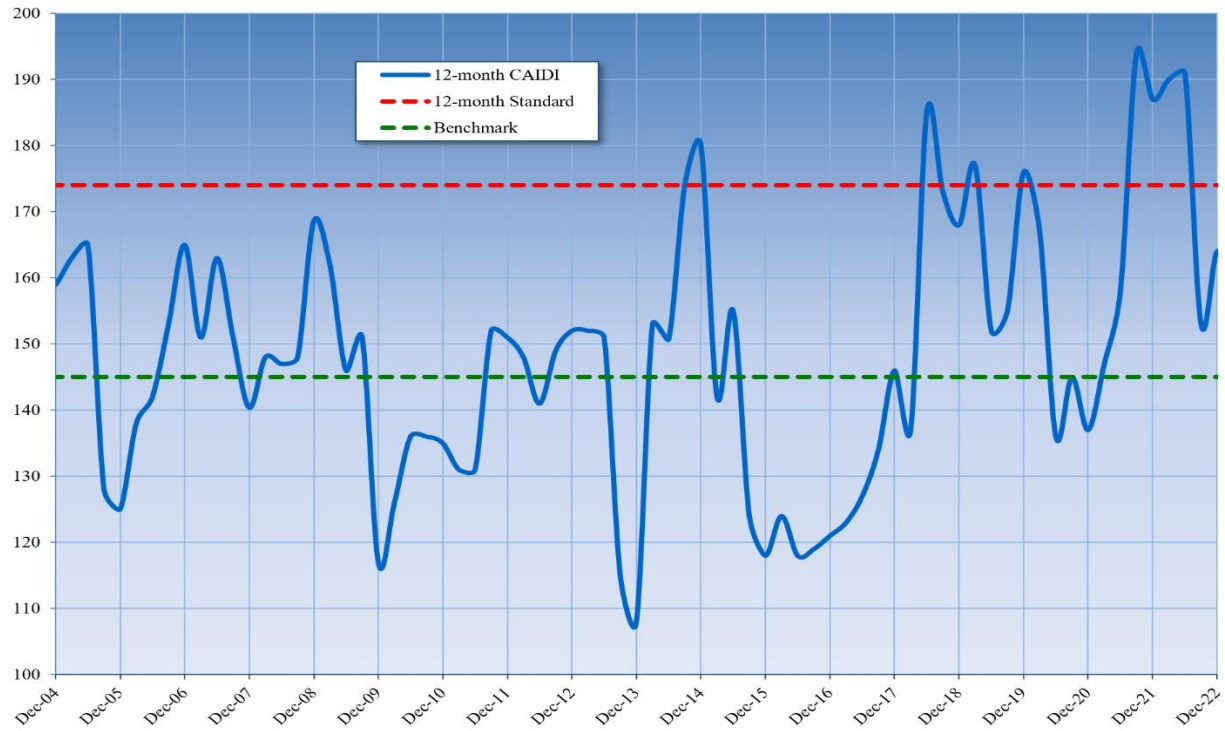


Figure 55 - PPL SAIFI (interruptions per customer)

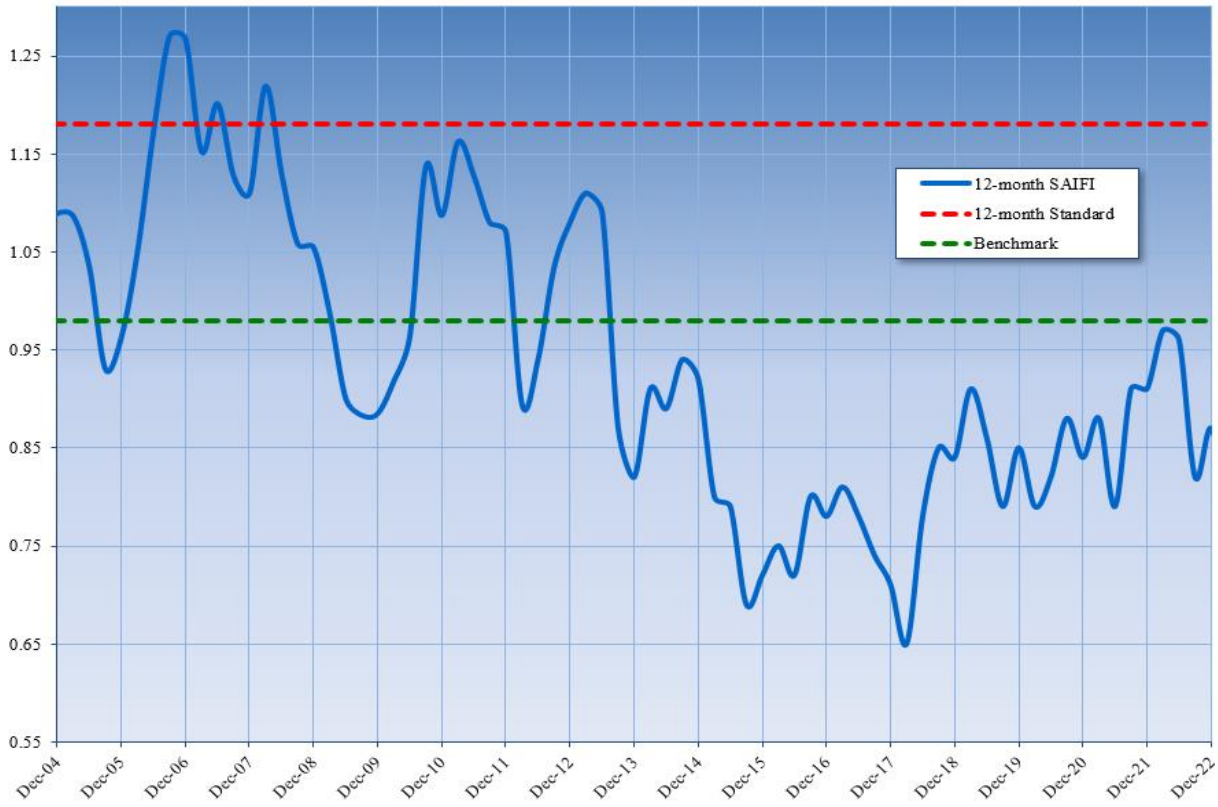


Figure 56 - PPL Outage Causes (percent of total outages)

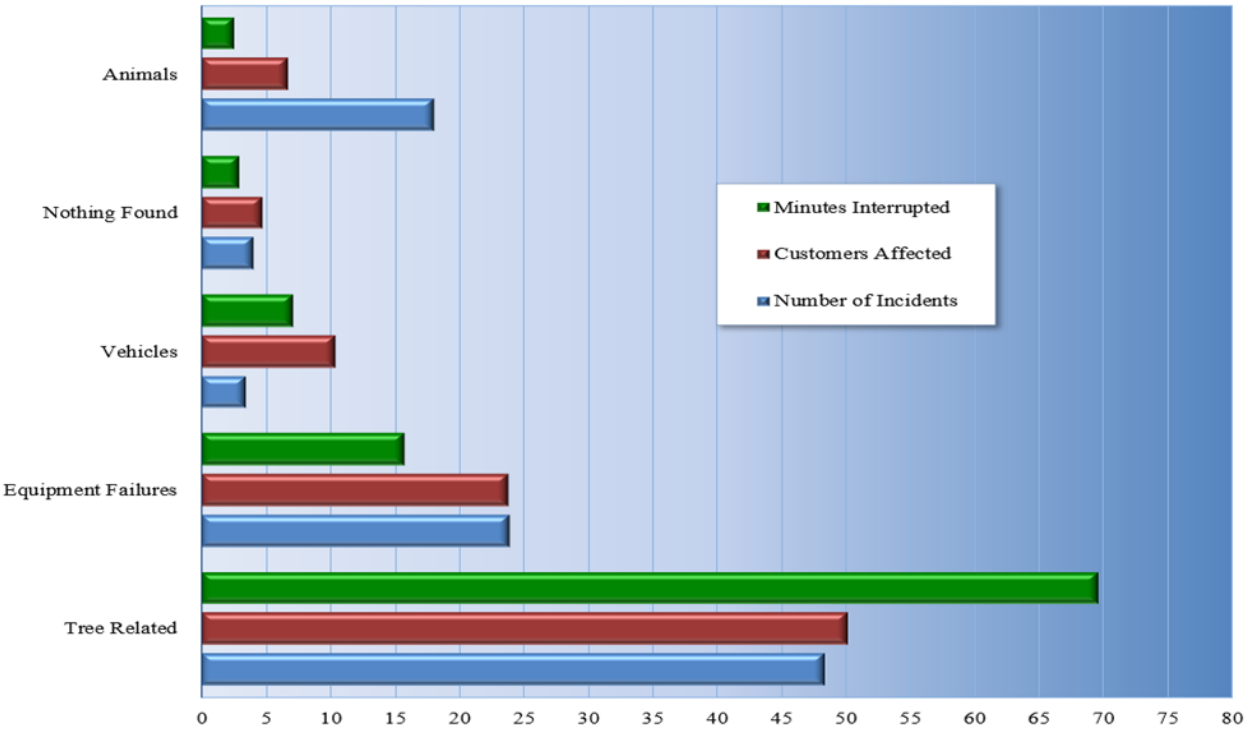


Figure 57 - PPL Outage Tracking (number of incidents)

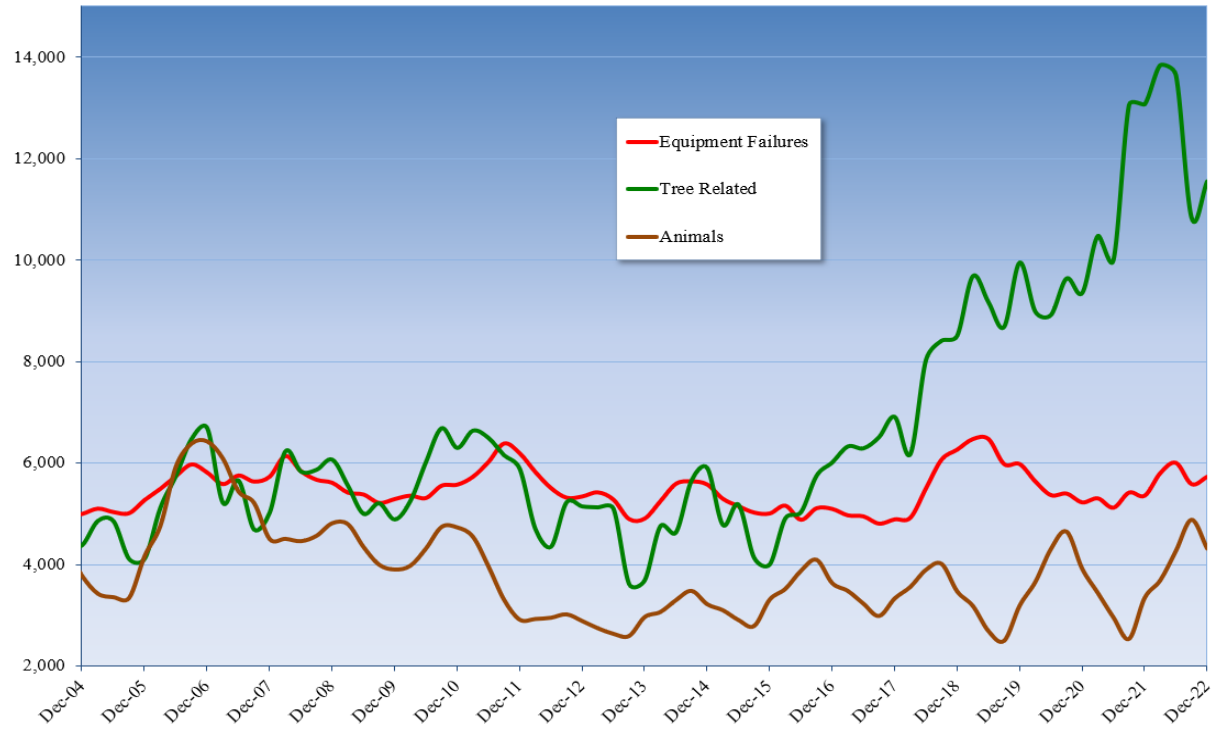


Figure 58 – PPL Outage Tracking (number of Customers Interrupted)

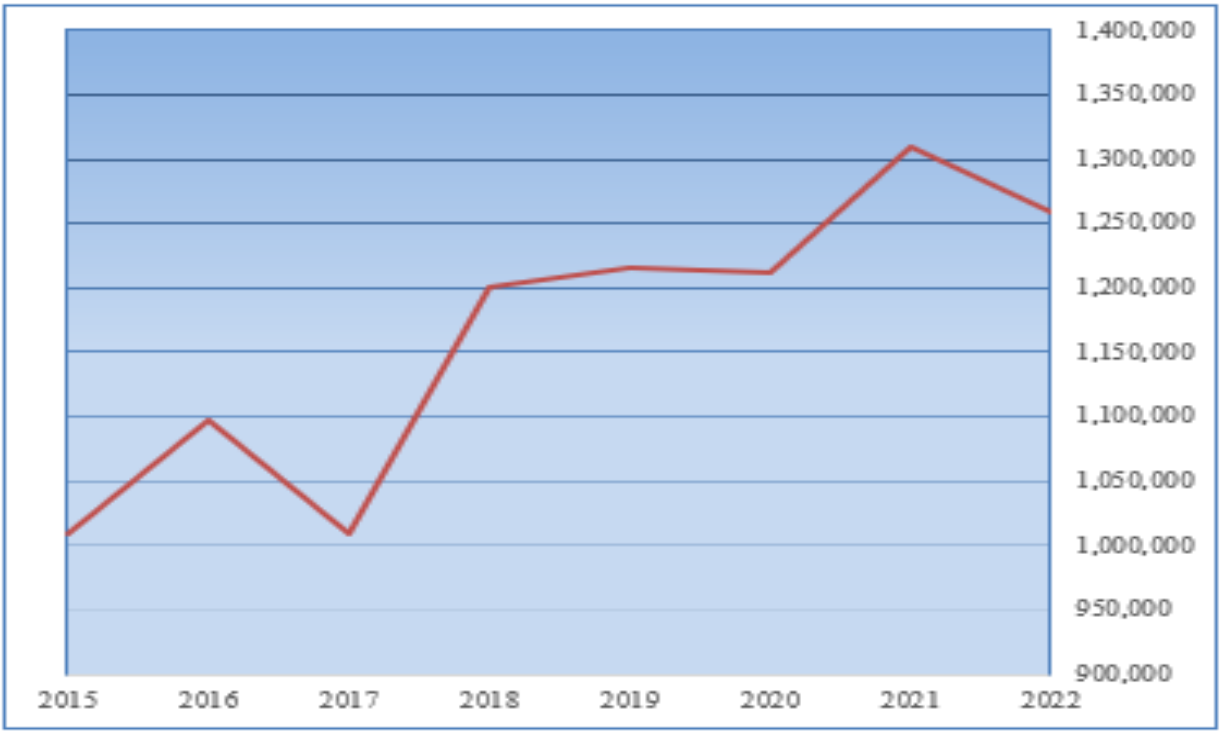


Figure 59 - PPL Outage Tracking (Customer-Minutes of Interruptions CMI)

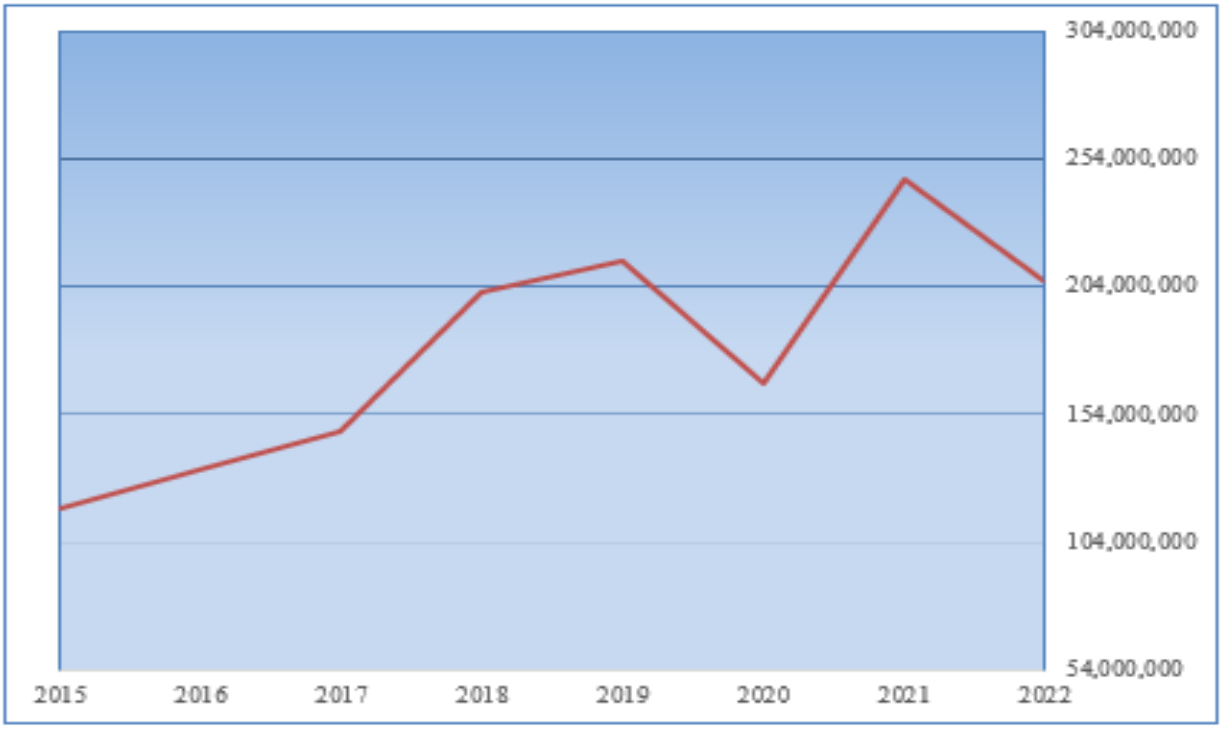
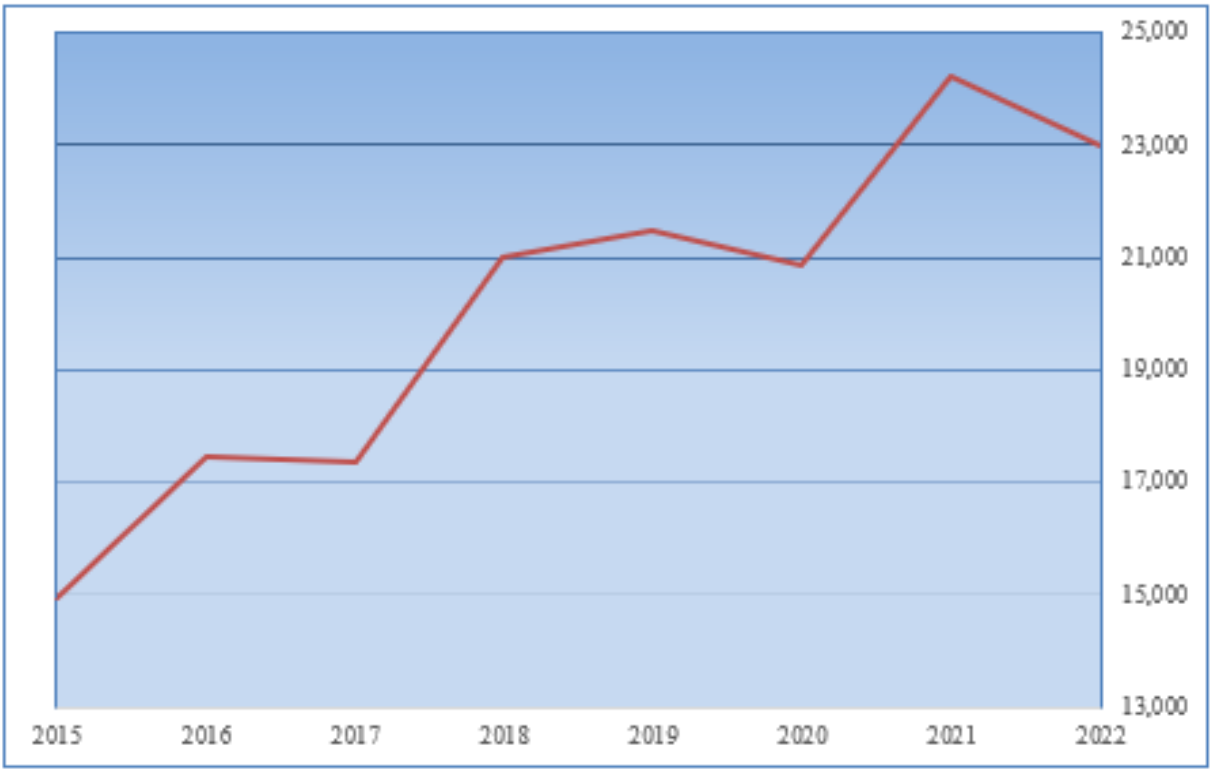


Figure 60 – PPL Outage Tracking (number of interruptions annually)



UGI Utilities Inc.

UGI has a service territory of about 410 square miles and serves about 62,506 customers.

In 2022, UGI experienced 54,075 customer interruptions and 8.4 million CMI as compared to: 58,992 customer interruptions and 7.9 million CMI in 2021; 25,110 customer interruptions and 4.1 million CMI in 2020; 59,946 customer interruptions and 11.3 million CMI in 2019; and 31,305 customer interruptions and 4.1 million CMI in 2018.

UGI experienced no Major Events during 2022.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 134 minutes in 2021 to 156 minutes in 2022; achieved benchmark by 7.7%.

3-year average: Decreased from 162 minutes in 2021 to 151 minutes in 2022; achieved standard by 18.1%.

SAIDI

Rolling 12-month: Increased from 127 minutes in 2021 to 135 minutes in 2022; achieved benchmark by 3.6%.

3-year average: Decreased from 125 minutes in 2021 to 109 minutes in 2022; achieved standard by 35.7%.

SAIFI

Rolling 12-month: Decreased from 0.95 outages in 2021 to 0.87 outages in 2022; failed to achieve benchmark by 4.8%.

3-year average: Decreased from 0.77 outages in 2021 to 0.74 outages in 2022; achieved standard by 18.7%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI performance trends are shown below in Figures 61 and 62. UGI failed to attain benchmark CAIDI performance in 2018 and 2019, as shown on the chart to be above the "green" benchmark performance upper-control-limit-line. However, UGI did achieve better-than-benchmark CAIDI performance in 2020, 2021, and 2022. Continued management attention is needed to ensure CAIDI performance is sustained below the "green" benchmark performance upper-control-limit-line.

UGI's SAIFI performance in 2018 and 2019 was inconsistent, as shown on the chart to be above the "green" benchmark performance upper-control-limit-line. However, prior to 2018, UGI was a consistent SAIFI benchmark performer and in 2020 matched its best annual SAIFI performance (2015). In 2021, UGI's SAIFI increased to a level of 0.95, which is above the benchmark for reliability. As of December 2022, UGI's SAIFI continues to be just above the benchmark. More management attention is needed to move SAIFI performance below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 63 below shows the top five reported outage cause categories in 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Trees, Animal, and Equipment Failure were the leading causes of the number of incidents. Trees were the leading cause of CMI. Over 51% of CMI was caused by Trees, with Weather Related and Equipment Failure at approximately 19% and 12%, respectively. The Commission cautions the use of categories such as Weather Related. Use of such broad categories can misrepresent equipment failures, pole and crossarm failures. The Commission recognizes that weather events can stress equipment beyond design, however the events can also cause weakened or previously damaged equipment to completely fail.

Figure 64 below shows the historical trend of the top three main outage causes. Trees, Weather Related and Equipment Failure are the three most frequent outage causes that are significantly negatively affecting UGI's distribution system reliability and resilience. As noted previously in this report, trees and equipment failures are the prominent causes of outages experienced by almost every EDC in Pennsylvania.

General Reliability

UGI notes that it has an outage management system (OMS) in place that allows it to gather information on system interruptions. The information accumulated in this system serves as the basis for determining UGI's reliability metrics and is analyzed to identify equipment failure trends and outage clusters. This information is also used to identify system deficiencies and allocate resources for maintenance and/or system upgrades. UGI states that in October 2022, it upgraded its OMS to gain additional management functionality, situational awareness, and efficiency.

UGI states that it continues to expand its distribution supervisory control and data acquisition (DSCADA) capabilities, which provide additional system performance visibility and awareness. UGI notes that DSCADA also acquires and historizes distribution data and controls distribution devices from the operations center.

UGI states that the largest contributors to outage incidents on its system and primary target areas for continued improvement and investment are tree-related outages and equipment failures. UGI notes that further analysis shows that customers served in some of the more rural and isolated areas of UGI's system have been impacted most significantly by multiple and extended outages. To address these areas, UGI states that it has increased vegetation management and tree removal across the system and focused on reliability prioritized line relocations and construction of remote tie-lines where appropriate.

To reduce outages caused by equipment failures, UGI notes that it continues an accelerated focus on infrastructure replacement, such as underground cable and wood pole replacements. UGI states that it has also accelerated programs to reduce outages caused by components susceptible to failure on the distribution system. For example, UGI has strategized an approach to replace porcelain insulators and cut-outs by prioritizing those that would result in the greatest impact to customers in the event of a failure. These programs will address significant long-term reliability

factors. Considering these programs and others documented in UGI's LTIIP, UGI fully expects to improve overall system reliability and, to some extent, smooth out historical weather-related variability.

UGI states that it has identified opportunities to reduce the duration and extent of outages using technology-based solutions and additional circuit sectionalizing. UGI notes that there were several instances in 2022 where many customers were interrupted by a single short duration outage incident, which led to an increase in SAIFI for the year. In an effort to prevent such cases in the future, UGI notes that it continues to increase sectionalizing capabilities and prepare the distribution network to accommodate a future automated system that can self-heal by isolating faulted line sections and restoring the undamaged portions, leading to fewer customer interruptions. Furthermore, remote control capability continues being integrated into existing transmission motor operated air-breaks to allow expedited sectionalizing and recovery of the transmission system following disturbances.

Conclusion

Trees and Equipment Failure are two of the leading causes of outages that negatively affect electrical reliability to UGI customers. In 2022, Trees and Equipment Failure outage causes contributed to over 63% of total CMI. The Commission notes that an increased focus on vegetation management may well produce a recovery to reliability levels achieved in 2020.

UGI has continued to maintain its CAIDI performance in 2022. However, UGI's SAIFI in 2022 continues to be just above the benchmark. Management focus should be on sustaining the CAIDI trend line below the "green" benchmark performance upper-control-limit-line and returning the SAIFI to a level below the "green" benchmark performance upper-control-limit-line. The Commission recommends continued and increased efforts in vegetation management and increased emphasis on response times.

The Commission recognizes that, overall, UGI's reliability, especially as related to the number of interruption events, may be worsening as witnessed by the data shown below. As can be seen in Figure 65 below, the number of UGI customers interrupted annually is on a trend upward. As shown in Figure 66 below, CMI is also trending upward. Figure 67 below shows an overall increase in actual interruption events.

Figure 61 - UGI CAIDI (minutes)

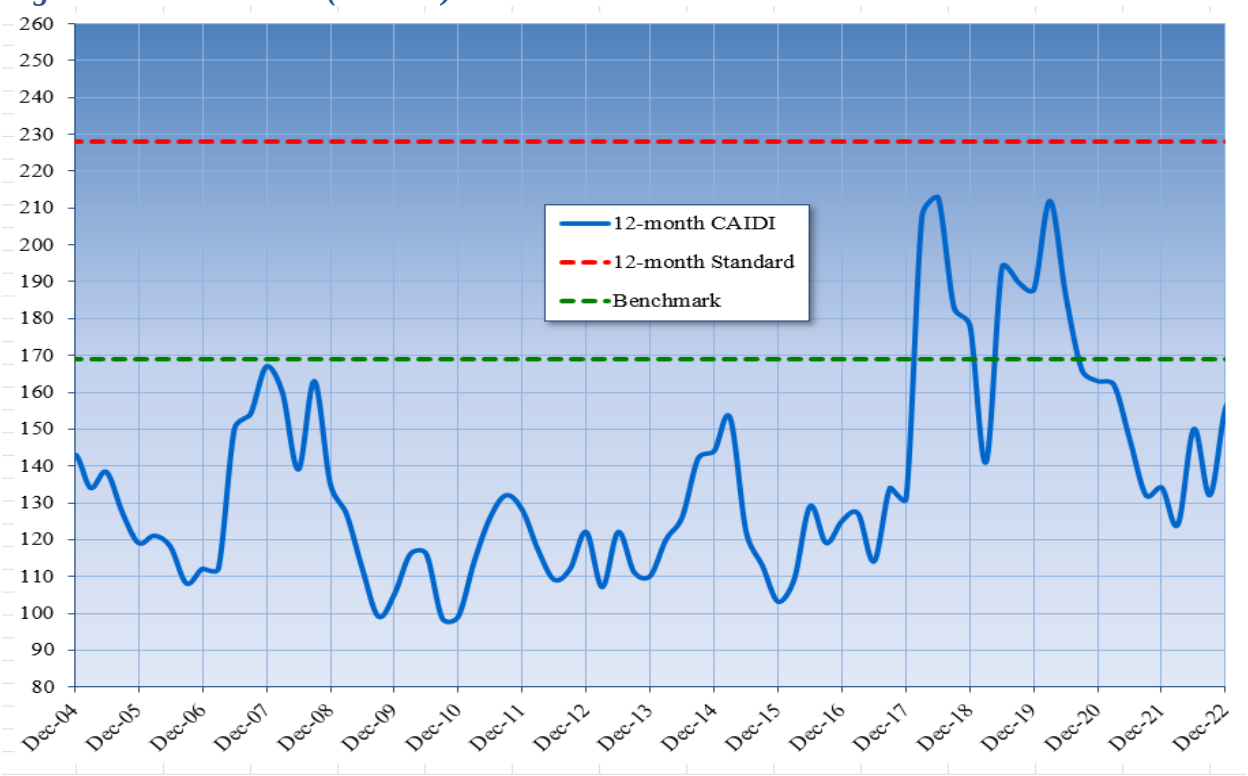


Figure 62 - UGI SAIFI (interruptions per customer)

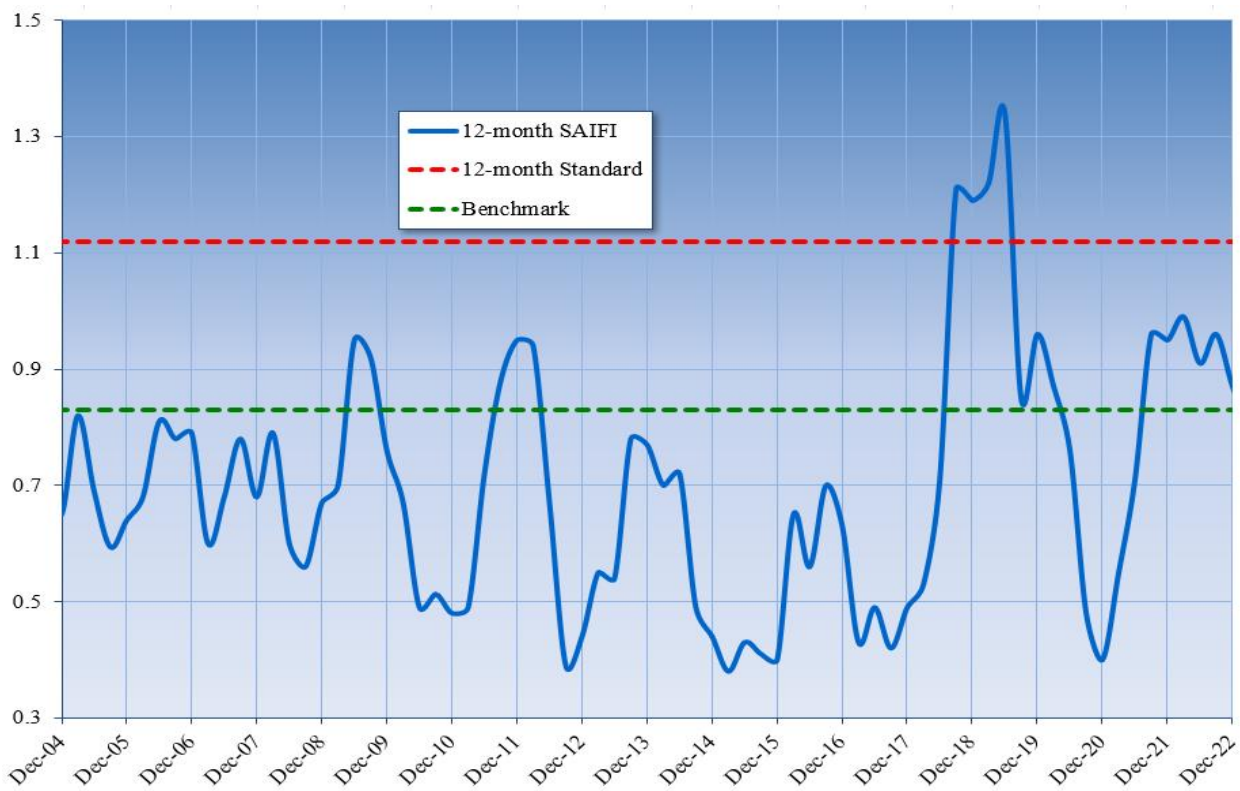


Figure 63 - UGI Outage Causes (percent of total outages)

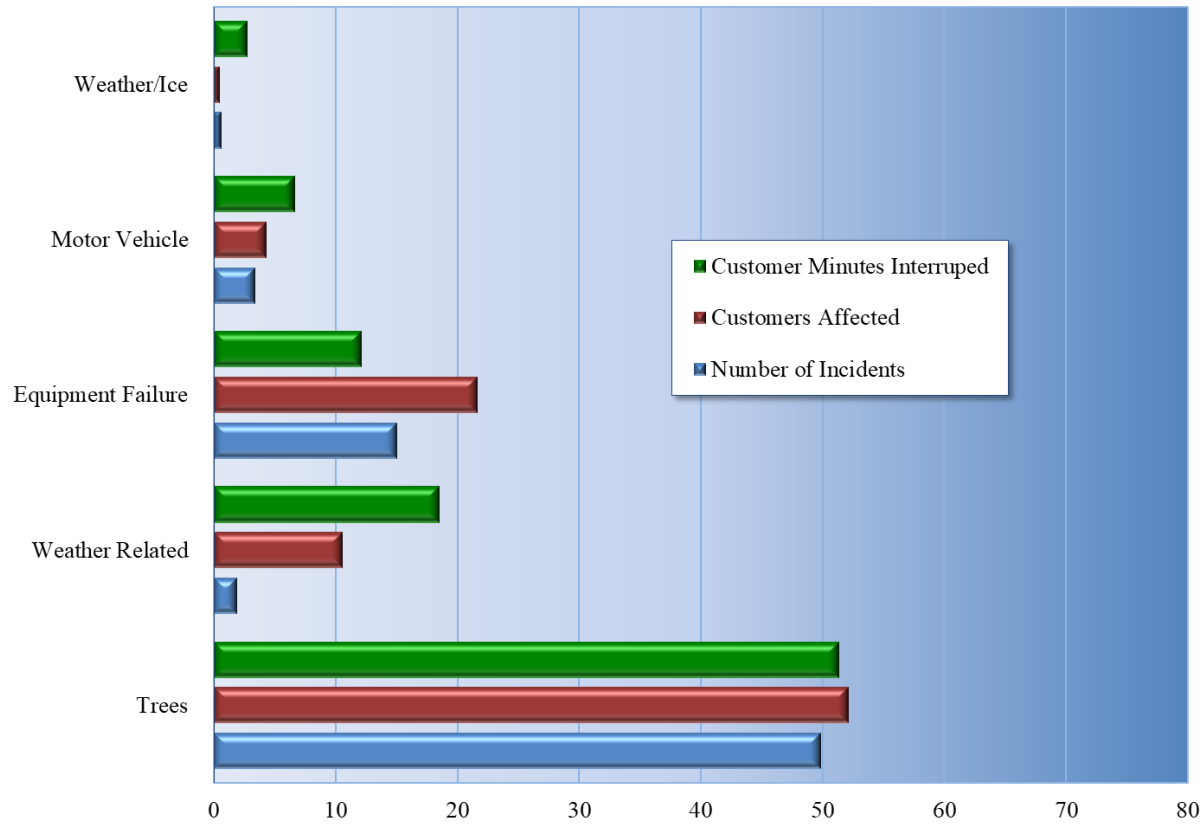


Figure 64 - UGI Outage Tracking (number of incidents)

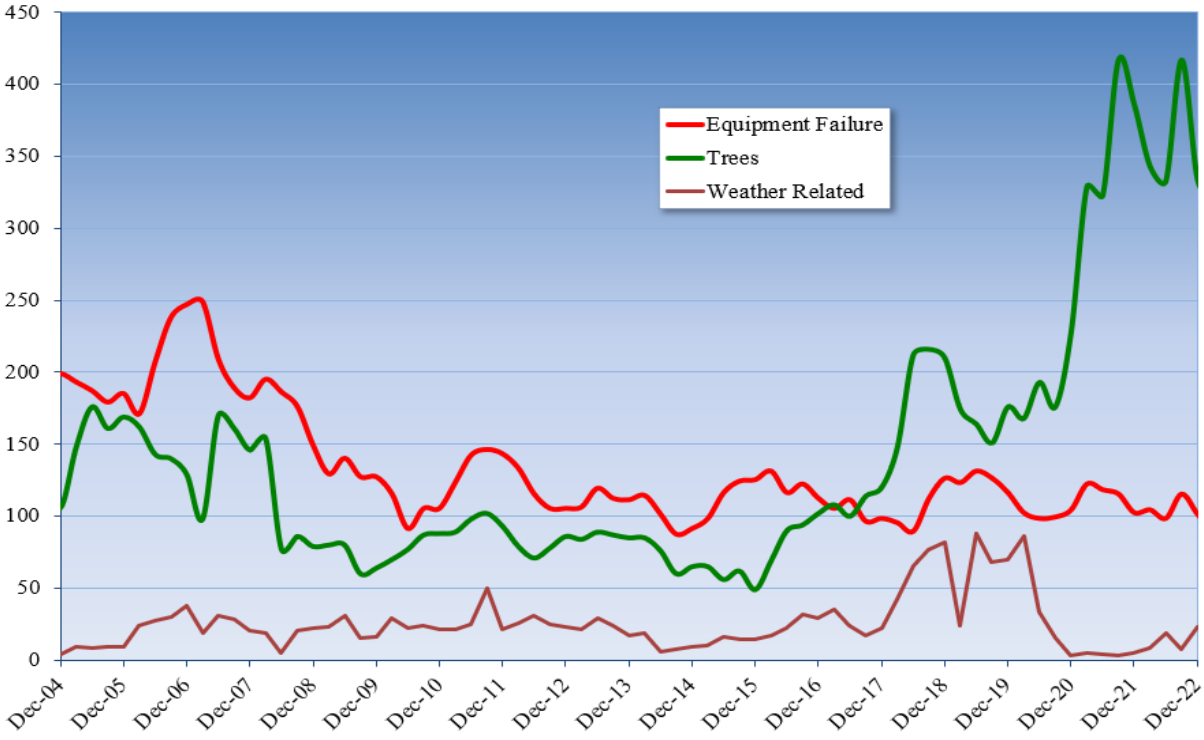


Figure 65 – UGI Outage Tracking (number of Customers Interrupted)

Figure 66 – UGI Outage Tracking (Customer-Minutes of Interruptions, or CMI)

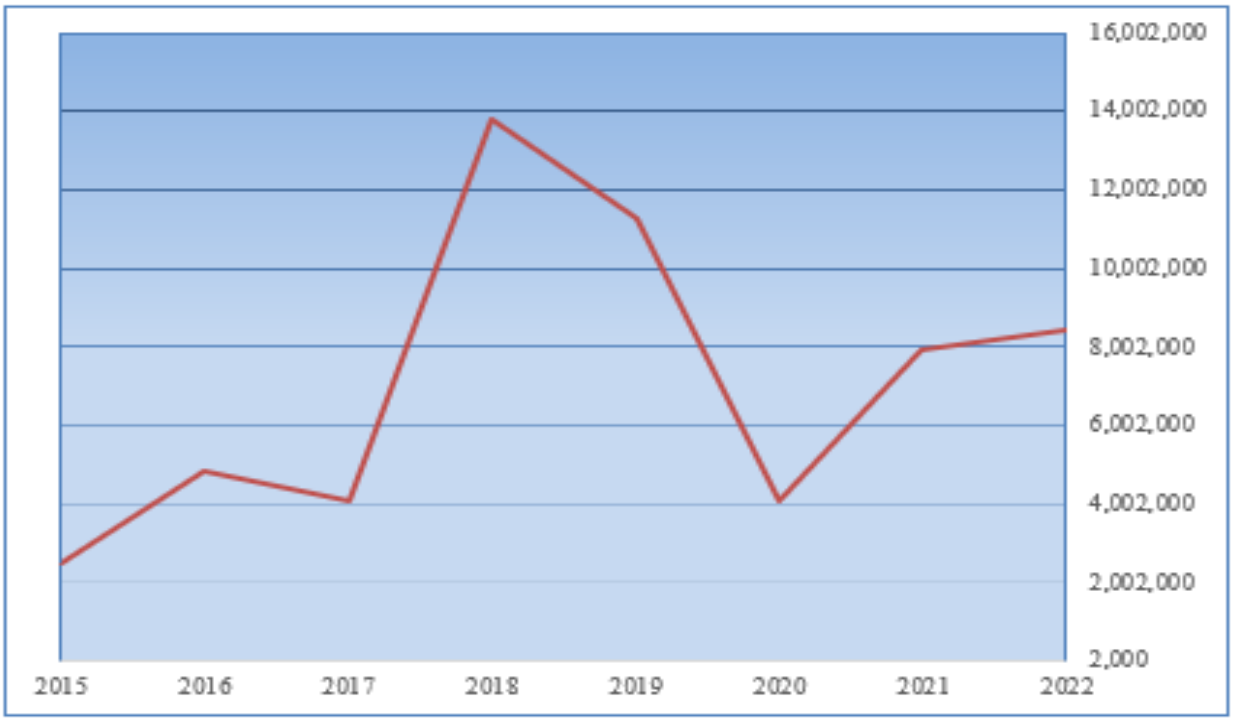
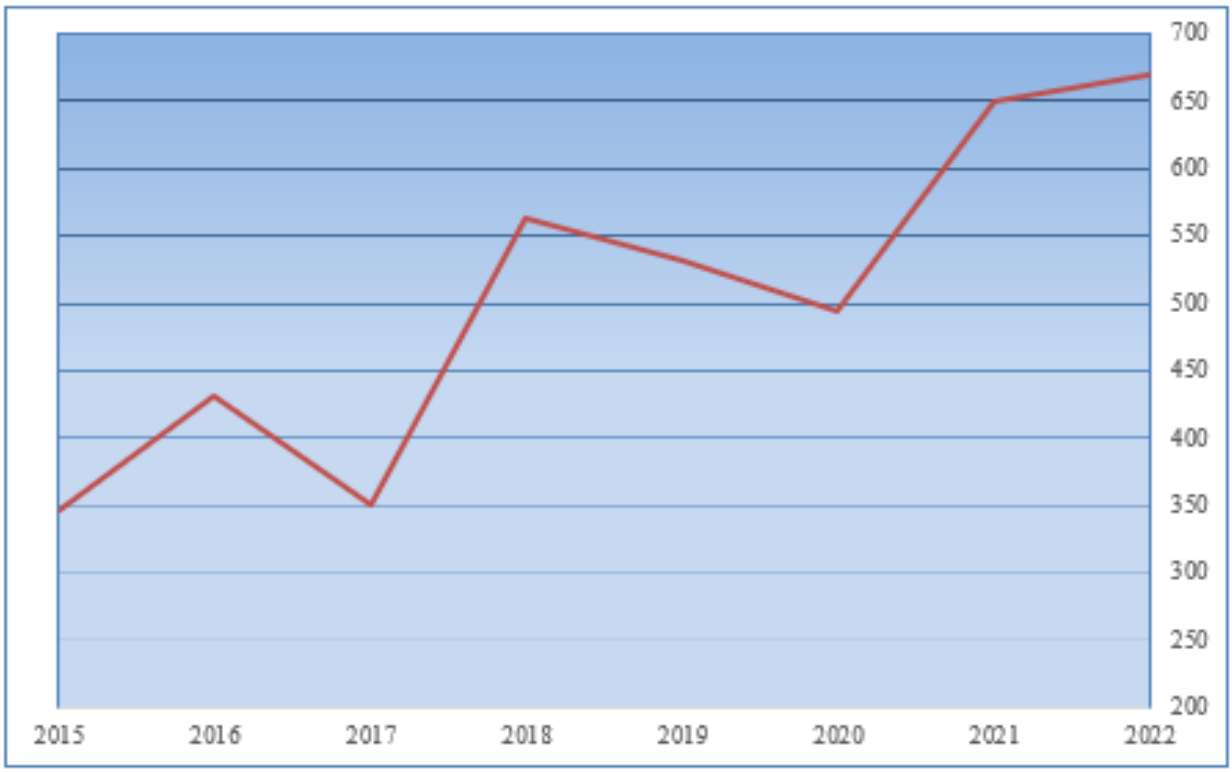


Figure 67 – UGI Outage Tracking (number of interruptions annually)



Wellsboro Electric Company

Wellsboro Electric Company (Wellsboro) has a service territory of about 178 square miles and serves about 6,433 customers.

In 2022, Wellsboro experienced 7,024 customer interruptions and 0.92 million CMI as compared to: 5,922 customer interruptions and 0.85 million CMI in 2021; 7,543 customer interruptions and 0.7 million CMI in 2020; 4,815 customer interruptions and 0.7 million CMI in 2019; and 8,565 customer interruptions and 1.1 million CMI in 2018.

Wellsboro experienced nine Major Events in 2022 on the dates listed below with a total of 1,974 customer interruptions and a total of 305,352 CMI not included in the total above.

- March 7, 2022
- April 19, 2022
- July 21, 2022
- July 22, 2022
- August 4, 2022
- August 30, 2022
- September 24, 2022
- September 26, 2022

- December 23, 2022

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Decreased from 144 minutes in 2021 to 130 minutes in 2022; failed to achieve benchmark by 4.8%

3-year average: Increased from 115 minutes in 2021 to 124 minutes in 2022; achieved standard by 9.1%.

SAIDI

Rolling 12-month: Increased from 133 minutes in 2021 to 142 minutes in 2022; achieved benchmark by 7.2%.

3-year average: Increased from 109 minutes in 2021 to 130 minutes in 2022; achieved standard by 29.9%.

SAIFI

Rolling 12-month: Increased from 0.93 outages in 2021 to 1.09 outages in 2022; achieved benchmark by 11.4%.

3-year average: Increased from 0.96 outages in 2021 to 1.06 outages in 2022; achieved standard by 21.2%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI reliability performance trends are shown in Figures 68 and Figure 69 below. Wellsboro's 2022 CAIDI performance worsened as shown to be above the "green" benchmark performance upper-control-limit-line. Prior to 2018, Wellsboro was a consistent CAIDI benchmark performer. Increased management attention is needed to ensure CAIDI performance is returned below the "green" benchmark performance upper-control-limit-line.

Wellsboro's 2022 SAIFI performance is below the "green" benchmark performance upper-control-limit-line and considered under control. Management attention is needed to ensure consistent SAIFI performance is sustained below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 70 below, shows the top five reported outage cause categories for 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Trees (combined off and on ROW) and Equipment Failure were the top cause of CMI. About 70% of CMI is caused by trees and equipment failure.

Figure 71 below, shows the historical trend of the leading three main outage causes. Trees (all causes) and Equipment Failure are the two most frequent outage causes. Tree outages and equipment failures are significantly negatively affecting Wellsboro's distribution system reliability and resilience, as well as almost every EDC in Pennsylvania.

General Reliability

Wellsboro experienced nine Major Events in 2022. Wellsboro notes that these were due to severe weather events.

Wellsboro notes that to address tree-related reliability issues, it has undertaken a program to shorten its tree trimming cycle to five years. Wellsboro notes that it will continue to trim 70 miles of circuit per year to maintain this pace and that it also identified some hot spot trimming opportunities in its downtown Wellsboro three-phase system. Wellsboro also notes that it continues its danger tree program on both on and OROW areas.

Wellsboro also identified that it has installed 12 new reclosers during 2022 and reconductored four miles of three-phase primary distribution line. Wellsboro notes that it plans to reconductor an additional six miles of three-phase line and install other group operated switches to continue reliability improvements.

Conclusion

In 2022, Wellsboro achieved benchmark performance for two of three reliability metrics: SAIFI and SAIDI. However, Wellsboro's CAIDI metric remains at a level above the 12-month benchmark. Wellsboro also experienced nine Major Events in 2022 and the impacts of those events were excluded from those reliability metric calculations. Wellsboro should continue to implement its reliability improvement plans to reduce the impact of severe weather to avoid Major Events and large customer disruption events. More management attention is also needed to return Wellsboro's CAIDI performance below the "green" benchmark performance upper-control-limit line and sustain SAIFI below the "green" benchmark performance level.

With the introduction of additional automatic sectionalizers on Wellsboro's system, the size and scope of outages should be reduced. However, while sectionalizing may reduce the number of customers impacted by an outage, it could possibly lead to increased CAIDI reliability metrics as the outages may be of longer duration. The Commission finds that in this regard, the CAIDI metric is becoming more realistic of the customer's experienced interruption duration, rather than a general average as determined by aggregate data. As this occurs, the drivers of these metrics, response times, repair times and overall restoration times, will have more effect on the results.

The Commission recognizes that, overall, Wellsboro's reliability may be worsening, as witnessed by the data shown below. As can be seen in Figure 72 below, the number of Wellsboro customers interrupted annually is on a general trend downward since 2016, but is still higher than it was in 2015. As shown in Figure 73 below, CMI is trending upwards and is much higher in 2022 than it was in 2015. Figure 74 below shows an overall increase in actual interruption events since 2015. The Commission posits that an emphasis on Vegetation Management efforts and automatic sectionalizing would improve Wellsboro's customer service.

Figure 68 - Wellsboro CAIDI (minutes)

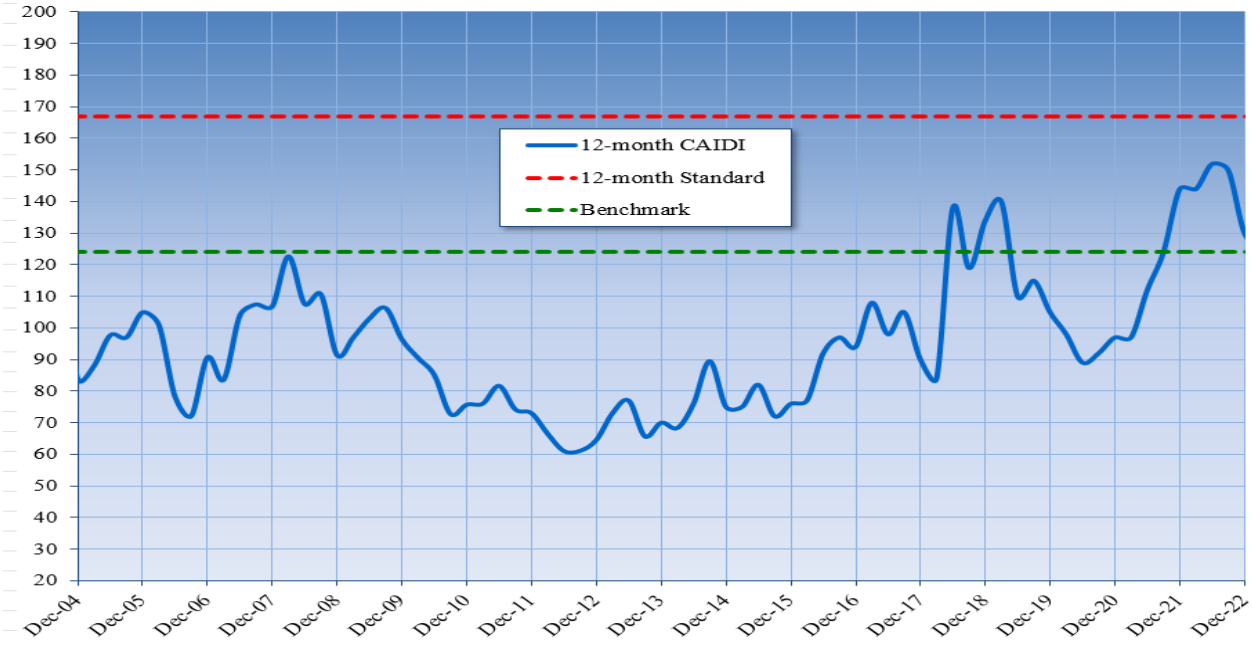


Figure 69 - Wellsboro SAIFI (interruptions per customer)

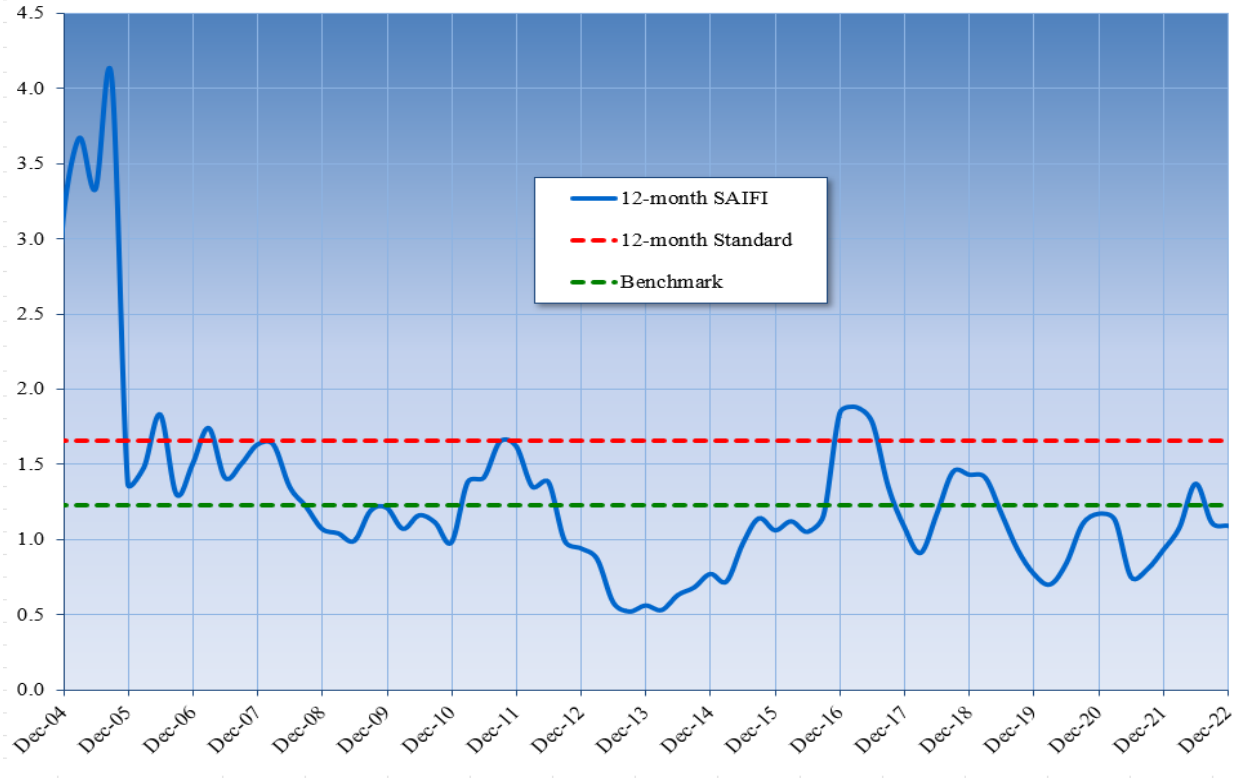


Figure 70 - Wellsboro Outage Causes (percent of total outages)

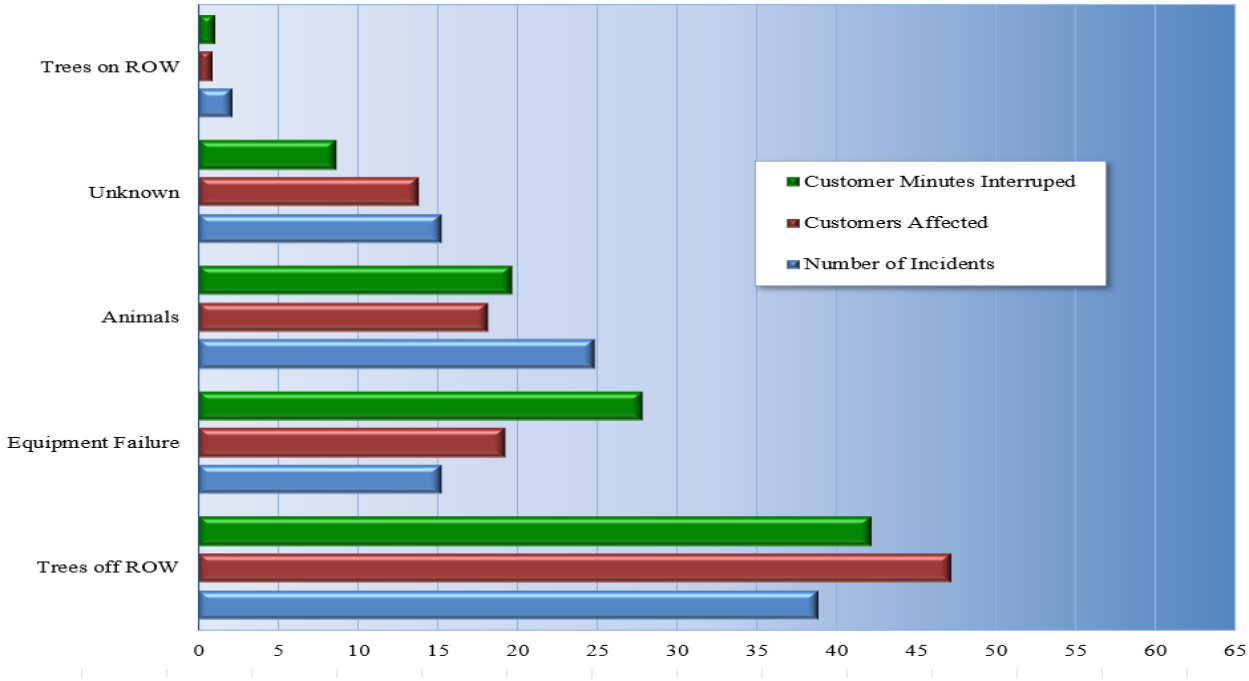


Figure 71 - Wellsboro Outage Tracking (number of incidents)

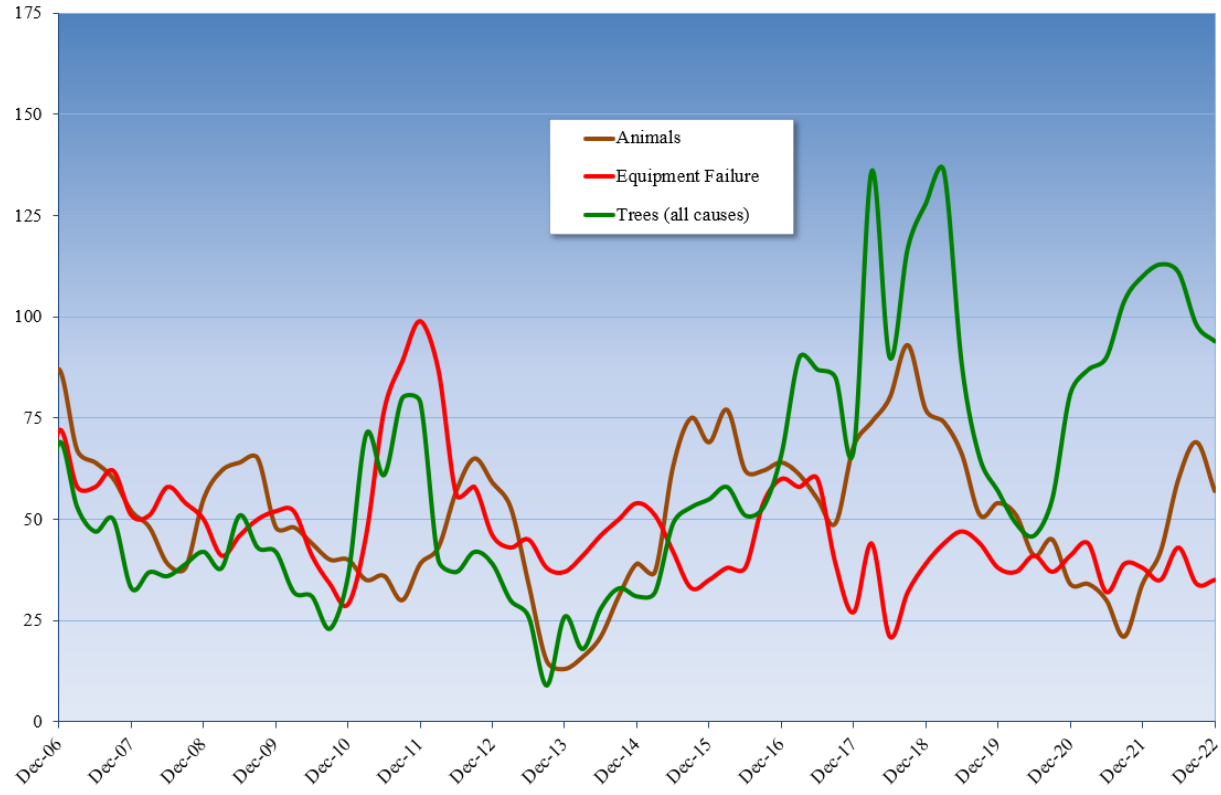


Figure 72 – Wellsboro Outage Tracking (number of Customers Interrupted)

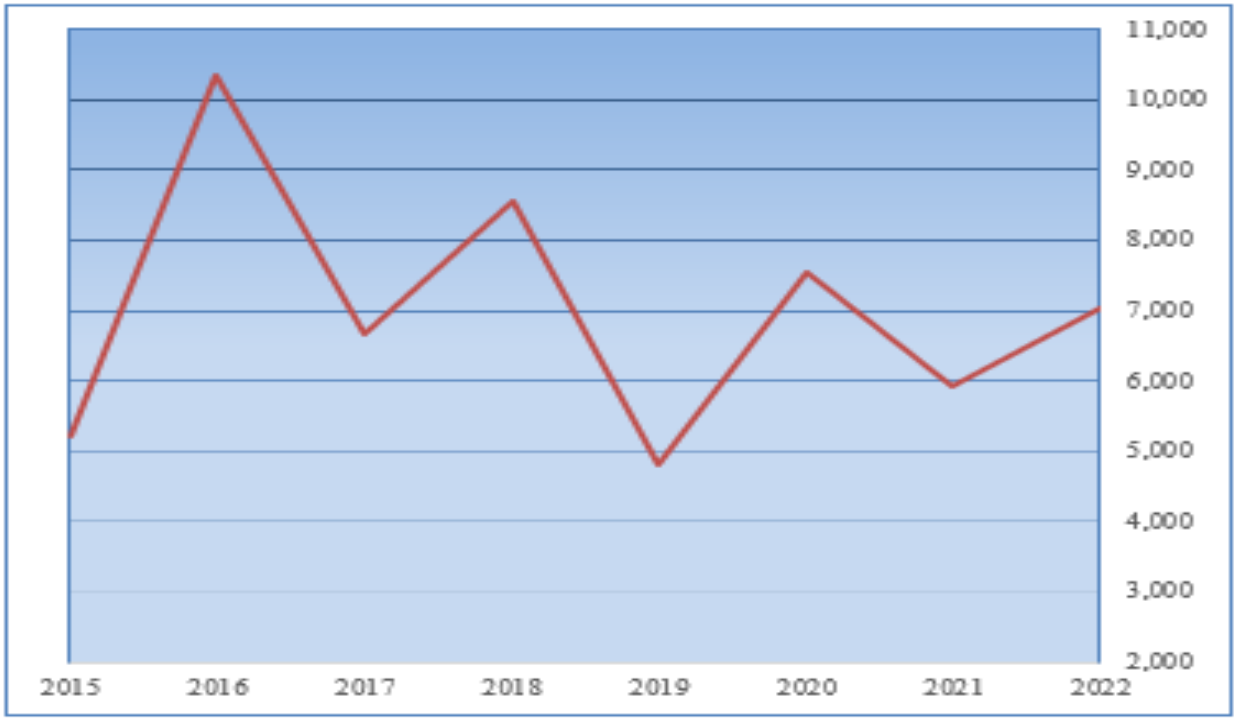


Figure 73 – Wellsboro Outage Tracking (Customer-Minutes of Interruptions CMI)

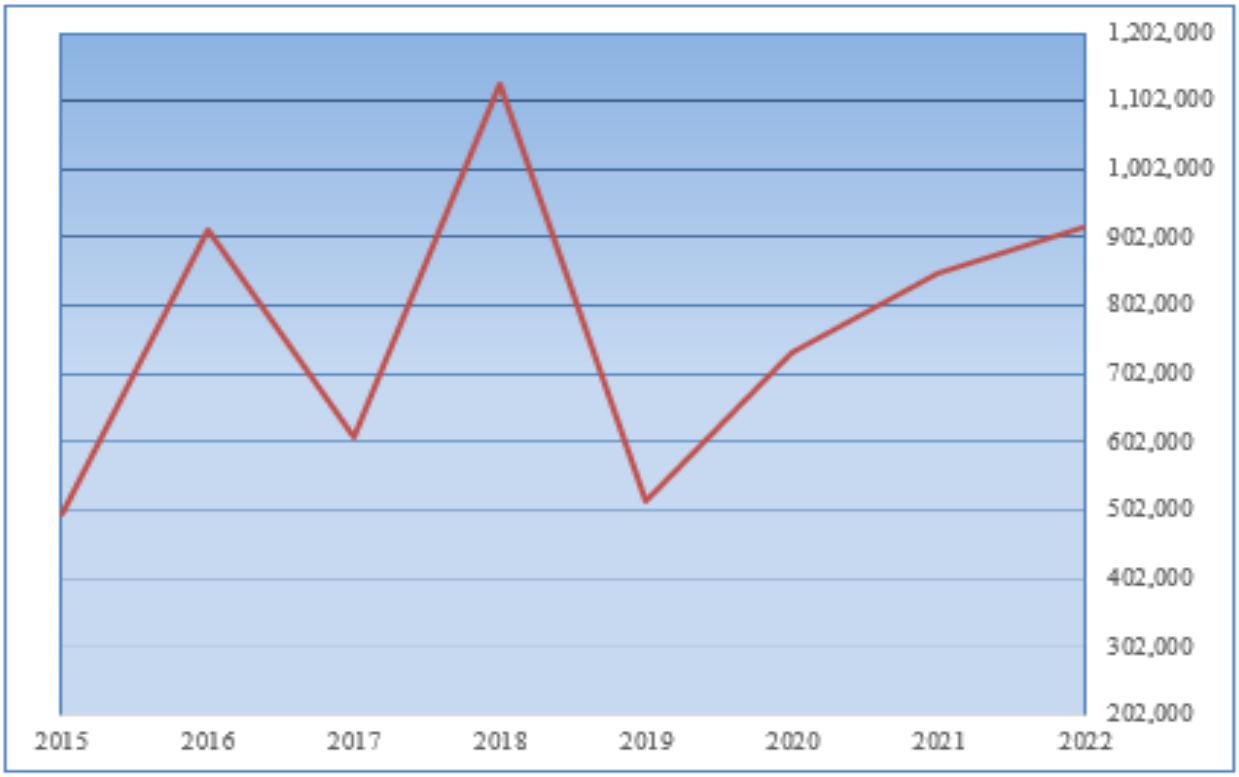
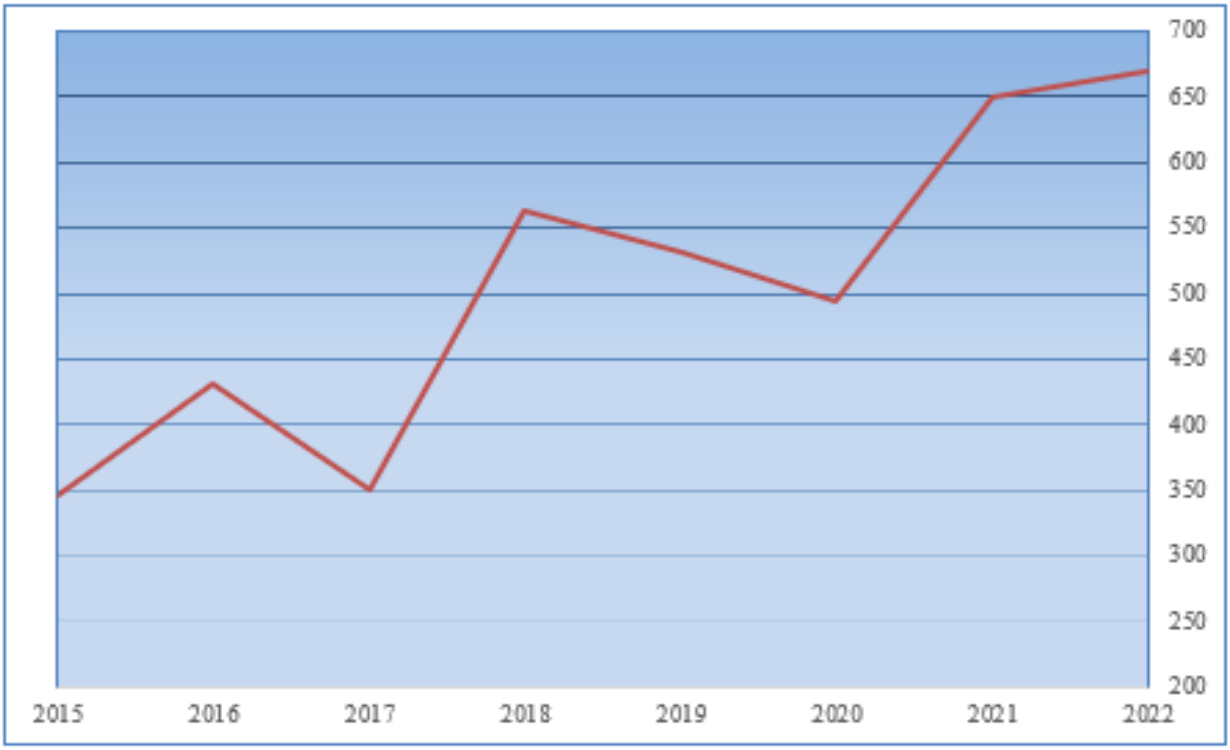


Figure 74 – Wellsboro Outage Tracking (number of interruptions annually)



West Penn Power Company

West Penn Power Company (West Penn) has a service territory of about 10,400 square miles and serves about 736,603 customers.

In 2022, West Penn experienced 957,562 customer interruptions and 264.3 million CMI as compared to: 910,590 customer interruptions and 174.5 million CMI in 2021; 806,924 customer interruptions and 173.9 million CMI in 2020; 851,338 customer interruptions and 140.3 million CMI in 2019; 844,298 customer interruptions and 136.3 million CMI in 2018.

West Penn experienced no Major Events in 2022.

CAIDI/SAIDI/SAIFI Evaluation

CAIDI

Rolling 12-month: Increased from 192 minutes in 2021 to 276 minutes in 2022; failed to achieve benchmark by 62.4%.

3-year average: Increased from 191 minutes in 2021 to 228 minutes in 2022; failed to achieve standard by 21.9%.

SAIDI

Rolling 12-month: Increased from 242 minutes in 2021 to 364 minutes in 2022; failed to achieve benchmark by 103.4%.

3-year average: Increased from 226 minutes in 2021 to 282 minutes in 2022; achieved standard by 30.1%.

SAIFI

Rolling 12-month: Increased from 1.26 outages in 2021 to 1.32 outages in 2022; failed to achieve benchmark by 25.7%.

3-year average: Increased from 1.19 outages in 2021 to 1.23 outages in 2022; failed to achieve standard by 6.3%.

CAIDI and SAIFI Performance

Historical rolling 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 75 and 76 below. West Penn's CAIDI performance has historically been erratic. However, from 2014 through part of 2019, CAIDI has been positively below the "green" benchmark performance upper-control-limit-line. Beginning in March 2020, West Penn's rolling 12-month CAIDI increased above the benchmark upper-control-limit-line and 10 minutes above the standard. In 2021, West Penn's CAIDI returned to below the rolling 12-month standard, but still above benchmark. Beginning early 2022, and continuing through the remainder of 2022, CAIDI increased to an unacceptable level of 282 minutes. West Penn management attention is required to return West Penn to the positive CAIDI trend it has previously exhibited between 2014 and 2019. Improved response times and shortened repair times may well prove essential to maintaining CAIDI at or below the benchmark level. The Commission recognizes that with the introduction of more system automation the CAIDI metric becomes more representative of actual customer interruption duration.

Beginning in 2004, West Penn's SAIFI performance trend has been erratic and continued through 2022. From 2017 through 2020, West Penn's SAIFI performance had been moving toward benchmark level. From mid-2021 to December 2022, West Penn's SAIFI rose above the 12-month standard level. West Penn needs to apply a major effort to ensure SAIFI performance at or below the benchmark level and should continue that effort to sustain the trend line below the "green" benchmark performance upper-control-limit-line.

Outage Causes

Figure 77 below, shows the top five reported outage cause categories for 2022, as a percentage, for the following three distinct performance metrics: CMI, Customers Affected, and Number of Incidents. Trees OROW and Equipment Failure (including line failure) were the leading cause of outages, customers affected, and CMI. About 56% of CMI is caused by trees and 16% are caused by equipment and line failures. As noted for Penelec, above, the Commission is concerned by West Penn's outage cause category of Ice. FirstEnergy should consider re-categorizing the outages causes currently categorized as Ice.

Figure 78 below, shows historical trend of the top three main outage causes. Trees and Equipment Failure are the two most impactful outage causes that are significantly negatively affecting West Penn's distribution system reliability and resilience, as well as most every EDC in Pennsylvania.

General Reliability

In 2016, West Penn started to execute its LTIIP. This plan included expenditures and programs designed to accelerate repair, improvement, or replacement of aging infrastructure 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 to increase overall spending in the 2019 program year. The Petition was approved, as filed, by Commission Order entered on May 23, 2019.[45] On Aug. 30, 2019, West Penn, along with the other FirstEnergy Companies (Met-Ed, Penelec, and Penn Power), filed a petition for a second LTIIP for the years 2020 through 2024. The petition was approved by Commission Order entered on Jan. 16, 2020.[46]

The PUC has also been performing extra monitoring of West Penn's work management system and RIP beginning in 2015 because of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.[47] West Penn's second LTIIP is designed to continue the reliability improvement efforts from the 2015 RIP. The Commission expects to see continuing improvement in reliability for the FirstEnergy Companies in 2023.

The FirstEnergy Companies note they utilize core programs to support cost-effective and reliable service. These programs include, but are not limited to:

- Inspection and Maintenance (I&M): FirstEnergy notes that the Distribution Inspection & Maintenance Practices are designed to assist in determining the need for, and prioritization of, the repair or replacement of distribution system components and facilities.

- Resistograph Technology: FirstEnergy avers that since 2021 the Companies have been using Resistograph technology. Poles showing incipient decay or poles that are thirty-five years old or older will be inspected by the use of a Resistograph. The Resistograph is a sophisticated electronically controlled drill that provides increased accuracy, when compared to manual drilling, in measuring the relative density of wood in timber structures. Driven by a drill motor, a long, thin needle is inserted into the wood pole in order to assess its density, structural integrity, and shell thickness.

- Vegetation Management: FirstEnergy notes that routine cycle tree trimming removes selected incompatible trees within the clearing zone corridor, removes certain defective

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

limbs that are overhanging primary conductors, controls selected incompatible brush, and removes off right-of-way priority trees. FirstEnergy notes that they are limited in their ability to legally address all forms of OROW tree management. However, priority OROW trees are identified when significantly encroaching the corridor and removed when customer consent is obtained or easement rights permit. FirstEnergy notes that portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. Portions of a circuit that experience high customer interruption minutes due to vegetation-caused outages may be targeted to include the removal of certain healthy limbs which overhang primary conductors based on tree species and condition. FirstEnergy avers that in response to damage caused by the Emerald Ash Borer, a program to proactively remove ash trees OROW was implemented. Post-storm circuit patrols target the areas with high tree-related outages. Circuit patrols identify trees damaged in a storm that may eventually lead to a future outage. Once identified, the tree is removed. In addition, damaged equipment identified as part of the circuit patrol is repaired or replaced.

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

- Load Forecasting and Distribution Planning: FirstEnergy notes that the load forecasting application 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: FirstEnergy 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.

- LTIIP: The FirstEnergy Companies first began to execute their respective LTIIP programs in 2016. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. West Penn's current LTIIP includes initiatives and expenditures within these two focus areas that are designed to maximize sustained reliability over the long-term.

The FirstEnergy Companies note that in addition to the reliability programs above, the FirstEnergy Companies also utilize various strategies to efficiently respond to customer and equipment outages. These include, but are not limited to:

- Minimizing Outage Impact: The Companies incorporate design philosophies that support grid operation resulting in maximized reliability. These philosophies include instantaneous breaker tripping on select circuits, circuit sectionalizing devices, and remote device operation (such as supervisory control and data acquisition) to minimize the impact of an outage when possible.

- Storm Exercises: Each FirstEnergy Company performs an annual storm exercise. A well-designed exercise provides a low-risk environment to test and validate capabilities, familiarize personnel with plans, procedures, roles, and responsibilities, and foster meaningful interaction and communication across internal and external organizations.

- Summer Readiness: FirstEnergy notes that Summer is the time when most electric utilities experience the highest system loads and most damaging storms. In order to prepare for this period of the year, the FirstEnergy Companies perform summer readiness activities such as capacitor inspections, substation inspections, transmission system reliability and capability review, and post-storm reviews to identify and disseminate lessons learned after significant events.

- Smart Meters: The FirstEnergy Companies have completed mass deployment of smart meters to customers across Pennsylvania. FirstEnergy notes that smart meter installation is a step toward a more modernized electric system that will enable automated meter readings. Smart meters also assist during outage restoration periods, especially when there are a significant number of single customer outages, by allowing the FirstEnergy Companies to ping the meter to determine if a customer's service has been restored.

- Incident Command System (ICS): The FirstEnergy Companies are beginning to utilize a more formalized ICS structure, which is designed to enable effective and efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organization. By expanding the use of ICS, FirstEnergy notes that its incident response ability is improved, and reliability is enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

Proposed Solutions – West Penn

West Penn analyzes its outage data to develop solutions for improving reliability. West Penn identified the top outage causes for the rolling 12-month period ending December 31, 2022, and the associated actions designed to address these outage causes.

To reduce outages caused by trees, West Penn states that it performs cycle-based tree trimming which removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes OROW priority trees. West Penn is legally limited in its ability to address all forms of OROW tree management. However, West Penn is legally permitted to identify priority OROW trees that are dead, dying, diseased, leaning, and significantly encroaching the corridor and remove those trees when customer consent is obtained or easement rights permit. West Penn is very active in pursuing this option, where available. Trees identified as a potential cause of a future outage are removed to prevent an interruption of electrical service to West Penn's customers. West Penn continues its program to mitigate trees subject to damage from the Emerald Ash Borer.

To reduce the likelihood of equipment and line failures, West Penn follows I&M programs that set forth schedules for regular inspections of distribution and substation facilities. These programs are geared towards specific components such as capacitors, poles, circuits, transformers, substations, and reclosers. Equipment identified is repaired or replaced as appropriate.

Conclusion

The Trees OROW and Equipment Failure causes are the top two outage causes that substantially negatively affect electrical reliability to West Penn customers. In 2022, these outage causes contributed to over 57% of the total CMI. Both categories are indicative of the need for increased vegetation management efforts.

West Penn had been a consistent CAIDI benchmark performer from 2014 through early 2020 at which time CAIDI rose above benchmark and has since continued to rise above the 12-month standard where it remains. The Commission hopes West Penn can return to benchmark CAIDI performance. West Penn's SAIFI and SAIDI performance continue to need much more management effort to establish a trend line heading downward to a point below the "green" benchmark performance upper-control-limit-line. The Commission expects improvement in reliability metrics for all the FirstEnergy Companies in 2023 and 2024.

The Commission strongly recommends increased budgeting for vegetation management and an exceptional effort and use of LTIIP funding to see improvement in reliability for West Penn and all the FirstEnergy Companies in 2023 and beyond. Additionally, it is recommended that West Penn increase its efforts in vegetation management and on improving outage response times. West Penn would do well to maximize their LTIIP efforts to increase storm hardening and increase automatic sectionalizing.

The Commission recognizes that, overall, West Penn's reliability is declining as witnessed by the data shown below. As can be seen in Figure 79 below, the number of West Penn customers interrupted annually is on a steep trend upward as compared to 2015. As shown in Figure 80 below, CMI is also trending upward. Figure 81 below shows a corresponding increase in the number of interruption events.

Figure 75 - West Penn CAIDI (minutes)

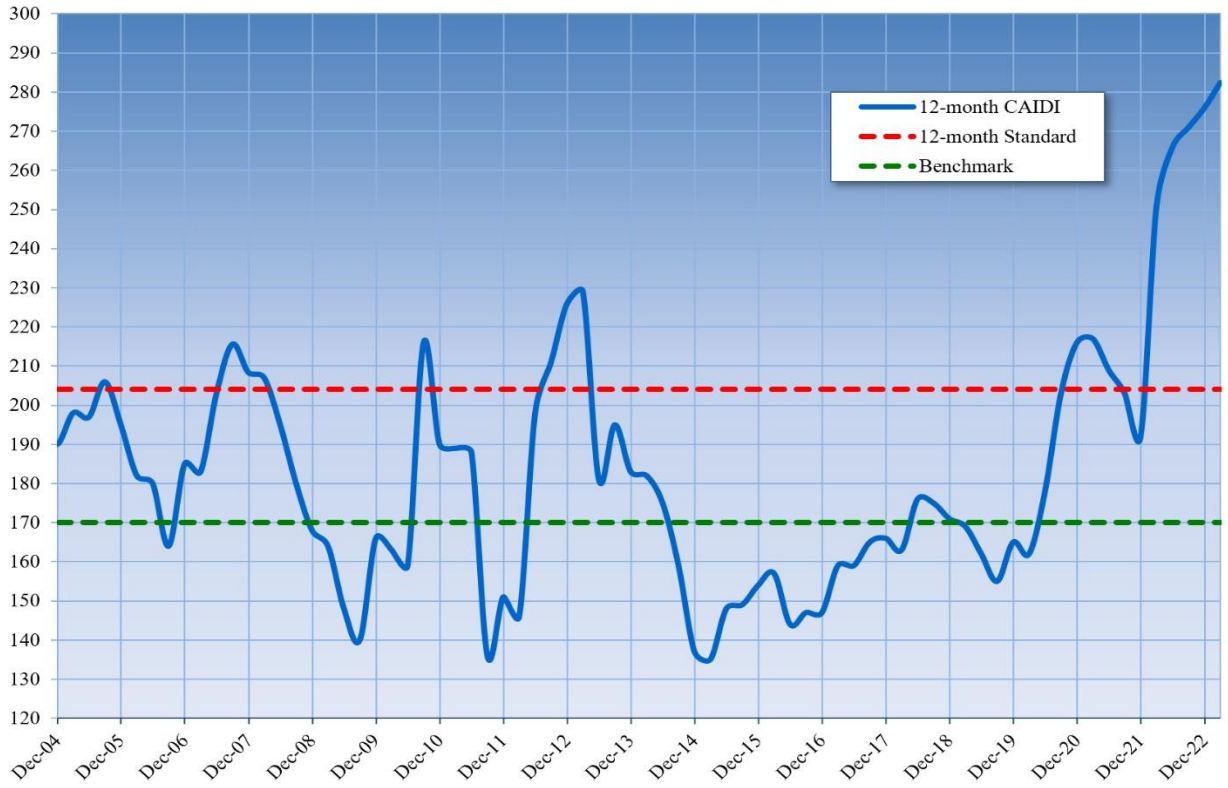


Figure 76 - West Penn SAIFI (interruptions per customer)

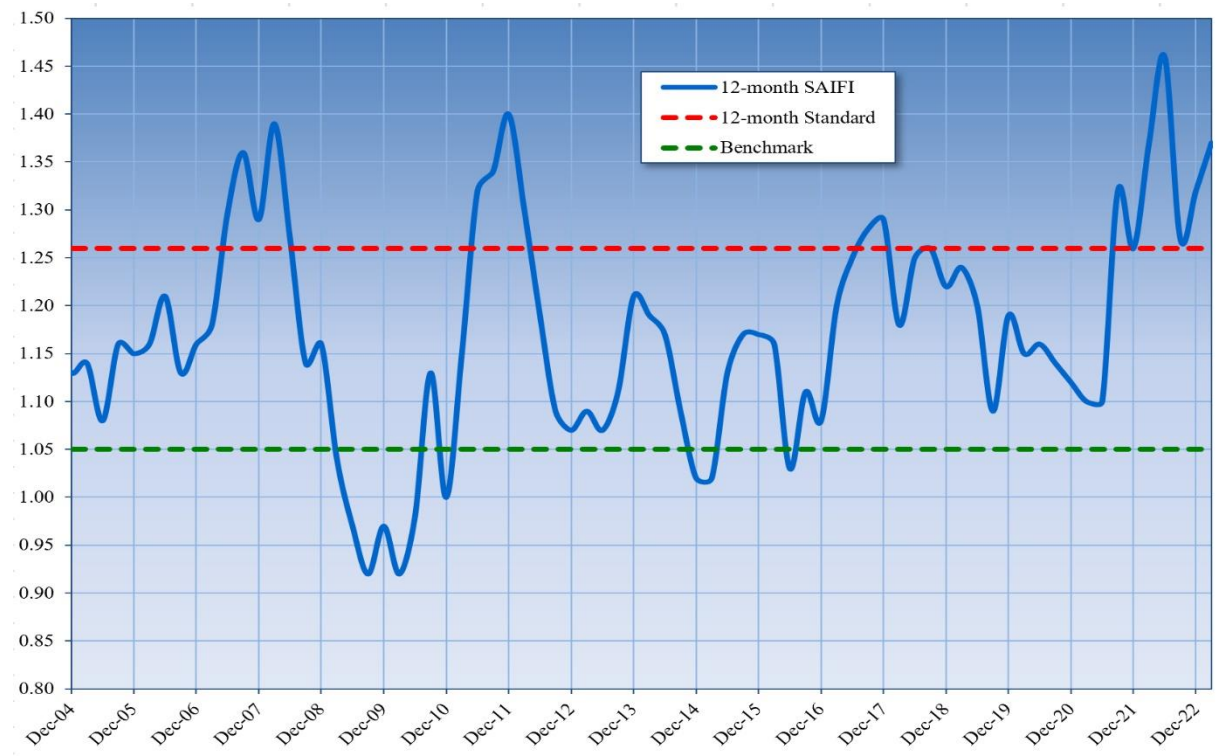


Figure 77 - West Penn Outage Causes (percent of total outages)

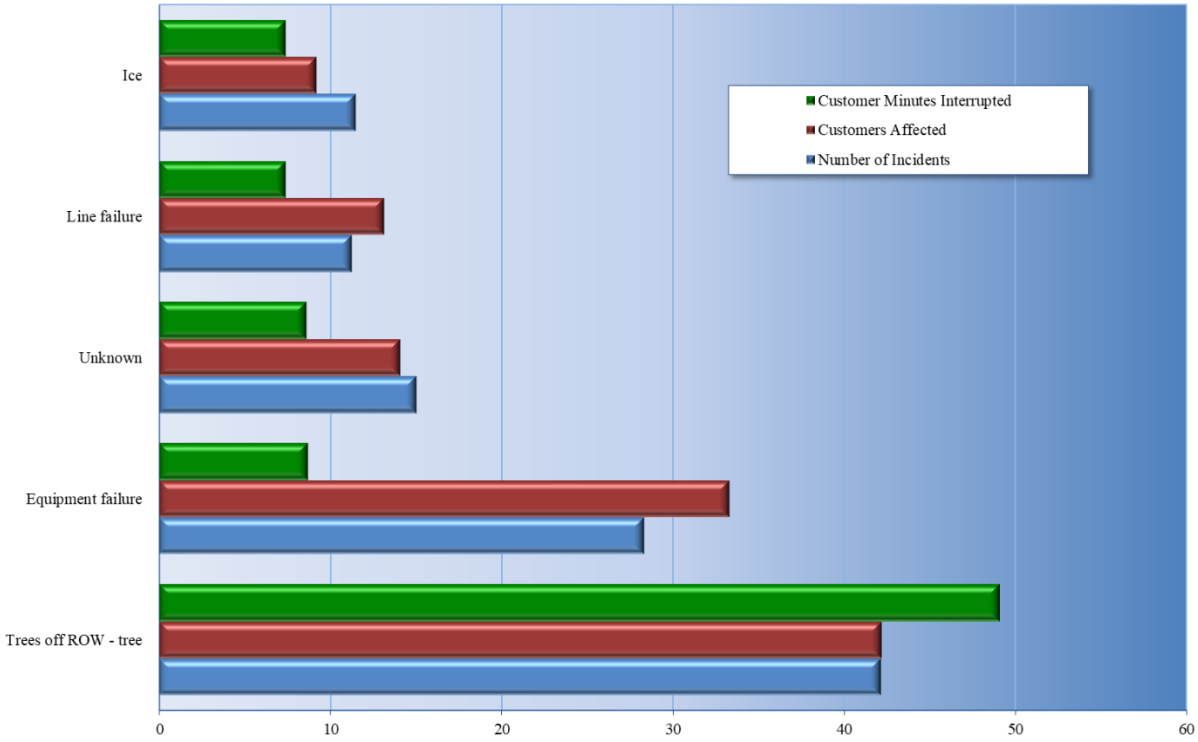


Figure 78 - West Penn Outage Tracking (number of incidents)

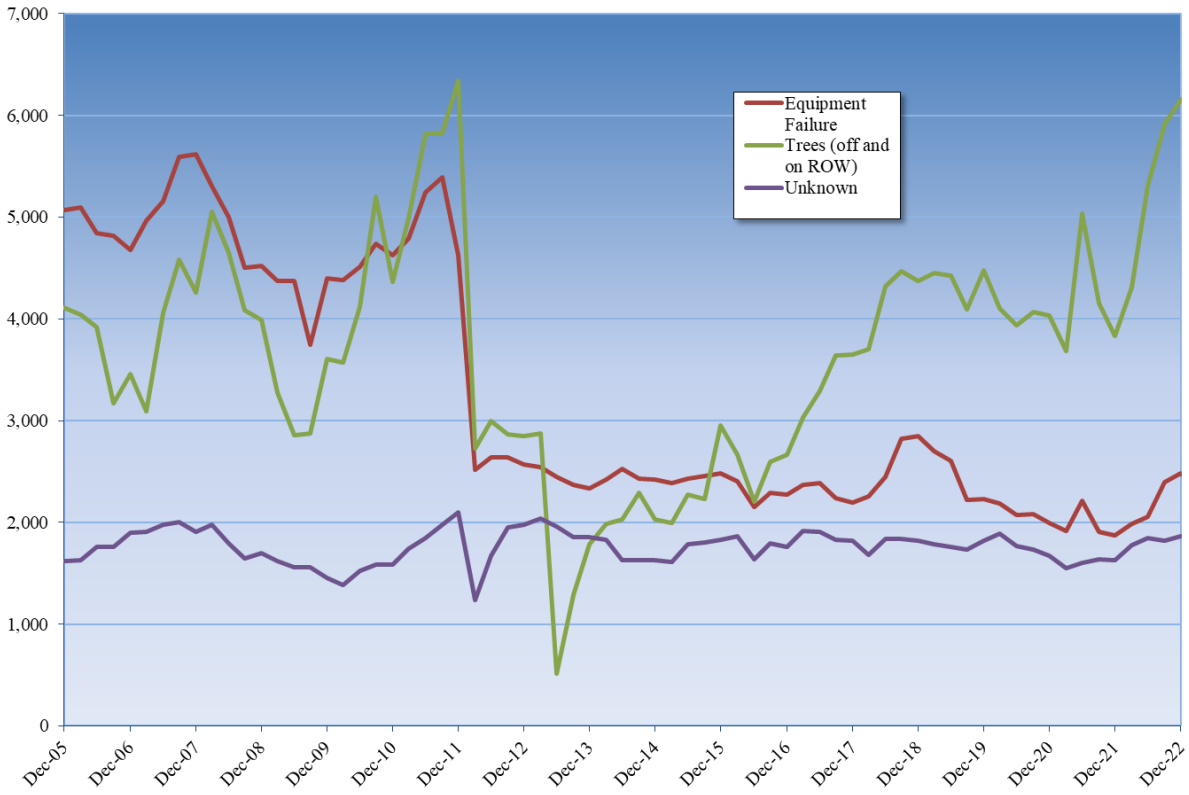


Figure 79 – West Penn Outage Tracking (number of Customers Interrupted)

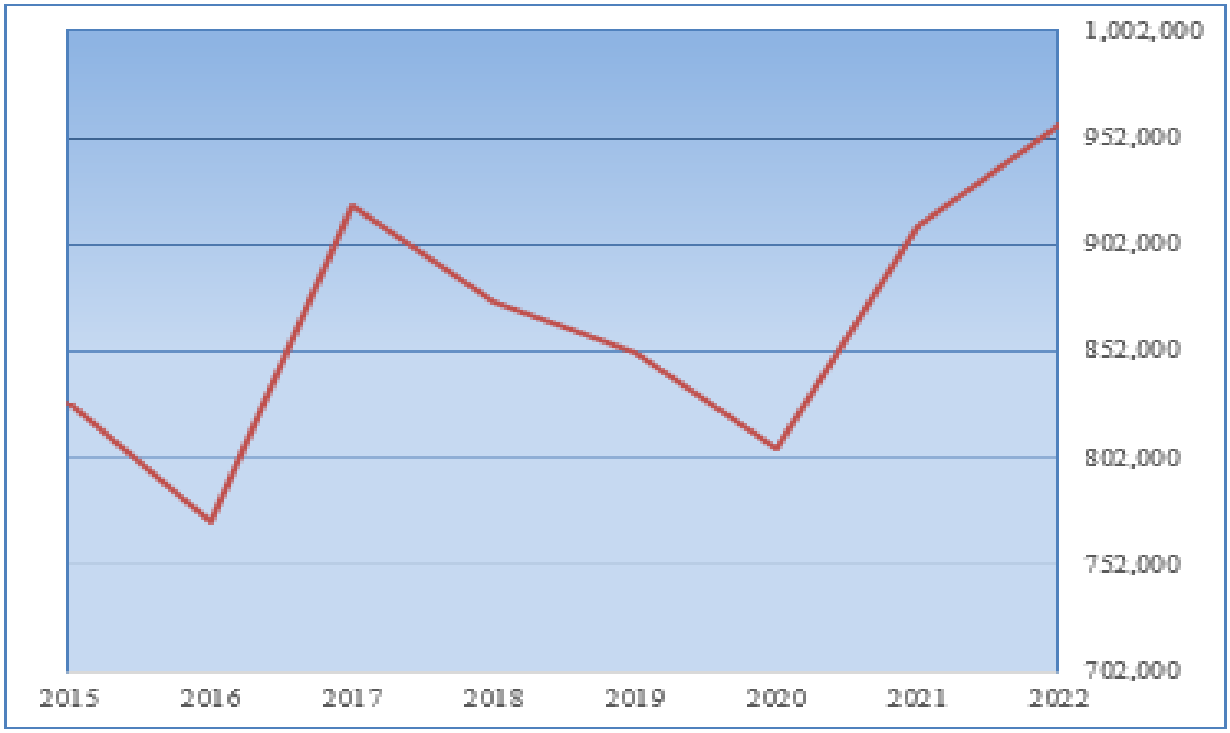


Figure 80 – West Penn Outage Tracking (Customer-Minutes of Interruptions CMI)

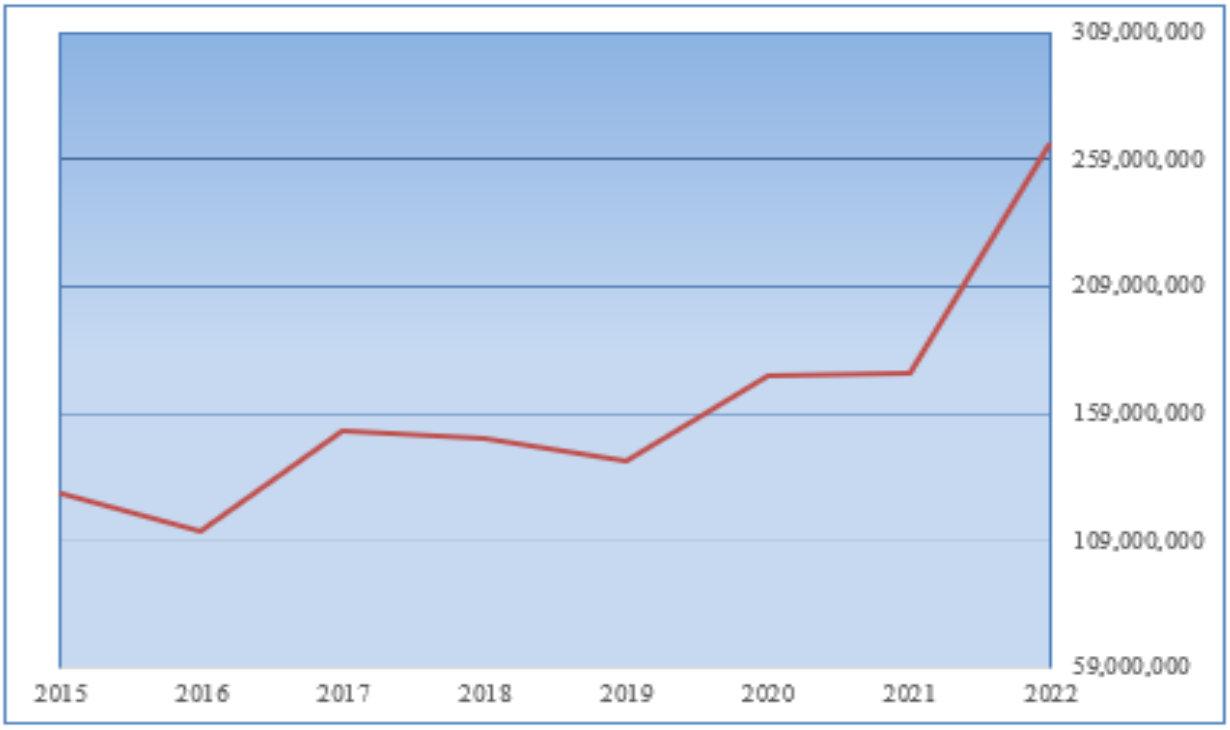
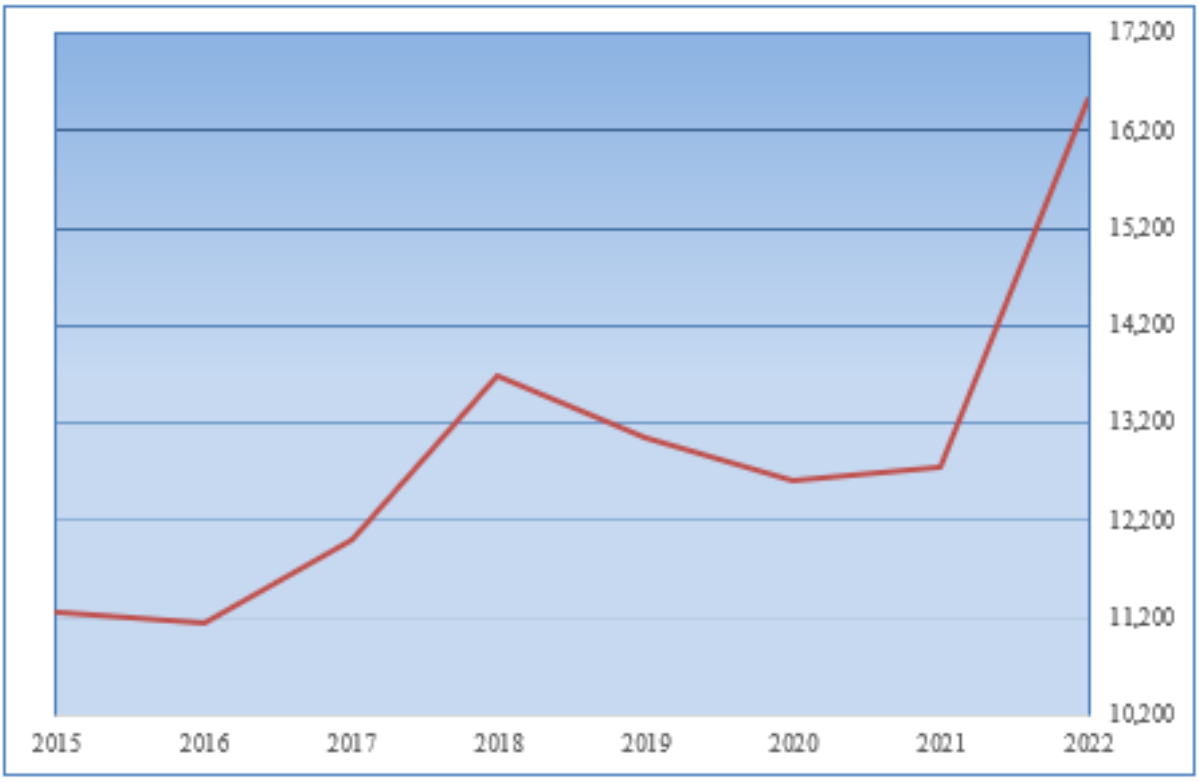


Figure 81 – West Penn Outage Tracking (number of interruptions annually)



Section 5 – Conclusion

Based on the information in this report and its Appendices, it can be seen that, with few exceptions, the reliability performance of the EDCs has continued to degrade. As shown in the three additional figures added to each EDC's section, above, reliability performance has exhibited a declining trend since 2015. Of the seven large EDCs, six have not achieved CAIDI benchmark performance during any of the rolling 12-month quarters during 2022. Only one of the large EDCs achieved CAIDI benchmark performance, PECO, which was for the last two rolling 12-month quarters of 2022. Of the small EDCs, only one, UGI, achieved CAIDI benchmark for all four rolling 12-month quarters of 2022. The 2022 CAIDI performance is reminiscent of performance during 2021 when no large EDCs achieved the CAIDI benchmark in any of the rolling 12-month quarters. In contrast, in 2021 three of the small EDCs achieved CAIDI benchmark performance in all of the rolling 12-month quarters.

CAIDI is an important measure as it relates to the average duration of a service outage. TUS views CAIDI as an important metric because it is a measure of resiliency and thus a good measure of an EDC's customer service. TUS notes that CAIDI is highly dependent upon the EDCs ability to respond to outages and restoration times. EDCs will be expected to improve worsening CAIDI. As noted above, as the EDCs install more sectionalizing devices (reclosers, etc.) that

reduce the number of customers impacted by a sustained outage, it could possibly lead to increased CAIDI reliability metrics as the outages may be of longer duration. The Commission finds that in this regard, the CAIDI metric is becoming more realistic of the customer's experienced interruption duration, rather than a general average as determined by aggregate data. In effect, CAIDI is moving toward being more realistic and representative of the average customer interruption length. As this occurs, the improvement of the drivers of these metrics such as response times, repair times and overall restoration times, will have more effect on the results.

As seen in Appendix B, only three of the 11 EDCs achieved benchmark for SAIFI in all rolling 12-month quarters in 2022, which was the same as in 2021. In 2020, six of the EDCs achieved benchmark for SAIFI in all of the rolling 12-month quarters. In 2022, five of the 11 EDCs achieved the rolling 12-month standard in all quarters, as compared to six in 2021 and eight in 2020. TUS views SAIFI as an important metric to focus on improving as it relates directly to the number of service outages experienced by a customer. Reducing service outages from occurring in the first place is crucial to improving reliability performance. As noted in the Executive Summary, the three EDCs that have expended the most capital through their LTIIPs have been the most consistent in achieving benchmark SAIFI performance the past three years (Duquesne, PECO, and PPL).

For all EDCs except Duquesne, approximately 5.47 million customers experienced interruptions in 2022 as compared to approximately 5.78 million in 2021 and 5.36 million in 2020. Duquesne calculates customer outages as kVA disrupted, rather than individual customers. Duquesne saw approximately 7.3 million kVA interrupted in 2022, which is approximately the same as experienced in 2021, but higher than the 6.5 million in kVA disrupted in 2020. Customer interruption data for all EDCs (excluding Duquesne) can be seen in figure 82 below. As shown in Figure 83 below, total CMI for all EDCs (except Duquesne) decreased to 854 million in 2022, as compared to: 921 million in 2021; 811 million in 2020; and 926 million in 2019.

EDCs continue to experience increasing numbers of outages annually, *i.e.,* outage events that lead to customers experiencing sustained interruptions. Since 2015, outages have increased from an annual level of 60,218 to 89,994 in 2022, which is an increase of 49% during the last 7 years. See Figure 84 below. The number of customers served by Pennsylvania EDCs, however, has only increased from 5,192,839 in 2015 to 5,259,066 in 2022 or increase of 1.2% during the period as shown in figure 85 below.

EDCs are experiencing a significant increase in vegetation-caused outages since 2015. In December 2015 there were 14,462 outages reportedly caused by vegetation. By December 2022 the annual figure had risen to 34,900 outages attributed to vegetation problems, which is an increase of 141%. See Figure 86 below.

As noted in Section 3 of this report, EDCs experienced 42 reportable outage events (ROEs) in 2022. EDCs had 63 ROEs in 2021, which was the highest number reported to the Commission since 1994 (the first year of the five-year benchmarking period). All of the ROEs were caused by weather impacts on the EDC distribution systems. Noting this fact is not to excuse a slip in reliability performance of the EDCs, but rather to reiterate the importance of EDCs continuing to

invest in reliability improvement and resiliency to weather events. As the EDCs continue to accelerate infrastructure improvement and to work on improving reliability and resilience through their LTIIPs the Commission will expect to see those numbers drop as increased automatic sectionalizing, storm hardening, and newer equipment is installed.

Another factor in reducing the number of events is the improvement of vegetation management by the EDCs. TUS expects all EDCs to review their vegetation management programs as vegetation issues are the number one cause of service outages for EDCs. Currently nine of the 11 EDCs have approved LTIIPs. As seen in this report's Executive Summary, TUS agrees with the EDCs that LTIIPs are an important tool in the toolbox for addressing failing infrastructure and improving resiliency. However, vegetation management is not an eligible project category for LTIIPs. As noted, EDCs should review their vegetation management programs to ensure that expenditures and procedures are most efficiently and effectively directed at the main cause of service outages. TUS also notes that it expects to see improvements in reliability as EDCs continue to execute their LTIIPs.

Figure 82 – ALL EDCs (except Duquesne) Customers Interrupted

Figure 83 – ALL EDCs (except Duquesne) Customer-Minutes of Interruptions, or CMI

Figure 84 – ALL EDCs (except Duquesne) Number of Interruptions Annually

Figure 85 – ALL EDCs (except Duquesne) Number of Customers Served

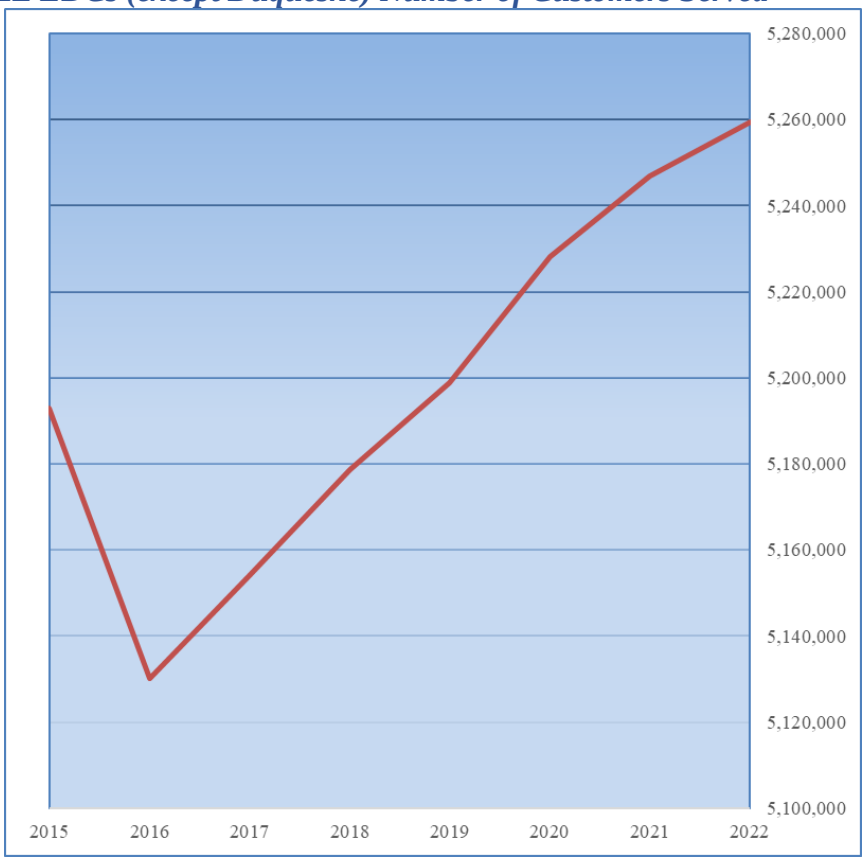


Figure 86 – Outage Causes ALL EDCs as Reported by EDCs for 2014-2022

Appendix A – Electric Reliability Metrics

12-Month Average Electric Reliability Indices for 2022

Customer Average Interruption Duration Index (CAIDI)- min/yr/cust				% Above (+) or	% Above (+) or
EDC	Dec-22	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	101	105	141	-4.3%	-28.7%
Duquesne Light	146	108	130	35.2%	12.3%
Met-Ed (FE)	160	117	140	36.8%	14.3%
PECO	99	112	134	-11.6%	-26.1%
Penelec (FE)	199	117	141	70.1%	41.1%
Penn Power (FE)	134	101	121	32.7%	10.7%
Pike County	159	174	235	-8.6%	-32.3%
PPL	164	145	174	13.1%	-5.7%
UGI	156	169	228	-7.7%	-31.6%
Wellsboro	130	124	167	4.8%	-22.2%
West Penn (FE)	276	170	204	62.4%	35.3%
System Average Interruption Frequency Index (SAIFI)- outages/yr/cust				**% Above (+) or**	**% Above (+) or**
EDC	Dec-22	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	0.27	0.20	0.27	35.0%	0.0%
Duquesne Light	0.92	1.17	1.40	-21.4%	-34.3%
Met-Ed (FE)	1.32	1.15	1.38	14.8%	-4.3%
PECO	0.71	1.23	1.48	-42.3%	-52.0%
Penelec (FE)	1.83	1.26	1.52	45.2%	20.4%
Penn Power (FE)	0.99	1.12	1.34	-11.6%	-26.1%
Pike County	0.50	0.61	0.82	-18.0%	-39.0%
PPL	0.87	0.98	1.18	-11.2%	-26.3%
UGI	0.87	0.83	1.12	4.8%	-22.3%
Wellsboro	1.09	1.23	1.66	-11.4%	-34.3%
West Penn (FE)	1.32	1.05	1.26	25.7%	4.8%
System Average Interruption Duration Index (SAIDI)- min/yr/cust				**% Above (+) or**	**% Above (+) or**
EDC	Dec-22	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	28	21	38	31.0%	-27.6%
Duquesne Light	134	126	182	6.3%	-26.4%
Met-Ed (FE)	211	135	194	56.3%	8.8%
PECO	71	138	198	-48.6%	-64.1%
Penelec (FE)	364	148	213	145.9%	70.9%
Penn Power (FE)	133	113	162	17.7%	-17.9%
Pike County	79	106	194	-25.5%	-59.3%
PPL	142	142	205	0.0%	-30.7%
UGI	135	140	256	-3.6%	-47.3%
Wellsboro	142	153	278	-7.2%	-48.9%
West Penn (FE)	364	179	257	103.4%	41.6%

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

Performance Benchmark. An EDC's performance benchmark is calculated by averaging the EDC's annual, system-wide reliability performance indices over the five-year period directly prior to the implementation of electric restructuring (1994 to 1998). The benchmark is the level of performance that the EDC should strive to achieve and maintain.

Three-Year Average Electric Reliability Indices for 2020-2022

Customer Average Interruption Duration Index (CAIDI)-min/yr/cust				*3-Year*	*3-Year*	*% Above (+) or*
EDC	*2020*	*2021*	*2022*	*Average*	*Standard*	*Below (-) Standard*
Citizens'	*87*	*94*	*101*	*94*	*115*	*-18.3%*
Duquesne Light	*132*	*187*	*146*	*155*	*119*	*30.3%*
Met-Ed (FE)	*150*	*173*	*160*	*161*	*129*	*24.8%*
PECO	*135*	*187*	*99*	*140*	*123*	*14.1%*
Penelec (FE)	*136*	*151*	*199*	*162*	*129*	*25.6%*
Penn Power (FE)	*185*	*129*	*134*	*149*	*111*	*34.5%*
Pike County	*184*	*153*	*159*	*165*	*192*	*-13.9%*
PPL	*137*	*187*	*164*	*163*	*160*	*1.7%*
UGI	*163*	*134*	*156*	*151*	*186*	*-18.8%*
Wellsboro	*97*	*144*	*130*	*124*	*136*	*-9.1%*
West Penn (FE)	*216*	*192*	*276*	*228*	*187*	*21.9%*
System Average Interruption Frequency Index (SAIFI)-outages/yr/cust				*3-Year*	*3-Year*	*% Above (+) or*
EDC	*2020*	*2021*	*2022*	*Average*	*Standard*	*Below (-) Standard*
Citizens'	*0.08*	*0.27*	*0.27*	*0.21*	*0.22*	*-6.1%*
Duquesne Light	*0.84*	*0.93*	*0.92*	*0.90*	*1.29*	*-30.5%*
Met-Ed (FE)	*1.27*	*1.35*	*1.32*	*1.31*	*1.27*	*3.4%*
PECO	*0.90*	*0.88*	*0.71*	*0.83*	*1.35*	*-38.5%*
Penelec (FE)	*1.58*	*1.84*	*1.83*	*1.75*	*1.39*	*25.9%*
Penn Power (FE)	*0.97*	*1.00*	*0.99*	*0.99*	*1.23*	*-19.8%*
Pike County	*0.45*	*1.40*	*0.50*	*0.78*	*0.67*	*16.9%*
PPL	*0.84*	*0.91*	*0.87*	*0.87*	*1.08*	*-19.1%*
UGI	*0.40*	*0.95*	*0.87*	*0.74*	*0.91*	*-18.7%*
Wellsboro	*1.17*	*0.93*	*1.09*	*1.06*	*1.35*	*-21.2%*
West Penn (FE)	*1.12*	*1.26*	*1.32*	*1.23*	*1.16*	*6.3%*
System Average Interruption Duration Index (SAIDI)-min/yr/cust				*3-Year*	*3-Year*	*% Above (+) or*
EDC	*2020*	*2021*	*2022*	*Average*	*Standard*	*Below (-) Standard*
Citizens'	*7*	*26*	*28*	*20*	*25*	*-19.9%*
Duquesne Light	*111*	*173*	*134*	*139*	*153*	*-8.9%*
Met-Ed (FE)	*190*	*233*	*211*	*211*	*163*	*29.7%*
PECO	*122*	*164*	*71*	*119*	*167*	*-28.7%*
Penelec (FE)	*214*	*277*	*364*	*285*	*179*	*59.2%*
Penn Power (FE)	*179*	*129*	*133*	*147*	*136*	*8.1%*
Pike County	*83*	*216*	*79*	*126*	*129*	*-2.3%*
PPL	*116*	*170*	*142*	*143*	*172*	*-17.1%*
UGI	*66*	*127*	*135*	*109*	*170*	*-35.7%*
Wellsboro	*114*	*133*	*142*	*130*	*185*	*-29.9%*
West Penn (FE)	*241*	*242*	*364*	*282*	*217*	*30.1%*

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

Performance Standard. An EDC's performance standard is a numerical value that represents the minimal performance allowed for each reliability index for a given EDC. Performance standards are based on a percentage of each EDC's historical performance benchmarks.

Appendix B – Reliability Performance Scorecard Results 2018-2022

2022 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	193	166	145	146	130	193	166	145	146
	SAIDI	126	190	162	130	134	182	190	162	130	134
	SAIFI	1.17	0.98	0.98	0.89	0.92	1.40	0.98	0.98	0.89	0.92
PECO	CAIDI	112	182	186	96	99	134	182	186	96	99
	SAIDI	138	173	170	67	71	198	173	170	67	71
	SAIFI	1.23	0.95	0.92	0.69	0.71	1.48	0.95	0.92	0.69	0.71
PPL	CAIDI	145	190	191	153	164	174	190	191	153	164
	SAIDI	142	185	183	125	142	205	185	183	125	142
	SAIFI	0.98	0.97	0.96	0.82	0.87	1.18	0.97	0.96	0.82	0.87
Met-Ed (FirstEnergy)	CAIDI	117	190	181	168	160	140	190	181	168	160
	SAIDI	135	288	262	229	211	194	288	262	229	211
	SAIFI	1.15	1.51	1.45	1.36	1.32	1.38	1.51	1.45	1.36	1.32
Penelec (FirstEnergy)	CAIDI	117	145	190	197	199	141	145	190	197	199
	SAIDI	148	275	369	360	364	213	275	369	360	364
	SAIFI	1.26	1.90	1.94	1.83	1.83	1.52	1.90	1.94	1.83	1.83
Penn Power (FirstEnergy)	CAIDI	101	135	130	125	134	121	135	130	125	134
	SAIDI	113	149	176	128	133	162	149	176	128	133
	SAIFI	1.12	1.11	1.36	1.02	0.99	1.34	1.11	1.36	1.02	0.99
West Penn (FirstEnergy)	CAIDI	170	251	266	271	276	204	251	266	271	276
	SAIDI	179	344	388	344	364	257	344	388	344	364
	SAIFI	1.05	1.37	1.46	1.27	1.32	1.26	1.37	1.46	1.27	1.32
Small EDCs											
Citizens'	CAIDI	105	98	112	98	101	141	98	112	98	101
	SAIDI	21	22	22	19	28	38	22	22	19	28
	SAIFI	0.20	0.22	0.20	0.19	0.27	0.27	0.22	0.20	0.19	0.27
Pike County	CAIDI	174	158	183	137	159	235	158	183	137	159
	SAIDI	106	215	188	85	79	194	215	188	85	79
	SAIFI	0.61	1.36	1.03	0.62	0.50	0.82	1.36	1.03	0.62	0.50
UGI	CAIDI	169	124	150	157	156	228	124	150	157	156
	SAIDI	140	122	136	136	135	256	122	136	136	135
	SAIFI	0.83	0.99	0.91	0.87	0.87	1.12	0.99	0.91	0.87	0.87
Wellsboro	CAIDI	124	144	152	150	130	167	144	152	150	130
	SAIDI	153	155	207	166	142	278	155	207	166	142
	SAIFI	1.23	1.08	1.37	1.11	1.09	1.66	1.08	1.37	1.11	1.09

[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.

2021 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	141	172	190	187	130	141	172	190	187
	SAIDI	126	112	151	184	173	182	112	151	184	173
	SAIFI	1.17	0.79	0.88	0.97	0.93	1.40	0.79	0.88	0.97	0.93
PECO	CAIDI	112	136	123	134	187	134	136	123	134	187
	SAIDI	138	121	102	198	164	198	121	102	198	164
	SAIFI	1.23	0.89	0.83	1.48	0.91	1.48	0.89	0.83	1.48	0.91
PPL	CAIDI	145	147	158	194	187	174	147	158	194	187
	SAIDI	142	130	126	176	170	205	130	126	176	170
	SAIFI	0.98	0.89	0.79	0.91	0.91	1.18	0.89	0.79	0.91	0.91
Met-Ed (FirstEnergy)	CAIDI	117	157	168	178	173	140	157	168	178	173
	SAIDI	135	193	206	237	233	194	193	206	237	233
	SAIFI	1.15	1.23	1.23	1.34	1.35	1.38	1.23	1.23	1.34	1.35
Penelec (FirstEnergy)	CAIDI	117	152	152	158	151	141	152	152	158	151
	SAIDI	148	253	252	299	277	213	253	252	299	277
	SAIFI	1.26	1.66	1.66	1.89	1.84	1.52	1.66	1.66	1.89	1.84
Penn Power (FirstEnergy)	CAIDI	101	187	171	166	129	121	187	171	166	129
	SAIDI	113	154	119	159	129	162	154	119	159	129
	SAIFI	1.12	0.83	0.70	0.96	1.00	1.34	0.83	0.70	0.96	1.00
West Penn (FirstEnergy)	CAIDI	170	217	209	203	192	204	217	209	203	192
	SAIDI	179	240	230	268	242	257	240	230	268	242
	SAIFI	1.05	1.10	1.10	1.32	1.26	1.26	1.10	1.10	1.32	1.26
Small EDCs											
Citizens'	CAIDI	105	88	78	94.1	94	141	88	78	94.1	94
	SAIDI	21	14	15	21.8	25.6	38	14	15	21.8	25.6
	SAIFI	0.20	0.16	0.19	0.23	0.27	0.27	0.16	0.19	0.23	0.27
Pike County	CAIDI	174	170	110	166	153	235	170	110	166	153
	SAIDI	106	89	88	219	216	194	89	88	219	216
	SAIFI	0.61	0.52	0.79	1.31	1.40	0.82	0.52	0.79	1.31	1.40
UGI	CAIDI	169	162	147	132	134	228	162	147	132	134
	SAIDI	140	89	104	127	127	256	89	104	127	127
	SAIFI	0.83	0.55	0.71	0.96	0.95	1.12	0.55	0.71	0.96	0.95
Wellsboro	CAIDI	124	97	112	124	144	167	97	112	124	144
	SAIDI	153	110	83	99	133	278	110	83	99	133
	SAIFI	1.23	1.13	0.75	0.80	0.93	1.66	1.13	0.75	0.80	0.93

[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.

2020 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	106	126	132	130	103	106	126	132
	SAIDI	126	98	84	102	111	182	98	84	102	111
	SAIFI	1.17	0.95	0.79	0.81	0.84	1.40	0.95	0.79	0.81	0.84
PECO	CAIDI	112	190	182	171	135	134	190	182	171	135
	SAIDI	138	193	181	157	122	198	193	181	157	122
	SAIFI	1.23	1.01	0.99	0.92	0.90	1.48	1.01	0.99	0.92	0.90
PPL	CAIDI	145	167	136	145	137	174	167	136	145	137
	SAIDI	142	131	111	128	116	205	131	111	128	116
	SAIFI	0.98	0.79	0.82	0.88	0.84	1.18	0.79	0.82	0.88	0.84
Met-Ed (FirstEnergy)	CAIDI	117	146	144	145	150	140	146	144	145	150
	SAIDI	135	222	202	205	190	194	222	202	205	190
	SAIFI	1.15	1.52	1.41	1.42	1.27	1.38	1.52	1.41	1.42	1.27
Penelec (FirstEnergy)	CAIDI	117	148	143	146	136	141	148	143	146	136
	SAIDI	148	246	231	235	214	213	246	231	235	214
	SAIFI	1.26	1.66	1.62	1.60	1.58	1.52	1.66	1.62	1.60	1.58
Penn Power (FirstEnergy)	CAIDI	101	137	160	161	185	121	137	160	161	185
	SAIDI	113	187	173	164	179	162	187	173	164	179
	SAIFI	1.12	1.37	1.08	1.02	0.97	1.34	1.37	1.08	1.02	0.97
West Penn (FirstEnergy)	CAIDI	170	162	178	203	216	204	162	178	203	216
	SAIDI	179	187	206	231	241	257	187	206	231	241
	SAIFI	1.05	1.15	1.16	1.14	1.12	1.26	1.15	1.16	1.14	1.12
Small EDCs											
Citizens'	CAIDI	105	88	90	90	87	141	87.6	90.3	90	87
	SAIDI	21	11	11	13	7	38	10.7	11	12.5	7
	SAIFI	0.20	0.12	0.12	0.14	0.08	0.27	0.12	0.12	0.14	0.08
Pike County	CAIDI	174	166	160	185	184	235	166	160	185	184
	SAIDI	106	75	96	107	83	194	75	96	107	83
	SAIFI	0.61	0.45	0.60	0.58	0.45	0.82	0.45	0.60	0.58	0.45
UGI	CAIDI	169	212	186	166	163	228	212	186	166	163
	SAIDI	140	185	142	81	66	256	185	142	81	66
	SAIFI	0.83	0.87	0.76	0.48	0.40	1.12	0.87	0.76	0.48	0.40
Wellsboro	CAIDI	124	98	89	92	97	167	98	89	92	97
	SAIDI	153	68	75	101	114	278	68	75	101	114
	SAIFI	1.23	0.70	0.84	1.10	1.17	1.66	0.70	0.84	1.10	1.17

[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.

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.

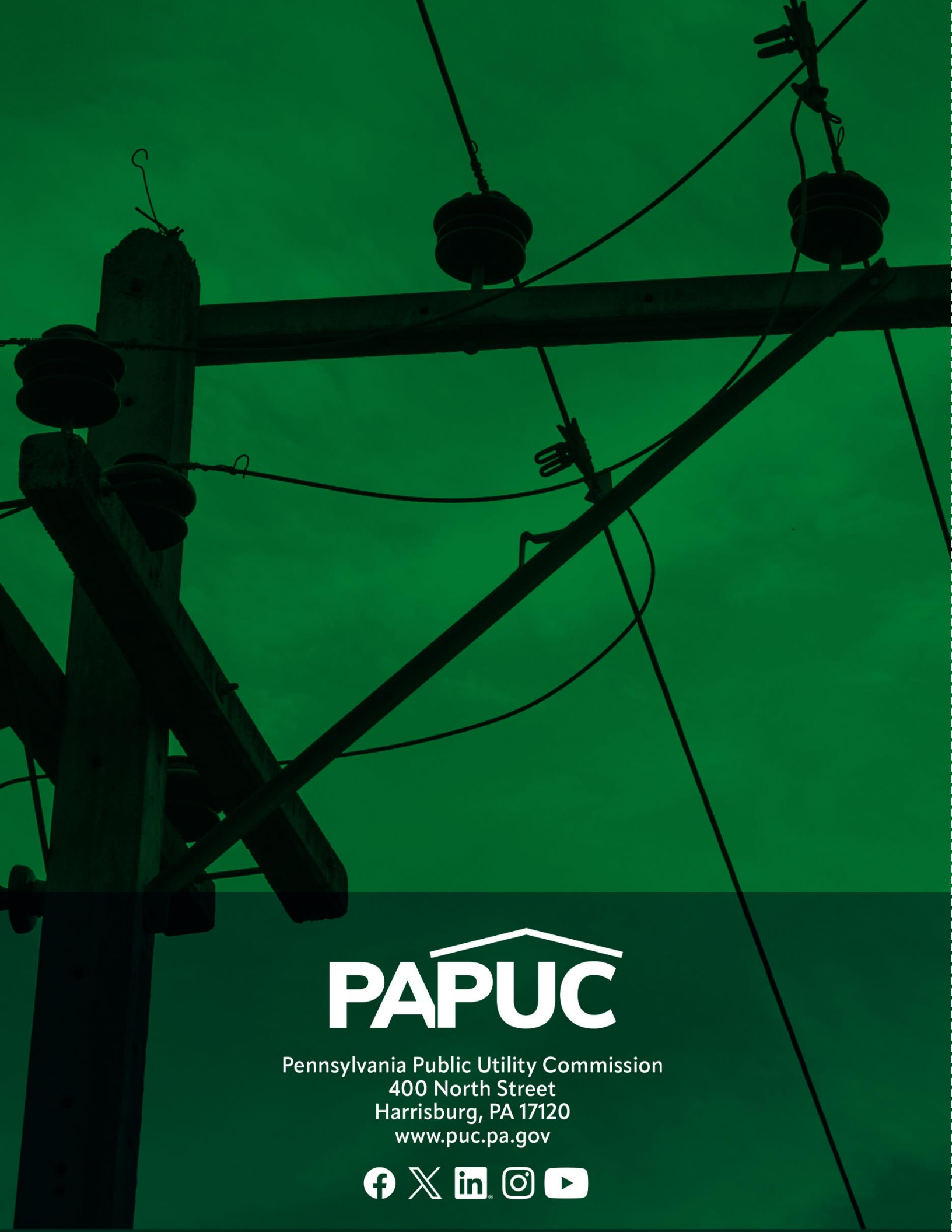
Appendix C – Modifications to Inspection and Maintenance Intervals

Modifications to Inspection and Maintenance Intervals (Group 2) Submitted October 2022, effective Jan. 1, 2024 – Dec. 31, 2025.

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
PECO	Above-ground pad-mounted transformers	Approved previously in the Jan. 1, 2020-Dec. 31, 2021 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 and belowground 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

Modifications to Inspection and Maintenance (I&M) Intervals (Group 1) Submitted October 2022, effective Jan. 1, 2023 – Dec. 31, 2024

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.
UGI Electric	Pole loading calculations	Approved previously in the Jan. 1, 2021-Dec. 31, 2022 I&M Plan.



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