



ELECTRIC SERVICE RELIABILITY  
IN PENNSYLVANIA

**2021**

PENNSYLVANIA PUBLIC UTILITY COMMISSION





# **PENNSYLVANIA ELECTRIC RELIABILITY REPORT 2021**

August 2022

Published by:

Pennsylvania Public Utility Commission

Commonwealth Keystone Building

400 North St

Harrisburg, PA 17105-3265

[www.puc.pa.gov](http://www.puc.pa.gov)

## **Technical Utility Services**

Paul T. Diskin, Director

## *Table of Contents*

### *Executive Summary*

#### ***Section 1 – Introduction***

---

<i>Purpose</i> .....	1
<i>Background</i> .....	1

#### ***Section 2 – Reliability Performance Measures***

---

<i>Reliability Performance Metrics</i> .....	2
<i>Major Events</i> .....	2
<i>Definitions: Benchmarks and Standards</i> .....	3
<i>Inspection and Maintenance</i> .....	4

#### ***Section 3 – 2021 Outage Response Review***

---

<i>Overview</i> .....	5
<i>Major Events</i> .....	15
<i>Review of Long Duration Outage Events</i> .....	20

#### ***Section 4 – EDC Reliability Performance Data***

---

<i>Statewide Summary</i> .....	20
<i>Utility Specific Performance Data</i> .....	24
<i>Duquesne Light Company</i> .....	24
<i>PECO Energy Company</i> .....	30
<i>PPL Electric Utilities Corporation</i> .....	35
<i>Metropolitan Edison Company</i> .....	40
<i>Pennsylvania Electric Company</i> .....	46
<i>Pennsylvania Power Company</i> .....	53
<i>West Penn Power Company</i> .....	59
<i>Citizens’ Electric Company</i> .....	67
<i>Pike County Light &amp; Power Company</i> .....	72
<i>UGI Utilities Inc</i> .....	76
<i>Wellsboro Electric Company</i> .....	81

#### ***Section 5 – Conclusion***

---

87

#### ***Appendix A – Electric Reliability Metrics***

---

88

#### ***Appendix B – Reliability Performance Scorecard Results 2016-2021***

---

90

#### ***Appendix C – Modifications to Inspection and Maintenance Intervals***

---

95

## *Executive Summary*

---

The Electricity Generation Customer Choice and Competition Act mandated the Pennsylvania Public Utility Commission (PUC or Commission) to ensure levels of reliability that existed prior to the restructuring of the electric utility industry continue in the new competitive markets.<sup>1</sup> 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.<sup>2</sup> The PUC also established reliability benchmarks and standards to measure the performance of each electric distribution company (EDC).<sup>3</sup>

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.<sup>4</sup> 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.<sup>5</sup>

As mandated, EDCs report reliability performance metrics<sup>6</sup> 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 2021 through 2016. More detailed analysis can be found in Section 4, *EDC Reliability Performance Data*. Appendix A provides the 2021 rolling 12-month and rolling 3-year reliability metrics for all EDCs. **Of note, only two of 11 EDCs achieved the standard performance metric in all three performance categories for the rolling 3-year average. For the rolling 12-months ending Dec. 31, 2021, only five of 11 EDCs achieved the SAIFI standard performance metric, and none of 11 EDCs achieved the benchmark metric in all three reliability performance categories.**

---

<sup>1</sup> Act of Dec. 3, 1996, P.L. 802, No. 138, 66 Pa.C.S. §§ 2801 *et seq.*

<sup>2</sup> Docket No. L-00970120; 52 Pa. Code §§ 57.191-57.197.

<sup>3</sup> See *Amended Reliability Benchmarks and Standards for the Electric Distribution Companies*, Order entered May 11, 2004, at Docket No. M-00991220.

<sup>4</sup> *Id.* at 24.

<sup>5</sup> *Id.* at 25.

<sup>6</sup> For an explanation of performance standards, see Section 2, page 2.

In addition to monitoring EDCs' reliability performance, the Commission established inspection and maintenance standards for electric transmission and distribution systems.<sup>7</sup> 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 continued to struggle with consistently achieving benchmark for the average number of outages experienced by customers, or SAIFI.<sup>8</sup> As seen in Appendix B, only five of the 11 EDCs achieved benchmark for SAIFI in all four quarters of 2021, and only six of the 11 EDCs achieved benchmark for SAIFI in all four quarters of 2020. During 2019, only four EDCs achieved benchmarks for SAIFI in all four quarters. Out of all 11 EDCs, only three have been consistently achieving benchmark for SAIFI in all quarters for the past three years (2019 through 2021).

EDCs also experienced a decline in meeting the rolling 12-month SAIFI standard. Only six of the 11 EDCs performed better than the rolling 12-month performance standard for SAIFI in all four quarters of 2021, as compared to 2020, when eight of the 11 EDCs performed better than the rolling 12-month performance standard for SAIFI in all quarters. In 2019, only six EDCs performed better than the rolling 12-month performance standard for SAIFI in all quarters of 2019.

It is hoped that this is not the beginning of declining 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 the customers. Of note, the three EDCs that have expended the most capital through their Long-Term Infrastructure Investment Plans (LTIPs) have been the most consistent in achieving benchmark SAIFI performance the past three years (Duquesne, PECO, and PPL).

CAIDI is also an important measure as it relates to average duration of a service outage and EDCs will be expected to improve CAIDI. TUS notes that CAIDI is important because it is a measure of response time and system resilience. However, TUS notes that reducing service outages from occurring in the first place is crucial to improving reliability performance. EDCs in 2021 have shown little improvement in CAIDI with only three of the 11 EDCs meeting benchmark score in all quarters of 2021, as compared to 2020, when only two of the EDCs achieved the benchmark Score in all quarters of the year. In terms of achieving the performance standard, eight of the 11 EDCs failed to achieve the standard for CAIDI in all four quarters of 2021, and six of 11 EDCs failed to meet the CAIDI standard in all four quarters of 2020.

---

<sup>7</sup> 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.

<sup>8</sup> See Section 2, below, for an explanation of SAIFI and all other reliability metrics.

As noted in last year's report,<sup>9</sup> electric reliability and resilience<sup>10</sup> appear to be most challenged by storm activity. In 2021, EDCs experienced the most reportable service outage events in the past 29 years, with 63 events.<sup>11</sup> Storm activity brings down off right-of-way (OROW) trees and limbs onto the distribution lines. As seen in Section 3, below, the number of impactful storms does not appear to be lessening and if the weather pattern of increasing severe storms continues, EDCs may struggle to achieve sustained benchmark performance. Trees, and especially OROW trees, are again the leading cause of outages and customer minutes interrupted in Pennsylvania, as can be seen by the individual EDC performance details in Section 4, 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. The key takeaways from the discussion were:

- All but one of the EDCs have approved LTIIPs,<sup>12</sup> which are designed to improve reliability and resiliency (storm hardening). Six of the EDCs are implementing their second LTIIP, with one EDC consistently achieving SAIFI benchmark performance in all quarters since 2015 and another EDC achieved benchmark performance for SAIFI in all but one quarter in 2021 since 2015, even with the increasing impact of severe storms.<sup>13</sup> The EDCs and EAP noted that they view the LTIIP and Distribution System Improvement Charge (DSIC)<sup>14</sup> as key tools to help improve reliability, along with regular capital investment and recovery through base rate cases. The EDCs with LTIIPs noted that they have seen progress in improving reliability, but that the results of the investments would take time to be evident in consistent achievement of reliability metrics. PPL has the most mature LTIIP program and regularly achieves benchmark performance. The EDCs and EAP also noted

---

<sup>9</sup> The Electric Service Reliability in Pennsylvania 2020 report is available for download here:

<https://www.puc.pa.gov/filing-resources/reports/electric-service-reliability-report/>.

<sup>10</sup> 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>.

<sup>11</sup> Service outages reports are required under 52 Pa. Code § 67.1. The reporting threshold for a 67.1 reportable outage event is 5% of total customers or 2,500 customers, whichever is less, experiencing a service outage for six or more consecutive hours.

<sup>12</sup> The 9 EDCs with approved LTIIPs are Met-Ed, PECO, Penelec, Penn Power, Pike, PPL, West Penn, Duquesne, and UGI.

<sup>13</sup> PECO, PPL, Met-Ed, Penelec, Penn Power and West Penn are implementing their second LTIIPs at Docket Nos. P-2020-3020974, P-2020-3020974, P-2019-3012617, P-2019-3012615, P-2019-3012614, and P-2019-3012618 respectively. PPL has consistently achieved benchmark performance SAIFI.

<sup>14</sup> EDCs were allowed to file for the DSIC beginning in 2013. 66 Pa.C.S. § 1353. A utility must have an LTIIP in order to charge a DSIC. 66 Pa.C.S. § 1352. LTIIP regulations were enacted at 52 Pa. Code § 121.

that the organizations were open to discussing how performance-based rates may be a benefit to drive better reliability performance.<sup>15</sup>

- Weather and trees are the biggest impacts to the EDCs' reliability performance. However, most tree problems are from OROW. EDCs noted that they all have programs to try and address OROW danger trees with landowners, but many fall-ins from OROW vegetation come from what appear to be healthy trees that have grown tall enough to be a fall-in threat. EDCs noted they would welcome a discussion on any regulatory and/or legislative incentives to improve OROW tree issues.
- All of the large EDCs utilize current reliability measurements based on methodologies developed by the IEEE when benchmarking against other similar EDCs nationwide.<sup>16</sup> The primary differences between the IEEE and PUC methodologies relate to excludable events and how benchmarks are calculated.<sup>17</sup> TUS noted that it finds that the Commission definition of a Major Event is subjective and may be outdated as compared to the IEEE methodology.<sup>18</sup> Several EDCs indicated that they believe the IEEE methodology for excludable events (Major Events) provides better data in terms of identifying worst performing circuits, among other features. TUS and the EDCs noted that a change to incorporate the IEEE exclusion methodology would involve a larger discussion on the reliability benchmark measures, which necessarily involves a discussion of the statutory requirements for electric distribution reliability in Pennsylvania. Several EDCs noted that other states have incorporated parts or all of the IEEE reliability methodologies and that they believed it provided a more dynamic measure of electric reliability.
- The EDCs and EAP also noted that the customer and customer experience should be part of the discussion to try and determine what are customers' expectations for electric reliability and the cost of that performance expectation through rates.

TUS and the Commission agreed with the EDCs that LTIIPs and the DSIC are effective tools in improving infrastructure and electric reliability and resiliency, although recognizing that results take time to develop. EDCs should continue to execute their LTIIP programs and other reliability improvement initiatives and TUS will continually evaluate EDC reliability performance. However, as noted above, there were a number of other reliability issues raised during the October 16, 2020, discussion as noted above. In order for the Commission to more fully inform any

---

<sup>15</sup> See 66 Pa.C.S. § 1330, and 52 Pa. Code § 69.3302 for the statute and Commission policy on alternate forms of ratemaking.

<sup>16</sup> The IEEE methodologies utilized by the EDCs are found at IEEE 1366-2012, *IEEE Guide for Electric Power Distribution Reliability Indices*.

<sup>17</sup> The Commission defines events that may be excluded from the calculation of EDC reliability statistics as Major Events, which are defined at 52 Pa. Code § 57.192. The IEEE methodology differs as exclusions are based on a statistical calculation of anomalous performance compared to average system performance, as contrasted to the Major Event definition where there may be some subjectivity as to when an "event" begins and ends.

<sup>18</sup> Some examples of where there were subjective differences between EDCs and TUS on what qualify as excludable events can be found at *Pennsylvania Electric Company v. Pennsylvania Public Utility Commission*, Order entered Dec. 1, 2011, at Docket No. M-2011-2265890, and *Request of Metropolitan Edison Company for Exclusion of Major Outage for Reliability Reporting Purposes*, Order entered Nov. 14, 2019, at Docket No. M-2018-3004552.

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.<sup>19</sup>

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, and subsequent meetings occurred on September 10, 2021, February 11, 2022, and April 8, 2022. 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 PA. TUS is preparing its recommendations to the Commission for consideration on next steps to be taken as the reliability review process moves forward.

---

<sup>19</sup> The Secretarial Letter was served on June 3, 2021, at Docket No. M-2021-3024513.



## *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.<sup>20</sup>

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).<sup>21</sup> 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 that 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.<sup>22</sup> 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.<sup>23</sup>

The Commission also established reliability benchmark and standard values to measure the performance of each EDC.<sup>24</sup> 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.<sup>25</sup> 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

---

<sup>20</sup> 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.

<sup>21</sup> For more information on CAIDI and SAIFI, see Section 2.

<sup>22</sup> 66 Pa.C.S. § 2802(3).

<sup>23</sup> 52 Pa. Code § 57.195.

<sup>24</sup> 52 Pa. Code §§ 57.191-57.198.

<sup>25</sup> 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.<sup>26</sup> 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.<sup>27</sup>

## *Section 2 –Reliability Performance Measures*

---

### *Reliability Performance Metrics*

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

1. **CAIDI** (Customer Average Interruption Duration Index): Measures average power restoration time (by minutes) for every customer who lost power during reporting period.
2. **SAIDI** (System Average Interruption Duration Index): Measures average outage duration time (by minutes) for every customer served during reporting period.
3. **SAIFI** (System Average Interruption Frequency Index): Measures average frequency of power interruptions for every customer served during reporting period.
4. **MAIFI** (Momentary Average Interruption Frequency Index): Measures average frequency of momentary (less than five minutes) interruptions for every customer served during reporting period.<sup>28</sup>

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.<sup>29</sup>
- Reliability performance on the 5% of worst performing circuits and a corrective action plan to increase the reliability of these circuits.

### *Major Events*

In order to analyze and set measurable goals for electric service reliability performance, outage data is separated into either normal or abnormal periods. Only outages during normal event periods

---

<sup>26</sup> 52 Pa. Code § 57.197(a).

<sup>27</sup> 52 Pa. Code § 57.194(h)(1).

<sup>28</sup> 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.

<sup>29</sup> This information is collected and trended by EDCs to reduce customer outages and improve system reliability.

are used in calculating the reliability metrics. The term “Major Event” is used to identify an abnormal event, such as a major storm, and is defined as either of the following:<sup>30</sup>

- 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 five years from 1994-98. The benchmark value serves as an upper limit that EDCs should be consistently achieving to ensure reliability performance is considered satisfactory and acceptable.

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

The performance rolling **12-month average** is 120% of the benchmark for the large EDCs and 135% for the small EDCs.<sup>31</sup> 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 2019, 2020 and 2021 calendar year data.

---

<sup>30</sup> See 52 Pa. Code § 57.192.

<sup>31</sup> Large EDCs currently include Duquesne Light, Met-Ed, Penelec, Penn Power, PECO, PPL and West Penn. Small EDCs include: UGI, Citizens’, Pike County and Wellsboro.

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

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

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 the EDC to submit a report discussing the reasons for not meeting the regulation and the corrective measures the company is taking to improve performance.<sup>32</sup> In addition, Commission staff may initiate an investigation to determine whether an EDC is providing reliable service.<sup>33</sup>

Benchmarks and standards for EDC reliability performance and actual reliability metrics for 2021 are 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.<sup>34</sup> 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:

---

<sup>32</sup> See 52 Pa. Code § 57.195(g).

<sup>33</sup> See 52 Pa. Code § 57.197(a).

<sup>34</sup> 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.
- Filed in October 2020 (effective January 2022 through December 2023) for Duquesne, PECO, PPL, Citizens’, Pike and Wellsboro.

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 provided justification for said exemptions.<sup>35</sup>

*Table 1 - Inspection and Maintenance Intervals*

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

### ***Section 3 – 2021 Outage Response Review***

---

#### ***Overview***

Tables 2A, 2B, 2C, and 2D, below, present a breakdown of reportable outage events (ROEs)<sup>36</sup> summarized for 2021 (63 Events), 2020 (46 events), 2019 (52 events), and 2018 (35 events).

Table 2E, below, details the number of ROEs from 1993 through 2021. 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. Also note that in 2021, the EDCs experienced the highest number of ROEs ever recorded by the PUC. 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

---

<sup>35</sup> See 52 Pa. Code § 57.198(c).

<sup>36</sup> Service outages reports are required under 52 Pa. Code § 67.1. The reporting threshold for a 67.1 reportable outage event is 5% of total customers or 2,500 customers, whichever is less, for six 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.

## 2021 Pennsylvania Electric Reliability Report

EDCs are expected to provide service at a level equal to or better than that provided during the benchmark period, regardless of whether the number of ROEs are increasing on an annual basis.

Table 2F below details the number of customers affected by ROEs from 1993 through 2021. In 2021, a total of 1,964,501 customers were negatively affected by ROEs as compared to 2,431,842 customers in 2020; 1,988,188 in 2019; 2,542,564 in 2018; 1,301,960 in 2017; and 779,512 in 2016.

Note: The high level of customers affected in 2003, 2011, 2012, and 2014 are primarily due to a few high-impact events, such as Isabel in 2003, Irene in 2011, Sandy in 2012, and Nika in 2014.

Table 2G below, details the cumulative number of ROEs by EDC from 2012 through 2021.

2021 Pennsylvania Electric Reliability Report

*Table 2A –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 tstorms, lightning, high winds
DLC	7/7/21	30,312	Severe tstorms, high winds, heavy rains
DLC	7/13/21	10,945	Severe tstorms, high winds, heavy rains
DLC	8/12/21	51,904	Severe tstorms & high winds
DLC	8/29/21	22,389	Severe tstorms & high winds
DLC	10/21/21	3,928	Severe storms & tornadoes
DLC	12/11/21	12,310	Severe tstorms & 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 tstorms, lightning, high winds
Met-Ed	6/21/21	25,398	Severe tstorms, lightning, high winds
Met-Ed	7/6/21	34,472	Stalled cold front & severe tstorms
Met-Ed	7/28/21	9,840	High winds, heavy rain, lightning
Met-Ed	8/10/21	32,810	Severe tstorms & 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 tstorms & high winds
Met-Ed	12/21/21	5,331	(Substation) 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 tstorms, lightning, high winds
Penelec	7/6/21	61,821	Stalled cold front & severe tstorms
Penelec	7/11/21	18,417	Severe tstorms, high winds, heavy rains
Penelec	7/12/21	42,137	Severe tstorms, high winds, heavy rains
Penelec	7/16/21	22,729	Severe tstorms, high winds, heavy rains
Penelec	8/11/21	29,544	Severe tstorms & high winds
Penelec	8/29/21	10,225	Severe tstorms & high winds
Penelec	12/11/21	29,855	Severe tstorms & high winds
Penelec	1/3/21	13,135	Heavy, wet snow
Penn Power	3/26/21	18,666	Cold front w/high winds & rain
PPL	2/15/21	8,903	Ice, sleet, snow, wind
PPL	3/1/21	18,979	High wind event

2021 Pennsylvania Electric Reliability Report

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

EDC	Date	Customers Affected	Cause
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 tstorms
PPL	7/11/21	17,598	Severe tstorms, high winds, heavy rains
PPL	7/17/21	23,347	High winds, heavy rain, lightning
PPL	8/11/21	44,493	Severe tstorms
PPL	9/1/21	84,647	Hurricane Ida remnants
PPL	9/13/21	27,847	Severe tstorms, 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 tstorms & 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 tstorms, lightning, high winds
West Penn	6/30/21	29,816	Severe tstorms, lightning, high winds
West Penn	7/7/21	39,810	Severe tstorms, high winds, heavy rains
West Penn	7/16/21	21,144	Severe tstorms, high winds, heavy rains
West Penn	8/11/21	84,048	Severe tstorms & high winds
West Penn	9/1/21	19,401	Hurricane Ida remnants
West Penn	12/11/21	28,942	Severe tstorms & high winds



2021 Pennsylvania Electric Reliability Report

**Table 2B –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, lightning, 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)
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, lightning, high winds
Met-Ed	11/1/20	27,210	Cold front, wind storm, 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, high 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 snow storm
Penelec	8/27/20	48,298	Severe thunderstorms, lightning, high winds
Penelec	9/7/20	21,571	Severe thunderstorms
Penelec	11/1/20	29,112	Cold front, wind storm, 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	Wind storm
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, high winds
PPL	11/1/20	42,194	Cold front, wind storm, 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, high winds, tornadic
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, high winds
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, wind storm, heavy rains

*Table 2C –67.1 Reportable Outage Events Summary 2019*

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

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

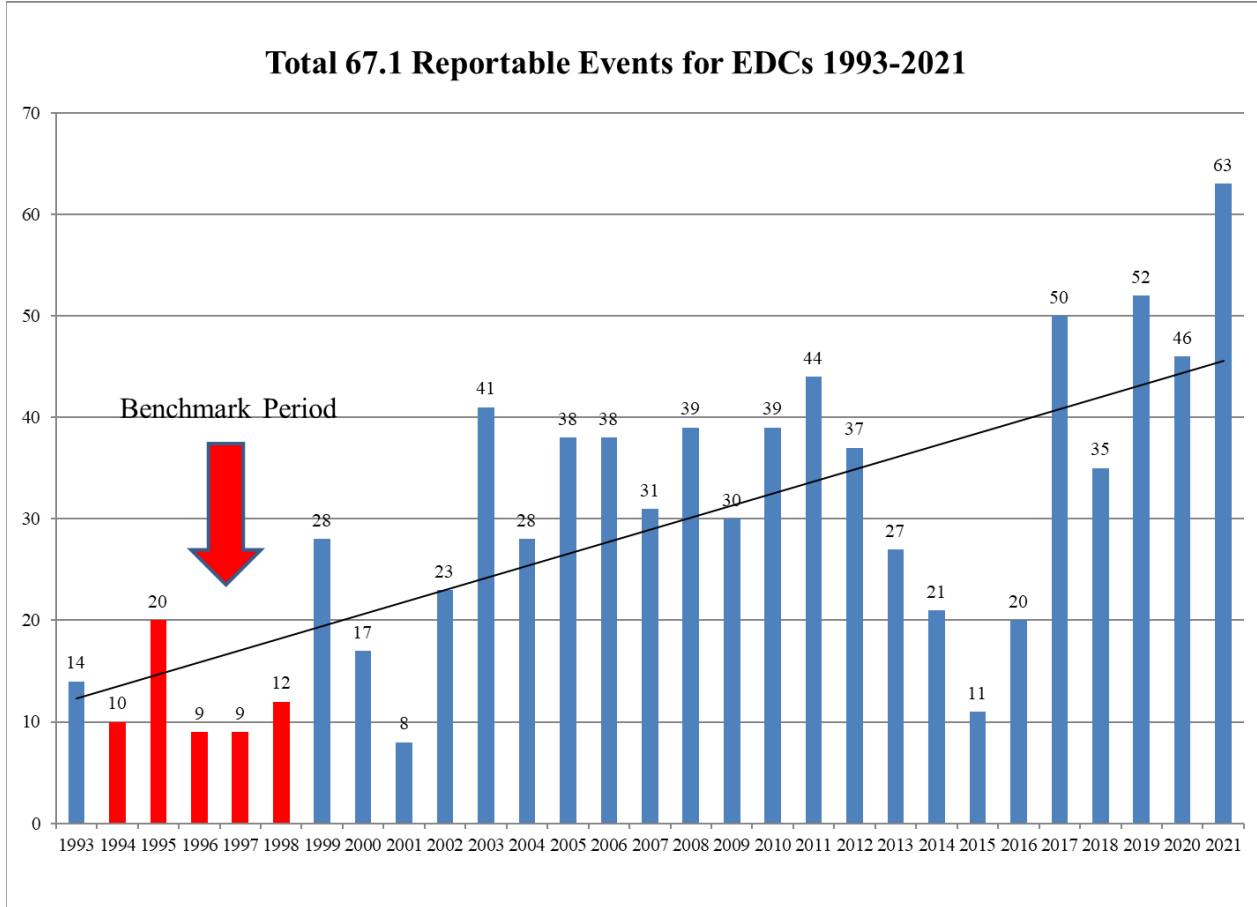
<b>EDC</b>	<b>Date</b>	<b>Customers Affected</b>	<b>Cause</b>
Penn Power	2/24/2019	36,177	Storm and trees
PPL	11/27/2019	19,989	Storm and trees
PPL	2/24/2019	79,031	Storm and trees
PPL	4/14/2019	50,884	Storm and trees
PPL	5/19/2019	20,778	Storm and trees
PPL	5/29/2019	16,982	Storm and trees
PPL	6/28/2019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

2021 Pennsylvania Electric Reliability Report

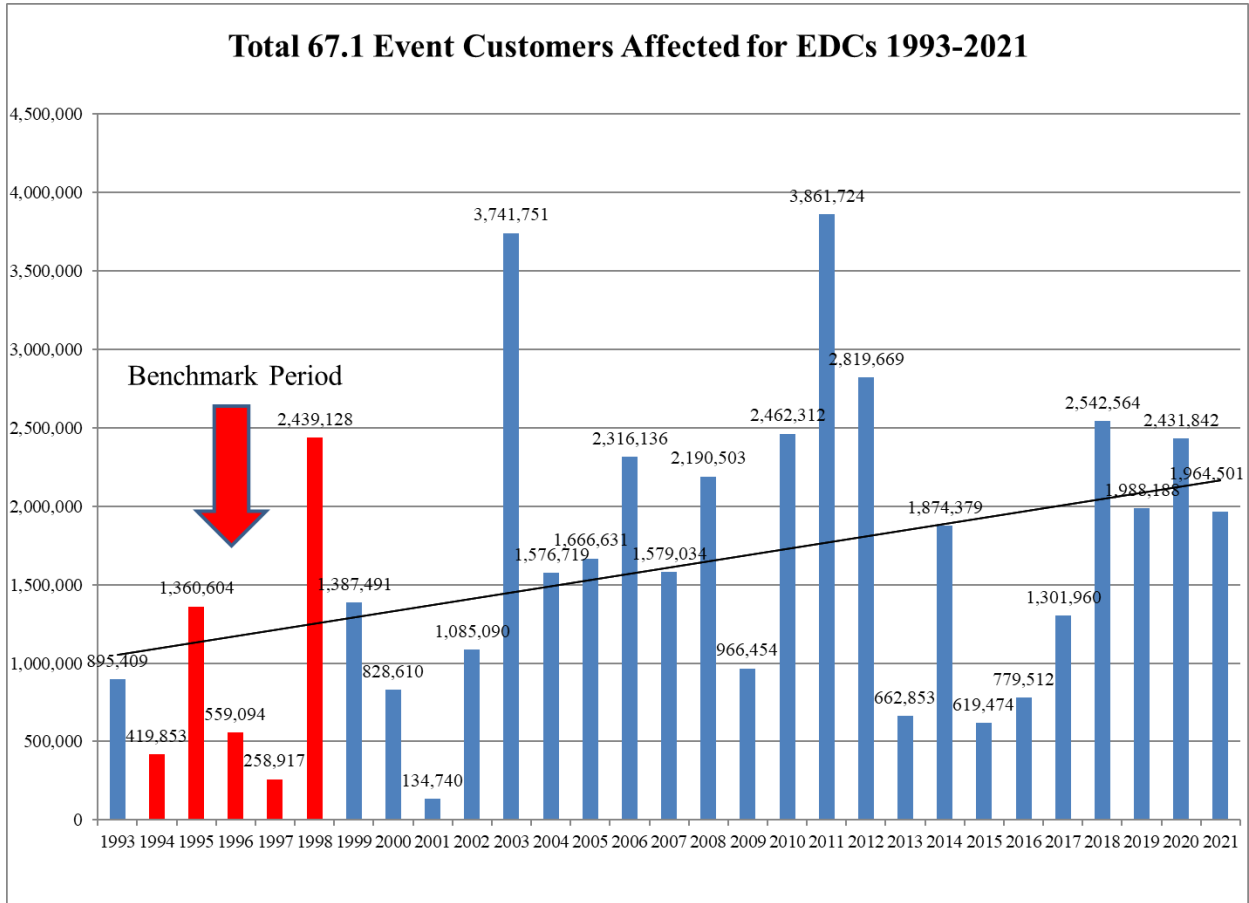
*Table 2D –67.1 Reportable Outage Events Summary-2018*

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

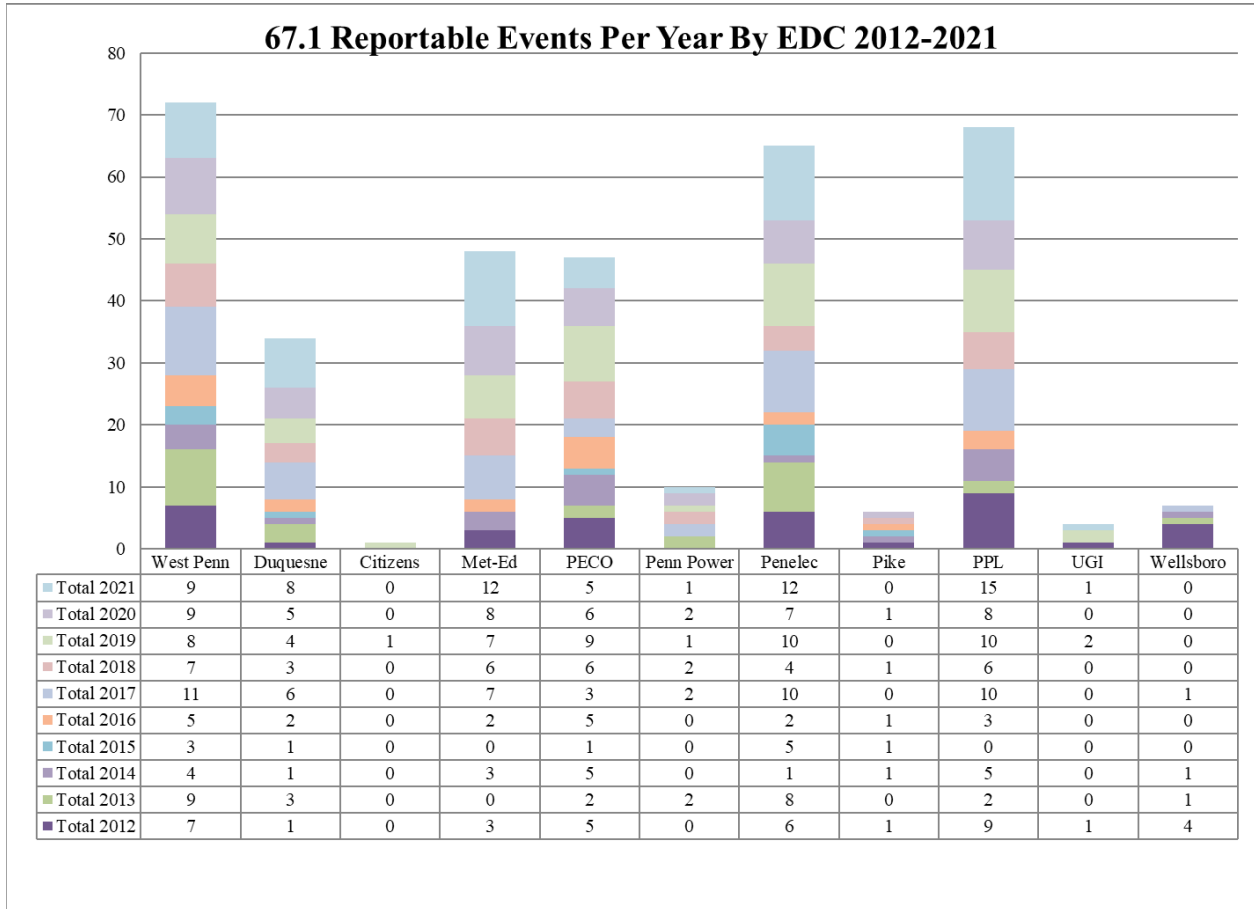
*Table 2E – Total 67.1 Reportable Events for EDCs 1993-2021*



**Table 2F – Total Customers Affected by 67.1 Reportable Events 1993-2020**



**Table 2G –67.1 Reportable Events by EDC 2012-2021**



**Major Events**

In 2021, 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 2021 with approximately 177,115 customers impacted by Major Events in 2021 as compared to 1.3 million customers impacted in 2020. In 2021, there were 22 Major Event exclusion requests approved as compared to 29 in 2020, 23 in 2019, 29 in 2018, 13 in 2017 and 11 in 2016. While the relative number of Major Events was slightly down from 2020, in 2021, the number of customers impacted was far less. 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 2021, 2020, 2019, 2018, and 2017 are shown below in Tables 3A, 3B, 3C, 3D, and 3E, respectively.

2021 Pennsylvania Electric Reliability Report

*Table 3A – 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	OffROW Tree	71,076
Citizens	6/30/2021	3,009	Weather	431,161
Citizens	8/18/2021	1,038	OffROW Tree	81,734
Citizens	8/20/2021	883	OffROW 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	Not reported
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	OffROW Tree	218,920
Wellsboro	10/26/2021	757	OffROW 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
	Totals	177,115	Totals	60,698,829



2021 Pennsylvania Electric Reliability Report

*Table 3B – 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
Duquense	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 load from main 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 load from main feed	379,807
Wellsboro	5/28/2020	1,705	Tree	99,572
Wellsboro	6/18/2020	1,515	Unkown fault on line	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 load from main feed	701,937
Wellsboro	8/8/2020	6,301	Loss of load from main 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
	<b>Totals</b>	<b>1,259,593</b>	<b>Totals</b>	<b>413,480,396</b>

2021 Pennsylvania Electric Reliability Report

*Table 3C – 2019 Major Events*

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

2021 Pennsylvania Electric Reliability Report

**Table 3D – 2018 Major Events**

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

**Table 3E – 2017 Major Events**

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

## *Review of Long Duration Outage Events*

There were four long duration electric outage events (those with outages lasting six or more days) in 2021. In addition to the four long duration events, there were also three high impact events that caused at least 133,000 customer outages. One of these high impact events was also a long duration event (Hurricane Ida remnants). Please see below:

- On Sep. 1, 2021, remnants from Hurricane Ida caused 330,354 reportable electric outages to four jurisdictional EDC territories. This also caused a long duration outage event for Met-Ed (61,317 outages) and PECO (164,989 outages) with restoration occurring on Sep. 6, 2021, for both companies. Five tornadoes were confirmed in the PECO territory alone, along with historic flooding to the Schuylkill River.
- Duquesne Light Company experienced a long duration electric outage event from June 13, 2021, to June 18, 2021. Severe thunderstorms with straight line winds up to 55-60 mph caused significant damage to the distribution system and there were 51,762 customer outages. The damage also closed multiple roads with electric lines in fallen trees.
- PECO experienced a long duration electric outage event from Jul. 29, 2021, to Aug. 4, 2021. The event was caused by two confirmed tornadoes which caused downed trees and limbs on power lines and disrupted power to 11,417 customers.
- Met-Ed experienced a long duration electric outage event from Aug. 10, 2021, to Aug. 15, 2021. The event disrupted power to 32,810 customers and was caused by continual thunderstorm activity during the restoration period and near 60 mph wind gusts on August 10-11 and near 50 mph wind gusts on Aug. 13, 2021.
- A stalled cold front with sustained wind gusts over 50 mph disrupted power to 133,125 customers on Mar. 26, 2021. The cold front caused five jurisdictional companies to have reportable electric outages.
- A cold front with severe thunderstorms, high winds, and heavy rains disrupted power to 134,660 customers on July 6, 2021. The cold front caused three jurisdictional companies to have reportable electric outages.

## *Section 4 –EDC Reliability Performance Data*

---

### *Statewide Summary*

#### **Rolling 12-month Benchmark Performance Compliance**

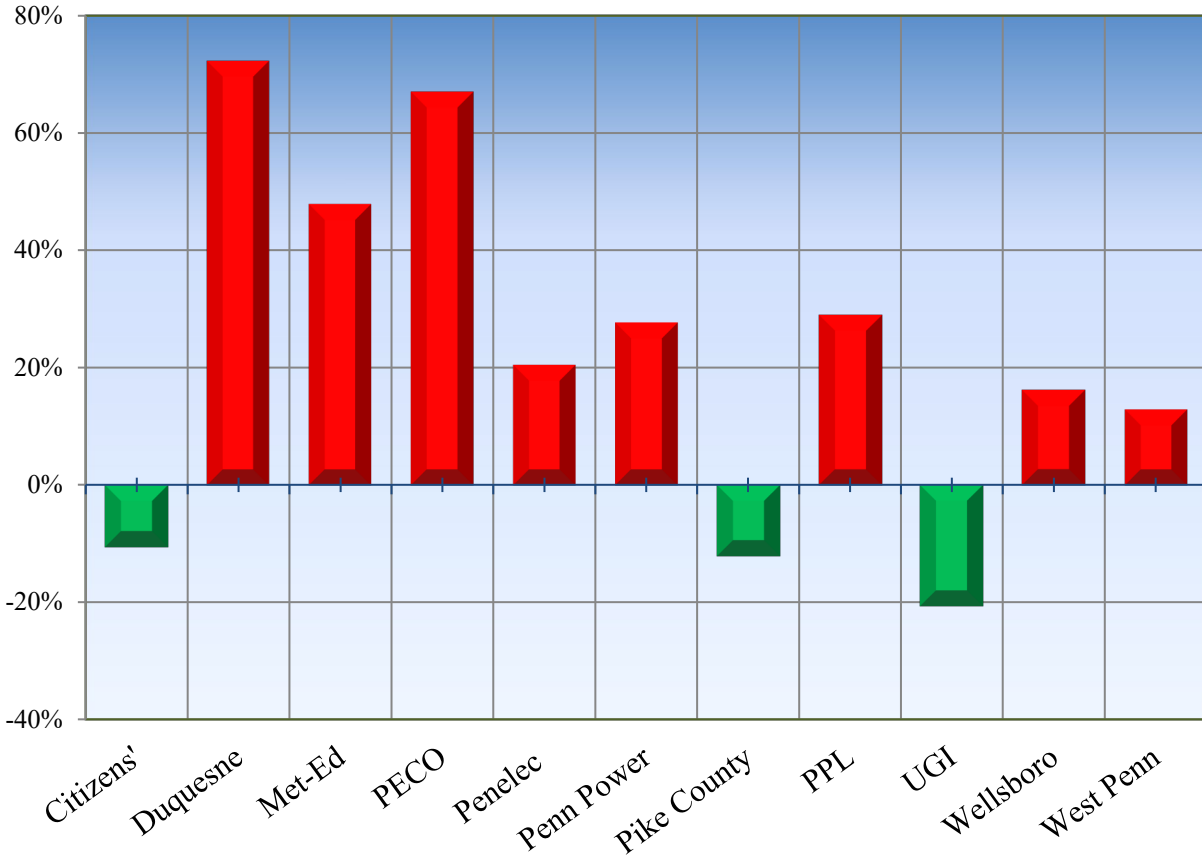
The 2021 end-of-year reliability data for **12-month CAIDI, SAIDI, and SAIFI Benchmark performance compliance** submitted by the 11 EDCs indicates:

- Three EDCs achieved the **CAIDI Benchmark**, while eight EDCs failed to achieve the CAIDI benchmark (Figure 1 below).

2021 Pennsylvania Electric Reliability Report

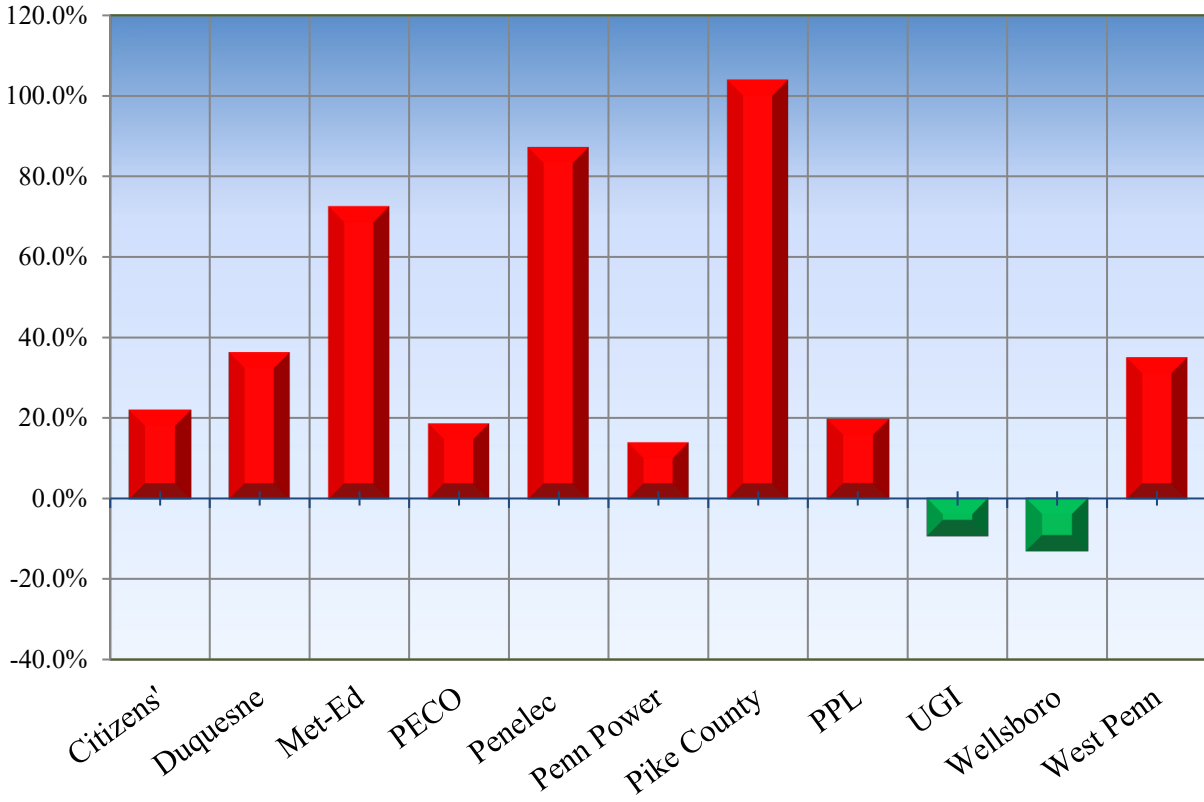
- Only two EDCs achieved the **SAIDI Benchmark**, while nine EDCs failed to achieve the SAIDI benchmark (Figure 2 below).
- Five EDCs achieved the **SAIFI Benchmark**, while six EDCs failed to achieve the SAIFI benchmark (Figure 3 below).

*Figure 1 – 2021 CAIDI Comparison (percent above or below benchmark)*

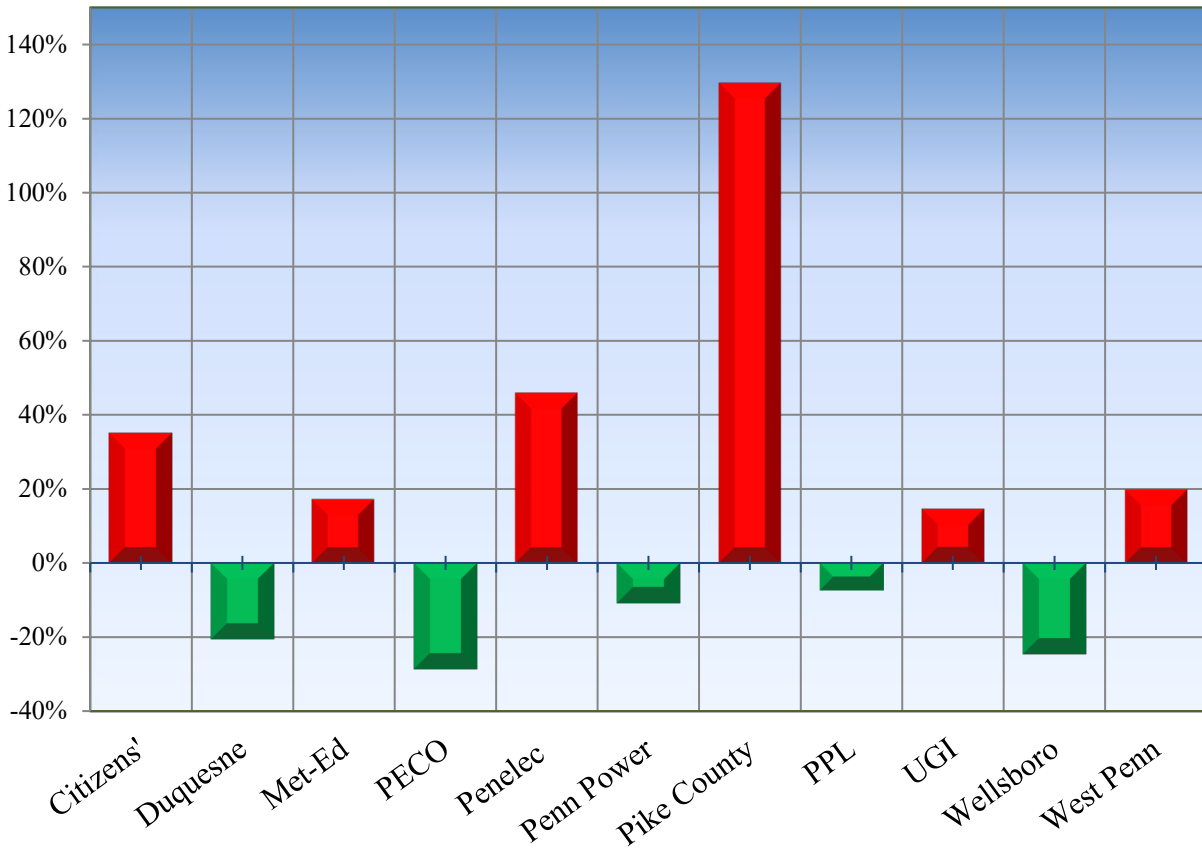


2021 Pennsylvania Electric Reliability Report

*Figure 2 – 2021 SAIDI Comparison (percent above or below benchmark)*



*Figure 3 – 2021 SAIFI Comparison (percent above or below benchmark)*



**Rolling 3-year Average (2019-2021) Performance Compliance**

Appendix A provides the 2021 results for the 12-month average and 3-year average reliability performance metrics for individual EDCs.

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

Four EDCs (Citizen's, Met-Ed, Penelec, Pike County, UGI, 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 three end-year metrics, as indicated in Appendix A. The following sections provide a detailed description of the 11 EDCs' individual reliability performance on a rolling 12-month and 3-year average basis.

### *Duquesne Light Company*

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

In 2021, Duquesne experienced 7.3 million kilovolt-amps (kVA) customer interruptions and 1,355 million kVA-minutes of customer-minutes interrupted as compared to: 6.5 million kilovolt-amps (kVA) customer interruptions and 857 million kVA-minutes of customer minutes interrupted in 2020; 7.3 million kVA customer interruptions and 772 million kVA minutes of customer-minutes interrupted in 2019; 6.1 million kilovolt-amps customer interruptions and 647 million kVA-minutes of customer-minutes interrupted in 2018; and 7.1 million kVA of customer interruptions and 813 million kVA-minutes of customer-minutes interrupted in 2017.

Duquesne did not experience any Major Events during 2021.

### **CAIDI/SAIDI/SAIFI Evaluation**

#### **CAIDI**

- Rolling 12-month:** Increased from 132 minutes in 2020 to 187 minutes in 2021; failed to achieve benchmark by 73.1%.
- 3-year average:** Increased from 115 minutes in 2020 to 142 minutes in 2021; failed to achieve standard by 19%.

#### **SAIDI**

- Rolling 12-month:** Increased from 111 minutes in 2020 to 173 minutes in 2021; failed to achieve benchmark by 37.3%.
- 3-year average:** Increased from 102 minutes in 2020 to 130 minutes in 2021; achieved standard by 15%

#### **SAIFI**

- Rolling 12-month:** Increased from 0.84 outages in 2020 to 0.93 outages in 2021; achieved benchmark by 20.5%.
- 3-year average:** Increased from 0.90 outages in 2020 to 0.93 outages in 2021; achieved standard by 28.2%.



### **CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 4 and 5 below. Duquesne's CAIDI performance had improved during 2018 and 2019, as seen in Figure 4, but has significantly declined for 2020 and greatly declined during 2021. Management should place significant emphasis upon achieving CAIDI results at or below the "green" benchmark performance upper-control-limit-line for CAIDI.

Beginning in December 2004 and continuing through 2021, Duquesne's SAIFI benchmark performance trend has generally been positive, as shown in Figure 5. 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.

### **Outage Causes**

Figure 6 below shows the top five reported 2021 outage-cause categories by customer-minutes interrupted, as a percentage, for the following three distinct performance metrics: KVA Minutes Interrupted, KVA Interrupted, and Number of Incidents. Trees were the top cause of outages and customer-minutes (KVA minutes) interrupted. Over 37% of outages are caused by trees (OROW).

Figure 7 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.

### **General Reliability**

Duquesne notes that it continues its reliability management work programs and resilience storm hardening activities. 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 believes 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.
- 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.

Duquesne notes that it continues to implement its LTIP.<sup>37</sup> Duquesne also notes that in 2020, the PUC completed its periodic review of Duquesne Light’s LTIP, finding that the plan is “designed adequately to ensure and maintain safe, adequate, reasonable, and reliable service and that DLC has substantially adhered to its plan.”<sup>38</sup>

### **Conclusion**

Trees and Equipment Failures are the top two outage causes that substantially negatively affect electrical reliability to Duquesne customers and contributed to over 60% of the total lost customer-minutes interrupted (Duquesne uses kVA-minutes interrupted) in 2021 and does not include any lost customer-minutes caused by Major Events.

Trees, and especially off-right-of-way trees, continue to be a chronic problem for Duquesne, as well as every EDC in Pennsylvania. The ongoing reliability collaborative described in the Executive Summary will hopefully provide a venue to develop some mitigation solutions to this issue.

---

<sup>37</sup> 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.

<sup>38</sup> See *Periodic Review of Duquesne Light Company’s Long-Term Infrastructure Improvement Plan*, Order entered Oct. 29, 2020, at Docket No. M-2020-3019708.

Figure 4 - Duquesne CAIDI (minutes)

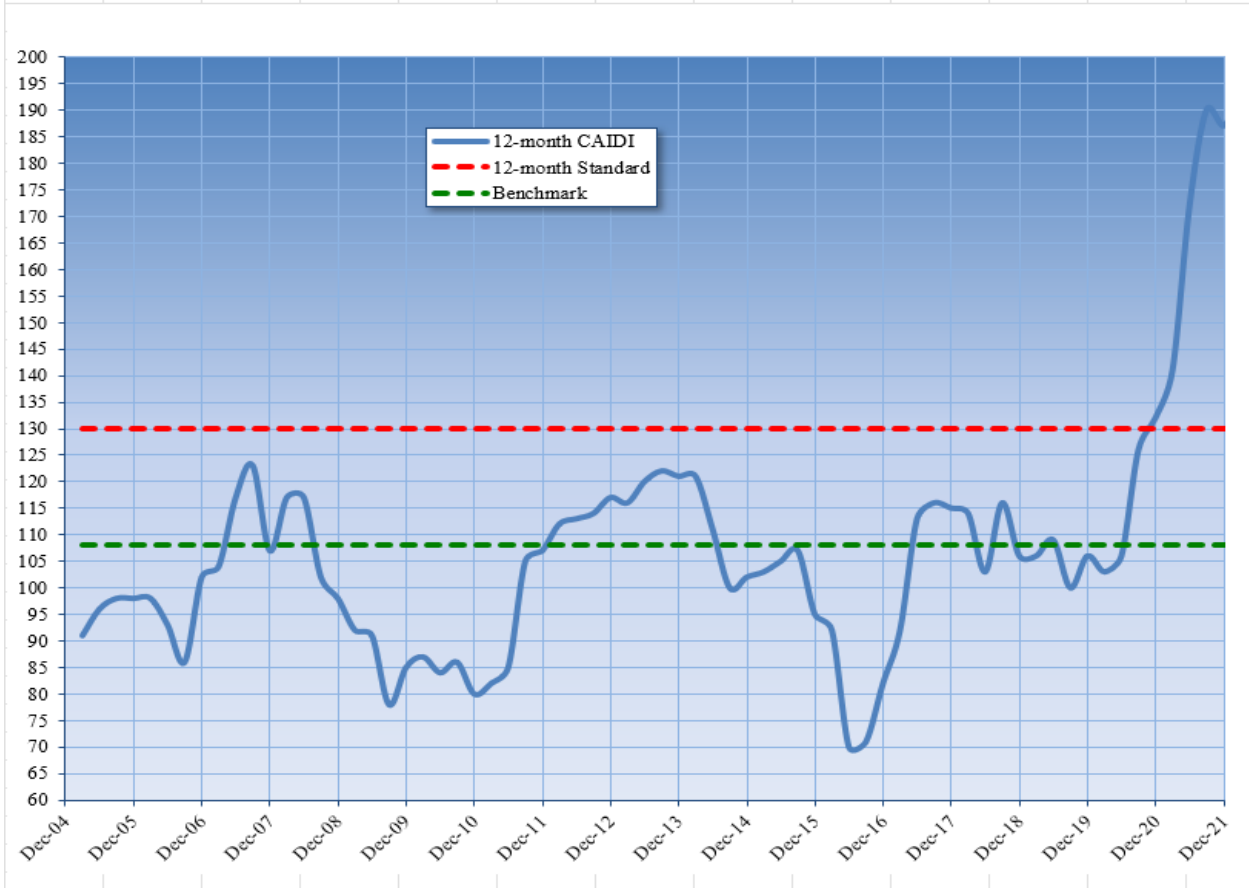


Figure 5 - Duquesne SAIFI (interruptions per customer)

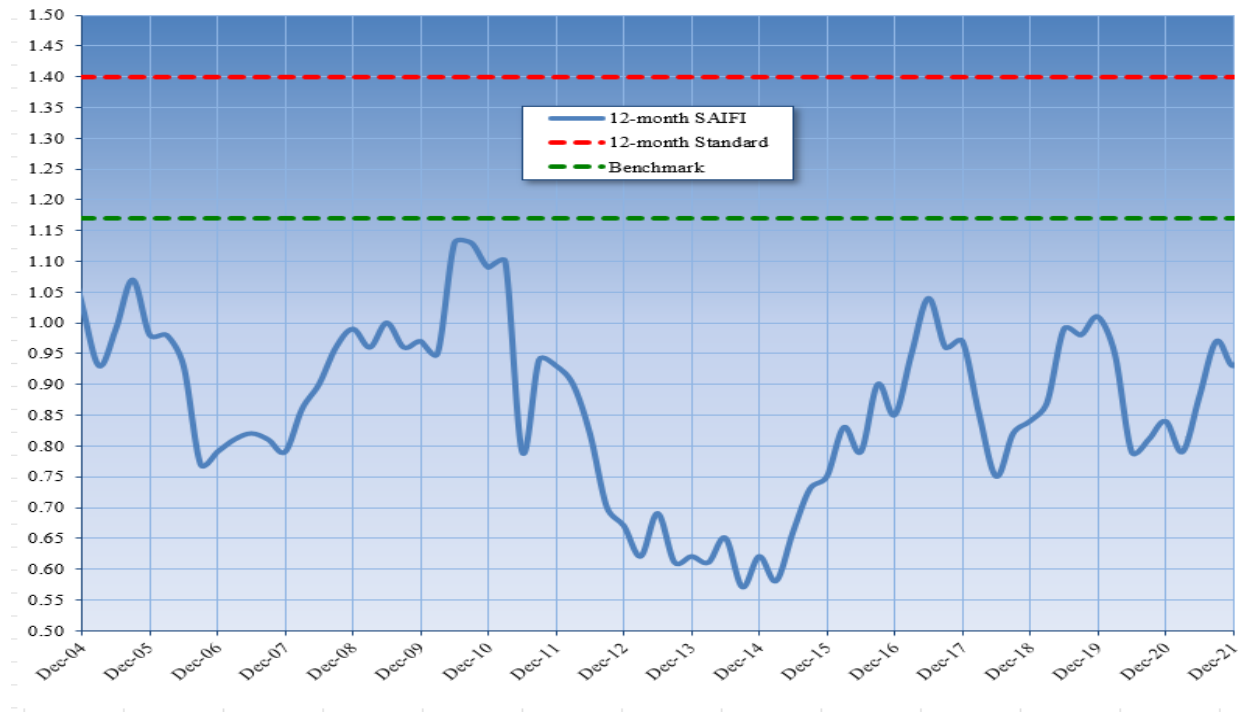
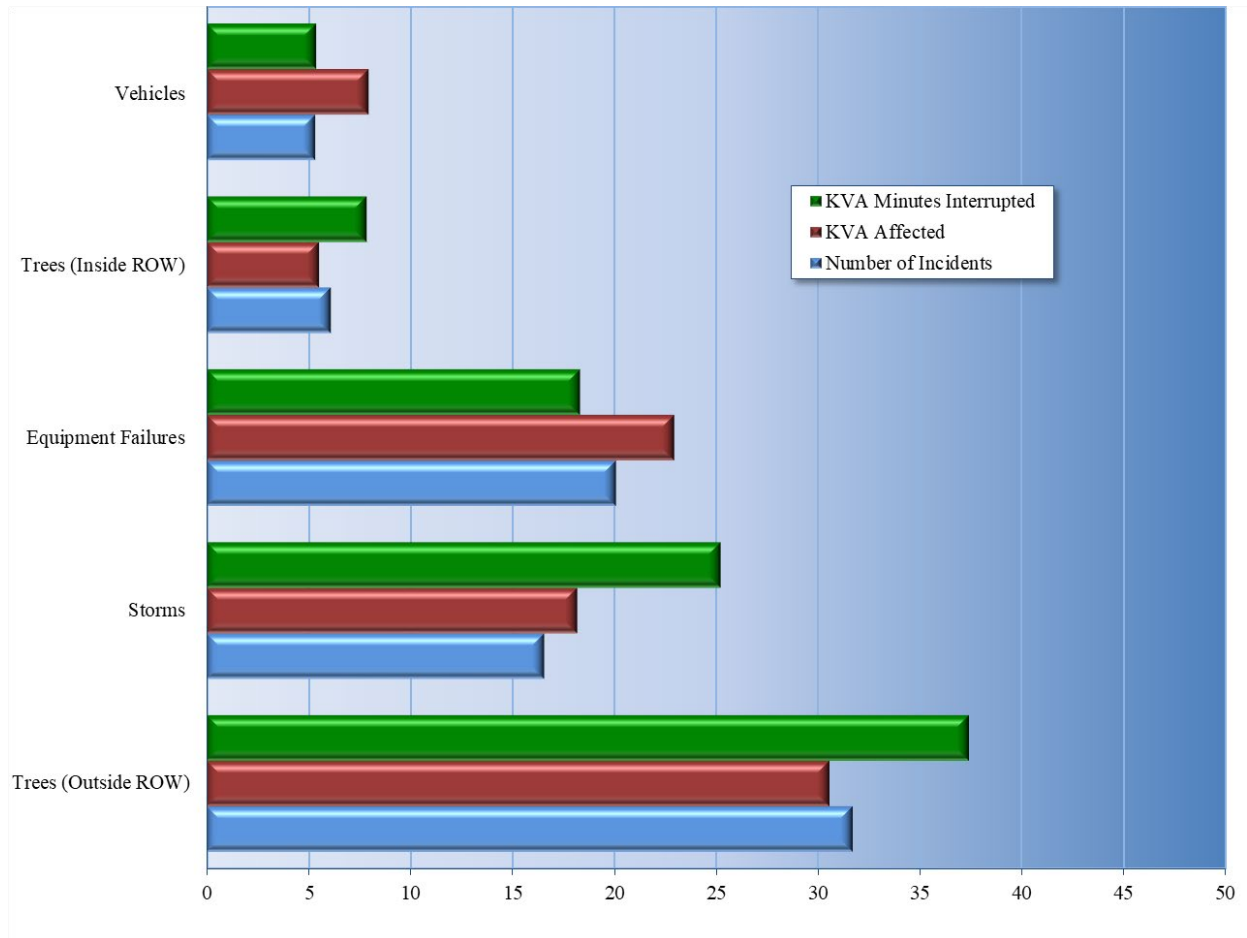
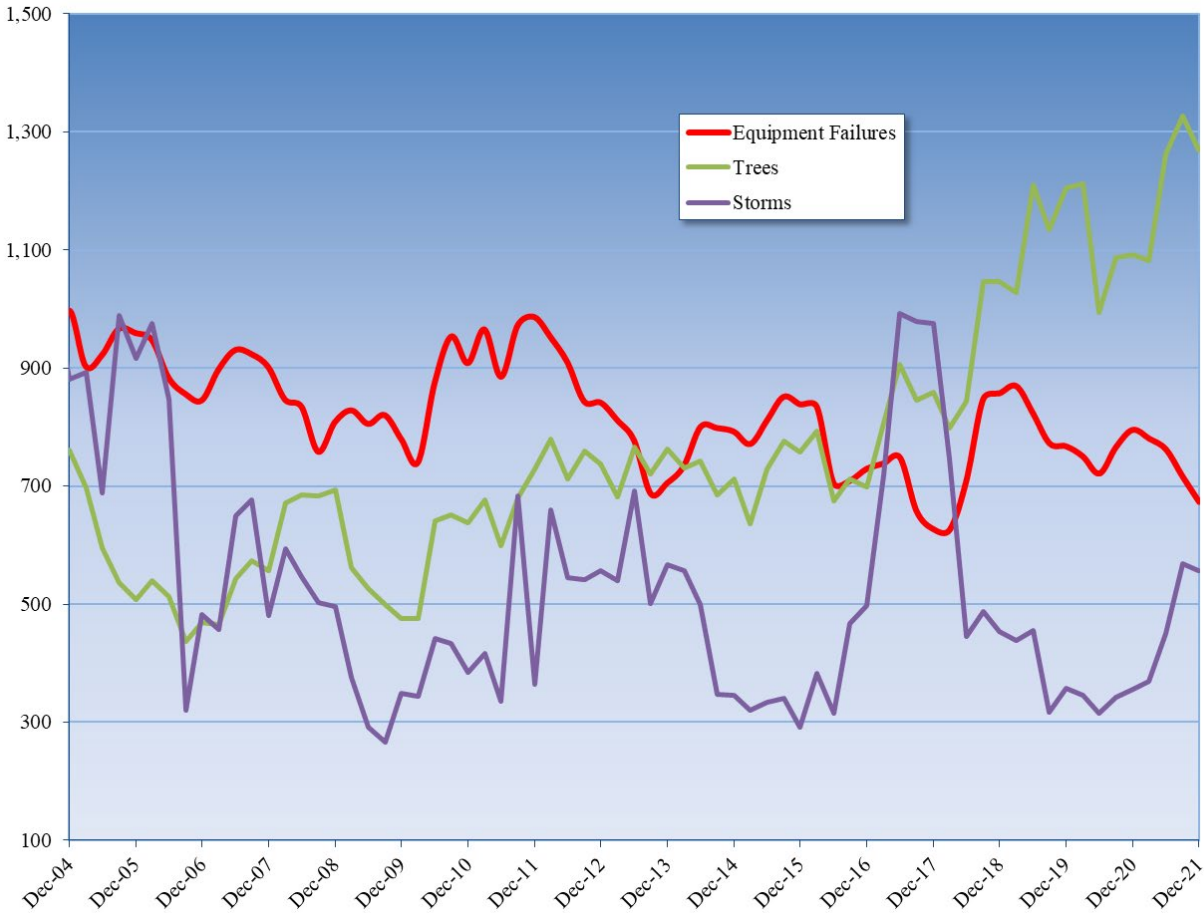


Figure 6 - Duquesne Outage Causes (percent of total outages)



**Figure 7 - Duquesne Outage Tracking (number of incidents)**



**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 1.6 million customers.

In 2021, PECO experienced 1.48 million customer interruptions and 275 million customer-minutes interrupted as compared to: 1.51 million customer interruptions and 203 million customer-minutes interrupted in 2020; 1.80 million customer interruptions and 341 million customer-minutes interrupted in 2019; 1.59 million customers interruptions and 174.6 million customer-minutes interrupted in 2018; and 1.35 million customer interruptions and 134.0 million customer-minutes interrupted in 2017.

PECO experienced no Major Events in 2021. However, the impacts and service outages caused by the remnants of Hurricane Ida fell just short of the Major Event exclusion threshold and are included in the total above.

**CAIDI/SAIDI/SAIFI Evaluation****CAIDI**

- Rolling 12-month:** Increased from 135 minutes in 2020 to 187 minutes in 2021; failed to achieve benchmark by 67%.
- 3-year average:** Increased from 145 minutes in 2020 to 170 minutes in 2021; failed to achieve standard by 38.5%.

**SAIDI**

- Rolling 12-month:** Increased from 122 minutes in 2020 to 164 minutes in 2021; failed to achieve benchmark by 18.8%.
- 3-year average:** Increased from 144 minutes in 2020 to 164 minutes in 2021; achieved standard by 2%.

**SAIFI**

- Rolling 12-month:** Decreased from 0.90 outages in 2020 to 0.88 outages in 2021; achieved benchmark by 28.5%.
- 3-year average:** Decreased from 0.98 outages in 2020 to 0.95 outages in 2021; achieved standard by 29.4%.

**CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown in Figures 8 and 9 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 2021, much of which could be attributed to effects of Hurricane IDA. Management should continue to work on improving PECO's CAIDI performance in 2022.

Beginning with December 2012, PECO's SAIFI benchmark performance trend has been positive, as shown below on Figure 9. This positive performance trend, below the benchmark performance upper-control-limit-line, has been consistently achieved by PECO, and is considered under-control. PECO is considered an excellent SAIFI benchmark performer.

**Outage Causes**

Figure 10 below shows the reported 2021 outage-cause categories by customer-minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Tree-related issues (this includes vegetation in-growth and vegetation broken/uprooted) were the top cause of customer-minutes interrupted and tied with equipment failure for the number of incidents. In terms of customers affected, the leading cause was equipment failure at approximately 39% and the second leading cause was tree-related issues at approximately 35%.

Figure 11 below, shows historical trend of the top three main outage causes. Equipment failure and tree-related are the two most frequent outage causes that are significantly 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 in 2021, the remnants of Hurricane Ida contributed heavily to negatively impact CAIDI. 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 LTIP, 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.<sup>39</sup> PECO notes that it is increasing and enhancing these investments in its 2021-2025 LTIP II.<sup>40</sup> 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 2021.

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 (T&S) problems are the top three outage causes that substantially negatively affect electrical reliability to PECO customers. In 2021, Vegetation and Equipment Failure outage causes contributed to over 66% of the total lost customer-minutes as compared to 85% in 2020. In 2021, T&S problems also contributed 16% total lost customer-minutes.

PECO experienced over 24 ROEs from 2018 through 2021, which appear to have negatively impacted CAIDI. PECO has sustained CAIDI and SAIFI benchmark performance beginning in 2011 and 2006, respectively, and is considered an excellent SAIFI benchmark performer. However, CAIDI performance requires continued management attention.

---

<sup>39</sup> 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.

<sup>40</sup> 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.



Figure 8 - PECO CAIDI (minutes)

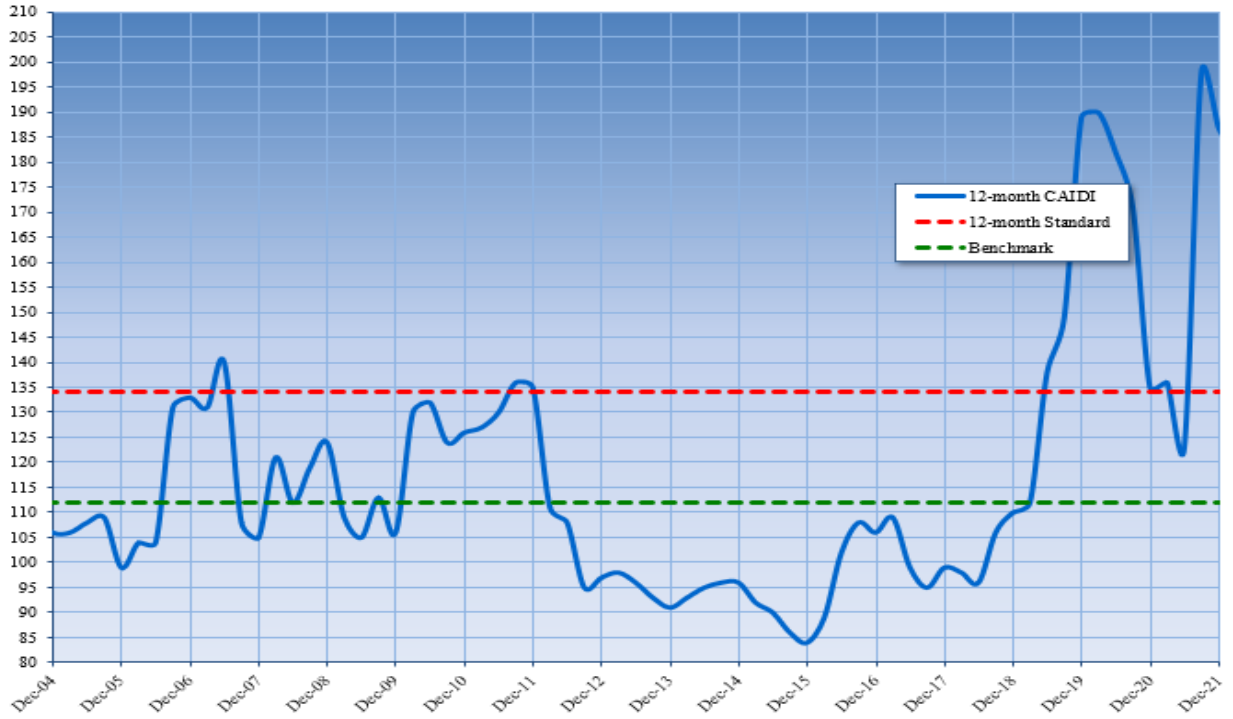


Figure 9 - PECO SAIFI (interruptions per customer)

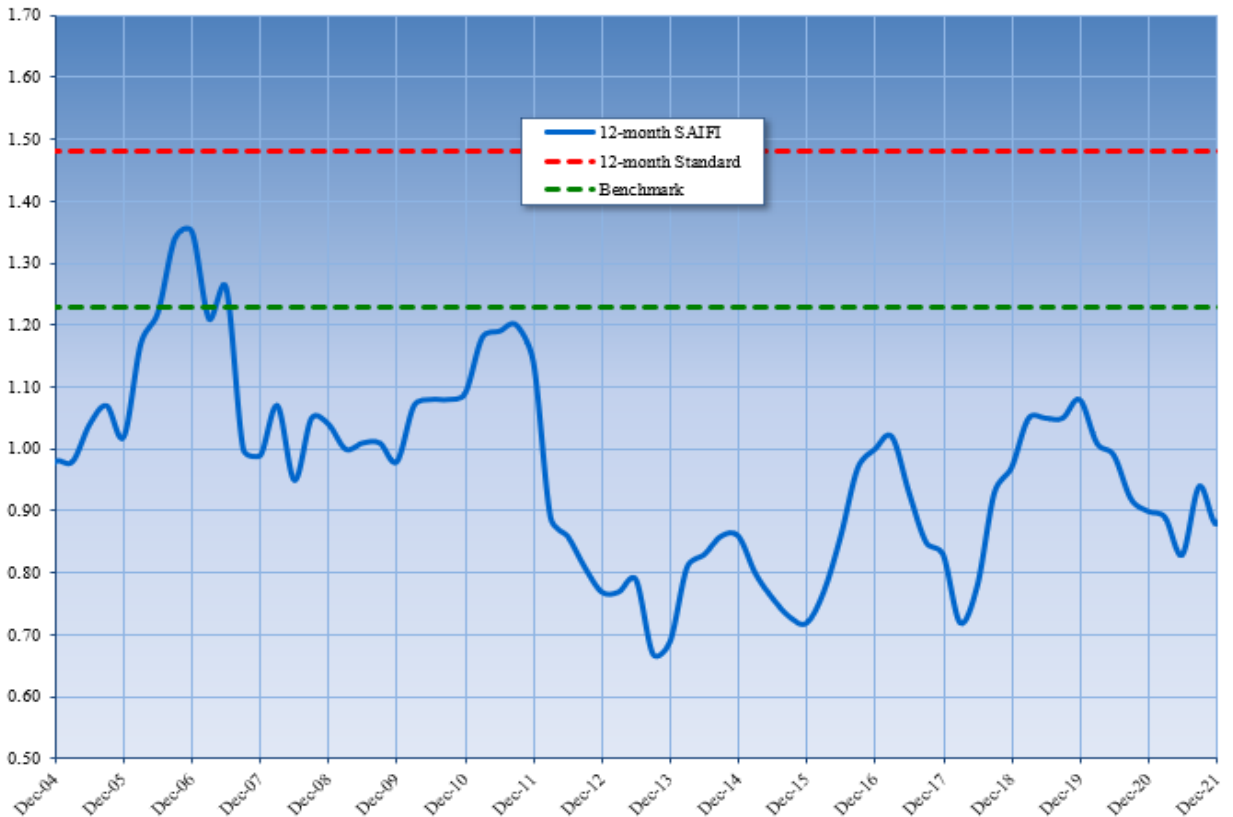


Figure 10 - PECO Outage Causes (percent of total outages)

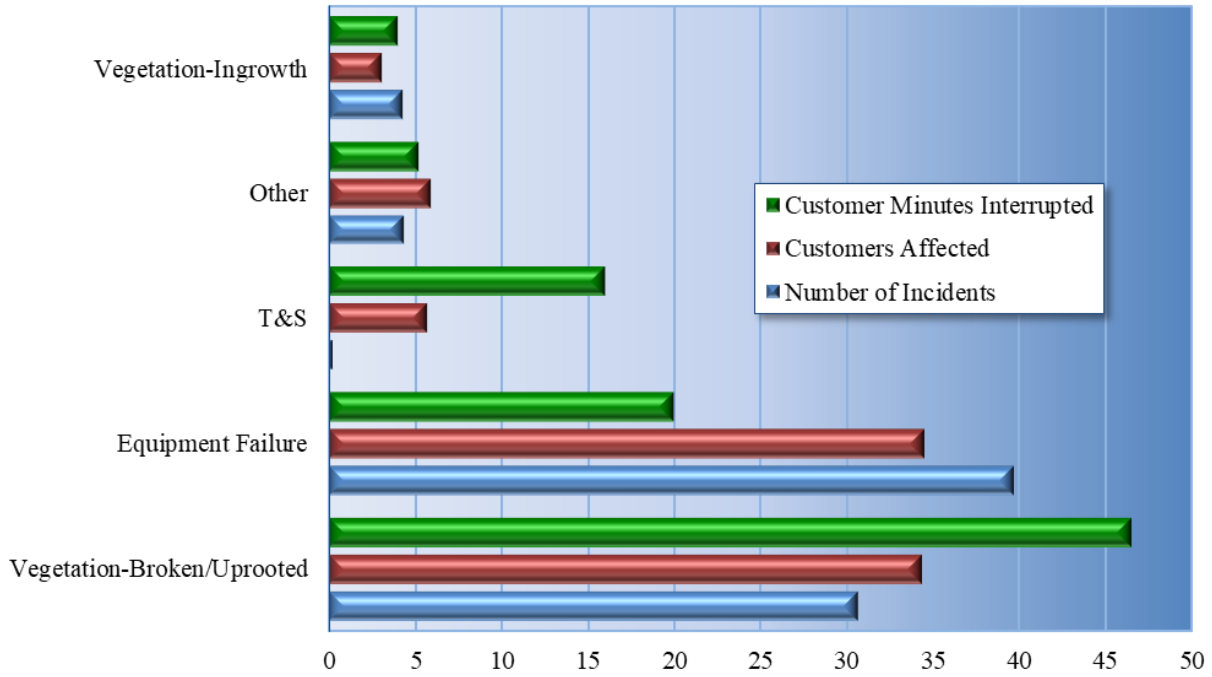
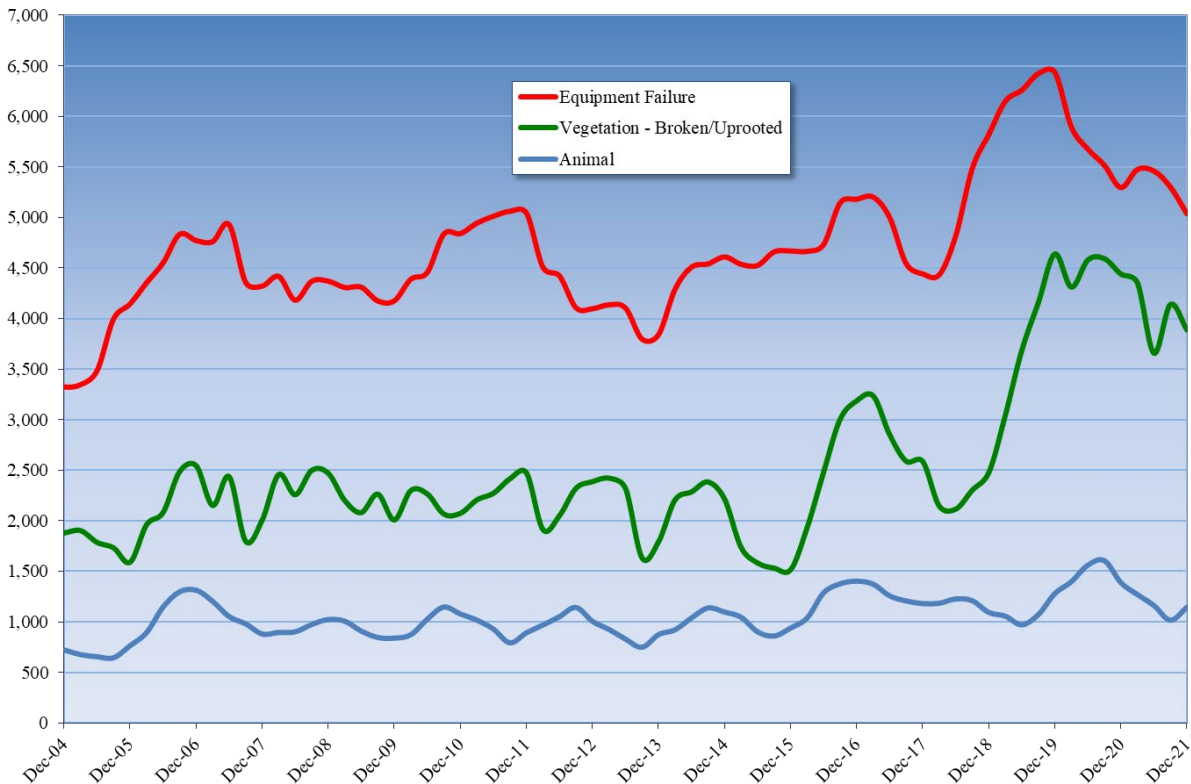


Figure 11 - PECO Outage Tracking (number of incidents)



## ***PPL Electric Utilities Corporation***

PPL Electric Utilities Corporation (PPL) has a service territory of about 10,000 square miles and serves approximately 1.4 million customers.

In 2021, PPL experienced 1.2 million customer interruptions and 245.4 million customer-minutes interrupted as compared to: 1.2 million customer interruptions and 166.4 million customer-minutes in 2020; 1.2 million customer interruptions and 213.9 million customer-minutes interrupted in 2019; 1.2 million customer interruptions and 201.5 million customer-minutes interrupted in 2018; and 1 million customer interruptions and 147.2 million customer-minutes interrupted in 2017. (Note these numbers exclude major events.)

PPL did not experience a Major Event in 2021.

### **CAIDI/SAIDI/SAIFI Evaluation**

#### **CAIDI**

- Rolling 12-month:** Increased from 176 minutes in 2020 to 187 minutes in 2021; failed to achieve benchmark by 29%.
- 3-year average:** Increased from 160 minutes in 2020 to 167 minutes in 2021; failed achieve standard by 4.2%.

#### **SAIDI**

- Rolling 12-month:** Increased from 116 minutes in 2020 to 170 minutes in 2021; Failed to achieve benchmark by 19.7%.
- 3-year average:** Increased from 136 minutes in 2020 to 145 minutes in 2021; achieved standard by 15.5%.

#### **SAIFI**

- Rolling 12-month:** Increased from 0.85 outages in 2020 to 0.91 outages in 2021; achieved benchmark by 7.1%.
- 3-year average:** Increased from 0.84 outages in 2020 to 0.87 outages in 2021; achieved standard by 19.8%.

### **CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 12 and 13. Beginning in 2004, PPL's CAIDI performance trend has been erratic. PPL's CAIDI for 2021 was 187, which surpassed both the benchmark and standard upper-control-limit-lines. Management should intensify its efforts to improve CAIDI performance and return performance to levels consistently below the "green" benchmark performance upper-control-limit-line.

Beginning in December 2013, PPL's SAIFI benchmark performance trend has been positive, as shown on Figure 13 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.

## **Outage Causes**

Figure 14 below shows the top five reported 2021 outage-cause categories by customer minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees were the top cause of outages and customer-minutes interrupted. Over 74% of customer minutes interrupted are caused by trees, and 13% are caused by equipment failure.

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

## **General Reliability**

PPL notes that in 2021 customers continued to experience top quartile industry reliability. PPL notes that its rolling 12-month SAIFI finished at 0.91, which was increased over 2020. PPL also notes its ongoing focus around preventing customer interruptions through system automation, vegetation management and asset performance continues to directly support overall strong reliability results, with over 200,000 customer outages eliminated in 2021 through automation. PPL states that this level of SAIFI performance is directly related to its high levels of customer satisfaction, with outages being reduced by 27% since 2011.

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

- Commitment to providing safe, reliable, affordable service to its customers.
- An extensive vegetation management program.
- Continued investment in distribution automation technology such as:
  - Multi and single-phase Smart Grid Initiative.
  - Increased leverage of PPL's Automated Distribution Management System (ADMS).
  - Full implementation of Fault Isolation and System Restoration (FISR) technology automatically restoring more than one 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 2021 results were achieved in a year of record storm frequency and intensity. 2021 saw an all-time peak of 42 total storms, easily surpassing the previous high of 33 in 2011. PPL notes that it experienced the most PUC storm cases, customers impacted, and minutes interrupted on record.

In terms of CAIDI performance, PPL notes that with storms in 2021 surpassing even the prior four years of higher storm frequency and magnitude, along with automated systems preventing and converting outages to momentary interruptions, higher CAIDI values for 2021 are not unexpected. However, several initiatives continue to be evaluated to improve CAIDI performance. Some of these strategic areas include:

- Optimize resource planning and scheduling.
- Setting Restore vs. Repair strategy early on in storm response.
- Resource Strategy/Optimization.
- Resource scheduling and prearrange resource availability.
- Leverage data technology to isolate impact and dispatch of resources needed to address outages.

### **Conclusion**

Trees and Equipment Failures are the top two outage causes that negatively affect electrical reliability to PPL customers. In 2021, tree-related outages contributed to almost 74% of the customer-minute interruptions.

PPL's CAIDI 2021 performance was above Benchmark and 12-month Standard. Management attention is required to sustain CAIDI performance below the "green" benchmark performance upper-control-limit-line. PPL has sustained SAIFI benchmark since 2012 and is considered an excellent SAIFI benchmark performer.

While SAIFI is a measure of outage frequency, CAIDI is a measure of customer restoration and can be improved by decreased response times and repair times.

Figure 12 - PPL CAIDI (minutes)

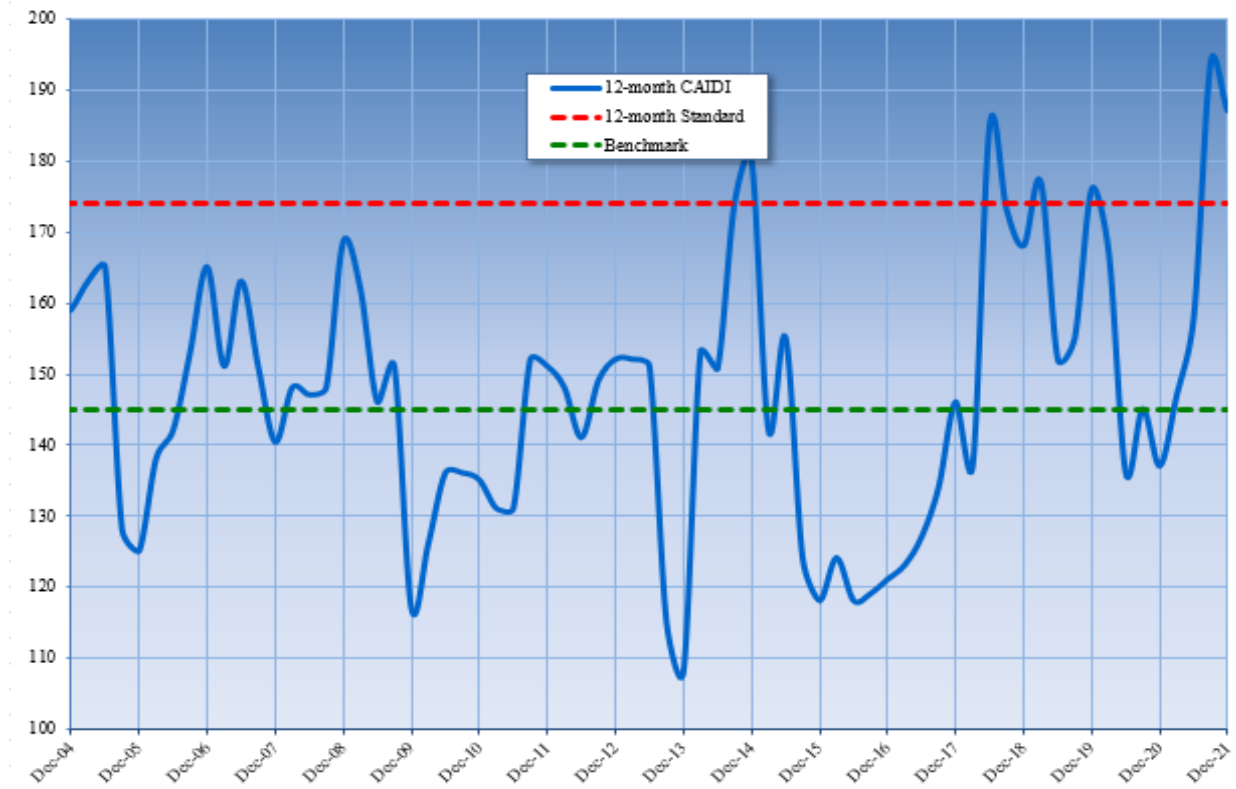


Figure 13 - PPL SAIFI (interruptions per customer)

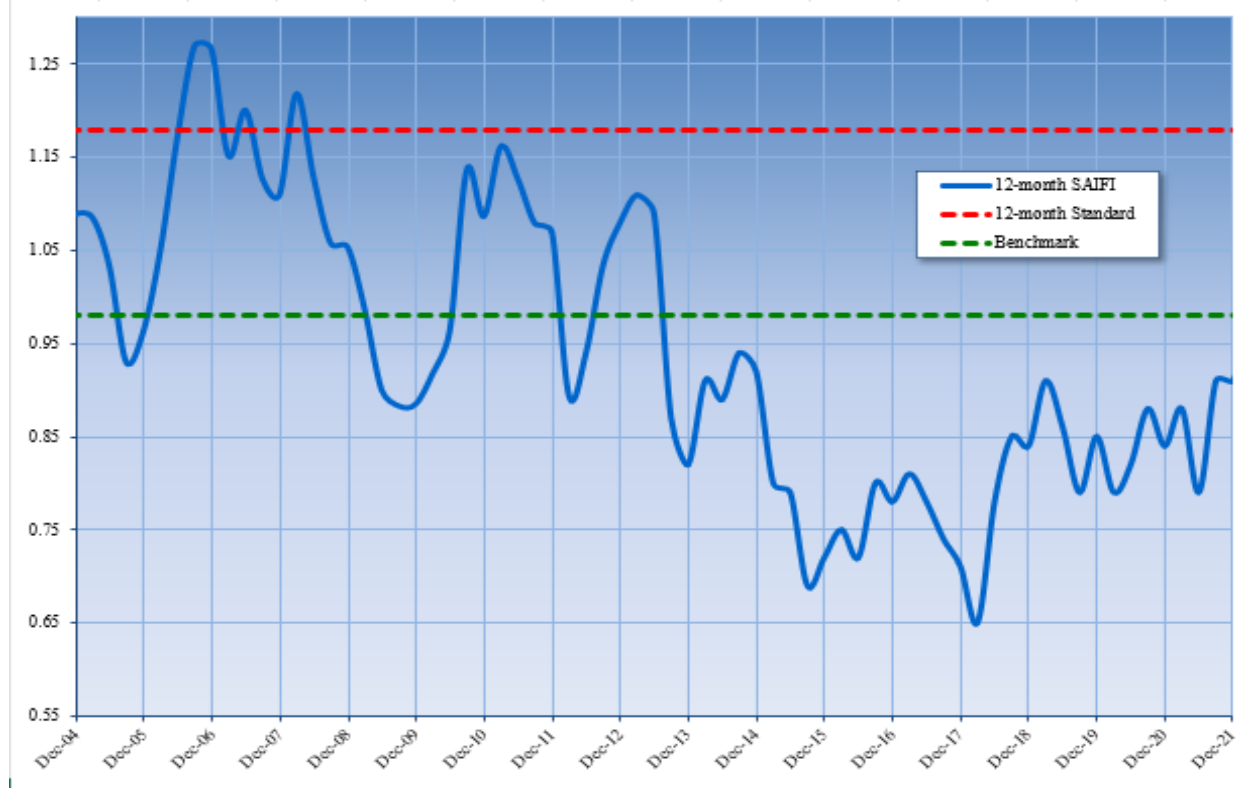


Figure 14 - PPL Outage Causes (percent of total outages)

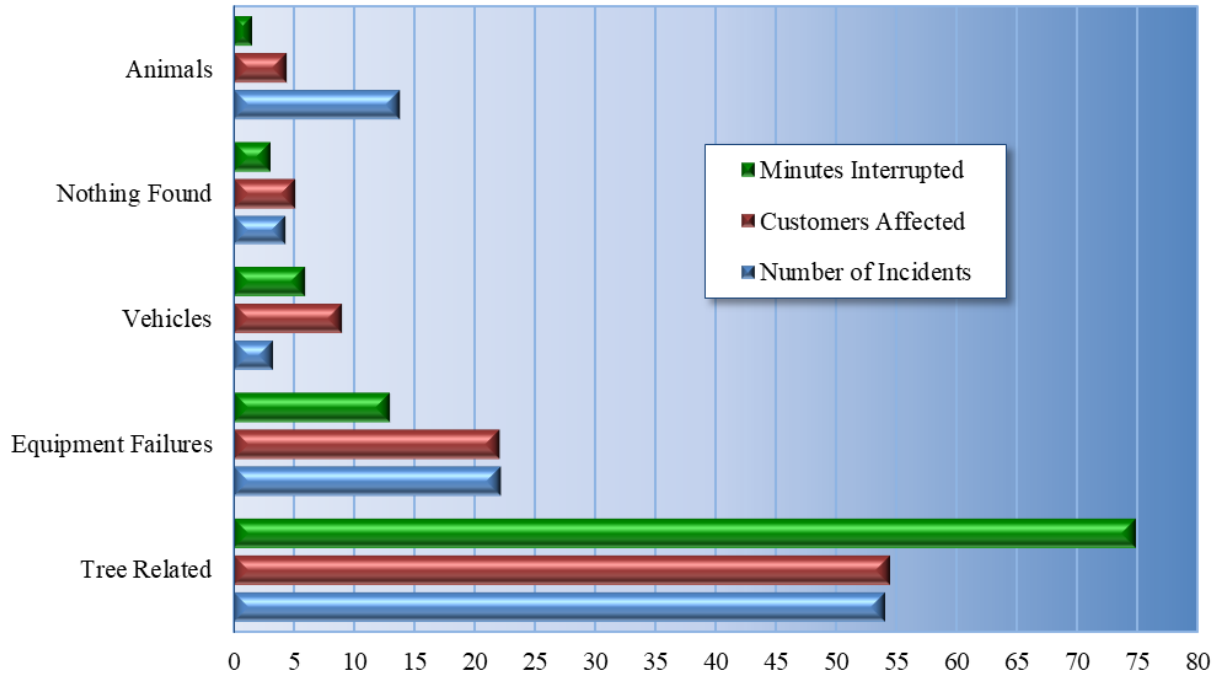
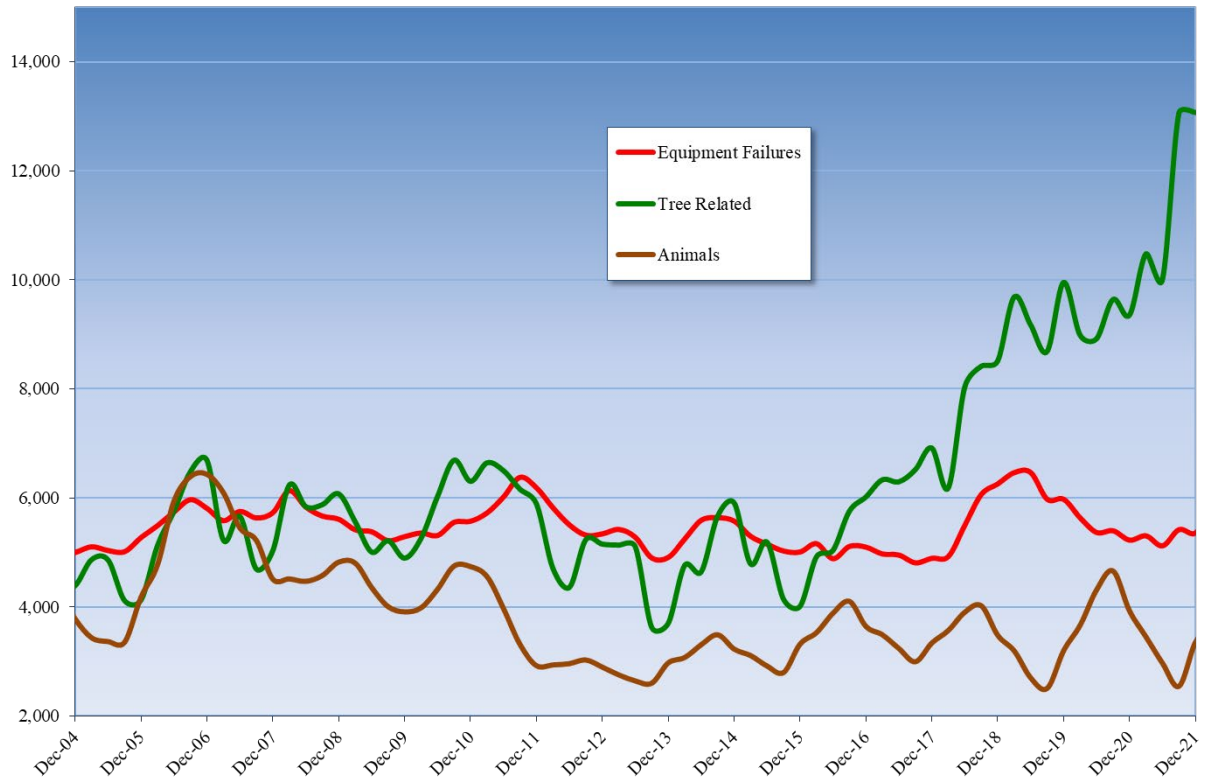


Figure 15 - PPL Outage Tracking (number of incidents)



## *Metropolitan Edison Company*

Metropolitan Edison Company (Met-Ed) has a service territory of about 3,300 square miles that serves about 573,857 customers.

In 2021, Met-Ed experienced 772,644 customer interruptions and 133.4 million customer-minutes interrupted as compared to: 724,138 customer interruptions and 108.4 million customer-minutes interrupted in 2020; 874,452 customer interruptions and 143.3 million customer-minutes interrupted in 2019; 713,881 customer interruptions and 92.8 million customer-minutes interrupted in 2018; and 827,461 customer interruptions and 121.9 million customer-minutes interrupted in 2017.

Met-Ed experienced a Major Event in 2021 on Sep. 1, 2021. The Major Event impacted over 61,317 customers, which is not reflected in the totals above.

### **CAIDI/SAIDI/SAIFI Evaluation**

#### **CAIDI**

- Rolling 12-month:** Increased from 150 minutes in 2020 to 173 minutes in 2021; failed to achieve benchmark by 47.9%.
- 3-year average:** Increased from 148 minutes in 2020 to 162 minutes in 2021; failed to achieve standard by 25.8%.

#### **SAIDI**

- Rolling 12-month:** Increased from 190 minutes in 2020 to 233 minutes in 2021; failed to achieve benchmark by 72.6%.
- 3-year average:** Increased from 202 minutes in 2020 to 225 minutes in 2021; failed to achieve standard by 38.2%.

#### **SAIFI**

- Rolling 12-month:** Increased from 1.27 outages in 2020 to 1.35 outages in 2021; failed to achieve benchmark by 17.4%.
- 3-year average:** Increased from 1.36 outages in 2020 to 1.39 outages in 2021; failed to achieve standard by 9.2%.

### **CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 16 and 17. Beginning in 2004, Met-Ed’s CAIDI performance trend has been erratic, and from 2013 to present has been trending negative. Met-Ed’s 2021 rolling 12-month CAIDI is above both benchmark and standard upper-control-limit-lines. The present CAIDI performance trend is 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. Attention to improving outage response time and repair times is warranted. Vegetation control may improve repair times by reducing larger and more damaging foliage contacts.



Beginning in 2004, Met-Ed’s SAIFI performance trend has been consistently outside of acceptable tolerances. From 2007 onward, the overall trend has been continually negative, except for a brief period in 2013-2014 when Met-Ed’s performance was positive and below the “green” benchmark performance upper-control-limit-line. Met-Ed’s SAIFI performance in 2021 was decreased and its rolling 12-month SAIFI remained just below the “red” standard performance upper-control-limit-line, but still increased above the benchmark measure. By all measures this showed a decrease in performance.

### **Outage Causes**

Figure 18 below, shows the 2021 top five reported outage-cause categories by customer-minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, 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. About 71% of Customer-minutes Interrupted was caused by trees and equipment failure.

Figure 19 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 LTIIIP. This plan includes expenditures and programs designed to accelerate repairment, improvement or replacement of aging infrastructure in order to adequately maintain and improve the efficiency, safety, adequacy, and reliability of the distribution system. On Jan. 18, 2019, Met-Ed filed a Petition for Approval of Modification of its LTIIIP 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.<sup>41</sup> On Aug. 30, 2019, Met-Ed, along with the other FirstEnergy Companies (Penelec, Penn Power, and West Penn) filed petitions for second LTIIIPs for the years 2020 through 2024. The petitions were approved by Commission Order entered on Jan. 16, 2020.<sup>42</sup>

The PUC has also been performing extra monitoring of Met-Ed’s work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy’s Implementation Plan to the findings of the Commission’s Focused Management and Operations Audit.<sup>43</sup> Met-Ed’s second LTIIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

---

<sup>41</sup> See *Petition of Metropolitan Edison Company for Approval of Modification of its Long-Term Infrastructure Improvement Plan*, at Docket No. P-2015-2508942.

<sup>42</sup> See *Petition of Metropolitan Edison Company for Approval of its Long-Term Infrastructure Improvement Plan*, at Docket No. P-2019-3012618.

<sup>43</sup> 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 their common reliability improvement programs that include, but are not limited to:

- **Inspection and Maintenance:** In 2021 FirstEnergy started using Resistograph technology for pole inspections. 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.
- **Tree Trimming:** 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 OROW priority trees. FirstEnergy notes that its companies are limited in their ability to legally address all forms of OROW tree management. FirstEnergy notes, however, that priority OROW trees are identified when significantly encroaching the corridor and removed when customer consent is obtained or easement rights permit. FirstEnergy further 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. In response to damage caused by the Emerald Ash Borer, FirstEnergy has a program to proactively remove ash trees from the ROW. FirstEnergy also performs post-storm circuit patrols target the areas with high tree-related outages. Company 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.
- **CEMI (customer experiencing multiple interruptions):** 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.
- **LTIPs:** The FirstEnergy Companies' second LTIPs, which span the five-year period of 2020 through 2024, focuses on two areas: asset health and outage exposure. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. The second LTIPs includes initiatives

and expenditures within these two focus areas that are designed to maximize sustained reliability over the long-term.

FirstEnergy notes that in addition to the reliability programs outlined above, they have other programs to minimize outage impacts such as:

- **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 its customers in 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 Companies to ping the meter to determine if a customer's service has been restored.
- **Incident Command System (ICS):** FirstEnergy is 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 its incident response ability is improved, and reliability is enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

FirstEnergy and Met-Ed note that the reliability and system improvement programs outlined above should allow the company to address its reliability performance and improve over the long-term.

**Conclusion**

Trees and Equipment Failure are the top two outage causes that substantially negatively affect electrical reliability to Met-Ed customers. In 2021, the trees and equipment failure outage causes contributed to over 74% of the total lost customer-minutes and did not include any lost customer-minutes caused by Major Events.

Beginning in 2004, Met-Ed’s CAIDI and SAIFI benchmark performance has been inconsistent and frequently out-of-control. Met-Ed’s overall CAIDI performance trend is troubling, with a continuing trend above standard and benchmark performance upper-control-limit-lines. Met-Ed’s SAIFI was below standard from 2011 to 2014 and showed improvement until 2016 when it rose above 12-month Standard and remained there until 2020 when it decreased to a point below Standard yet still above Benchmark. Continued management attention is needed to bring Met-Ed’s failing reliability performance back into control and to sustain the trend line below the “green” benchmark performance upper-control-limit-line. The Commission expects to see improvement in reliability for the FirstEnergy Companies in 2022 and 2023.

*Figure 16 - Met-Ed CAIDI (minutes)*

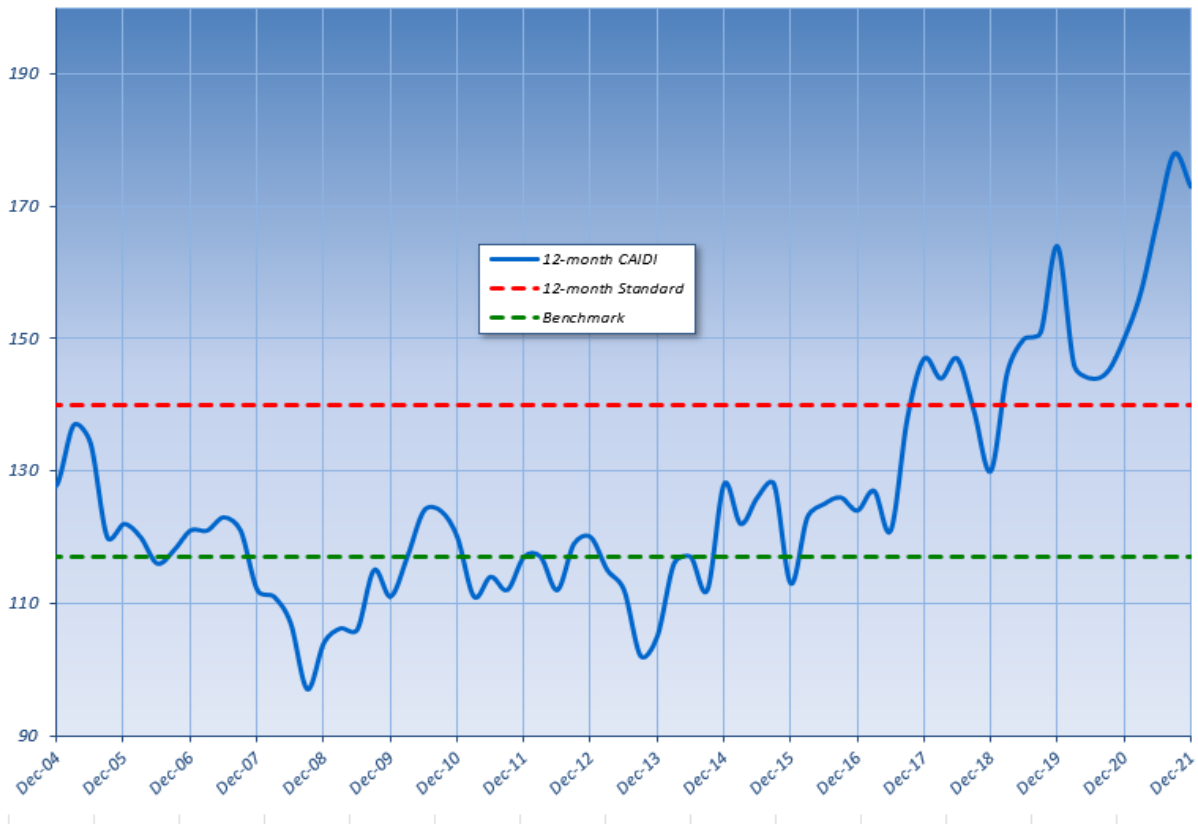


Figure 17 - Met-Ed SAIFI (interruptions per customer)

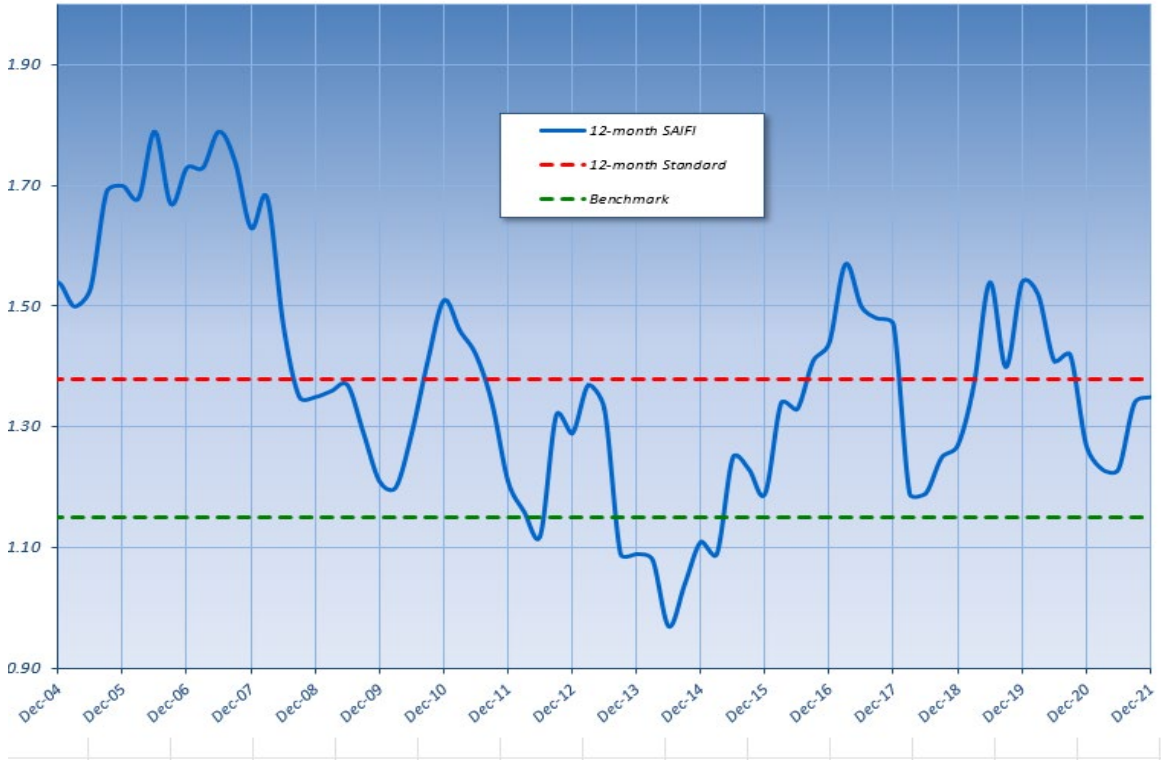
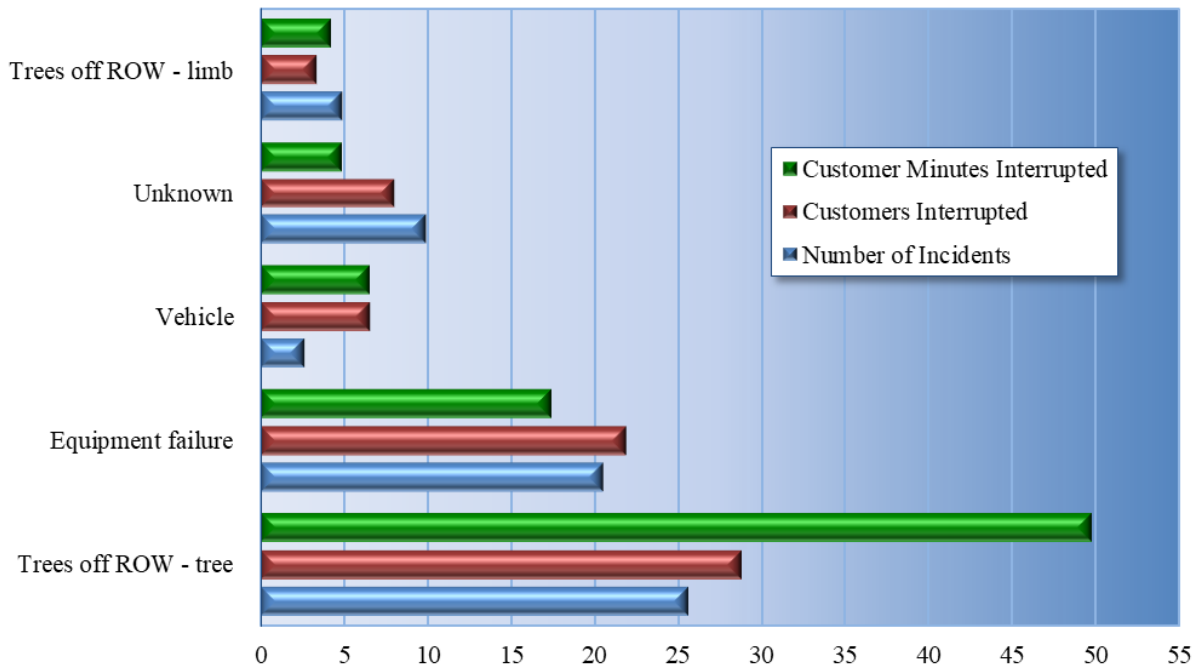
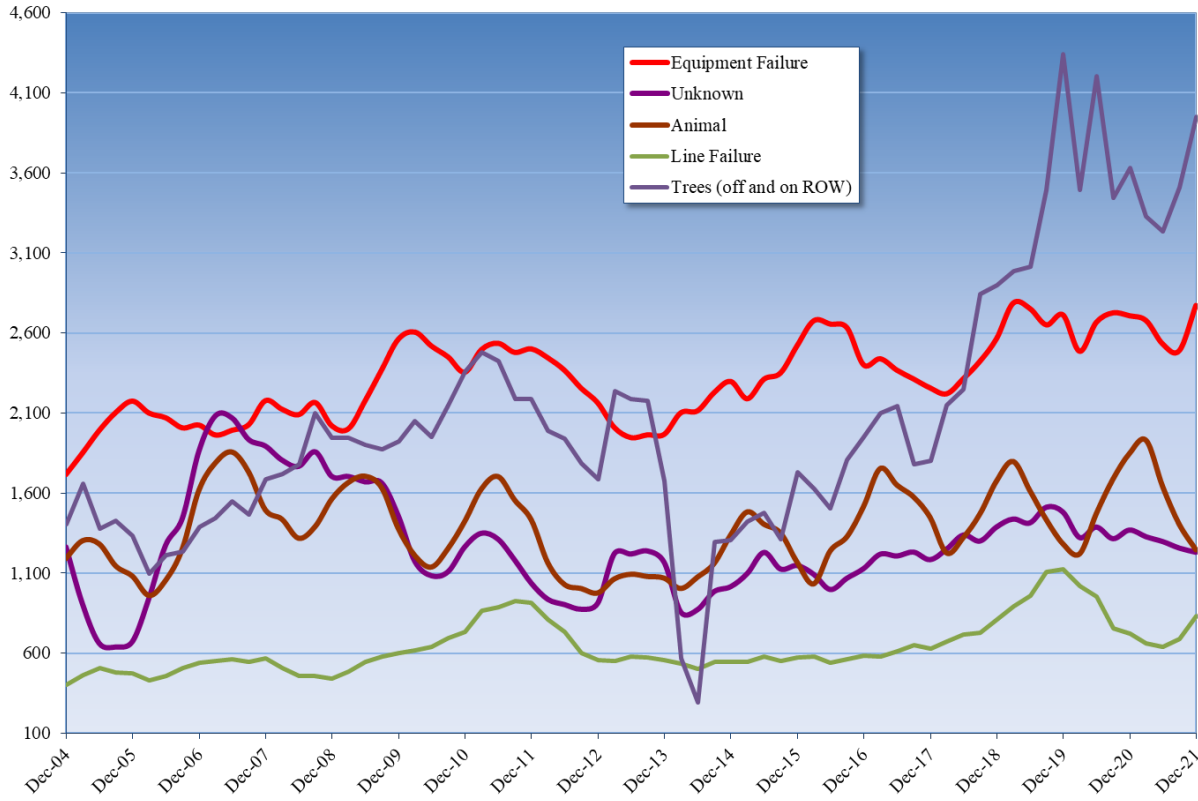


Figure 18 - Met-Ed Outage Causes (percent of total outages)



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



**Pennsylvania Electric Company**

Pennsylvania Electric Company (Penelec) has a service territory of about 17,600 square miles serving approximately 580,000 customers.

In 2021, Penelec experienced 1,065,004 customer interruptions and 160.5 million customer-minutes interrupted as compared: to 914,716 customer interruptions and 124.1 million customer-minutes interrupted in 2020; 995,121 customer interruptions and 146.1 million customer-minutes interrupted in 2019; 992,756 customer interruptions and 113.1 million customer-minutes interrupted in 2018; and 1 million customer interruptions and 138.5 million customer-minutes interrupted in 2017.

Penelec experienced one Major Event on Jul. 6, 2021. This Major Event impacted over 61,821 customers, which is not reflected in the total above.

**CAIDI/SAIDI/SAIFI Evaluation**

**CAIDI**

**Rolling 12-month:** Increased from 136 minutes in 2020 to 141 minutes in 2021; failed to achieve benchmark by 20.5%.

**3-year average:** Increased from 132 minutes in 2020 to 141 minutes in 2021; failed to achieve standard by 12.1%.

## **SAIDI**

- Rolling 12-month:** Increased from 214 minutes in 2020 to 277 minutes in 2021; failed to achieve benchmark by 87.2%
- 3-year average:** Increased from 220 minutes in 2020 to 248 minutes in 2021; failed to achieve standard by 38.4%.

## **SAIFI**

- Rolling 12-month:** Increased from 1.58 outages in 2020 to 1.84 outages in 2021; failed to achieve benchmark by 46%.
- 3-year average:** Increased from 1.67 outages in 2020 to 1.71 outages in 2021; failed to achieve standard by 23.3%.

## **CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 20 and 21. 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. However, CAIDI performance requires more management attention to address the inconsistent performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line. 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.

Beginning in 2004, Penelec's SAIFI performance trend has been inconsistent and frequently outside of acceptable tolerances. From 2004 through 2019, the overall trend has been continually trending negative. For the last five 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 attention is greatly needed to address the poor SAIFI performance and 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 improve service reliability.

## **Outage Causes**

Figure 22 below, shows the top reported 2021 outage-cause categories by customer minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Equipment failure (which includes line failure) and OROW trees were the leading cause of outages, customers affected, and customer-minutes interrupted. Over 69% of customer minutes interrupted was caused by equipment failure and trees.

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

## **General Reliability**

In 2016, Penelec started to execute its LTIP. The LTIP 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.<sup>44</sup> On Aug. 30, 2019, Penelec, along with the other FirstEnergy Companies (Met-Ed, Penn Power, and West Penn) filed petitions for second LTIPs for the years 2020 through 2024. The petitions were approved by Commission Order entered on Jan. 16, 2020.<sup>45</sup>

The PUC also has been performing extra monitoring of Penelec's work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.<sup>46</sup> Penelec's second LTIP is designed to continue the reliability improvement efforts from the 2015 RIP.

The FirstEnergy Companies note their common reliability improvement programs that include, but are not limited to:

- **Inspection and Maintenance:** In 2021 FirstEnergy started using Resistograph technology for pole inspections. 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.
- **Tree Trimming:** 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 OROW priority trees.<sup>47</sup> FirstEnergy notes that its companies are limited in their ability to legally address all forms of OROW tree management. FirstEnergy notes, however, that priority OROW trees are identified when significantly encroaching the corridor and removed when customer consent is obtained or easement rights permit. FirstEnergy further 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

---

<sup>44</sup> See *Petition of Pennsylvania Electric Company for Approval of Modification of its Long-Term Infrastructure Improvement Plan*, at Docket No. P-2015-2508936.

<sup>45</sup> See *Petition of Pennsylvania Electric Company for Approval of its Long-Term Infrastructure Improvement Plan* at Docket No. P-2019-3012615.

<sup>46</sup> Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

<sup>47</sup> FirstEnergy defines these as trees located off the right-of-way that are either dead, diseased, declining, structurally compromised, severely leaning, or significantly encroaching onto the right-of-way.



which overhang primary conductors based on tree species and condition. In response to damage caused by the Emerald Ash Borer, FirstEnergy has a program to proactively remove ash trees from the ROW. FirstEnergy also performs post-storm circuit patrols target the areas with high tree-related outages. Company 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.

- CEMI (customer experiencing multiple interruptions): 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.
- LTIPs: The FirstEnergy Companies' second LTIPs, which span the five-year period of 2020 through 2024, focuses on two areas: asset health and outage exposure. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. The second LTIPs includes initiatives and expenditures within these two focus areas that are designed to maximize sustained reliability over the long-term.

FirstEnergy notes that in addition to the reliability programs outlined above, they have other programs to minimize outage impacts such as:

- 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 its customers in 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 Companies to ping the meter to determine if a customer's service has been restored.
- **Incident Command System (ICS):** FirstEnergy is 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 its incident response ability is improved, and reliability is enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

FirstEnergy and Penelec note that the reliability and system improvement programs outlined above should allow the company to address its reliability performance and improve over the long-term.

## **Conclusion**

Trees and Equipment Failure are the top two outage causes that negatively affect electrical reliability to Penelec customers. In 2020, trees and equipment failure outage causes contributed to over 69% of the total lost customer-minutes and does not include any lost customer-minutes caused by Major Events.

Beginning in 2004, Penelec's CADI and SAIFI benchmark performance has been erratic and frequently outside of acceptable tolerances. Penelec through its RIP and LTIP will need to address the inconsistent CAIDI and SAIFI performance and sustain the trend line below the "green" benchmark performance upper-control-limit-line. The Commission expects to see improvement in reliability for the FirstEnergy Companies in 2022 and 2023.

Figure 20 - Penelec CAIDI (minutes)

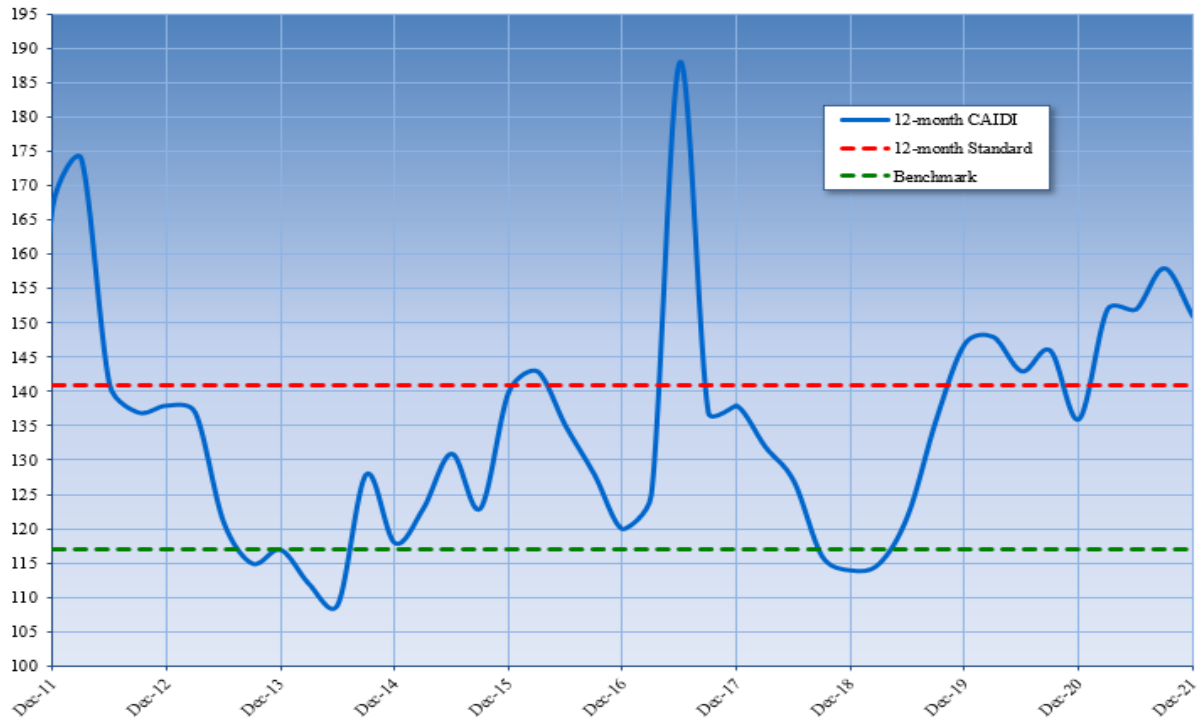


Figure 21 - Penelec SAIFI (interruptions per customer)

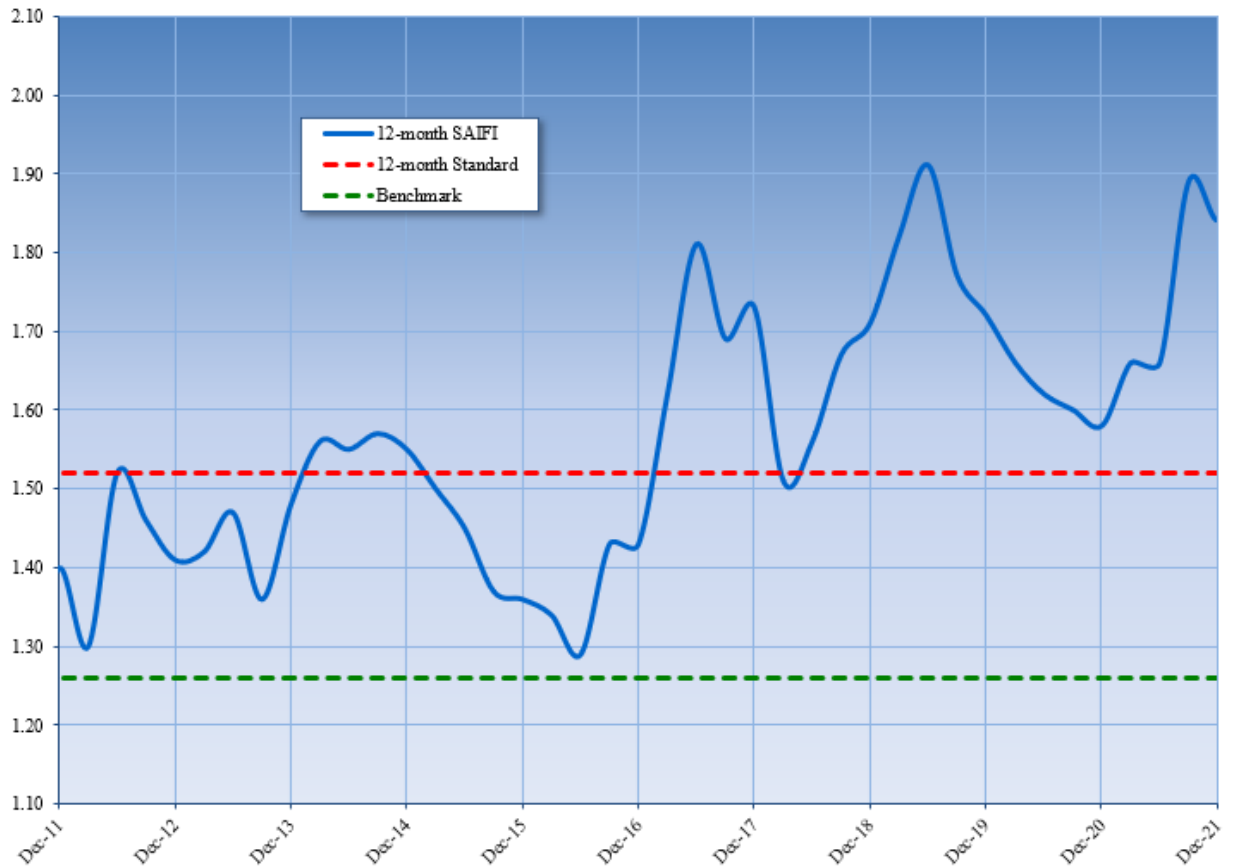


Figure 22 - Penelec Outage Causes (percent of total outages)

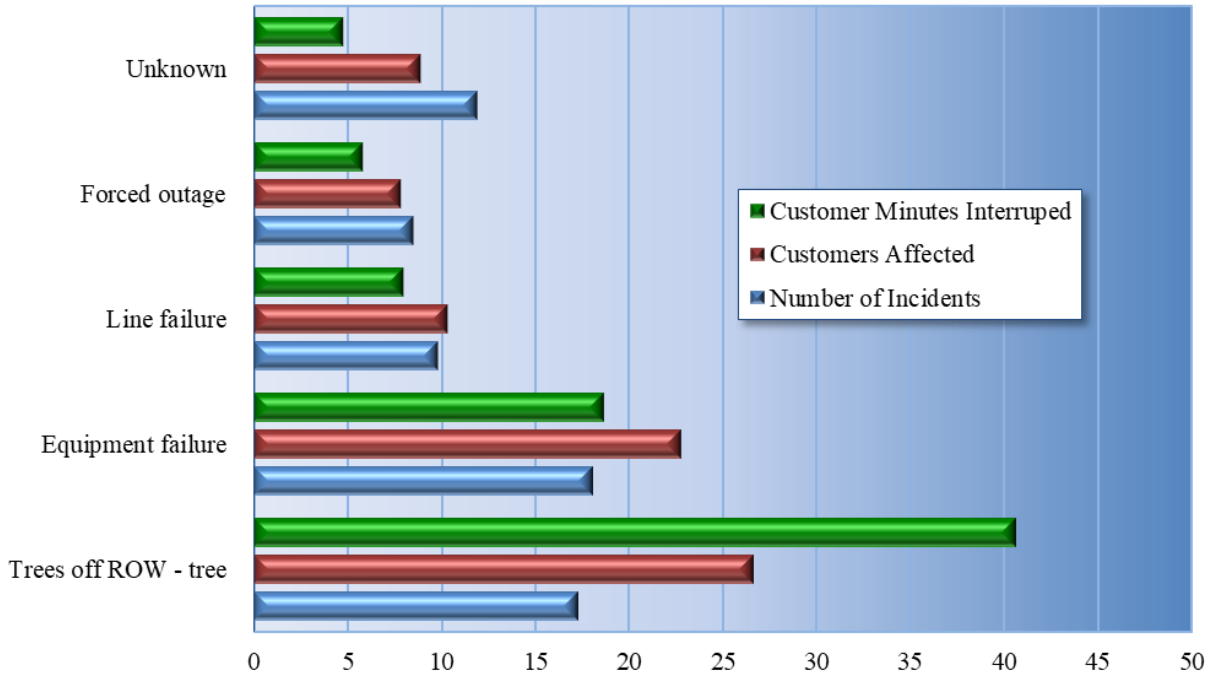
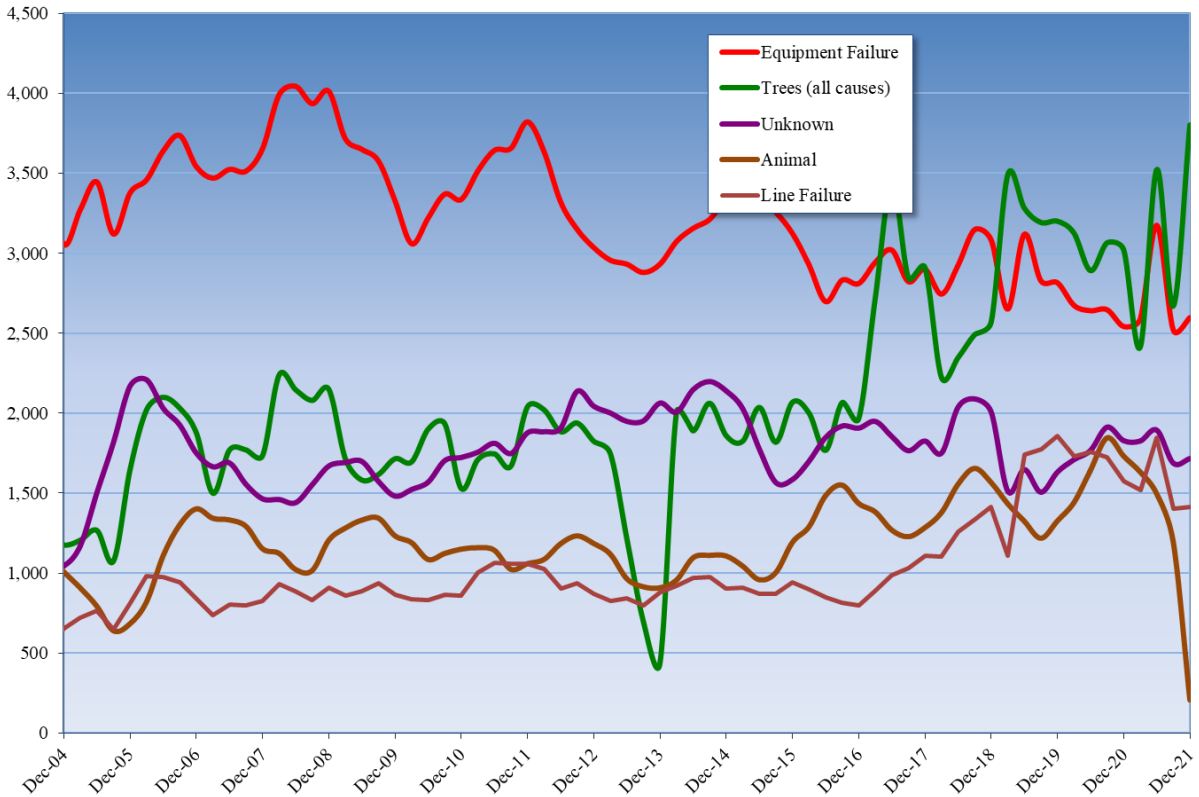


Figure 23-Penelec Outage Tracking (number of incidents)



## *Pennsylvania Power Company*

Pennsylvania Power Company (Penn Power) has a service territory of about 1,100 square miles that serves approximately 166,590 customers.

In 2021, Penn Power experienced 166,681 customer interruptions and 21.6 million customer-minutes interrupted as compared to: 159,907 customer interruptions and 29.6 million customer-minutes interrupted in 2020; 226,745 customer interruptions and 29.2 million customer-minutes interrupted in 2019; 180,247 customer interruptions and 113.1 million customer-minutes interrupted in 2018; and 173,036 customer interruptions and 26 million customer-minutes interrupted in 2017.

Penn Power experienced a Major Event on March 26, 2021, due to severe weather. This Major Event impacted over 18,666 customers, which is not reflected in the total above.

### **CAIDI/SAIDI/SAIFI Evaluation**

#### **CAIDI**

- Rolling 12-month:** Decreased from 185 minutes in 2020 to 129 minutes in 2021; failed to achieve benchmark by 27.7%.
- 3-year average:** Decreased from 151 minutes in 2019 to 148 minutes in 2021; failed to achieve standard by 33.0%.

#### **SAIDI**

- Rolling 12-month:** Decreased from 179 minutes in 2020 to 129 minutes in 2021; failed to achieve benchmark by 14.2%.
- 3-year average:** Decreased from 170 minutes in 2020 to 162 minutes in 2021; failed to achieve standard by 19.1%.

#### **SAIFI**

- Rolling 12-month:** Increased from 0.97 outages in 2020 to 1.00 outages in 2021; achieved benchmark by 10.7%.
- 3-year average:** Decreased from 1.15 outages in 2020 to 1.12 outages in 2021; achieved standard by 9.2%.

### **CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 24 and 25. 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. However, CAIDI performance requires more management attention to address the inconsistent performance and sustain the trend line below the “green” benchmark performance upper-control-limit-line. 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.

Penn Power's SAIFI performance for 2021 continued improvements seen in 2020 to remain below the benchmark upper-control-limit-line. Continued management attention is required 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 26 below, shows the top reported 2021 outage-cause categories by customer minutes interrupted, as a percentage, for the following 3 distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees OROW and Equipment/line failures were the leading cause of outages, customers affected, and customer-minutes interrupted. Over 59% of customer-minutes interrupted were caused by trees

Figure 27 below, shows historical trend of the top five main outage causes. Trees, Line and Equipment Failures 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 LTIIIP. 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 LTIIIP 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.<sup>48</sup> On Aug. 30, 2019, Penn Power, along with the other FirstEnergy Companies (Met-Ed, Penelec, and West Penn) filed petitions for second LTIIIPs for the years 2020 through 2024. The petitions were approved by Commission Order entered on Jan. 16, 2020.<sup>49</sup>

The PUC has also been performing extra monitoring of Penn Power's work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy's Implementation Plan to the findings of the Commission's Focused Management and Operations Audit.<sup>50</sup> Penn Power's second LTIIIP is designed to continue the reliability improvement efforts from the 2015 RIP.

The FirstEnergy Companies note their common reliability improvement programs that include, but are not limited to:

---

<sup>48</sup> See *Petition of Pennsylvania Power Company for Approval of Modification of its Long-Term Infrastructure Improvement Plan*, at Docket No. P-2015-2508931.

<sup>49</sup> See *Petition of Pennsylvania Power Company for Approval of its Long-Term Infrastructure Improvement Plan* at Docket No. P-2019-3012614.

<sup>50</sup> Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

- **Inspection and Maintenance:** In 2021 FirstEnergy started using Resistograph technology for pole inspections. 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.
- **Tree Trimming:** 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 OROW priority trees.<sup>51</sup> FirstEnergy notes that its companies are limited in their ability to legally address all forms of OROW tree management. FirstEnergy notes, however, that priority OROW trees are identified when significantly encroaching the corridor and removed when customer consent is obtained or easement rights permit. FirstEnergy further 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. In response to damage caused by the Emerald Ash Borer, FirstEnergy has a program to proactively remove ash trees from the ROW. FirstEnergy also performs post-storm circuit patrols target the areas with high tree-related outages. Company 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.
- **CEMI (customer experiencing multiple interruptions):** 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.
- **LTIPs:** The FirstEnergy Companies' second LTIPs, which span the five-year period of 2020 through 2024, focuses on two areas: asset health and outage exposure. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. The second LTIPs includes initiatives and

---

<sup>51</sup> FirstEnergy defines these as trees located off the right-of-way that are either dead, diseased, declining, structurally compromised, severely leaning, or significantly encroaching onto the right-of-way.

expenditures within these two focus areas that are designed to maximize sustained reliability over the long-term.

FirstEnergy notes that in addition to the reliability programs outlined above, they have other programs to minimize outage impacts such as:

- **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 its customers in 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 Companies to ping the meter to determine if a customer's service has been restored.
- **Incident Command System (ICS):** FirstEnergy is 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 its incident response ability is improved, and reliability is enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

FirstEnergy and Penn Power note that the reliability and system improvement programs outlined above should allow the company to address its reliability performance and improve over the long-term.



**Conclusion**

Trees and Equipment Failure are the top two outage causes that substantially negatively affect electrical reliability to Penn Power customers. Trees and Equipment Failure outage causes contributed to over 66% of the total lost customer-minutes.

Beginning in 2004, Penn Power’s CAIDI and SAIFI benchmark performance has been inconsistent. Penn Power through its RIP and LTIP will need to address the inconsistent CAIDI and SAIFI performance and sustain the trend line below the “green” benchmark performance upper-control-limit-line. The Commission expects to see continuing improvement in reliability for the FirstEnergy Companies in 2022 and 2023.

*Figure 24 - Penn Power CAIDI (minutes)*

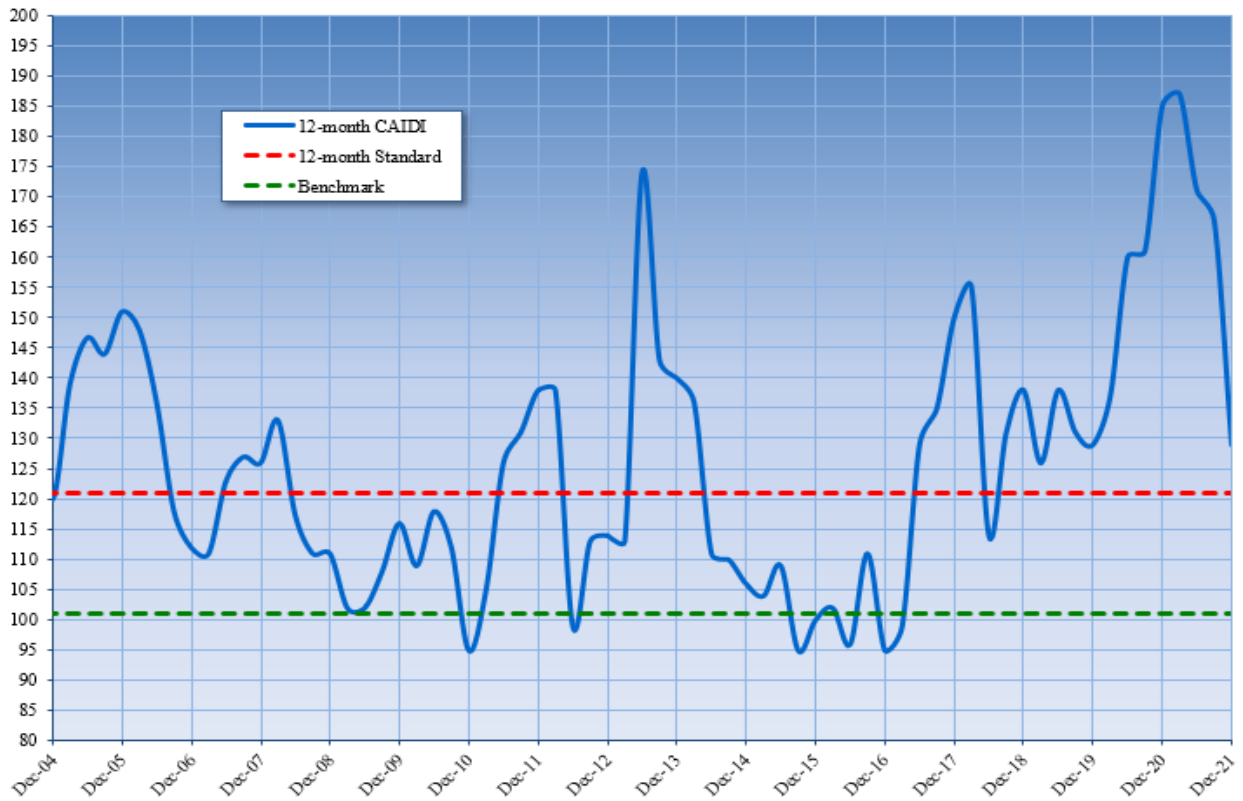


Figure 25 - Penn Power SAIFI (interruptions per customer)

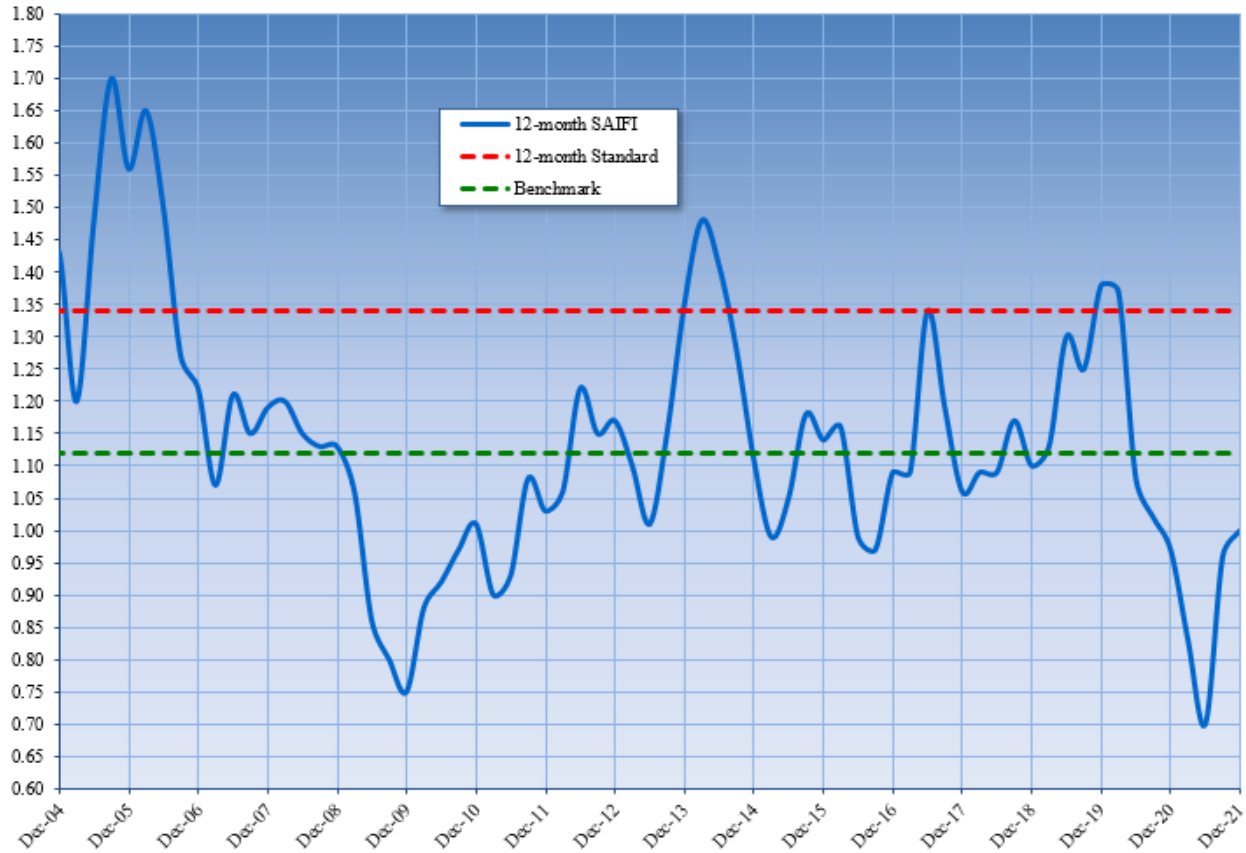
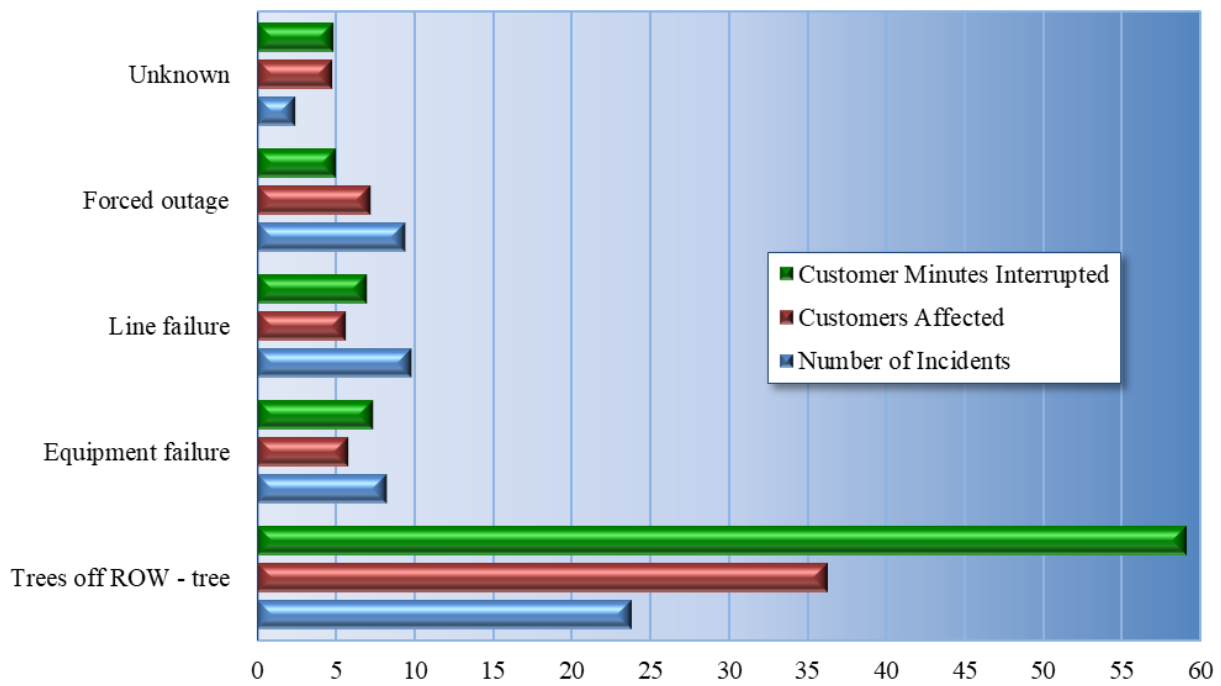
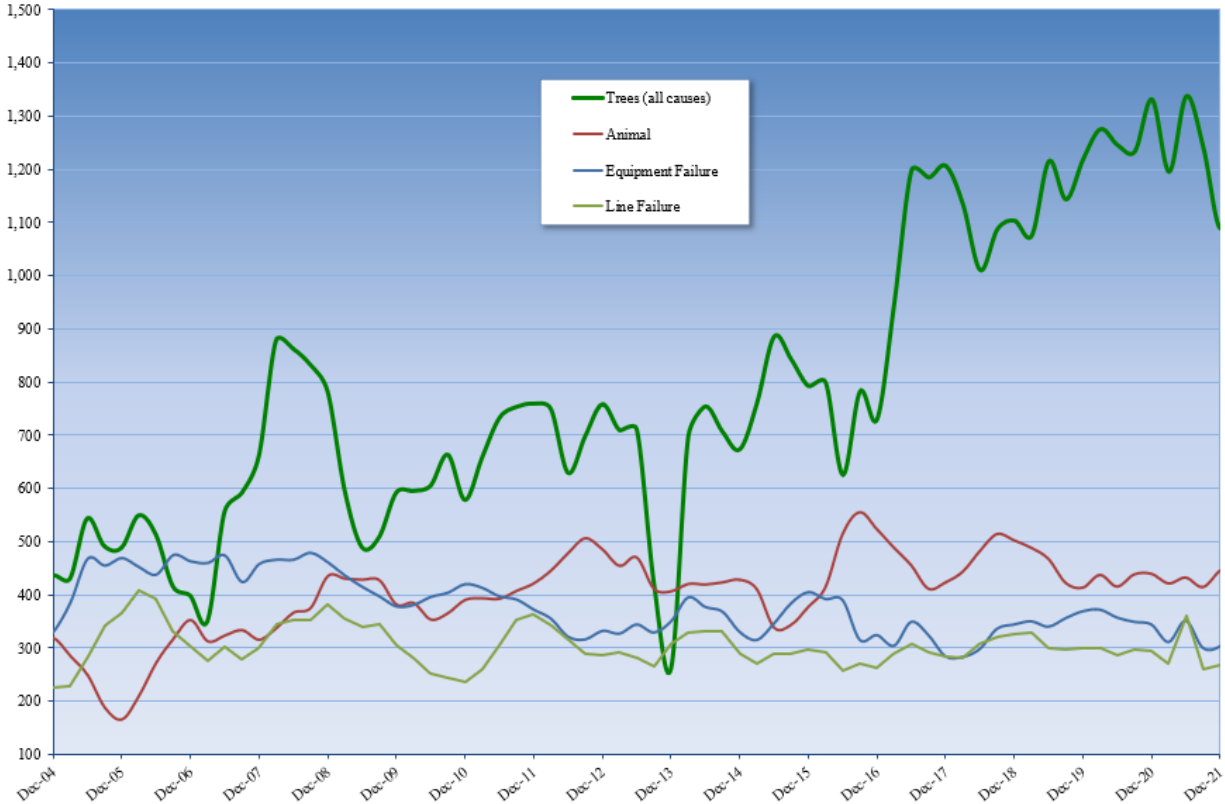


Figure 26 - Penn Power Outage Causes (percent of total outages)



**Figure 27- Penn Power Outage Tracking (number of incidents)**



**West Penn Power Company**

West Penn Power Company (West Penn) has a service territory of about 10,400 square miles and serves about 722,000 customers.

In 2021, West Penn experienced 910,590 customer interruptions and 174.5 million customer-minutes interrupted as compared to: 806,924 customer interruptions and 173.9 million customer-minutes interrupted in 2020; 851,338 customer interruptions and 140.3 million customer-minutes interrupted in 2019; 844,298 customer interruptions and 136.3 million customer-minutes interrupted in 2018; and 919,673 customer interruptions and 152.7 million customer-minutes interrupted in 2017.

West Penn experienced no Major Events in 2021.

**CAIDI/SAIDI/SAIFI Evaluation**

**CAIDI**

**Rolling 12-month:** Decreased from 216 minutes in 2020 to 192 minutes in 2021; failed to achieve benchmark by 12.9%.

**3-year average:** Increased from 184 minutes in 2020 to 191 minutes in 2021; failed to achieve standard by 2.1%.

**SAIDI**

**Rolling 12-month:** Increased from 241 minutes in 2020 to 242 minutes in 2021; failed to achieve benchmark by 35.2%.

**3-year average:** Increased from 215 minutes in 2020 to 226 minutes in 2020; achieved standard by 4.3%.

**SAIFI**

**Rolling 12-month:** Increased from 1.12 outages in 2020 to 1.26 outages in 2021; failed to achieve benchmark by 20.0%.

**3-year average:** Increased from 1.18 outages in 2020 to 1.19 outages in 2021; failed to achieve standard by 2.6%.

**CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 28 and 29. West Penn’s CAIDI performance trend 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 2020, West Penn’s rolling 12-month CAIDI was significantly above the benchmark upper-control-limit-line and 10 minutes above the standard. In 2021, West Penn’s CAIDI returned to a point 12 minutes below the 12-month Standard but still above benchmark. 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. It is suggested that management focus upon improving these. Vegetation management emphasis may also be effective to shorten outage times, in so much as elimination of larger trees near lines will likely result in less damage to line equipment.

Beginning in 2004, West Penn’s SAIFI performance trend has been erratic. From 2017 through 2020, West Penn’s SAIFI performance had been improving, until 2021, at which time SAIFI went above the 12-month Standard. West Penn needs to ensure management attention to sustain the trend line below the “green” benchmark performance upper-control-limit-line.

**Outage Causes**

Figure 30 below, shows the top five reported 2019 outage-cause categories by customer minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Equipment Failure (including line failure) and OROW trees were the leading cause of outages, customers affected, and customer-minutes interrupted. About 49% of customer interrupted minutes are caused by trees and 20% are caused by equipment and line failures.

Figure 31 below, shows historical trend of the top four main outage causes. Tree and Equipment Failure and Line 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 LTIIIP. This plan included expenditures and programs designed to accelerate repairment, improvement or replacement of aging infrastructure in order to adequately maintain and improve the efficiency, safety, adequacy, and reliability of the distribution system. On Jan. 18, 2019, West Penn filed a Petition for Approval of Modification of its Long-Term Infrastructure Improvement Plan in order to increase overall spending in the 2019 program year. The Petition was approved, as filed, by Commission Order entered on May 23, 2019.<sup>52</sup> On Aug. 30, 2019, West Penn, along with the other FirstEnergy Companies (Met-Ed, Penelec, and Penn Power) filed petitions for second LTIIIPs for the years 2020 through 2024. The petitions were approved by Commission Order entered on Jan. 16, 2020.<sup>53</sup>

The PUC has also been performing extra monitoring of West Penn’s work management system and Reliability Improvement Plan (RIP) beginning in 2015 as a result of a Commission Motion regarding FirstEnergy’s Implementation Plan to the findings of the Commission’s Focused Management and Operations Audit.<sup>54</sup> West Penn’s second LTIIIP 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 2022.

The FirstEnergy Companies note their common reliability improvement programs that include, but are not limited to:

- **Inspection and Maintenance:** In 2021 FirstEnergy started using Resistograph technology for pole inspections. 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.
- **Tree Trimming:** 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 OROW priority trees.<sup>55</sup> FirstEnergy notes that its companies are limited in their ability to legally address all forms of OROW tree management. FirstEnergy notes, however, that

---

<sup>52</sup> See *Petition of West Penn Power Company for Approval of Modification of its Long-Term Infrastructure Improvement Plan*, at Docket No. P-2015-2508948.

<sup>53</sup> See *Petition of West Penn Power Company for Approval of its Long-Term Infrastructure Improvement Plan* at Docket No. P-2019-3012617.

<sup>54</sup> Final Order entered Nov 5, 2015, at Docket Nos. D-2013-2365991, D-2013-2365992, D-2013-2365993, and D-2013-2365994.

<sup>55</sup> FirstEnergy defines these as trees located off the right-of-way that are either dead, diseased, declining, structurally compromised, severely leaning, or significantly encroaching onto the right-of-way.

priority OROW trees are identified when significantly encroaching the corridor and removed when customer consent is obtained or easement rights permit. FirstEnergy further 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. In response to damage caused by the Emerald Ash Borer, FirstEnergy has a program to proactively remove ash trees from the ROW. FirstEnergy also performs post-storm circuit patrols target the areas with high tree-related outages. Company 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.

- CEMI (customer experiencing multiple interruptions): 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.
- LTIIPs: The FirstEnergy Companies' second LTIIPs, which span the five-year period of 2020 through 2024, focuses on two areas: asset health and outage exposure. Asset health focuses on maintaining the system in a state of good repair while outage exposure focuses on minimizing the impact of customer outages. The second LTIIPs includes initiatives and expenditures within these two focus areas that are designed to maximize sustained reliability over the long-term.

FirstEnergy notes that in addition to the reliability programs outlined above, they have other programs to minimize outage impacts such as:

- 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 its customers in 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 Companies to ping the meter to determine if a customer’s service has been restored.
- **Incident Command System (ICS):** FirstEnergy is 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 its incident response ability is improved, and reliability is enhanced by utilizing a common system for incident response personnel (both intrastate and interstate).

FirstEnergy and West Penn note that the reliability and system improvement programs outlined above should allow the company to address its reliability performance and improve over the long-term.

## **Conclusion**

Off ROW Trees and Equipment Failure are the top two outage causes that substantially negatively affect electrical reliability to West Penn customers. In 2021, these outage causes contributed to over 59% of the total lost customer-minutes.

West Penn had been a consistent CAIDI benchmark performer since 2014. The Commission hopes this is a one-year anomaly and West Penn can return to benchmark CAIDI performance. West Penn’s SAIFI performance continues to need more management attention to sustain the trend line below the “green” benchmark performance upper-control-limit-line. The Commission expects to see continuing improvement in reliability for the FirstEnergy Companies in 2022 and 2023.

Figure 28 - West Penn CAIDI (minutes)

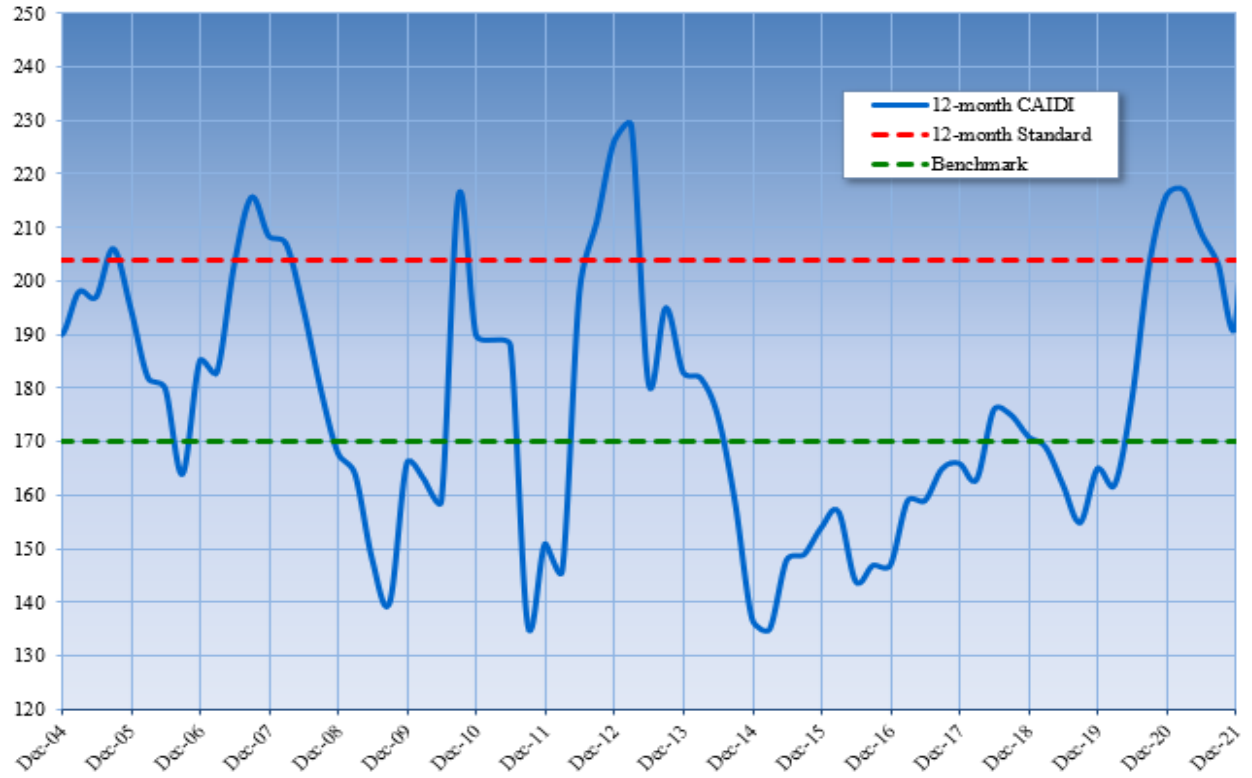




Figure 29 - West Penn SAIFI (interruptions per customer)

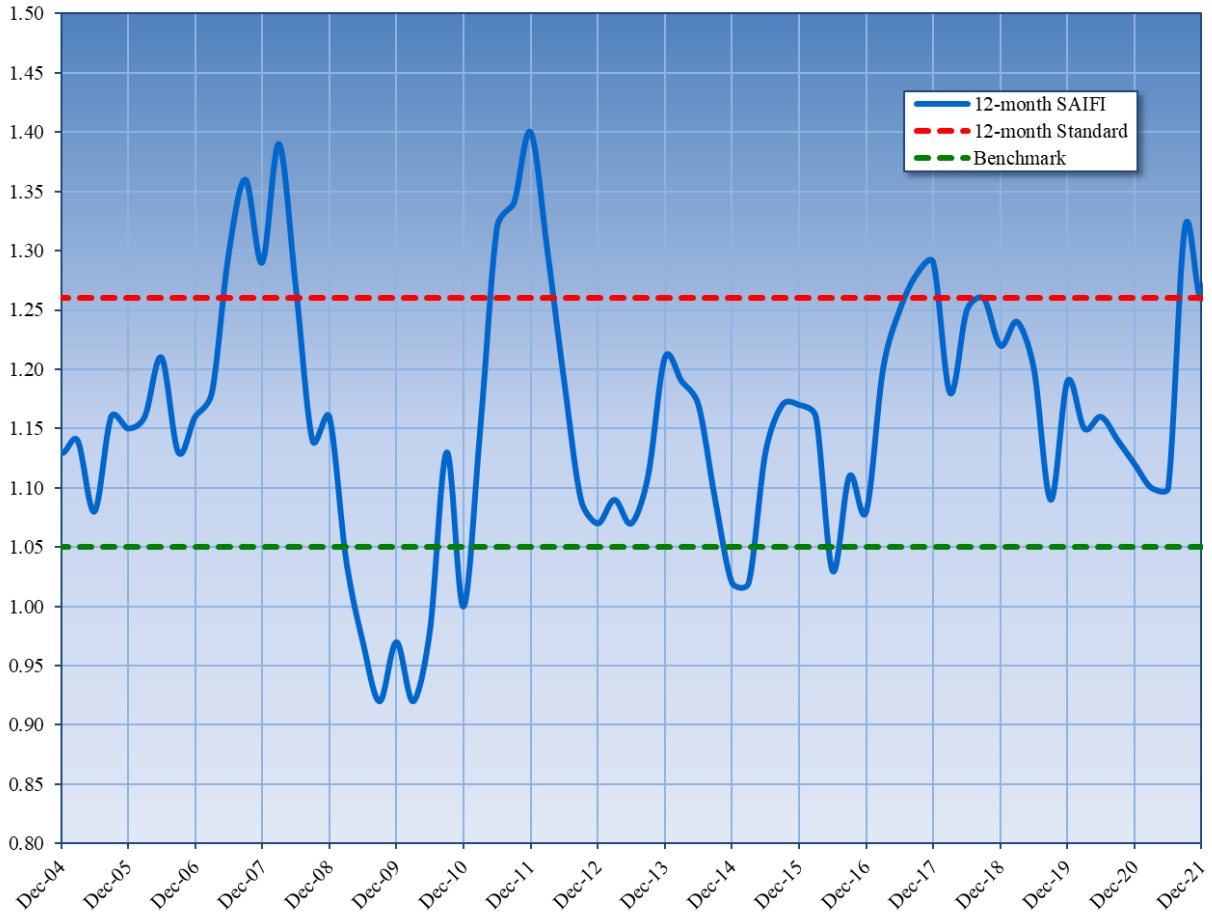


Figure 30 - West Penn Outage Causes (percent of total outages)

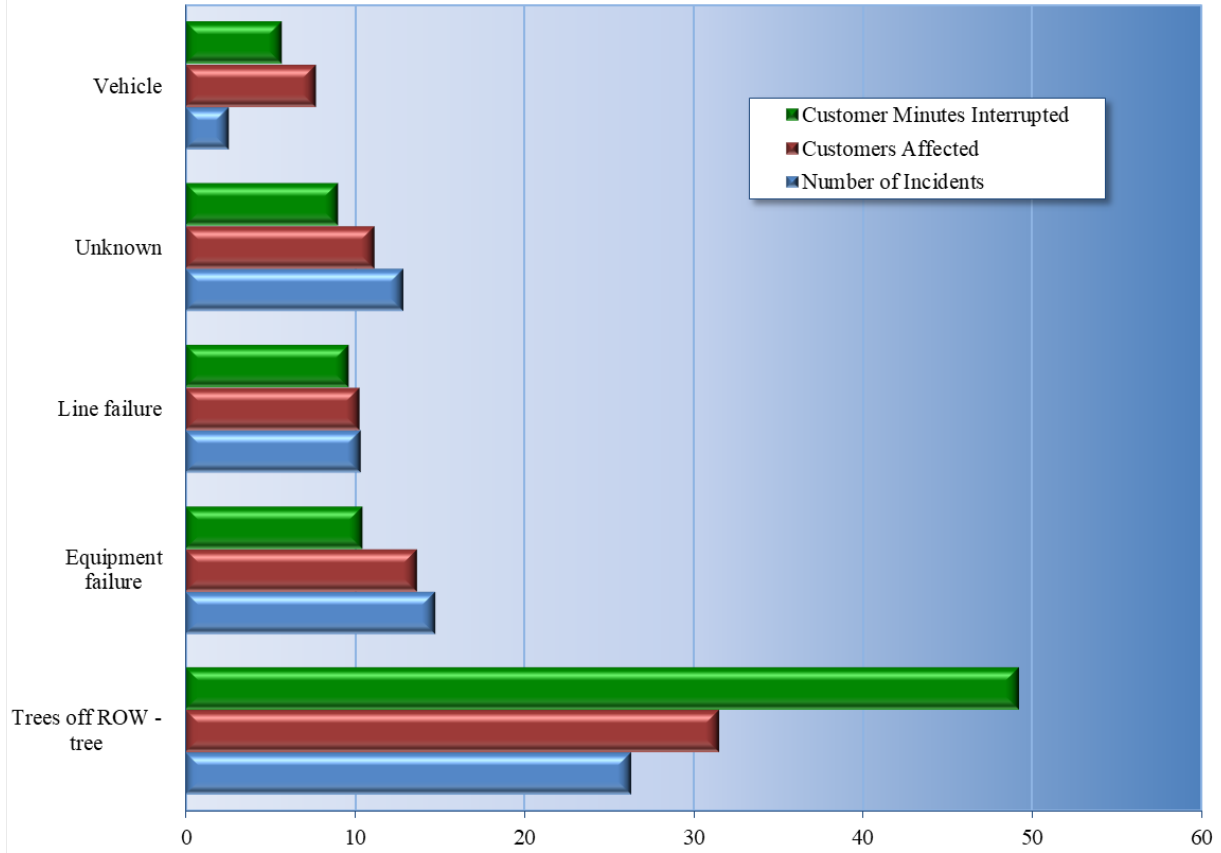
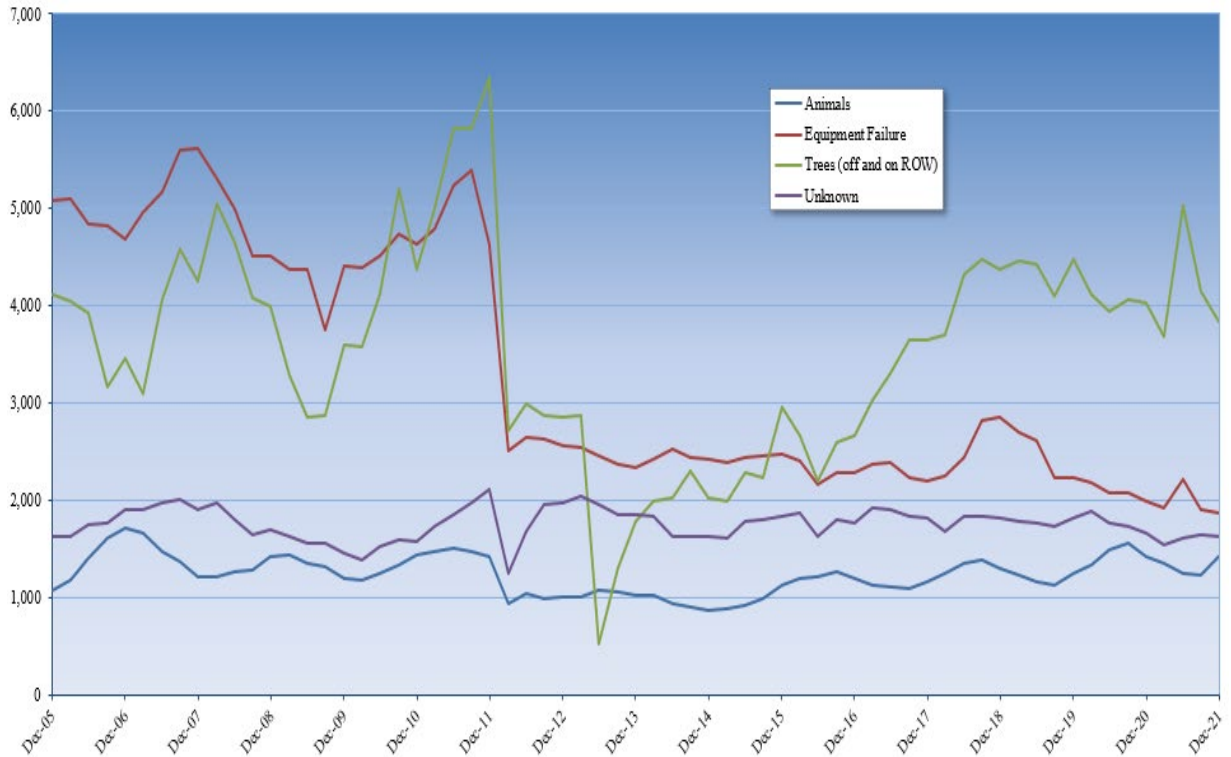


Figure 31 - West Penn Outage Tracking (number of incidents)



### *Citizens' Electric Company*

Citizens' Electric Company (Citizens') has an operating service area of about 41 square miles with about 7,075 customers. The electric system consists of one distribution substation and nine distribution feeder lines.

In 2021, Citizens' experienced 1,926 customer interruptions and 181,274 customer-minutes interrupted as compared to: 561 customer interruptions and 48,645 customer-minutes interrupted in 2020; 1,982 customer interruptions and 154,257 customer-minutes interrupted in 2019; 1,449 customer interruptions and 109,478 customer-minutes interrupted in 2018, and 3,180 customer interruptions and 588,067 customer-minutes interrupted in 2017.

Citizens' experienced seven Major Events in 2021 on the dates listed below with a total of 8,905 customer interruptions and 874,039 customer-minutes interrupted not included in the total above.

- Feb. 16, 2021
- Mar. 1, 2021
- Apr. 11, 2021
- Apr. 30, 2021
- Jun. 30, 2021
- Aug. 11, 2021
- Aug. 20, 2021

### **CAIDI/SAIDI/SAIFI Evaluation**<sup>56</sup>

#### **CAIDI**

**Rolling 12-month:** Increased from 87 minutes in 2020 to 94 minutes in 2021; achieved benchmark by 10.5%.

**3-year average:** Increased from 80 minutes in 2020 to 86 minutes in 2021; achieved standard by 25.2%.

#### **SAIDI**

**Rolling 12-month:** Increased from 7 minutes in 2020 to 26 minutes in 2021; failed to achieve benchmark by 21.9%.

**3-year average:** Increased from 15 minutes in 2020 to 18 minutes in 2021; achieved standard by 27.9%.

---

<sup>56</sup> Smaller CAIDI, SAIFI, and SAIDI benchmark values are typical for companies with fewer customers. While Citizens' did not achieve benchmark for SAIFI in 2021, its SAIFI value for 2021 is still lower than that of all other EDCs.

## SAIFI

**Rolling 12-month:** Increased from 0.08 outages in 2020 to 0.27 outages in 2021; failed to achieve benchmark by 35%.

**3-year average:** Increased from 0.19 outages in 2020 to 0.21 outages in 2021; achieved standard by 4.5%.

## CAIDI and SAIFI Performance

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

Beginning in 2004, Citizens' SAIFI performance has been inconsistent. From the 4<sup>th</sup> quarter 2011 through the 4<sup>th</sup> 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 has been more challenging for Citizens' in meeting SAIFI benchmark. Beginning in 2020, SAIFI has been trending upward past benchmark and near 12-month standard. More management attention is needed to ensure consistent SAIFI performance is sustained below the "green" benchmark performance upper-control-limit-line.

## Outage Causes

Figure 34 below, shows the top five reported 2021 outage-cause categories by customer-minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted; Customers Affected; and Number of Incidents. OROW trees, Vehicle, and Equipment were the top causes for number of customers affected. The OROW trees and Vehicle causes were the largest contributors to customer minutes interrupted.

Figure 35 below, shows the historical trend of the top three main outage causes. OROW trees, Animals and Equipment 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' notes that its customers enjoyed another year of reliable service in 2021. Citizens' notes that its year-end reliability indices, though up slightly from 2020, remain strong, with all reportable metrics within the PUC standard for the Company. Citizens' notes that its reliability indices were all within the three-year standard. While not reflected in reported indices, Citizens' notes that it experienced an above-average number of major events. Seven events were reported, spread across the first three quarters of the year. The most severe of these was an event in June caused by severe thunderstorms, which interrupted over 40% of Citizens' customers.

Citizens' notes that it continued its commitment to a responsible vegetation management program as evidenced by its 19th consecutive year to be recognized as a "Tree Line USA" utility by the National Arbor Day Foundation. This award recognizes utilities for their use of nationally approved trimming techniques and vegetation management procedures. Citizens' notes that a particular value within the Company's "Tree Line" effort is its annual educational session hosted in cooperation with the Penn State Extension. This event provides education not only for Citizens' employees, but also the current vegetation management contractor, and local municipal road and public works crews. Topics covered include directional pruning techniques, "Right Tree in the Right Place" planning, and updates on current and expected threats to Pennsylvania forests. By inviting local municipalities, Citizens' notes that it encourages cooperative relationships, as well as garners the mutual benefits of consistent vegetation management practices throughout the area.

Citizens' notes that it continues to evaluate, compare and improve its practices through participation in a variety of industry peer groups. Its unique connection to both the rural electric and investor-owned utility groups allows Citizens' staff to tap a wide knowledge base, including the Pennsylvania Rural Electric Association, the Energy Association of Pennsylvania, the National Rural Electric Cooperative Association and the International Association of Arboriculture.

### **Conclusion**

Citizens' CAIDI remained well below benchmark and 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 flirting with 12-month Standard levels. During 2021, Citizens' has seen increases in all levels of reliability indices. Citizens' should continue to refine its processes and methods to improve on this performance.

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

Figure 32 - Citizens' CAIDI (minutes)

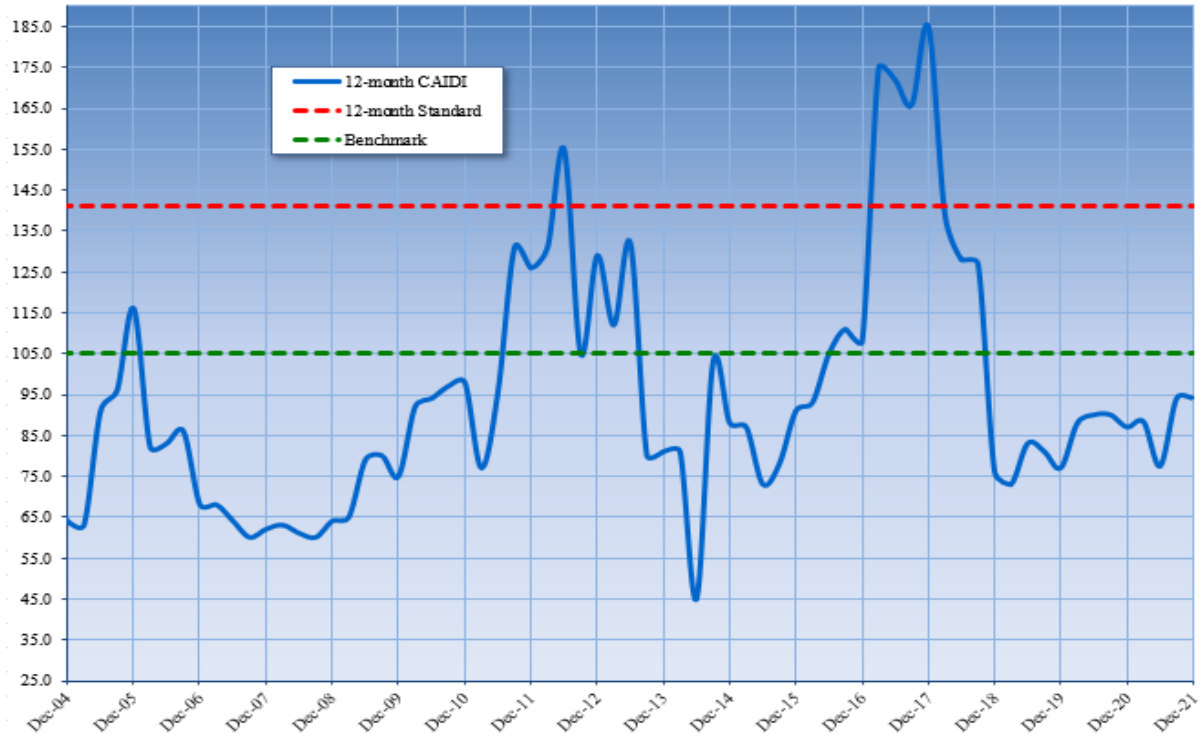


Figure 33 - Citizens' SAIFI (interruptions per customer)

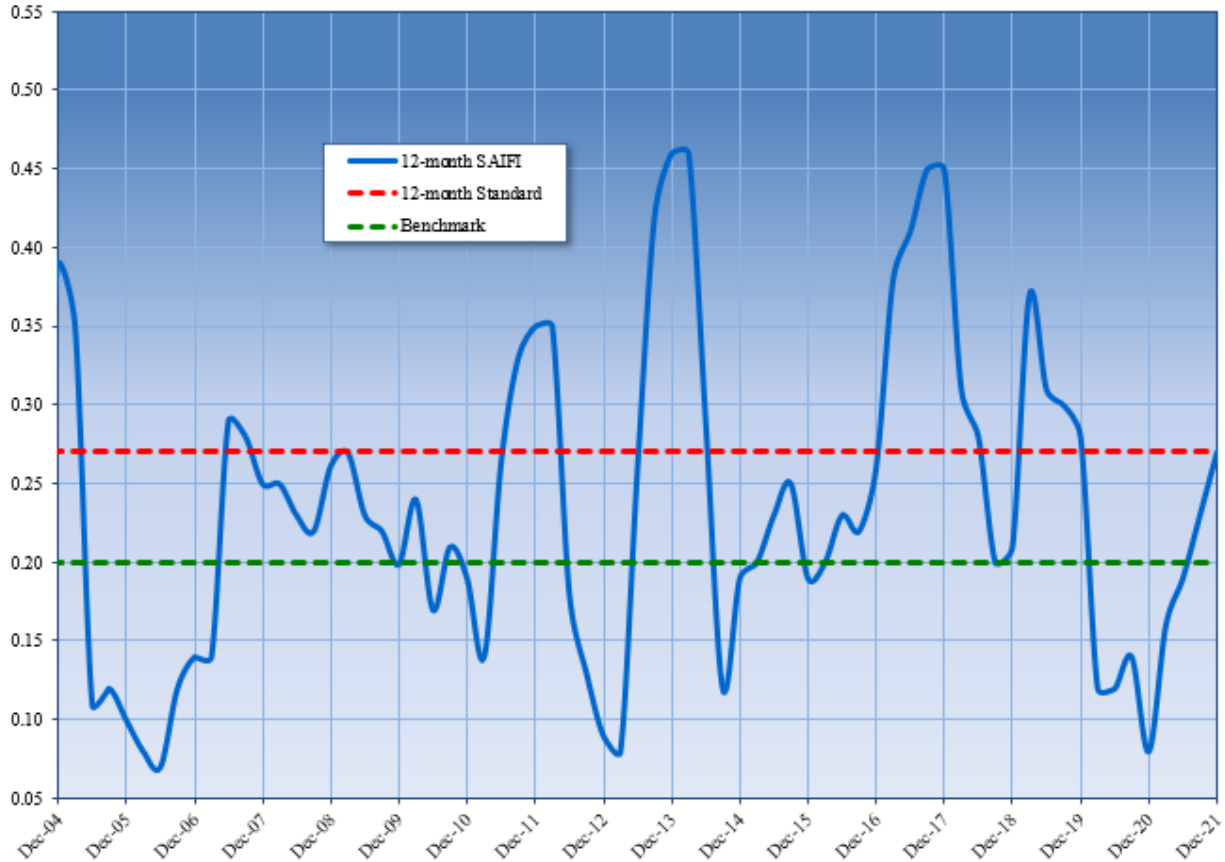


Figure 34 - Citizens' Outage Causes (percent of total outages)

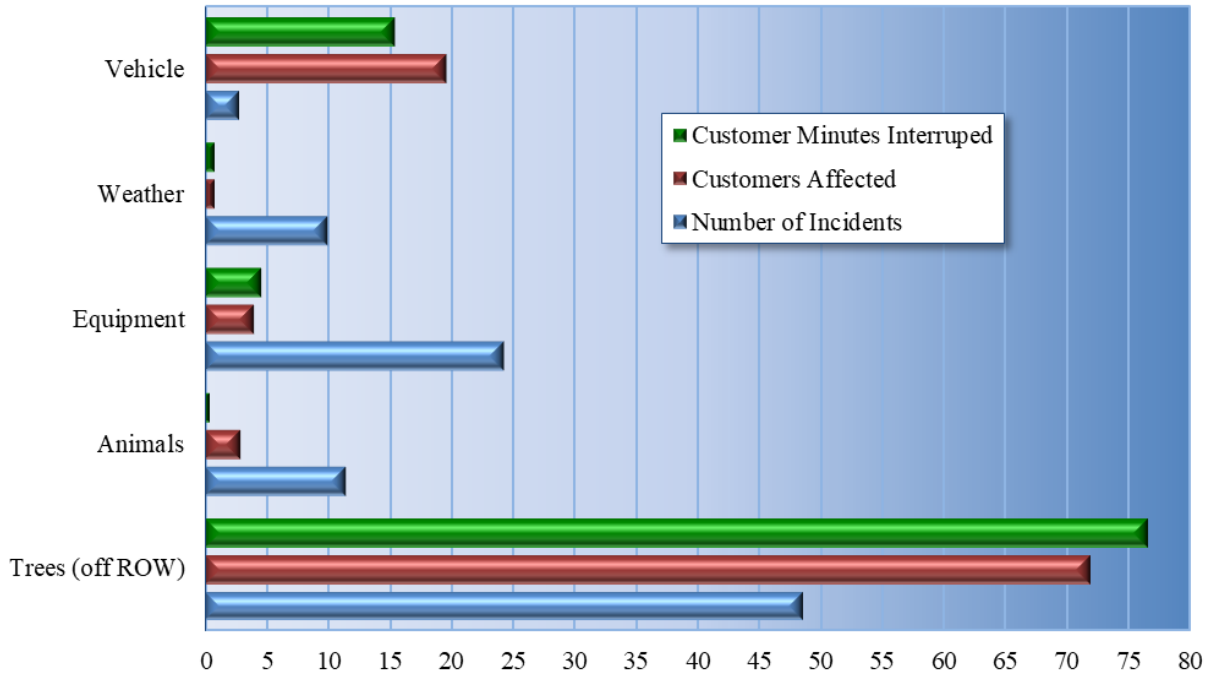
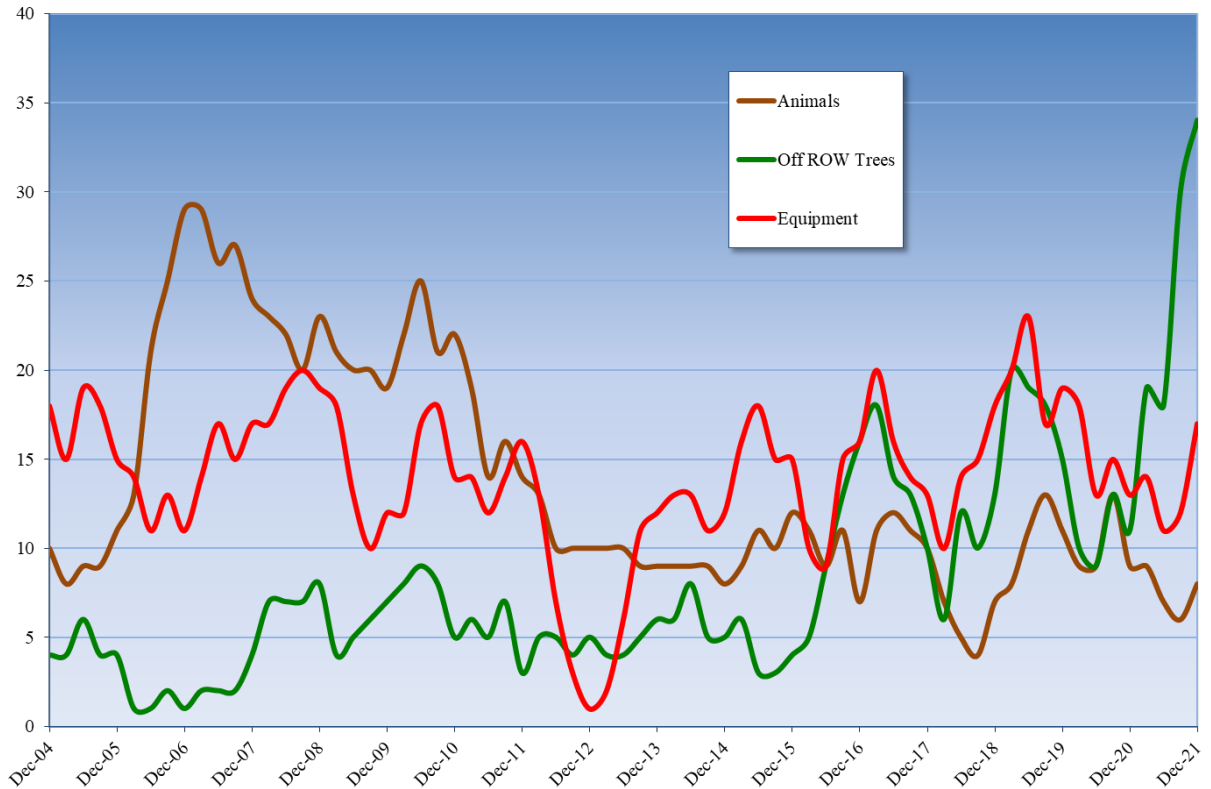


Figure 35 - Citizens' Outage Tracking (number of incidents)



***Pike County Light & Power Company***

Pike County Light & Power Company (Pike) has a relatively small operating service area of approximately 44 square miles with about 4,891 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 116-4-34 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 2021, Pike experienced 6,890 customer interruptions and 1,058,853 customer-minutes interrupted as compared to: 2,356 customer interruptions and 432,428 customer-minutes interrupted in 2020; 1,870 customer interruptions and 331,335 customer-minutes interrupted in 2019; 4,057 customer interruptions and 872,312 customer-minutes interrupted in 2018; and 4,648 customer interruptions and 475,003 customer-minutes interrupted in 2017.

Pike experienced two Major Events on the dates listed below with a total of 4,214 customer interruptions and a total of 210,939 customer minutes of interruption, not included in the total above.

- Jan. 18, 2021
- May 18, 2021

**CAIDI/SAIDI/SAIFI Evaluation**

**CAIDI**

**Rolling 12-month:** Decreased from 184 minutes in 2020 to 153 minutes in 2021; achieved benchmark by 12.1%.

**3-year average:** Decreased from 199 minutes in 2020; to 171 minutes in 2021, achieved standard by 10.8%.

**SAIDI**

**Rolling 12-month:** Increased from 83 minutes in 2020 to 216 minutes in 2021; failed to achieve benchmark by 103.8%.

**3-year average:** Increased from 117 minutes in 2020 to 123 minutes in 2021; achieved standard by 4.9%.

**SAIFI**

**Rolling 12-month:** Increased from 0.45 outages in 2020 to 1.40 outages in 2021; failed to achieve benchmark by 129.5%.

**3-year average:** Increased from 0.56 outages in 2020 to 0.75 outages in 2021; failed to achieve standard by 11.4%.



### **CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 36 and 37. From 2004 through 2021, 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 2019, 2020 and 2021. More management attention is needed to ensure consistent CAIDI performance is sustained below the “green” benchmark performance upper-control-limit-line.

Pike’s SAIFI performance trend has been overall positive during the two years of 2019 and 2020. However, in 2021, Pike’s SAIFI has significantly increased to a point well above the “red” 12-month standard. Significant management attention is needed to return SAIFI performance below the “green” benchmark performance upper-control-limit-line.

### **Outage Causes**

Figure 38 below shows the top six reported 2021 outage-cause categories, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Tree Contact and Loss of Feed were the leading causes of customer-minutes interrupted, while Tree Contact and Equipment Failure created the greatest number of incidents. Approximately 42.1% of outages and 71.5% of customer-minutes interrupted are caused by Tree Contact.

Figure 39, below shows the historical trend of the top three 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 2021, it continued implementation of its reliability improvement programs such as: hot-spot tree trimming and select hazardous tree removals; accelerated pole inspections and replacement; and accelerated pad-mount transformer/underground cable-end inspection. Pike believes that the results of the work will eventually be reflected in the indices associated with reduction in total interruptions, customers affected and customer minutes.

Pike states that it has also focused its reliability efforts on pole inspections and defective pole replacements. Pike notes that in 2022 it will inspect over 750 poles. Pike notes that the second stage of priority is to replace defective poles along with the attached equipment, such as transformers, regulators and reclosers.

**Conclusion**

In 2019 and 2020, Pike had improved both CAIDI and SAIFI performance. However, with the year 2021, Pike failed to maintain progress with respect to SAIFI performance. 2021 saw a sharp increase in SAIFI to a level significantly above the 12-month standard. It is expected that Pike will direct more management attention to SAIFI and return to 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.

**Figure 36 - Pike County CAIDI (minutes)**

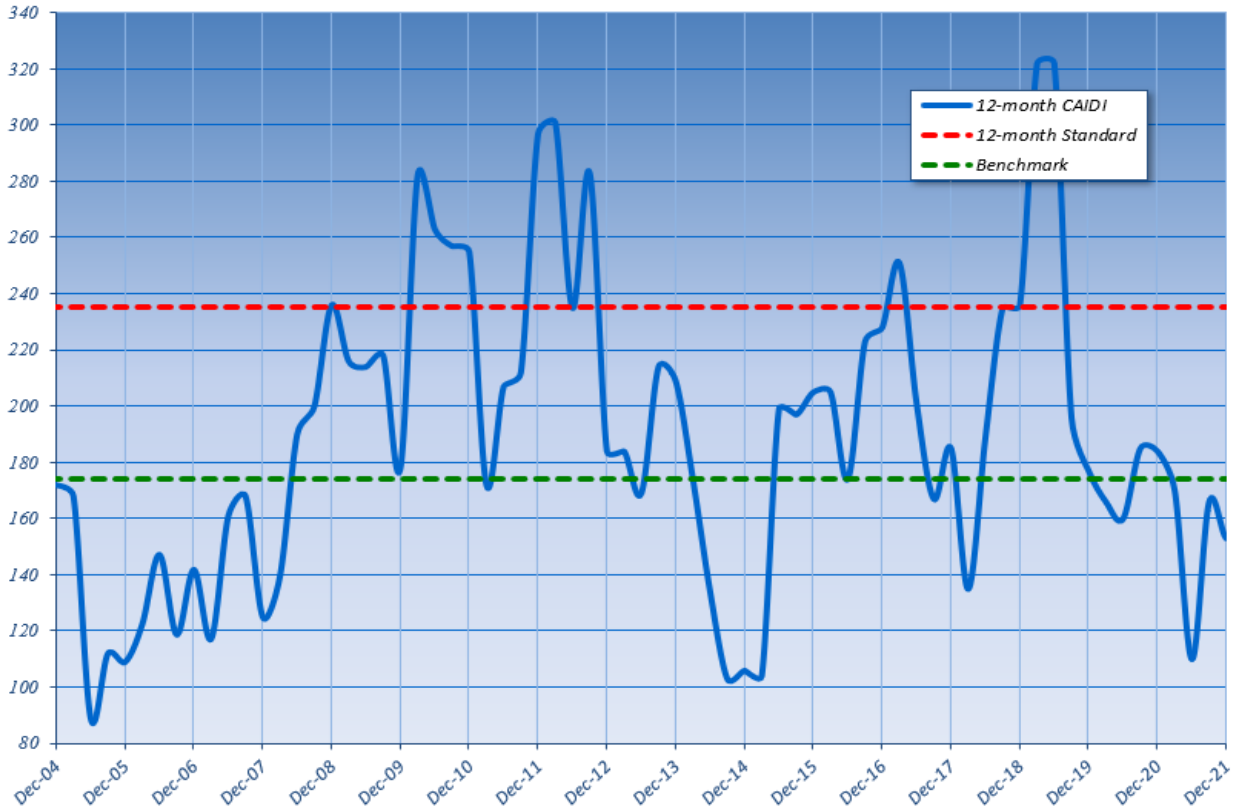


Figure 37 - Pike County SAIFI (interruptions per customer)

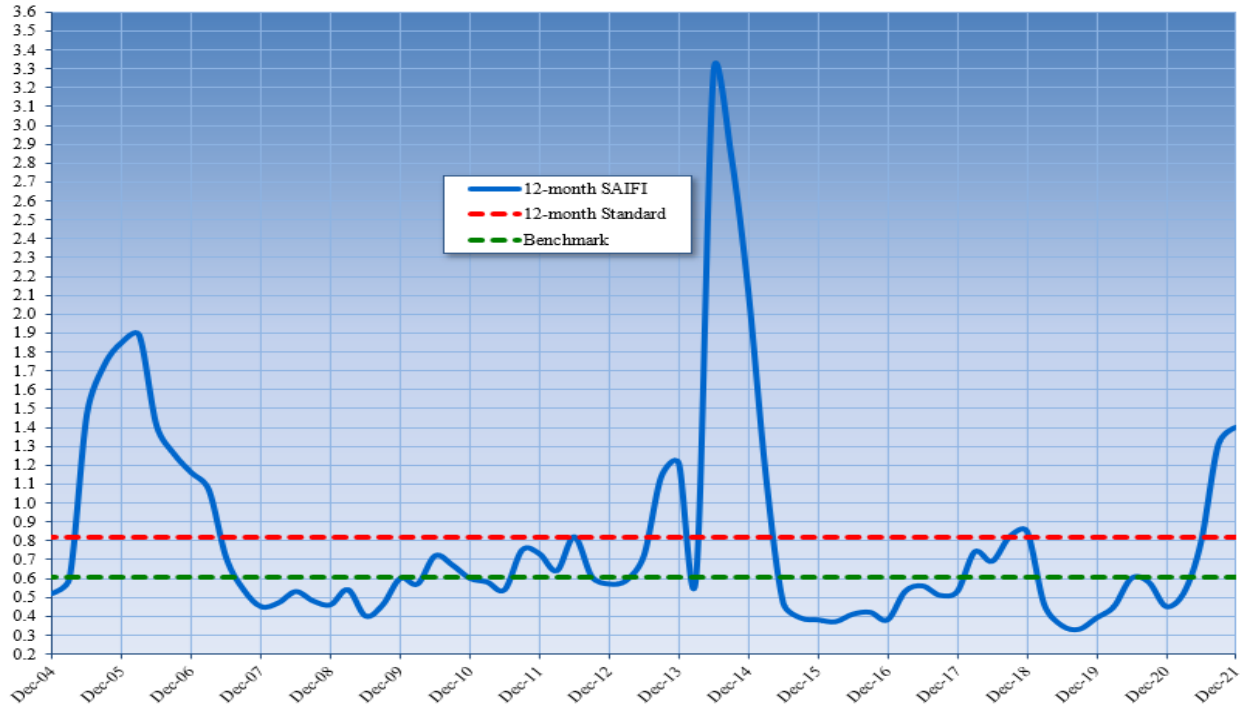
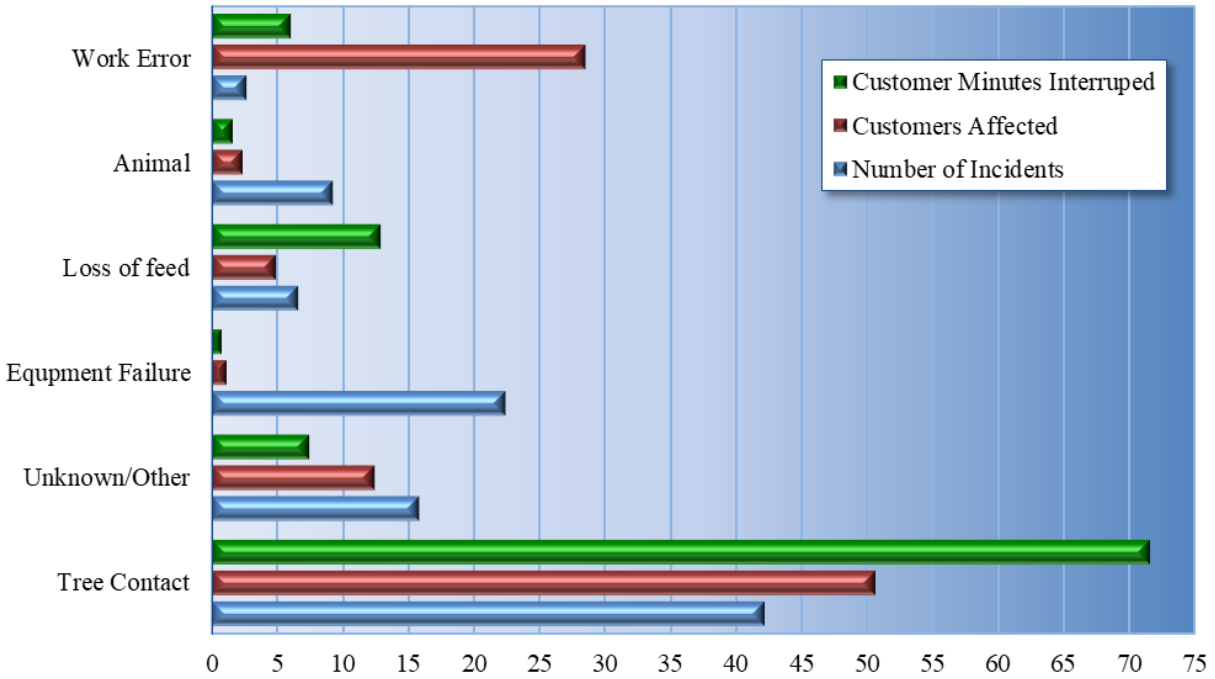
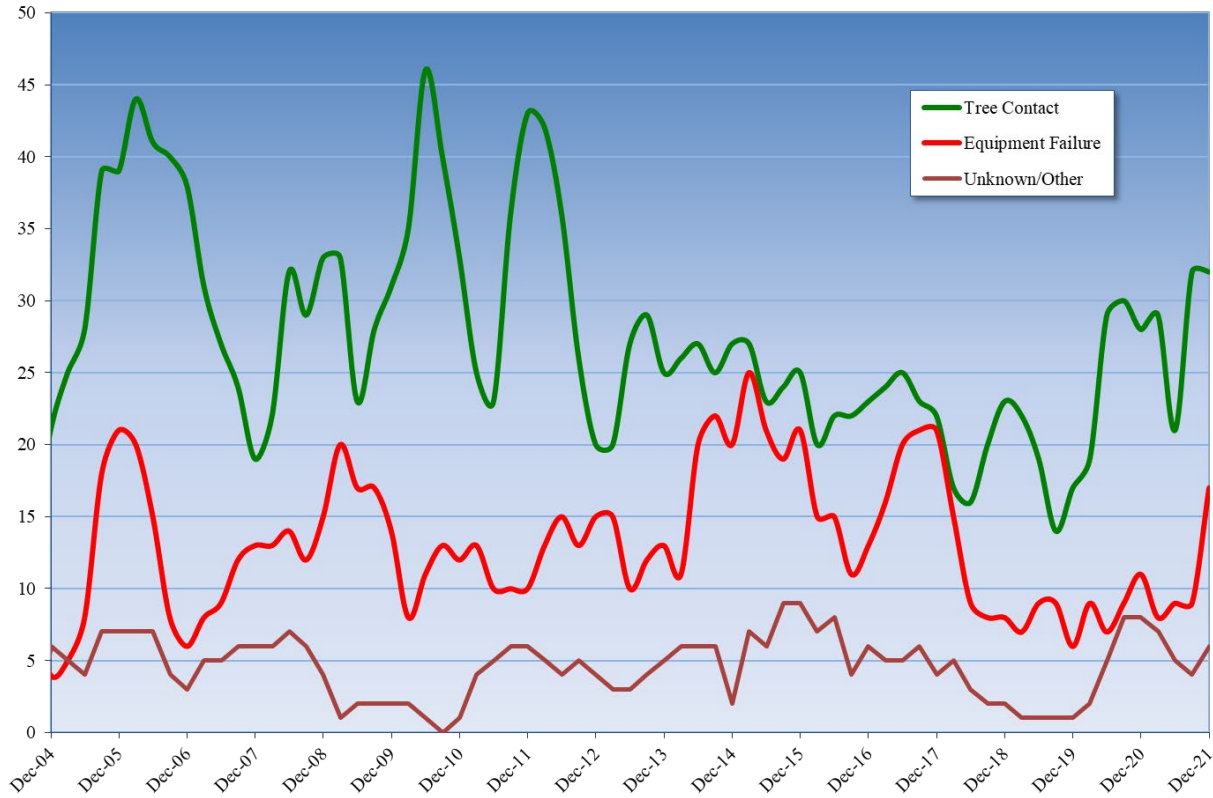


Figure 38 - Pike County Outage Causes (percent of total outages)



**Figure 39 - Pike County Outage Tracking (number of incidents)**



**UGI Utilities Inc.**

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

In 2021, UGI experienced 58,992 customer interruptions and 7.9 million customer-minutes interrupted as compared to: 25,110 customer interruptions and 4.1 million customer-minutes interrupted in 2020; 59,946 customer interruptions and 11.3 million customer-minutes interrupted in 2019; 31,305 customer interruptions and 4.1 million customer-minutes interrupted in 2018; and 31,395 customer interruptions and 4.1 million customer-minutes interrupted in 2017.

UGI experienced one Major Event in 2021 on Aug. 12, 2021, with 10,182 customer interruptions not included in the total above.

**CAIDI/SAIDI/SAIFI Evaluation**

**CAIDI**

- Rolling 12-month:** Decreased from 163 minutes in 2020 to 134 minutes in 2021; achieved benchmark by 41.2%.
- 3-year average:** Decreased from 176 minutes in 2020 to 162 minutes in 2021; achieved standard by 13.1%.

**SAIDI**

- Rolling 12-month:** Increased from 66 minutes in 2020 to 127 minutes in 2021; achieved benchmark by 9.3%.
- 3-year average:** Decreased from 154 minutes in 2020 to 125 minutes in 2021; achieved standard by 26.5%.

**SAIFI**

- Rolling 12-month:** Increased from 0.40 outages in 2020 to 0.95 outages in 2021; failed to achieve benchmark by 14.5%.
- 3-year average:** Decreased from 0.85 outages in 2020 to 0.77 outages in 2021; achieved standard by 15.4%.

**CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 40 and 41. 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 and 2021. More 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 UGI in 2020 tied with 2015 for its best annual SAIFI performance. In 2021, UGI’s SAIFI increased to a level of 0.95, which is above the benchmark for reliability. More management attention is needed to ensure SAIFI performance is again being sustained below the “green” benchmark performance upper-control-limit-line.

**Outage Causes**

Figure 42 below, shows the top five reported 2021 outage cause categories by customer minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees and Equipment Failure were the leading causes of outages, and Trees caused most of the customer-minutes interrupted. Over 67.3% of customer minutes interrupted were caused by Trees and Equipment Failure.

Figure 43 below shows the historical trend of the top three main outage causes. Trees and Equipment Failure are the two most frequent outage-causes that are significantly negatively affecting UGI’s distribution system reliability and resilience, as well as 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. UGI notes that the information accumulated in this system is analyzed to identify equipment failure trends and outage clusters. This information is also used to identify weaknesses in the system and decide how to allocate resources for maintenance and/or system upgrades. UGI notes that it is currently upgrading its OMS to gain additional functionality and efficiency, with completion expected by September 2022.

UGI also states that it continues to expand its distribution supervisory control and data acquisition (DSCADA) into operations to allow further visibility and awareness into the distribution system. UGI notes that the DSCADA acquires and historizes distribution data and allows the control of distribution devices from UGI's operations center.

UGI notes that the largest contributors to outage incidents on its system and primary target for improvement projects are tree-related outages and equipment failures. UGI states that customers served in some of the more remote and isolated areas of its system have been impacted most significantly by multiple and extended outages. To address these areas, UGI is targeting increased vegetation management and tree removal as well as line relocations and construction of remote tie-lines where appropriate. UGI states that it has increased its vegetation management budget and added tree-trimming resources to supplement regular trim cycles as outlined in its maintenance plan.

To reduce outages caused by equipment failures, UGI notes that it has undertaken an accelerated focus on infrastructure replacement, such as underground cable and wood pole replacement. UGI has increased initiatives to reduce outages caused by components susceptible to failure on the distribution system, such as porcelain insulators and cut-outs, which have been targeted for replacement. UGI notes that these programs will address significant long-term reliability factors. Considering these programs and others documented in the UGI LTIP, UGI fully expects to improve overall system reliability and, to some extent, smooth out historical weather-related variability.

In addition to the physical infrastructure upgrades, UGI notes that it has identified opportunities to reduce the duration and impact of outages by using technology-based solutions and additional circuit sectionalizing. UGI continues preparing the distribution network to accommodate a future system that can self-heal and will isolate faulted line sections and restore the undamaged portions. UGI notes that remote control capability is being integrated into existing transmission motor operated air-breaks to allow expedited sectionalizing and recovery of the system following disturbances.

## **Conclusion**

Trees and Equipment Failure are the leading two outage causes that negatively affect electrical reliability to UGI customers. In 2021, Trees and Equipment Failure outage causes contributed to over 83% of the total lost customer-minutes. 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 2021. However, UGI’s SAIFI in 2021 has raised to a level 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.

**Figure 40 - UGI CAIDI (minutes)**

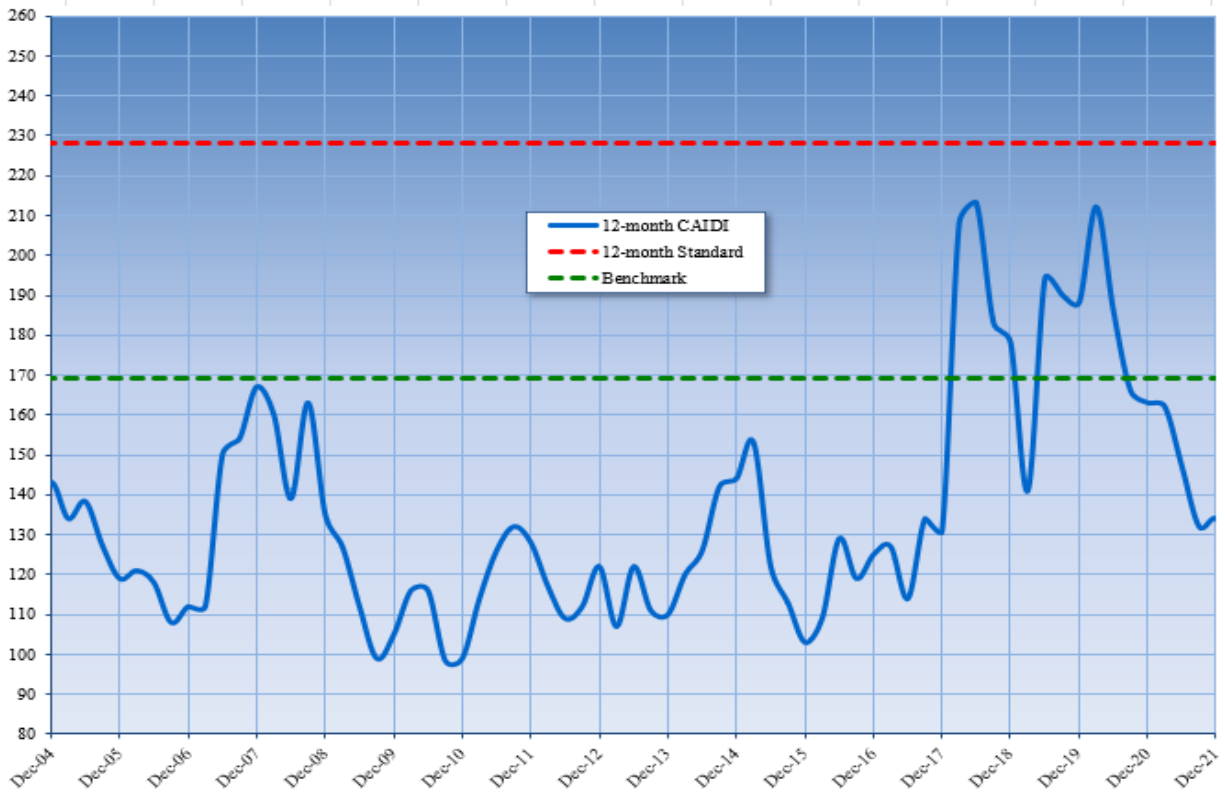


Figure 41 - UGI SAIIFI (interruptions per customer)

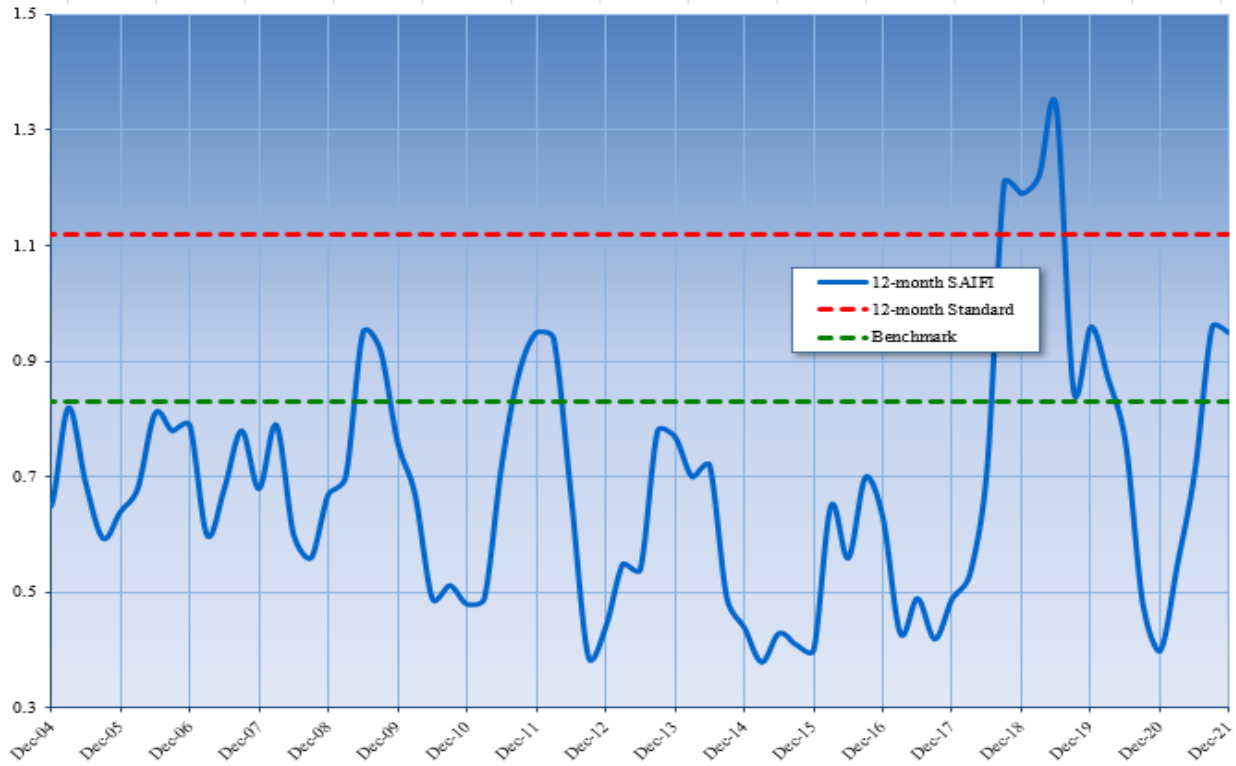


Figure 42 - UGI Outage Causes (percent of total outages)

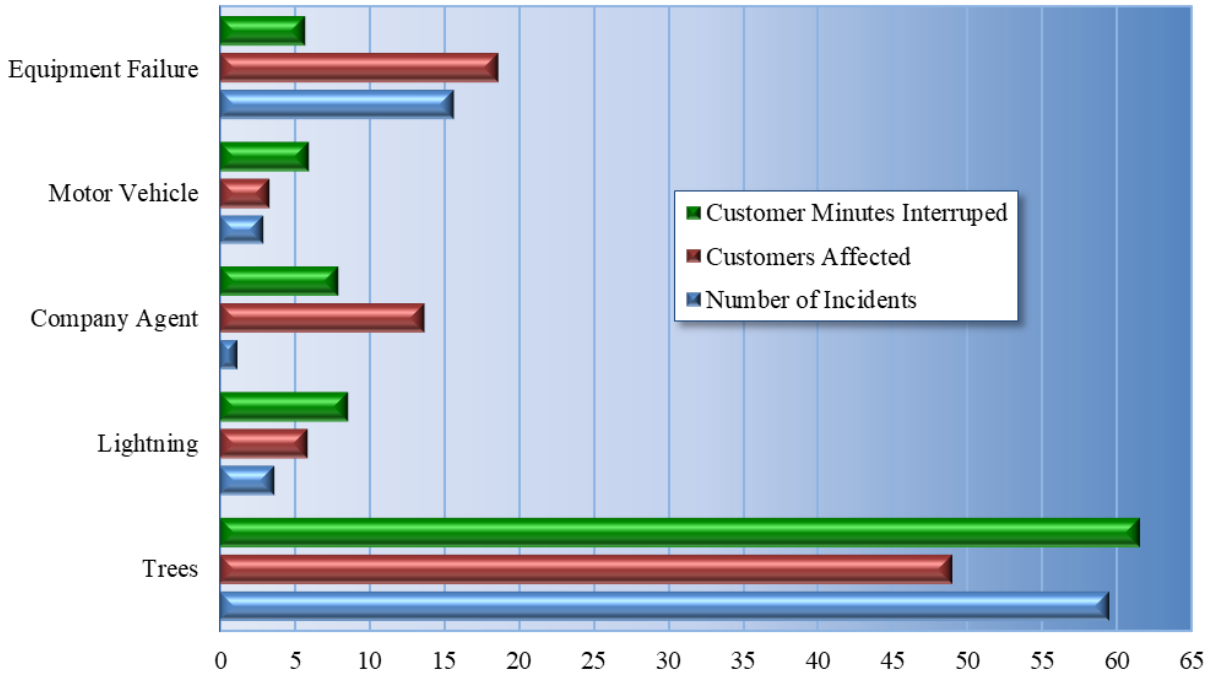
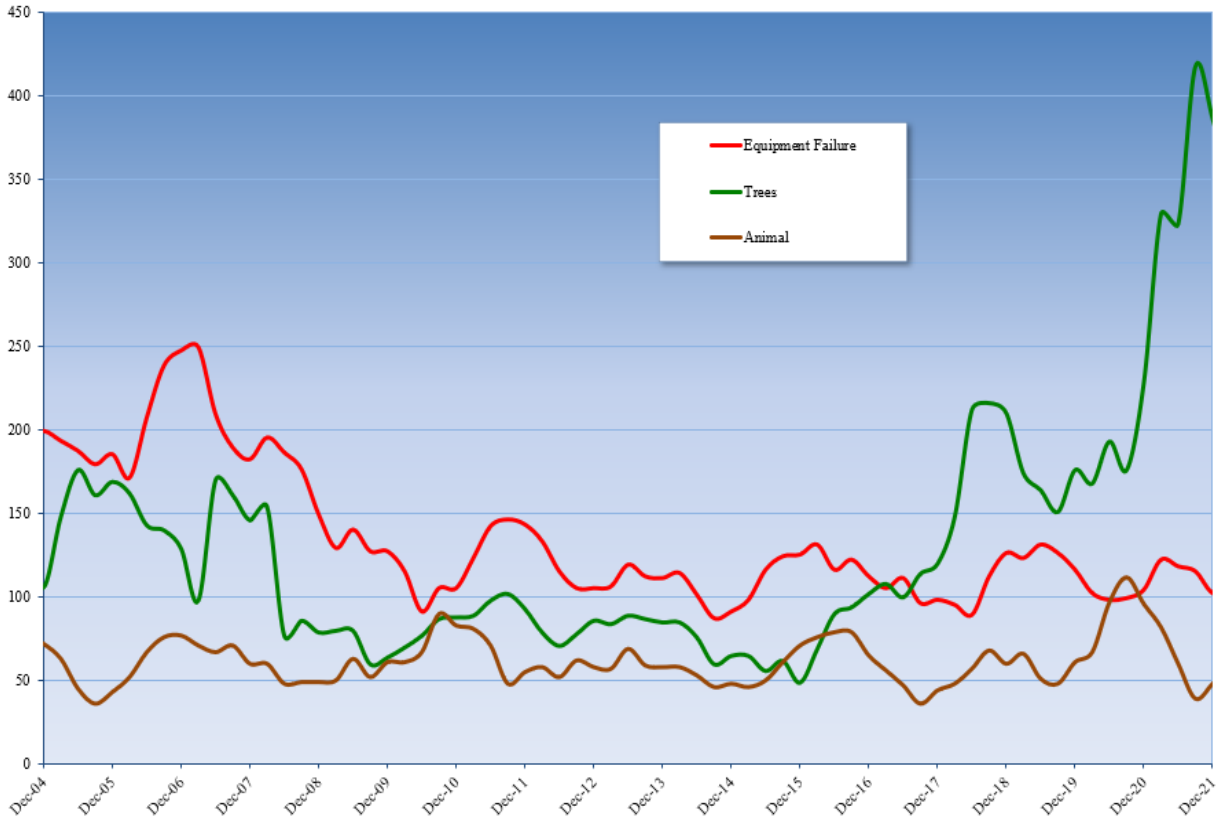


Figure 43 - UGI Outage Tracking (number of incidents)



## 2021 Pennsylvania Electric Reliability Report



### *Wellsboro Electric Company*

Wellsboro Electric Company (Wellsboro) has a service territory of about 178 square miles and serves about 6,351 customers.

In 2021, Wellsboro experienced 5,922 customer interruptions and 0.85 million customer-minutes interrupted as compared to: 7,543 customer interruptions and 0.7 million customer-minutes interrupted in 2020; 4,815 customer interruptions and 0.7 million customer-minutes interrupted in 2019; 8,565 customer interruptions and 1.1 million customer-minutes interrupted in 2018; and 6,816 customer interruptions and 0.3 million customer-minutes interrupted in 2017.

Wellsboro experienced nine Major Events in 2021 on the dates listed below with a total of 12,010 customer interruptions not included in the total above.

- Mar. 26, 2021
- Jun. 29, 2021
- Jul. 7, 2021
- Oct. 16, 2021
- Oct. 26, 2021

- Oct. 27, 2021
- Nov. 11, 2021
- Dec. 11, 2021
- Dec. 16, 2021

### **CAIDI/SAIDI/SAIFI Evaluation**

#### **CAIDI**

**Rolling 12-month:** Increased from 97 minutes in 2020 to 144 minutes in 2021; failed to achieve benchmark by 16.1%

**3-year average:** Increased from 112 minutes in 2020 to 115 minutes in 2021; achieved standard by 15.2%.

#### **SAIDI**

**Rolling 12-month:** Increased from 114 minutes in 2020 to 133 minutes in 2021; achieved benchmark by 13.1%.

**3-year average:** Decreased from 129 minutes in 2020 to 109 minutes in 2021; achieved standard by 40.9%.

#### **SAIFI**

**Rolling 12-month:** Decreased from 1.17 outages in 2020 to 0.93 outages in 2021; achieved benchmark by 24.4%.

**3-year average:** Decreased from 1.12 outages in 2020 to 0.96 outages in 2021; achieved standard by 29.1%.

### **CAIDI and SAIFI Performance**

Historical 12-month CAIDI and SAIFI benchmark reliability performance trends are shown below in Figures 44 and 45. Wellsboro's 2021 CAIDI performance worsened as shown on the chart to be above the "green" benchmark performance upper-control-limit-line and is above its previous worst CAIDI year in 2018. 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 2021 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 46 below, shows the top five reported 2021 outage-cause categories by customer-minutes interrupted, as a percentage, for the following three distinct performance metrics: Customer-minutes Interrupted, Customers Affected, and Number of Incidents. Trees (combined off and on ROW) and Equipment Failure were the top cause of customer-minutes interrupted. About 84% of the customer minutes interrupted are caused by trees and equipment failure.

Figure 47 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 2021. 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 started to install new reclosers in order to be able to isolate outages to smaller customer counts. Wellsboro notes that it plans to install additional reclosers and upgrade other equipment circuits in 2021, with an expected completion in 2022.

## **Conclusion**

Wellsboro achieved benchmark performance for two of three reliability metrics: SAIFI and SAIDI. However, Wellsboro's CAIDI increased to a level above the 12-month benchmark. Wellsboro also experienced nine Major Events in 2021 and the impacts of those events were excluded from those reliability metric calculations. It is also expected that, for smaller EDCs, a year in which there are several severe storms may result in a higher number of excludable events because of the relatively small customer interruption number to reach Major Event level (10% or more of total customers interrupted for five or more minutes). However, 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.

Figure 44 - Wellsboro CAIDI (minutes)

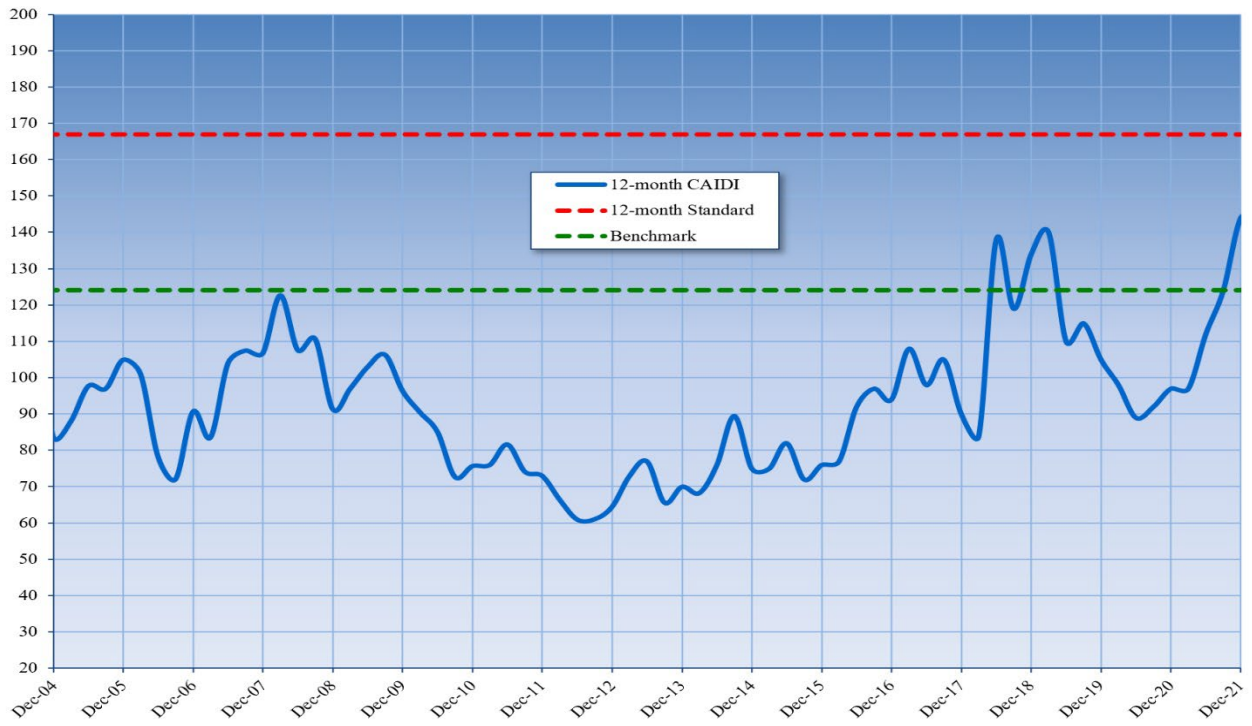


Figure 45 - Wellsboro SAIIFI (interruptions per customer)

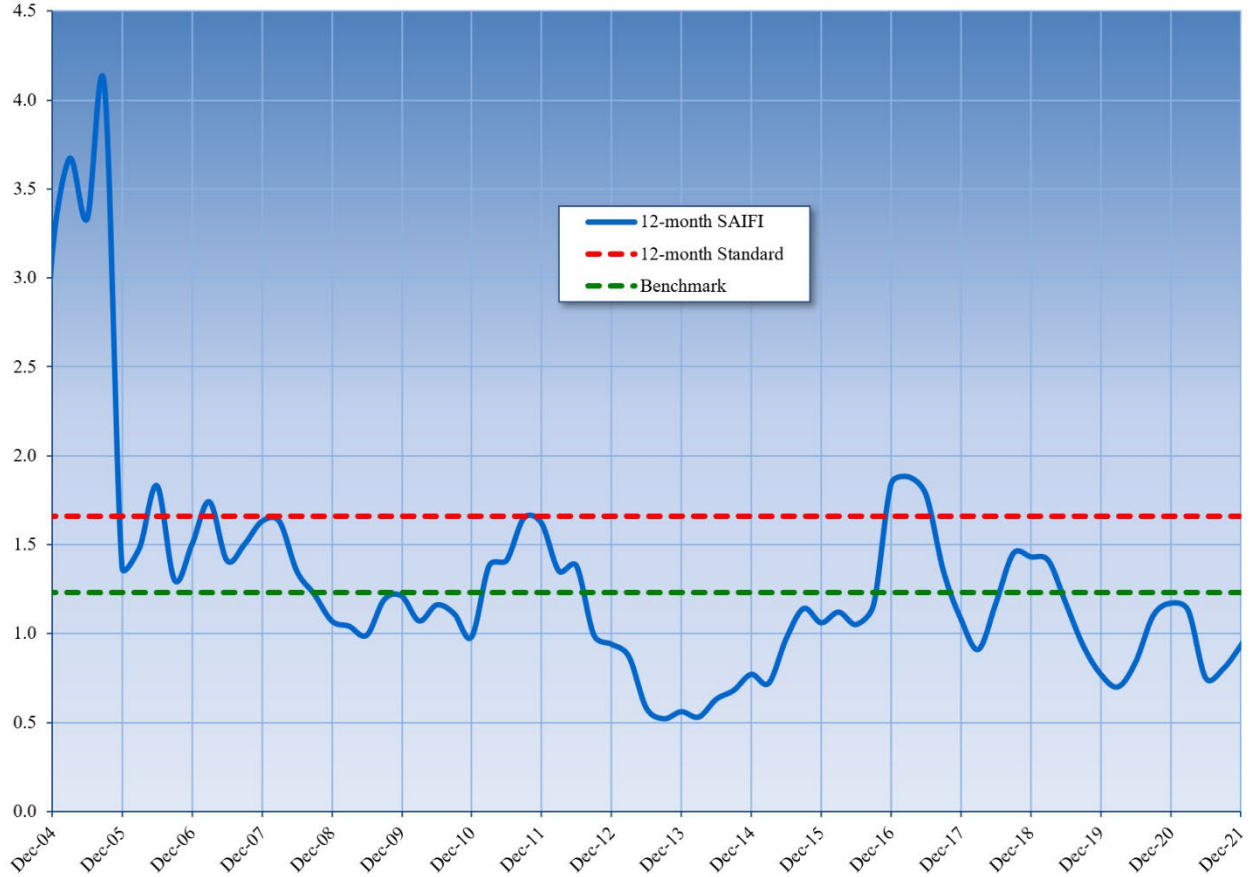


Figure 46 - Wellsboro Outage Causes (percent of total outages)

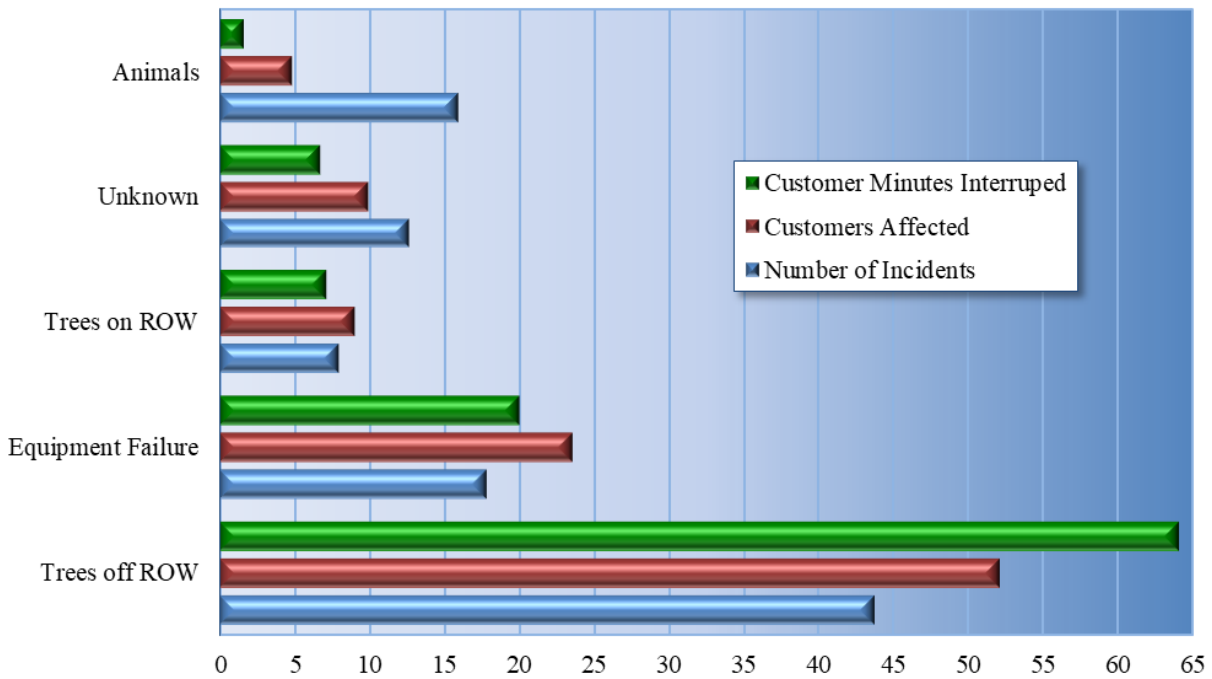
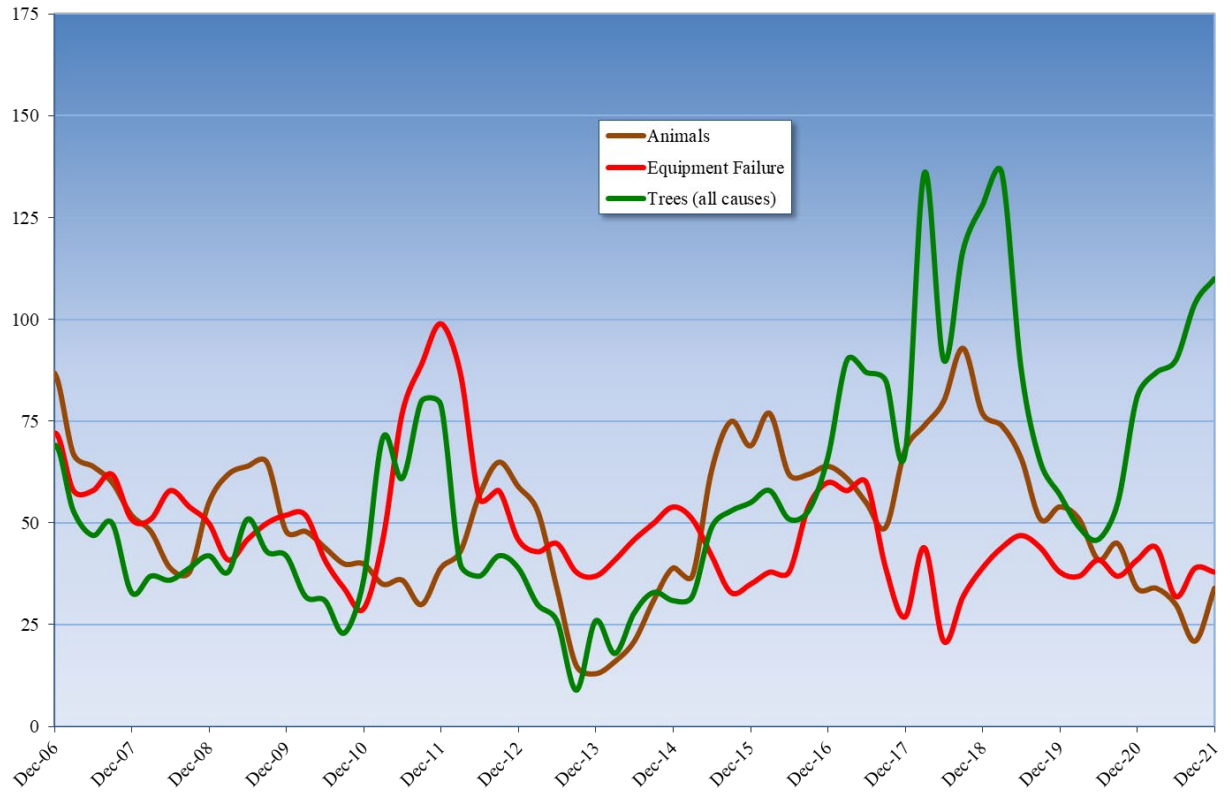


Figure 47 - Wellsboro Outage Tracking (number of incidents)



## *Section 5 – Conclusion*

---

As has been the case the past four years, severe weather in Pennsylvania was challenging to both electrical reliability and resilience in 2021. During 2021 a reduction was observed in the number of EDCs achieving CAIDI benchmark performance. In 2021, only three of the 11 EDCs achieved CAIDI benchmark performance levels. Also seen in Appendix B, only five of the 11 EDCs achieved benchmark for SAIFI in 2021, as compared to eight in 2020. In 2021, seven of the 11 EDCs performed better than the rolling 12-month performance standard for SAIFI, as compared to 10 in 2020.<sup>57</sup>

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. CAIDI is also an important measure as it relates to average duration of a service outage, and EDCs will be expected to improve worsening CAIDI, but 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 LTIPs have been the most consistent in achieving benchmark SAIFI performance the past three years (Duquesne, PECO, and PPL).

For all EDCs except Duquesne, approximately 5.8 million customer outages were experienced in 2021 as compared to 5.4 million in 2020. Duquesne calculates customer outages as kVA disrupted, rather than individual customers. Duquesne also saw an increase to 7.3 million kVA disrupted in 2021 from 6.4 million kVA disrupted in 2020. Only one EDC, PECO, saw a slight decrease in customer outages from 1.51 million in 2020 to 1.48 million in 2021. For customer minutes interrupted, all EDCs except Penn Power saw an increase. Excluding Duquesne, there were 1.02 billion customer minutes interrupted in 2021 as compared to 811 million in 2020.

As noted in Section 3 of this report, EDCs experienced the highest number of reportable outage events in 2021 that the PUC has ever recorded. All events were caused by weather impacts on the EDC distribution systems. Noting this fact is, again, 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 resilience to weather events. The EDCs continue to accelerate infrastructure improvement and to work on improving reliability and resilience through their Long-Term Infrastructure Improvement Plans (LTIPs). There are now nine of the 11 EDCs that have approved LTIPs. As seen in this report's Executive Summary, TUS agrees with the EDCs that LTIPs are an important tool in the toolbox for addressing failing infrastructure and improving resiliency. However, as also mentioned in the Executive Summary, there are several other areas of concern ripe for further discussion with the EDCs and other key stakeholders. TUS looks forward to continuing with any future action stemming from the Reliability Collaborative process. TUS also notes that it expects to see continuing improvements in reliability as EDCs execute their LTIPs.

---

<sup>57</sup> Two EDCs performed right at the standard metric, but not better than the standard metric.

## Appendix A – Electric Reliability Metrics

### 12-Month Average Electric Reliability Indices for 2021

Customer Average Interruption Duration Index (CAIDI)- min/yr/cust				% Above (+) or	% Above (+) or
EDC	Dec-21	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	94	105	141	-10.5%	-33.3%
Duquesne Light	187	108	130	73.1%	43.8%
Met-Ed (FE)	173	117	140	47.9%	23.6%
PECO	187	112	134	67.0%	39.6%
Penelec (FE)	141	117	141	20.5%	0.0%
Penn Power (FE)	129	101	121	27.7%	6.6%
Pike County	153	174	235	-12.1%	-34.9%
PPL	187	145	174	29.0%	7.5%
UGI	134	169	228	-20.7%	-41.2%
Wellsboro	144	124	167	16.1%	-13.8%
West Penn (FE)	192	170	204	12.9%	-5.9%
System Average Interruption Frequency Index (SAIFI)- outages/yr/cust				% Above (+) or	% Above (+) or
EDC	Dec-21	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	0.27	0.20	0.27	35.0%	0.0%
Duquesne Light	0.93	1.17	1.40	-20.5%	-33.6%
Met-Ed (FE)	1.35	1.15	1.38	17.4%	-2.2%
PECO	0.88	1.23	1.48	-28.5%	-40.5%
Penelec (FE)	1.84	1.26	1.52	46.0%	21.1%
Penn Power (FE)	1.00	1.12	1.34	-10.7%	-25.4%
Pike County	1.40	0.61	0.82	129.5%	70.7%
PPL	0.91	0.98	1.18	-7.1%	-22.9%
UGI	0.95	0.83	1.12	14.5%	-15.2%
Wellsboro	0.93	1.23	1.66	-24.4%	-44.0%
West Penn (FE)	1.26	1.05	1.26	20.0%	0.0%
System Average Interruption Duration Index (SAIDI)- min/yr/cust				% Above (+) or	% Above (+) or
EDC	Dec-21	Benchmark	Standard	Below (-) Benchmark	Below (-) Standard
Citizens'	26	21	38	21.9%	-32.6%
Duquesne Light	173	126	182	37.3%	-4.9%
Met-Ed (FE)	233	135	194	72.6%	20.1%
PECO	164	138	198	18.8%	-17.2%
Penelec (FE)	277	148	213	87.2%	30.0%
Penn Power (FE)	129	113	162	14.2%	-20.4%
Pike County	216	106	194	103.8%	11.3%
PPL	170	142	205	19.7%	-17.1%
UGI	127	140	256	-9.3%	-50.4%
Wellsboro	133	153	278	-13.1%	-52.2%
West Penn (FE)	242	179	257	35.2%	-5.8%

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.*



2021 Pennsylvania Electric Reliability Report

**3-Year Average Electric Reliability Indices for 2019-2021**

<i>Customer Average Interruption Duration Index (CAIDI)-min/yr/cust</i>				<i>3-Year</i>	<i>3-Year</i>	<i>% Above (+) or</i>
<i>EDC</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>	<i>Average</i>	<i>Standard</i>	<i>Below (-) Standard</i>
<i>Citizens'</i>	<i>77</i>	<i>87</i>	<i>94</i>	<i>86</i>	115	<i>-25.2%</i>
<i>Duquesne Light</i>	<i>106</i>	<i>132</i>	<i>187</i>	<i>142</i>	119	<i>19.0%</i>
<i>Met-Ed (FE)</i>	<i>164</i>	<i>150</i>	<i>173</i>	<i>162</i>	129	<i>25.8%</i>
<i>PECO</i>	<i>189</i>	<i>135</i>	<i>187</i>	<i>170</i>	123	<i>38.5%</i>
<i>Penelec (FE)</i>	<i>147</i>	<i>136</i>	<i>141</i>	<i>141</i>	129	<i>9.6%</i>
<i>Penn Power (FE)</i>	<i>129</i>	<i>185</i>	<i>129</i>	<i>148</i>	111	<i>33.0%</i>
<i>Pike County</i>	<i>177</i>	<i>184</i>	<i>153</i>	<i>171</i>	192	<i>-10.8%</i>
<i>PPL</i>	<i>176</i>	<i>137</i>	<i>187</i>	<i>167</i>	160	<i>4.2%</i>
<i>UGI</i>	<i>188</i>	<i>163</i>	<i>134</i>	<i>162</i>	186	<i>-13.1%</i>
<i>Wellsboro</i>	<i>105</i>	<i>97</i>	<i>144</i>	<i>115</i>	136	<i>-15.2%</i>
<i>West Penn (FE)</i>	<i>165</i>	<i>216</i>	<i>192</i>	<i>191</i>	187	<i>2.1%</i>
<i>System Average Interruption Frequency Index (SAIFI)-outages/yr/cust</i>				<i>3-Year</i>	<i>3-Year</i>	<i>% Above (+) or</i>
<i>EDC</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>	<i>Average</i>	<i>Standard</i>	<i>Below (-) Standard</i>
<i>Citizens'</i>	<i>0.28</i>	<i>0.08</i>	<i>0.27</i>	<i>0.21</i>	0.22	<i>-4.5%</i>
<i>Duquesne Light</i>	<i>1.01</i>	<i>0.84</i>	<i>0.93</i>	<i>0.93</i>	1.29	<i>-28.2%</i>
<i>Met-Ed (FE)</i>	<i>1.54</i>	<i>1.27</i>	<i>1.35</i>	<i>1.39</i>	1.27	<i>9.2%</i>
<i>PECO</i>	<i>1.08</i>	<i>0.90</i>	<i>0.88</i>	<i>0.95</i>	1.35	<i>-29.4%</i>
<i>Penelec (FE)</i>	<i>1.72</i>	<i>1.58</i>	<i>1.84</i>	<i>1.71</i>	1.39	<i>23.3%</i>
<i>Penn Power (FE)</i>	<i>1.38</i>	<i>0.97</i>	<i>1.00</i>	<i>1.12</i>	1.23	<i>-9.2%</i>
<i>Pike County</i>	<i>0.39</i>	<i>0.45</i>	<i>1.40</i>	<i>0.75</i>	0.67	<i>11.4%</i>
<i>PPL</i>	<i>0.85</i>	<i>0.84</i>	<i>0.91</i>	<i>0.87</i>	1.08	<i>-19.8%</i>
<i>UGI</i>	<i>0.96</i>	<i>0.40</i>	<i>0.95</i>	<i>0.77</i>	0.91	<i>-15.4%</i>
<i>Wellsboro</i>	<i>0.77</i>	<i>1.17</i>	<i>0.93</i>	<i>0.96</i>	1.35	<i>-29.1%</i>
<i>West Penn (FE)</i>	<i>1.19</i>	<i>1.12</i>	<i>1.26</i>	<i>1.19</i>	1.16	<i>2.6%</i>
<i>System Average Interruption Duration Index (SAIDI)-min/yr/cust</i>				<i>3-Year</i>	<i>3-Year</i>	<i>% Above (+) or</i>
<i>EDC</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>	<i>Average</i>	<i>Standard</i>	<i>Below (-) Standard</i>
<i>Citizens'</i>	<i>22</i>	<i>7</i>	<i>26</i>	<i>18</i>	25	<i>-27.9%</i>
<i>Duquesne Light</i>	<i>106</i>	<i>111</i>	<i>173</i>	<i>130</i>	153	<i>-15.0%</i>
<i>Met-Ed (FE)</i>	<i>253</i>	<i>190</i>	<i>233</i>	<i>225</i>	163	<i>38.2%</i>
<i>PECO</i>	<i>205</i>	<i>122</i>	<i>164</i>	<i>164</i>	167	<i>-2.0%</i>
<i>Penelec (FE)</i>	<i>252</i>	<i>214</i>	<i>277</i>	<i>248</i>	179	<i>38.4%</i>
<i>Penn Power (FE)</i>	<i>178</i>	<i>179</i>	<i>129</i>	<i>162</i>	136	<i>19.1%</i>
<i>Pike County</i>	<i>69</i>	<i>83</i>	<i>216</i>	<i>123</i>	129	<i>-4.9%</i>
<i>PPL</i>	<i>150</i>	<i>116</i>	<i>170</i>	<i>145</i>	172	<i>-15.5%</i>
<i>UGI</i>	<i>182</i>	<i>66</i>	<i>127</i>	<i>125</i>	170	<i>-26.5%</i>
<i>Wellsboro</i>	<i>81</i>	<i>114</i>	<i>133</i>	<i>109</i>	185	<i>-40.9%</i>
<i>West Penn (FE)</i>	<i>196</i>	<i>241</i>	<i>242</i>	<i>226</i>	217	<i>4.3%</i>

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 2017-2021**

<b>2021 EDC Performance Scorecard</b>												
Metrics achieved	GREEN	Benchmark Metrics not achieved	YELLOW	Standard Metrics not achieved								RED
		Rolling 12-Month										
		Benchmark Score					Standard Score					
EDCs	<sup>1</sup> Metrics	<sup>2</sup> BM	Q1	Q2	Q3	Q4	<sup>3</sup> STD	Q1	Q2	Q3	Q4	
<b>Large EDCs</b>												
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	186	164	198	121	102	198	164	
	SAIFI	1.23	0.89	0.83	0.94	0.88	1.48	0.89	0.83	0.94	0.88	
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	0.88	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	141	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	
<b>Small EDCs</b>												
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	
<sup>1</sup> 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.											
<sup>2</sup> 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).											
<sup>3</sup> STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multiplying BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.											

2021 Pennsylvania Electric Reliability Report

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	<sup>1</sup> Metrics	<sup>2</sup> BM	Q1	Q2	Q3	Q4	<sup>3</sup> STD	Q1	Q2	Q3	Q4	
<b>Large EDCs</b>												
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	
<b>Small EDCs</b>												
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	
<sup>1</sup> 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.										
<sup>2</sup> 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).										
<sup>3</sup> STD		(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multiplying BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.										

2021 Pennsylvania Electric Reliability Report

2019 EDC Performance Scorecard															
Metrics achieved		GREEN		Benchmark Metrics not achieved				YELLOW		Standard Metrics not achieved				RED	
EDCs		Rolling 12-Month													
		Benchmark Score					Standard Score								
		<sup>1</sup> Metrics	<sup>2</sup> BM	Q1	Q2	Q3	Q4	<sup>3</sup> STD	Q1	Q2	Q3	Q4			
<b>Large EDCs</b>															
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				
<b>Small EDCs</b>															
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				
<sup>1</sup> 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.														
<sup>2</sup> 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).														
<sup>3</sup> STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multiplying BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.														

2021 Pennsylvania Electric Reliability Report

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	<sup>1</sup> Metrics	<sup>2</sup> BM	Q1	Q2	Q3	Q4	<sup>3</sup> STD	Q1	Q2	Q3	Q4	
<b>Large EDCs</b>												
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	
<b>Small EDCs</b>												
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	
<sup>1</sup> 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.											
<sup>2</sup> 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).											
<sup>3</sup> STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multiplying BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.											

2021 Pennsylvania Electric Reliability Report

<b>2017 EDC Performance Scorecard</b>											
Metrics achieved <b>GREEN</b>		Benchmark Metrics not achieved <b>YELLOW</b>				Standard Metrics not achieved <b>RED</b>					
		Rolling 12-Month									
		Benchmark Score					Standard Score				
EDCs	<sup>1</sup> Metrics	<sup>2</sup> BM	Q1	Q2	Q3	Q4	<sup>3</sup> STD	Q1	Q2	Q3	Q4
<b>Large EDCs</b>											
Duquesne Light	CAIDI	108	92	113	116	115	130	92	113	116	115
	SAIDI	126	87	117	111	112	182	87	117	111	112
	SAIFI	1.17	0.95	1.04	0.96	0.98	1.40	0.95	1.04	0.96	0.98
PECO	CAIDI	112	109	99	95	99	134	109	99	95	99
	SAIDI	138	111	92	80	82	198	111	92	80	82
	SAIFI	1.23	1.02	0.93	0.85	0.83	1.48	1.02	0.93	0.85	0.83
PPL	CAIDI	145	123	127	134	146	174	123	127	134	146
	SAIDI	142	99	98	99	104	205	99	98	99	104
	SAIFI	0.98	0.81	0.78	0.74	0.71	1.18	0.81	0.78	0.74	0.71
Met-Ed (FirstEnergy)	CAIDI	117	127	121	138	147	140	127	121	138	147
	SAIDI	135	199	181	205	217	194	199	181	205	217
	SAIFI	1.15	1.57	1.50	1.48	1.47	1.38	1.57	1.50	1.48	1.47
Penelec (FirstEnergy)	CAIDI	117	125	188	137	138	141	125	188	137	138
	SAIDI	148	202	340	232	239	213	202	340	232	239
	SAIFI	1.26	1.62	1.81	1.69	1.73	1.52	1.62	1.81	1.69	1.73
Penn Power (FirstEnergy)	CAIDI	101	99	129	135	150	121	99	129	135	150
	SAIDI	113	108	173	161	160	162	108	173	161	160
	SAIFI	1.12	1.09	1.34	1.19	1.06	1.34	1.09	1.34	1.19	1.06
West Penn (FirstEnergy)	CAIDI	170	159	159	165	166	204	159	159	165	166
	SAIDI	179	191	198	211	214	257	191	198	211	214
	SAIFI	1.05	1.20	1.25	1.28	1.29	1.26	1.20	1.25	1.28	1.29
<b>Small EDCs</b>											
Citizens'	CAIDI	105	175	172	166	185	141	175	172	166	185
	SAIDI	21	67	70	74	84	38	67	70	74	84
	SAIFI	0.20	0.38	0.41	0.45	0.45	0.27	0.38	0.41	0.45	0.45
Pike County	CAIDI	174	251	201	167	185	235	251	201	167	185
	SAIDI	106	134	113	84	102	194	134	113	84	102
	SAIFI	0.61	0.53	0.56	0.51	0.53	0.82	0.53	0.56	0.51	0.53
UGI	CAIDI	169	127	114	134	131	228	127	114	134	131
	SAIDI	140	55	56	57	64	256	55	56	57	64
	SAIFI	0.83	0.43	0.49	0.42	0.49	1.12	0.43	0.49	0.42	0.49
Wellsboro	CAIDI	124	108	98	105	90	167	108	98	105	90
	SAIDI	153	203	175	143	97	278	203	175	143	97
	SAIFI	1.23	1.88	1.78	1.35	1.08	1.66	1.88	1.78	1.35	1.08
<sup>1</sup> 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.										
<sup>2</sup> 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).										
<sup>3</sup> STD	(Standard) - EDC's upper limit performance value. CAIDI STD & SAIFI STD is calculated by multiplying BM by 120% for large EDCs and 135% for small EDCs. SAIDI STD is calculated by multiplying CAIDI STD x SAIFI STD.										

***Appendix C – Modifications to Inspection and Maintenance Intervals***

***Modifications to Inspection and Maintenance (I&M) Intervals (Group 1) Submitted October 2021, effective Jan. 1, 2023 – Dec. 31, 2024***

<b>Company</b>	<b>Exemption Requested</b>	<b>Justification</b>
<b>FirstEnergy companies: Penelec, Penn Power, Met-Ed, and West Penn Power</b>	Pole loading calculations	Approved previously in the Jan. 1, 2013-Dec. 31, 2014 I&M Plan.
<b>FirstEnergy companies: Penelec, Penn Power, Met-Ed, and West Penn Power</b>	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.
<b>FirstEnergy companies: Penelec, Penn Power, Met-Ed, and West Penn Power</b>	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.
<b>UGI Electric</b>	Pole loading calculations	Approved previously in the Jan. 1, 2021-Dec. 31, 2022 I&M Plan.



*Modifications to Inspection and Maintenance Intervals (Group 2) Submitted October 2020, effective Jan. 1, 2022 – Dec. 31, 2023*

<b>Company</b>	<b>Exemption Requested</b>	<b>Justification</b>
<b>Citizens'</b>	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec.31, 2013 I&M Plan.
<b>Duquesne</b>	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>Duquesne</b>	Overhead line inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>Duquesne</b>	Overhead transformer inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>Duquesne</b>	Above-ground pad-mounted transformers	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>PECO</b>	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>PECO</b>	Above-ground pad-mounted transformers	Approved previously in the Jan. 1, 2020- Dec. 31, 2021 I&M Plan
<b>Pike County</b>	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>PPL</b>	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>PPL</b>	Overhead line inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>PPL</b>	Overhead transformer inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>PPL</b>	Pad mounted and below-ground transformer inspections	Approved previously in the Jan. 1, 2012- Dec. 31, 2013 I&M Plan
<b>PPL</b>	Recloser inspections	Approved previously in the Jan. 1, 2014- Dec. 31, 2015 I&M Plan
<b>PPL</b>	Substation inspections	Provisional approved in the Jan. 1, 2017- Dec. 31, 2018 I&M Plan (docket M-2009-2094773)
<b>Wellsboro</b>	Pole loading calculations	Approved previously in the Jan. 1, 2012- Dec.31, 2013 I&M Plan





Pennsylvania Public Utility Commission  
400 North Street  
Harrisburg, PA 17120  
[www.puc.pa.gov](http://www.puc.pa.gov)

