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**FEDERAL EXPRESS**

April 30, 2019

Rosemary Chiavetta, Secretary  
Pennsylvania Public Utility Commission  
Commonwealth Keystone Building  
400 North Street  
Harrisburg, Pennsylvania 17120

M-2016-2522508

**Re: PPL Electric Utilities Corporation  
2018 Annual Reliability Report  
Docket No. L-00030161**

Dear Ms. Chiavetta:

Enclosed for filing on behalf of PPL Electric Utilities Corporation ("PPL Electric") is an original of PPL Electric's 2018 Annual Reliability Report to the Pennsylvania Public Utility Commission. This report is being filed pursuant to the Commission's regulations at 52 Pa. Code § 57.195(a).

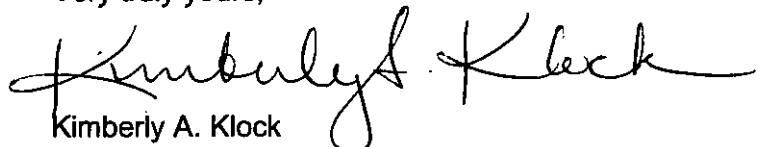
As required by the Commission's regulations, copies of the enclosed report have been served upon the Office of Consumer Advocate ("OCA") and the Office of Small Business Advocate ("OSBA").

Pursuant to 52 Pa. Code § 1.11, the enclosed document is to be deemed filed on April 30, 2019, which is the date it was deposited with an overnight express delivery service as shown on the delivery receipt attached to the mailing envelope.

In addition, please date and time-stamp the enclosed extra copy of this letter and return it to me in the envelope provided.

If you have any questions regarding the enclosed report, please call me or B. Kathryn Frazier, PPL Electric's Regulatory Affairs Manager at (610) 774-3372.

Very truly yours,

  
Kimberly A. Klock

Enclosures

cc: Tanya J. McCloskey, Esquire  
Mr. John R. Evans  
Mr. Daniel Searfoorce

**RECEIVED**

APR 30 2019

PA PUBLIC UTILITY COMMISSION  
SECRETARY'S BUREAU



**PPL Electric Utilities**

**PPL Electric Utilities Corporation  
2018 Annual Reliability Report  
to the  
Pennsylvania Public Utility Commission**

RECEIVED

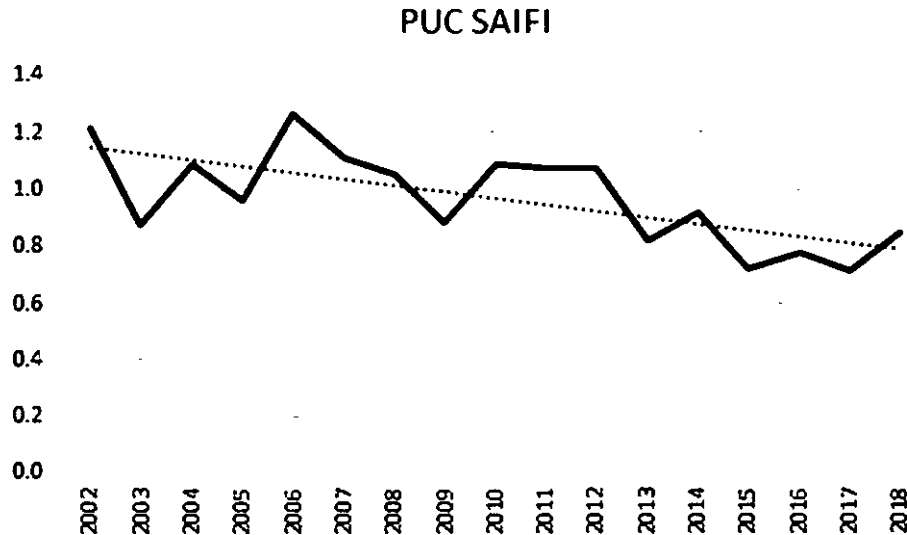
APR 30 2019

PA PUBLIC UTILITY COMMISSION  
SECRETARY'S BUREAU

*May 1, 2019*

**1) An overall current assessment of the state of the system reliability in the EDC's service territory including a discussion of the EDC's current programs and procedures for providing reliable electric service.**

In 2018, PPL Electric customers continued to experience historically low levels of interruptions, even with a non-excludable top 15 storm striking in May.



In 2018, SAIFI was 14% below the established benchmark level, SAIDI was 1% below the benchmark, and CAIDI was 15% above the benchmark. All metrics were well within the 12-month standard, and all but CAIDI were within the 36-month standard.

2018 metrics in general, and CAIDI in particular, were negatively impacted by the PUC reportable storm of May 15, which approached major event status, with 8.6% of the customer base interrupted. At over 1,500 trouble cases and over 134,000 customer interruptions, this was a top 15 all-time storm as measured by cases. Prior to the installation of numerous Smart Grid and other automated enhancements such as FISR (Fault Isolation and Service Restoration) to the PPL Electric distribution system, this event would have qualified as a major event and would have been excluded from reliability metrics. Had this event been excludable, the reliability index values would have been 0.76 for SAIFI; 115 for CAIDI; and 87 for SAIDI – all very near historic bests. Additionally, approximately 55,000 of PPL Electric's customer interruptions in 2018 were the result of forced outages due to UGI gas leaks.

Since 2013, PPL Electric customers have generally enjoyed their best reliability ever. The company attributes this improved level of performance to:

- A robust vegetation management program.
- Significant investment in distribution automation technology such as:
  - Continued investment in the Smart Grid Initiative.
  - Increased leverage of our Distribution Management System (DMS).

- Full implementation of Fault Isolation and System Restoration (FISR) technology.
- Well-targeted reliability investments including fusing, single-phase tripping, and storm hardening.
- An increased focus on remediating momentary outages before they become permanent outages.
- An emphasis on making optimal, data-driven asset investment decisions.

It is PPL Electric's goal to achieve and maintain best in class levels of electric delivery service to its customers in a cost-effective manner. Maintenance programs are one of the key elements that focus on maintaining system and circuit reliability, equipment performance, and interruption prevention. The scope of these maintenance programs, procedures, and activities covers all areas of the electrical infrastructure.

These programs include:

#### **Transmission**

Transmission inspection programs include aerial patrols conducted via helicopter or UAV (Unmanned Aerial Vehicle). These patrols focus on comprehensive inspections and routine "stop and go" inspections for identification of maintenance work. Inspections focus on all Transmission line equipment, including poles, arms, line switches, interrupters, arresters, grounding, guying, anchors, and other key components. Proactive replacement programs are in place to target specific risk areas (e.g. cellon treated wood poles, upswept wood arms, etc.) and to apply data-driven approaches to mitigate known reliability risks (e.g. avian interference, lightning performance, etc.).

#### **Substation**

Substation maintenance programs include inspections and overhauls of equipment, such as breakers, disconnects, power cables, and security equipment. Some equipment is maintained on a time basis; other equipment is condition-monitored. These two methods help ensure that maintenance work is performed in a cost-effective manner. Besides time and condition-based maintenance, thermo-graphic inspections help ensure that substation equipment does not operate at elevated temperature levels for an extended period of time, which could lead to equipment failure.

#### **Distribution**

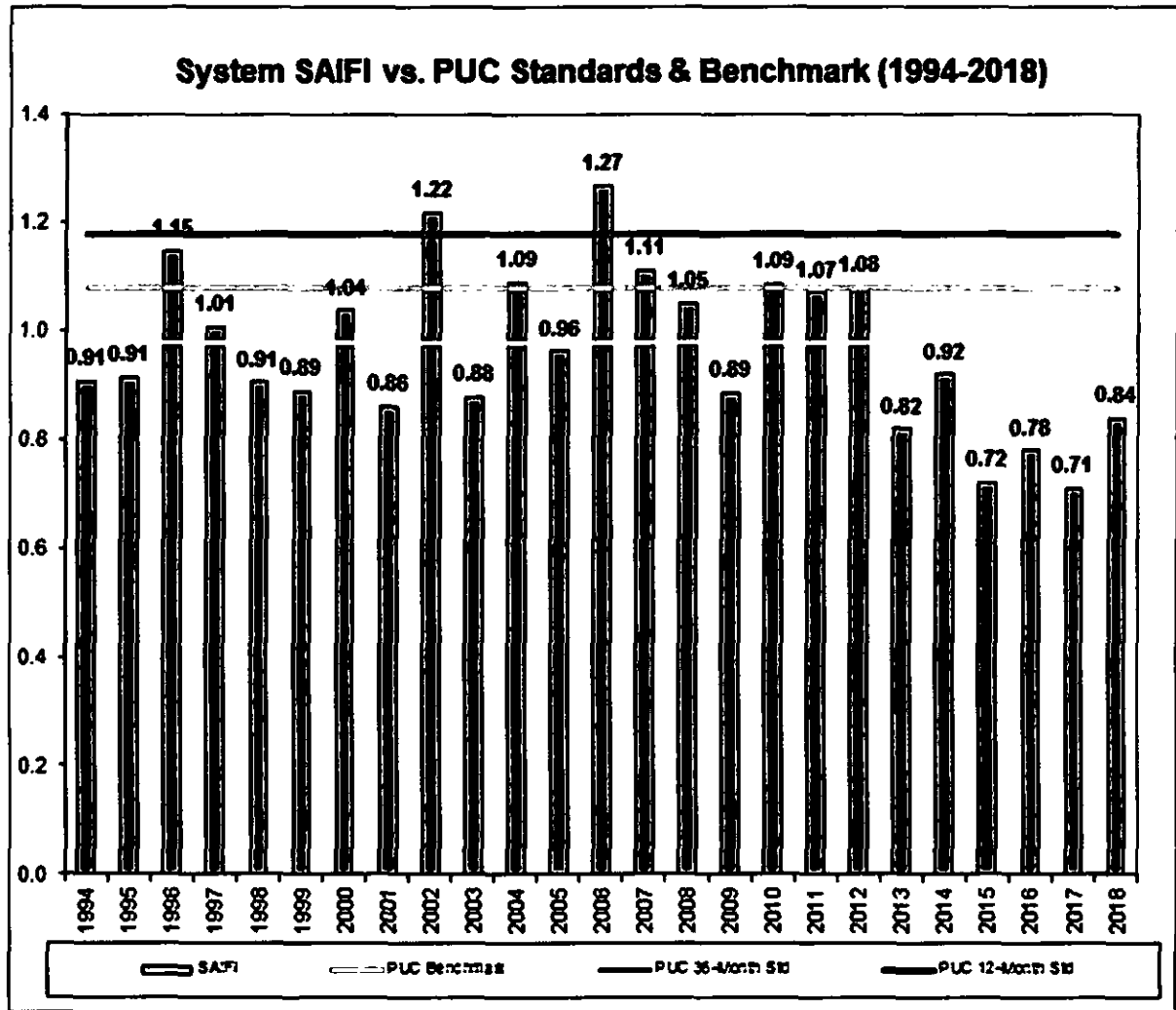
Distribution programs encompass many maintenance aspects similar to transmission and substations, and also include load surveys that help engineers determine peak load requirements, circuit analyses for the identification of lines requiring maintenance work, voltage relief, or other capital improvements. Overhead line inspections can identify damaged or deteriorated equipment that can be repaired or replaced. In addition, distribution maintenance includes inspections of poles, voltage regulators, line switches, capacitors, and other key distribution equipment. PPL Electric also tests underground cable to determine if the cable needs to be replaced, repaired or cured to prevent future failures.

**Vegetation**

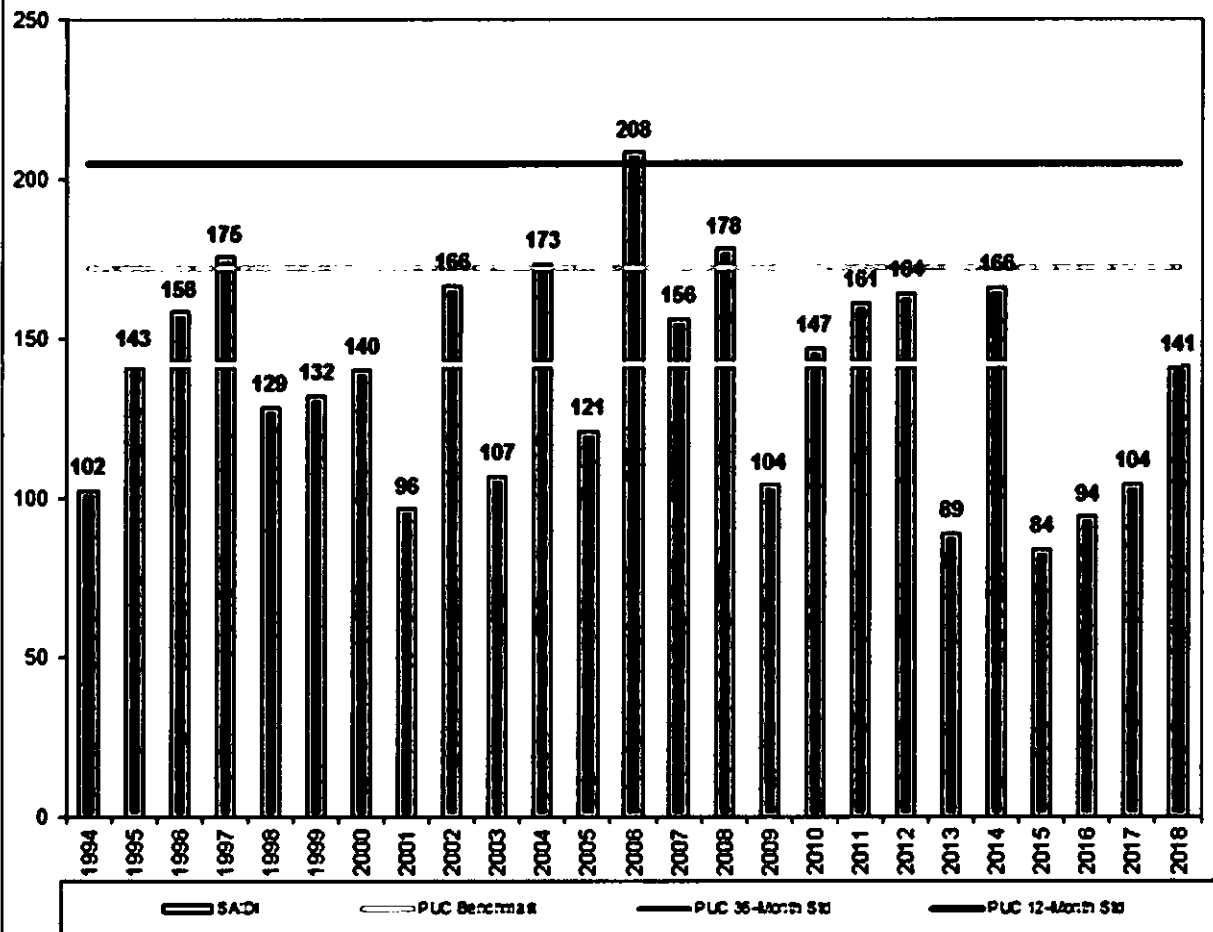
The vegetation on PPL Electric's transmission and distribution rights-of-way (ROW) is maintained utilizing a combination of several management techniques. These include tree pruning, tree removal, re-clearing and herbicide application. Lines are field-surveyed on a regular basis. The work is scheduled and budgeted based on the conditions observed and past performance. Outside of the ROW, danger trees with the potential to fall into the ROW are removed when possible.

Each of these programs is more fully described in Appendices A through D.

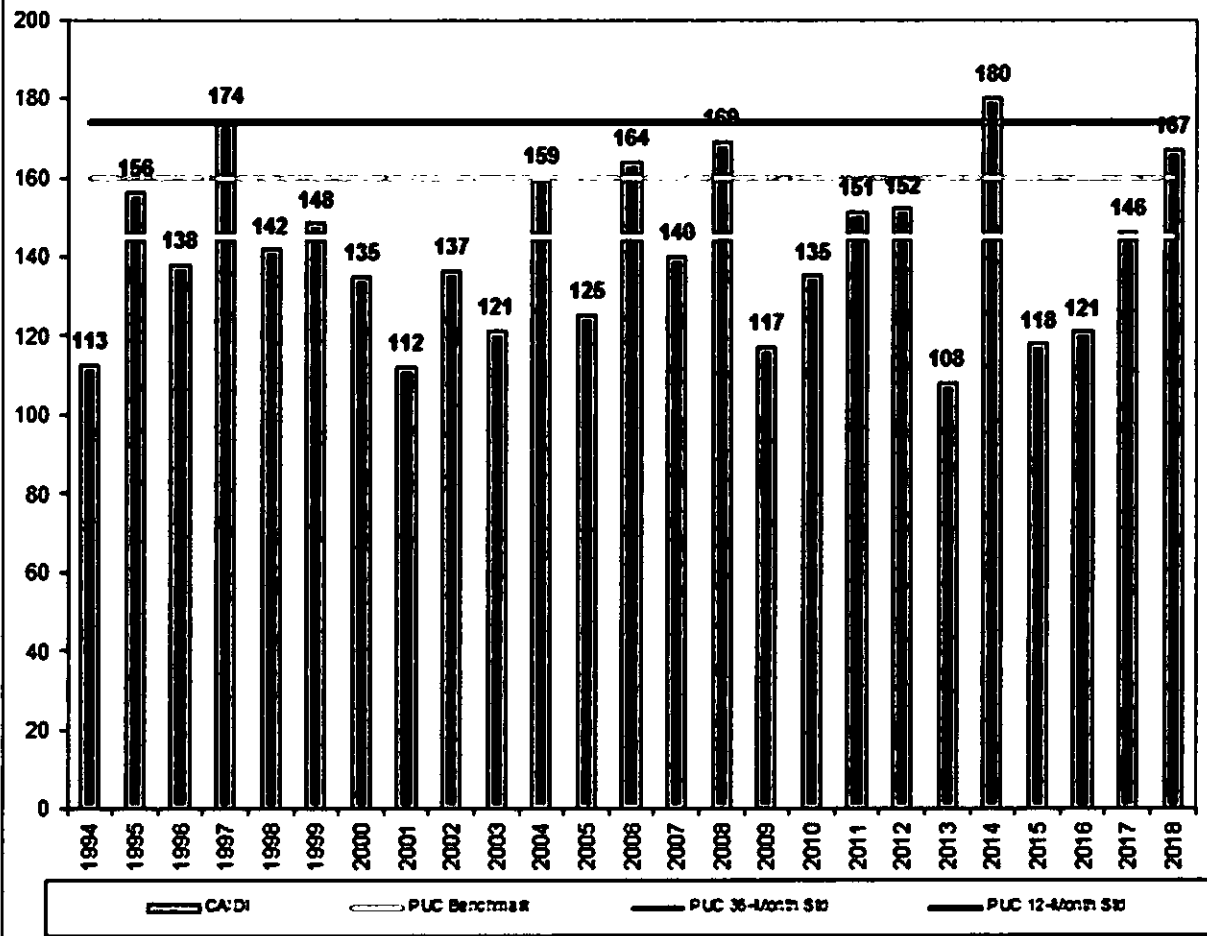
Since 2013, marked improvement can be seen across all reliability measures, with 2014 mildly distorted because of ice storm Nika, which inflicted concentrated damage but was not a major event, and 2018 mildly distorted by the May 15 storm, which was also not classified as a major event notwithstanding damage of over 1,500 cases.



**System SAIDI vs. PUC Standards & Benchmark (1994-2018)**



**System CAIDI vs. PUC Standards & Benchmark (1994-2018)**



- 2) *A description of each major event that occurred during the year being reported on, including the time and duration of the event, the number of customers affected, the cause of the event and any modified procedures adopted in order to avoid or minimize the impact of similar events in the future.*

Riley / Quinn

Beginning March 2, 2018, winter storm Riley, an intense nor'easter, entered the PPL Electric territory. Storm Riley underwent explosive development known as bombogenesis, which is defined as a 1000 millibar drop in pressure in under 24 hours. At the height of impact, the storm produced approximately 16 hours of gusts exceeding 40 MPH gusts, with peak gusts of 60 MPH.

On March 7, with Riley restorations still underway, a second winter storm (Quinn) impacted the service territory snow accumulations of generally 8-12 inches and wind gusts of 25 to 30 MPH. A peak snow accumulation of 23.6 inches was recorded in Coolbaugh township. The large amount of snow and wind gusts significantly slowed ongoing restorations. Interstates and major roads were closed, and some motorists were stranded in their vehicles overnight. A state of emergency was declared, and the National Guard was activated to aid stranded motorists.

The effects of the combined event affected the PPL Electric territory for 9 days and caused 261,341 customer interruptions and 2,801 cases of trouble.

PPL Electric has taken steps to improve their Emergency Response Plan based on lessons learned from the 2018 storms and benchmark studies with other utilities and industry organizations.

Initiatives for 2018 involved improvements to all aspects of our plan. Listed below are some key highlights:

- Refinement of our Damage Assessment Procedure to support a more aggressive assessment timeline and incorporate the use of Unmanned Aerial Vehicles (UAVs).
- Acquisition of mobile command centers to support restoration efforts and have a local presence in areas of concentrated damage.
- Restructuring of our emergency response teams to support key functions: strategy development, damage assessment, and work assignment and completion.
- Refinement of our housing and feeding process with the addition of a central hub, hotline, and process improvements.

- **Enhancement of Base Camp / Staging Site process to expand service providers and streamline and exercise our processes.**

- 3) *A table showing the actual values of each of the reliability indices (SAIFI, CAIDI, SAIDI, and if available, MAIFI) for the EDC's service territory for each of the preceding 3 calendar years. The report shall include the data used in calculating the indices, namely the average number of customers served, the number of sustained customer interruptions, the number of customers affected, and the customer minutes of interruption. If MAIFI values are provided, the number of customer momentary interruptions shall also be reported.*

| <b>Year</b>                                                                                       | <b>2016</b> | <b>2017</b> | <b>2018<sup>1</sup></b> | <b>3 Yr. Avg.</b> |
|---------------------------------------------------------------------------------------------------|-------------|-------------|-------------------------|-------------------|
| <b>SAIFI</b><br>(Benchmark = 0.98;<br>Rolling 12-month Std. = 1.18;<br>Rolling 3-yr. Std. = 1.08) | 0.777       | 0.712       | 0.845                   | 0.778             |
| <b>CAIDI</b><br>(Benchmark = 145;<br>Rolling 12-month Std. = 174;<br>Rolling 3-yr. Std. = 160)    | 121.1       | 145.6       | 167.1                   | 144.6             |
| <b>SAIDI</b><br>(Benchmark = 142;<br>Rolling 12-month Std. = 205;<br>Rolling 3-yr. Std. = 172)    | 94.1        | 103.7       | 141.2                   | 113.0             |
| <b>MAIFI</b>                                                                                      | 7.3         | 6.4         | 7.2                     | 7.0               |
| <b>Customers Served<sup>2</sup></b>                                                               | 1,411,897   | 1,417,978   | 1,422,558               | 1,417,478         |
| <b>Number of Sustained Customer Interruptions (Trouble Cases)</b>                                 | 17,473      | 17,387      | 21,007                  | 18,622            |
| <b>Number of Customers Affected<sup>3</sup></b>                                                   | 1,097,145   | 1,009,767   | 1,201,596               | 1,102,836         |
| <b>Customer Minutes of Interruptions (CMI)</b>                                                    | 132,840,591 | 147,064,995 | 201,484,665             | 160,463,417       |
| <b>Number of Customer Momentary Interruptions</b>                                                 | 10,246,275  | 9,178,624   | 10,198,199              | 9,874,366         |

<sup>1</sup> Any slight variations from data provided previously are the result of error corrections.

<sup>2</sup> PPL Electric calculates the annual indices using customers served at the end of the period. This is consistent with the method used to calculate PPL Electric's benchmarks.

<sup>3</sup> The data reflects the number of customers interrupted for each interruption event summed for all events, also known as customer interruptions. If a customer is affected by three separate cases of trouble, that customer represents three customer interruptions, but only one customer interrupted.

- 4) *A breakdown and analysis of outage causes during the year being reported on, including the number and percentage of service outages, the number of customers interrupted, and customer interruption minutes categorized by outage cause such as equipment failure, animal contact, tree related, and so forth. Proposed solutions to identified service problems shall be reported.*

The table shows a breakdown of service outage causes for 2018.<sup>4</sup> Service interruption definitions are provided in Appendix E. PPL Electric has maintenance programs to address controllable service outages. Those programs are detailed in Appendices A through D.

| Cause Description                    | Trouble Cases | Percent of Trouble Cases | Customer Interruptions | Percent of Customer Interruptions | Customer Minutes | Percent of Customer Minutes |
|--------------------------------------|---------------|--------------------------|------------------------|-----------------------------------|------------------|-----------------------------|
| <b>Animals</b>                       | 3,471         | 16.5%                    | 43,753                 | 3.6%                              | 3,402,832        | 1.7%                        |
| <b>Contact / Dig-In</b>              | 134           | 0.6%                     | 11,217                 | 0.9%                              | 791,683          | 0.4%                        |
| <b>Directed by Non-PPL Authority</b> | 83            | 0.4%                     | 16,638                 | 1.4%                              | 742,020          | 0.4%                        |
| <b>Equipment Failures</b>            | 6,261         | 29.8%                    | 385,942                | 32.1%                             | 38,801,710       | 19.3%                       |
| <b>Improper Design</b>               | 4             | 0.0%                     | 5,111                  | 0.4%                              | 92,220           | 0.0%                        |
| <b>Improper Installation</b>         | 3             | 0.0%                     | 544                    | 0.0%                              | 69,065           | 0.0%                        |
| <b>Improper Operation</b>            | 3             | 0.0%                     | 5,469                  | 0.5%                              | 37,839           | 0.0%                        |
| <b>Nothing Found</b>                 | 1,249         | 5.9%                     | 61,367                 | 5.1%                              | 6,137,603        | 3.0%                        |
| <b>Other Controllable</b>            | 122           | 0.6%                     | 15,717                 | 1.3%                              | 707,000          | 0.4%                        |
| <b>Other Non Control</b>             | 278           | 1.3%                     | 8,608                  | 1.3%                              | 1,497,964        | 0.7%                        |
| <b>Other Public</b>                  | 34            | 0.2%                     | 7,381                  | 0.6%                              | 508,035          | 0.3%                        |
| <b>Tree Related</b>                  | 8,510         | 40.5%                    | 482,939                | 40.2%                             | 136,103,186      | 67.6%                       |
| <b>Unknown</b>                       | -             | 0.0%                     | -                      | 0.0%                              | -                | 0.0%                        |
| <b>Vehicles</b>                      | 783           | 3.7%                     | 101,481                | 8.4%                              | 10,109,399       | 5.0%                        |
| <b>Forced due to UGI gas leaks</b>   | 72            | 0.3%                     | 55,429                 | 4.6%                              | 2,484,108        | 1.2%                        |
| <b>Total</b>                         | 21,007        | 100.0%                   | 1,201,596              | 100.0%                            | 201,484,664      | 100.0%                      |

<sup>4</sup> Any slight variations from data provided previously are the result of error corrections.

Analysis of causes contributing to the majority of service interruptions:

**Weather Conditions:** PPL Electric records weather conditions, such as wind or lightning, as contributing factors to service interruptions, but does not code them as direct interruption causes. Therefore, some fluctuations in cause categories, especially tree- and equipment-related causes, are attributable to weather variations. For this annual reporting period, weather was considered a significant contributing cause in 53% of cases, 59% of customer interruptions, and 79% of CMI.

**Tree Related:** PPL Electric has recently increased funding to more aggressively address outside the right-of-way danger trees. For trees within the right-of-way, PPL Electric has implemented a more robust trimming strategy.

**Animals:** Animals accounted for approximately 17% of PPL Electric's cases of trouble. Although this represents a significant number of cases, the effect on SAIFI and CAIDI is small because approximately 75% of the number of cases of trouble was associated with individual distribution transformers. However, when animals contact substation equipment, the effect may be widespread and potentially can interrupt thousands of customers on multiple circuits. In addition to guarding new distribution transformers and substations, in 2009, PPL Electric initiated distribution and substation animal guarding programs to focus systematically on protecting existing facilities most at risk of incurring animal-caused interruptions. All PPL Electric substations have received animal guarding.

**Vehicles:** Although vehicles cause a small percentage of the number of cases of trouble, they accounted for a large percentage of customer interruptions and customer minutes, because main distribution lines generally are located along major thoroughfares with higher traffic densities. In addition, vehicle-related cases often result in extended repair times to replace broken poles. Service interruptions due to vehicles are on the rise as a result of an increasing number of drivers and vehicles on the road. PPL Electric has a program to identify and relocate poles that are subject to multiple vehicle hits.

**Equipment Failure:** Equipment failure is one of the largest single contributors to the number of cases of trouble, customer interruptions and customer minutes. However, approximately 45% of the cases of trouble, 51% of the customer interruptions and 61% of the customer minutes attributed to equipment failure were weather-related and, as such, are not considered to be strong indicators of equipment condition or performance.

***5) Specific remedial efforts taken to date and planned for circuits that have been on worst performing 5% of circuits list for a year or more.***

Ten PPL Electric circuits have been on the worst performing circuit list for a year or more.

**Circuit 22003 -- BOHEMIA 20-03**

Remedial Actions

- In 2018, an existing capacitor was upgraded.
- In 2018, full circuit trimming was performed.
- In 2019, additional animal guarding will be installed at several locations.
- In 2019, 10 or more locations will receive fusing.
- In 2019, an additional recloser will be added to the circuit.
- In 2019, an existing recloser will be replaced.
- In 2019, additional sectionalizing switches will be added to the circuit.
- In 2020, a three-phase tie line to the TWIN LAKES 81-02 will be constructed.
- In 2021, a section of single-phase will be reconductored.
- In 2021, a new Smart Grid device will be installed on this circuit.

**Circuit 24901 -- WHITE HAVEN 49-01**

Remedial Actions

- In 2018, an existing switch was upgraded to a Smart Grid device.
- In 2018, animal guarding was installed at four locations.
- In 2018, additional fusing was installed at fifteen locations.
- In 2019, a single-phase recloser will be installed.
- In 2020, a section of three-phase line will be reconfigured.
- In 2020, a section of three-phase line will be extended and made more accessible.
- In 2020, full circuit trimming will be performed.
- In 2020, an additional Smart Grid device will be installed.
- In 2020, an Expanded Operational Review will be performed.

## **Circuit 26601 -- BROOKSIDE 66-01**

### **Remedial Actions**

- In 2018, fusing was installed at five locations.
- In 2018, 21 poles were replaced.
- In 2018, addition animal guarding was installed on this circuit.
- In 2019, a single-phase recloser will be installed on this circuit.
- In 2019, several porcelain cutouts will be replaced with polymer.
- In 2019, reconductoring several sections of single-phase will be evaluated.
- In 2020, full circuit trimming will be performed.
- In 2021, a section of single-phase conductor will be extended.

## **Circuit 26604 -- BROOKSIDE 66-04**

### **Remedial Actions**

- In 2018, a motor operated air break was replaced with a recloser as part of the Smart Grid Program.
- In 2018, 105 poles were replaced.
- In 2018, a set of Smart fault indicators was installed.
- In 2018, several additional locations received animal guarding.
- In 2019, three fuses will be installed.
- In 2019, numerous porcelain cutouts will be replaced with polymer cutouts.
- In 2019, 25 additional locations will receive animal guarding.
- In 2019, a section of single-phase will be reconductored.
- In 2019, a section of single-phase will be extended and re-sourced.
- In 2020, full circuit trimming will be performed.
- In 2021, a section of single-phase will be extended and re-sourced.
- In 2021, a tie to BROOKSIDE 66-02 will be constructed.
- In 2021, a new line and terminal will be constructed for this circuit.

## **Circuit 28602 -- BLYTHEBURN 86-02**

### **Remedial Actions**

- In 2018, a three-phase recloser was installed as part of the Smart Grid program.
- In 2018, multiple porcelain cutout fuses were replaced.
- In 2018, a single-phase tap fuse was installed.
- In 2019, full circuit trimming was performed.
- In 2019, two additional switches will be installed.
- In 2019, an additional single-phase recloser will be installed.
- In 2019, a substation conversion will be evaluated.
- In 2019, a tie line to the BLYTHEBURN 86-04 will be evaluated.
- In 2019, an Expanded Operational Review will be performed.
- In 2020, an additional Smart Grid device will be installed.
- In 2020, a section of difficult-to-access single-phase will be relocated.

## **Circuit 45002 -- LIMESTONE 50-02**

### **Remedial Actions**

- In 2018, an infrared scan was performed; several minor items were identified and remediated.
- In 2018, a section of difficult-to-access conductor was relocated.
- In 2018, hot spot tree trimming was performed.
- In 2018, additional animal guarding was installed.
- In 2018, three additional fuses were installed.
- In 2019, a new tie line for this circuit will be evaluated.
- In 2019, several sections of difficult-to-access conductor will be evaluated for relocation.
- In 2019, a new Smart Grid device will be added to this circuit.
- In 2019, an Expanded Operational Review will be performed.

## **Circuit 47704 -- BLOOMSBURG 77-04**

### **Remedial Actions**

- In 2017, hazard tree removal was performed.
- In 2018, the circuit breaker was replaced.
- In 2019, line reconfiguration will be performed on a section of single-phase line.
- In 2019, two sections of difficult-to-access conductor will be evaluated for relocation.
- In 2019, construction of a new substation will be evaluated.
- In 2020, full circuit trimming will be performed.

## **Circuit 52402 -- GREEN PARK 24-02**

### **Remedial Actions**

- In 2018, over 1000 hazard trees were removed.
- In 2018, over 70 single-phase fuses were installed.
- In 2018, a section of three-phase conductor was replaced.
- In 2019, six sections of conductor will be relocated.
- In 2019, a second transmission source into the distribution substation will be constructed.
- In 2019, two additional sectionalizers will be installed.
- In 2019, additional animal guarding has been installed.
- In 2020, two sections of difficult-to-access conductor will be relocated.
- In 2019, a single-phase sectionalizing device will be installed.
- In 2019, additional single-phase sectionalizing will be evaluated.
- In 2019, coordination of protective devices will be reviewed.
- In 2021, two sections of single phase will be re-sourced to reduce exposure.

## **Circuit 53602 -- DALMATIA 36-02**

### **Remedial Actions**

- In 2018, right-of-way was expanded for a section of this circuit to allow for more effective tree trimming.
- In 2018, the MEISERVILLE substation was built to provide load support for this circuit and reduce outage exposure.
- In 2018, two single-phase fuses were installed.
- In 2018, infrared scanning was performed.
- In 2018 through 2019, full circuit tree trimming was performed.
- In 2019, a section of single-phase line will be relocated and re-sourced.
- In 2019, single phase sectionalizing will be evaluated.

## **Circuit 56501 -- ROCKVILLE 65-01**

### **Remedial Actions**

- In 2018, infrared scanning was performed. As a result, several minor repairs were completed.
- In 2018, an additional single-phase fuse was installed.
- In 2018 through 2019, full circuit tree trimming was performed.
- In 2018, an existing recloser was upgraded.
- In 2019, a new substation will be evaluated to reduce load on this circuit.
- In 2020, an additional Smart Grid device will be installed on this circuit.
- In 2020, an additional tie point will be added to this circuit.
- In 2019, voltage support devices will be installed to increase tie capability.
- In 2019, a single-phase tie with single phase Smart Grid device will be evaluated.

- 6) *A comparison of established transmission and distribution inspection and maintenance goals/objectives versus actual results achieved during the year being reported on. Explanations of any variances shall be included.*

| Inspection & Maintenance Goals/Objectives                  | 2018 Budget | 2018 Actual | Variance (%) |
|------------------------------------------------------------|-------------|-------------|--------------|
| <b>Transmission</b>                                        |             |             |              |
| Transmission C-tag poles (# of structures)                 | 559         | 525         | -6.1%        |
| Transmission arm replacements (# of arms)                  | 144         | 205         | 42.4%        |
| Transmission air break switch inspections (# of switches)  | 0           | 4           | NA           |
| Transmission surge arrester installations (# of sets)      | 0           | 0           | NA           |
| Transmission structure inspections (# of activities)       | 28,882      | 27,455      | -4.9%        |
| Transmission tree side trim-Bulk Power (linear feet)       |             |             | NA           |
| Transmission herbicide-Bulk Power (# of acres)             |             |             | NA           |
| Transmission reclearing (# of miles) BES Only              | 913         | 913         | 0.0%         |
| Transmission reclearing (# of miles) 69 kV                 | 1,550       | 1,550       | 0.0%         |
| Transmission reclearing (# of miles) 138 kV                | 89          | 89          | 0.0%         |
| Transmission danger tree removals-Bulk Power (# of trees)  |             |             | NA           |
| <b>Substation</b>                                          |             |             |              |
| Substation batteries (# of activities)                     | 673         | 674         | 0.1%         |
| Circuit breakers (# of activities)                         | 639         | 590         | -7.7%        |
| Substation inspections (# of activities)                   | 1,797       | 1,804       | 0.4%         |
| Transformer maintenance (# of activities)                  | 175         | 127         | -27.4%       |
| <b>Distribution</b>                                        |             |             |              |
| Distribution C-tag poles replaced (# of poles)             | 3,490       | 2,735       | -21.6%       |
| C-truss distribution poles (# of poles)                    | 5,094       | 5,054       | -0.8%        |
| Capacitor (MVAR added)                                     | 0           | 35          | NA           |
| OCR Replacements (# of)                                    | 30          | 34          | 13.3%        |
| Distribution pole inspections (# of poles)                 | 70,338      | 70,053      | -0.4%        |
| Distribution line inspections (hours)                      | 9,742       | 7,227       | -25.8%       |
| Group re-lamping (# of lamps)                              | 12,112      | 11,947      | -1.4%        |
| Test sections of underground distribution cable            | 863         | 863         | 0.0%         |
| Distribution tree trimming (# of miles)                    | 4,500       | 4,100       | -8.9%        |
| Distribution herbicide (# of acres)                        |             |             | NA           |
| Distribution >18" removals within R/W (# of trees)         |             |             | NA           |
| Distribution hazard tree removals outside R/W (# of trees) |             |             | NA           |
| LTN manhole inspections (# of)                             | 300         | 439         | 46.3%        |
| LTN vault inspections (# of)                               | 637         | 901         | 41.4%        |
| LTN network protector overhauls (# of)                     | 65          | 75          | 15.4%        |
| LTN reverse power trip testing (# of)                      | 23          | 33          | 43.5%        |

Explanation of variances greater than 10%:

**Transmission arm replacements** – 14 emergent jobs in 2018 called for the replacement of arms. This significantly increased actual arm count versus planned.

**Substation Inspections** - Resources were focused on the failure and corrective work during the fourth quarter. Inspection work was reevaluated based on inspection cycles.

**Distribution C-tag poles replaced** - The work was prioritized to replace the critical poles based on resource availability and focus on higher reliability driven work.

**OCR Replacements** - Additional OCR replacements were pulled into scope based on reliability impact.

**Distribution Line Inspection Hours** – Under budget due to improvement in work execution efficiency.

**LTN manhole inspections** – Backlog of inspections were completed from prior year.

**LTN vault inspections** – Backlog of inspections were completed from prior year.

**LTN network protector overhauls** – Backlog of work was completed from prior year.

**LTN reverse power trip testing** - Backlog of work was completed from prior year.

**7) A comparison of budgeted versus actual transmission and distribution operation and maintenance expenses for the year being reported on in total and detailed by the EDC's own functional account code or FERC account code as available. Explanations of any variances 10% or greater shall be included.**

The following table provides operation and maintenance expenses for PPL Electric, as a whole, and includes the work identified in the response to Item (6).

| Activity                  | 2018 Budget (\$000) | 2018 Actual (\$000) | Variance (%) |
|---------------------------|---------------------|---------------------|--------------|
| Provide Electric Service  | 7,475               | 6,463               | -13.5%       |
| Vegetation Management     | 46,843              | 42,125              | -10.1%       |
| Customer Response         | 51,177              | 72,268              | 41.2%        |
| Reliability Maintenance   | 36,629              | 28,732              | -21.6%       |
| System Upgrade            | 10,350              | 12,061              | 16.5%        |
| Customer Service/Accounts | 124,863             | 112,639             | -9.8%        |
| Others                    | 31,376              | 51,359              | 63.7%        |

Explanation of variances of 10% or greater:

**Provide Electric Service** - Customer requested work did not follow historical trends.

**Vegetation Management** - Under budget due to lower line miles completed than projected.

**Customer Response** - Higher than budget as a result of Storm Riley (\$9.1M) and storms that occurred in April, May, and July.

**Reliability Maintenance** - Unitizing work was introduced creating efficiencies and optimization within our workforce.

**System Upgrade** - Projects ran slightly higher than initial estimate of job due to additional work being performed.

**Other** - Higher primarily related to project write-offs and mutual assistance costs.

- 8) *A comparison of budgeted versus actual transmission and distribution capital expenditures for the year being reported on in total and detailed by the EDC's own functional account code or FERC account code as available. Explanations of any variances 10% or greater shall be included.*

The following table provides capital expenditures for PPL Electric, as a whole, which includes transmission and distribution activities.

| Activity                  | 2018<br>Budget<br>(\$000) | 2018 Actual<br>(\$000) | Variance<br>(%) |
|---------------------------|---------------------------|------------------------|-----------------|
| New Service/Revenue       | 88,127                    | 89,398                 | 1.4%            |
| System Upgrade            | 582,816                   | 607,626                | 4.3%            |
| Reliability & Maintenance | 474,068                   | 434,121                | -8.4%           |
| Customer Response         | 15,710                    | 43,562                 | 177.3%          |
| Other                     | 24,056                    | 23,105                 | -4.0%           |

Explanation of variances of 10% or greater:

**Customer Response:** Primarily driven by storm Riley/Quinn and additional storm costs.

***Quantified transmission and distribution inspection and maintenance goals/objectives for the current year detailed by system area (that is, transmission, substation and distribution).***

| <b>Inspection &amp; Maintenance Goals/Objectives</b>       | <b>2019 Budget</b> |
|------------------------------------------------------------|--------------------|
| <b>Transmission</b>                                        |                    |
| Transmission C-tag poles (# of poles)                      | 661                |
| Transmission arm replacements (# of sets)                  | 20                 |
| Transmission air break switch inspections (# of switches)  | 0                  |
| Transmission lightning arrester installations (# of sets)  | 0                  |
| Transmission structure inspections (# of activities)       | 33,243             |
| Transmission tree side trim-Bulk Power (linear feet)       | N/A                |
| Transmission herbicide-Bulk Power (# of acres)             | N/A                |
| Transmission reclearing (# of miles) BES Only              | 654                |
| Transmission reclearing (# of miles) 69 kV                 | 1,581              |
| Transmission reclearing (# of miles) 138 kV                | 196                |
| Transmission danger tree removals-Bulk Power (# of trees)  | N/A                |
| <b>Substation</b>                                          |                    |
| Substation batteries (# of activities)                     | 456                |
| Circuit breakers (# of activities)                         | 95                 |
| Substation inspections (# of activities)                   | 775                |
| Transformer maintenance (# of activities)                  | 41                 |
| <b>Distribution</b>                                        |                    |
| Distribution C-tag poles replaced (# of poles)             | 3,418              |
| C-truss distribution poles (# of poles)                    | 0                  |
| Capacitor (MVAR added)                                     | 5,094              |
| OCR Replacements (# of)                                    | 31                 |
| Distribution pole inspections (# of poles)                 | 90,000             |
| Distribution line inspections (hours)                      | 10,459             |
| Group re-lamping (# of lamps)                              | 13,434             |
| Test sections of underground distribution cable            | N/A                |
| Distribution tree trimming (# of miles)                    | 5,967              |
| Distribution herbicide (# of acres)                        | N/A                |
| Distribution >18" removals within R/W (# of trees)         | N/A                |
| Distribution hazard tree removals outside R/W (# of trees) | N/A                |
| LTN manhole inspections (# of)                             | 271                |
| LTN vault inspections (# of)                               | 230                |
| LTN network protector overhauls (# of)                     | 16                 |
| LTN reverse power trip testing (# of)                      | 8                  |

**10) Budgeted transmission and distribution operation and maintenance expenses for the current year in total and detailed by the EDC's own functional account code or FERC account code as available.**

The following table provides budgeted operation and maintenance expenses for PPL Electric, in total, and includes the work identified in the response to Item (9).

| Activity                      | 2019<br>Budget<br>(\$000) |
|-------------------------------|---------------------------|
| Provide Electric Service      | 6,771                     |
| Vegetation Management         | 42,944                    |
| Customer Response             | 56,808                    |
| Reliability Maintenance       | 41,575                    |
| System Upgrade                | 11,436                    |
| Customer Service/Accounts     | 111,016                   |
| Others                        | 30,211                    |
| <b>Total O&amp;M Expenses</b> | <b>300,761</b>            |

**11) Budgeted transmission and distribution capital expenditures for the current year in total and detailed by the EDC's own functional account code or FERC account code as available.**

The following table provides budgeted capital expenditures for PPL Electric, in total, and includes transmission and distribution activities.

| Activity                  | 2019 Budget<br>(\$000) |
|---------------------------|------------------------|
| New Service/Revenue       | 83,438                 |
| System Upgrade            | 447,936                |
| Reliability & Maintenance | 499,755                |
| Customer Response         | 17,043                 |
| Other                     | 19,753                 |
| <b>Total</b>              | <b>1,067,924</b>       |

***12) Significant changes, if any, to the transmission and distribution inspection and maintenance programs previously submitted to the Commission.***

No significant changes were submitted in 2018.

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Transmission Programs & Procedures***

| <b>Program</b>                              | <b>Activity</b>                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Helicopter Inspections<br>– Routine         | Aerial linemen perform annual routine transmission line patrols from a helicopter. They identify damaged or deteriorated equipment. Engineers review the findings and develop plans for repair or replacement.                                                                                                                                                    |
| Helicopter Inspections<br>– Comprehensive   | Aerial linemen perform an overhead comprehensive inspection of transmission line facilities on a risk-based time cycle. Detailed condition reports with close up digital photos are prepared for each specific component problem found along the transmission line and right of way. Engineers review the findings and schedule corrective maintenance as needed. |
| Helicopter Inspections<br>– Emergency       | Aerial linemen perform patrols of transmission lines that operate abnormally. This inspection focuses on identifying damage that may have been caused by lightning, inclement weather, equipment failure or vandalism. Because of the nature of this work, corrective actions are usually expedited.                                                              |
| Field Inspections<br>– Emergency            | Line personnel perform emergency foot patrols to inspect transmission lines that operated abnormally. This inspection focuses on identifying damage that may have been caused by lightning, inclement weather, equipment failure or vandalism. Due to the nature of this damage, corrective actions are generally expedited.                                      |
| Steel Structure Inspection/Repair           | Personnel inspect steel structures at the ground line for corrosion, mechanical damage and foundation degradation. Structural components are coated, and repairs are made based on the findings of the inspections as necessary.                                                                                                                                  |
| Equipment Maintenance                       | During helicopter and foot patrols, equipment and facilities are identified that require repairs. Based on need and criticality, repairs are either scheduled or completed as soon as possible.                                                                                                                                                                   |
| Planned Replacement Programs                | Lightning arresters and avian guards are installed on targeted 69kV and 138kV facilities based on a data-driven risk analysis to improve reliability of worst performing circuits.                                                                                                                                                                                |
| Line Switches<br>– Maintenance & Inspection | Line personnel inspect, maintain, and perform operational tests on 138kV and 69kV transmission line switches to assure proper operation.                                                                                                                                                                                                                          |

## **Appendix A**

| <b>Program</b>       | <b>Activity</b>                                                                                                                                                                          |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Line Switch Upgrades | Transmission line switches are being programmatically upgraded to include motor operators to allow for remote sectionalizing that substantially improves switching times during outages. |
| Circuit Analysis     | Engineers analyze circuit loading and performance to identify areas needing increased line capacity or improved line reliability.                                                        |

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Substation Programs & Procedures***

| <b>Program</b>                            | <b>Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Load Survey                               | Automatic monitoring devices such as Supervisory Control and Data Acquisition (SCADA) provide continuous, real-time loading information. Engineers review equipment loading and identify facilities and transfer capabilities approaching capacity limits. A portion of the load may be supplied from a different source, the existing facilities may be upgraded, new lines and equipment may be added, or a new substation may be built to address capacity deficiencies.                                                                                        |
| Substation Inspection/Repair              | Electricians inspect substations for security and equipment reliability on a time based maintenance cycle. They attempt to identify and correct potential equipment problems before a failure or interruption of service occurs.                                                                                                                                                                                                                                                                                                                                   |
| Equipment Service                         | Electricians perform operational tests on power transformers, load tap changers (LTC), voltage regulators, circuit breakers, circuit switchers, vacuum switches, air break switches and transformer protective switches on a time based maintenance cycle to assure that equipment is operating within established parameters. Equipment serviced includes batteries, battery chargers, protective relays, HV fuses and high-speed automatic grounding switches. Depending on the type of equipment, "service" can include actions other than operational testing. |
| Inspection & Overhaul                     | Electricians inspect and overhaul circuit breakers, wave traps, ground switches, stick-operated disconnects, gang-operated disconnects and motor-operated disconnects on a time based maintenance cycle to assure proper operation.                                                                                                                                                                                                                                                                                                                                |
| Insulation Testing                        | Electricians perform power factor testing on power transformer, potential transformers, lightning arresters, current transformers, circuit breakers and power cables on a time based maintenance cycle. Testing also includes other instrument transformers (CCVTs, coupling capacitors, potential devices, etc.). They also perform high-potential testing on air and vacuum circuit breakers to assure proper operation.                                                                                                                                         |
| Condition Monitoring of Station Equipment | Technicians perform dissolved gas-in-oil, dielectric, oxygen, and oil acidity tests for oil in power transformers and impedance and capacity tests on station batteries to assure equipment is within normal parameters. Periodically, AC power factor tests, hi-potential tests, contact resistance tests and motion tests are performed on circuit breakers. Oil dielectric testing is conducted for oil circuit breakers.                                                                                                                                       |

## **Appendix B**

| <b>Program</b>                  | <b>Activity</b>                                                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Thermographic Inspections       | Technicians perform thermography surveys of substation facilities to identify components operating at elevated temperature. Based on the findings, engineers develop plans to repair or replace the component(s) prior to failure. |
| Minor Improvements              | Maintenance activities may identify conditions where additions or upgrades are needed to assure reliability. Engineers evaluate the need and develop action plans and schedules to complete the work.                              |
| DC Station Service Improvements | Repairmen identify deteriorated station batteries, battery chargers and battery components. Engineers schedule repair or replacement as necessary.                                                                                 |
| Capacitor Bank Protection       | Engineers monitor the need for synchronous closing schemes on vacuum switches on 69kv capacitor banks. They plan and schedule installations as needed.                                                                             |
| Area/Regional Supply            | Engineers develop specific projects aimed at improving capacity shortfalls or replacing deteriorated or substandard station equipment.                                                                                             |
| SCADA Replacement               | Engineers identify deteriorating substation SCADA equipment and develop plans to repair or replace it.                                                                                                                             |

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Appendix CPA PUBLIC UTILITY COMMISSION  
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Distribution Programs & Procedures***

| <b>Program</b>                                                                            | <b>Activity</b>                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Load Survey<br>– of equipment that is not continuously monitored                          | Line personnel measure the loading of facilities during peak periods. Engineers use this data for system studies.                                                                                                                                        |
| Load Survey<br>– by automatic monitoring devices                                          | Automatic monitoring devices such as SCADA provide continuous, real-time loading information. Operators use this data to assure that loads do not exceed design limits. Engineers use this data for system studies.                                      |
| Circuit Analysis                                                                          | Engineers analyze circuit voltage profiles to balance loads and to identify areas requiring voltage support to maintain required voltage at the customer facility.                                                                                       |
| Voltage Regulator<br>– Inspection & Maintenance                                           | Line personnel inspect existing equipment for potential failure, and inspect and maintain controls and tap changers to assure proper operation. Line personnel repair or replace any defective equipment.                                                |
| Overhead Line Switch<br>– Inspection & Maintenance                                        | Line personnel inspect switch installations to identify cracked or broken insulators / bushings, stuck or misaligned blades, insulation or gasket deterioration or other operational problems. Line personnel repair or replace any defective equipment. |
| Transformer Maintenance                                                                   | Engineers analyze customer usage data to identify overloaded transformers. Transformers that are heavily loaded are replaced with higher capacity units or part of the load is transferred to other nearby transformers.                                 |
| Wood Pole<br>– Inspection, Maintenance, Replacement, Trussing, Fiber Wrap (reinforcement) | Inspectors examine wood poles for deterioration and measure the degree of rot. Based on the results, the pole is either scheduled for a future inspection, reinforcement for extended life or replacement.                                               |
| Overhead Line Inspection                                                                  | Line inspectors examine overhead facilities to identify damaged, deteriorated or substandard equipment. Line personnel repair or replace any defective equipment. Includes visual and thermo-graphic inspections.                                        |
| Circuit Performance Review                                                                | Engineers use the PPL Electric's Circuit Performance Index to ascertain the need for additional circuit reviews / inspections.                                                                                                                           |

## **Appendix C**

| <b>Program</b>                                                              | <b>Activity</b>                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Underground Primary Cable<br>– Testing, Maintenance,<br>Replacement, Curing | Line personnel perform insulation and neutral tests on cable in residential developments with potential problems to identify deteriorated cable. Based on the results, the cable is placed back in service, repaired or replaced.                                                                     |
| LTN Maintenance                                                             | Electricians will inspect, service, maintain and overhaul LTN vaults, manholes, cables, transformers, low voltage network protectors and primary transformer disconnect switches. Based on results, defective equipment is either repaired or replaced.                                               |
| Public Damaged Facilities Review                                            | A program aimed at identifying the locations of facilities that have been damaged by public contact more than once. Technicians evaluate those installations and, if relocation is possible, schedule work to move the facilities.                                                                    |
| Underground Service Cable                                                   | Engineers resolve customer service problems that are due to deteriorated service conductors.                                                                                                                                                                                                          |
| Oil Circuit Reclosers                                                       | Line personnel replace in-service oil circuit reclosers on a time based maintenance cycle. Removed units are overhauled, tested and returned to service.                                                                                                                                              |
| Line Protection Equipment                                                   | Engineers perform load calculations to identify line protection devices that are approaching their capacity limits. Devices are replaced or upgraded to assure that they function properly.                                                                                                           |
| Capacitor Installation                                                      | Engineers perform voltage profiles to determine the need, location and size of any new voltage support equipment required to maintain adequate service voltage levels at customer facilities and provide needed reactive support for system stability. Line personnel install the required equipment. |
| Upgrade System Facilities                                                   | Engineers determine the need for additional capacity and design new and upgraded facilities to assure system reinforcements are constructed by the time they are needed.                                                                                                                              |

***PPL Electric Utilities Corporation  
Vegetation Programs & Procedures***

| <b>Program</b>        | <b>Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tree Pruning          | Tree pruning is scheduled based on field conditions observed and/or a system prioritization process. All pruning is done in accordance with <u>American National Standard for Tree Care Operations-Tree, Shrub and Other Woody Plant Maintenance – Standard Practices (ANSI A300)</u> . All circuits are fully trimmed on a 4 year cycle (south) or a 5 year cycle (north), with intermediate work performed on an as-needed basis. |
| Danger Tree Removal   | Trees located both within the right-of-way corridor and outside the right-of-way that may be a threat to line performance/ safety are removed when it is feasible to do so.                                                                                                                                                                                                                                                         |
| Herbicide Application | Tall-growing, undesirable vegetation growing within the rights-of-way corridors is selectively treated with herbicides. Low-growing vegetation that does not represent a hazard to the safe, reliable operation of PPL Electric's facilities is preserved wherever possible.                                                                                                                                                        |
| Reclearing            | Tall-growing, undesirable vegetation growing within the rights-of-way corridors is selectively removed in those situations where herbicides can't be utilized. Low-growing vegetation that does not represent a hazard to the safe, reliable operation of PPL Electric's facilities is preserved wherever possible.                                                                                                                 |

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### ***PPL Electric Utilities Corporation*** ***Service Interruption Definitions***

**Trouble Definitions:** After field investigations and repairs are complete, PPL Electric linemen report the cause of each case of trouble. The definitions of the cause codes appear below. Note that while internal codes allow vegetation caused outages to be separated into trimming related and not trimming related, these categories are generally merged for internal reporting purposes, and consistent with the response to question 4.

|                              |                  |                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Improper Design              | Controllable     | <ul style="list-style-type: none"> <li>When an employee or agent of PPL Electric is responsible for an error of commission or omission in the engineering or design of the distribution system.</li> </ul>                                                                                                                                                                        |
| Improper Installation        | Controllable     | <ul style="list-style-type: none"> <li>When an employee or agent of PPL Electric is responsible for an error of commission or omission in the construction or installation of the distribution system.</li> </ul>                                                                                                                                                                 |
| Improper Operation           | Controllable     | <ul style="list-style-type: none"> <li>When an employee or agent of PPL Electric is responsible for an error of commission or omission in the operation or maintenance of the distribution system.</li> </ul>                                                                                                                                                                     |
| Trees –Trimming Related      | Controllable     | <ul style="list-style-type: none"> <li>Outages resulting from conductors contacted by tree growth within the clearance zone defined by the current trimming specification (within the Right-of-Way).</li> </ul>                                                                                                                                                                   |
| Trees – Not Trimming Related | Non-Controllable | <ul style="list-style-type: none"> <li>Outages due to trees, but not related to lack of proper tree trimming maintenance. This includes danger timber blown into PPL Electric facilities, and trees or limbs felled by the public.</li> </ul>                                                                                                                                     |
| Animals                      | Controllable     | <ul style="list-style-type: none"> <li>Any outage caused by an animal directly or indirectly coming in contact with PPL Electric facilities. This includes birds, squirrels, raccoons, snakes, cows, etc.</li> </ul>                                                                                                                                                              |
| Vehicles                     | Public           | <ul style="list-style-type: none"> <li>When cars, trucks or other types of vehicles or their cargoes strike facilities causing a problem.</li> </ul>                                                                                                                                                                                                                              |
| Contact/Dig-in               | Public           | <ul style="list-style-type: none"> <li>When work in the vicinity of energized overhead facilities results in interruptions due to accidental contact by cranes, shovels, TV antennas, construction equipment (lumber, siding, ladders, scaffolding, roofing, etc.).</li> <li>When contact is made by a non-employee with an underground facility causing interruption.</li> </ul> |

## **Appendix E**

|                                                     |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment Failure                                   | Controllable     | <ul style="list-style-type: none"><li>• Outages resulting from equipment failures caused by corrosion or contamination from build-up of materials, such as cement dust or other pollutants.</li><li>• Outages resulting from a component wearing out due to age or exposure, including fuse tearing or breaking.</li><li>• Outages resulting from a component or substance comprising a piece of equipment failing to perform its intended function.</li><li>• Outages resulting from a failure that appears to be the result of a manufacturer's defect or cannot be described by any other code indicating the specific type of failure.</li></ul>                                                                                                    |
| Directed by Non-PPL Authority                       | Non-Controllable | <ul style="list-style-type: none"><li>• Interruptions under the control of a PPL Electric switchman or direction of a PPL Electric System Operator for the purpose of dropping load or isolating facilities upon request during emergency situations.</li><li>• Interruptions which cannot be postponed or scheduled for a later time, and include situations like load curtailment during system emergencies, and requests of civil authorities such as fire departments, police departments, civil defense, etc. for interruption of PPL Electric facilities.</li></ul>                                                                                                                                                                               |
| Other – Controllable (Lineman provides explanation) | Controllable     | <ul style="list-style-type: none"><li>• Interruptions caused by phase to phase or phase to neutral contacts, resulting from sleet or ice dropping off conductors, galloping conductors, or any other phase to phase or phase to neutral contact where weather is a factor.</li><li>• Interruptions resulting from excessive load that cause that facility to fail.</li><li>• When restoration of service to a facility, which had been interrupted for repairs or other reasons, causes an additional interruption to another facility which had not been involved in the initial interruptions.</li><li>• Controllable interruptions or Power Service Problems whose cause is not described by one of the previous controllable cause codes.</li></ul> |
| Nothing Found                                       | Non-Controllable | <ul style="list-style-type: none"><li>• When no cause for the interruption can be found.</li><li>• When there is no evidence of equipment failure, damage or contact after line patrol is completed. This could be the case during a period of heavy thunder and lightning, when a line fuse blows or a single phase OCR locks open.</li><li>• When closed for test, the fuse holds or the OCR remains closed. A patrol of the tap reveals nothing.</li></ul>                                                                                                                                                                                                                                                                                           |

## **Appendix E**

|                                                         |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Other Public (Lineman provides explanation)             | Public           | <ul style="list-style-type: none"><li>• All outages resulting from gunfire, civil disorder, objects thrown, or any other act intentionally committed for the purpose of disrupting service or damaging company facilities.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Other – Non-Controllable (Lineman provides explanation) | Non-Controllable | <ul style="list-style-type: none"><li>• Any outage occurring because of a fire, flood or a situation that develops as a result of a fire or flood. Do not use when facilities are de-energized at the request of civil authorities.</li><li>• When an interruption is caused by objects other than trees, such as kites, balls, model airplanes, roofing material, or fences, being accidentally blown or thrown into overhead facilities.</li><li>• All problems caused by contact of energized equipment with facilities of other attached companies or by trouble on customer owned equipment.</li><li>• Interruptions or Power Service Problems whose cause is not described by one of the previous non-controllable cause codes, but is not affected by a PPL Electric employee's decisions.</li></ul> |

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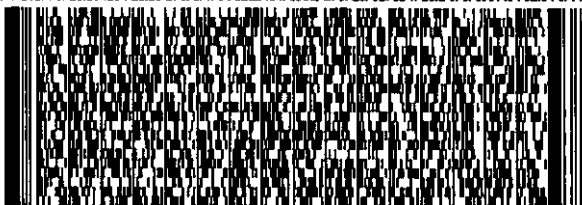
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