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E-FILE

April 30, 2020

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

**Re: PPL Electric Utilities Corporation
2019 Annual Reliability Report
Docket No. L-00030161**

Dear Ms. Chiavetta:

Enclosed for filing on behalf of PPL Electric Utilities Corporation ("PPL Electric") is PPL Electric's 2019 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, 2020, which is the date it was filed electronically with the Commission's E-Filing System.

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,

A handwritten signature in blue ink that reads "Kimberly A. Klock".

Kimberly A. Klock

Enclosures

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

Mr. Daniel Searfoorce
Mr. David Washko



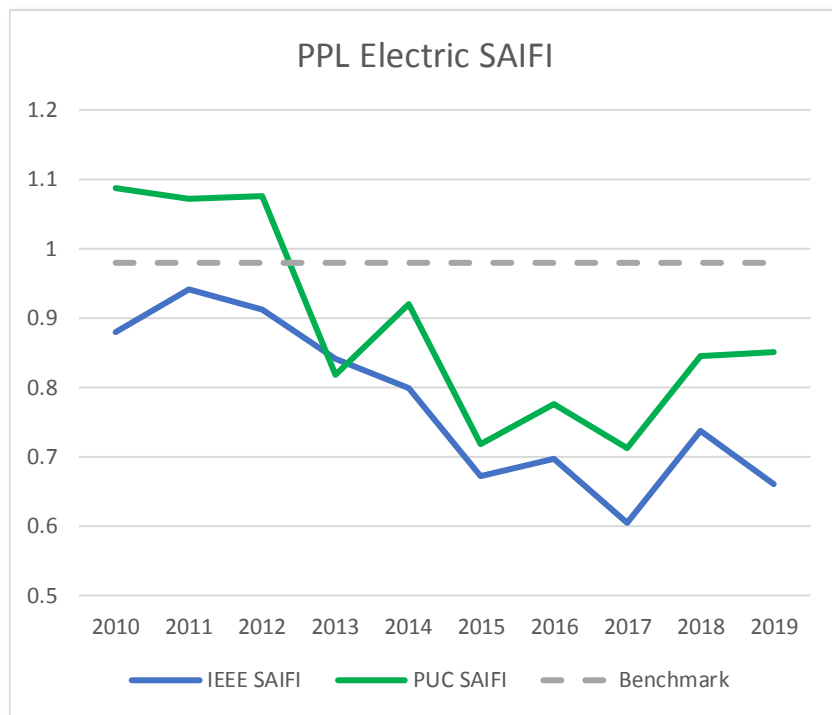
**PPL Electric Utilities Corporation
2019 Annual Reliability Report
to the
Pennsylvania Public Utility Commission**

May 1, 2020

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.***

SAIFI Performance

In 2019, PPL Electric customers continued to experience historically low levels of interruptions with PUC SAIFI at 0.85 (13% below PUC benchmark) and IEEE SAIFI at 0.66. 2019 IEEE SAIFI was the second best in company history with top quartile industry performance. Our continued focus around preventing customer interruptions through system automation, vegetation management and asset performance continues to directly support overall strong reliability results with over 260,000 customer outages eliminated in 2019 through automation. Customer outages have reduced by 30% since 2011 as shown in the SAIFI graph below.



PPL Electric Utilities continues to drive high levels of reliability performance through:

- Commitment to providing safe, reliable, affordable service to our customers.
- Extensive vegetation management program.
- Continued investment in distribution automation technology such as:
 - Multi and single-phase Smart Grid Initiative.
 - Increased leverage of our Automated Distribution Management System (ADMS).
 - Full implementation of Fault Isolation and System Restoration (FISR) technology automatically restoring more than 800,000 customers since 2015.

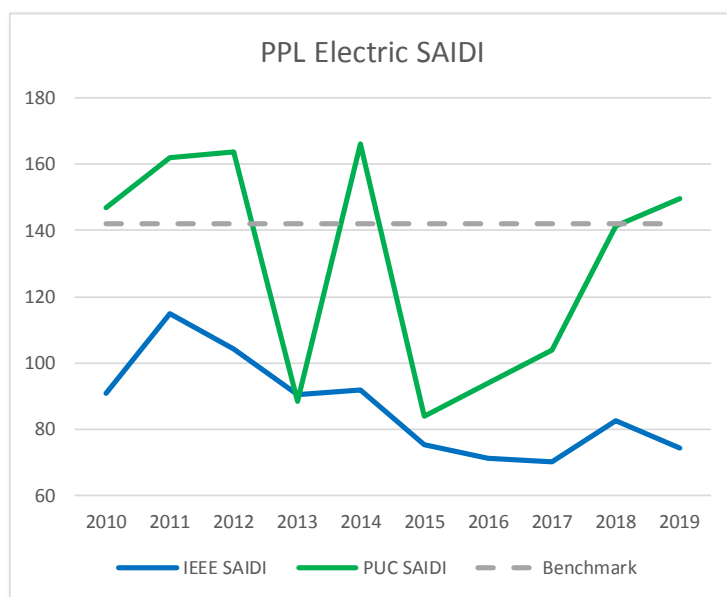
- Strategic data-driven reliability investments including asset replacement, system improvements that include storm hardening standards.
- An increased focus on remediating momentary outages before they become permanent outages.
- Continued focus on outage response improvements.

2019 results were achieved in a year of continued storm frequency and intensity. 2019 saw 10 reportable storms, which ties with 2017 and 2010 for the most on record in the PPL region. Wind gust magnitude and frequency were also at the highest levels for data going back to 2010.

PUC Storms (Major Events Excluded)					
Year	Non-Reportable	PUC Reportable	Total Storms	Customers Interrupted	IEEE Major Event Days
2014	11	5	16	294,917	3
2015	19	1	20	167,931	2
2016	20	4	24	266,922	4
2017	16	10	26	258,504	8
2018	17	5	22	305,482	9
2019	16	10	26	409,578	10

SAIDI Performance

For 2019 SAIDI performance was marginally higher at 6% above PUC benchmark as compared to 2018 as a result of increased storm wind levels and frequency of occurrence. IEEE SAIDI, which is more weather-normalized, shows 2019 SAIDI performance at 10% lower than 2018, and is indicative of the long-term core system performance improvement.



CAIDI Performance

In 2019 PUC CAIDI performance was 21% higher than the PUC benchmark. With the 2019 storms consistent with the last 3 years of higher frequency and greater magnitude, along with the automated system design in preventing and converting outages to momentary interruptions, the higher PUC CAIDI performance is not unexpected. However, a number of initiatives have been put into place to address CAIDI performance. These strategic areas include:

Optimize resource planning and scheduling

- Increase the impact of our system 1st responders
- Setting Restore vs. Repair strategy
- Resource Strategy - balancing resources and outage volume

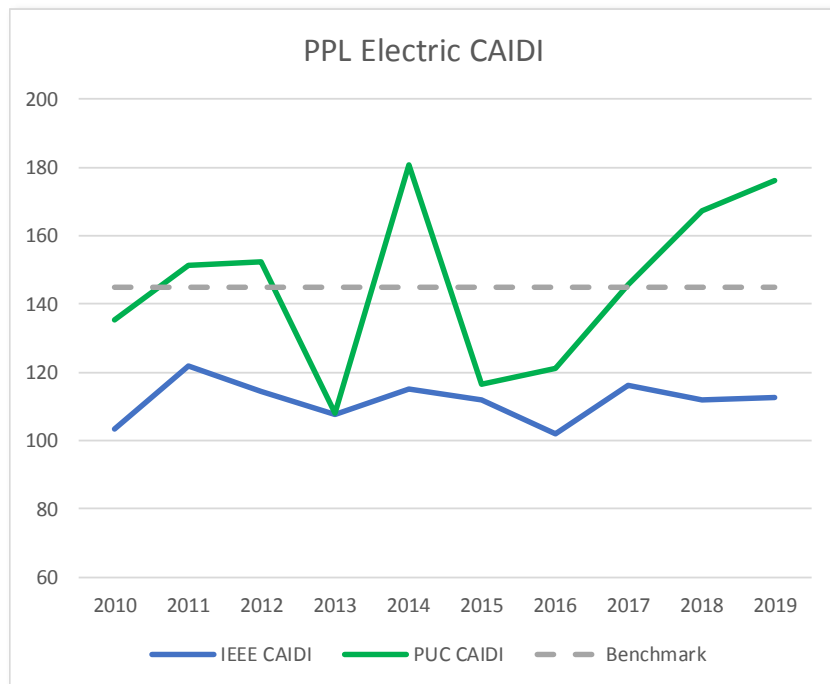
Smart Dispatching

- Leverage technology investments – AMI, ADMS, Smart Grid
- Resource Optimization

Storm Strategy

- Leverage technology for quicker assessment

An internal PPL Electric data review was also completed in 2019 to take into considered the impact to CAIDI based on PPL system automation (FISR), AMI data use, and the increase in storm frequency and intensity. This review determined the a “Net CAIDI” of 89.1 for 2019, significantly below the PUC benchmark of 145.



IEEE Metrics

Because weather has a significant impact to volatility in reliability metrics, PPL Electric's IEEE Metrics are shown below. The IEEE 1366 standard is a widely used methodology that allows for weather normalized performance evaluation that better reflects system performance during non-major storm events. PPL Electric is consistently a first quartile SAIFI performer, a first quartile SAIDI performer, and a second quartile CAIDI performer. The table below lists PPL Electric's IEEE performance metrics compared to the performance quartiles for large utilities nationally, as issued by the IEEE annual reliability survey. PPL Electric's continued focus on improving system reliability is directly related to its strong SAIFI performance.

	IEEE CAIDI	IEEE SAIFI	IEEE SAIDI
2017	116	0.60	70.0
2018	112	0.74	82.5
2019	113	0.66	74.3
IEEE First Quartile Ceiling	100	0.80	85
IEEE Second Quartile Ceiling	114	1.00	112

Reliability Programs

It is PPL Electric's continuing 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 and keep rates low for our customers. 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 helps prevent 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 identify damaged or deteriorated equipment that is repaired or replaced proactively. 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.

- 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.*

No major events occurred during 2019.

- 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.*

Year		2017	2018	2019¹	3 Yr. Avg.
SAIFI	BM 0.98	0.712	0.845	.850	.802
	STD 1.18	0.712	0.845	.850	.802
CAIDI	BM 145	145.6	167.1	176.1	162.9
	STD 174	145.6	167.1	176.1	162.9
SAIDI	BM 142	103.7	141.2	149.7	131.5
	STD 205	103.7	141.2	149.7	131.5
MAIFI		6.4	7.2	5.7	6.4
Customers Served²		1,417,978	1,422,558	1,429,035	1,423,190
Number of Sustained Customer Interruptions (Trouble Cases)		17,387	21,007	21,498	19,964
Number of Customers Affected³		1,009,767	1,201,596	1,214,856	1,142,073
Customer Minutes of Interruptions (CMI)		147,064,995	201,484,665	213,941,314	187,496,991
Number of Customer Momentary Interruptions		9,178,624	10,198,199	8,083,944	9,153,589

¹ Any slight variations from data provided previously are the result of error corrections.

² 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.

³ 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 2019.⁴ 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	Trouble Cases	Percent of Trouble Cases	Customer Interruptions	Percent of Customer Interruptions	Customer Minutes	Percent of Customer Minutes
Animals	3,193	14.9%	46,505	3.8%	2,913,916	1.4%
Contact/Dig-In	160	0.7%	11,657	1.0%	769,028	0.4%
Directed by Non-PPL Authority	98	0.5%	24,077	2.0%	1,368,128	0.6%
Equipment Failures	5,977	27.8%	332,999	27.4%	33,092,000	15.5%
Improper Design	1	0.0%	31	0.0%	295	0.0%
Improper Installation	2	0.0%	84	0.0%	8,024	0.0%
Improper Operation	18	0.1%	7,020	0.6%	108,073	0.1%
Nothing Found	1,031	4.8%	61,250	5.0%	5,171,686	2.4%
Other-Controllable	89	0.4%	9,040	0.7%	516,410	0.2%
Other-Non Control	230	1.1%	9,141	0.8%	1,125,518	0.5%
Other-Public	45	0.2%	9,538	0.8%	769,440	0.4%
Tree Related	9,957	46.3%	619,986	51.0%	159,254,046	74.4%
Vehicles	697	3.2%	83,528	6.9%	8,844,749	4.1%
Total	21,498	100.0%	1,214,856	100.0%	213,941,313	100.0%

⁴ 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 55% of cases, 64% of customer interruptions, and 83% of CMI.

Tree Related: PPL Electric has recently increased efforts to 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 15% 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 42% of the cases of trouble, 48% of the customer interruptions and 58% 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.*

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

52402 -- GREEN PARK 24-02

Remedial Actions

- In 2019, a single-phase sectionalizing device was installed.
- In 2019, additional animal guarding was installed.
- In 2019, a section of difficult-to-access single-phase was relocated.
- In 2019, 80 additional fuses were installed.
- In 2020, three sections of conductor were relocated, with three more to be relocated in 2020.
- In 2020, a second transmission source to the distribution substation will be constructed.
- In 2020, additional single-phase sectionalizing will be installed at two locations.
- In 2020, two sections of difficult-to-access conductor will be relocated.
- In 2020, multiple additional single-phase sectionalizing devices will be installed.
- In 2020, a Proactive Circuit Analysis will be performed.
- In 2021, one section of single-phase will be relocated to underground.
- In 2021 and 2022, two sections of single-phase will be reconducted.
- In 2022, two sections of single-phase will be resourced
- In 2022, full circuit vegetation maintenance will be performed.

55001 – Newport 50-01

Remedial Actions

- In 2019, a new Smart Grid device was installed.
- In 2019, a battery demonstration energy storage system was installed to study reliability benefits and voltage control.
- In 2019, three single-phase reclosers were installed, along with related fusing.
- In 2019, a substation conversion was performed.
- In 2019, protection coordination was evaluated.
- In 2019, additional single-phase sectionalizing was installed.
- In 2019, a drone and infrared inspection was performed. Several minor remediations will be performed in 2020 as a result.
- In 2020, an additional single-phase sectionalizer was installed.
- In 2020, single-phase sectionalizing devices will be installed at three locations.
- In 2020, full circuit tree trimming will be performed.
- In 2020, a section of single-phase will be resourced.
- In 2020, a Proactive Circuit Analysis will be performed.

- In 2020, a section of three-phase will be evaluated for relocation.
- In 2022, a section of single-phase will be reconductored.

56501 -- ROCKVILLE 65-01

Remedial Actions

- In 2019, full circuit tree trimming was performed.
- In 2019, voltage support devices were installed to increase tie capability.
- In 2019, an existing recloser was upgraded to a Smart Grid device.
- In 2020, additional animal guarding was installed at six locations with 12 more locations scheduled.
- In 2020, two new fuses were installed with seven more scheduled.
- In 2020, a section of line will be re-sourced.
- In 2020, an additional Smart Grid device will be installed.
- In 2020, an additional tie line will be installed.
- In 2020, two new Smart Grid devices will be evaluated.
- In 2020, three-phase reconductoring will be evaluated for this circuit.
- In 2020, a new substation will be evaluated.

59202 -- THOMPSONTOWN 92-02

Remedial Actions

- In 2019, a section of line was storm hardened with new conductor, upgraded poles, and static tree wire.
- In 2019, a Smart Grid device was installed.
- In 2019, an additional single-phase sectionalizing device was installed.
- In 2019, additional fusing was installed at two locations.
- In 2020, four single-phase sectionalizing devices will be installed.
- In 2020, a section of inaccessible conductor will be relocated.
- In 2020, additional fusing was installed, with more planned for 2020.
- In 2020, a three-phase protective device will be upgraded to a Smart Grid device.
- In 2020, a section of single-phase will be evaluated for reconductoring.
- In 2021, full circuit vegetation maintenance will be performed.
- In 2022, two locations of single phase will be relocated underground

26001 -- WEST DAMASCUS 60-01

Remedial Actions

- In 2019, 10 single-phase reclosers were installed.
- In 2019, 40 cross arms were replaced.
- In 2019, additional animal guarding was installed.
- In 2019, an additional Smart Grid device was installed.
- In 2020, seven additional single-phase reclosers will be installed.
- In 2020, settings were optimized on several reclosers.
- In 2020, multiple porcelain cutouts will be replaced.
- In 2020, multiple sections of conductor will be replaced.
- In 2020, additional animal guarding will be installed.
- In 2020, three reclosers will be replaced.
- In 2021, a battery solution will be installed to improve restoration time.

26601 -- BROOKSIDE 66-01

Remedial Actions

- In 2019, a single-phase recloser was installed.
- In 2019, several porcelain cutouts were replaced with polymer.
- In 2020, additional fusing will be installed at multiple locations.
- In 2020, full circuit vegetation maintenance will be performed.
- In 2020, an additional single-phase recloser will be installed.

26703 -- HEMLOCK FARMS 67-03

Remedial Actions

- In 2019, four single-phase reclosers were installed.
- In 2019, a new three-phase recloser was installed.
- In 2019, 27 overhead transformers were replaced.
- In 2019, additional fusing was installed.
- In 2020, 80 porcelain cutouts will be replaced.
- In 2020, full circuit vegetation maintenance will be performed.
- In 2020, an additional single-phase recloser will be installed.
- In 2021, an additional single-phase recloser will be installed.

28602 -- BLYTHEBURN 86-02

Remedial Actions

- In 2019, full circuit vegetation maintenance was performed.
- In 2019, an additional single-phase recloser was installed.
- In 2019, a section of difficult-to-access single-phase was relocated.
- In 2019, a Proactive Circuit Analysis was performed. As a result, several minor remediations will be performed.
- In 2020, an additional Smart Grid device was installed.
- In 2020, a drone patrol identified several minor items which will be remediated in 2020.
- In 2020, several span will be reconducted.
- In 2020, undergrounding will be evaluated for a section of heavily wooded conductor.
- In 2020, additional single-phase reclosers will be evaluated for this circuit.
- In 2020, off-cycle vegetation maintenance will be evaluated at the highest priority locations.
- In 2021, a three-phase section will be reconducted.
- In 2022, a three-phase tie line will be constructed.
- In 2023, a substation conversion will be performed.

40201 -- BEAR GAP 02-01

Remedial Actions

- In 2019, additional fusing was installed at eight locations.
- In 2020, three single-phase reclosers will be installed.
- In 2020, full circuit vegetation maintenance will be performed.
- In 2020, a section of existing conductor will be relocated and reconducted.
- In 2020, several sections of difficult-to-access conductor will be evaluated for relocation.
- In 2022, a section of conductor in a heavily wooded area will be rebuilt as underground.

40602 -- PINE GROVE 06-02

Remedial Actions

- In 2019, an additional Smart Grid device was installed.
- In 2019, an additional single-phase recloser was installed.
- In 2019, two poles were replaced.
- In 2019, ten additional locations received fusing.
- In 2019, a drone patrol was performed. As a result, several cross-arms, several splices, and a pole were replaced.

- In 2020, a section of single-phase line will be reconducted to three-phase, and the protection scheme will be upgraded.
- In 2020, an additional single-phase recloser will be installed.
- In 2021, full circuit vegetation maintenance will be performed.
- In 2022, a section of conductor in a heavily wooded area will be relocated.

41602 -- CLEVELAND 16-02

Remedial Actions

- In 2019, hazard tree removal was performed.
- In 2019, an existing recloser was upgraded to a Smart Grid device.
- In 2019, an additional Smart Grid device was installed.
- In 2019, a new single-phase recloser was installed.
- In 2020, additional single-phase reclosers will be evaluated.
- In 2020, reconductoring will be evaluated for a section of heavily wooded conductor.
- In 2020, a Proactive Circuit Review will be performed.
- In 2020, the CLEVELAND substation will be rebuilt.
- In 2021, aerial and Hendrix cable will be installed.
- In 2021, a section of single-phase conductor in a heavily wooded area will be undergrounded.

42701 -- AUGUSTAVILLE 27-01

Remedial Actions

- In 2019, two additional single-phase reclosers were installed.
- In 2019, a section of multi-phase conductor was replaced.
- In 2019, an additional Smart Grid device was installed.
- In 2020, full circuit vegetation maintenance will be performed.
- In 2020, a single-phase recloser will be installed.
- In 2020, a section of difficult-to-access conductor will be relocated.
- In 2020, an additional Smart Grid device will be installed.
- In 2020, an additional single-phase relocation will be evaluated.

43401 -- BENTON 34-01

Remedial Actions

- In 2019, an additional single-phase recloser was installed.
- In 2019, an additional Smart Grid device was installed.
- In 2019, a Proactive Circuit Analysis was performed. As a result, several minor remediations will be performed.

- In 2020, additional single-phase fusing will be installed.
- In 2020, full circuit vegetation maintenance will be performed.
- In 2021, two additional single-phase reclosers will be installed.

44301 -- BEAVERTOWN 43-01

Remedial Actions

- In 2019, a section of difficult-to-access single-phase was relocated.
- In 2019, additional fusing was installed on this circuit.
- In 2019, 40 poles were replaced.
- In 2021, two sections of three-phase conductor will be relocated.
- In 2021, two additional Smart Grid devices will be installed.
- In 2021, full circuit vegetation maintenance will be performed.

45302 -- WEST BERWICK 53-02

Remedial Actions

- In 2019, a recloser was replaced with a telemetric triple-single recloser.
- In 2020, a section of single-phase will be re-sourced.
- In 2020, two additional single-phase reclosers will be installed.
- In 2021, a section of difficult-to-access conductor will be relocated.
- In 2022, a section of difficult-to-access conductor will be relocated.

Circuit 45402 -- WEST BLOOMSBURG 54-02

Remedial Actions

- In 2019, numerous porcelain cutouts were replaced with polymer cutouts.
- In 2019, several additional locations received animal guarding.
- In 2020, additional fusing will be evaluated.
- In 2020, additional single-phase reclosers will be evaluated for this circuit.

45602 -- WOOLRICH 56-02

Remedial Actions

- In 2019, an additional Smart Grid device was installed.
- In 2019, additional animal guarding was installed.
- In 2019, a Proactive Circuit Analysis was performed. Several minor remediations will be performed in 2020 as a result.
- In 2020, a tie to the WOOLRICH 56-01 will be evaluated.
- In 2020, an additional single-phase sectionalizing device will be installed.
- In 2020, additional animal guarding will be installed.
- In 2020, additional fusing will be installed.
- In 2021, an additional single-phase recloser will be installed.

46206 -- DANVILLE 62-06

Remedial Actions

- In 2019, two additional single-phase reclosers were installed.
- In 2019, a section of single-phase conductor was rebuilt to underground.
- In 2019, a section of single-phase conductor was re-sourced.
- In 2019, multiple porcelain cutouts were replaced.
- In 2020, a tie to the DANVILLE 62-04 will be constructed.

46302 -- ROHRSBURG 63-02

Remedial Actions

- In 2019, an additional single-phase recloser was installed.
- In 2019, an additional Smart Grid device was installed.
- In 2019, full circuit vegetation maintenance was performed.
- In 2020, additional fusing will be installed.
- In 2021, a section of three-phase will be relocated.
- In 2021, a section of single-phase will be re-sourced.

47704 -- BLOOMSBURG 77-04

Remedial Actions

- In 2020, full circuit vegetation maintenance will be performed.
- In 2020, a Proactive Circuit Analysis will be performed.
- In 2021, two additional single-phase reclosers will be installed.
- In 2022, a section of single-phase will be relocated to underground.
- In 2022, a new substation will be constructed.

- 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	2019		Variance (%)
	Budget	Actual	
Transmission			
Transmission C-tag poles (# of structures)	661	821	24%
Transmission arm replacements (# of arms)	20	55	175%
Transmission air break switch inspections (# of switches)		5	
Transmission surge arrester installations (# of sets)		314	
Transmission structure inspections (# of activities)	37,069	37,154	0
Transmission tree side trim-Bulk Power (linear feet)			
Transmission herbicide-Bulk Power (# of acres)			
Transmission reclearing (# of miles) BES Only	627	627	0%
Transmission reclearing (# of miles) 69 kV	1,535	1,367	-11%
Transmission reclearing (# of miles) 138 kV	171	161	-6%
Transmission danger tree removals-Bulk Power (# of trees)			
Substation			
Substation batteries (# of activities)	481	694	2%
Circuit breakers (# of activities)	95	474	-1%
Substation inspections (# of activities)	1,775	1,819	0
Transformer maintenance (# of activities)	41	139	239%
Distribution			
Distribution C-tag poles replaced (# of poles)	3,940	2,991	-24%
C-truss distribution poles (# of poles)	1,498	1,498	0%
Capacitor (MVAR added)		15	
OCR Replacements (# of)	36	36	0%
Distribution pole inspections (# of poles)	90,000	12,144	-87%
Distribution line inspections (miles)	2,176	1,535	-29%
Group re-lamping (# of lamps)	13,434	8,331	-38%
Test sections of underground distribution cable		973	
Distribution tree trimming (# of miles)	5,540	5,642	2%
Distribution herbicide (# of acres)			
Distribution >18" removals within R/W (# of trees)			
Distribution hazard tree removals outside R/W (# of trees)			
LTN manhole inspections (# of)	448	416	-7%
LTN vault inspections (# of)	345	469	3%
LTN network protector overhauls (# of)	92	45	9.8%
LTN reverse power trip testing (# of)	33	25	-24%

Explanation of variances greater than 10%:

Transmission C Tag Poles: Scope identified as emergent, as well as projects identified that were able to be completed in year led to the actual number of structures replaced being greater than the budget number.

Transmission arm replacements: Arm replacements that were identified in year and deemed 'emergent' contributed to the actual being greater than the original budget number.

Transmission reclearing: Changes in execution strategy and transition to new planning contractor.

Transformer maintenance activities: Work scheduled for year-end 2018 was delayed into early 2019 due to resource reprioritization.

Distribution C Tag Poles: The work was prioritized to replace the critical poles based on resource availability and emergent and customer work.

Distribution Pole Inspections: The first full 10 year pole inspection program completed in 2019 coming in under budget; the next pole inspection cycle will resume in 2020.

Distribution Line Inspections: Inspections now performed via new technology (e.g. flying drones) implemented in late 2019. Delays experienced in program rollout but will be back on-track in 2020 with overall plan.

Group Relamping: Deferred to 2020 for higher priority work.

LTN Reverse Power Trip Testing: Work scheduled for year-end 2019 was delayed into 2020 due to resource reprioritization.

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, and includes the work identified in the response to Item (6).

Activity	2019 Budget (\$000)	2019 Actual (\$000)	Variance (%)
Provide Electric Service	6,771	6,710	-1%
Vegetation Management	42,944	44,602	4%
Customer Response	56,808	70,483	24%
Reliability Maintenance	41,575	28,450	-32%
System Upgrade	11,436	6,841	-40%
Customer Service/Accounts	111,016	98,930	-11%
Others	30,211	54,168	79%

Explanation of variances of 10% or greater:

Customer Response - No Lights and Power Service Problem activity higher than projections, including storm work classified as normal operations

Reliability Maintenance - Unitizing work and portfolio true-up of general unitized field work contributed to the lower costs.

System Upgrade - Lower than projected costs related to the Smart Meter Program and System Facilities Upgrade.

Customer Service/Accounts: Lower than projected costs related to customer support of Metering Services and Customer Care

Other - Work reprioritization to support portfolio achieving year end targets contributed to the higher 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 which includes transmission and distribution activities.

Activity	2019 Budget (\$000)	2019 Actual (\$000)	Variance (%)
New Service/Revenue	83,438	81,474	-2%
System Upgrade	447,106	456,835	2%
Reliability & Maintenance	500,584	487,120	-3%
Customer Response	17,043	32,714	92%
Other	19,753	17,846	-9.7%

Explanation of variances of 10% or greater:

Customer Response: Higher than projected driven by 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).

Inspection & Maintenance Goals/Objectives	2020 Budget
Transmission	
Transmission C-tag poles (# of poles)	509
Transmission arm replacements (# of sets)	24
Transmission air break switch inspections (# of switches)	2
Transmission lightning arrester installations (# of sets)	1,500
Transmission structure inspections (# of activities)	18,241
Transmission tree side trim-Bulk Power (linear feet)	NA
Transmission herbicide-Bulk Power (# of acres)	NA
Transmission reclearing (# of miles) BES Only	901
Transmission reclearing (# of miles) 69 kV	1,651
Transmission reclearing (# of miles) 138 kV	57
Transmission danger tree removals-Bulk Power (# of trees)	NA
Substation	
Substation batteries (# of activities)	1,058
Circuit breakers (# of activities)	99
Substation inspections (# of activities)	2,283
Transformer maintenance (# of activities)	1,378
Distribution	
Distribution C-tag poles replaced (# of poles)	1238
C-truss distribution poles (# of poles)	3,888
Capacitor (MVAR added)	1.5
OCR Replacements (# of)	0
Distribution pole inspections (# of poles)	69,900
Distribution line inspections (hours)	3,288
Group re-lamping (# of lamps)	24,100
Test sections of underground distribution cable	NA
Distribution tree trimming (# of miles)	5,261
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)	326
LTN vault inspections (# of)	361
LTN network protector overhauls (# of)	84
LTN reverse power trip testing (# of)	28

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 and includes the work identified in the response to Item (9).

Activity	2020 Budget (\$000)
Provide Electric Service	5,927
Vegetation Management	36,213
Customer Response	61,834
Reliability Maintenance	33,865
System Upgrade	7,235
Customer Service/Accounts	113,140
Others	38,045
Total O&M Expenses	296,259

11) Budgeted transmission and distribution capital expenditures for the current year 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 and includes transmission and distribution activities.

Activity	2020 Budget (\$000)
New Service/Revenue	95,015
System Upgrade	337,320
Reliability & Maintenance	567,236
Customer Response	26,857
Other	22,667
Total	1,049,095

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

In 2019, PPL EU requested and was granted permission for the following change:

- A change of the pole inspection cycle from every 10 years to every 12 years, with poles under 25 years of age inspected visually only.

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

Program	Activity
Helicopter Inspections – 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 – 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 – 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 – 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 – Maintenance & Inspection	Line personnel inspect, maintain, and perform operational tests on 138kV and 69kV transmission line switches to assure proper operation.

Appendix A

Program	Activity
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.

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

Program	Activity
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

Program	Activity
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.

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

Program	Activity
Load Survey – 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 – 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 – 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 – 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 – 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

Program	Activity
Underground Primary Cable – Testing, Maintenance, 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***

Program	Activity
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.

***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	• 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.
Improper Installation	Controllable	• 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.
Improper Operation	Controllable	• 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.
Trees –Trimming Related	Controllable	• Outages resulting from conductors contacted by tree growth within the clearance zone defined by the current trimming specification (within the Right-of-Way).
Trees – Not Trimming Related	Non-Controllable	• 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.
Animals	Controllable	• Any outage caused by an animal directly or indirectly coming in contact with PPL Electric facilities. This includes birds, squirrels, raccoons, snakes, cows, etc.
Vehicles	Public	• When cars, trucks or other types of vehicles or their cargoes strike facilities causing a problem.
Contact/Dig-in	Public	• 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.). • When contact is made by a non-employee with an underground facility causing interruption.

Appendix E

Equipment Failure	Controllable	• Outages resulting from equipment failures caused by corrosion or contamination from build-up of materials, such as cement dust or other pollutants. • Outages resulting from a component wearing out due to age or exposure, including fuse tearing or breaking. • Outages resulting from a component or substance comprising a piece of equipment failing to perform its intended function. • 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.
Directed by Non-PPL Authority	Non-Controllable	• 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. • 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.
Other – Controllable (Lineman provides explanation)	Controllable	• 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. • Interruptions resulting from excessive load that cause that facility to fail. • 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. • Controllable interruptions or Power Service Problems whose cause is not described by one of the previous controllable cause codes.
Nothing Found	Non-Controllable	• When no cause for the interruption can be found. • 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. • When closed for test, the fuse holds or the OCR remains closed. A patrol of the tap reveals nothing.

Appendix E

Other Public (Lineman provides explanation)	Public	• 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.
Other – Non-Controllable (Lineman provides explanation)	Non-Controllable	• 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. • 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. • All problems caused by contact of energized equipment with facilities of other attached companies or by trouble on customer owned equipment. • 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.