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E-FILE

April 30, 2021

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

M-2016-2522508-AEL-4/30/21

Re: PPL Electric Utilities Corporation
2020 Annual Reliability Report
Docket No. [redacted]

Dear Ms. Chiavetta:

Enclosed for filing on behalf of PPL Electric Utilities Corporation ("PPL Electric") is PPL Electric's 2020 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, 2021, 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 Nikki Jones, PPL Electric's Director of Public Affairs at (717) 603-4029.

Respectfully submitted,

Kimberly A. Klock

Enclosures

cc via email: Tanya J. McCloskey, Esquire
Steven Gray, Esquire
Mr. Daniel Searfoorce
Mr. John Van Zant

PPL Electric Utilities Corporation
2020 Annual Reliability Report
to the
Pennsylvania Public Utility Commission

April 30, 2021

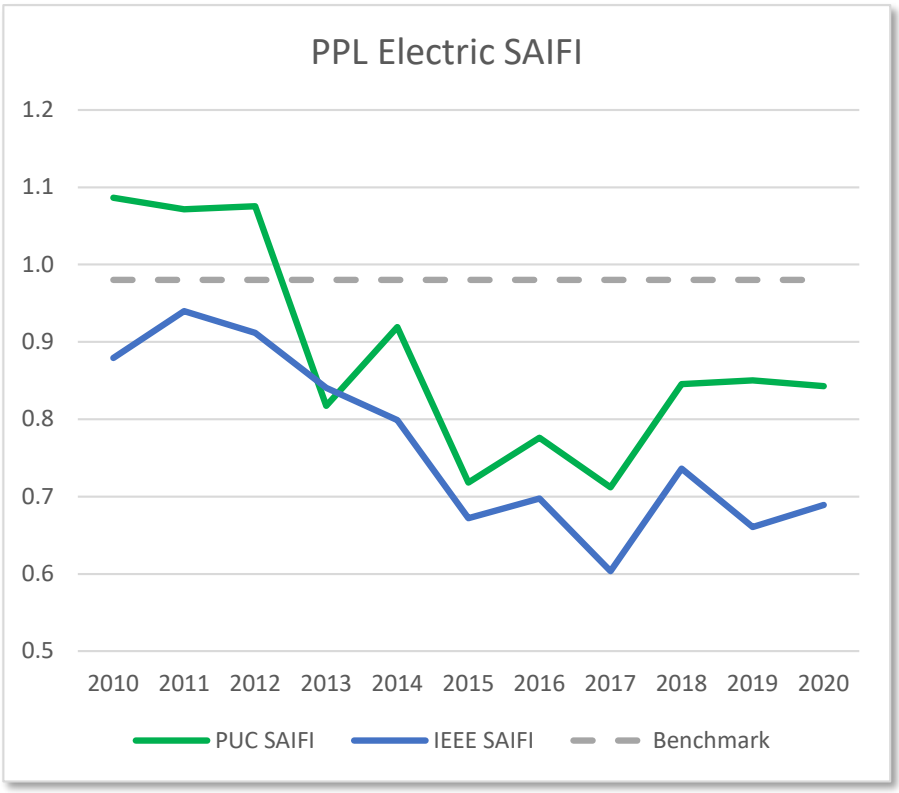
1) An overall current assessment of the state of the system reliability in the EDC's service territory including a discussion of the EDC's current programs and procedures for providing reliable electric service.

SAIFI Performance

In 2020, PPL Electric customers continued to experience top quartile industry reliability. PUC SAIFI finished at 0.84, or 14% below PUC benchmark, an improvement over 2019 and our best performance since 2017.

IEEE SAIFI finished at 0.69 which was the fourth best in company history, and top quartile industry performance among large electric utilities nationally.

Our ongoing focus around preventing customer interruptions through system automation, vegetation management and asset performance continues to directly support overall strong reliability results, with over 200,000 customer outages eliminated in 2020 through automation. This level of SAIFI performance is directly related to our high levels of customer satisfaction, with outages being reduced by 27% since 2011 as shown in the SAIFI graph below.



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

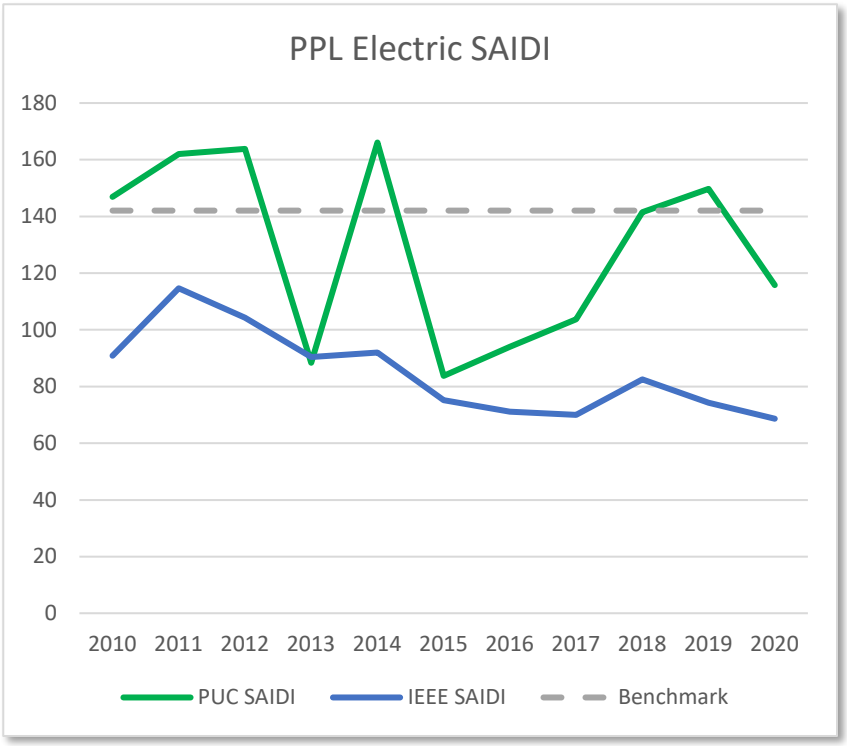
- Commitment to providing safe, reliable, affordable service to our customers.
- Extensive vegetation management program.
- Continued investment in distribution automation technology such as:
  - Multi and single-phase Smart Grid Initiative.
  - Increased leverage of our Automated Distribution Management System (ADMS).
  - Full implementation of Fault Isolation and System Restoration (FISR) technology automatically restoring more than one million customers since 2015.
- Strategic data-driven reliability investments including asset replacement, and system improvements that include storm hardening standards.
- An increased focus on remediating momentary outages before they become permanent outages.
- Continued focus on outage response improvements.

2020 results were achieved in a year of continued storm frequency and intensity. 2020 saw a recent peak of 27 total storms, which is second only to the 28 events of 2006. There were also less IEEE excludable days than during the prior two years. NOAA average severe wind gust magnitude for Pennsylvania was at the highest level since 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	264,998	4
2017	16	10	26	258,504	8
2018	17	5	22	305,482	9
2019	16	10	26	409,578	10
2020	19	8	27	460,733	8

SAIDI Performance

2020 PUC SAIDI performance saw a 23% improvement over 2019 performance and was well within PUC benchmark. IEEE SAIDI, which is more weather-normalized, shows 2020 SAIDI performance at the best on record, and is indicative of the long-term core system performance improvement.



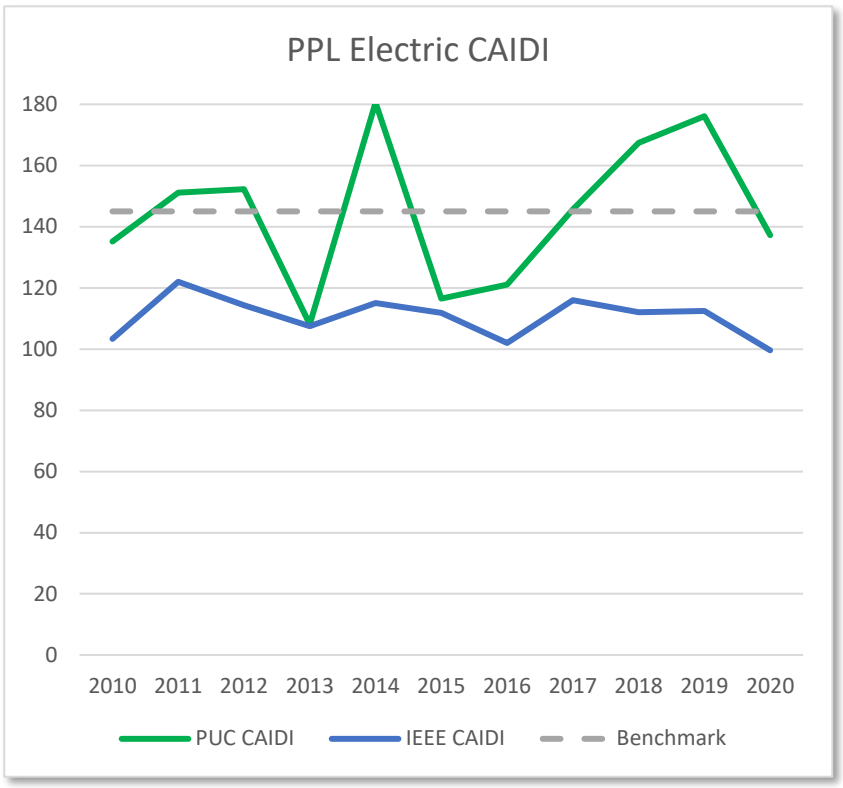
CAIDI Performance

In 2020 PUC CAIDI performance was 22% improved over 2019, and 5% below the PUC benchmark. Our more weather normalized IEEE CAIDI was under 100, and the best ever achieved.

With 2020 storms consistent with the last 4 years of higher frequency and greater magnitude, along with the automated system design in preventing and converting outages to momentary interruptions, higher un-weather normalized CAIDI values are not unexpected. However, a number of initiatives have been put into place that have begun to improve CAIDI performance. These strategic areas include:

Optimize resource planning and scheduling:

- Increase the impact of our system first 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



IEEE Metrics

PPL Electric's IEEE Metrics are shown below. Note that weather events during 2020 had an impact on the volatility of our reliability metrics. 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 most recently a first 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
2020	99.6	0.69	68.6
IEEE First Quartile Ceiling	103	0.85	85
IEEE Second Quartile Ceiling	110	1.01	107

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 2020.

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		**2018**	**2019**	**2020[1]**	**3 Yr. Avg.**
SAIFI	BM 0.98	0.845	0.85	0.84	0.846
	STD 1.18	0.845	0.85	0.84	0.846
CAIDI	BM 145	167.1	176.1	137.3	160.2
	STD 174	167.1	176.1	137.3	160.2
SAIDI	BM 142	141.2	149.7	115.7	135.5
	STD 205	141.2	149.7	115.7	135.5
MAIFI		7.2	5.7	5.3	6.1
Customers Served[2]		1,422,558	1,429,035	1,438,204	1,429,932
Number of Sustained Customer Interruptions (Trouble Cases)		21,007	21,498	20,877	21,127
Number of Customers Affected		1,201,596	1,214,856	1,212,136	1,209,529
Customer Minutes of Interruptions (CMI)		201,484,665	213,941,314	166,414,603	193,946,861
Number of Customer Momentary Interruptions		10,198,199	8,083,944	7,639,856	8,640,666

[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.

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 2020. 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
Animals	3,918	18.8%	55,368	4.6%	3,246,630	2.0%
Contact / Dig-In	183	0.9%	23,246	1.9%	1,140,267	0.7%
Directed by Non-PPL Authority	72	0.3%	10,991	0.9%	911,458	0.5%
Equipment Failures	5,223	25.0%	370,770	30.6%	32,645,494	19.6%
Improper Design	2	0.0%	295	0.0%	22,885	0.0%
Improper Installation	4	0.0%	1,799	0.1%	85,944	0.1%
Improper Operation	13	0.1%	6,021	0.5%	1,019,615	0.6%
Nothing Found	1,013	4.9%	55,483	4.6%	4,021,673	2.4%
Other Controllable	88	0.4%	23,973	2.0%	418,660	0.3%
Other Non-Control	210	1.0%	27,799	2.3%	3,424,408	2.1%
Other Public	30	0.1%	6,267	0.5%	246,400	0.1%
Tree Related	9,353	44.8%	509,559	42.0%	108,127,529	65.0%
Unknown	1	0.0%	426	0.0%	613,423	0.4%
Vehicles	767	3.7%	120,139	9.9%	10,490,216	6.3%
Total	**20,877**	**100.0%**	**1,212,136**	**100.0%**	**166,414,603**	**100.0%**

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 49% of cases, 55% of customer interruptions, and 72% 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 21% 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 76% 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 37% of the cases of trouble, 47% of the customer interruptions and 45% 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.

Eleven PPL Electric circuits have been on the worst performing circuit list for a year or more, down from twenty in 2019.

41602 -- CLEVELAND 16-02

Remedial Actions

- In 2019, a single-phase recloser was installed.
- In 2019, a new Smart Grid device was installed.
- In 2020, a Proactive Circuit Analysis was performed.
- In 2020, multiple cross arms and transformer cutouts were replaced as the result of the Proactive Circuit Analysis.
- In 2020, hot spot trimming was performed on this circuit.
- In 2021, multiple porcelain cutouts will be replaced.
- In 2021, an additional sectionalizing device will be installed.
- In 2022, full circuit trimming will be performed.

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, an additional single-phase recloser was installed.
- In 2020, a section of single-phase line was reconductored to three-phase, and the protection scheme was upgraded.
- In 2021, full circuit trimming will be performed.
- In 2021, an additional Smart Grid device will be installed on this circuit.
- In 2021, five additional fuses will be installed.
- In 2022, a section of difficult-to-access single-phase will be relocated.
- In 2022, an additional single-phase recloser will be installed.

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. Since that time, it has operated once, saving 2,724 customer minutes.
- In 2019, three single-phase reclosers were installed, along with related fusing.
- In 2019, a substation conversion was performed.
- In 2019, additional single-phase sectionalizing was installed.
- In 2020, three single-phase reclosers were installed.
- In 2020, three fuses were installed.
- In 2020, full circuit trimming was performed.
- In 2020, a section of single-phase was resourced.
- In 2020, a Proactive Circuit Analysis was performed with several minor remediations implemented.
- In 2021, an additional single-phase recloser was installed.
- In 2021, six additional fuses will be installed.
- In 2022, a section of three-phase conductor in a heavily wooded area will be relocated.
- In 2022, a section of single-phase will be reconductored.

52401 -- GREEN PARK 24-01

Remedial Actions

- In 2019, two fuses were installed.
- In 2019, two single-phase reclosers were installed.
- In 2020, multiple hazard trees were removed.
- In 2020, three single-phase reclosers were installed.
- In 2020, a transmission upgrade was completed.
- In 2021, five additional fuses will be installed.
- In 2021, protective device coordination will be reviewed.
- In 2021, a single-phase relocation will be evaluated.
- In 2022, full circuit trimming will be performed.
- In 2022, three sections of single-phase will be relocated.
- In 2022, a section of single-phase will be reconductored.
- In 2022, additional sectionalizing devices will be installed.
- In 2022, an additional Smart Grid device will be installed.

56501 -- ROCKVILLE 65-01

Remedial Actions

- In 2019, full circuit tree trimming was performed.
- In 2019, voltage support devices were installed.
- In 2019, an existing recloser was upgraded to a Smart Grid device.
- In 2020, 18 locations received animal guarding.
- In 2020, nine new fuses were installed.
- In 2020, ten new single-phase reclosers were installed and will have protection settings optimized in 2021.
- In 2020, three new Smart Grid devices were evaluated and will be installed in 2023.
- In 2021, an additional Smart Grid device was installed.
- In 2021, an additional tie line was installed.
- In 2021, a new substation and three-phase reconductoring will be evaluated.
- In 2021, a section of line was re-sourced.
- In 2021, sections of single-phase and three-phase will be reconductored.

40201 -- BEAR GAP 02-01

Remedial Actions

- In 2019, additional fusing was installed at eight locations.
- In 2020, a single-phase recloser was replaced.
- In 2020, additional fusing was installed at four locations.
- In 2020, full circuit trimming was performed.
- In 2020, a section of existing conductor was relocated and reconductored.
- In 2021, six single-phase reclosers will be installed.
- In 2021, a single-phase recloser will be replaced.
- In 2022, a section of conductor in a heavily wooded area will be undergrounded.

25801 – SULLIVAN TRAIL 58-01

Remedial Actions

- In 2020, an off-cycle drone inspection was performed with several minor remediations performed as a result.
- In 2021, two additional single-phase reclosers were installed on this circuit with another scheduled.
- In 2021, a section of three-phase will be reconductored.
- In 2021, a section of three-phase conductor will be extended.
- In 2021, full circuit trimming will be performed.

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, five sections of conductor were relocated.
- In 2020, a second transmission source to the distribution substation was constructed.
- In 2020, six single-phase sectionalizing devices were installed.
- In 2020, a Proactive Circuit Analysis was performed, several future remediations were identified as a result.
- In 2020, additional animal guarding was installed.
- In 2020, additional fusing was installed.
- In 2021, an additional section of single-phase will be relocated overhead.
- In 2021, a new line and terminal and three-phase tie will be evaluated.
- In 2021, full circuit trimming will be performed.
- In 2021, additional reconductoring and relocation will be evaluated for six sections of line.
- In 2021, one section of single-phase will be relocated to underground.
- In 2021, additional animal guarding will be installed.
- In 2021, one section of single-phase will be reconductored.
- In 2021, expanded trimming right-of-way will be sought for this circuit.
- In 2022, an additional section of single-phase will be reconductored.
- In 2022, two sections of single-phase will be re-sourced to reduce exposure.
- In 2023, a substation upgrade will be performed.

59002 -- MIFFLINTOWN 90-02

Remedial Actions

- In 2019, two single-phase sectionalizing devices were installed.
- In 2019, additional animal guarding was installed.
- In 2019, additional single-phase fusing was installed.
- In 2020, an additional single-phase recloser was installed.
- In 2020, additional single-phase fusing was installed.
- In 2020, additional animal guarding was installed.
- In 2020, a new line and terminal at MIFFLINTOWN substation was installed.
- In 2020, an additional single-phase recloser will be evaluated.
- In 2021, an additional single-phase recloser will be installed.
- In 2021, full circuit trimming will be performed.
- In 2021, a recloser will be evaluated for replacement and modification to single-phase tripping operation.

56504 -- ROCKVILLE 65-04

Remedial Actions

- In 2019, multiple single-phase sectionalizing devices were installed.
- In 2020, eight fuses were installed.
- In 2020, 150 hazard trees were removed.
- In 2020, seven single-phase sectionalizing devices were installed.
- In 2021, additional animal guards will be installed.
- In 2021, additional fusing will be installed.
- In 2022, a section of single-phase will be relocated underground.
- In 2022, five additional single-phase reclosers will be installed.

21206 -- EAST CARBONDALE 12-06

Remedial Actions

- In 2019, the protection settings for this circuit were reviewed. Several minor remediations were performed.
- In 2019, dissimilar metal connections were remediated at two locations.
- In 2020, two Smart Grid devices were replaced.
- In 2020, dissimilar metal connections were remediated at three locations.
- In 2020, full circuit trimming was performed.
- In 2021, multiple porcelain cutouts will be replaced.
- In 2021, additional animal guarding will be installed.
- In 2021, a section of this circuit will be re-sourced, and additional sectionalizing will be installed.
- In 2022, additional single-phase reclosers will be installed.

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	2020		Variance (%)
	Budget	Actual	
Transmission			
Transmission C-tag poles (# of structures)	686	686	0.0%
Transmission arm replacements (# of arms)	56	56	0.0%
Transmission air break switch inspections (# of switches)	5	5	0.0%
Transmission surge arrester installations (# of sets)	1,500	1,538	2.5%
Transmission structure inspections (# of activities)	18,241	18,492	1.4%
Transmission tree side trim-Bulk Power (linear feet)	N/A	31,678	
Transmission herbicide-Bulk Power (# of acres)	N/A	2,085	
Transmission reclearing (# of miles) BES Only	844	844	0.0%
Transmission reclearing (# of miles) 69 kV	1,584	1,584	0.0%
Transmission reclearing (# of miles) 138 kV	91	91	0.0%
Transmission danger tree removals-Bulk Power (# of trees)	N/A	1,514	
Substation			
Substation batteries (# of activities)	1,102	1,086	-1.5%
Circuit breakers (# of activities)	98	86	-12.2%
Substation inspections (# of activities)	2,281	2,258	-1.0%
Transformer maintenance (# of activities)	1,410	328	-9.6%
Distribution			
Distribution C-tag poles replaced (# of poles)	1,294	1,240	-4.2%
C-truss distribution poles (# of poles)	4,030	4,030	0.0%
Capacitor (MVAR added)	1.2	0	-100.0%
OCR Replacements (# of)	0	0	0.0%
Distribution pole inspections (# of poles)	67,988	67,988	0.0%
Distribution line inspections (miles)	3,288	3,288	0.0%
Group re-lamping (# of lamps)	24,100	8,687	-64.0%
Test sections of underground distribution cable	NA	608	
Distribution tree trimming (# of miles)	5,089	5,069	-0.4%
Distribution herbicide (# of acres)	N/A	1,612	
Distribution >18” removals within R/W (# of trees)	N/A		
Distribution hazard tree removals outside R/W (# of trees)	NA	25,012	
LTN manhole inspections (# of)	323	274	-15.2%
LTN vault inspections (# of)	356	340	-4.5%
LTN network protector overhauls (# of)	85	58	-31.8%
LTN reverse power trip testing (# of)	36	28	-22.2%

Explanation of variances greater than 10%:

Circuit Breakers (# of Activities): Some circuit breaker maintenance jobs with a low reliability impact were deferred to 2021.

Capacitor (MVAR Added): Difference is due to capacitors covered under replacement being included in the initial projection, thus overstating the projected quantity of capacitors to be added onto the system. This has since been corrected.

Group Re-lamping (# lamps): Deferred for higher priority work.

LTN Manhole Inspections (# of): Some manhole inspections were deferred to 2021 for scheduling optimization purposes.

LTN Network Protector overhauls (# of): Some network protector overhaul jobs with a low reliability impact were deferred to 2021.

LTN Reverse Power Trip Testing (# of): Some reverse power trip jobs with a low reliability impact were deferred to 2021.

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	2020 Budget ($000)	2020 Actual ($000)	Variance (%)
Provide Electric Service	5,927	6,755	14%
Vegetation Management	36,213	37,424	3%
Customer Response	61,834	66,102	7%
Reliability Maintenance	33,865	28,669	-15%
System Upgrade	7,235	5,013	-31%
Customer Service/Accounts	113,140	80,790	-29%
Others	38,045	54,908	44%

Explanation of variances of 10% or greater:

Provide Electric Service – 2020 service requests were higher than projections.

Reliability Maintenance - Lower volume of group re-lamping and substation emergency repairs contributed to lower costs.

System Upgrade - Lower than projected costs related to System Facilities Upgrade.

Customer Service/Accounts - Lower than projected costs related to customer support of Metering Services, Customer Care and Revenue Cycle Service.

Other – Higher than projected driven by project write-offs.

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	2020 Budget ($000)	2020 Actual ($000)	Variance (%)
New Service/Revenue	95,015	92,097	-3%
System Upgrade	337,320	331,634	-2%
Reliability & Maintenance	567,236	573,184	1%
Customer Response	26,857	35,376	32%
Other	22,667	11,021	-51%

Explanation of variances of 10% or greater:

Customer Response - Higher than projected driven by storm costs.

Other - Lower than projected driven by timing adjustment of Revenue Cycle Service assets and Vehicle delivery delays.

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	2021 Budget
Transmission	
Transmission C-tag poles (# of poles)	65
Transmission arm replacements (# of sets)	8
Transmission air break switch inspections (# of switches)	0
Transmission surge arrester installations (# of sets)	N/A
Transmission structure inspections (# of activities)	12,564
Transmission tree side trim-Bulk Power (linear feet)	NA
Transmission herbicide-Bulk Power (# of acres)	NA
Transmission reclearing (# of miles) BES Only	539
Transmission reclearing (# of miles) 69 kV	998
Transmission reclearing (# of miles) 138 kV	80
Transmission danger tree removals-Bulk Power (# of trees)	N/A
Substation	
Substation batteries (# of activities)	1,032
Circuit breakers (# of activities)	1,545
Substation inspections (# of activities)	2,058
Transformer maintenance (# of activities)	413
Distribution	
Distribution C-tag poles replaced (# of poles)	3083
C-truss distribution poles (# of poles)	N/A
Capacitor (MVAR added)	0
OCR Replacements (# of)	1
Distribution pole inspections (# of poles)	74,500
Distribution line inspections (miles)	2,200
Group re-lamping (# of lamps)	16,140
Test sections of underground distribution cable	NA
Distribution tree trimming (# of miles)	5,848
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)	519
LTN vault inspections (# of)	318
LTN network protector overhauls (# of)	69
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	2021 Budget ($000)
Provide Electric Service	6,239
Vegetation Management	36,696
Customer Response	61,140
Reliability Maintenance	25,438
System Upgrade	3,625
Customer Service/Accounts	119,095
Others	39,453
Total O&M Expenses	**291,687**

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	2021 Budget ($000)
New Service/Revenue	95,137
System Upgrade	188,825
Reliability & Maintenance	422,424
Customer Response	28,711
Other	22,271
Total	**757,367**

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

No significant changes were requested.

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Appendix A

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.

Appendix B

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.

Appendix C

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	Inspectors examine 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	Inspectors examine 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	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.

Program	Activity
Underground Primary Cable – Testing, Maintenance, Replacement, Curing	Inspectors 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 condition based maintenance cycle. Removed units may be overhauled, tested and returned to service based on condition.
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.

Appendix D

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 American National Standard for Tree Care Operations-Tree, Shrub and Other Woody Plant Maintenance – Standard Practices (ANSI A300). All circuits are fully trimmed on a 5 year cycle, 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.

Appendix E

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.

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.

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.