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**FEDERAL EXPRESS**

January 29, 2016

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

**RECEIVED**

JAN 29 2016

PA PUBLIC UTILITY COMMISSION  
SECRETARY'S BUREAU

**Re: PPL Electric Utilities Corporation  
Quarterly Reliability Report for the  
Period Ended December 31, 2015  
Docket No. L-00030161**

M-2016-2522508

Dear Ms. Chiavetta:

Enclosed for filing on behalf of PPL Electric Utilities Corporation ("PPL Electric") is an original of PPL Electric's Quarterly Reliability Report for the Period Ended December 31, 2015. Also enclosed, in a sealed envelope, is a copy of the report containing competitively sensitive and proprietary information. The Company hereby requests that the Commission treat that information, and the report containing the information, as privileged and confidential. The report is being filed pursuant to 52 Pa. Code § 57.195(d).

Pursuant to 52 Pa. Code § 1.11, the enclosed document is to be deemed filed on January 29, 2016, which is the date it was deposited with an overnight express delivery service as shown on the delivery receipt attached to the mailing envelope.

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

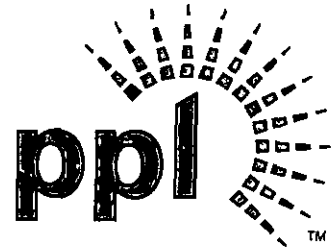
If you have any questions regarding this document, please call me or B. Kathryn Frazier, PPL Electric's Regulatory Affairs Manager at (610) 774-3372.

Very truly yours,

Paul E. Russell

Enclosures

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



**PPL Electric Utilities**

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

*February 2016*

**RECEIVED**

**JAN 29 2016**

**PA PUBLIC UTILITY COMMISSION  
SECRETARY'S BUREAU**

- 1) *A description of each major event that occurred during the preceding quarter, 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.*

There were no major events during the fourth quarter of 2015.

- 2) **Rolling 12-month reliability index values (SAIFI, CAIDI, SAIDI, and if available, MAIFI) for the EDC's service territory for the preceding quarter. 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 report shall also include the number of customer momentary interruptions.**

The following table provides data for the 12 months ending December 31, 2015<sup>1</sup>.

SAIFI (Benchmark = 0.98; Rolling 12-month Std. = 1.18)	0.72
CAIDI (Benchmark = 145; Rolling 12-month Std. = 174)	118
SAIDI (Benchmark = 142; Rolling 12-month Std. = 205)	84
MAIFI <sup>2</sup>	4.2
Average Number of Customers Served <sup>3</sup>	1,405,701
Number of Sustained Customer Interruptions (Trouble Cases)	14,973
Number of Customers Affected <sup>4</sup>	1,007,983
Customer Minutes of Interruptions (CMI)	118,547,919
Number of Customer Momentary Interruptions	5,886,251

During the fourth quarter, there were no (0) PUC major events, no (0) PUC reportable storm, and four (4) other storms that required the opening of one or more area emergency centers to manage restoration efforts.

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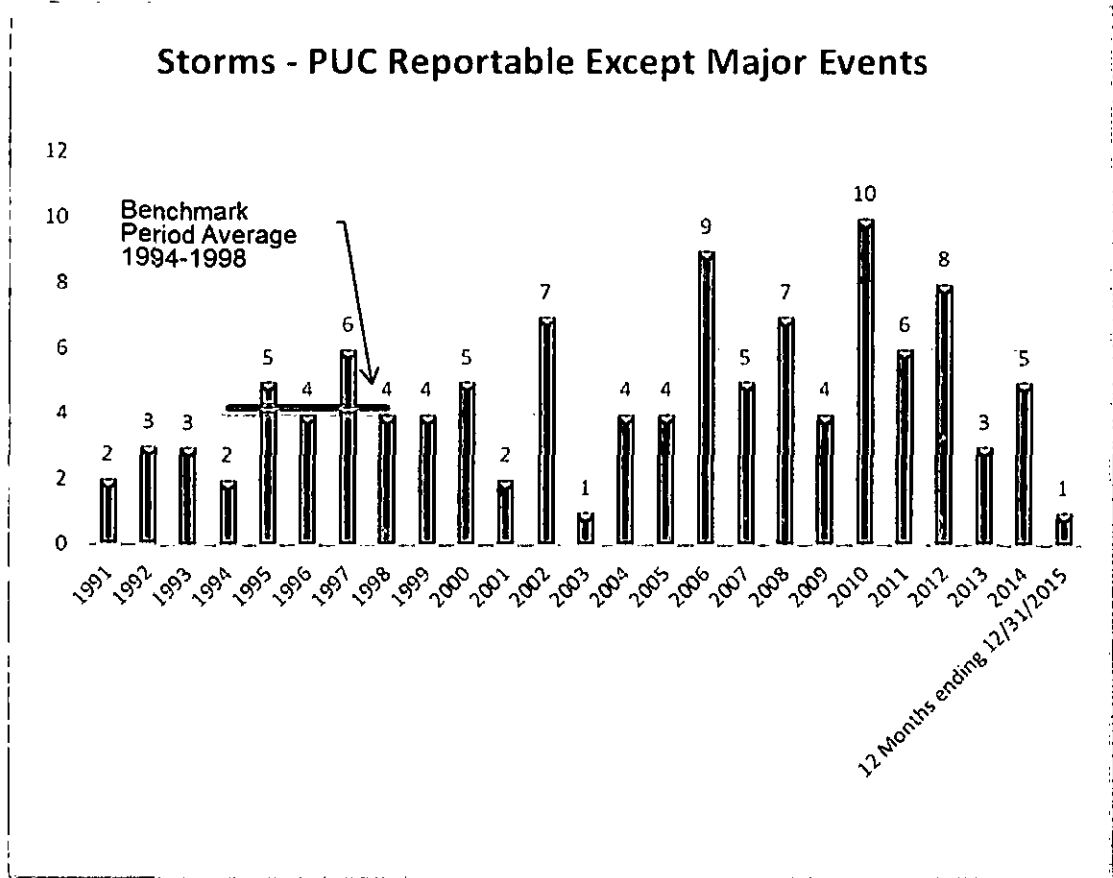
<sup>1</sup> Non-PPL Electric problems are excluded here, but may be found in Item 5.

<sup>2</sup> MAIFI data is obtained at the substation breaker level and at certain reclosers.

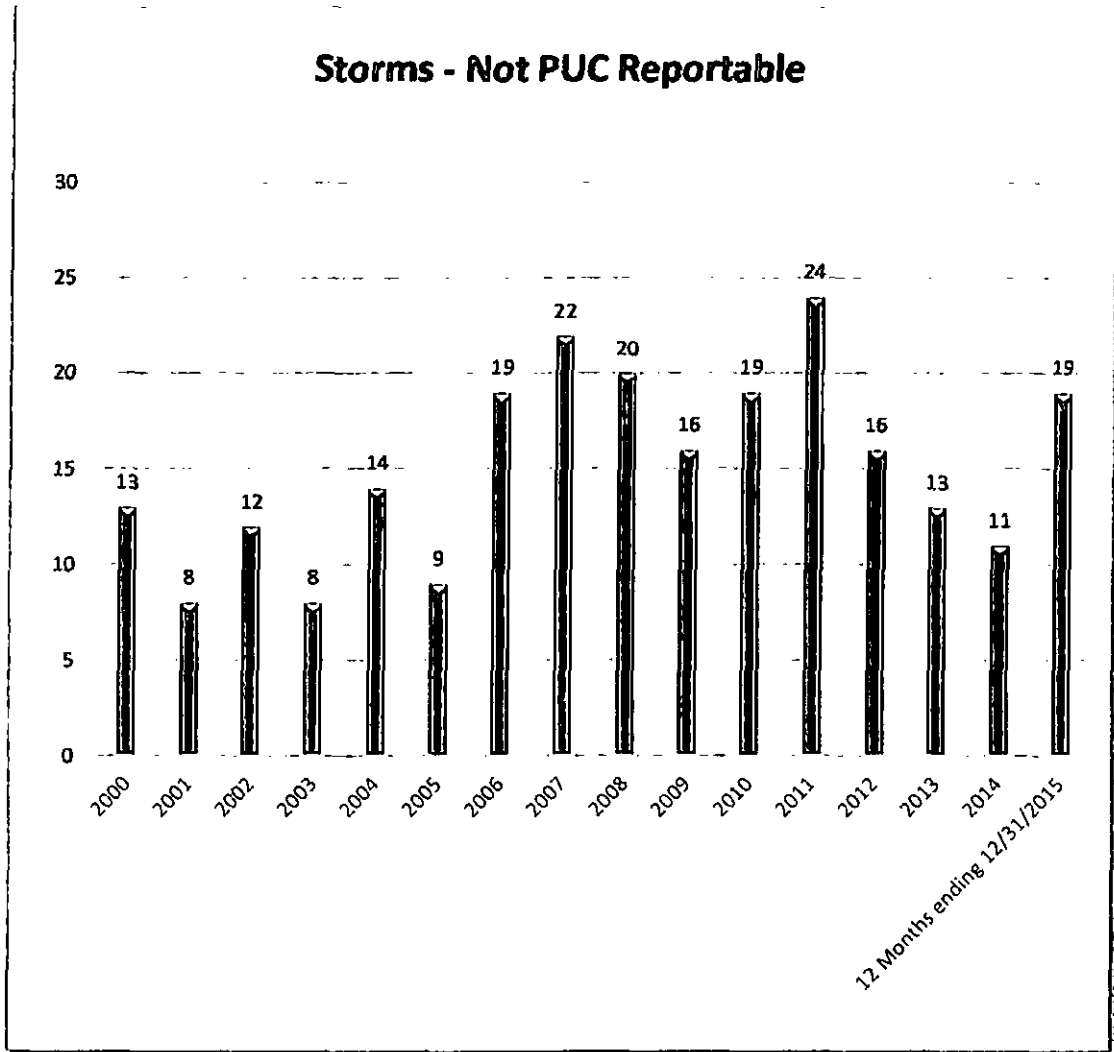
<sup>3</sup> PPL Electric calculates the annual indices using customers served at the end of period. This is consistent with the method used to calculate PPL Electric's benchmarks.

<sup>4</sup> The data reflects the number of customers interrupted for each interruption event summed for all events, also known as customer interruptions. If a customer is affected by three separate cases of trouble, that customer represents three customer interruptions, but only one customer interrupted.

Specifically, during the 12-month reporting period, there were no (0) PUC major events and one (1) PUC-reportable storm ( $\geq 2,500$  customers interrupted for  $\geq 6$  hours) other than major events.



In addition, there were nineteen (19) storms that were not reportable, but which did require the opening of one or more area emergency centers to manage restoration efforts.



- 3) *Rolling 12-month reliability index values (SAIFI, CAIDI, SAIDI, CMI, and if available, MAIFI) and other pertinent information such as customers served, number of interruptions, customer minutes interrupted, number of lockouts, and so forth, for the worst performing 5% of the circuits in the system. An explanation of how the EDC defines its worst performing circuits shall be included.*

The following table provides reliability index values for the worst performing 5% of the circuits in the system for the 12 months ended at the current quarter. An explanation of how PPL Electric defines its worst performing circuits is included in Appendix A.

WPC Rank	Feeder ID	SAIDI	CAIDI	SAIFI	MAIFI	Customers	Cases of Trouble	Customer Minutes Interrupted (CMI)
1	27101	1,357	3,029	0.45	4.16	1,835	45	2,489,695
2	14403	418	128	3.27	5.55	2,542	40	1,062,307
3	21206	381	89	4.30	6.45	2,508	15	954,507
4	46001	382	365	1.05	2.40	2,356	27	898,855
5	42201	513	128	4.01	5.01	1,730	27	886,747
6	61801	541	238	2.27	7.60	1,605	36	868,805
7	45602	527	376	1.40	10.16	1,592	39	838,860
8	11102	409	329	1.24	2.00	1,981	17	811,032
9	47001	317	153	2.07	4.23	2,492	54	790,239
10	14501	414	147	2.82	0.99	1,883	16	779,259
11	44301	378	345	1.09	7.98	2,056	51	776,163
12	10705	267	159	1.68	1.94	2,620	25	700,225
13	59101	398	193	2.06	7.62	1,706	40	679,512
14	51603	275	116	2.37	6.31	2,416	13	663,244
15	64201	357	123	2.91	7.71	1,850	23	660,656
16	22201	54,934	362	151.92	3.00	12	4	659,203
17	65202	234	98	2.37	1.10	2,805	6	655,697
18	29502	827	155	5.33	1.58	780	24	644,904
19	63403	449	120	3.75	4.24	1,433	33	644,110
20	16101	434	144	3.02	13.21	1,479	32	642,359
21	25801	353	160	2.21	5.86	1,816	42	641,738
22	13105	267	153	1.75	0.58	2,368	18	632,755
23	42401	862	306	2.81	6.76	724	22	624,090
24	16801	383	91	4.21	5.62	1,605	25	614,507
25	10702	328	266	1.23	1.99	1,847	16	605,088

WPC Rank	Feeder ID	SAIDI	CAIDI	SAIFI	MAIFI	Customers	Cases of Trouble	Customer Minutes Interrupted (CMI)
26	22805	246	239	1.03	6.33	2,371	9	584,230
27	66504	307	99	3.08	11.18	1,873	20	574,098
28	52403	448	276	1.62	3.89	1,261	47	564,716
29	53602	256	118	2.18	8.71	2,195	42	561,970
30	22901	254	247	1.03	0.02	2,185	8	555,077
31	24602	357	112	3.20	1.87	1,509	39	539,289
32	47703	383	190	2.02	11.73	1,389	31	532,073
33	67302	282	194	1.46	3.00	1,859	15	524,429
34	40101	244	142	1.72	4.70	2,140	25	522,559
35	67804	253	85	2.97	9.21	2,028	14	514,069
36	16204	398	469	0.85	3.75	1,280	12	509,872
37	65603	203	163	1.25	3.50	2,459	35	499,892
38	67502	272	174	1.57	5.76	1,825	26	496,656
39	28604	277	170	1.63	2.76	1,786	36	494,502
40	46602	343	236	1.45	4.79	1,429	43	489,516
41	27502	165	273	0.60	1.69	2,935	15	484,046
42	44904	603	118	5.12	0.99	802	16	483,926
43	12701	311	112	2.79	7.18	1,535	54	478,074
44	57501	256	70	3.64	4.48	1,817	12	465,529
45	40201	269	147	1.82	5.11	1,650	51	443,153
46	17001	284	182	1.56	2.07	1,508	43	428,321
47	23604	206	88	2.33	7.99	2,059	19	423,441
48	64502	215	199	1.08	2.61	1,925	12	413,929
49	17804	269	339	0.79	3.01	1,505	29	405,050
50	62606	152	73	2.07	0.51	2,657	9	404,380
51	51905	208	165	1.26	7.81	1,921	11	399,375
52	42601	184	121	1.52	5.71	2,160	13	397,155
53	61303	261	130	2.00	7.32	1,517	24	396,202
54	67401	289	470	0.61	10.85	1,368	34	395,254
55	51502	214	101	2.11	8.17	1,842	16	393,321
56	43202	334	118	2.83	4.60	1,175	29	392,594
57	44902	237	151	1.57	19.06	1,645	28	390,030
58	17802	204	197	1.03	6.39	1,895	52	385,856
59	64801	254	320	0.79	9.45	1,518	41	385,246
60	27403	157	90	1.74	7.57	2,444	9	384,257
61	45501	266	153	1.74	7.64	1,432	31	380,599
62	10903	223	80	2.77	4.84	1,706	26	380,239

**4) *Specific remedial efforts taken and planned for the worst performing 5% of the circuits identified in paragraph (3).***

**01 Circuit 27101 -- GREENFIELD 71-01**

Performance Analysis

The GREENFIELD 71-01 circuit experienced no outages of over 100,000 CMI between January 2015 and December 2015.

In total, the GREENFIELD 71-01 circuit had 45 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (14); animal contacts (13); equipment failure (13); other (3); nothing found (2).

Remedial Actions

- In 2015, a section of difficult-to-access three-phase line was moved to a more accessible location.
- In 2015, full circuit tree trimming was performed.
- In 2015, single-phase fuses were added in multiple locations.
- In 2016, two sections of difficult-to-access three-phase line will be moved to more accessible locations.
- In 2016, a new sectionalizing device will be evaluated for this circuit.
- In 2016, an Extended Operational Review will be completed.
- In 2020, a new tie line is planned between EYNON 16-01 and GREENFIELD 71-01. This tie will provide additional sectionalizing capabilities and help balance line load.

## **02 Circuit 14403 -- SO SLATINGTON 44-03**

### Performance Analysis

The SO SLATINGTON 44-03 circuit experienced three outages of over 100,000 CMI between January 2015 and December 2015.

On July 1, 2015, an equipment failure occurred on a pole or pole arm causing a circuit breaker to trip to lockout. This outage affected 2,543 customers for up to 782 minutes resulting in 300,110 CMI.

On September 12, 2015, a vehicle contact occurred causing a circuit breaker to trip to lockout. This outage affected 2,541 customers for up to 798 minutes resulting in 354,302 CMI.

On October 28, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 637 customers for up to 167 minutes resulting in 105,907 CMI.

In total, the SO SLATINGTON 44-03 circuit had 40 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (16); equipment failure (10); nothing found (6); animal contacts (5); other (2); vehicles (1).

### Remedial Actions

- In 2014, an Expanded Operational Review was completed.
- In 2015, a single-phase tap was reviewed and a broken cross arm was repaired.
- In 2015, several spans of conductor having excess slack were repaired to prevent future outages resulting from the conductors coming together due to wind.
- In 2015, additional fuses and solid blade disconnects were installed.
- In 2015 a line inspection was performed and a number of minor improvements were identified for remediation in 2016.

- In 2016, two large single-phase taps will be reviewed for improved sectionalizing to reduce outage impacts.
- In 2018, two sections of difficult-to-access conductor will be relocated to more accessible locations.
- In 2018, full circuit trimming will be performed.

### **03 Circuit 21206 -- EAST CARBONDALE 12-06**

#### Performance Analysis

The EAST CARBONDALE 12-06 circuit experienced three outages of over 100,000 CMI between January 2015 and December 2015.

On June 27, 2015, during a period of strong wind, a tree made contact with an overhead switch causing a recloser to trip to lockout. This outage affected 4,242 customers for up to 1,271 minutes resulting in 2,299,760 CMI.

On August 28, 2015, an improper operation occurred on an overhead lightning protector causing a recloser to trip to lockout. This outage affected 1,823 customers for up to 257 minutes resulting in 243,392 CMI.

On September 22, 2015, an equipment failure occurred on an overhead splice causing a circuit breaker to trip to lockout. This outage affected 2,500 customers for up to 263 minutes resulting in 500,030 CMI.

In total, the EAST CARBONDALE 12-06 circuit had 15 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (11); tree related (2); animal contacts (1); improper design (1).

## Remedial Actions

- In 2015, full circuit trimming was performed.
- In 2015, an Expanded Operation Review was performed
- In 2015, a tap fuse was added to increase reliability.
- In 2016, aging dead ends and switches will be replaced.
- In 2016, fault indicators will be installed on an underground residential development to allow for faster fault location and restoration.
- In 2016, a tie line between the EAST CARBONDALE 12-06 and EAST CARBONDALE 12-02 lines will be investigated.
- In 2016, automated switching by the Fault Identification System Restoration computer system will go live on this circuit, which will reduce outage durations.
- In 2016, adding a single-phase trip, single-phase lockout device to this circuit will be evaluated.

## **04 Circuit 46001 -- BERWICK 60-01**

### Performance Analysis

The BERWICK 60-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 27, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 946 customers for up to 501 minutes resulting in 470,327 CMI.

In total, the BERWICK 60-01 circuit had 33 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (11); equipment failure (10); animal contacts (7); nothing found (2); vehicles (2); other (1).

## Remedial Actions

- In 2015, a remotely operable sectionalizing device was added.
- In 2016, full circuit tree trimming will be performed.
- In 2017, a project to improve the reliability for customers that have experienced multiple interruptions is scheduled.
- In 2017, two new remotely operable sectionalizing devices will be added to this circuit.

## **05 Circuit 42201 -- SHENANDOAH 22-01**

### Performance Analysis

The SHENANDOAH 22-01 circuit experienced four outages of over 100,000 CMI between January 2015 and December 2015.

On March 14, 2015, during a period of heavy rain, an equipment failure occurred on a pole or pole arm causing a recloser to trip to lockout. This outage affected 1,020 customers for up to 248 minutes resulting in 207,453 CMI.

On April 21, 2015, during a period of heavy rain, an equipment failure occurred on a pole or pole arm causing a recloser to trip to lockout. This outage affected 1,020 customers for up to 712 minutes resulting in 294,149 CMI.

On October 28, 2015, during a period of heavy rain, an errant blimp tether made contact with an overhead transmission component causing a circuit breaker to trip to lockout. This outage affected 1,724 customers for up to 66 minutes resulting in 113,473 CMI.

On November 11, 2015, an equipment failure occurred on an overhead switch causing a recloser to trip to lockout. This outage affected 1,026 customers for up to 608 minutes resulting in 176,378 CMI.

In total, the SHENANDOAH 22-01 circuit had 27 outages between January 2015 and December

2015, with the causes breaking down as follows: animal contacts (10); equipment failure (8); tree related (5); other (2); contact or dig in (1); nothing found (1).

### Remedial Actions

- In 2015, additional fusing was installed on several three-phase taps.
- In 2016, additional fusing will be installed on single-phase taps.
- In 2016, animal guarding installations will be evaluated in multiple locations.
- In 2017, a new manual switch will be installed on a section of single and three-phase line to improve sectionalizing capabilities.
- In 2017, full circuit tree trimming will be performed.

## **06 Circuit 61801 -- E ELIZABETHTOWN 18-01**

### Performance Analysis

The E ELIZABETHTOWN 18-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On May 18, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 1,596 customers for up to 924 minutes resulting in 606,838 CMI.

On June 23, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 1,598 customers for up to 266 minutes resulting in 156,547 CMI.

In total, the E ELIZABETHTOWN 18-01 circuit had 36 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (15); tree related (10); animal contacts (5); other (3); nothing found (2); vehicles (1).

## Remedial Actions

- In 2014, full circuit tree trimming was performed.
- In 2015, all aluminum crimps were replaced on three-phase copper conductor.
- In 2016, a sectionalizing device will be installed in a heavily wooded area.
- In 2016, single-phase fuses will be added in multiple locations.
- In 2016, resourcing a section of single-phase line will be evaluated.
- In 2017, a manual switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.

## **07 Circuit 45602 -- WOOLRICH 56-02**

### Performance Analysis

The WOOLRICH 56-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On September 9, 2015, a vehicle made contact with a pole causing the circuit to be interrupted. This outage affected 815 customers for up to 606 minutes resulting in 493,890 CMI.

In total, the WOOLRICH 56-02 circuit had 35 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (21); equipment failure (8); nothing found (3); animal contacts (2); vehicles (1).

### Remedial Actions

- In 2015, an Expanded Operational Review was performed in on this circuit. As a result minor repairs were performed at five locations.
- In 2016, a smart grid device will be added to this circuit.
- In 2016, an existing single phase hydraulic device will be replaced with a larger vacuum recloser to allow additional downstream fusing to be installed at 12 locations.

- In 2016, this circuit will be evaluated for hot spot tree trimming.
- In 2017, a smart grid device will be added to this circuit.
- In 2017, full circuit tree trimming will be performed.

## **08 Circuit 11102 -- EGYPT 11-02**

### Performance Analysis

The EGYPT 11-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 30, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 1,978 customers for up to 722 minutes resulting in 586,860 CMI.

On June 30, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 154 customers for up to 1,165 minutes resulting in 156,265 CMI.

In total, the EGYPT 11-02 circuit had 17 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (7); tree related (6); vehicles (2); animal contacts (1); other (1).

### Remedial Actions

- In 2015, an Expanded Operational Review identified minor issues, all of which have been remediated.
- In 2016, full circuit tree trimming will be performed.
- In 2017, three additional sectionalizing devices with remote operational capability will be installed as part of the smart grid initiative.

## **09 Circuit 47001 -- HUGHESVILLE 70-01**

### Performance Analysis

The HUGHESVILLE 70-01 circuit experienced three outages of over 100,000 CMI between January 2015 and December 2015.

On May 27, 2015, an animal interfered with a substation component causing a circuit breaker to trip to lockout. This outage affected 2,482 customers for up to 166 minutes resulting in 336,951 CMI.

On June 27, 2015, an improper operation occurred on an overhead switch. This outage affected 827 customers for up to 785 minutes resulting in 115,928 CMI.

On August 4, 2015, an improper operation occurred causing a recloser to trip to lockout. This outage affected 827 customers for up to 345 minutes resulting in 200,027 CMI.

In total, the HUGHESVILLE 70-01 circuit had 48 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (16); tree related (13); animal contacts (8); nothing found (4); Improper Operation (3); vehicles (2); contact or dig in (1); other (1).

### Remedial Actions

- In 2015, a normally open switch between the HUGHESVILLE 70-01 and HUGHESVILLE 70-02 circuits was upgraded to a device with remote operational capability as part of the smart grid initiative.
- In 2015, the underground getaway for this circuit was proactively replaced.
- In 2015, animal guarding was installed at the HUGHESVILLE Substation.
- In 2015, a project increased the load that can be transferred from the HUGHESVILLE 70-01 to the MILLVILLE 32-02. Approximately 8,500 feet of larger capacity conductor was installed on the MILLVILLE 32-02.

- In 2015, additional transmission switches were installed to allow the HUGHESVILLE transmission tap to be fed by either the CLINTON – MUNCY #1 transmission line or the CLINTON – MUNCY #2 transmission line.
- In 2016, full circuit tree trimming will be performed.
- In 2016, fuses will be added to protect the three-phase backbone, and series fusing will be added at one location.
- In 2017, a project is planned to build one mile of new single-phase and remove one mile of difficult-to-access copper conductor.
- In 2017, a new manually operable switch will be installed to allow line crews to transfer the HUGHESVILLE 70-01 to the HUGHESVILLE 70-02 should the HUGHESVILLE 70-01 circuit breaker or getaway fail.
- In 2018, a project is planned to build 2,500 feet of new single-phase.

## **10 Circuit 14501 -- SCHOENECK 45-01**

### Performance Analysis

The SCHOENECK 45-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 8, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 1,867 customers for up to 1,120 minutes resulting in 428,768 CMI.

In total, the SCHOENECK 45-01 circuit had 16 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (5); animal contacts (4); equipment failure (4); nothing found (3).

### Remedial Actions

- In 2015, an Expanded Operational Review was completed.
- In 2015, fault indicators were installed to aid in troubleshooting future outages.

- In 2016, six locations will be evaluated for single-phase fusing.
- In 2016, a large project will be completed at the SCHOENECK Substation. This project involves installation of two new lines and an additional transformer and transmission source. One of the new lines will split the SCHOENECK 45-01 line into two separate lines, reducing outage exposure. Additionally, the SCHOENECK 45-01 and the new line will receive sectionalizing devices with remote operational capability.
- In 2016, full circuit tree trimming will be performed.

## **11 Circuit 44301 -- BEAVERTOWN 43-01**

### Performance Analysis

The BEAVERTOWN 43-01 circuit experienced three outages of over 100,000 CMI between January 2015 and December 2015.

On February 19, 2015, a vehicle contact occurred causing a recloser to trip to lockout. This outage affected 473 customers for up to 359 minutes resulting in 130,140 CMI.

On May 31, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 476 customers for up to 439 minutes resulting in 175,929 CMI.

On June 30, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 475 customers for up to 1,329 minutes resulting in 309,939 CMI.

In total, the BEAVERTOWN 43-01 circuit had 47 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (16); tree related (16); animal contacts (7); nothing found (3); vehicles (3); other (2).

## Remedial Actions

- In 2015, an existing recloser, sectionalizing switch and normally open tie switch were upgraded to remotely operable devices.
- In 2015, full circuit trimming was performed.
- In 2016, an Expanded Operation Review will be performed.
- In 2017, a project is being investigated to build 600 feet of new single-phase in order to eliminate 2,700 feet of difficult-to-access single-phase.
- In 2018, two existing devices will be upgraded to smart grid technology.
- In 2021, a project is planned that will provide a tie for 1133 radial customers. As part of this project 7,350 feet of new three-phase will be installed and 7,500 feet of existing line will be reconducted.

## **12 Circuit 10705 -- CATASAUQUA 07-05**

### Performance Analysis

The CATASAUQUA 07-05 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 30, 2015, during a period of strong wind, a tree made contact with a pole or pole arm causing a circuit breaker to trip to lockout. This outage affected 2,616 customers for up to 156 minutes resulting in 384,734 CMI.

On July 1, 2015, during a period of strong wind, a tree made contact with an overhead fuse causing a load break fuse to operate. This outage affected 188 customers for up to 570 minutes resulting in 107,052 CMI.

In total, the CATASAUQUA 07-05 circuit had 25 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (16); equipment failure (5); vehicles (2); animal contacts (1); other (1).

### Remedial Actions

- In 2016, six single-phase taps will be fused.
- In 2016, an existing three-phase manual switch will be upgraded as part of the smart grid initiative.
- In 2016, an additional three-phase smart grid device will be installed as part of the smart grid initiative.
- In 2017, an additional three-phase smart grid device will be installed as part of the smart grid initiative.

## **13 Circuit 59101 -- WALKER 91-01**

### Performance Analysis

The WALKER 91-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 8, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 1,117 customers for up to 1,491 minutes resulting in 506,301 CMI.

In total, the WALKER 91-01 circuit had 40 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (19); equipment failure (11); nothing found (4); animal contacts (3); vehicles (2); other (1).

### Remedial Actions

- In 2016, additional single-phase fusing will be investigated in several areas.
- In 2017, full circuit trimming will be performed.
- In 2018, two sectionalizing devices are scheduled to be installed as part of the smart grid initiative.

## **14 Circuit 51603 -- DUKE 16-03**

### Performance Analysis

The DUKE 16-03 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On March 3, 2015, an equipment failure occurred on an overhead switch causing a circuit breaker to trip to lockout. This outage affected 3,125 customers for up to 171 minutes resulting in 355,047 CMI.

On May 10, 2015, an unidentified issue occurred with a substation component causing a circuit breaker to trip to lockout. This outage affected 2,391 customers for up to 126 minutes resulting in 275,469 CMI.

In total, the DUKE 16-03 circuit had 13 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (7); nothing found (2); tree related (2); animal contacts (1); other (1).

### Remedial Actions

- In 2015, full circuit trimming was performed.
- In 2015, a roughly one mile tie line was constructed, and reconductoring was performed to provide an alternate source for sectionalizing during cases of trouble.
- In 2015, load balancing was performed.
- In 2016, two locations will be evaluated for single-phase fusing.

## **15 Circuit 64201 -- KINZER 42-01**

### Performance Analysis

The KINZER 42-01 circuit experienced three outages of over 100,000 CMI between January 2015 and December 2015.

On June 23, 2015, during a period of strong wind, a tree made contact with an overhead switch causing a circuit breaker to trip to lockout. This outage affected 1,867 customers for up to 283 minutes resulting in 316,302 CMI.

On June 23, 2015, during a period of strong wind, an animal interfered with an overhead switch causing a circuit breaker to trip to lockout. This outage affected 659 customers for up to 233 minutes resulting in 153,553 CMI.

On December 27, 2015, during a period of heavy rain, a tree made contact with a pole or pole arm causing a recloser to trip to lockout. This outage affected 771 customers for up to 223 minutes resulting in 103,855 CMI.

In total, the KINZER 42-01 circuit had 23 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (8); tree related (6); animal contacts (4); nothing found (2); vehicles (2); other (1).

### Remedial Actions

- In 2014, full circuit tree trimming was performed.
- In 2015, a recloser was replaced with an automated vacuum recloser with additional animal guarding.
- In 2015, a tie line was built between the KINZER 42-01 line and the KINZER 42-02. This tie will provide additional sectionalizing capabilities.
- In 2016, single-phase fuses will be installed in multiple locations.

- In 2017, a manual switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.

## **16 Circuit 22201 -- ELK MOUNTAIN 22-01**

### Performance Analysis

The ELK MOUNTAIN 22-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 27, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 903 customers for up to 647 minutes resulting in 520,467 CMI.

On August 11, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 906 customers for up to 210 minutes resulting in 138,089 CMI.

In total, the ELK MOUNTAIN 22-01 circuit had 4 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (4).

### Remedial Actions

- In 2016, an Expanded Operation Review will be performed.
- In 2016, additional single-phase fusing will be installed.
- In 2018, full circuit trimming will be performed.

## **17 Circuit 65202 -- PRINCE 52-02**

### Performance Analysis

The PRINCE 52-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On November 13, 2015, an unidentified issue occurred with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 2,804 customers for up to 170 minutes resulting in 275,967 CMI.

On November 14, 2015, during a period of strong wind, an equipment failure occurred on a substation component causing a circuit breaker to trip to lockout. This outage affected 2,804 customers for up to 135 minutes resulting in 310,003 CMI.

In total, the PRINCE 52-02 circuit had 6 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (2); equipment failure (2); nothing found (2).

### Remedial Actions

- In 2016, the PRINCE 52-02 circuit breaker will be replaced.
- In 2016, seven manual switches will be replaced with automated vacuum reclosers as part of the smart grid initiative.
- In 2016, a tie line will be built between the PRINCE 52-02 line and the ENGLSIDE 26-06. This tie will provide additional sectionalizing capabilities.
- In 2016, single-phase fuses will be added in multiple locations.
- In 2016, an Expanded Operational Review will be performed.
- In 2016, all three-phase line protection schemes will be evaluated.
- In 2017, a manual switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.

- In 2017, two new smart grid devices will be installed on this circuit as part of the smart grid initiative.

## **18 Circuit 29502 – LEDGEDALE 95-02**

### Performance Analysis

The LEDGEDALE 95-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On October 28, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 1,944 customers for up to 134 minutes resulting in 202,789 CMI.

On October 29, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 1,941 customers for up to 386 minutes resulting in 402,133 CMI.

In total, the LEDGEDALE 95-02 circuit had 24 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (9); animal contacts (8); nothing found (5); equipment failure (1); other (1).

### Remedial Actions

- In 2016, multiple VCR controllers are being upgraded with new controls.
- In 2016, additional tap fusing is being evaluated, which will reduce exposure for customers.
- In 2016, series fusing is being evaluated at several locations to improve reliability.
- In 2016, animal guarding locations are being evaluated for this circuit.

## **19 Circuit 63403 -- HONEYBROOK 34-03**

### Performance Analysis

The HONEYBROOK 34-03 circuit experienced three outages of over 100,000 CMI between January 2015 and December 2015.

On February 15, 2015, during a period of strong wind, an equipment failure occurred on an overhead switch causing a recloser to trip to lockout. This outage affected 575 customers for up to 297 minutes resulting in 170,775 CMI.

On March 23, 2015, a vehicle contact occurred causing a recloser to trip to lockout. This outage affected 1,167 customers for up to 395 minutes resulting in 161,711 CMI.

On August 7, 2015, a vehicle made contact with a pole causing a circuit breaker to trip to lockout. This outage affected 1,441 customers for up to 559 minutes resulting in 163,205 CMI.

In total, the HONEYBROOK 34-03 circuit had 33 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (14); animal contacts (6); tree related (5); vehicles (5); nothing found (2); other (1).

### Remedial Actions

- In 2015, all aluminum crimps on three-phase copper conductor were replaced.
- In 2015, an additional pole was added to reduce slack span and potential phase to phase contact.
- In 2016, single-phase fuses will be added in multiple locations.
- In 2016, two manual switches will be replaced with automated vacuum reclosers as part of the smart grid initiative.
- In 2016, relocating a section of three-phase line to the road will be investigated to reduce customer exposure by eliminating difficult-to-access lines.
- In 2017, full circuit tree trimming will be performed.

- In 2017, a new smart grid device will be installed on this circuit as part of the smart grid initiative.

## **20 Circuit 16101 -- BINGEN 61-01**

### Performance Analysis

The BINGEN 61-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 14, 2015, during a period of strong wind, a tree made contact with an overhead fuse causing a circuit breaker to trip to lockout. This outage affected 2,921 customers for up to 781 minutes resulting in 411,463 CMI.

On June 25, 2015, a vehicle made contact with a pole causing a recloser to trip to lockout. This outage affected 940 customers for up to 273 minutes resulting in 146,563 CMI.

In total, the BINGEN 61-01 circuit had 32 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (11); animal contacts (9); equipment failure (9); vehicles (3).

### Remedial Actions

- In 2014, five smart grid devices were installed on this circuit as part of the smart grid initiative.
- In 2016, a single-phase tap that has experienced repeat interruptions will be reviewed for targeted tree trimming and additional sectionalizing.
- In 2016, a long two-phase tap feeding 500+ customers will be reviewed for additional sectionalizing.
- In 2016, a single-phase tap that has experience several tree related outages will be reconducted with heavier conductor.
- In 2017, a new automated tie switch will be installed as part of the smart grid initiative.

## **21 Circuit 25801 -- SULLIVAN TRAIL 58-01**

### Performance Analysis

The SULLIVAN TRAIL 58-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On April 4, 2015, during a period of heavy rain, an equipment failure occurred on a pole or pole arm causing a circuit breaker to trip to lockout. This outage affected 1,818 customers for up to 486 minutes resulting in 179,226 CMI.

On December 29, 2015, during a period of ice/sleet/snow, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 633 customers for up to 333 minutes resulting in 210,789 CMI.

In total, the SULLIVAN TRAIL 58-01 circuit had 42 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (23); animal contacts (9); equipment failure (9); nothing found (1).

### Remedial Actions

- In 2014, a line inspection was completed to proactively identify deteriorated equipment. As a result of this inspection, 19 locations were identified and corrected in 2015.
- In 2015, locations for fault indicators on the SULLIVAN TRAIL 58-01 line were identified to improve troubleshooting during outages.
- In 2016, full circuit tree trimming will be performed.
- In 2016, two new sectionalizing devices with remote operational capability will be installed on this circuit as part of the smart grid initiative.
- In 2016, three three-phase solid blade disconnect switch installations are being evaluated for this circuit.

## **22 Circuit 13105 -- NORTHAMPTON 31-05**

### Performance Analysis

The NORTHAMPTON 31-05 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 30, 2015, during a period of strong wind, a tree made contact with an overhead switch causing a recloser to trip to lockout. This outage affected 1,494 customers for up to 249 minutes resulting in 372,006 CMI.

On July 15, 2015, a vehicle made contact with a pole causing a circuit breaker to trip to lockout. This outage affected 2,366 customers for up to 572 minutes resulting in 220,455 CMI.

In total, the NORTHAMPTON 31-05 circuit had 18 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (7); tree related (5); vehicles (3); equipment failure (2); nothing found (1).

### Remedial Actions

- In 2016, three-phase taps will be investigated for fuses or load break disconnect switches.
- In 2016, several locations will be reviewed for single-phase fuses.
- In 2016, three new smart grid devices will be installed on the line allowing remote sectionalizing and restoration.

## **23 Circuit 42401 -- GIRARD MANOR 24-01**

### Performance Analysis

The GIRARD MANOR 24-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On October 28, 2015, during a period of heavy rain, an errant blimp tether made contact with an overhead transmission component causing a circuit breaker to trip to lockout. This outage affected 727 customers for up to 196 minutes resulting in 142,492 CMI.

On October 28, 2015, during a period of strong wind, an errant blimp tether made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 1,072 customers for up to 1,090 minutes resulting in 435,964 CMI.

In total, the GIRARD MANOR 24-01 circuit had 22 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (8); animal contacts (6); tree related (3); nothing found (2); other (2); vehicles (1).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2016, three-phase fusing at several locations will be installed.
- In 2016, an existing sectionalizing device will be automated as part of the smart grid initiative.
- In 2016, an Expanded Operational Review will be performed.

## **24 Circuit 16801 -- WAGNERS 68-01**

### Performance Analysis

The WAGNERS 68-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 27, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 1,609 customers for up to 247 minutes resulting in 232,453 CMI.

On August 19, 2015, an equipment failure occurred on an overhead transmission component causing a circuit breaker to trip to lockout. This outage affected 1,608 customers for up to 95 minutes resulting in 152,052 CMI.

In total, the WAGNERS 68-01 circuit had 25 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (11); equipment failure (10); animal contacts (1); nothing found (1); other (1); vehicles (1).

### Remedial Actions

- In 2015, single-phase fuses were added in multiple locations.
- In 2015, a switch was reprogrammed to act as a protective device.
- In 2015, WAGNERS Substation was upgraded to improve reliability and make the substation less susceptible to transmission outages.
- In 2016, single-phase fuses will be added in multiple locations.
- In 2019, a new line and terminal project is planned which will improve reduce exposure and customer counts and improve reliability for customers on this circuit.

## **25 Circuit 10702 -- CATASAUQUA 07-02**

### Performance Analysis

The CATASAUQUA 07-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 30, 2015, during a period of strong wind, an unidentified issue occurred with an overhead conductor causing a recloser to trip to lockout. This outage affected 908 customers for up to 313 minutes resulting in 268,753 CMI.

In total, the CATASAUQUA 07-02 circuit had 16 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (9); equipment failure (3); animal contacts (2); other (1); vehicles (1).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2015, additional fusing will be evaluated for ten single-phase locations, and several three-phase locations.
- In 2016, an Expanded Operational Review will be completed.
- In 2016, two sectionalizing devices with remote operational capability will be installed as part of the smart grid initiative.
- In 2017, two sectionalizing devices with remote operational capability will be installed as part of the smart grid initiative.
- In 2017, a project is scheduled to reconfigure a portion of the line and transfer it to a new feeder.

## **26 Circuit 22805 -- HAUTO 28-05**

### Performance Analysis

The HAUTO 28-05 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

*On June 22, 2015, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 2,372 customers for up to 566 minutes resulting in 577,916 CMI.*

In total, the HAUTO 28-05 circuit had 9 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (5); animal contacts (2); tree related (2).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2016, several cutout and insulator replacements will be performed.
- In 2016, single and three-phase fusing at multiple locations will be installed.
- In 2016, a manual switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.

## **27 Circuit 66504 -- SOUTH MANHEIM 65-04**

### Performance Analysis

The SOUTH MANHEIM 65-04 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On September 30, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 1,834 customers for up to 499 minutes resulting in 385,110 CMI.

On October 9, 2015, during a period of heavy rain, a tree made contact with an overhead switch causing an interruption. This outage affected 1,951 customers for up to 93 minutes resulting in 133,081 CMI.

In total, the SOUTH MANHEIM 65-04 circuit had 20 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (8); tree related (6); animal contacts (2); nothing found (2); other (2).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2015, all aluminum crimps on three-phase copper conductors were replaced.
- In 2016, the SOUTH MANHEIM 65-04 circuit breaker will be replaced.
- In 2017, five new smart grid devices will be installed on this circuit as part of the smart grid Initiative.
- In 2017, a new single-phase recloser will be installed.

## **28 Circuit 52403 -- GREEN PARK 24-03**

### Performance Analysis

The GREEN PARK 24-03 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 8, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 457 customers for up to 224 minutes resulting in 102,080 CMI.

On June 8, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 97 customers for up to 1,216 minutes resulting in 118,704 CMI.

In total, the GREEN PARK 24-03 circuit had 47 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (24); equipment failure (9); animal contacts (7); nothing found (5); other (1); vehicles (1).

### Remedial Actions

- In 2014, full circuit trimming was performed.
- In 2015, a roughly four mile tie line was constructed to provide customers with an alternate source for sectionalizing. As part of this project approximately two miles of conductor was relocated to a more accessible location.
- In 2015, a recloser was upgraded with a new communicating device as part of the smart grid initiative.
- In 2015, an additional section of difficult-to-access single-phase line was relocated.
- In 2015, an Expanded Operational Review was performed and various improvements were identified.
- In 2015, additional fusing was installed at several locations on this circuit.
- In 2016, several more locations will be considered for fusing.

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

### Performance Analysis

The DALMATIA 36-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On May 31, 2015, an equipment failure occurred causing an interruption. This outage affected 814 customers for up to 440 minutes resulting in 145,867 CMI.

On June 12, 2015, during a period of heavy rain, an equipment failure occurred on a pole or pole arm causing a recloser to trip to lockout. This outage affected 672 customers for up to 676 minutes resulting in 123,518 CMI.

In total, the DALMATIA 36-02 circuit had 42 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (15); equipment failure (13); nothing found (6); animal contacts (4); other (2); vehicles (2).

### Remedial Actions

- In 2014, full circuit trimming was performed.
- In 2015, four sectionalizing devices were upgraded with remote operational capability as part of the smart grid initiative.
- In 2015, a problematic recloser was replaced.
- In 2016, additional single-phase fusing will be evaluated.
- In 2016, three additional devices with remote operational capability will be installed.
- In 2016, 17 motor operated switches are scheduled to be installed on the SUNBURY-DAUPHIN and DAUPHIN-PINE GROVE transmission lines. The switches will allow operators to quickly sectionalize transmission outages to no more than a single distribution substation.
- In 2017, a section of difficult-to-access line will be relocated to a more accessible location, and reconducted with spacer cable to minimize outage exposure.

- In 2018, a new substation in the Meiserville area is scheduled for construction. The project will significantly reduce customer counts and circuit miles on the DALMATIA 36-02 circuit as well increase transfer capability in the area.

## **30 Circuit 22901 -- HARWOOD 29-01**

### Performance Analysis

The HARWOOD 29-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 27, 2015, during a period of heavy rain, an equipment failure occurred on an overhead splice causing a circuit breaker to trip to lockout. This outage affected 2,179 customers for up to 1,120 minutes resulting in 549,635 CMI.

In total, the HARWOOD 29-01 circuit had 8 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (6); nothing found (1); tree related (1).

### Remedial Actions

- In 2014, full circuit tree trimming was performed.
- In 2015, three smart grid devices were installed on this circuit.
- In 2015, a tie line between two three-phase sections was built to improve sectionalizing capabilities.
- In 2015, a tie line between the EAST HAZLETON 41-01 and the HARWOOD 29-01 was built.
- In 2016, a recloser will be automated as part of the smart grid initiative.
- In 2016, additional three-phase fusing is being evaluated.
- In 2017, a new sectionalizing device with remote operational capability will be installed as part of the smart grid initiative.

## **31 Circuit 24602 -- VARDEN 46-02**

### Performance Analysis

The VARDEN 46-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On May 27, 2015, during a period of heavy rain, an equipment failure occurred on an overhead switch causing a recloser to trip to lockout. This outage affected 1,255 customers for up to 168 minutes resulting in 181,122 CMI.

On November 19, 2015, a vehicle contact occurred causing a recloser to trip to lockout. This outage affected 2,099 customers for up to 105 minutes resulting in 168,665 CMI.

In total, the VARDEN 46-02 circuit had 39 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (15); equipment failure (13); animal contacts (8); vehicles (2); nothing found (1).

### Remedial Actions

- In 2015, two sectionalizing devices with remote operational capability were installed as part of the smart grid initiative.
- In 2015, single-phase fuses were added in multiple locations.
- In 2015, relocation of two sections of three-phase line to a more accessible location was investigated.
- In 2016, a line inspection will be completed.
- In 2016, hot spot tree trimming will be performed.
- In 2016, a section of single-phase line will be rebuilt to a more accessible location.
- In 2016, multi-phase fusing will be evaluated.
- In 2017, a sectionalizing device with remote operational capability will be installed as part of the smart grid initiative.

## **32 Circuit 47703 -- BLOOMSBURG 77-03**

### Performance Analysis

The BLOOMSBURG 77-03 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On March 31, 2015, during a period of ice/sleet/snow, a vehicle made contact with a pole causing a recloser to trip to lockout. This outage affected 584 customers for up to 441 minutes resulting in 227,276 CMI.

On October 28, 2015, during a period of heavy rain, an errant blimp tether made contact with an overhead transmission component causing a circuit breaker to trip to lockout. This outage affected 1,392 customers for up to 126 minutes resulting in 174,904 CMI.

In total, the BLOOMSBURG 77-03 circuit had 31 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (10); animal contacts (7); equipment failure (7); other (4); nothing found (2); vehicles (1).

### Remedial Actions

- In 2016, construction of a new tie between the BLOOMSBURG 77-03 line and the BLOOMSBURG 77-04 line is planned.
- In 2016, a new remotely operable device is planned for this circuit.
- In 2016, a rural section of line will be permanently transferred to another circuit which will reduce the customer count and reduce the exposure to potential outages.
- In 2016, additional automation will be added to tie BLOOMSBURG 77-03 with the DANVILLE 62-03 line.
- In 2017, full circuit trimming will be performed.
- In 2020, a project is planned to tie to the EAST DANVILLE 48-02 circuit.

## **33 Circuit 67302 -- WYOMISSING 73-02**

### Performance Analysis

The WYOMISSING 73-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On January 11, 2015, during a period of extreme temperatures, a vehicle contact occurred causing a circuit breaker to trip to lockout. This outage affected 1,850 customers for up to 390 minutes resulting in 338,386 CMI.

In total, the WYOMISSING 73-02 circuit had 15 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (6); animal contacts (3); tree related (3); vehicles (2); nothing found (1).

### Remedial Actions

- In 2015, a new smart grid device was installed on this circuit.
- In 2015, a manual switch was replaced with an automated vacuum recloser as part of the smart grid Initiative.
- In 2015, all aluminum crimps on three-phase copper conductor were replaced.
- In 2015, animal guards were installed at the WYOMISSING substation.
- In 2015, a disconnect switch on a three-phase underground dip was installed.
- In 2016, an Expanded Operational Review will be performed.
- In 2017, two new smart grid devices will be installed on this circuit as part of the smart grid initiative.

## **34 Circuit 40101 -- HUNTER 01-01**

### Performance Analysis

The HUNTER 01-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On January 7, 2015, during a period of strong wind, an equipment failure occurred on an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 2,132 customers for up to 315 minutes resulting in 415,858 CMI.

In total, the HUNTER 01-01 circuit had 25 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (9); animal contacts (7); equipment failure (6); nothing found (1); other (1); vehicles (1).

### Remedial Actions

- In 2015, full circuit tree trimming was completed.
- In 2015, an Expanded Operational Review was performed. Several minor improvements were identified and implemented.
- In 2016, three-phase solid blade disconnect switch installations are being investigated at several locations.

## **35 Circuit 67804 -- WEST LANCASTER 78-04**

### Performance Analysis

The WEST LANCASTER 78-04 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On July 20, 2015, an equipment failure occurred on an underground conductor causing a circuit breaker to trip to lockout. This outage affected 2,030 customers for up to 77 minutes resulting in 101,545 CMI.

On September 30, 2015, during a period of strong wind, a tree made contact with an overhead switch causing a recloser to trip to lockout. This outage affected 1,219 customers for up to 422 minutes resulting in 313,027 CMI.

In total, the WEST LANCASTER 78-04 circuit had 14 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (8); tree related (4); animal contacts (1); nothing found (1).

### Remedial Actions

- In 2015, all aluminum crimps on three-phase copper conductor were replaced.
- In 2015, two reclosers were replaced with automated vacuum reclosers as part of the smart grid initiative.
- In 2015, single-phase fuses were added in multiple locations.
- In 2016, load balancing will be performed.
- In 2016, an infrared inspection will be performed on all three-phase backbone.
- In 2017, a section of three-phase line will be relocated to a more accessible location.
- In 2017, full circuit tree trimming will be performed.
- In 2017, a new smart grid device will be installed on this circuit as part of the smart grid initiative.

- In 2017, a manual switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.

## **36 Circuit 16204 -- POCONO FARMS 62-04**

### Performance Analysis

The POCONO FARMS 62-04 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 27, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 962 customers for up to 492 minutes resulting in 472,659 CMI.

In total, the POCONO FARMS 62-04 circuit had 12 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (4); tree related (4); animal contacts (2); contact or dig in (2).

### Remedial Actions

- In 2014, full circuit tree trimming was performed.
- In 2015, single-phase fuses were added in multiple locations.
- In 2016, a new tie line to an adjacent feeder is under evaluation.
- In 2016, an Expanded Operational Review will be performed.
- In 2016, a tie line between POCONO FARMS 62-04 and POCONO FARMS 64-03 will be investigated.

## **37 Circuit 65603 -- QUARRYVILLE 56-03**

### Performance Analysis

The QUARRYVILLE 56-03 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On August 2, 2015, a vehicle made contact with a pole causing a circuit breaker to trip to lockout. This outage affected 2,458 customers for up to 479 minutes resulting in 365,733 CMI.

In total, the QUARRYVILLE 56-03 circuit had 35 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (14); tree related (11); animal contacts (5); other (3); nothing found (1); vehicles (1).

### Remedial Actions

- In 2015, all aluminum crimps on three-phase copper conductor were replaced.
- In 2015, improvements were made to several distribution capacitors to improve the circuit's voltage regulation.
- In 2016, full circuit tree trimming will be performed.
- In 2017, a new line and terminal is planned.
- In 2017, a new smart grid device will be installed on this circuit as part of the smart grid initiative.
- In 2017, a manual switch and two reclosers will be replaced with automated vacuum reclosers as part of the smart grid initiative.

## **38 Circuit 67502 -- WEST WILLOW 75-02**

### Performance Analysis

The WEST WILLOW 75-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On June 23, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 1,748 customers for up to 1,359 minutes resulting in 229,510 CMI.

On July 9, 2015, during a period of strong wind, a tree made contact with an overhead switch causing a recloser to trip to lockout. This outage affected 253 customers for up to 421 minutes resulting in 106,424 CMI.

In total, the WEST WILLOW 75-02 circuit had 26 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (12); equipment failure (8); animal contacts (5); vehicles (1).

### Remedial Actions

- In 2015, all aluminum crimps on the three-phase copper conductor were replaced.
- In 2015, a sectionalizer was replaced by a single-phase recloser to improve reliability.
- In 2016, single-phase fuses will be added in multiple locations.
- In 2016, relocating a section of single-phase line to a more accessible location will be investigated.
- In 2016, a sectionalizer will be replaced by a single-phase recloser to improve reliability.
- In 2017, a manual switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.
- In 2017, three new smart grid devices will be installed on this circuit.
- In 2017, full circuit tree trimming will be performed.

## **39 Circuit 28604 -- BLYTHEBURN 86-04**

### Performance Analysis

The BLYTHEBURN 86-04 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On April 4, 2015, during a period of heavy rain, an equipment failure occurred on an overhead lightning protector causing a circuit breaker to trip to lockout. This outage affected 1,776 customers for up to 168 minutes resulting in 298,243 CMI.

On April 20, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 602 customers for up to 558 minutes resulting in 151,094 CMI.

In total, the BLYTHEBURN 86-04 circuit had 36 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (17); equipment failure (7); tree related (5); nothing found (4); contact or dig in (3).

### Remedial Actions

- In 2015, single-phase fusing will be installed in multiple locations.
- In 2016, additional fusing and animal guarding locations will be evaluated.
- In 2016, the installation of a three-phase solid blade disconnect switch will be evaluated to increase sectionalizing capability.
- In 2018, a section of single-phase will be relocated and fed from a different source in order to eliminate difficult-to-access lines.
- In 2018, full circuit tree trimming will be performed.

## **40 Circuit 46602 -- LARRYS CREEK 66-02**

### Performance Analysis

The LARRYS CREEK 66-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On January 5, 2015, during a period of strong wind, a tree made contact with a pole or pole arm causing a recloser to trip to lockout. This outage affected 647 customers for up to 328 minutes resulting in 212,216 CMI.

On March 31, 2015, during a period of ice/sleet/snow, a vehicle made contact with a pole causing a recloser to trip to lockout. This outage affected 666 customers for up to 261 minutes resulting in 173,826 CMI.

In total, the LARRYS CREEK 66-02 circuit had 41 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (24); nothing found (7); equipment failure (6); animal contacts (3); vehicles (1).

### Remedial Actions

- In 2015, 10 spans of difficult-to-access line were relocated.
- In 2015, five additional fuses were installed on single-phase lines.
- In 2016, the power transformer at the LARRYS CREEK substation will be replaced with a new, larger capacity transformer.
- In 2016, a project is scheduled to install several fuses to add additional sectionalizing.

## **41 Circuit 27502 -- WEISSPORT 75-02**

### Performance Analysis

The WEISSPORT 75-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On July 22, 2015, a vehicle contact occurred causing a recloser to trip to lockout. This outage affected 1,577 customers for up to 284 minutes resulting in 447,868 CMI.

In total, the WEISSPORT 75-02 circuit had 15 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (6); equipment failure (4); tree related (2); nothing found (1); other (1); vehicles (1).

### Remedial Actions

- In 2014, full circuit tree trimming was performed.
- In 2015, an Expanded Operational Review was performed. Several improvements were identified and completed.
- In 2015, a deteriorated river crossing pole was repaired.
- In 2016, the conductor crossing the river between East Jim Thorpe and West Jim Thorpe will be rebuilt. The wood pole structure will be replaced with steel poles, and the existing conductor will be upgraded to a heavier conductor.

## **42 Circuit 44904 -- SCOTT 49-04**

### Performance Analysis

The SCOTT 49-04 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On October 28, 2015, an errant blimp tether made contact with an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 2,043 customers for up to 763 minutes resulting in 429,978 CMI.

In total, the SCOTT 49-04 circuit had 16 outages between January 2015 and December 2015, with the causes breaking down as follows: *other (4); animal contacts (3); equipment failure (3); nothing found (3); tree related (2); vehicles (1).*

### Remedial Actions

- In 2015, an underground getaway was proactively replaced at this substation.
- In 2017, three-phase fusing will be installed in one location.
- In 2018, full circuit tree trimming will be performed.

## **43 Circuit 12701 -- MACUNGIE 27-01**

### Performance Analysis

The MACUNGIE 27-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On September 1, 2015, a vehicle contact occurred causing a transformer to be interrupted. This outage affected 1,421 customers for up to 549 minutes resulting in 171,428 CMI.

In total, the MACUNGIE 27-01 circuit had 54 outages between January 2015 and December

2015, with the causes breaking down as follows: equipment failure (18); tree related (16); vehicles (8); animal contacts (7); nothing found (5).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2016, a new reliability substation in Zionsville will be constructed to split the Macungie 27-01 and reduce customer outage exposure. Additional remote sectionalizing devices will also be installed.
- In 2016, a smart grid device will be installed on this circuit as part of the smart grid initiative.
- In 2016, a section conductor will be relocated to a more accessible location.
- In 2018, a section of three-phase conductor will be relocated to a more accessible location.

## **44 Circuit 57501 -- LAWNTON 75-01**

### Performance Analysis

The LAWNTON 75-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On January 26, 2015, during a period of ice/sleet/snow, a vehicle contact occurred causing a circuit breaker to trip to lockout. This outage affected 1,542 customers for up to 130 minutes resulting in 146,305 CMI.

On December 9, 2015, a tree made contact with a substation component causing a circuit breaker to trip to lockout. This outage affected 3,356 customers for up to 162 minutes resulting in 154,071 CMI.

In total, the LAWNTON 75-01 circuit had 12 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (5); equipment failure (3); tree related (3); vehicles (1).

#### Remedial Actions

- In 2015, full circuit trimming was performed.
- In 2015, an infrared inspection was performed on this circuit. Several minor items were identified and remediated.
- In 2015, a tap was moved from one phase to another to improve load balancing.
- In 2016, additional circuit load balancing work will be performed.
- In 2016, additional fusing will be installed on this circuit.
- In 2017, a new recloser with smart grid capability will be installed on this circuit.
- In 2018, a new recloser with smart grid capability will be installed on this circuit.

### **45 Circuit 40201 -- BEAR GAP 02-01**

#### Performance Analysis

The BEAR GAP 02-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On August 18, 2015, an unidentified issue occurred with a pole or pole arm causing a recloser to trip to lockout. This outage affected 1,642 customers for up to 475 minutes resulting in 168,936 CMI.

In total, the BEAR GAP 02-01 circuit had 51 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (21); equipment failure (14); animal contacts (7); nothing found (4); other (4); vehicles (1).

## Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2015, a new sectionalizing device with remote operational capability was installed as part of the smart grid initiative.
- In 2015, single and three-phase fusing was installed in multiple locations.
- In 2016, additional animal guarding areas will be installed.
- In 2016, a manual sectionalizing switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.
- In 2016, a new single-phase recloser will be installed.

## **46 Circuit 17001 -- RIDGE ROAD 70-01**

### Performance Analysis

The RIDGE ROAD 70-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On December 19, 2015, an equipment failure occurred on an overhead conductor. This outage affected 775 customers for up to 311 minutes resulting in 108,873 CMI.

On December 24, 2015, an equipment failure occurred on an overhead conductor causing a recloser to trip to lockout. This outage affected 782 customers for up to 237 minutes resulting in 113,298 CMI.

In total, the RIDGE ROAD 70-01 circuit had 43 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (24); equipment failure (9); nothing found (5); animal contacts (4); vehicles (1).

## Remedial Actions

- In 2014, three smart grid devices were installed.
- In 2015, hot spot tree trimming was performed to address momentary interruptions.
- In 2015, two reclosers were updated to remote operability as part of the smart grid initiative.
- In 2016, full circuit trimming will be performed.
- In 2016, a line patrol will be performed.
- In 2016, several single-phase taps will be fused.
- In 2016, a section of difficult-to-access three-phase conductor will be relocated to a more accessible location and the protection scheme will be revised.
- In 2017, fusing will be installed to remediate a group of high CEMI customers.

## **47 Circuit 23604 -- WRIGHT 36-04**

### Performance Analysis

The WRIGHT 36-04 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On April 10, 2015, an equipment failure occurred on an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 2,056 customers for up to 282 minutes resulting in 255,260 CMI.

In total, the WRIGHT 36-04 circuit had 19 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (7); equipment failure (7); tree related (5).

### Remedial Actions

- In 2015, aerial cable testing was performed on this circuit.
- In 2017, one existing manual disconnect switch will be automated as part of the smart grid initiative.
- In 2017, an Expanded Operational Review will be performed.
- In 2017, full circuit tree trimming will be performed.
- In 2018, an existing three-phase disconnect in a difficult-to-access location is being considered for an automated recloser device.

## **48 Circuit 64502 -- LAVINO 45-02**

### Performance Analysis

The LAVINO 45-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 12, 2015, during a period of lightning, an unidentified issue occurred with an overhead switch causing a recloser to trip to lockout. This outage affected 1,894 customers for up to 171 minutes resulting in 323,627 CMI.

In total, the LAVINO 45-02 circuit had 12 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (4); vehicles (3); equipment failure (2); tree related (2); nothing found (1).

### Remedial Actions

- In 2015, full circuit tree trimming was performed
- In 2015, all aluminum crimps on three-phase copper conductor were replaced.
- In 2015, two new sectionalizing devices were added to this circuit.
- In 2016, a project to reconductor a section of the LAVINO 45-02 line to strengthen the tie between the LAVINO 45-02 and HEIDELBERG 35-01 line will be evaluated.

- In 2016, an infrared inspection will be performed on all three-phase backbone.
- In 2017, a recloser will be replaced with automated vacuum recloser as part of the smart grid initiative.
- In 2017, transmission switches will be replaced with automate switches to improve switching capabilities between two transmission lines.
- In 2018, reconductoring will be performed on a section of the LAVINO 45-03 line to strengthen the tie between the LAVINO 45-02 and LAVINO 45-03 line.

## **49 Circuit 17804 -- GILBERT 78-04**

### Performance Analysis

The GILBERT 78-04 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On February 15, 2015, during a period of ice/sleet/snow, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 598 customers for up to 1,084 minutes resulting in 281,868 CMI.

In total, the GILBERT 78-04 circuit had 29 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (9); equipment failure (8); animal contacts (5); nothing found (5); contact or dig in (1); vehicles (1).

### Remedial Actions

- In 2015, a new tie line was completed.
- In 2016, three single-phase reclosers were added to single-phase and two phase taps.
- In 2016, a new electronic recloser will be installed.
- In 2017, full circuit trimming will be performed.

## **50 Circuit 62606 -- ENGLSIDE 26-06**

### Performance Analysis

The ENGLSIDE 26-06 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On March 2, 2015, during a period of ice/sleet/snow, an unidentified issue occurred with a substation component causing a circuit breaker to trip to lockout. This outage affected 2,646 customers for up to 90 minutes resulting in 147,474 CMI.

On July 9, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing an interruption. This outage affected 2,641 customers for up to 231 minutes resulting in 228,270 CMI.

In total, the ENGLSIDE 26-06 circuit had 9 outages between January 2015 and December 2015, with the causes breaking down as follows: animal contacts (2); equipment failure (2); nothing found (2); other (2); tree related (1).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2015, a new smart grid device was installed on this circuit as part of the smart grid initiative.
- In 2015, all aluminum crimps on the three-phase copper conductor were replaced.
- In 2016, two manual switches will be replaced with automated vacuum reclosers as part of the smart grid initiative.
- In 2016, two new smart grid devices will be installed on this circuit as part of the smart grid initiative.
- In 2016, a tie line will be built between the ENGLSIDE 26-06 line and the PRINCE 52-02. This tie will provide additional sectionalizing capabilities.

- In 2017, a new smart grid device will be installed on this circuit as part of the smart grid initiative.

## **51 Circuit 51905 -- COLONIAL PARK 19-05**

### Performance Analysis

The COLONIAL PARK 19-05 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On May 12, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing an interruption. This outage affected 1,924 customers for up to 469 minutes resulting in 287,864 CMI.

On July 15, 2015, an equipment failure occurred on an overhead conductor causing a circuit breaker to trip to lockout. This outage affected 370 customers for up to 340 minutes resulting in 101,360 CMI.

In total, the COLONIAL PARK 19-05 circuit had 11 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (6); equipment failure (4); animal contacts (1).

### Remedial Actions

- In 2015, full circuit trimming was performed.
- In 2015, an Expanded Operational Review and infrared inspection were performed on this circuit.
- In 2016, several locations will be evaluated for single-phase fusing.
- In 2016, a lengthy two-phase tap will be reviewed for additional sectionalizing.
- In 2016, approximately one mile of aging underground getaway will be replaced with overhead double circuit.
- In 2017, a new automated tie switch will be installed as part of the smart grid initiative.

## **52 Circuit 42601 -- TUSCARORA 26-01**

### Performance Analysis

The TUSCARORA 26-01 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On January 5, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 1,051 customers for up to 97 minutes resulting in 101,947 CMI.

On October 28, 2015, during a period of strong wind, an errant blimp tether broke a pole causing a circuit breaker to trip to lockout. This outage affected 2,163 customers for up to 429 minutes resulting in 286,122 CMI.

In total, the TUSCARORA 26-01 circuit had 13 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (7); tree related (3); animal contacts (1); nothing found (1); other (1).

- In 2015, SCADA was installed at the TUSCARORA substation.
- In 2016, an existing disconnect switch will be automated as part of the smart grid initiative.
- In 2016, additional single-phase fusing on single-phase taps is being proposed.
- In 2018, full circuit tree trimming will be performed.

## **53 Circuit 61303 -- EARL 13-03**

### Performance Analysis

The EARL 13-03 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On January 21, 2015, during a period of ice/sleet/snow, a vehicle contact occurred causing a recloser to trip to lockout. This outage affected 1,520 customers for up to 468 minutes resulting in 251,849 CMI.

In total, the EARL 13-03 circuit had 24 outages between January 2015 and December 2015, with the causes breaking down as follows: vehicles (8); equipment failure (7); tree related (7); animal contacts (1); other (1).

### Remedial Actions

- In 2015, single-phase fuses were added in multiple locations.
- In 2015, all aluminum crimps on the three-phase copper conductor were replaced.
- In 2016, an infrared inspection will be performed on all three-phase backbone.
- In 2017, a manual switch will be replaced with an automated vacuum recloser as part of the smart grid initiative.
- In 2017, a new smart grid device will be installed on this circuit as part of the smart grid initiative.
- In 2017, full circuit tree trimming will be performed.

## **54 Circuit 67401 -- WAKEFIELD 74-01**

### Performance Analysis

The WAKEFIELD 74-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 23, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing a load break fuse to operate. This outage affected 99 customers for up to 1,398 minutes resulting in 138,341 CMI.

In total, the WAKEFIELD 74-01 circuit had 34 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (15); equipment failure (14); animal contacts (4); other (1).

### Remedial Actions

- In 2015, single-phase fuses were added in multiple locations.
- In 2015, a single-phase recloser and several new load break disconnect switches were installed.
- In 2015, all aluminum on copper crimps on the three-phase line were replaced.
- In 2016, a new tie line is planned between WAKEFIELD 74-01 and WAKEFIELD 74-02. This tie will provide additional sectionalizing capabilities.
- In 2017, full circuit tree trimming will be performed.
- In 2017, a new smart grid device will be installed on this circuit as part of the smart grid initiative.

## **55 Circuit 51502 -- SWATARA 15-02**

### Performance Analysis

The SWATARA 15-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On June 9, 2015, during a period of strong wind, a tree made contact with an overhead conductor causing an interruption. This outage affected 1,834 customers for up to 839 minutes, resulting in 313,285 CMI.

In total, the SWATARA 15-02 circuit had 16 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (7); animal contacts (3); tree related (3); contact or dig in (2); vehicles (1).

### Remedial Actions

- In 2014, four sectionalizing devices were upgraded with remote operational capability as part of the smart grid initiative.
- In 2015, this circuit was inspected for aluminum-on-copper crimps. Any found were remediated. The circuit was also evaluated for any critical issues at this time.
- In 2015, a no-load transformer was removed from this circuit.
- In 2015, an infrared inspection was performed on this circuit and several minor items remediated.
- In 2016, the protection scheme and device settings for the circuit will be evaluated.
- In 2016, *full circuit trimming will be performed.*
- In 2018, two new devices with remote sectionalizing capability will be installed as part of the smart grid initiative.

## **56 Circuit 43202 -- MILLVILLE 32-02**

### Performance Analysis

The MILLVILLE 32-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On October 28, 2015, during a period of strong wind, an errant blimp tether made contact with overhead transmission conductor, breaking a pole and causing a circuit breaker to trip to lockout. This outage affected 1,176 customers for up to 155 minutes resulting in 181,198 CMI.

In total, the MILLVILLE 32-02 circuit had 29 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (17); equipment failure (5); animal contacts (3); nothing found (2); other (2).

### Remedial Actions

- In 2015, reconductored several spans of three-phase to larger conductor.
- In 2015, hot spot trimming for CEMI customers and hazard tree removal was performed.
- In 2015, replaced single-phase hydraulic device with a larger vacuum recloser and installed series fusing.
- In 2015, a project that will increase transfer capability from the MILLVILLE 32-02 to the HUGHESVILLE 70-01 was completed. Approximately 8,500 feet of larger capacity conductor was installed on the MILLVILLE 32-02.
- In 2016, full circuit trimming will be performed.

## **57 Circuit 44902 -- SCOTT 49-02**

### Performance Analysis

The SCOTT 49-02 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On October 28, 2015, during a period of strong wind, an errant blimp tether made contact with an overhead transmission component, breaking a pole and causing a circuit breaker to trip to lockout. This outage affected 1,710 customers for up to 151 minutes resulting in 257,320 CMI.

*In total, the SCOTT 49-02 circuit had 28 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (13); other (5); equipment failure (4); nothing found (3); vehicles (2); animal contacts (1).*

### Remedial Actions

- In 2015, load balancing was performed on this circuit.
- In 2015, the underground getaway for this circuit was retired and replaced with a new over-head getaway.
- In 2017, full circuit trimming will be performed.

## **58 Circuit 17802 -- GILBERT 78-02**

### Performance Analysis

The GILBERT 78-02 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On August 30, 2015, an equipment failure occurred on an overhead conductor causing a recloser to trip to lockout. This outage affected 596 customers for up to 223 minutes resulting in 132,794 CMI.

On September 13, 2015, during a period of heavy rain, a tree made contact with an overhead conductor causing a recloser to trip to lockout. This outage affected 596 customers for up to 194 minutes resulting in 115,182 CMI.

In total, the GILBERT 78-02 circuit had 52 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (18); tree related (15); animal contacts (9); nothing found (5); vehicles (4); other (1).

### Remedial Actions

- In 2015, an Expanded Operational Review was conducted.
- In 2016, full circuit trimming will be performed.
- In 2016, two fusing opportunities will be investigated.
- In 2016, automated switching by the Fault Identification System Restoration computer system will go live on this circuit, which will reduce outage durations.

## **59 Circuit 64801 -- MOUNT NEBO 48-01**

### Performance Analysis

The MOUNT NEBO 48-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On February 16, 2015, during a period of ice/sleet/snow, an equipment failure occurred on an overhead switch causing a recloser to trip to lockout. This outage affected 520 customers for up to 446 minutes resulting in 207,406 CMI.

In total, the MOUNT NEBO 48-01 circuit had 41 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (17); equipment failure (14); animal contacts (6); nothing found (2); other (2).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2015, all aluminum crimps on the three-phase copper conductor were replaced.
- In 2016, single-phase fuses will be added in multiple locations.
- In 2016, a manual switch will be replaced with a single-phase fuse.
- In 2016, an infrared inspection will be performed on the three-phase backbone.
- In 2016, a sectionalizing device will be evaluated for a heavily wooded area.
- In 2017, a new smart grid device will be installed on this circuit.
- In 2017, three manual switches will be replaced with automated vacuum reclosers as part of the smart grid initiative.

## **60 Circuit 27403 -- KEYSER AVENUE 74-03**

### Performance Analysis

The KEYSER AVENUE 74-03 circuit experienced two outages of over 100,000 CMI between January 2015 and December 2015.

On October 12, 2015, a vehicle contact occurred causing a recloser to trip to lockout. This outage affected 1,203 customers for up to 245 minutes resulting in 113,611 CMI.

On October 29, 2015, during a period of strong wind, an unidentified issue occurred with an overhead switch causing a recloser to trip to lockout. This outage affected 1,203 customers for up to 125 minutes resulting in 124,872 CMI.

In total, the KEYSER AVENUE 74-03 circuit had 9 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (5); nothing found (3); vehicles (1).

### Remedial Actions

- In 2015, additional fusing opportunities were evaluated.
- In 2016, an electronic recloser will be installed to operate as a tie point.

## **61 Circuit 45501 -- DERRY 55-01**

### Performance Analysis

The DERRY 55-01 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On October 20, 2014, an equipment failure occurred on an underground conductor causing a temporary open point to be interrupted. This outage affected 347 customers for up to 1,148 minutes resulting in 298,420 CMI.

In total, the DERRY 55-01 circuit had 32 outages between January 2015 and December 2015, with the causes breaking down as follows: equipment failure (9); tree related (9); animal contacts (6); nothing found (4); vehicles (3); other (1).

### Remedial Actions

- In 2015, a new manual disconnect switch was installed on this circuit.
- In 2015, a new sectionalizing device with remote operational capability was installed to improve sectionalizing as part of the smart grid initiative.
- In 2016, additional fusing will be installed.
- In 2016, solid blade disconnects will be installed on a three-phase tap.
- In 2017, full circuit trimming will be performed.
- In 2017, 500 feet of new single-phase will be built to replace a section of difficult-to-access conductor, and a new recloser will be installed.

## **62 Circuit 10903 -- COOPERSBURG 09-03**

### Performance Analysis

The COOPERSBURG 09-03 circuit experienced one outage of over 100,000 CMI between January 2015 and December 2015.

On March 9, 2015, a tree made contact with a substation component causing a circuit breaker to trip to lockout. This outage affected 1,679 customers for up to 129 minutes resulting in 101,972 CMI.

In total, the COOPERSBURG 09-03 circuit had 26 outages between January 2015 and December 2015, with the causes breaking down as follows: tree related (11); animal contacts (6); equipment failure (6); vehicles (2); other (1).

### Remedial Actions

- In 2015, full circuit tree trimming was performed.
- In 2016, single-phase fusing will be evaluated on several taps.
- In 2018, a new smart grid device will be installed on this circuit as part of the smart grid initiative.

5) *A rolling 12-month breakdown and analysis of outage causes during the preceding quarter, 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 following table shows a breakdown of service interruption causes for the 12 months ended at the current quarter. PPL Electric's maintenance programs focus on corrective actions to address controllable service interruptions (e.g., trees and equipment failure).

Cause Description	Trouble Cases	Percent of Trouble Cases	Customer Interruptions	Percent of Customer Interruptions	Customer Minutes	Percent of Customer Minutes
Animals	3,311	22.1%	47,721	4.7%	3,920,788	3.3%
Contact / Dig-In	182	1.2%	15,750	1.6%	901,884	0.8%
Directed by Non-PPL Authority	189	1.3%	23,362	2.3%	2,200,404	1.9%
Equipment Failures	5,005	33.4%	311,581	30.9%	34,279,080	28.9%
Improper Design	3	0.0%	1,856	0.2%	245,849	0.2%
Improper Installation	3	0.0%	1,023	0.1%	81,632	0.1%
Improper Operation	4	0.0%	4,509	0.4%	429,290	0.4%
Nothing Found	1,102	7.4%	58,466	5.8%	4,899,228	4.1%
Other Controllable	83	0.6%	8,412	0.8%	353,752	0.3%
Other Non Control	257	1.7%	66,499	6.6%	5,568,006	4.7%
Other Public	69	0.5%	13,411	1.3%	1,600,576	1.4%
Tree Related	4,006	26.8%	298,061	29.6%	48,851,318	41.2%
Vehicles	759	5.1%	157,332	15.6%	15,216,113	12.8%
<b>Total</b>	<b>14,973</b>	<b>100%</b>	<b>1,007,983</b>	<b>100%</b>	<b>118,547,920</b>	<b>100%</b>

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 the current reporting period, weather was considered a significant contributing cause in 39% of cases, 45% of customer interruptions, and 48% of CMI.

**Tree Related:** PPL Electric has recently increased funding to more aggressively address outside of the right-of-way danger trees. For trees within the right-of-way, PPL Electric has implemented a more aggressive trimming strategy. We are in year three of a five year cycle for the new standard.

**Animals:** Animals accounted for about 22% 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 80% of the number of cases of trouble was associated with individual distribution transformers. However, when animal contacts affect 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 substations are scheduled to be animal guarded by 2017.

**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 40% of the cases of trouble, 41% of the customer interruptions and 46% 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.

**Nothing Found:** This description is recorded when the responding crew can find no cause for the interruption. That is, when there is no evidence of equipment failure, damage, or contact after a line patrol is completed. For example, during heavy thunderstorms, when a line fuse blows or a single-phase OCR locks open and when closed for test, the fuse holds, or the OCR remains closed, and a patrol reveals nothing.

6) *Quarterly and year-to-date information on progress toward meeting transmission and distribution inspection and maintenance goals/objectives. (For first, second and third quarter reports only.)*

Inspection & Maintenance Goals/Objectives	Annual Budget	4th Quarter		Year-to-date	
		Budget	Actual	Budget	Actual
<b>Transmission</b>					
Transmission C-tag poles (# of poles)	324	80	80	324	220
Transmission arm replacements (# of sets)	23	0	8	20	20
Transmission air break switch inspections (# of switches)	13	0	4	13	11
Transmission lightning arrester installations (# of sets)	5,484	1,240	1,260	5,485	5,063
Transmission structure inspections (# of structures)	737	198	270	737	665
Transmission tree side trim-Bulk Power (linear feet)	N/A				
Transmission herbicide-Bulk Power (# of acres)	N/A				
Transmission reclearing (# of miles) BES Only	625	40	30	625	584
Transmission reclearing (# of miles) 69 kV	974	254	227	974	985
Transmission reclearing (# of miles) 138 kV	336	61	157	293	310
Transmission danger tree removals-Bulk Power (# of trees)	N/A	N/A	6,507	N/A	26,166
<b>Substation</b>					
Substation batteries (# of activities)	652	43	46	652	652
Circuit breakers (# of activities)	582	116	714	582	529
Substation inspections (# of activities)	4,326	832	1,088	4,326	4,595
Transformer maintenance (# of activities)	1,353	311	301	1,353	1,384

Inspection & Maintenance Goals/Objectives	Annual Budget	4th Quarter		Year-to-date	
		Budget	Actual	Budget	Actual
<b>Distribution</b>					
Distribution C-tag poles replaced (# of poles)	1,234	150	179	1,234	1,194
C-truss distribution poles (# of poles)	5,254	1,405	1,405	5,254	5,254
Capacitor (MVAR added)	0	0	0	0	0
OCR Replacements (# of)	106	0	1	106	110
Distribution pole inspections (# of poles)	114,822	29,695	19,697	114,822	104,884
Distribution line inspections (hours)	8,820	1,253	1,589	8,820	8,473
Group re-lamping (# of lamps)	15,073	0	1,377	15,073	15,108
Test sections of underground distribution cable	698	299	299	698	904
Distribution tree trimming (# of miles)	6,247	1,584	1,741	6,334	6,264
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	N/A	5,690	N/A	19,105
LTN manhole inspections (# of)	313	49	81	313	312
LTN vault inspections (# of)	714	131	166	714	726
LTN network protector overhauls (# of)	75	16	23	75	70
LTN reverse power trip testing (# of)	49	14	22	49	67

- 7) *Quarterly and year-to-date information on budgeted versus actual transmission and distribution operation and maintenance expenditures in total and detailed by the EDC's own functional account code or FERC account code as available.*

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

Activity	4th Quarter		Year-to-date	
	Budget (\$000)	Actual (\$000)	Budget (\$000)	Actual (\$000)
Provide Electric Service	2,084	2,144	7,880	7,979
Vegetation Management	13,254	16,574	56,471	58,607
Customer Response	18,106	11,250	73,075	53,681
Reliability Maintenance	12,586	16,919	54,453	58,938
System Upgrade	66	2,587	496	3,008
Customer Service/Accounts	34,718	34,960	135,140	136,726
Others	8,748	13,551	35,023	43,065
<b>Total O&amp;M Expenses</b>	<b>89,560</b>	<b>97,985</b>	<b>362,536</b>	<b>362,004</b>

- 8) *Quarterly and year-to-date information on budgeted versus actual transmission and distribution capital expenditures in total and detailed by the EDC's own functional account code or FERC account code as available.*

The following table provides the capital expenditures for PPL Electric, as a whole, which includes transmission and distribution (“T&D”) activities.

Activity	4th Quarter		Year-to-date	
	Budget (\$000)	Actual (\$000)	Budget (\$000)	Actual (\$000)
New Service/Revenue	20,068	17,894	76,935	86,721
System Upgrade	101,307	115,489	505,452	476,639
Reliability & Maintenance	89,193	119,405	418,681	457,018
Customer Response	3,051	819	11,351	5,952
Other	9,322	11,335	31,191	29,312
<b>Total</b>	<b>222,940</b>	<b>264,942</b>	<b>1,043,611</b>	<b>1,055,643</b>

- 9) *Dedicated staffing levels for transmission and distribution operation and maintenance at the end of the quarter, in total and by specific category (for example, linemen, technician and electrician).*

The following table shows the dedicated staffing levels as of the end of the quarter. Job descriptions are provided in Appendix B.

<b>Transmission and Distribution(T&amp;D)</b>	
Lineman Leader	65
Journeyman Lineman	223
Journeyman Lineman-Trainee	51
Helper	0
Groundhand	5
Troubleman	51
<b>T&amp;D Total</b>	<b>395</b>
<b>Electrical</b>	
Elect Leaders-UG	5
Elect Leaders-Net	10
Elect Leaders-Sub	23
Journeyman Elect-UG	21
Journeyman Elect-Net	28
Journeyman Elect-Sub	54
Journeyman Elect Trainee-UG	2
Journeyman Elect Trainee-Net	7
Journeyman Elect Trainee-Sub	30
Helper	5
Laborer-Network	0
Laborer-Substation	0
<b>Electrical Total</b>	<b>180</b>
<b>Overall Total</b>	<b>575</b>

*PPL Electric Utilities Corporation*

*Worst Performing Circuit Definition / Comparison under old and new  
Circuit Performance Index (CPI) formulas.*

PPL Electric uses total Customer Minutes Interrupted (CMI) during the previous four quarters to define the worst performing circuits on its system. Major events and pre-arranged outages are excluded. This ranking system was put in place as of the second quarter of 2013, for the following reasons:

- It focuses remediation efforts where they will have the greatest customer impact. Small pockets of customers with multiple interruptions are addressed under the CEMI (Customers Experiencing Multiple Interruptions) program, which is adequately funded to remediate these smaller customer groups.
- It identifies the circuits contributing the most to system SAIDI.
- It is simple and transparent, therefore allowing WPCs to be identified and remediated on a short timetable.

***PPL Electric Utilities Corporation***

***Job Descriptions***

***Transmission and Distribution***

Groundhand	<ul style="list-style-type: none"><li>• Performs manual labor and assists employees in higher job classifications.</li></ul>
Helper	<ul style="list-style-type: none"><li>• Performs semi-skilled labor at any work location on de-energized overhead and underground transmission, and distribution facilities to prepare the employee for entrance into the Journeyman Lineman Apprenticeship Program.</li></ul>
Journeyman Lineman	<ul style="list-style-type: none"><li>• Works alone or as part of a crew on the maintenance, operation, and construction activities of the transmission and distribution systems associated with, but not limited to, PPL Electric facilities.</li></ul>
Journeyman Lineman-Trainee	<ul style="list-style-type: none"><li>• Works alone or as part of a crew on the maintenance, operation, and construction activities of the transmission and distribution systems associated with, but not limited to, PPL Electric facilities.</li></ul>
Lineman Leader	<ul style="list-style-type: none"><li>• Responsible for completing assigned work by directing one or multiple groups of employees involved in the maintenance, operation, and construction activities of the transmission and distribution systems associated with, but not limited to, PPL Electric facilities.</li><li>• Engage in and perform work along with providing the necessary leadership, all-around knowledge, initiative, judgment, and experience to produce a quality job.</li><li>• Performs all the direct duties of the Journeyman Lineman when not acting as a Lineman Leader.</li></ul>
Troubleman	<ul style="list-style-type: none"><li>• Investigates and resolves trouble calls, voltage abnormalities on transmission and distribution systems associated with, but not limited to, PPL Electric facilities.</li></ul>

## Appendix B

### *Electrical*

Electrician Leader - Substation - Network - Underground	<ul style="list-style-type: none"><li>• Responsible for completing assigned work by directing one or multiple groups of employees involved in the construction and maintenance activities of the transmission and distribution systems associated with, but not limited to, PPL Electric facilities.</li><li>• Engage in and perform work along with providing the necessary leadership, all-around knowledge, initiative, judgment, and experience to produce a quality job.</li><li>• Performs all direct duties of the Journeyman Electrician when not acting as a leader.</li></ul>
Helper - Substation - Network - Underground	<ul style="list-style-type: none"><li>• Performs manual labor at any work location including those areas containing non-exposed energized electrical equipment, and to prepare the employee for entrance into the Apprenticeship Program.</li></ul>
Laborer - Substation - Network - Underground	<ul style="list-style-type: none"><li>• Performs manual labor and assists employees in higher job classifications.</li></ul>
Journeyman Electrician - Substation - Network - Underground	<ul style="list-style-type: none"><li>• Normally under limited supervision performs and is responsible for work associated with, but not limited to, PPL Electric facilities involving the highest degree of skill in construction and maintenance work associated with substations, LTN or underground distribution and transmission.</li><li>• Uses microprocessor based equipment for troubleshooting and revising relay logic and its control systems related to the Field Services electrical discipline.</li></ul>

## Appendix B

<p>Journeyman Electrician - Trainee</p> <ul style="list-style-type: none"><li>- Substation</li><li>- Network</li><li>- Underground</li></ul>	<ul style="list-style-type: none"><li>• Normally under limited supervision performs and is responsible for work associated with, but not limited to, PPL Electric facilities involving the highest degree of skill in construction and maintenance work associated with substations, LTN or underground distribution and transmission.</li><li>• Uses microprocessor based equipment for troubleshooting and revising relay logic and its control systems related to the Field Services electrical discipline.</li></ul>
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