



Ameren Missouri 4 CSR 240-23.010 Electric Utility System Reliability Monitoring and Reporting Submission Requirements – Annual Reliability Report

Introduction

This report details Union Electric (dba Ameren Missouri) Company's annual reliability metrics and worst performing circuits for calendar year 2018 as required by Missouri Public Service Commission Rule 4 CSR 240-23.010, Electric Utility System Reliability Monitoring and Reporting Submission Requirements (referred to in the remainder of this document as "the Rule"). This report is required by Sections (2), (7), and (8) of the Rule which state, *"The information required by section (1) shall be filed annually by the last business day of April of the calendar year following the calendar year for which the information was accumulated.... The information developed in accordance with section (6) shall be reported as part of the annual report required by section (2).... If on or after the time the annual report required by section (7) for calendar year 2011 is filled, a circuit has been on the worst performing circuit list for two (2) of the three (3) most recent consecutive calendar years the electrical corporation shall include detailed plans and schedules for improving the performance of that circuit in addition to the other information required by section (7)."* This report will provide the reliability measures requested by the Rule, the list of Worst Performing Circuits (WPCs), including Multi-Year Worst Performing Circuits (MWPCs), and the actions taken or planned to improve the performance of these circuits.

Definitions

For the purposes of this report, the following definitions shall apply:

1. System Average Interruption Frequency Index (SAIFI) – The average frequency of service interruptions in number of occurrences per customer (total number of customer interruptions divided by the total number of customers served).
2. Customer Average Interruption Frequency Index (CAIFI) – The average number of interruptions per customer interrupted (total number of customer interruptions divided by the total number of customers affected).
3. System Average Interruption Duration Index (SAIDI) – The average interruption in minutes per customer served (sum of all customer interruption durations divided by the total number of customers served).
4. Customer Average Interruption Duration Index (CAIDI) – The average interruption duration (sum of all customer interruption durations divided by the total number of customers interrupted).



5. Worst Performing Circuit (WPC) – A distribution circuit whose SAIFI value, adjusted to exclude major storm events per IEEE Standard 1366-2012, when compared to the SAIFI values for the other circuits in the Ameren Missouri system places it among the 5% of circuits with the highest SAIFI values in the Ameren Missouri system.
6. Multi-Year Worst Performing Circuit (MWPC) – A distribution circuit whose SAIFI value has ranked it as a Worst Performing Circuit for any two (2) of the three (3) most recent consecutive calendar years.

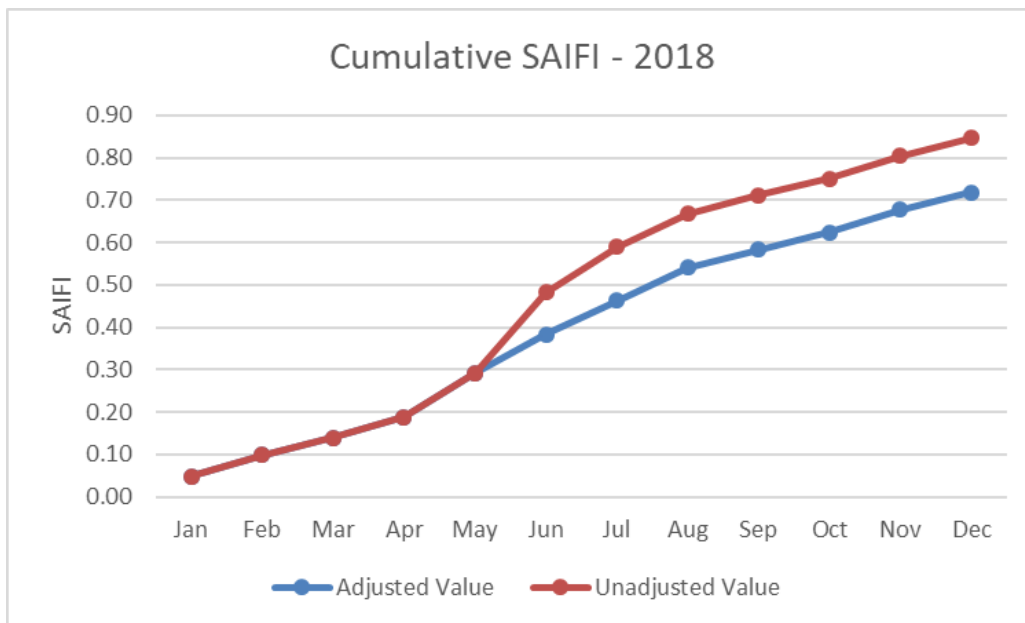


Reliability Metrics

4 CSR 240-23.010, section 3 states “The information required by section (1) shall be filed both unadjusted and adjusted to exclude major storm events per IEEE Standard 1366-2012, Guide for Electric Power Distribution Reliability Indices.” The following tables and graphs show Ameren Missouri’s unadjusted and adjusted reliability metrics for calendar year 2018:

SAIFI:

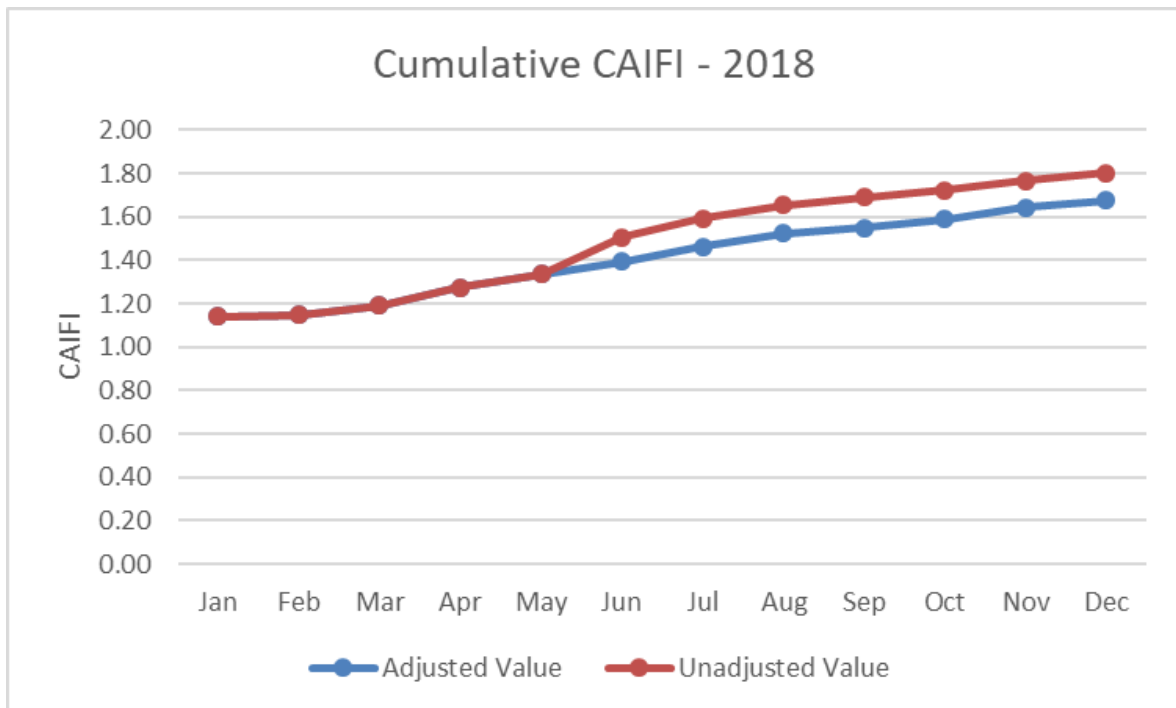
MONTH	Adjusted Value	Unadjusted Value
Jan	0.05	0.05
Feb	0.10	0.10
Mar	0.14	0.14
Apr	0.19	0.19
May	0.29	0.29
Jun	0.38	0.48
Jul	0.46	0.59
Aug	0.54	0.67
Sep	0.58	0.71
Oct	0.62	0.75
Nov	0.68	0.80
Dec	0.72	0.85





CAIFI:

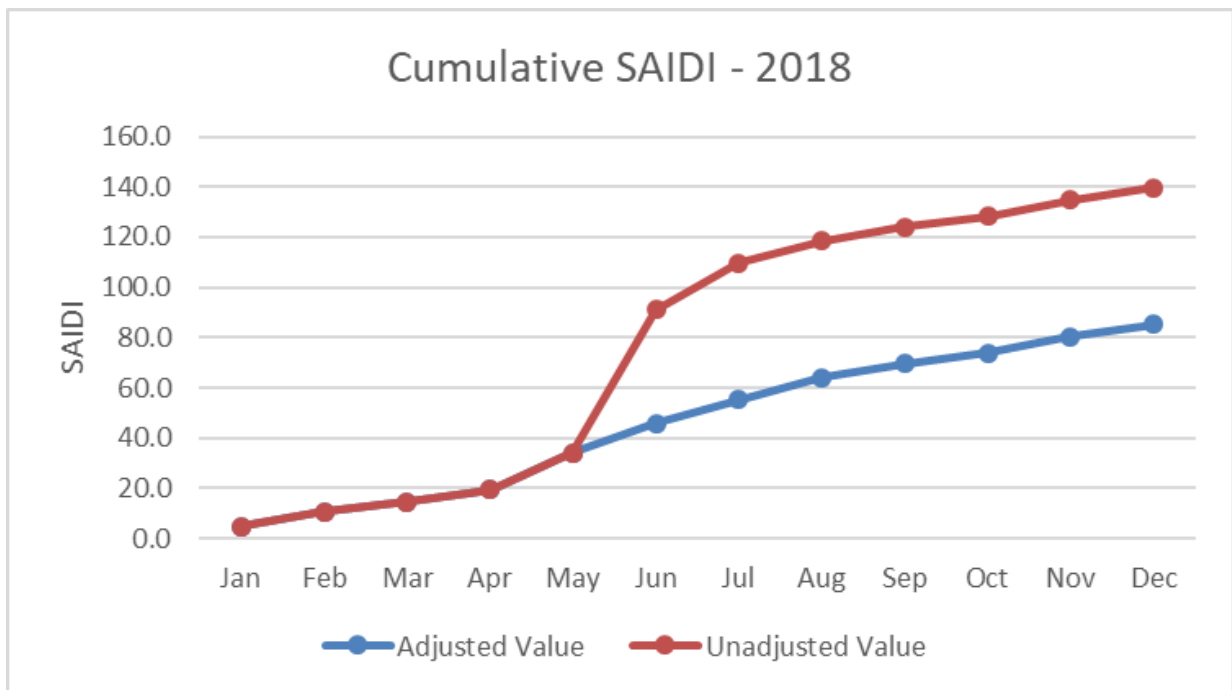
MONTH	Adjusted Value	Unadjusted Value
Jan	1.14	1.14
Feb	1.15	1.15
Mar	1.19	1.19
Apr	1.27	1.27
May	1.34	1.34
Jun	1.39	1.50
Jul	1.46	1.59
Aug	1.52	1.65
Sep	1.55	1.69
Oct	1.59	1.72
Nov	1.64	1.77
Dec	1.68	1.80





SAIDI:

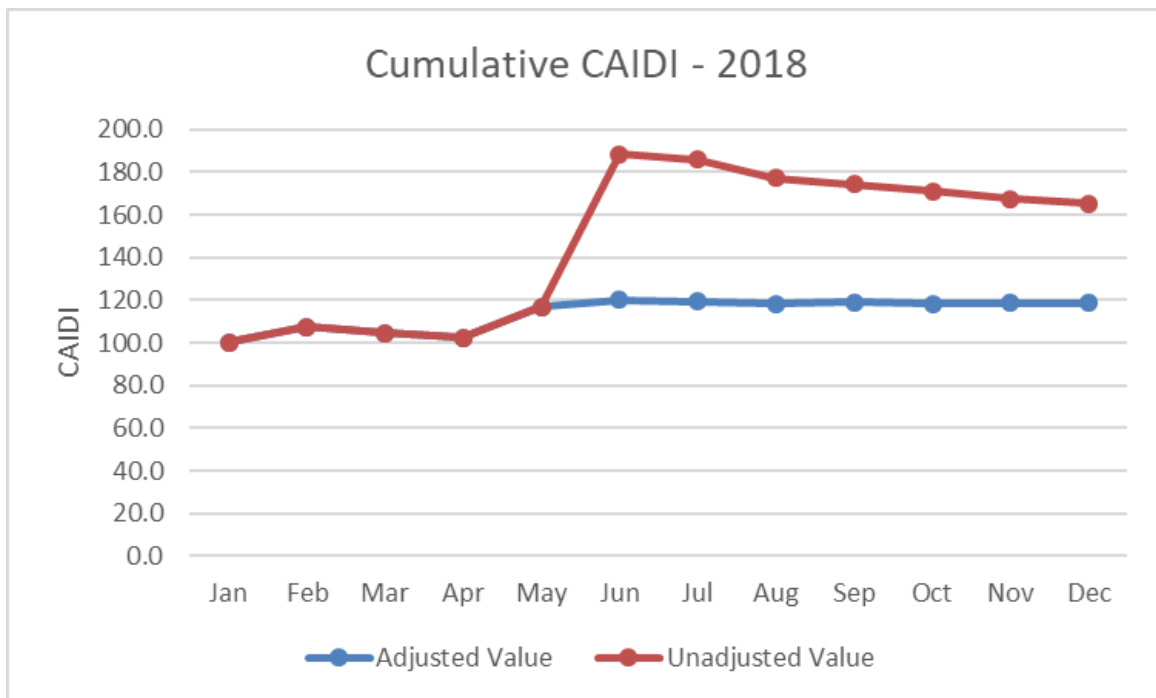
MONTH	Adjusted Value	Unadjusted Value
Jan	4.8	4.8
Feb	10.5	10.5
Mar	14.6	14.6
Apr	19.3	19.3
May	34.1	34.1
Jun	46.0	91.0
Jul	55.3	109.8
Aug	64.0	118.5
Sep	69.5	124.0
Oct	73.8	128.3
Nov	80.3	134.8
Dec	85.3	139.8





CAIDI:

MONTH	Adjusted Value	Unadjusted Value
Jan	100.1	100.1
Feb	107.6	107.6
Mar	104.6	104.6
Apr	102.4	102.4
May	116.8	116.8
Jun	120.2	188.6
Jul	119.6	186.1
Aug	118.4	177.3
Sep	119.0	174.3
Oct	118.5	171.0
Nov	118.7	167.6
Dec	118.7	165.2





Ameren Missouri 2018 Worst Performing Circuits

Ameren Missouri has performed SAIFI calculations on all of its distribution circuits in accordance with section (6) of the Rule. The circuits have been ranked in order of descending 2018 SAIFI and the 5 percent of the circuits with the highest SAIFI values have been designated as Worst Performing Circuits (WPCs). Multi-Year Worst Performing Circuits (MWPCs) have also been identified. The 2018 WPCs, including those designated as MWPCs are listed in Appendix A. The circuit numbers for the MWPCs have been highlighted in red.

Ameren Missouri has analyzed each of the WPCs for the reasons the circuit qualifies as a WPC and the actions planned or taken to improve the WPC's performance have been included in Appendix B. Each of the MWPCs in Appendix B is identified with the title "Multi-Year WPC Analysis and Remedial Action Report". The MWPC reports contain detailed information regarding work completed or planned to improve the performance of each of the MWPCs as required by the Rule.

Multi-year Worst Performing Circuits not on the 2018 WPC list

The MWPCs circuits not identified as WPCs in 2018 but which were WPCs in 2016 and 2017 are listed in Appendix C. Appendix D details the actions taken and/or planned to improve the performance of these circuits.

Conclusion

This report satisfies the reporting requirements of 4 CSR 240-23.010 for the calendar year 2018. The reported reliability metrics demonstrate continued improvement in the reliability of Ameren Missouri's electric distribution system. With an adjusted SAIFI value of 0.72, Ameren Missouri's customers now experience, on average, less than one extended outage per year. The reported analyses and corrective actions for the Worst Performing Circuits also demonstrate Ameren Missouri's high level of focus on improving reliability and our full commitment to satisfying both the intent and the requirements of this rule.



Division	Operating Area	Circuit	Volt	Cust	CI	CMI	SAIDI	SAIFI	2016	2017	2018	Years WPC
GATEWAY	DORSETT	297051	12	57	1312	46935	823	23.02			WPC	1
GATEWAY	DORSETT	235054	12	13	148	24063	1851	11.38			WPC	1
NORTHEAST MO	KIRKSVILLE	974001	4	7	69	3498	500	9.86			WPC	1
ARCHVIEW	GERALDINE	174016	4	62	563	140883	2272	9.08			WPC	1
ARCHVIEW	GERALDINE	128007	4	35	242	36577	1045	6.91			WPC	1
ARCHVIEW	GERALDINE	238005	4	96	632	144644	1507	6.58			WPC	1
CENTRAL MO	EXCELSIOR SPRINGS	760051	13	390	2398	301215	772	6.15			WPC	1
NORTHEAST MO	WENTZVILLE	674052	12	431	2450	365388	848	5.68			WPC	1
CENTRAL MO	MEXICO	792052	12	154	847	54209	352	5.50			WPC	1
SEMO	HAYTI	456057	12	127	663	147171	1159	5.22		WPC	WPC	2
ARCHVIEW	GERALDINE	202007	4	153	761	40993	268	4.97		WPC	WPC	2
ARCHVIEW	GERALDINE	160001	4	453	1798	122772	271	3.97			WPC	1
ARCHVIEW	GERALDINE	120005	4	218	857	79143	363	3.93			WPC	1
ARCHVIEW	GERALDINE	158004	4	9	35	2388	265	3.89			WPC	1
ARCHVIEW	GERALDINE	142002	4	152	547	34566	227	3.60			WPC	1
MERAMEC VALLEY	ELLISVILLE	197056	12	1631	5350	540860	332	3.28	WPC		WPC	2
ARCHVIEW	MACKENZIE	146008	4	789	2499	160950	204	3.17			WPC	1
GATEWAY	BERKELEY	215054	12	1190	3756	229033	192	3.16			WPC	1
ARCHVIEW	MACKENZIE	143004	4	684	2158	275402	403	3.15			WPC	1
ARCHVIEW	MACKENZIE	037008	4	822	2559	177661	216	3.11			WPC	1
GATEWAY	DORSETT	262051	12	343	1042	81729	238	3.04			WPC	1
NORTHEAST MO	KIRKSVILLE	858052	12	1	3	118	118	3.00		WPC	WPC	2
CENTRAL MO	JEFFERSON CITY	818051	12	1453	4293	360324	248	2.95			WPC	1
GATEWAY	BERKELEY	163001	4	507	1488	204285	403	2.93			WPC	1
MERAMEC VALLEY	ELLISVILLE	292054	12	624	1825	432727	693	2.92			WPC	1
MERAMEC VALLEY	JEFFERSON	553057	12	589	1641	129514	220	2.79		WPC	WPC	2
GATEWAY	BERKELEY	265054	12	1351	3728	398832	295	2.76			WPC	1
ARCHVIEW	GERALDINE	025010	4	27	72	17801	659	2.67			WPC	1
ARCHVIEW	MACKENZIE	110058	12	573	1501	264163	461	2.62			WPC	1
CENTRAL MO	LAKESIDE	578056	12	518	1352	23354	45	2.61			WPC	1
GATEWAY	BERKELEY	154007	4	246	638	132085	537	2.59			WPC	1
NORTHEAST MO	LOUISIANA	783053	12	1147	2965	250665	219	2.59			WPC	1
CENTRAL MO	LAKESIDE	205051	12	531	1342	106206	200	2.53			WPC	1
NORTHEAST MO	KIRKSVILLE	753053	4	81	201	56913	703	2.48			WPC	1
GATEWAY	DORSETT	182002	4	512	1268	196654	384	2.48			WPC	1
ARCHVIEW	MACKENZIE	143003	4	694	1672	283922	409	2.41			WPC	1
SEMO	DEXTER	688003	4	293	693	122700	419	2.37			WPC	1
ARCHVIEW	MACKENZIE	146001	4	836	1971	96815	116	2.36			WPC	1
SEMO	CAPE GIRARDEAU	680057	12	877	2055	151747	173	2.34			WPC	1



Division	Operating Area	Circuit	Volt	Cust	CI	CMI	SAIDI	SAIFI	2016	2017	2018	Years WPC
SEMO	DEXTER	688001	4	3	7	2085	695	2.33			WPC	1
NORTHEAST MO	LOUISIANA	672053	12	293	682	81139	277	2.33		WPC	WPC	2
MERAMEC VALLEY	ELLISVILLE	292053	12	141	327	38997	277	2.32	WPC		WPC	2
NORTHEAST MO	WENTZVILLE	649052	12	474	1091	101210	214	2.30			WPC	1
NORTHEAST MO	LOUISIANA	629053	12	259	596	91322	353	2.30			WPC	1
SEMO	DEXTER	688007	4	213	489	120720	567	2.30			WPC	1
ARCHVIEW	GERALDINE	238004	4	752	1715	249169	331	2.28			WPC	1
GATEWAY	DORSETT	264054	12	1707	3868	119796	70	2.27			WPC	1
ARCHVIEW	MACKENZIE	253053	12	1549	3506	511450	330	2.26			WPC	1
GATEWAY	DORSETT	266052	12	104	235	41105	395	2.26			WPC	1
SEMO	CAPE GIRARDEAU	607055	12	287	646	73406	256	2.25	WPC		WPC	2
GATEWAY	BERKELEY	167052	12	602	1342	78193	130	2.23		WPC	WPC	2
ARCHVIEW	MACKENZIE	231051	12	1999	4449	304872	153	2.23		WPC	WPC	2
MERAMEC VALLEY	JEFFERSON	189052	12	807	1789	191575	237	2.22			WPC	1
GATEWAY	BERKELEY	131001	4	609	1344	116797	192	2.21			WPC	1
GATEWAY	DORSETT	262054	12	165	364	9951	60	2.21			WPC	1
SEMO	CAPE GIRARDEAU	603005	4	98	216	20946	214	2.20			WPC	1
NORTHEAST MO	WENTZVILLE	673053	12	757	1667	165917	219	2.20	WPC		WPC	2
GATEWAY	BERKELEY	227008	4	888	1955	351814	396	2.20			WPC	1
MERAMEC VALLEY	FRANKLIN	179055	12	1299	2850	254429	196	2.19			WPC	1
ARCHVIEW	MACKENZIE	137054	12	1818	3959	592896	326	2.18			WPC	1
ARCHVIEW	MACKENZIE	273052	12	1242	2700	362309	292	2.17			WPC	1
ARCHVIEW	MACKENZIE	228056	12	1326	2881	257865	194	2.17			WPC	1
MERAMEC VALLEY	ELLISVILLE	115052	12	1708	3708	522686	306	2.17	WPC		WPC	2
GATEWAY	DORSETT	247054	12	323	695	78079	242	2.15			WPC	1
GATEWAY	BERKELEY	141008	4	371	798	112941	304	2.15			WPC	1
GATEWAY	BERKELEY	163003	4	459	983	52050	113	2.14			WPC	1
SEMO	CAPE GIRARDEAU	617051	12	710	1517	183904	259	2.14			WPC	1
ARCHVIEW	GERALDINE	083006	4	75	160	20408	272	2.13			WPC	1
GATEWAY	BERKELEY	227006	4	134	284	14306	107	2.12			WPC	1
MERAMEC VALLEY	ELLISVILLE	279053	12	478	1011	111797	234	2.12			WPC	1
GATEWAY	BERKELEY	156008	4	594	1255	89643	151	2.11			WPC	1
GATEWAY	BERKELEY	163005	4	675	1421	128070	190	2.11			WPC	1
MERAMEC VALLEY	JEFFERSON	560057	12	845	1778	99661	118	2.10			WPC	1
MERAMEC VALLEY	ELLISVILLE	230056	12	916	1917	109728	120	2.09			WPC	1
CENTRAL MO	JEFFERSON CITY	849001	4	212	443	116425	549	2.09			WPC	1
SEMO	HAYTI	459051	12	673	1406	118374	176	2.09	WPC		WPC	2
CENTRAL MO	MEXICO	CE1051	7	12	25	4209	351	2.08			WPC	1
NORTHEAST MO	WENTZVILLE	691051	12	1184	2455	64695	55	2.07		WPC	WPC	2



Division	Operating Area	Circuit	Volt	Cust	CI	CMI	SAIDI	SAIFI	2016	2017	2018	Years WPC
MERAMEC VALLEY	JEFFERSON	168055	12	884	1825	181364	205	2.06			WPC	1
MERAMEC VALLEY	JEFFERSON	211053	12	82	169	11989	146	2.06			WPC	1
GATEWAY	DORSETT	262058	12	69	141	10236	148	2.04	WPC		WPC	2
MERAMEC VALLEY	FRANKLIN	179053	12	503	1025	185538	369	2.04			WPC	1
GATEWAY	DORSETT	267053	12	1072	2184	355432	332	2.04			WPC	1
ARCHVIEW	MACKENZIE	150008	4	920	1869	493949	537	2.03			WPC	1
GATEWAY	BERKELEY	229056	12	1160	2348	127538	110	2.02			WPC	1
CENTRAL MO	JEFFERSON CITY	527051	12	503	1013	130239	259	2.01			WPC	1
GATEWAY	BERKELEY	140001	4	409	820	51367	126	2.00	WPC		WPC	2
ARCHVIEW	MACKENZIE	024051	13	6	12	1445	241	2.00	WPC		WPC	2
SEMO	DEXTER	698007	4	114	227	53079	466	1.99	WPC		WPC	2
ARCHVIEW	MACKENZIE	146009	4	1048	2085	122726	117	1.99			WPC	1
GATEWAY	DORSETT	266055	12	78	155	16055	206	1.99			WPC	1
SEMO	CAPE GIRARDEAU	635007	4	931	1850	160880	173	1.99			WPC	1
GATEWAY	DORSETT	247053	12	846	1677	161328	191	1.98			WPC	1
ARCHVIEW	MACKENZIE	223054	12	1103	2165	199436	181	1.96			WPC	1
ARCHVIEW	GERALDINE	017010	4	250	490	66343	265	1.96			WPC	1
NORTHEAST MO	WENTZVILLE	641051	12	908	1768	108216	119	1.95			WPC	1
MERAMEC VALLEY	ELLISVILLE	289055	12	768	1493	398119	518	1.94			WPC	1
UNDERGROUND	UNDERGROUND	213051	13	603	1169	234216	388	1.94			WPC	1
SEMO	DEXTER	685053	12	488	942	259153	531	1.93			WPC	1
GATEWAY	BERKELEY	167054	12	1478	2850	414573	280	1.93			WPC	1
GATEWAY	DORSETT	318054	12	254	489	75588	298	1.93			WPC	1
ARCHVIEW	GERALDINE	029003	4	976	1869	134342	138	1.91			WPC	1
ARCHVIEW	GERALDINE	174011	4	467	879	233941	501	1.88			WPC	1
GATEWAY	BERKELEY	259053	12	1071	1985	147957	138	1.85			WPC	1
CENTRAL MO	LAKESIDE	584053	12	648	1196	341783	527	1.85			WPC	1
SEMO	CAPE GIRARDEAU	828056	12	312	571	143449	460	1.83			WPC	1
SEMO	DEXTER	678005	4	378	681	47167	125	1.80		WPC	WPC	2
MERAMEC VALLEY	JEFFERSON	550057	12	626	1121	76465	122	1.79			WPC	1
GATEWAY	BERKELEY	259058	12	2272	4062	620571	273	1.79	WPC	WPC	WPC	3
GATEWAY	DORSETT	147051	12	392	698	66302	169	1.78			WPC	1
MERAMEC VALLEY	FRANKLIN	504053	12	478	849	119700	250	1.78			WPC	1
MERAMEC VALLEY	ELLISVILLE	169055	12	725	1277	252825	349	1.76	WPC		WPC	2



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 017010
Division: ARCHVIEW
ZIP Codes(s) Served: 63104
Customers Served: 250
Customer Interruptions (CI): 490
SAIFI Value: 1.96
SAIDI Value: 265.37

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	490	100.0%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The primary conductor was blown off the insulator pins on pole 104589 and repaired on OAS 183053917. On another section of the circuit the primary was loose and was tightened on OAS 183053088. An infrared inspection was completed in February with no issues found. A drone inspection has been requested for this circuit. Engineering will also check all taps on this feeder to ensure they are fused properly.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 024051
Division: ARCHVIEW
ZIP Codes(s) Served: 63111
Customers Served: 6
Customer Interruptions (CI): 12
SAIFI Value: Y2016 - 3.00; Y2017 - 1.40; Y2018 - 2.00
SAIDI Value: 240.83

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	0	0	4	33.33%	2
EQUIPMENT/OH	10	2	8	66.67%	2
PUBLIC	5	0	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2016) Three incidents account for all of the customer interruption in 2016 on this circuit. The first was due to public damage. The second involved 2 spans of primary wrapping together in a rain/wind scenario. The wrapped conductors were repaired on OAS 161560115 and were checked for proper tension. These spans were re-investigated by engineering and found to be acceptable. The third incident was due to a 34kV supply outage at the substation. A mid-cycle trim was performed in 2016. Repair work identified as a result of the 2016 overhead and underground visual inspections was completed in accordance with Ameren Missouri's infrastructure inspection policy.

Corrective Actions Planned

One incident accounts for 67% of the customer interruptions in 2018 and was due to a connector burning open. The other 33% of customer interruptions were due to a customer equipment issue on the customer side of the meter. A regular cycle tree trim was performed in 2018. A project is planned for 2020 to add high and low side automatic switchgear to the substation. The existing sub is manual transfer on the loss of a supply. A 1,600' reconductoring project will be performed on this circuit in 2019 under WR 21MT696188. A special drone inspection was performed on 3,600' of this circuit and associated repair work completed in 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 025010
Division: ARCHVIEW
ZIP Codes(s) Served: 63115, 63120
Customers Served: 27
Customer Interruptions (CI): 72
SAIFI Value: 2.67
SAIDI Value: 659.30

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	42	58.33%	3
EQUIPMENT/UG	1	1.39%	1
LIGHTNING	1	1.39%	1
OTHER	1	1.39%	1
PUBLIC	27	37.50%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused the majority of customer interruptions on this circuit in 2018. The first was caused by a public vehicle hitting a guy wire on pole 136505 causing the pole to break. Urgent repairs were completed on OAS 180363791. The second incident was due to a section of primary conductor being brought down during a storm; the conductor was replaced with the same size wire. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 029003
Division: ARCHVIEW
ZIP Codes(s) Served: 63110
Customers Served: 977
Customer Interruptions (CI): 1869
SAIFI Value: 1.91
SAIDI Value: 137.65

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1515	81.06%	5
OTHER	3	<0.01%	3
OVERLOAD	1	<0.01%	1
PUBLIC	1	<0.01%	1
UNKNOWN	349	18.67%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 92% of the customer interruptions on this circuit in 2018. The first was a blown fuse which was replaced with a solid blade switch on pole 4013472 under OAS 181330390. The second incident was due to damaged/broken secondary. A project to re-conductor the secondary from #4 copper to 4/0 aluminum and to add a 75KVA transformer to split the load on the secondary has been created under DOJM 21MT719640.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 037008
Division: ARCHVIEW
ZIP Codes(s) Served: 63123, 63125
Customers Served: 822
Customer Interruptions (CI): 2559
SAIFI Value: 3.11
SAIDI Value: 216.13

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	888	34.70%	4
OTHER	2	<0.01%	2
TREE	1669	65.22%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Three incidents account for 96% of the customer interruptions in 2018. The first is due to the circuit's feeder breaker tripping after an adjacent circuit was tied to this circuit. The second incident was due to tree contact during a rain storm. The third incident was caused by a pole breaking during high winds. There is no consistent related issues and, as such, no additional work is planned at this time outside of the regular inspection process.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 083006
Division: ARCHVIEW
ZIP Codes(s) Served: 63147
Customers Served: 75
Customer Interruptions (CI): 160
SAIFI Value: 2.13
SAIDI Value: 272.11

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	76	47.50%	1
LIGHTNING	76	47.50%	1
OTHER	1	<0.01%	1
PUBLIC	7	4.38%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Three incidents caused 85% of the customer interruptions on this circuit in 2018. The first was a circuit outage due to lightning in a major storm and was restored under OAS 181807121 and 181803900. The second was due to 1 span of downed primary conductor during a storm, which was repaired under WR 21MT697467 and OAS 181343204. The third was due to a public vehicle hitting and breaking a pole, with repairs were made under OAS 182143107. No further work is planned on the circuit.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 110058
Division: ARCHVIEW
ZIP Codes(s) Served: 63026, 63123, 63127
Customers Served: 573
Customer Interruptions (CI): 1501
SAIFI Value: 2.62
SAIDI Value: 461.02

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	22	1.47%	2
EQUIPMENT/OH	124	8.31%	9
LIGHTNING	9	<0.01%	1
PUBLIC	574	38.47%	1
TREE	681	45.64%	5
UNKNOWN	82	5.50%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A circuit outage occurred due to a public vehicle tearing down a primary neutral conductor. It was repaired under WR 21MT701671. A second circuit outage occurred due to a tree taking down 1 span of primary conductor. Repairs were made under WR 21MT712354. These two outages caused 68% of the circuit's customer interruptions. Several other fused tap outages caused the bulk of the remaining CI. A groundline inspection and a detailed underground inspection are planned on the circuit in 2019 but otherwise no other work is planned at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 115052
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63011, 63017, 63021
Customers Served: 1709
Customer Interruptions (CI): 3708
SAIFI Value: Y2016 - 2.22; Y2017 - 0.32; Y2018 - 2.17
SAIDI Value: 306.02

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	206	308	52	1.40%	5
CUSTOMER	0	0	39	1.05%	2
EMPLOYEES	19	0	0	0.00%	0
EQUIPMENT/OH	1733	51	1710	46.12%	3
EQUIPMENT/UG	1747	93	141	3.80%	12
OTHER	9	2	0	0.00%	0
OVERLOAD	0	14	0	0.00%	0
PUBLIC	9	0	1720	46.39%	3
TREE	1	0	30	<0.01%	3
UNKNOWN	29	80	16	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Underground infrared hot spot inspections should be done again with the detailed inspection. No other additional improvements since faulted circuit interrupters are present throughout this area. 55% of the CMI outages for 2016 were due to a switch pad 6953 failure at the end of the Holloway Road underground section, a location not identified in the last inspection. Animal related outages are not significant for Customer Minute Interruptions, less than 2.5%.

Corrective Actions Planned

Approximately 50% of the circuit is underground. Fault Current Indicators (FCIs) are already present at terminal poles, on many underground sections, and in other overhead sections where appropriate to aid in identifying fault locations. To aid restoration times for underground issues, fiber optic indicators will be installed at newer switch pads 10671 and 6899 under WR 21MT715501. Also, in 2020, the circuit will have tree trim and inspection work.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 120005
Division: ARCHVIEW
ZIP Codes(s) Served: 63121
Customers Served: 217
Customer Interruptions (CI): 857
SAIFI Value: 3.95
SAIDI Value: 363.04

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
PUBLIC	1	<0.01%	1
UNKNOWN	856	99.88%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One incident caused 99.7% of the customer interruptions on this circuit in 2018. The feeder was patrolled with no cause found under OAS 183382834. A regular overhead visual inspection was performed in 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 128007
Division: ARCHVIEW
ZIP Codes(s) Served: 63115, 63120
Customers Served: 35
Customer Interruptions (CI): 242
SAIFI Value: 6.91
SAIDI Value: 1045.06

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	48	19.83%	2
OTHER	1	<0.01%	1
TREE	193	79.75%	6

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Overgrown trees and vines caused 88% of the customer interruptions on this circuit in 2018. The Forestry team completed a hot spot trim on the circuit in 2018. The scheduled cycle trim for 2019 has also been completed. No further work needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 131001
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63114, 63135
Customers Served: 608
Customer Interruptions (CI): 1344
SAIFI Value: 2.21
SAIDI Value: 191.78

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	616	45.83%	3
OTHER	1	<0.01%	1
PUBLIC	18	1.34%	2
TREE	702	52.23%	8
UNKNOWN	7	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

To reduce outage durations, 3 Trip-Saver devices and a phase cut will be performed under WR 21MT717822.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 137054
Division: ARCHVIEW
ZIP Codes(s) Served: 63125
Customers Served: 1817
Customer Interruptions (CI): 3959
SAIFI Value: 2.18
SAIDI Value: 326.13

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	45	1.14%	2
EQUIPMENT/OH	3855	97.37%	7
EQUIPMENT/UG	22	<0.01%	1
TREE	26	<0.01%	3
UNKNOWN	11	<0.01%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents account for 97% of the customer interruptions in 2018. One incident was due to a broken crossarm that was replaced under WR 21MT708164. The second incident was caused by a pole being burned through due to a 34kV insulator failure. The 34kV was overbuilt on the same pole lead as the 12kV circuit. The pole was replaced under WR 21MT696775. The insulators on the 34kV overbuilt circuit were inspected. It was determined that all 34kv insulators on 10 poles will be replaced. This will be completed in 2019 under WR 21MT699988. An overhead visual inspection will be performed in 2019 and any repair work identified as a result of this inspection will be completed in accordance with Ameren Missouri's infrastructure inspection policy.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 140001
Division: GATEWAY
ZIP Codes(s) Served: 63132, 63141
Customers Served: 408
Customer Interruptions (CI): 820
SAIFI Value: Y2016 - 2.03; Y2017 - 0.01; Y2018 - 2.01
SAIDI Value: 125.59

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	8	0	0	0.00%	0
EMPLOYEES	2	0	0	0.00%	0
EQUIPMENT/OH	817	1	820	100.0%	3
OTHER	1	0	0	0.00%	0
TREE	1	3	0	0.00%	0
UNKNOWN	0	1	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) (2016) Corrective actions completed include adding fused switches, replace switch D6123 with a recloser, replacing pole 284724 and correcting a 3-phase span issue by adding a pole in-lead under WR 21MT670062. These actions were developed through engineering field checking reviews, circuit patrol, and tree trimming.

Corrective Actions Planned

One circuit outage, which accounted for the majority of customer interruptions in 2018, was caused by an overhead jumper that burnt open. The overhead jumper was repaired under WR 21MT704593. Engineering will conduct a review of the remaining device outages and transformer outages on this circuit in early 2019 to determine if any additional action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 141008
Division: GATEWAY
ZIP Codes(s) Served: 63124, 63132
Customers Served: 371
Customer Interruptions (CI): 798
SAIFI Value: 2.15
SAIDI Value: 304.42

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	766	95.99%	12
EQUIPMENT/UG	7	<0.01%	5
TREE	17	2.13%	5
UNKNOWN	8	1.00%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One circuit outage, which accounted for the majority of customer interruptions in 2018, was caused by an overhead jumper that burnt open on a solid blade switch pole. The jumper was replaced under WR 21MT699873. No further action is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 142002
Division: ARCHVIEW
ZIP Codes(s) Served: 63139
Customers Served: 151
Customer Interruptions (CI): 547
SAIFI Value: 3.62
SAIDI Value: 227.41

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	10	1.83%	1
EQUIPMENT/UG	474	86.65%	3
OTHER	62	11.33%	1
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Three incidents caused 98% of the customer interruptions on this circuit in 2018. One incident was due to a failed overhead connector that was repaired under OAS 183423755. The second was due to faulted underground exit cable. The cable was inspected and replaced under DOJM 21MT712364. The third was due to failed switchgear that was replaced with a new size under DOJM 21MT705739. No further work is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 143003
Division: ARCHVIEW
ZIP Codes(s) Served: 63111, 63116
Customers Served: 694
Customer Interruptions (CI): 1672
SAIFI Value: 2.41
SAIDI Value: 409.11

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	268	16.03%	5
TREE	1402	83.85%	4
UNKNOWN	2	<0.01%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Three incidents account for 94% of the customer interruptions in 2018. One was due to tree contact across 3 phases of the circuit. The other two incidents were due to primary conductors downed at separate locations on separate occasions. Repairs were made under OAS 181623241 and WR 21MT702512. A regular cycle trim will be completed in 2019 but otherwise no further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 143004
Division: ARCHVIEW
ZIP Codes(s) Served: 63109, 63116, 63123
Customers Served: 684
Customer Interruptions (CI): 2158
SAIFI Value: 3.15
SAIDI Value: 402.63

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	688	31.88%	6
OTHER	1	<0.01%	1
PUBLIC	72	3.34%	1
TREE	699	32.39%	3
UNKNOWN	698	32.34%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Three incidents caused 95% of the customer interruptions in 2018. The first was due to a tree issue resulting in a broken pole in a 3-phase portion of the circuit, which was repaired under OAS 181346097. The second was a circuit outage due to tree contact during a thunderstorm. The third was due to a feeder exit cable failure that was repaired under WR21MT713057. A regular cycle trim will be completed in 2019 but otherwise no further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 146001
Division: ARCHVIEW
ZIP Codes(s) Served: 63118
Customers Served: 834
Customer Interruptions (CI): 1971
SAIFI Value: 2.36
SAIDI Value: 115.81

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	302	15.32%	3
EQUIPMENT/UG	1654	83.92%	2
OTHER	3	<0.01%	3
PUBLIC	1	<0.01%	1
UNKNOWN	11	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 99% of the customer interruptions on the circuit in 2018, with 84% from an underground cable failure on the 34kV supply to the 4kV substation. However, due to a failure of the substation automated switching to operate properly, this circuit was dropped for automatic load reduction (ALR) reasons resulting in a circuit outage. Repairs were performed under OAS 181644734. The other 15% were due to a downed primary conductor that was repaired under WR 21MT708139. A regular cycle tree trim was performed in 2018. No further circuit work is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 146008
Division: ARCHVIEW
ZIP Codes(s) Served: 63111, 63116, 63118
Customers Served: 789
Customer Interruptions (CI): 2499
SAIFI Value: 3.17
SAIDI Value: 203.99

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	72	2.88%	3
EQUIPMENT/UG	1596	63.87%	3
OTHER	786	31.45%	3
TREE	45	1.80%	5

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 94% of the customer interruptions on the circuit in 2018. One issue was an underground cable failure on the 34kV supply to the 4kV substation. However, due to a failure of the substation automated switching to operate properly, this circuit was dropped for automatic load reduction (ALR) reasons resulting in a circuit outage. Repairs were performed under OAS 181644734. The other was due to an overhead equipment failure repaired under OAS 183322805. A regular cycle tree trim was performed in 2018. The outages were unrelated so no further circuit work is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 146009
Division: ARCHVIEW
ZIP Codes(s) Served: 63111, 63116, 63118
Customers Served: 1049
Customer Interruptions (CI): 2085
SAIFI Value: 1.99
SAIDI Value: 117.10

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	47	2.25%	5
EQUIPMENT/UG	2037	97.70%	2
TREE	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 98% of the customer interruptions in 2018. One was an underground cable failure in a dip between two overhead sections. This was repaired under WR 21MT689606. The second was an underground cable failure in the feeder exit cable. This was repaired under WR 21MT708434. A regular cycle tree trim was performed in 2018. The cable failures were in completely unrelated sections of cable and both failed sections have been repaired. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 147051
Division: GATEWAY
ZIP Codes(s) Served: 63122, 63141
Customers Served: 393
Customer Interruptions (CI): 698
SAIFI Value: 1.78
SAIDI Value: 169.14

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	20	2.87%	2
CUSTOMER	25	3.58%	1
EQUIPMENT/OH	76	10.89%	4
EQUIPMENT/UG	288	41.26%	2
TREE	1	<0.01%	1
UNKNOWN	288	41.26%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The largest outage in 2018 for this circuit was caused by the 34kV circuit outage due to two burned sleeves on the 34kV cable at pole 21333. This outage, in turn, caused the distribution circuit's feeder breaker to trip at the substation. The 34kV cable was repaired under OAS 182263020. Other outages included a customer-requested planned outage and a burned jumper on a single phase conductor, which was repaired under WR 21MT690653. No further corrective actions are recommended at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 150008
Division: ARCHVIEW
ZIP Codes(s) Served: 63111, 63116
Customers Served: 919
Customer Interruptions (CI): 1869
SAIFI Value: 2.03
SAIDI Value: 536.90

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EMPLOYEES	1	<0.01%	1
EQUIPMENT/OH	42	2.25%	6
LIGHTNING	5	<0.01%	5
OTHER	16	<0.01%	1
TREE	1805	96.58%	5

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 96% of the customer interruptions in 2018. Both incidents were related to downed primary conductors caused by tree issues in a storm. One was repaired under OAS 181346192 and the other under WR 21MT697947. A regular cycle tree trim was completed in Fall 2018. Engineering field checked the site where the 2018 tree issues occurred and verified the tree condition has been cleared. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 154007
Division: GATEWAY
ZIP Codes(s) Served: 63033, 63034
Customers Served: 246
Customer Interruptions (CI): 638
SAIFI Value: 2.59
SAIDI Value: 536.93

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	638	100.0%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

In April 2018, this distribution circuit took a maintenance outage to repair broken 34kV crossarms and broken insulators on the overbuilt subtransmission circuit. In addition, abnormal switching with adjacent circuits caused this circuit to have an artificially high SAIFI score. No further work is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 156008
Division: GATEWAY
ZIP Codes(s) Served: 63114, 63134
Customers Served: 593
Customer Interruptions (CI): 1255
SAIFI Value: 2.12
SAIDI Value: 150.91

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	32	2.55%	2
OVERLOAD	38	3.03%	1
TREE	1185	94.42%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The two 2018 circuit outages were caused by trees. The last tree trim was in 2016. A 'hot spot' tree trim on circuit backbone has been requested under OAS 190783172.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 158004
Division: ARCHVIEW
ZIP Codes(s) Served:
Customers Served: 9
Customer Interruptions (CI): 35
SAIFI Value: 3.89
SAIDI Value: 265.33

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	35	100.0%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One incident caused the customer interruptions on this circuit in 2018. Switch D12317 burned up and was replaced with the same size. No further work is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 160001
Division: ARCHVIEW
ZIP Codes(s) Served: 63102, 63106, 63124
Customers Served: 453
Customer Interruptions (CI): 1798
SAIFI Value: 3.97
SAIDI Value: 271.02

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	24	2.36%	3
EQUIPMENT/UG	993	97.64%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One incident caused 98% of the customer interruptions on this circuit in 2018. The incident was due to a section of failed underground primary cable. It was replaced under WR 21TM690913. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 163001
Division: GATEWAY
ZIP Codes(s) Served: 63135, 63136
Customers Served: 506
Customer Interruptions (CI): 1488
SAIFI Value: 2.94
SAIDI Value: 402.93

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	980	65.86%	6
PUBLIC	507	34.07%	1
TREE	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One outage for this circuit was caused by a broken crossarm which was repaired under WR 21MT709227. Another outage was caused by a public vehicle knocking over a 12kV primary pole and transformer. No further corrective action is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 163003
Division: GATEWAY
ZIP Codes(s) Served: 63136
Customers Served: 458
Customer Interruptions (CI): 983
SAIFI Value: 2.15
SAIDI Value: 113.40

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	462	47.00%	4
EQUIPMENT/UG	31	3.15%	1
PUBLIC	1	<0.01%	1
TREE	489	49.75%	8

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two outages on this circuit were storm-related. One was a tree issue that occurred after a scheduled trim. Although the tree that caused the outage had been trimmed, it was tall enough that when it fell it struck the circuit. No further corrective action is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 163005
Division: GATEWAY
ZIP Codes(s) Served: 63136
Customers Served: 675
Customer Interruptions (CI): 1421
SAIFI Value: 2.11
SAIDI Value: 189.73

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1377	96.90%	8
LIGHTNING	1	<0.01%	1
OTHER	1	<0.01%	1
TREE	42	2.96%	6

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One circuit outage was due to a burned jumper at Switch D8633. The jumper was repaired and a single phase transformer changed out under WR 21MT704995. Another outage was caused by a lightning strike during a major storm event. No further corrective action is planned at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 167052
Division: GATEWAY
ZIP Codes(s) Served: 63033, 63136, 63137, 63138
Customers Served: 602
Customer Interruptions (CI): 1342
SAIFI Value: Y2016 - 0.52; Y2017 - 2.45; Y2018 - 2.23
SAIDI Value: 129.89

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	61	47	1	<0.01%	1
EQUIPMENT/OH	126	845	1285	95.75%	9
EQUIPMENT/UG	23	0	42	3.13%	1
OTHER	0	0	1	<0.01%	1
TREE	2	0	13	<0.01%	2
UNKNOWN	108	609	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Investigated circuit downstream of Fuse 2318. The fuse was replaced with a Trip-Saver under 21MT694707 in 2018.

Corrective Actions Planned

Engineering plans to add 2 Intellirupter DA switches on this circuit to reduce feeder outages under WR 21MT718057.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 167054
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63137, 63138
Customers Served: 1477
Customer Interruptions (CI): 2850
SAIFI Value: 1.93
SAIDI Value: 280.50

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	47	1.65%	8
EQUIPMENT/UG	44	1.54%	1
LIGHTNING	496	17.40%	3
TREE	2194	76.98%	16
UNKNOWN	69	2.42%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The majority of customer interruptions on this circuit were due to tree issues. This circuit is due for a mid-cycle patrol by Forestry in 2019 and a full cycle trim in 2021. Other corrective actions to reduce outages are to replace fuse 10049 and fuse 11694 with Trip-Savers under 21MT718065.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 168055
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63028, 63050, 63070
Customers Served: 884
Customer Interruptions (CI): 1825
SAIFI Value: 2.06
SAIDI Value: 205.16

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	2	<0.01%	1
EQUIPMENT/OH	4	<0.01%	4
EQUIPMENT/UG	15	<0.01%	2
PUBLIC	12	<0.01%	1
TREE	12	<0.01%	4
UNKNOWN	1780	97.53%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The circuit experienced two outages with no causes found, one in March in calm weather and one in December in windy conditions. These two outages resulted in 97% of the customer interruptions in 2018. In 2019 another circuit outage occurred due to a failure of a 3-phase capacitor bank installed near the end of the feeder. There are several layers of system protection between the capacitor and the circuit's breaker. A coordination study determined that protection coordination was well within tolerances. The next step in the analysis will be to request a thermal scan of the backbone using a drone to determine possible issues that may account for the circuit outages.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 169055
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63017, 63038, 63040, 63069
Customers Served: 725
Customer Interruptions (CI): 1277
SAIFI Value: Y2016 - 2.59; Y2017 - 0.47; Y2018 - 1.76
SAIDI Value: 348.72

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	1	2	18	1.41%	7
CUSTOMER	0	2	0	0.00%	0
EMPLOYEES	0	2	2	<0.01%	2
EQUIPMENT/OH	822	52	860	67.35%	9
EQUIPMENT/UG	13	9	5	<0.01%	4
LIGHTNING	1	1	2	<0.01%	2
OTHER	1	0	71	5.56%	2
OVERLOAD	202	0	2	<0.01%	2
PUBLIC	734	0	55	4.31%	3
TREE	63	269	173	13.55%	11
UNKNOWN	22	5	89	6.97%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2016) Two circuit outages occurred at two different instances when a neutral was hit at the Highway 100 crossing near Melrose/Woodland Meadows Road. The crossing was raised at this location and fuse protection was added at Manchester and St. Albans Road under WR 21MT668579.

Corrective Actions Planned

Approximately 70% of customer interruptions were due to a crossarm that broke on the circuit backbone on a calm day. Engineering investigated sectionalizing the circuit. A new sectionalizing switch, with faulted circuit indicators, will be installed near Highway 100 and Melrose under WR 21MT715213. Tree trim and inspection work are scheduled for 2020.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 174011
Division: ARCHVIEW
ZIP Codes(s) Served: 63105
Customers Served: 467
Customer Interruptions (CI): 879
SAIFI Value: 1.88
SAIDI Value: 500.94

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	51	5.80%	3
EQUIPMENT/UG	361	41.07%	1
LIGHTNING	1	<0.01%	1
TREE	466	53.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 94% of the customer interruptions on this circuit in 2018. One incident was due to underground primary and secondary failure. The conduit and cable were replaced under WR 21MT699260. The second incident was due to tree contact on a primary conductor. The tree was cleared and the primary and secondary conductors were replaced and repaired, respectively, under OAS 181655142. No further work planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 174016
Division: ARCHVIEW
ZIP Codes(s) Served: 63105
Customers Served: 62
Customer Interruptions (CI): 563
SAIFI Value: 9.08
SAIDI Value: 2272.31

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/UG	56	9.95%	1
TREE	507	90.05%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Customer interruptions on this circuit were inflated due to a mapping error. The majority of customer interruptions were actually on McKnight-04 circuit. No corrective action is required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 179053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63077
Customers Served: 503
Customer Interruptions (CI): 1025
SAIFI Value: 2.04
SAIDI Value: 368.86

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	505	49.27%	2
EQUIPMENT/OH	12	1.17%	4
EQUIPMENT/UG	1	<0.01%	1
TREE	507	49.46%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

This circuit incurred two outages in 2018. The first occurred in April due to tree contact just outside the substation during a thunderstorm. The circuit was later trimmed in September of 2018. The second occurred in November due to animal contact between the primary circuit and the grounding conductor on the circuit terminal pole. WR 23FR064971 was initiated to have line workers check the six terminal poles at the substation to ensure that the cable terminal pole bracket is NOT grounded in accordance with distribution standard 141216** and make corrections if necessary. This will help eliminate future animal related outages.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 179055
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63077
Customers Served: 1296
Customer Interruptions (CI): 2850
SAIFI Value: 2.20
SAIDI Value: 195.87

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	1	<0.01%	1
EQUIPMENT/OH	5	<0.01%	1
OTHER	1	<0.01%	1
PUBLIC	1311	46.00%	1
TREE	1531	53.72%	8
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two circuit outages accounted for 92% of the customer interruptions in 2018. The first occurred in March when a tree limb fell across the overhead primary 3-phase backbone on a rainy day. The other circuit outage occurred in April when a contractor pushed a tree into the overhead primary conductors. The major taps off the circuit backbone have been protected with either fuses or reclosers. No further action is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 182002
Division: GATEWAY
ZIP Codes(s) Served: 63119, 63122, 63124
Customers Served: 512
Customer Interruptions (CI): 1268
SAIFI Value: 2.48
SAIDI Value: 384.09

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1266	99.84%	8
PUBLIC	1	<0.01%	1
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

There were two circuit outages which accounted for the majority of customer interruptions in 2018. One circuit outage was caused by an overhead jumper wire that burned open on Renderer Dr. The second circuit outage was due to an overhead equipment malfunction on North Dr. Division Engineering will conduct a patrol of the circuit in early 2019 to determine if any additional action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 189052
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63020, 63028
Customers Served: 806
Customer Interruptions (CI): 1789
SAIFI Value: 2.22
SAIDI Value: 237.39

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	8	<0.01%	3
EQUIPMENT/OH	381	21.30%	17
OTHER	1	<0.01%	1
PUBLIC	550	30.74%	3
TREE	848	47.40%	4
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two outages accounted for at least 75% of the total CI in 2018. The first occurred in May due to a broken tree limb contacting conductors during a storm. The second outage occurred in September when a truck struck a pole. The circuit was trimmed in 2018 on a normal cycle trim schedule. All major breakoffs from the backbone are currently protected by either fuses or circuit reclosers. No further actions are planned for this feeder at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 197056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63021, 63025, 63088
Customers Served: 1631
Customer Interruptions (CI): 5350
SAIFI Value: Y2016 - 2.01; Y2017 - 0.16; Y2018 - 3.28
SAIDI Value: 331.61

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	19	0	19	<0.01%	1
EQUIPMENT/OH	0	92	1695	31.68%	2
EQUIPMENT/UG	112	154	3634	67.93%	8
LIGHTNING	0	0	1	<0.01%	1
OTHER	0	0	1	<0.01%	1
PUBLIC	3127	8	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2016) Approximately 95% of customer interruptions were caused by a car hitting a pole at Big Bend east of Westbrooke Terrace Drive. The pole is well off the road surface and would not be considered at risk for being hit. The pole was replaced. No additional corrective action was taken.

Corrective Actions Planned

Approximately 55% of the customer interruptions were due to a cable fault on the (non-WPC) feeder Castlewood 197-52 circuit, which is in the same manhole as this circuit. Overhead sections of these two circuits are also built on the same poles. To provide restoration and isolation options, two new switches with faulted circuit indicators will be installed in the overhead section of this circuit so that these sections can be isolated from issues with adjacent Castlewood 197-52. The new switches will be installed under WR 21MT715507. Tree trimming and inspections are planned for 2020.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 202007
Division: ARCHVIEW
ZIP Codes(s) Served: 63105, 63110, 63117
Customers Served: 153
Customer Interruptions (CI): 761
SAIFI Value: Y2016 - 0.00; Y2017 - 1.99; Y2018 - 4.97
SAIDI Value: 267.93

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	0	154	0	0.00%	0
EQUIPMENT/UG	0	153	761	100.0%	7

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) A fault of unknown cause resulted in 50% of the customer interruptions and a loss of the 34kV feed to the substation caused the other 50%.

Corrective Actions Planned

Four incidents caused 87% of the customer interruptions on this circuit in 2018. The other outages were from 2017. The first incident was due to switch failure in switchgear which was restored under OAS 182082626. The second was due to underground primary dip failure and was repaired and restored under OAS 182552616. The third was due to an underground malfunction with customer equipment. Power restored under OAS 182553113. The fourth incident was due to an underground primary dip failure. The dip was repaired under WR 21MT696063. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 205051
Division: CENTRAL MO
ZIP Codes(s) Served: 65026, 65032, 65047, 65082
Customers Served: 531
Customer Interruptions (CI): 1342
SAIFI Value: 2.53
SAIDI Value: 200.01

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	3	<0.01%	2
EQUIPMENT/OH	353	30.17%	10
OTHER	11	<0.01%	1
OVERLOAD	172	14.70%	1
PUBLIC	533	45.56%	1
TREE	24	2.05%	2
UNKNOWN	74	6.32%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Reclosers will be replaced with Intellirupter DA switches under WR 27LE039681 for better coordination and sectionalization on the circuit.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 211053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63010
Customers Served: 82
Customer Interruptions (CI): 169
SAIFI Value: 2.06
SAIDI Value: 146.21

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	85	50.30%	4
LIGHTNING	1	<0.01%	1
OTHER	1	<0.01%	1
PUBLIC	82	48.52%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

There were two circuit outages on this circuit in 2018. The first occurred in June due to one span of primary conductor downed for an unknown reason. The second occurred in November when a truck hit a pole. This 12kV circuit is underbuilt on the BAUM-71 34kV subtransmission circuit which underwent major reconductoring in 2018. All the poles from Arnold-Tenbrook Road north on Fannie to Baumgartner Substation have been replaced. This along with major tree trimming effort along the circuit should enhance the reliability of the circuit. A set of circuit fault indicators will be installed on 12kV switch J4083 to help reduce the time needed to locate issues along a stretch of the circuit with limited accessibility under WR 26JF147308.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 213051
Division: UNDERGROUND
ZIP Codes(s) Served: 63101, 63103, 63106
Customers Served: 604
Customer Interruptions (CI): 1169
SAIFI Value: 1.94
SAIDI Value: 388.42

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/UG	1002	100.0%	5

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Nearly all the customer interruptions are the result of a manhole fire in April. The April manhole fire damaged or completely destroyed all primary and secondary cables, joints, and connection devices within the manhole. Between repairing the initial manhole fire damage and restoration construction, SAIFI for all affected customers was artificially high, appearing as if all affected customers experienced 2 outages. Damage analysis did not reveal the root cause: possible causes include damaged network secondary cable resulting in a fault and fire, or a primary bolted Y-joint that did not include a cable adaptor restraint. Corrective actions implemented when rebuilding the manhole included construction to the current bolted Y-joints standard that includes restraints, and rebuilding the network secondary to current standards. Prior to the manhole fire, existing cable training resulted in a cable congested manhole; the manhole cable systems were replaced per the manhole cable racking standard providing cable spacing to reduce collateral damage on the walls and diversifying the network secondary cable routing within the manhole to all walls. No further action is required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 215054
Division: GATEWAY
ZIP Codes(s) Served: 63033, 63136
Customers Served: 1190
Customer Interruptions (CI): 3756
SAIFI Value: 3.16
SAIDI Value: 192.46

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	9	<0.01%	2
EQUIPMENT/OH	40	1.06%	3
EQUIPMENT/UG	83	2.21%	5
OTHER	1	<0.01%	1
OVERLOAD	11	<0.01%	1
PUBLIC	1	<0.01%	1
TREE	3589	95.55%	5
UNKNOWN	22	<0.01%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The majority of the customer interruptions on this circuit were due to tree issues. This circuit is due for a mid-cycle tree trim in 2019 and a full trim in 2021. No further work planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 223054
Division: ARCHVIEW
ZIP Codes(s) Served: 63042, 63123, 63125, 63128,
Customers Served: 1100
Customer Interruptions (CI): 2165
SAIFI Value: 1.97
SAIDI Value: 180.81

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EMPLOYEES	7	<0.01%	1
EQUIPMENT/OH	169	7.81%	6
EQUIPMENT/UG	1872	86.47%	2
OTHER	33	1.52%	1
PUBLIC	2	<0.01%	2
TREE	82	3.79%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A feeder exit cable failure in July caused 83% of the circuit's customer interruptions. It was repaired under WR 21MT701215. There are no recurring problems on the circuit and no other work is required at this time. A detailed underground inspection is planned on the circuit in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 227006
Division: GATEWAY
ZIP Codes(s) Served: 63114, 63132
Customers Served: 134
Customer Interruptions (CI): 284
SAIFI Value: 2.12
SAIDI Value: 106.76

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	148	52.11%	3
PUBLIC	136	47.89%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

About half of the customer interruptions on this circuit was caused by public vehicle accidents. A vehicle struck the 34kV tap into the distribution substation, causing an outage to the substation. The pole and primary were replaced under WR 21MT699538. Another vehicle struck a different 34kV pole along Page Ave causing an outage to the distribution circuit only. This was repaired under WR 21MT695598. No further corrective actions are recommended at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 227008
Division: GATEWAY
ZIP Codes(s) Served: 63109, 63114, 63132
Customers Served: 888
Customer Interruptions (CI): 1955
SAIFI Value: 2.20
SAIDI Value: 396.19

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1855	94.88%	8
PUBLIC	8	<0.01%	3
TREE	85	4.35%	6
UNKNOWN	7	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A majority of the customer interruptions on this circuit were due to overhead malfunctions. The largest incident occurred in June when a vehicle struck a 34kV pole, which was the main supply to the distribution substation, causing a circuit outage. Other incidents include: tree contact on the overhead primary in May, which was repaired under OAS 18147003; and wind damage to the overhead line in December, which was repaired under OAS 183614537. No further corrective actions are recommended at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 228056
Division: ARCHVIEW
ZIP Codes(s) Served: 63126, 63127
Customers Served: 1326
Customer Interruptions (CI): 2881
SAIFI Value: 2.17
SAIDI Value: 194.47

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	50	1.74%	1
EQUIPMENT/OH	1361	47.24%	4
EQUIPMENT/UG	1	<0.01%	1
LIGHTNING	68	2.36%	4
TREE	1400	48.59%	7
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A conductor burned open at a switch in a storm in May resulting in a circuit outage. It was repaired under WR 21MT697458. A tree broke in a storm in June and made contact with the circuit backbone on private property. These two outages caused 92% of the circuit's customer interruptions. There are no recurring problems on the circuit and no other work is required at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 229056
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63034
Customers Served: 1162
Customer Interruptions (CI): 2348
SAIFI Value: 2.02
SAIDI Value: 109.95

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1	<0.01%	1
EQUIPMENT/UG	1793	76.36%	5
OTHER	1	<0.01%	1
TREE	553	23.55%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

This circuit experienced multiple outages due to failed underground cables. The faulted cable was replaced under WR 21MT694515 and WR 21MT704842. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 230056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63017
Customers Served: 917
Customer Interruptions (CI): 1917
SAIFI Value: 2.09
SAIDI Value: 119.79

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	943	49.19%	3
EQUIPMENT/UG	973	50.76%	4
OTHER	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Eighty-five percent of customer interruptions were due to a feeder exit cable failure. Faulted circuit indicators at the feeder exit pole, a new sectionalizing switch in the feeder backbone, and fuses on a 3-phase multispans tap will be installed under WR 21MT715898. A 3-phase tap was fused in 2018 after a circuit outage due to a broken pole under WR 21MT697822. No further work is planned.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 231051
Division: ARCHVIEW
ZIP Codes(s) Served: 63017, 63123, 63129
Customers Served: 1999
Customer Interruptions (CI): 4449
SAIFI Value: Y2016 - 0.55; Y2017 - 3.24; Y2018 - 2.23
SAIDI Value: 152.51

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	22	4	63	1.42%	5
CUSTOMER	23	0	0	0.00%	0
EMPLOYEES	40	0	0	0.00%	0
EQUIPMENT/OH	581	2087	156	3.51%	5
EQUIPMENT/UG	410	2254	2223	49.97%	8
OTHER	0	72	0	0.00%	0
PUBLIC	0	2070	2007	45.11%	3
TREE	2	1	0	0.00%	0
UNKNOWN	29	0	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Three incidents account for 92% of the customer interruptions in 2017. The first was due to an underground primary cable failure that was repaired under WR 21MT678122. The second was due to a public vehicle breaking a pole. The pole was replaced under WR 21MT680519. The third incident was a short outage to clear a pole, which had been hit by a public vehicle, to be able to make repairs due to a hardware issue on the pole. That repair was completed under OAS 172833456. A mid-cycle trim was performed in 2018. An overhead visual inspection and underground detailed inspection were performed in 2018.

Corrective Actions Planned

Two incidents caused 90% of the customer interruptions in 2018. The first was due to a public vehicle hitting a pole that was repaired under WR 21MT698266. The second was due to an underground cable failure in the feeder exit cable which was repaired under WR 21MT711450. Repair work identified as a result of the 2018 overhead and underground visual inspections will be completed in accordance with Ameren Missouri's infrastructure inspection policy. The pole lead along Forder Rd. will be evaluated by Engineering to determine if there is a way to better protect these poles from being damaged by public vehicles.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 235054
Division: GATEWAY
ZIP Codes(s) Served: 63026, 63088
Customers Served: 13
Customer Interruptions (CI): 148
SAIFI Value: 11.38
SAIDI Value: 1851.00

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	148	100.0%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

There was one circuit outage in 2018 caused by a broken crossarm which occurred during abnormally switched conditions. The crossarm was replaced under WR 21MT692455 in 2018. No further action is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 238004
Division: ARCHVIEW
ZIP Codes(s) Served: 63130, 63133
Customers Served: 752
Customer Interruptions (CI): 1715
SAIFI Value: 2.28
SAIDI Value: 331.34

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	840	48.98%	5
LIGHTNING	13	<0.01%	2
OTHER	8	<0.01%	2
PUBLIC	751	43.79%	1
TREE	103	6.01%	5

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 92% of the customer interruptions in 2018. One was due to a public vehicle incident resulting in two broken poles and downed primary that was repaired under WR 21MT707936. The second was due to a failed transformer. The transformer was replaced and customers were restored under DOJM 21MT699724. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 238005
Division: ARCHVIEW
ZIP Codes(s) Served: 63133
Customers Served: 96
Customer Interruptions (CI): 632
SAIFI Value: 6.58
SAIDI Value: 1506.71

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	362	57.28%	2
LIGHTNING	245	38.77%	3
OTHER	1	<0.01%	1
PUBLIC	24	3.80%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 95% of the customer interruptions in 2018. One was due to a failed overhead switch with the customers restored under OAS 182020132. The second was due to lightning with the customers restored under OAS 181804039. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 247053
Division: GATEWAY
ZIP Codes(s) Served: 63124, 63131, 63141, 63146
Customers Served: 845
Customer Interruptions (CI): 1677
SAIFI Value: 1.98
SAIDI Value: 190.70

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	101	6.02%	13
EQUIPMENT/OH	105	6.26%	14
EQUIPMENT/UG	4	<0.01%	1
LIGHTNING	1	<0.01%	1
PUBLIC	1262	75.25%	5
TREE	175	10.44%	11
UNKNOWN	29	1.73%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A common cause of outages in 2018 was tree contact. In July a tree branch had fallen onto the primary conductors and was repaired under WR 21MT701120. Other tree related outages occurred in July when tree contact was made on the primary conductors downstream of Fuse SL68080309. These repairs were made under OAS 182055259 and 182100388. This circuit is scheduled to be trimmed in 2019. Another distribution circuit outage was caused by a subtransmission supply issue in August, which was repaired under OAS 182184047. No further corrective actions are recommended at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 247054
Division: GATEWAY
ZIP Codes(s) Served: 63131
Customers Served: 323
Customer Interruptions (CI): 695
SAIFI Value: 2.15
SAIDI Value: 241.73

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	18	2.59%	6
CUSTOMER	3	<0.01%	1
EQUIPMENT/OH	347	49.93%	3
EQUIPMENT/UG	322	46.33%	1
TREE	5	<0.01%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Overhead malfunctions were the leading cause of the circuit outages in 2018. In February an outage caused by a broken pole during a thunderstorm was replaced under OAS 180550072. Other outages included an burnt jumper that was repaired under OAS 181240140 and a cable fault failure occurring during switching, which was repaired under OAS 181750534. No further corrective actions are recommended at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 253053
Division: ARCHVIEW
ZIP Codes(s) Served: 63128, 63129
Customers Served: 1550
Customer Interruptions (CI): 3506
SAIFI Value: 2.26
SAIDI Value: 330.18

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	24	<0.01%	2
EQUIPMENT/OH	1699	48.46%	7
EQUIPMENT/UG	173	4.93%	14
LIGHTNING	1	<0.01%	1
OTHER	56	1.60%	1
PUBLIC	2	<0.01%	2
TREE	1551	44.24%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two incidents caused 88% of the customer interruptions in 2018. One was due to a burning transformer jumper that caused a pole fire. The pole was replaced under OAS 180560198. The second incident was due to a tree limb contacting primary conductors in high winds. A regular cycle tree trim was completed in early 2018. No further action is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 259053
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63135
Customers Served: 1071
Customer Interruptions (CI): 1985
SAIFI Value: 1.85
SAIDI Value: 138.15

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	48	2.42%	3
EMPLOYEES	26	1.31%	2
EQUIPMENT/OH	686	34.56%	13
EQUIPMENT/UG	37	1.86%	1
LIGHTNING	1	<0.01%	1
OTHER	44	2.22%	4
PUBLIC	1	<0.01%	1
TREE	1125	56.68%	7
UNKNOWN	17	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Engineering plans to replace Fuse 10447 with a Trip-Saver to reduce circuit outages under WR 21MT718069.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 259058
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63034
Customers Served: 2273
Customer Interruptions (CI): 4062
SAIFI Value: Y2016 - 3.87; Y2017 - 3.02; Y2018 - 1.79
SAIDI Value: 273.14

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	230	266	9	<0.01%	2
EQUIPMENT/OH	1	3623	2182	53.72%	6
EQUIPMENT/UG	208	2667	116	2.86%	7
LIGHTNING	0	0	115	2.83%	1
OTHER	3	0	52	1.28%	2
PUBLIC	5419	1	922	22.70%	6
TREE	3982	265	659	16.22%	6
UNKNOWN	8	10	7	<0.01%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Fuses 9990 and 1712 were replaced with Trip-Savers under WR 21MT694702 to reduce feeder outages.

Corrective Actions Planned

Engineering plans to install 2 Intellirupter DA switches on the circuit under WR 21MT699476 and 21MT699478 to improve reliability on this feeder.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 262051
Division: GATEWAY
ZIP Codes(s) Served: 63131
Customers Served: 343
Customer Interruptions (CI): 1042
SAIFI Value: 3.04
SAIDI Value: 238.28

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	7	<0.01%	4
EQUIPMENT/OH	344	33.01%	2
EQUIPMENT/UG	345	33.11%	2
OTHER	1	<0.01%	1
TREE	343	32.92%	1
UNKNOWN	2	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

There were three circuit outages that accounted for the majority of customer interruptions in 2018. One circuit outage was caused by an overhead switch failure on the feeder exit cable terminal pole. The second circuit outage was due to a failure of the underground feeder exit cable. The feeder exit cable was replaced under WR 21MT708345 in 2018. The third circuit outage was caused by a tree branch making contact with the overhead conductors. Division Engineering will conduct a patrol of the circuit in early 2019 to determine if further action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 262054
Division: GATEWAY
ZIP Codes(s) Served: 63122, 63131
Customers Served: 165
Customer Interruptions (CI): 364
SAIFI Value: 2.21
SAIDI Value: 60.31

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EMPLOYEES	326	89.56%	1
EQUIPMENT/OH	12	3.30%	1
EQUIPMENT/UG	10	2.75%	5
LIGHTNING	10	2.75%	1
TREE	5	1.37%	1
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

There was one circuit outage that accounted for the majority of customer interruptions in 2018. The circuit outage was the result of an operating error caused by inadvertently opening an incorrect switch. The remaining device and transformer outages due to equipment malfunctions and tree contact will be reviewed to determine if further action is needed.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 262058
Division: GATEWAY
ZIP Codes(s) Served: 63131
Customers Served: 69
Customer Interruptions (CI): 141
SAIFI Value: Y2016 - 6.58; Y2017 - 0.06; Y2018 - 2.04
SAIDI Value: 148.35

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	69	0	64	45.39%	1
EQUIPMENT/UG	256	0	72	51.06%	2
PUBLIC	69	0	1	<0.01%	1
TREE	1	0	4	2.84%	1
UNKNOWN	0	4	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2016) There were several circuit outages that accounted for the majority of customer interruptions in 2016. One circuit outage was due to a clearance problem between overhead wires, which were contacting each other during high winds. Wire spacers were installed under WR 21MT640071. The second circuit outage was due to a failed switch inside a switchgear. This switch was replaced under WR 21MT640518. Another circuit outage was due to an underground cable failure at a terminal pole. The underground cable was repaired under WR 21MT642908.

Corrective Actions Planned

In 2018 there was one circuit outage that was caused by an underground feeder exit cable failure. The feeder exit cable was replaced under WR 21MT692047 in 2018. Division Engineering will perform a circuit patrol in early 2019 and review the remaining device outages to determine if any additional action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 264054
Division: GATEWAY
ZIP Codes(s) Served: 63114, 63132, 63146
Customers Served: 1706
Customer Interruptions (CI): 3868
SAIFI Value: 2.27
SAIDI Value: 70.18

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EMPLOYEES	6	<0.01%	1
EQUIPMENT/OH	3716	96.07%	16
EQUIPMENT/UG	131	3.39%	1
TREE	2	<0.01%	2
UNKNOWN	13	<0.01%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

There was one circuit outage that accounted for the majority of customer interruptions in 2018. The circuit outage was caused by a broken pole, which was replaced under WR 21MT701111. The remaining device and transformer outages due to equipment malfunctions and tree contacts will be reviewed to determine if further action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 265054
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63033
Customers Served: 1351
Customer Interruptions (CI): 3728
SAIFI Value: 2.76
SAIDI Value: 295.21

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	59	1.58%	6
EQUIPMENT/OH	2147	57.61%	11
EQUIPMENT/UG	1	<0.01%	1
LIGHTNING	2	<0.01%	2
TREE	1463	39.25%	3
UNKNOWN	55	1.48%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Engineering will replace Fuses 10062 and 10097 with Trip-Savers to reduce circuit outages under 21MT718070.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 266052
Division: GATEWAY
ZIP Codes(s) Served: 63043, 63045
Customers Served: 104
Customer Interruptions (CI): 235
SAIFI Value: 2.26
SAIDI Value: 395.24

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/UG	127	54.04%	3
PUBLIC	108	45.96%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The largest outage occurred in December due to a switching error that damaged underground cable and switchgear. The cable and switchgear were repaired under OAS 183392271. Another outage occurred in July due to a customer digging into a primary underground cable. This was repaired under claim number 8032X. In August a single-phase fault was repaired under WR 21MT704412. No further corrective actions are recommended at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 266055
Division: GATEWAY
ZIP Codes(s) Served: 63044, 63045
Customers Served: 78
Customer Interruptions (CI): 155
SAIFI Value: 1.99
SAIDI Value: 205.83

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	2	1.29%	2
EQUIPMENT/UG	152	98.06%	3
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The largest outage occurred in December due to a switching error that damaged underground cable and switchgear. The cable and switchgear were repaired under OAS 183392272. The second largest outage occurred in June when an underground switchgear and an underground lateral failed simultaneously. The switchgear and cable were replaced under WR 21MT699423. No further corrective actions are recommended at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 267053
Division: GATEWAY
ZIP Codes(s) Served: 63011, 63017, 63141
Customers Served: 1072
Customer Interruptions (CI): 2184
SAIFI Value: 2.04
SAIDI Value: 331.56

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	97	4.44%	8
EMPLOYEES	1	<0.01%	1
EQUIPMENT/OH	1912	87.55%	13
EQUIPMENT/UG	119	5.45%	4
PUBLIC	1	<0.01%	1
TREE	53	2.43%	9
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A majority of outages were due to overhead malfunctions. A porcelain terminator at a terminal pole burned causing an outage. This was repaired under WR 21MT697492. Two outages occurred at Switch D2073. The first occurred in July where a single phase of the switch was burned and replaced on OAS 181970111. The second outage occurred in November when a different phase of the primary conductor fell causing two phases to burn. The switch was replaced under WR 21MT710045. Other causes were tree contact. A tree had contacted the primary which was repaired under WR 21MT708730. Another outage occurred where tree contact was made on the primary and repaired under OAS 183010489. Engineering will review these outages to see if more corrective actions will need to be taken.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 273052
Division: ARCHVIEW
ZIP Codes(s) Served: 63017, 63128
Customers Served: 1242
Customer Interruptions (CI): 2700
SAIFI Value: 2.17
SAIDI Value: 291.71

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1291	47.81%	3
EQUIPMENT/UG	45	1.67%	1
LIGHTNING	53	1.96%	2
PUBLIC	1240	45.93%	1
TREE	70	2.59%	6
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A circuit outage occurred due to a vehicle breaking a pole in September, which was repaired under WR 21MT706739. Another circuit outage occurred during high winds in December but no damage was found. These two outages resulted in 92% of the circuit's customer interruptions. There are no recurring problems on the circuit and no other work is required at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 279053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63005, 63017, 63141
Customers Served: 478
Customer Interruptions (CI): 1011
SAIFI Value: 2.12
SAIDI Value: 233.88

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	4	<0.01%	3
EQUIPMENT/OH	26	2.57%	1
EQUIPMENT/UG	488	48.27%	3
PUBLIC	487	48.17%	2
UNKNOWN	6	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Approximately 55% of customer interruptions were due to a private contractor dropping a tree into the circuit backbone. Additional faulted circuit indicators will be added to the circuit backbone to aid restoration under WR 21MT716020. In 2020, a section of the overhead circuit located in the rear of private property west of Conway Village Drive will be relocated to underground as a SMART Energy project.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 289055
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63025
Customers Served: 768
Customer Interruptions (CI): 1493
SAIFI Value: 1.94
SAIDI Value: 518.38

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	572	38.31%	9
EQUIPMENT/UG	12	<0.01%	3
OTHER	1	<0.01%	1
PUBLIC	1	<0.01%	1
TREE	821	54.99%	6
UNKNOWN	86	5.76%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Several transformers on the circuit backbone will have fuses installed under WR 21MT716499. The circuit has appropriate tap fusing, switches, and faulted circuit indicators. Approximately 69% of customer interruptions were due to one incident of a tree falling on the circuit's primary backbone and restored under OAS 183080051. Cycle tree trimming is scheduled for 2019. No further work is planned.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 292053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63005, 63017
Customers Served: 141
Customer Interruptions (CI): 327
SAIFI Value: Y2016 - 2.38; Y2017 - 0.67; Y2018 - 2.32
SAIDI Value: 276.57

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	0	93	141	43.12%	1
LIGHTNING	1	0	94	28.75%	1
PUBLIC	247	0	0	0.00%	0
TREE	96	0	0	0.00%	0
UNKNOWN	247	1	92	28.13%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2016) The circuit experienced two circuit outages in 2016. One was due to a dump truck, with its bed up, hitting primary at the Breckenridge Materials plant. The other outage occurred during a thunderstorm but no damage was found. Clearance in the area where the dump truck made contact was checked; it is sufficient so no changes were made. A section of primary has been identified that can be fused to limit exposure for the circuit. The new fuses were installed under WR 21MT668345.

Corrective Actions Planned

A circuit outage was caused by high winds blowing phases together behind the Breckenridge Materials plant. The phases had protective cover installed on them. An isolation switch with faulted circuit indicators will be installed in the circuit just past the plant under WR 21MT716026. Animal guards and new lightning arresters will be installed behind Fuse SL46081807, which experienced multiple outages in 2018, under WR 21MT716162.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 292054
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63005, 63017
Customers Served: 623
Customer Interruptions (CI): 1825
SAIFI Value: 2.93
SAIDI Value: 693.47

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	2	<0.01%	2
EQUIPMENT/UG	1200	65.75%	3
PUBLIC	623	34.14%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Faulted circuit indicators with fiber optic indicators will be installed on newer switchpads to aid with outage analysis and restoration. Additionally faulted circuit indicators will be installed at terminal poles. Both tasks will be performed under WR 21MT716252.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 297051
Division: GATEWAY
ZIP Codes(s) Served: 63043, 63146
Customers Served: 57
Customer Interruptions (CI): 1312
SAIFI Value: 23.02
SAIDI Value: 823.42

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	2	<0.01%	1
EQUIPMENT/OH	1310	99.85%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A device outage due to an equipment malfunction occurred while this circuit was in an abnormally switched condition. This accounted for the majority of customer interruptions in 2018. No further action is currently planned for this circuit.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 318054
Division: GATEWAY
ZIP Codes(s) Served: 63021, 63131
Customers Served: 254
Customer Interruptions (CI): 489
SAIFI Value: 1.93
SAIDI Value: 297.59

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	11	2.25%	3
EQUIPMENT/UG	25	5.11%	3
TREE	452	92.43%	4
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

There was one circuit outage which accounted for the majority of customer interruptions in 2018. The circuit outage was caused by a tree branch contacting overhead conductors. WR 21MT694773 was created to replace a solid blade switch with fuses to help isolate this section of the backbone where the tree contact occurred. Division Engineering will review the remaining device and transformer outages on this circuit in early 2019 to determine if any additional action is needed.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 456057
Division: SEMO
ZIP Codes(s) Served: 63827, 63851, 63857
Customers Served: 127
Customer Interruptions (CI): 663
SAIFI Value: Y2016 - 1.27; Y2017 - 5.75; Y2018 - 5.22
SAIDI Value: 1158.83

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	6	2	6	<0.01%	2
CUSTOMER	2	0	0	0.00%	0
EQUIPMENT/OH	13	428	466	70.29%	10
LIGHTNING	9	56	7	1.06%	1
OTHER	0	125	179	27.00%	3
PUBLIC	126	0	0	0.00%	0
TREE	1	125	5	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Additional reclosers were installed on this circuit to isolate outages on WR2TSE120483 in 2018.

Corrective Actions Planned

No other work is planned for 2019.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 459051
Division: SEMO
ZIP Codes(s) Served: 63841, 63851
Customers Served: 671
Customer Interruptions (CI): 1406
SAIFI Value: Y2016 - 2.10; Y2017 - 0.38; Y2018 - 2.10
SAIDI Value: 175.89

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	4	38	37	2.63%	6
EMPLOYEES	0	1	0	0.00%	0
EQUIPMENT/OH	696	58	18	1.28%	4
EQUIPMENT/UG	1	60	0	0.00%	0
LIGHTNING	696	60	0	0.00%	0
OTHER	1	1	2	<0.01%	2
OVERLOAD	2	0	0	0.00%	0
PUBLIC	1	0	2	<0.01%	2
TREE	1	9	676	48.08%	5
UNKNOWN	18	31	671	47.72%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2016) Additional Intellirupter DA switches were installed on this circuit to isolate outages and to allow switching to alternative circuits under WRs 2TSE116994 and 2TSE116995 in 2017.

Corrective Actions Planned

Additional reclosers will be installed to isolate outages and also re-coordinate fuse sizes to improve circuit operation under WR 2TSE123847 in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 504053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63039, 63069, 63072, 63084,
Customers Served: 478
Customer Interruptions (CI): 849
SAIFI Value: 1.78
SAIDI Value: 250.42

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	2	<0.01%	2
EQUIPMENT/UG	1	<0.01%	1
LIGHTNING	1	<0.01%	1
PUBLIC	479	56.42%	2
TREE	366	43.11%	7

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The largest outage on this circuit occurred in February when a public vehicle hit a pole. Four other outages were caused by tree contact during severe weather. The last tree trim was in 2014. The next scheduled trim is in 2020. To improve reliability on a long single phase tap, Recloser 298 will be replaced under WR 23FR064915. Along with the recloser replacement, 14 single phase transformers will be animal guarded.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 527051
Division: CENTRAL MO
ZIP Codes(s) Served: 65013
Customers Served: 503
Customer Interruptions (CI): 1013
SAIFI Value: 2.01
SAIDI Value: 258.92

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	2	<0.01%	2
EQUIPMENT/OH	7	1.37%	1
EQUIPMENT/UG	1	<0.01%	1
TREE	502	98.05%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Tree issues on same day caused 2 circuit outages. The tree issues have been corrected. No further action is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 550057
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63019, 63028
Customers Served: 626
Customer Interruptions (CI): 1121
SAIFI Value: 1.79
SAIDI Value: 122.15

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	81	7.23%	6
EQUIPMENT/OH	997	88.94%	9
LIGHTNING	1	<0.01%	1
UNKNOWN	42	3.75%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A circuit outage in January was caused by two primary phases contacting each other. The slack has been removed from one phase to correct the issue. In February a pole fire led to the operation of a set of reclosers on a tap serving 212 customers. The next issue was several outages behind a three-phase fuse with no cause found. This section of circuit is very difficult to access due to the line being in wooded and overgrown back yards. In the spring of 2018 the circuit was analyzed by a drone flyover. Several items were identified including deteriorated poles and cross arms. The project to repair these items is currently in budget review. Another drone flyover on this tap only using IR technology that will be capable of detecting issues not readily visible has been requested. Another solution to be explored will be the replacing of the fuses with circuit reclosers. There are also a couple of poles in jeopardy due to a soil erosion issue along an old levee. WR 26JF147317 has been set up to address issues on this tap.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 553057
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63016, 63050, 63066
Customers Served: 589
Customer Interruptions (CI): 1641
SAIFI Value: Y2016 - 1.09; Y2017 - 2.90; Y2018 - 2.79
SAIDI Value: 219.89

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	0	3	27	1.65%	5
CUSTOMER	1	0	0	0.00%	0
EQUIPMENT/OH	26	205	710	43.27%	12
EQUIPMENT/UG	584	0	2	<0.01%	2
LIGHTNING	0	1	1	<0.01%	1
PUBLIC	0	653	0	0.00%	0
TREE	7	235	888	54.11%	9
UNKNOWN	21	586	13	<0.01%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) The majority of customer interruptions on the circuit in 2017 were caused by two separate circuit outages. The first was on May 1, 2017 when trees came down along Highway BB, which was flooded at the time. This circuit outage cause was erroneously coded as Unknown. The other circuit outage occurred in November of 2017 caused by a public vehicle accident. The circuit was trimmed in 2018. There are no specific reliability improvements scheduled for this feeder.

Corrective Actions Planned

In 2018 two major outages resulted in a large majority of the customer outages. In January a 34kV insulator broke during a period of freezing rain which caused the 34kV conductor to fall onto the underbuilt 12kV feeder. In June a public vehicle accident caused another circuit outage. This circuit runs along a section of the Big River and is subject to continual flooding. To improve reliability, installation of additional backbone switches will be investigated under WR 26JF147093.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 560057
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63026, 63049
Customers Served: 845
Customer Interruptions (CI): 1778
SAIFI Value: 2.10
SAIDI Value: 117.94

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	2	<0.01%	2
EQUIPMENT/UG	8	<0.01%	2
LIGHTNING	874	49.16%	2
OTHER	6	<0.01%	1
PUBLIC	885	49.78%	2
TREE	3	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two outages accounted for 91% of the total customer interruptions on the circuit. The first circuit outage occurred in June due to lightning in a storm. The second circuit outage occurred in September when a vehicle hit a pole. On analysis of the circuit, reliability improvement could be obtained by installing a set of line reclosers on a three-phase breakoff on Meadow Lark Drive, west of Brennen Road by limiting exposure to the circuit backbone. This plan will be studied to determine the feasibility and size required and will be done on WR 26JF147138 if feasible.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 578056
Division: CENTRAL MO
ZIP Codes(s) Served: 65026, 65049
Customers Served: 518
Customer Interruptions (CI): 1352
SAIFI Value: 2.61
SAIDI Value: 45.08

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1347	99.63%	1
EQUIPMENT/UG	4	<0.01%	1
OTHER	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

This circuit is on the WPC list due to an abnormal switching situation. Two circuits were tied together when the outage occurred. No further work is required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 584053
Division: CENTRAL MO
ZIP Codes(s) Served: 65017, 65052, 65065, 65591
Customers Served: 648
Customer Interruptions (CI): 1196
SAIFI Value: 1.85
SAIDI Value: 527.44

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	20	1.67%	7
EQUIPMENT/OH	156	13.04%	10
LIGHTNING	6	<0.01%	2
OTHER	10	<0.01%	1
TREE	999	83.53%	4
UNKNOWN	5	<0.01%	5

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

This circuit is on the WPC list due to an abnormal switching situation. Two circuits were tied together when the outage occurred. No further work is required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 603005
Division: SEMO
ZIP Codes(s) Served: 63701
Customers Served: 99
Customer Interruptions (CI): 216
SAIFI Value: 2.18
SAIDI Value: 213.73

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	1	<0.01%	1
LIGHTNING	116	53.70%	3
OTHER	89	41.20%	1
TREE	10	4.63%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Insulators on steel crossarms were replaced with 69kV poly post insulators to prevent flashover under WR 2TSE122161 in 2018. No other work is planned for 2019.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 607055
Division: SEMO
ZIP Codes(s) Served: 63736, 63767
Customers Served: 287
Customer Interruptions (CI): 646
SAIFI Value: Y2016 - 2.25; Y2017 - 0.14; Y2018 - 2.25
SAIDI Value: 255.77

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	1	0	7	1.08%	3
CUSTOMER	0	3	0	0.00%	0
EQUIPMENT/OH	578	8	11	1.70%	7
EQUIPMENT/UG	0	2	0	0.00%	0
LIGHTNING	2	0	1	<0.01%	1
PUBLIC	0	26	431	66.72%	3
TREE	28	0	18	2.79%	3
UNKNOWN	0	0	178	27.55%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2016) Additional reclosers for improved coordination for this circuit were installed under WR 2TSE116981 and 2TSE116982 in 2017.

Corrective Actions Planned

Fused switches will be replaced with reclosers for improved coordination under WR 2TSE123850 in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 617051
Division: SEMO
ZIP Codes(s) Served: 63701, 63740, 63745, 63752
Customers Served: 710
Customer Interruptions (CI): 1517
SAIFI Value: 2.14
SAIDI Value: 259.02

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	6	<0.01%	2
EQUIPMENT/OH	797	52.54%	6
EQUIPMENT/UG	13	<0.01%	2
LIGHTNING	3	<0.01%	1
TREE	698	46.01%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

3200' of the circuit will be reconductored with 1/0AAAC on Hwy Z in Gordonville under WR 2TSE123836 in 2019. A fused switch will be replaced with a recloser and another recloser will be replaced for better coordination under WR 2TSE123837 and 2TSE123838 in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 629053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63330, 63336, 63343, 63344
Customers Served: 259
Customer Interruptions (CI): 596
SAIFI Value: 2.30
SAIDI Value: 352.59

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	409	68.62%	14
LIGHTNING	69	11.58%	12
TREE	118	19.80%	11

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Fused switches will be added to 18 single-phase transformers and one single-phase tap under WR 2WWZ190388. Three reclosers on the circuit along Hwy W north of Hwy WW will be added under WR 2WWZ190490. The projects are scheduled to be completed in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 635007
Division: SEMO
ZIP Codes(s) Served: 63701, 63703
Customers Served: 927
Customer Interruptions (CI): 1850
SAIFI Value: 2.00
SAIDI Value: 172.80

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	2	<0.01%	1
EQUIPMENT/OH	4	<0.01%	2
EQUIPMENT/UG	10	<0.01%	1
TREE	1834	99.14%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Fused switches will be installed on taps off the backbone to help prevent circuit outages under WR 2TSE123849 in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 641051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63366, 63376
Customers Served: 903
Customer Interruptions (CI): 1768
SAIFI Value: 1.96
SAIDI Value: 119.18

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	68	3.85%	5
CUSTOMER	6	<0.01%	1
EQUIPMENT/OH	1094	61.88%	4
EQUIPMENT/UG	1	<0.01%	1
TREE	390	22.06%	4
UNKNOWN	209	11.82%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

A circuit outage was caused by a failed capacitor bank, which has subsequently been repaired. The other outages that affected a high number of customers were fused device outages due to trees, animals and unknown reasons. Fuse 2668 and Fuse 6541 both have long radial overhead primary on private property where the trees off of the Ameren easements are taller than the Ameren poles. Projects to convert the lines behind these fuses to underground primary have been submitted under WR 2WWZ190492 and 2WWZ190492 .



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 649052
Division: NORTHEAST MO
ZIP Codes(s) Served: 63369, 63389
Customers Served: 474
Customer Interruptions (CI): 1091
SAIFI Value: 2.30
SAIDI Value: 213.52

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	18	1.73%	4
EMPLOYEES	13	1.25%	1
EQUIPMENT/OH	360	34.68%	4
LIGHTNING	129	12.43%	6
OTHER	1	<0.01%	1
OVERLOAD	13	1.25%	1
PUBLIC	481	46.34%	2
TREE	13	1.25%	1
UNKNOWN	10	<0.01%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

An old three-phase 14.4kV recloser will be replaced with three new single-phase 14.4kV reclosers along Brevator Rd just east of Hwy 79 under WR 2WWZ190357. Three fuse switches and three solid blade switches will be installed and 2 spans of single-phase 7.2kV circuit will be eliminated in Winfield under WR 2WWZ190527. Three fault indicators will be added at Switch W11419 along Hwy 79 in Winfield, MO to facilitate identifying outage cause location.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 672053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63334, 63353
Customers Served: 293
Customer Interruptions (CI): 682
SAIFI Value: Y2016 - 0.67; Y2017 - 3.44; Y2018 - 2.33
SAIDI Value: 276.92

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	1	0	5	<0.01%	5
EQUIPMENT/OH	99	684	645	94.57%	23
EQUIPMENT/UG	0	15	0	0.00%	0
LIGHTNING	1	290	8	1.17%	4
PUBLIC	85	6	0	0.00%	0
TREE	5	9	24	3.52%	8

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) WR 2WWZ184275 was completed to add fuse switches on seven single-phase transformers on the three-phase circuit. WR 2WWZ179995 was completed to add fuse switches on two single-phase transformers on the three-phase circuit. In addition, the mid-cycle trim was completed in 2017.

Corrective Actions Planned

WR 2WWZ186938 has been created to install two 12.5kV Intellirupter DA switches to facilitate supplying affected customers from a different substation during certain contingencies. In addition, another project will be created to replace a fuse switch with a new Trip-Saver device.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 673053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63362, 63379
Customers Served: 758
Customer Interruptions (CI): 1667
SAIFI Value: Y2016 - 1.98; Y2017 - 0.02; Y2018 - 2.20
SAIDI Value: 219.18

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	4	2	1	<0.01%	1
EQUIPMENT/OH	651	1	57	3.42%	3
EQUIPMENT/UG	27	6	1	<0.01%	1
LIGHTNING	662	2	0	0.00%	0
PUBLIC	4	0	1586	95.14%	7
TREE	0	0	22	1.32%	1
UNKNOWN	13	1	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) WR 2WWZ183825 was completed to add a fuse switch to one single-phase transformer on the three phase circuit. In addition, a mid-cycle tree trim was completed this year.

Corrective Actions Planned

WR 2WWZ184884 has been created to install 34.5kV Viper reclosers on both sides of the tap to the Moscow Mills Substation to provide auto-transfer between the two different PTPR-71 and LINC-71 34kV circuits.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 674052
Division: NORTHEAST MO
ZIP Codes(s) Served: 63377, 63379
Customers Served: 431
Customer Interruptions (CI): 2450
SAIFI Value: 5.68
SAIDI Value: 847.77

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	19	<0.01%	5
EMPLOYEES	4	<0.01%	1
EQUIPMENT/OH	912	37.22%	5
LIGHTNING	30	1.22%	6
PUBLIC	1439	58.73%	3
TREE	32	1.31%	5
UNKNOWN	14	<0.01%	5

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

WR 2WWZ190386 has been created to replace a cross-arm, add fuse switches at four locations, replace insulators, and add animal guards to three reclosers.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 678005
Division: SEMO
ZIP Codes(s) Served: 63845
Customers Served: 378
Customer Interruptions (CI): 681
SAIFI Value: Y2016 - 0.54; Y2017 - 2.00; Y2018 - 1.80
SAIDI Value: 124.78

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	1	0	0	0.00%	0
EQUIPMENT/OH	205	11	671	98.53%	10
EQUIPMENT/UG	0	2	0	0.00%	0
LIGHTNING	0	0	5	<0.01%	1
OTHER	1	1	0	0.00%	0
OVERLOAD	0	743	0	0.00%	0
PUBLIC	1	0	0	0.00%	0
TREE	0	2	5	<0.01%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) The district identified and made corrective overhead repairs on WR2TSE119410 in 2017. No other work was planned for 2018.

Corrective Actions Planned

A circuit protection coordination study will be undertaken. Any fused switches requiring replacement for better circuit operation will be performed under WR 2TSE123852 in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 680057
Division: SEMO
ZIP Codes(s) Served: 63701, 63702, 63703
Customers Served: 875
Customer Interruptions (CI): 2055
SAIFI Value: 2.35
SAIDI Value: 173.03

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	15	<0.01%	6
EQUIPMENT/OH	102	4.96%	15
EQUIPMENT/UG	15	<0.01%	5
LIGHTNING	905	44.04%	3
PUBLIC	94	4.57%	1
TREE	44	2.14%	5
UNKNOWN	880	42.82%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Insulators on steel crossarms were replaced with 69kV poly post insulators to prevent flashover under WR 2TSE122160 in 2018. No other work is planned for 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 685053
Division: SEMO
ZIP Codes(s) Served: 63801, 63867, 63868
Customers Served: 488
Customer Interruptions (CI): 942
SAIFI Value: 1.93
SAIDI Value: 531.05

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	56	5.94%	5
EQUIPMENT/OH	349	37.05%	10
EQUIPMENT/UG	33	3.50%	5
PUBLIC	503	53.40%	2
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Circuit storm hardening was performed under WR 2TSE118506 in 2018. No other work is planned for 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 688001
Division: SEMO
ZIP Codes(s) Served: 63868
Customers Served: 3
Customer Interruptions (CI): 7
SAIFI Value: 2.33
SAIDI Value: 695.00

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	4	57.14%	2
PUBLIC	3	42.86%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One circuit outage occurred due to a public vehicle accident breaking a 34kV pole in 2018. There are no other plans for 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 688003
Division: SEMO
ZIP Codes(s) Served: 63801, 63868
Customers Served: 293
Customer Interruptions (CI): 693
SAIFI Value: 2.37
SAIDI Value: 418.77

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	64	9.24%	10
PUBLIC	332	47.91%	3
TREE	296	42.71%	1
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One circuit outage occurred due to a public vehicle accident breaking a 34kV pole in 2018. There are no other plans for 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 688007
Division: SEMO
ZIP Codes(s) Served: 63801, 63841, 63846, 63868
Customers Served: 213
Customer Interruptions (CI): 489
SAIFI Value: 2.30
SAIDI Value: 566.76

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	4	<0.01%	2
EQUIPMENT/OH	43	8.79%	4
PUBLIC	211	43.15%	1
TREE	231	47.24%	4

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One circuit outage occurred due to a public vehicle accident breaking a 34kV pole in 2018. There are no other plans for 2019.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 691051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63334, 63343, 63344, 63359,,
Customers Served: 1184
Customer Interruptions (CI): 2455
SAIFI Value: Y2016 - 1.39; Y2017 - 3.20; Y2018 - 2.07
SAIDI Value: 54.64

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	15	30	9	<0.01%	8
CUSTOMER	1	2	0	0.00%	0
EQUIPMENT/OH	665	2483	2278	92.79%	23
LIGHTNING	193	41	85	3.46%	12
OTHER	0	1	0	0.00%	0
PUBLIC	0	1189	0	0.00%	0
TREE	670	40	70	2.85%	10
UNKNOWN	84	7	13	<0.01%	8

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) WR 2WWZ178208 and 2WWZ178209 were completed in the fall of 2017 to add two 3-phase 12.5kV automated switches to the circuit. One is located in this circuit and the other is located at the tie point between this circuit and the adjacent 674-52 circuit. WR 2WWZ183823 was completed to add a fused switch on a single-phase tap of the three-phase circuit. In addition, the circuit will be tree trimmed during its cycle trim this year.

Corrective Actions Planned

A project is in design for construction in 2020 to extend the Elsberry 630-53 12.5kV feeder along Hwy B to provide tie capability to this circuit under WO J0FFS. (Some load on the Auburn 691-51 12.5kV circuit can be picked up in certain contingency conditions.) In addition, another project will be created to replace fuse switches at two location with new Trip-Saver switches.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 698007
Division: SEMO
ZIP Codes(s) Served: 63823
Customers Served: 113
Customer Interruptions (CI): 227
SAIFI Value: Y2016 - 3.95; Y2017 - 1.11; Y2018 - 2.01
SAIDI Value: 465.61

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
EMPLOYEES	1	0	0	0.00%	0
EQUIPMENT/OH	16	13	115	50.66%	2
LIGHTNING	416	0	112	49.34%	1
PUBLIC	0	116	0	0.00%	0
TREE	17	0	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) No other work is planned for 2018.

Corrective Actions Planned

A circuit protection coordination study will be undertaken. Any fused switches requiring replacement for better circuit operation will be performed under WR 2TSE123851 in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 753053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63446, 63447, 63458, 63537
Customers Served: 81
Customer Interruptions (CI): 201
SAIFI Value: 2.48
SAIDI Value: 702.63

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	164	81.59%	2
TREE	37	18.41%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Three of the four device outages in 2018 were due to failed insulators. The failed insulators were replaced. This circuit has vacuum reclosers at the substation for protection. These reclosers will be replaced with a DA switch that has SCADA control and communication under 2HGH054274. This will give Operating an opportunity to recognize repeated momentary outages and enable proactive repair actions.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 760051
Division: CENTRAL MO
ZIP Codes(s) Served: 64624, 64638, 64656, 64664,
Customers Served: 390
Customer Interruptions (CI): 2398
SAIFI Value: 6.15
SAIDI Value: 772.35

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	190	9.56%	2
EQUIPMENT/OH	1394	70.12%	16
LIGHTNING	1	<0.01%	1
OTHER	1	<0.01%	1
TREE	10	<0.01%	4
UNKNOWN	392	19.72%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Division engineering personnel performed an inspection of the circuit. The Division is installing five Intellirupter DA switches, replacing the existing old style reclosers and the two older smart switches remaining on the line. The Division is also installing two additional Intellirupter DA switches to divide the 18.7 pole miles of line into three sections. This will allow all of the units to communicate with each other, allowing for proper coordination with reclosing abilities and reduce the duration of outages. Work to be performed on WRs 2HGH053782, 2HGH053783, 2HGH053784, 2HGH054304, and 2HGH054305. In addition to the Intellirupter work, aluminum bells, crossarms, and cutouts will be replaced as well as providing associated animal guarding under WR 2HGH053983. Tree trimming is scheduled for completion in 2019. Next Overhead Visual inspection to take place in 2021.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 783053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63334, 63359
Customers Served: 1148
Customer Interruptions (CI): 2965
SAIFI Value: 2.58
SAIDI Value: 218.54

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	23	<0.01%	7
CUSTOMER	2	<0.01%	1
EMPLOYEES	1	<0.01%	1
EQUIPMENT/OH	2386	80.47%	23
LIGHTNING	155	5.23%	8
PUBLIC	172	5.80%	2
TREE	226	7.62%	10

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

WRs 2WWZ190459 and 2WWZ190462 will add fuse switches to 14 transformers and to 3 taps. In addition, one fuse switch will be replaced with a Trip-Saver switch. WR 2WWZ190290 will replace a solid-blade switch W11289 along Bus Hwy 61 east of Hwy 161 in Bowling Green with an Intellirupter DA switch. Five spans of three-phase 12.5kV circuit will be reconducted along Old Bus Hwy 61 in Bowling Green.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 792052
Division: CENTRAL MO
ZIP Codes(s) Served: 65231, 65265
Customers Served: 154
Customer Interruptions (CI): 847
SAIFI Value: 5.50
SAIDI Value: 352.01

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	51	6.02%	3
EQUIPMENT/OH	563	66.47%	3
LIGHTNING	87	10.27%	5
OTHER	2	<0.01%	1
PUBLIC	89	10.51%	2
TREE	1	<0.01%	1
UNKNOWN	54	6.38%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Division engineering personnel performed an inspection of the circuit. No further work is required at this time. Tree trimming is scheduled for completion in 2019. The next Overhead Visual inspection to take place in 2022.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 818051
Division: CENTRAL MO
ZIP Codes(s) Served: 65101, 65109
Customers Served: 1453
Customer Interruptions (CI): 4293
SAIFI Value: 2.95
SAIDI Value: 247.99

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	27	<0.01%	2
EQUIPMENT/OH	997	23.23%	3
EQUIPMENT/UG	1759	40.98%	6
OTHER	57	1.33%	4
OVERLOAD	1452	33.83%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Two outages were caused by a 69kV substation malfunction; the other outage was caused by a failed underground cable which was replaced. No further work is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 828056
Division: SEMO
ZIP Codes(s) Served: 63784, 63801, 63824
Customers Served: 312
Customer Interruptions (CI): 571
SAIFI Value: 1.83
SAIDI Value: 459.77

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	88	15.41%	4
EQUIPMENT/OH	238	41.68%	9
LIGHTNING	26	4.55%	1
TREE	218	38.18%	4
UNKNOWN	1	<0.01%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Additional fused switches are to be installed on taps off the circuit backbone to help prevent circuit outages under WR 2TSE123848 in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 849001
Division: CENTRAL MO
ZIP Codes(s) Served: 63014, 65041
Customers Served: 212
Customer Interruptions (CI): 443
SAIFI Value: 2.09
SAIDI Value: 549.17

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	3	<0.01%	2
LIGHTNING	1	<0.01%	1
PUBLIC	416	93.91%	2
TREE	23	5.19%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

The majority of the customer interruptions were caused by two public vehicle outages. No further work is planned.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 858052
Division: NORTHEAST MO
ZIP Codes(s) Served: 63435
Customers Served: 1
Customer Interruptions (CI): 3
SAIFI Value: Y2016 - 1.00; Y2017 - 2.00; Y2018 - 3.00
SAIDI Value: 118.00

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	0	1	1	33.33%	1
EQUIPMENT/OH	0	0	1	33.33%	1
EQUIPMENT/UG	1	0	0	0.00%	0
LIGHTNING	0	0	1	33.33%	1
TREE	0	1	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) The outages in 2016 and 2017 were due to issues on the Culver Stockton College primary meter. The customer's fuses on their primary meter pole are labeled K2516 on Ameren mapping for communication purposes. Outages to these fuses are due to customer issues.

Corrective Actions Planned

The outages in 2016, 2017 and 2018 were due to issues on the Culver Stockton College primary meter and the college's system past their primary meter. Outages at these fuses are due to customer issues. This feeder is only 300' in total length, it has been inspected by engineering and no reliability work on this Ameren feeder is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 974001
Division: NORTHEAST MO
ZIP Codes(s) Served: 63501
Customers Served: 7
Customer Interruptions (CI): 69
SAIFI Value: 9.86
SAIDI Value: 499.71

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	31	44.93%	1
LIGHTNING	38	55.07%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

One of the three outages was a planned customer-requested outage. The other two outages occurred on the same day during a lightning storm. These two outages were actually a DA switch SWPD94 operating and picking up this circuit's load along with the Baltimore 951-2 circuit. The customers actually experienced momentary outages as result.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: CE1051
Division: CENTRAL MO
ZIP Codes(s) Served: 63352, 63384
Customers Served: 12
Customer Interruptions (CI): 25
SAIFI Value: 2.08
SAIDI Value: 350.75

Outage Analysis

Causes	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	25	100.0%	3

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions

Majority of this circuit was recondored in the summer of 2018 due to deteriorating, single strand copper wire frequently failing. This project was completed under WO# J0FDK, which was WR 2DLD091337. Only one outage due to a failed lightning arrestor occurred after recondoring project was completed. No further work is currently planned.

APPENDIX C

Division	Operating Area	Circuit	Volt	Cust	CI	CMI	SAIDI	SAIFI	2016	2017	2018	Years WPC
SEMO	HAYTI	464054	12	876	887	156983	179	1.01	WPC	WPC		2
MERAMEC VALLEY	ELLISVILLE	295052	12	870	698	132530	152	0.80	WPC	WPC		2
NORTHEAST MO	KIRKSVILLE	890051	13	1300	282	26182	20	0.22	WPC	WPC		2
SEMO	CAPE GIRARDEAU	607054	12	293	61	4310	15	0.21	WPC	WPC		2
SEMO	HAYTI	465051	12	482	94	11534	24	0.20	WPC	WPC		2
ARCHVIEW	MACKENZIE	020002	4	111	15	4245	38	0.14	WPC	WPC		2
SEMO	HAYTI	457055	12	437	58	6189	14	0.13	WPC	WPC		2
GATEWAY	BERKELEY	393055	12	663	79	24447	37	0.12	WPC	WPC		2
GATEWAY	DORSETT	145060	12	913	44	6173	7	0.05	WPC	WPC		2
MERAMEC VALLEY	ELLISVILLE	218053	12	751	35	3674	5	0.05	WPC	WPC		2
ARCHVIEW	MACKENZIE	024052	13	5	0	0	0	0.00	WPC	WPC		2
UNDERGROUND	UNDERGROUND	294056	13	13	0	0	0	0.00	WPC	WPC		2



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 020002
Division: ARCHVIEW
ZIP Codes(s) Served: 63102, 63103, 63104
Customers Served: 111
Customer Interruptions (CI): 15
SAIFI Value: Y2016 - 3.89; Y2017 - 4.05; Y2018 - 0.14

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/OH	112	267	12	80.00%	1
EQUIPMENT/UG	91	0	0	0.00%	0
OTHER	110	2	0	0.00%	0
OVERLOAD	0	0	1	6.67%	1
PUBLIC	114	0	0	0.00%	0
TREE	0	0	1	6.67%	1
UNKNOWN	1	185	1	6.67%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) A regular cycle tree trim was completed in 2018. Fault indicators were installed under WR 21MT677035 and 21MT677036. Work to permanently remove slack from a span of primary was completed under WR 21MT665112. The circuit was inspected by division engineering in 2018 to identify locations to install additional protective devices. Work was performed under WR 21MT692881 to install these additional protective devices.

Corrective Actions Planned

The improvements performed in 2018 have helped this feeder. In 2018 this circuit saw just 15 customer interruptions for a 0.14 SAIFI. An underground visual inspection is planned for 2019 and repair work identified as a result of the inspection will be completed in accordance with Ameren Missouri's infrastructure inspection policy.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 024052
Division: ARCHVIEW
ZIP Codes(s) Served: 63111
Customers Served: 5
Customer Interruptions (CI): 0
SAIFI Value: Y2016 - 2.60; Y2017 - 1.80; Y2018 - 0.00

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
CUSTOMER	5	0	0	0.00%	0
EQUIPMENT/OH	3	1	0	0.00%	0
EQUIPMENT/UG	1	0	0	0.00%	0
PUBLIC	4	5	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) A project was being investigated to possibly add a high and low side automatic switchgear to the substation in 2020. The existing sub is manual transfer on the loss of a supply. A regular cycle trim was planned for 2018.

Corrective Actions Planned

In 2018 no customer interruptions were experienced on this feeder. A regular cycle trim was performed in 2018. A project is planned for 2020 to add high and low side automatic switchgear to the substation. The existing sub is manual transfer on the loss of a supply.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 145060
Division: GATEWAY
ZIP Codes(s) Served: 63011, 63124, 63131, 63141
Customers Served: 913
Customer Interruptions (CI): 44
SAIFI Value: Y2016 - 7.16; Y2017 - 2.13; Y2018 - 0.05

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	6	10	24	54.55%	6
CUSTOMER	2	0	0	0.00%	0
EQUIPMENT/OH	1982	768	0	0.00%	0
EQUIPMENT/UG	973	929	10	22.73%	4
OTHER	25	0	2	4.55%	2
OVERLOAD	2548	0	0	0.00%	0
PUBLIC	0	1	1	2.27%	1
TREE	13	232	3	6.82%	2
UNKNOWN	998	9	4	9.09%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) This circuit serves 914 customers. In 2017, this feeder experienced one feeder outage. This occurred in December 2017, where lightning arrestors and cable terminals burned near the substation. These were repaired under WR 21MT688112. Other outages included overhead malfunctions and tree contact. The circuit inspection for this circuit as well as the tree trimming was completed in 2018. This circuit is also close to being overloaded. A project was submitted in 2017 that will use an open feeder compartment at the Ballas substation to divert some load off of this circuit. This project was budgeted for 2018-2019. A portion of the project will be completed in 2018 and the rest will be completed in 2019.

Corrective Actions Planned

The project submitted to divert load from this circuit will be complete in 4th quarter 2019. Other improvements include a new Ballas substation project to replace the older substation equipment with new equipment to help improve reliability. This project will be completed in 4th quarter 2019. A project to upgrade a subtransmission supply circuit to this circuit's substation will be completed in 2nd quarter 2019.

APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 218053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63011
Customers Served: 752
Customer Interruptions (CI): 35
SAIFI Value: Y2016 - 2.08; Y2017 - 2.04; Y2018 - 0.05

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	0	9	4	11.43%	1
EMPLOYEES	0	4	4	11.43%	1
EQUIPMENT/OH	53	6	12	34.29%	2
EQUIPMENT/UG	760	763	1	2.86%	1
LIGHTNING	0	0	7	20.00%	2
OTHER	1	0	0	0.00%	0
PUBLIC	764	0	0	0.00%	0
TREE	12	768	7	20.00%	2

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) This circuit has a significant section of underground cable between the substation and the feeder exit terminal pole. After that, the feeder is mostly built as private property rear distribution along a creek. A system of SCADA switchgear will be installed under WR 21MT690050 to transfer intact feeder sections in the event of an overhead problem. This project was budgeted outside of the Worst Performing Circuit program. A 2017 circuit outage occurred on the underground section between the substation and feeder exit. The faulted cable was repaired and replaced on WR 21MT674359. No other improvements are planned for the underground section of the feeder.

Corrective Actions Planned

Two SCADA Switchgears are being constructed in the spring of 2019 under WR 21MT690050. The project is expected to be completed by May 2019. The switchgear provides two functions: the first gear isolates damage to the applicable section of this circuit, and the second gear autoswitches intact sections to reserve circuit 218-57 if needed. A visual inspection of the circuit is scheduled for 2019. Any corrective actions identified will be performed.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 294056
Division: UNDERGROUND
ZIP Codes(s) Served: 63101, 63102
Customers Served: 13
Customer Interruptions (CI): 0
SAIFI Value: Y2016 - 9.46; Y2017 - 9.31; Y2018 - 0.00

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
EQUIPMENT/UG	123	121	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) (2016) Circuit erroneously placed on WPC due to mapping error. No further work necessary.

Corrective Actions Planned

This circuit's feeder cable is included in part of the downtown St. Louis revitalization efforts. It will be rebuilt, replacing all of the PILC cable on the circuit with EPR cable over the life of the Smart Energy Plan. Projects are currently in design and construction to prepare for the cable replacements for the later years. The circuit should have all PILC cable removed and replaced by 2022.

APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 295052
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63005, 63011, 63038
Customers Served: 871
Customer Interruptions (CI): 698
SAIFI Value: Y2016 - 2.85; Y2017 - 1.94; Y2018 - 0.80

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	0	29	2	<0.01%	1
EQUIPMENT/OH	862	869	75	10.74%	5
EQUIPMENT/UG	43	1	16	2.29%	2
LIGHTNING	1	276	0	0.00%	0
OTHER	3	1	0	0.00%	0
PUBLIC	1520	214	459	65.76%	2
TREE	62	289	146	20.92%	6
UNKNOWN	4	2	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Additional faulted circuit indicators were installed at the northern portion of the circuit, switch D14495 on Orville Rd, where the circuit has road access under WR 21MT694401. A mid-cycle tree trim was completed in 2018.

Corrective Actions Planned

No additional work planned as this circuit is not a 2018 WPC.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 393055
Division: GATEWAY
ZIP Codes(s) Served: 63121, 63134
Customers Served: 663
Customer Interruptions (CI): 79
SAIFI Value: Y2016 - 2.23; Y2017 - 2.39; Y2018 - 0.12

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	0	66	11	13.92%	5
CUSTOMER	7	0	0	0.00%	0
EMPLOYEES	6	0	0	0.00%	0
EQUIPMENT/OH	648	719	10	12.66%	4
LIGHTNING	0	0	1	1.27%	1
PUBLIC	689	34	0	0.00%	0
TREE	62	803	50	63.29%	7
UNKNOWN	124	1	7	8.86%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) This circuit underwent maintenance cycle tree trimming in 2016. An overhead visual inspection was completed in 2016 resulting in WRs 21MT660627, 21MT660630, 21MT662077, 21MT662078, 21MT662079, 21MT662080, 21MT662081, 21MT662082 and 21MT668292. The circuit was reviewed and patrolled.

Corrective Actions Planned

A mid-cycle patrol was conducted in 2018 to identify and perform any necessary hot spot tree trimming. No further action is planned.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 457055
Division: SEMO
ZIP Codes(s) Served: 63837, 63847, 63852, 63862,
Customers Served: 438
Customer Interruptions (CI): 58
SAIFI Value: Y2016 - 3.65; Y2017 - 4.40; Y2018 - 0.13

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	6	463	3	5.17%	2
CUSTOMER	1	2	0	0.00%	0
EMPLOYEES	1	0	0	0.00%	0
EQUIPMENT/OH	194	122	0	0.00%	0
LIGHTNING	486	893	0	0.00%	0
OTHER	21	20	47	81.03%	3
PUBLIC	0	0	7	12.07%	1
TREE	452	463	0	0.00%	0
UNKNOWN	484	0	1	1.72%	1

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) There were three incidents where lightning took out the 34kV line and one incident where animal contact took out Gibson substation in 2017. There is no planned work on this circuit in 2018.

Corrective Actions Planned

Additional storm hardening and lightning protection will be installed under WR 2TSE123853, 2TSE123854, 2TSE123855, 2TSE123856 and 2TSE123857 in 2019.



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Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 464054
Division: SEMO
ZIP Codes(s) Served: 63838, 63862, 63866, 63869,,
Customers Served: 876
Customer Interruptions (CI): 887
SAIFI Value: Y2016 - 2.50; Y2017 - 3.25; Y2018 - 1.01

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	9	18	12	1.35%	4
CUSTOMER	101	0	0	0.00%	0
EQUIPMENT/OH	1963	12	354	39.91%	7
LIGHTNING	126	1813	65	7.33%	7
OTHER	5	4	39	4.40%	3
PUBLIC	12	0	390	43.97%	5
TREE	49	924	27	3.04%	3
UNKNOWN	1	114	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Additional reclosers were installed on this circuit to isolate outages under WR2TSE120486 in 2018.

Corrective Actions Planned

No other work is planned for 2019.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 465051
Division: SEMO
ZIP Codes(s) Served: 63877
Customers Served: 484
Customer Interruptions (CI): 94
SAIFI Value: Y2016 - 4.52; Y2017 - 2.06; Y2018 - 0.19

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	6	2	0	0.00%	0
EQUIPMENT/OH	1574	1001	64	68.09%	17
LIGHTNING	0	6	1	1.06%	1
OTHER	0	0	22	23.40%	2
PUBLIC	177	0	0	0.00%	0
TREE	520	14	7	7.45%	1
UNKNOWN	6	0	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Additional reclosers were installed on this circuit to isolate outages under WR2TSE120487 in 2018.

Corrective Actions Planned

No other work is planned for 2019.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 607054
Division: SEMO
ZIP Codes(s) Served: 63736
Customers Served: 293
Customer Interruptions (CI): 61
SAIFI Value: Y2016 - 2.77; Y2017 - 2.39; Y2018 - 0.21

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	0	1	1	1.64%	1
EQUIPMENT/OH	754	294	59	96.72%	3
EQUIPMENT/UG	1	1	0	0.00%	0
LIGHTNING	0	104	1	1.64%	1
PUBLIC	0	291	0	0.00%	0
TREE	50	0	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) Additional reclosers were installed on this circuit to isolate outages under WR2TSE120499 in 2018.

Corrective Actions Planned

No other work is planned for 2019.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 890051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63501
Customers Served: 1300
Customer Interruptions (CI): 282
SAIFI Value: Y2016 - 4.04; Y2017 - 1.95; Y2018 - 0.22

Outage Analysis

Causes	2016 Total CI	2017 Total CI	2018 Total CI	2018 % Total CI	2018 # Incidents
ANIMAL	48	60	130	46.10%	8
EMPLOYEES	0	1117	0	0.00%	0
EQUIPMENT/OH	3860	17	39	13.83%	7
EQUIPMENT/UG	0	31	32	11.35%	1
LIGHTNING	1276	0	71	25.18%	1
OTHER	0	0	1	<0.01%	1
PUBLIC	1	0	0	0.00%	0
TREE	13	1272	9	3.19%	3
UNKNOWN	17	43	0	0.00%	0

Corrective actions taken or planned are noted below. These actions were developed through any combination of engineering reviews, circuit patrols, circuit inspections, and trimming. Circuit inspections and trimming are conducted on an appropriate cycle per rules 4 CSR 240-23.020 and 4 CSR 240.23-030 respectively.

Corrective Actions Taken

(2017) One of the circuit outages in 2017 was due to operator error in performing the work. There are no more planned projects for this circuit at this time. In 2017 project WO J0F51 was created to replace brittle 2/0 copper conductor with 556 AAAC, fusing unfused taps, undergrounding a section of the circuit backbone, changing out 6-ft. cross arms with 8-ft. cross arms and adding two automated switches to the circuit.

Corrective Actions Planned

Three DA devices are planned for installation on this circuit in 2019. A Trip-Saver is planned to replace Fuse 1384. Two Intellirupters DA Switches are planned, replacing Switches K9700 and K6995. These two Intellirupters will make it possible to supply this circuit from the Kirksville 965-53 circuit in the event of loss of power at switch K9700.