



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 2017 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 1366-2003, 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.

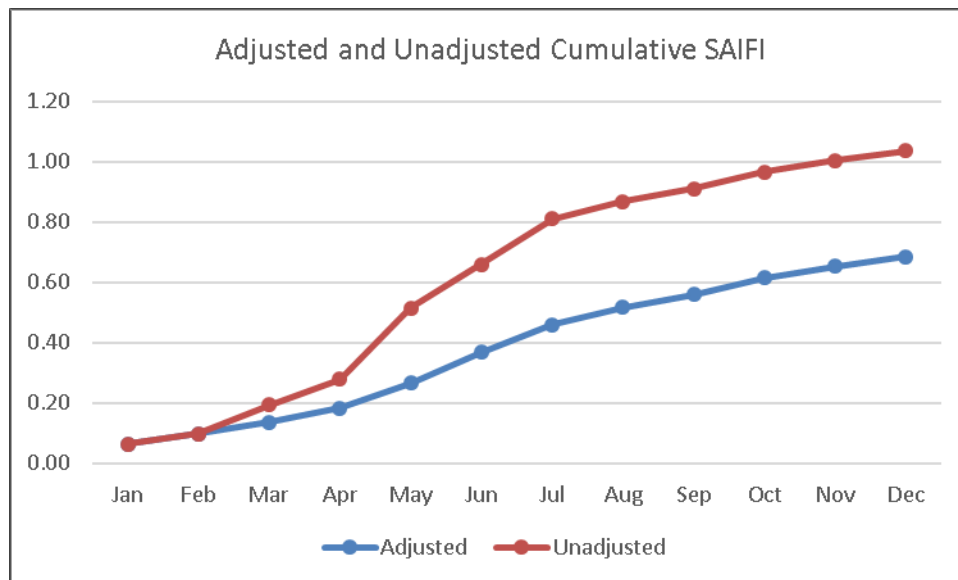


Reliability Metrics

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 1366-2003, Guide for Electric Power Distribution Reliability Indices.” The following tables and graphs show Ameren Missouri’s unadjusted and adjusted reliability metrics for calendar year 2017:

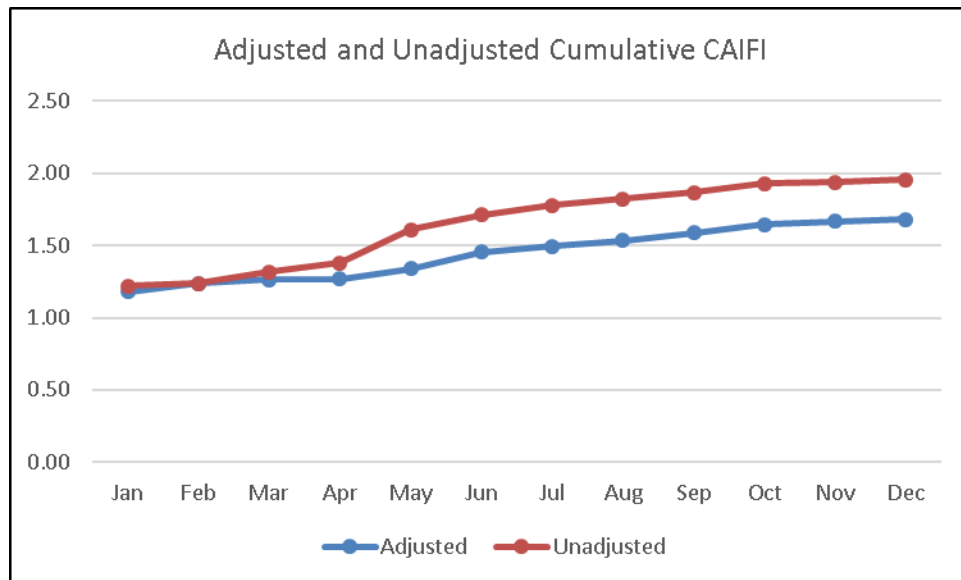
SAIFI:

MONTH	Adjusted Value	Unadjusted Value
Jan	0.06	0.06
Feb	0.10	0.10
Mar	0.14	0.19
Apr	0.18	0.28
May	0.26	0.51
Jun	0.37	0.66
Jul	0.46	0.81
Aug	0.52	0.87
Sep	0.56	0.91
Oct	0.62	0.97
Nov	0.65	1.00
Dec	0.68	1.04



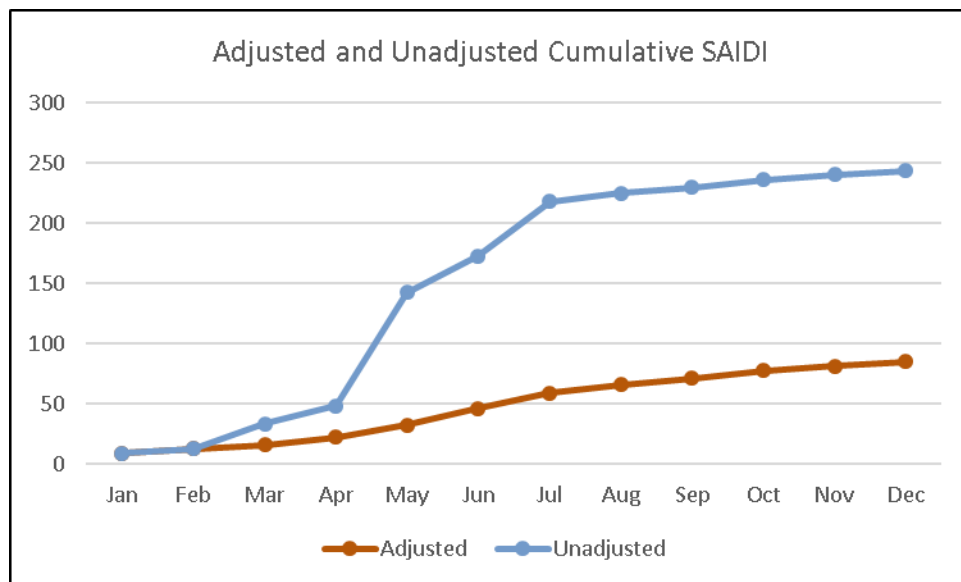
CAIFI:

MONTH	Adjusted Value	Unadjusted Value
Jan	1.18	1.22
Feb	1.24	1.24
Mar	1.26	1.32
Apr	1.27	1.38
May	1.34	1.61
Jun	1.46	1.71
Jul	1.49	1.78
Aug	1.54	1.82
Sep	1.59	1.87
Oct	1.65	1.93
Nov	1.67	1.94
Dec	1.68	1.96



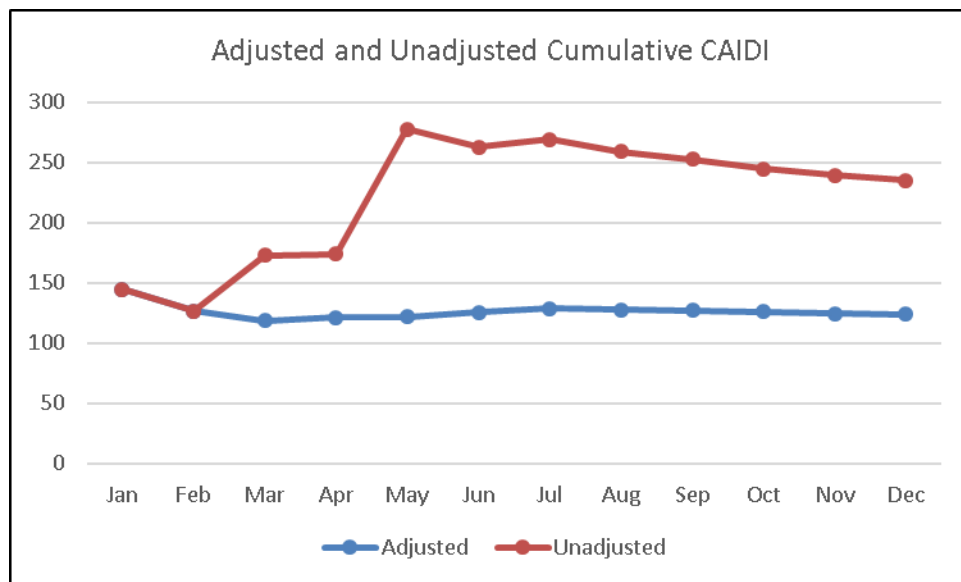
SAIDI:

MONTH	Adjusted Value	Unadjusted Value
Jan	9	9
Feb	12	12
Mar	16	33
Apr	22	48
May	32	143
Jun	46	173
Jul	59	218
Aug	66	225
Sep	71	230
Oct	78	236
Nov	81	240
Dec	85	244



CAIDI:

MONTH	Adjusted Value	Unadjusted Value
Jan	145	145
Feb	127	127
Mar	119	173
Apr	121	174
May	122	278
Jun	125	263
Jul	129	269
Aug	128	259
Sep	127	253
Oct	126	245
Nov	125	239
Dec	124	235





Ameren Missouri 2017 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 2017 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 2017 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 2017 WPC list

The MWPCs circuits not identified as WPCs in 2017 but which were WPCs in 2015 and 2016 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 2017. The reported reliability metrics demonstrate continued improvement in the reliability of Ameren Missouri's electric distribution system. With an adjusted SAIFI value of 0.68, 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.

APPENDIX A

Division	Operating Area	Circuit	Volt	Cust	CI	CMI	SAIDI	SAIFI	2015	2016	2017	Years WPC
ARCHVIEW	GERALDINE	113010	4	2	464	22148	11074	232.00			WPC	1
UNDERGROUND	UNDERGROUND	294056	13	13	121	7058	543	9.31		WPC	WPC	2
SEMO	HAYTI	456057	12	128	736	92070	719	5.75			WPC	1
NORTHEAST MO	WENTZVILLE	658051	12	40	205	19155	479	5.13			WPC	1
GATEWAY	BERKELEY	260053	12	394	1880	242699	616	4.77			WPC	1
MERAMEC VALLEY	JEFFERSON	550052	12	1510	6745	563544	373	4.47			WPC	1
SEMO	HAYTI	457055	12	446	1963	227988	511	4.40	WPC	WPC	WPC	3
GATEWAY	BERKELEY	152006	4	723	3081	386373	534	4.26			WPC	1
NORTHEAST MO	WENTZVILLE	630052	12	140	570	39644	283	4.07			WPC	1
ARCHVIEW	MACKENZIE	020002	4	112	454	49754	444	4.05		WPC	WPC	2
ARCHVIEW	MACKENZIE	196002	4	344	1336	135915	395	3.88			WPC	1
NORTHEAST MO	LOUISIANA	672053	12	292	1004	60575	207	3.44			WPC	1
SEMO	DEXTER	699051	12	664	2249	148998	224	3.39			WPC	1
ARCHVIEW	MACKENZIE	122004	4	114	381	56295	494	3.34			WPC	1
GATEWAY	DORSETT	209052	12	180	598	55727	310	3.32			WPC	1
SEMO	HAYTI	455053	12	806	2676	315908	392	3.32			WPC	1
SEMO	HAYTI	464054	12	887	2885	204062	230	3.25		WPC	WPC	2
ARCHVIEW	MACKENZIE	231051	12	2002	6488	976496	488	3.24			WPC	1
NORTHEAST MO	WENTZVILLE	691051	12	1184	3793	449110	379	3.20			WPC	1
NORTHEAST MO	WENTZVILLE	675052	12	494	1573	240124	486	3.18			WPC	1
GATEWAY	DORSETT	182001	4	374	1181	107802	288	3.16			WPC	1
MERAMEC VALLEY	ELLISVILLE	217051	12	280	855	184709	660	3.05			WPC	1
ARCHVIEW	GERALDINE	252001	4	520	1585	185978	358	3.05			WPC	1
GATEWAY	BERKELEY	259058	12	2261	6832	513243	227	3.02		WPC	WPC	2
CENTRAL MO	JEFFERSON CITY	856052	12	397	1172	130248	328	2.95	WPC		WPC	2
MERAMEC VALLEY	JEFFERSON	553057	12	584	1695	271748	465	2.90			WPC	1
GATEWAY	BERKELEY	259060	12	1949	5535	550661	283	2.84			WPC	1
GATEWAY	DORSETT	182007	4	825	2312	404766	491	2.80			WPC	1
ARCHVIEW	GERALDINE	029007	4	111	306	26071	235	2.76			WPC	1
MERAMEC VALLEY	JEFFERSON	550051	12	1972	5306	464955	236	2.69			WPC	1
CENTRAL MO	EXCELSIOR SPRINGS	982051	12	62	165	19237	310	2.66			WPC	1
GATEWAY	BERKELEY	210055	12	1796	4730	413778	230	2.63			WPC	1
GATEWAY	DORSETT	266054	12	67	175	38438	574	2.61			WPC	1
SEMO	HAYTI	456055	12	90	232	18334	204	2.58	WPC		WPC	2
ARCHVIEW	GERALDINE	UE1002	4	2	5	1829	915	2.50			WPC	1
GATEWAY	BERKELEY	167052	12	612	1501	113285	185	2.45	WPC		WPC	2
NORTHEAST MO	KIRKSVILLE	890052	13	1395	3420	323875	232	2.45			WPC	1
GATEWAY	DORSETT	203059	12	409	981	170468	417	2.40			WPC	1
GATEWAY	BERKELEY	393055	12	678	1623	246878	364	2.39		WPC	WPC	2



APPENDIX A

SEMO	CAPE GIRARDEAU	607054	34	289	691	131752	456	2.39		WPC	WPC	2
CENTRAL MO	MOBERLY	939052	12	277	655	58610	212	2.36			WPC	1
SEMO	DEXTER	690057	12	616	1441	119862	195	2.34	WPC		WPC	2
ARCHVIEW	GERALDINE	086006	4	145	338	30096	208	2.33			WPC	1
MERAMEC VALLEY	FRANKLIN	504052	12	847	1970	125524	148	2.33			WPC	1
CENTRAL MO	LAKESIDE	569057	12	620	1442	218494	352	2.33			WPC	1
MERAMEC VALLEY	ELLISVILLE	165056	12	151	349	185922	1231	2.31	WPC		WPC	2
SEMO	DEXTER	656055	12	1039	2398	139094	134	2.31	WPC		WPC	2
GATEWAY	DORSETT	254054	12	1150	2624	220563	192	2.28			WPC	1
MERAMEC VALLEY	ELLISVILLE	295056	12	583	1330	165940	285	2.28	WPC		WPC	2
CENTRAL MO	EXCELSIOR SPRINGS	718052	12	397	904	30618	77	2.28			WPC	1
ARCHVIEW	MACKENZIE	196008	4	571	1279	55312	97	2.24	#N/A	#N/A	WPC	1
NORTHEAST MO	KIRKSVILLE	858053	12	558	1240	51614	92	2.22			WPC	1
GATEWAY	BERKELEY	167055	12	545	1208	163514	300	2.22			WPC	1
MERAMEC VALLEY	ELLISVILLE	169056	12	640	1409	78058	122	2.20			WPC	1
MERAMEC VALLEY	JEFFERSON	553056	12	691	1521	119332	173	2.20			WPC	1
SEMO	POTOSI	475051	12	541	1185	153666	284	2.19			WPC	1
CENTRAL MO	EXCELSIOR SPRINGS	982052	12	1220	2658	343868	282	2.18			WPC	1
SEMO	DEXTER	620052	12	200	435	48363	242	2.18			WPC	1
ARCHVIEW	GERALDINE	246001	4	892	1923	126650	142	2.16			WPC	1
ARCHVIEW	GERALDINE	083008	4	34	73	11597	341	2.15			WPC	1
CENTRAL MO	MOBERLY	939053	12	576	1236	137718	239	2.15			WPC	1
GATEWAY	DORSETT	145060	12	914	1949	324176	355	2.13		WPC	WPC	2
CENTRAL MO	MOBERLY	882073	34	118	251	40553	344	2.13	#N/A	#N/A	WPC	1
GATEWAY	DORSETT	267052	12	1715	3641	708309	413	2.12			WPC	1
ARCHVIEW	MACKENZIE	280052	12	1507	3187	732175	486	2.11			WPC	1
MERAMEC VALLEY	FRANKLIN	503056	12	628	1328	124784	199	2.11			WPC	1
CENTRAL MO	MOBERLY	740052	12	1256	2652	267397	213	2.11			WPC	1
NORTHEAST MO	KIRKSVILLE	813051	13	583	1221	50450	87	2.09			WPC	1
ARCHVIEW	GERALDINE	113007	4	59	123	9447	160	2.08			WPC	1
MERAMEC VALLEY	JEFFERSON	587055	12	2115	4391	200786	95	2.08			WPC	1
GATEWAY	BERKELEY	393051	12	59	122	15070	255	2.07			WPC	1
MERAMEC VALLEY	JEFFERSON	560053	12	1354	2797	332835	246	2.07	WPC		WPC	2
SEMO	DEXTER	734053	12	46	95	10871	236	2.07			WPC	1
SEMO	ST FRANCOIS	563053	12	1640	3385	381691	233	2.06			WPC	1
SEMO	HAYTI	465051	12	497	1023	164711	331	2.06	WPC	WPC	WPC	3
ARCHVIEW	GERALDINE	255002	4	342	701	111114	325	2.05			WPC	1
ARCHVIEW	GERALDINE	083005	4	83	170	57143	688	2.05	WPC		WPC	2
ARCHVIEW	MACKENZIE	136052	12	689	1410	248975	361	2.05	WPC		WPC	2
MERAMEC VALLEY	ELLISVILLE	218053	12	761	1550	105947	139	2.04		WPC	WPC	2

APPENDIX A

NORTHEAST MO	WENTZVILLE	726054	12	123	250	21223	173	2.03			WPC	1
ARCHVIEW	GERALDINE	238006	4	262	532	38854	148	2.03			WPC	1
NORTHEAST MO	KIRKSVILLE	754002	4	288	584	62525	217	2.03			WPC	1
CENTRAL MO	LAKESIDE	170051	12	814	1650	152021	187	2.03			WPC	1
NORTHEAST MO	KIRKSVILLE	754051	4	75	152	14345	191	2.03			WPC	1
CENTRAL MO	JEFFERSON CITY	955054	12	1219	2460	155793	128	2.02			WPC	1
ARCHVIEW	GERALDINE	246004	4	887	1787	173274	195	2.01			WPC	1
ARCHVIEW	MACKENZIE	034005	4	368	741	39099	106	2.01			WPC	1
CENTRAL MO	ELDON	613001	4	369	743	88859	241	2.01			WPC	1
ARCHVIEW	MACKENZIE	020012	4	398	800	33496	84	2.01			WPC	1
SEMO	CAPE GIRARDEAU	835004	4	121	243	15825	131	2.01			WPC	1
GATEWAY	BERKELEY	047001	4	673	1351	60661	90	2.01			WPC	1
SEMO	DEXTER	678005	4	379	759	26182	69	2.00			WPC	1
UNDERGROUND	UNDERGROUND	287052	13	31	62	6105	197	2.00			WPC	1
GATEWAY	BERKELEY	047004	4	11	22	2986	271	2.00			WPC	1
NORTHEAST MO	KIRKSVILLE	858052	12	1	2	107	107	2.00	WPC		WPC	2
MERAMEC VALLEY	JEFFERSON	560051	12	987	1970	178581	181	2.00			WPC	1
ARCHVIEW	GERALDINE	202007	4	154	307	14283	93	1.99			WPC	1
SEMO	ST FRANCOIS	161053	12	804	1574	218557	272	1.96			WPC	1
ARCHVIEW	GERALDINE	017011	4	66	129	15585	236	1.95			WPC	1
UNDERGROUND	UNDERGROUND	285055	13	79	154	13570	172	1.95			WPC	1
NORTHEAST MO	KIRKSVILLE	890051	13	1304	2540	153583	118	1.95		WPC	WPC	2
MERAMEC VALLEY	JEFFERSON	550056	12	1444	2807	507814	352	1.94			WPC	1
MERAMEC VALLEY	ELLISVILLE	295052	12	868	1681	227263	262	1.94		WPC	WPC	2
SEMO	DEXTER	685057	12	132	252	35993	273	1.91			WPC	1
SEMO	POTOSI	484053	12	604	1153	118211	196	1.91			WPC	1
SEMO	POTOSI	451054	13	363	685	204755	564	1.89	WPC		WPC	2
GATEWAY	DORSETT	258052	12	583	1094	86558	148	1.88	WPC		WPC	2
GATEWAY	BERKELEY	140005	4	362	672	165313	457	1.86			WPC	1
CENTRAL MO	MOBERLY	745051	12	560	1035	269542	481	1.85			WPC	1
ARCHVIEW	MACKENZIE	280056	12	1649	3023	260147	158	1.83			WPC	1
ARCHVIEW	MACKENZIE	024052	13	5	9	338	68	1.80		WPC	WPC	2
CENTRAL MO	JEFFERSON CITY	978053	12	545	973	96873	178	1.79			WPC	1



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 017011
Division: ARCHVIEW
ZIP Codes(s) Served: 63103, 63104
Customers Served: 66
Customer Interruptions (CI): 129
SAIFI Value: 1.95
SAIDI Value: 236.14

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	64	49.61%	1
PUBLIC	65	50.39%	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 vehicle hit pole 2652420 on 2/19/17, knocking down primary conductors and taking out the feeder. It was repaired on WR 21MT667535. A thunderstorm took down one span of primary on 10/9/17. It was repaired on WR 21MT683998. Both of these outages caused over 80% of the circuit's CI (104 out of 129). A cycle trim was completed on the circuit in 2017. No further corrective actions needed at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 020002
Division: ARCHVIEW
ZIP Codes(s) Served: 63102, 63103, 63104
Customers Served: 112
Customer Interruptions (CI): 454
SAIFI Value: **Y2015** - 0.92; **Y2016** - 3.89; **Y2017** - 4.05
SAIDI Value: 444.23

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
CUSTOMER	2	0	0	0.00%	0
EQUIPMENT/OH	1	112	267	58.81%	5
EQUIPMENT/UG	0	91	0	0.00%	0
OTHER	0	110	2	<0.01%	2
OVERLOAD	1	0	0	0.00%	0
PREARRANGED	2	0	0	0.00%	0
PUBLIC	93	114	0	0.00%	0
UNKNOWN	0	1	185	40.75%	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 Taken

The 2016 outages were due to a public vehicle incident repaired on WR 21MT651783 and a primary down repaired on OAS 162923361, as well as issues on neighboring circuits that resulted in the loss of this circuit also. Repair work identified as a result of the 2016 OH Visual Inspection was completed in accordance with Ameren Missouri's infrastructure inspection policy. A mid cycle trim was completed in 2016. In 2017 disconnect switches failed on separate occasions in separate locations and were replaced on WR 21MT676440 and on OAS 171820535. Also in 2017 primary wires wrapped together during high winds causing an outage. Temporary repairs were made to this span of wire on OAS 170101459. These 2017 issues account for 93% of the circuit customer interruptions in 2017.

Corrective Actions Planned

A regular cycle tree trim will be completed in 2018. Fault indicators will be installed on WR 21MT677035 and 21MT677036. Work to permanently remove slack from a span of primary will be completed on WR 21MT665112. The circuit was inspected by division engineering in 2018 for locations to install additional protective devices and work will be performed on WR 21MT692881 to install these additional protective devices.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 020012
Division: ARCHVIEW
ZIP Codes(s) Served: 63101, 63102, 63104, 63106
Customers Served: 398
Customer Interruptions (CI): 800
SAIFI Value: 2.01
SAIDI Value: 84.16

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	399	49.88%	3
EQUIPMENT/UG	2	<0.01%	1
TREE	398	49.75%	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

Two incidents account for 99% of the customer interruptions in 2017. The first is due to a primary down repaired on WR 21MT665407 and the second due to a broken tree limb on the primary during high winds which was removed on OAS 171373446. A regular cycle trim will be performed in 2018. The circuit was inspected by division engineering in 2018 to determine if locations for additional protective devices could be identified. No additional advantageous locations were found.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 024052
Division: ARCHVIEW
ZIP Codes(s) Served: 63111
Customers Served: 5
Customer Interruptions (CI): 9
SAIFI Value: Y2015 - ; Y2016 - 2.60; Y2017 - 1.80
SAIDI Value: 67.60

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
CUSTOMER	0	5	0	0.00%	0
EQUIPMENT/OH	0	3	1	16.67%	1
EQUIPMENT/UG	0	1	0	0.00%	0
PUBLIC	0	4	5	83.33%	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

In 2016 three 34kv bus outages resulted in this 13.8kv circuit being out on 3 occasions. Two of the bus outage incidents were due to public/customer damage. A mid-cycle trim was performed in 2016. Repair work identified as a result of the 2016 overhead visual inspection and underground detailed inspection was completed in accordance with Ameren Missouri's infrastructure policy. Two incidents account for 100% of the customer interruptions in 2017 on this very small feeder of 5 customers. One incident was due to a public vehicle breaking a pole. The pole was replaced on OAS 171401935. A second incident was due to the loss of a 34kv supply at the sub.

Corrective Actions Planned

A project is 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 is planned for 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 029007
Division: ARCHVIEW
ZIP Codes(s) Served: 63110
Customers Served: 111
Customer Interruptions (CI): 306
SAIFI Value: 2.76
SAIDI Value: 234.87

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	1	<0.01%	1
PUBLIC	304	99.35%	3
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

A building collapsed onto a pole, broke an 8' crossarm and took down 4/0 CU primary, taking out the feeder, on 6/5/17 (OAS# 171564601 and 171564342). This outage caused 99% of the circuit's CI (303 out of 306). A cycle trim was completed on the circuit in 2017. No further corrective actions needed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 034005
Division: ARCHVIEW
ZIP Codes(s) Served: 63119, 63144
Customers Served: 368
Customer Interruptions (CI): 741
SAIFI Value: 2.01
SAIDI Value: 106.25

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	1	<0.01%	1
TREE	740	99.87%	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

Tree contact broke a crossarm, took down the 4/0 CU primary and took out the feeder on 8/1/2017. A tree also made contact with all three phases to take out the feeder on 10/7/2017 . These two tree contact issues accounted for 98.9% of the CI. Both were corrected (WR 21MT679021 and OAS# 172801142, respectively). A cycle trim was completed on the circuit in 2017. No further corrective actions needed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 047001
Division: GATEWAY
ZIP Codes(s) Served: 63114, 63130
Customers Served: 673
Customer Interruptions (CI): 1351
SAIFI Value: 2.01
SAIDI Value: 90.14

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	2	<0.01%	2
EQUIPMENT/UG	1348	99.78%	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

This circuit serves 677 customers. In January 2017, cable faulted at the terminal pole outside the substation. Other outages were single outages to customers caused by tree contact and overhead malfunctions. The cable was repaired under WR 21MT664809. No further corrective actions are needed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 047004
Division: GATEWAY
ZIP Codes(s) Served: 63114
Customers Served: 11
Customer Interruptions (CI): 22
SAIFI Value: 2.00
SAIDI Value: 271.45

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	5	22.73%	3
EQUIPMENT/UG	11	50.00%	2
LIGHTNING	3	13.64%	1
PUBLIC	3	13.64%	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 circuit serves 11 customers. The largest outage occurred in January 2017 due to an underground malfunction. The cable faulted outside the substation. The cable was repaired under WR 21MT665237. A vehicle struck a pole and knocked the wire down and knocked the brackets loose from the transformers in June 2017. The pole and wire was repaired under WR 21MT676744. No further corrective actions are needed at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 083005
Division: ARCHVIEW
ZIP Codes(s) Served: 63147
Customers Served: 83
Customer Interruptions (CI): 170
SAIFI Value: Y2015 - 4.29; Y2016 - 1.02; Y2017 - 2.05
SAIDI Value: 688.47

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	0	1	<0.01%	1
EQUIPMENT/OH	156	0	84	49.41%	3
LIGHTNING	24	1	0	0.00%	0
OTHER	0	0	2	1.18%	2
PREARRANGED	86	0	0	0.00%	0
PUBLIC	93	83	0	0.00%	0
UNKNOWN	1	0	83	48.82%	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 Taken

(2015) On Oct. 14, 2015 cables failed between switchgear #2 and transformer #2. Simple repairs weren't able to be done. The station was put back in service operating on just transformer #1 and all seven circuits were switched to that transformer. In Dec. of 2016 transformer #2 will be replaced and transformer #1 will be removed. In 2018 both switchgears will be removed and a new five position switchgear will be installed with high side transfer. In 2017 circuit 83-1 will be reconductored and circuits 83-5 and 8 will have new ties built in order to create additional opportunities to pick up load from adjacent substations.

Corrective Actions Planned

The substation transformer and switchgear replacements are planned for completion in 2019. The circuit reconductoring and additional tie switches are expected to be completed in 2018. After engineering review further action is needed. Spacers will be added to conductors with WR 21MT694593 and jumpers repairs performed with WR 21MT69459.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 083008
Division: ARCHVIEW
ZIP Codes(s) Served: 63107, 63147
Customers Served: 34
Customer Interruptions (CI): 73
SAIFI Value: 2.15
SAIDI Value: 341.09

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	73	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

An abnormal switching situation on adjacent feeders on 1/18/2017 led to 95% of the CI (69 out of 73). Feeder 83-8 ordinarily has 34 customers, but it was temporarily tied to feeder 83-4 to help pick up load when a jumper burned up. Because of this, many more customers and CI were associated with it and resulted in the high SAIFI. A cycle trim was completed on the circuit in 2017. No corrective actions are needed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 086006
Division: ARCHVIEW
ZIP Codes(s) Served: 63106
Customers Served: 145
Customer Interruptions (CI): 338
SAIFI Value: 2.33
SAIDI Value: 207.56

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	40	11.83%	1
EQUIPMENT/OH	3	<0.01%	3
EQUIPMENT/UG	294	86.98%	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

This circuit serves approximately 145 customers. Five outages made up over 98% of all of the customer interruptions on this circuit in 2017. Four outages comprised of 86.98% of all outages were caused by underground malfunctions which were repaired as soon as possible following the main outage. One outage comprised of 11.83% of all outages was caused by an animal and repaired at the time of the outage. Overhead equipment and other items were repaired at the outage time. No further corrective actions are needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 113007
Division: ARCHVIEW
ZIP Codes(s) Served: 63110
Customers Served: 59
Customer Interruptions (CI): 123
SAIFI Value: 2.08
SAIDI Value: 160.12

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	122	99.19%	3
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

Two feeder outages accounted for over 99% of the CI on the circuit. Both outages occurred on windy days with notes on one outage indicating phase-to-phase contact. District engineering will patrol the circuit in an attempt to identify possible phase-to-phase locations.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 113010
Division: ARCHVIEW
ZIP Codes(s) Served: 63110, 63139
Customers Served: 2
Customer Interruptions (CI): 464
SAIFI Value: 232.00
SAIDI Value: 11074.00

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/UG	462	99.57%	1
OTHER	1	<0.01%	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

An abnormal switching situation on adjacent feeders on 7/13/2017 led to over 99% of the CI (462 out of 464). Feeder 113-10 ordinarily has 2 customers, but it was temporarily tied to other feeders to help pick up load, so many more customers and CI were associated with it (resulting in the very high SAIFI). An overhead visual inspection was completed on the circuit in 2017. An underground detailed inspection is scheduled on the circuit for 2018. Repair work identified as a result of the 2017 overhead visual inspection and 2018 underground visual inspection will be completed in accordance with Ameren Missouri's infrastructure inspection policy.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 122004
Division: ARCHVIEW
ZIP Codes(s) Served: 63111, 63147
Customers Served: 114
Customer Interruptions (CI): 381
SAIFI Value: 3.34
SAIDI Value: 493.82

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	9	2.36%	7
OTHER	1	<0.01%	1
PUBLIC	227	59.58%	3
TREE	23	6.04%	1
UNKNOWN	121	31.76%	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

Three incidents account for 90% of the customer interruptions in 2017. The first was due to a public vehicle breaking a pole which was replaced on WR 21MT673849. The second involved the substation breaker tripping during a thunderstorm. The third incident was due to another public vehicle hitting a pole at a different location from the pole hit earlier in the year, this pole was replaced on WR 21MT688115. A mid-cycle tree trim was performed in 2017. Repair work identified as a result of the 2017 overhead visual inspection and underground visual 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: 136052
Division: ARCHVIEW
ZIP Codes(s) Served: 63123, 63129
Customers Served: 689
Customer Interruptions (CI): 1410
SAIFI Value: Y2015 - 2.42; Y2016 - 1.24; Y2017 - 2.05
SAIDI Value: 361.36

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	46	58	4.11%	2
CUSTOMER	0	3	0	0.00%	0
EQUIPMENT/OH	1253	1	93	6.60%	5
EQUIPMENT/UG	51	25	72	5.11%	2
OTHER	50	0	0	0.00%	0
PREARRANGED	28	0	0	0.00%	0
PUBLIC	279	83	0	0.00%	0
TREE	9	0	689	48.87%	2
UNKNOWN	1	692	498	35.32%	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

Repair work from the 2014 overhead visual inspection and underground visual inspection have been completed in accordance with Ameren Missouri's infrastructure inspection policy. In 2015 a solid blade switch was replaced, a broken ground wire repaired and primary conductors that had wrapped together during a vehicle accident were repaired. This circuit was not on the 2016 Worst Performing Circuit list. Three incidents account for 88% of the customer interruptions in 2017. The first is due to a tree breaking in high winds resulting in a broken crossarm that was repaired on WR 21MT672947. The second was due to the feeder breaker tripping during a thunderstorm, possibly due to trees but could not be verified. The third issue was a primary down that was repaired on OAS 173611573.

Corrective Actions Planned

A mid-cycle trim is planned for 2018 as well as an overhead and underground visual inspection. Division engineering will patrol the circuit in 2018 to determine if any additional protection devices are needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 140005
Division: GATEWAY
ZIP Codes(s) Served: 63132
Customers Served: 362
Customer Interruptions (CI): 672
SAIFI Value: 1.86
SAIDI Value: 456.67

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	35	5.21%	2
EQUIPMENT/OH	71	10.57%	4
LIGHTNING	4	<0.01%	1
OTHER	1	<0.01%	1
PUBLIC	364	54.17%	3
TREE	193	28.72%	4
UNKNOWN	4	<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 are 363 customers that are served on this circuit. The largest outage occurred in July 2017 where a vehicle hit a pole causing the feeder outage. The pole are replaced under WR 21MT678812. Other outages occurred due to tree contact. In November 2017, two outages occurred at 9678 Mesa and 9677 Grandview due to tree contact. The damage at both sections of the circuit were repaired under WR 21MT674307 and 21MT686448. A mid-cycle trim happened in 2017 and the next tree trim cycle will begin in 2019. No further corrective actions are needed at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 145060
Division: GATEWAY
ZIP Codes(s) Served: 63011, 63124, 63131, 63141
Customers Served: 914
Customer Interruptions (CI): 1949
SAIFI Value: **Y2015** - 0.57; **Y2016** - 7.16; **Y2017** - 2.13
SAIDI Value: 354.68

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	3	6	10	<0.01%	6
CUSTOMER	0	2	0	0.00%	0
EQUIPMENT/OH	224	1982	768	39.40%	7
EQUIPMENT/UG	36	973	929	47.67%	6
LIGHTNING	21	0	0	0.00%	0
OTHER	3	25	0	0.00%	0
OVERLOAD	0	2548	0	0.00%	0
PREARRANGED	42	0	0	0.00%	0
PUBLIC	0	0	1	<0.01%	1
TREE	187	13	232	11.90%	4
UNKNOWN	6	998	9	<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

(2016) For this circuit there were two feeder outages in 2016. A cable fault occurred from the substation to the terminal pole. The cable was patrolled and then repaired under WR 21MT641029. On January 23, 2016 a public vehicle struck a pole along Clayton Rd. , knocking the pole down completely. This was restored under WR 21MT640910. Other outages were due to broken trees hitting primary, burned jumpers on reclosers, as well as unknown failures. Last year a project was submitted under WO 25105 to create another feeder (145-51) from the substation to help relieve the load.

Corrective Actions Planned

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 will be 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 pick up some of the



APPENDIX B

load off of the 145-60 feeder. 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.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 152006
Division: GATEWAY
ZIP Codes(s) Served: 63114, 63147
Customers Served: 723
Customer Interruptions (CI): 3081
SAIFI Value: 4.26
SAIDI Value: 534.40

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EMPLOYEES	1	<0.01%	1
EQUIPMENT/OH	416	13.50%	12
PUBLIC	1932	62.71%	3
TREE	731	23.73%	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

There were three circuit outages which account for the majority of customer interruptions in 2017. One circuit outage was due to a tree branch that made contact with the overhead lines. The other two circuit outages were due to public vehicle accidents that damaged utility poles. Maintenance cycle tree trimming was performed in 2016. A mid-cycle patrol will be conducted in 2018 to identify and perform any necessary hot spot tree trimming in 2018. No further action is planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 161053
Division: SEMO
ZIP Codes(s) Served: 63637, 63640
Customers Served: 804
Customer Interruptions (CI): 1574
SAIFI Value: 1.96
SAIDI Value: 271.84

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	3	<0.01%	3
EQUIPMENT/OH	45	2.86%	14
LIGHTNING	15	<0.01%	1
OTHER	157	9.97%	3
OVERLOAD	1	<0.01%	1
TREE	1345	85.45%	18
UNKNOWN	8	<0.01%	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

Tree Trimming Full Cycle Trim is currently underway and scheduled to be completed in 2018 which will address 85% of the outages for this circuit. Other planned actions for this feeder include the installation of multiple reclosers in various areas to help reduce future potential outages primarily caused by tree issues, the installation of a number of fuses on multiple taps and transformers to help limit the number of customers impacted per outage, the replacement of some poles and/or equipment deemed at-risk, and the installation of sectionalizing switches to be able to isolate and reduce the number of customers impacted by outages. Planned work will be completed by the end of 2018 under WR 28SF042436.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 165056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63001, 63025, 63069
Customers Served: 151
Customer Interruptions (CI): 349
SAIFI Value: Y2015 - 2.17; Y2016 - 0.91; Y2017 - 2.31
SAIDI Value: 1231.27

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	20	17	4.87%	3
EMPLOYEES	0	27	0	0.00%	0
EQUIPMENT/OH	1	78	115	32.95%	6
EQUIPMENT/UG	0	1	0	0.00%	0
OTHER	0	2	0	0.00%	0
PUBLIC	5	0	0	0.00%	0
TREE	322	0	104	29.80%	5
UNKNOWN	7	9	113	32.38%	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 Taken

(2015) Trees in a private property rear section of the feeder continue to be the main issue. This is the section south of fuse U SL33859821. Cycle tree trimming is planned for 2016.

Corrective Actions Planned

Approximately 60% of the Customer Minute Interruptions on the circuit were caused by record Meramec River flooding. This required disconnection of customers at the Hunters Ford and Sheerin Road areas at the south end of the circuit. Customers were eventually reconnected via a temporary primary cable laid through a customer's field outside of the flood plain. We developed a permanent solution using this same path on WR 672794. However, we need easement across the customer's field, and they are not cooperating. If this cannot be resolved we will have to seek another path, or hope we can get the same temporary access in event of future flooding.



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: 612
Customer Interruptions (CI): 1501
SAIFI Value: **Y2015** - 3.07; **Y2016** - 0.52; **Y2017** - 2.45
SAIDI Value: 185.11

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	332	61	47	3.13%	3
EQUIPMENT/OH	113	126	845	56.30%	11
EQUIPMENT/UG	56	23	0	0.00%	0
OTHER	2	0	0	0.00%	0
PREARRANGED	73	0	0	0.00%	0
TREE	0	2	0	0.00%	0
UNKNOWN	1340	108	609	40.57%	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

(2015) The division engineering personnel performed an inspection of the circuit and several improvement opportunities were identified. The repair work indentified as result of the inspection will be performed under WR 21MT645042 (Replace 50 kva transformer with 75 kva on pole 154659, add fused cut-out and animal guard) and replace a cross arm on pole 233119 under WR 21MT645046.

Corrective Actions Planned

Investigate downstream of fuse 2318 and potentially install a trip saver to reduce feeder outages on 21MT694707.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 167055
Division: GATEWAY
ZIP Codes(s) Served: 63137, 63138
Customers Served: 545
Customer Interruptions (CI): 1208
SAIFI Value: 2.22
SAIDI Value: 300.03

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	19	1.57%	2
EQUIPMENT/OH	1035	85.68%	12
LIGHTNING	104	8.61%	1
OTHER	2	<0.01%	2
PUBLIC	29	2.40%	1
TREE	19	1.57%	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

Engineering plans to check protective device coordination on this feeder to ensure Recloser 1482 coordinates with the breaker in the sub. No other recommendations at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 169056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63025, 63038, 63040
Customers Served: 640
Customer Interruptions (CI): 1409
SAIFI Value: 2.20
SAIDI Value: 121.97

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	4	<0.01%	4
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	961	68.20%	6
EQUIPMENT/UG	28	1.99%	4
OTHER	18	1.28%	2
TREE	302	21.43%	5
UNKNOWN	95	6.74%	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

Of the customer minute interruptions, 21% from poles that broke on a calm day, 22% from a tree that broke, 26% from fuses that blew during a thunderstorm, and 13% from primary wires that fell on a calm day. Cycle trimming completed in 2017 has addressed the tree related outages. Overhead visual inspection planned for 2018 will check for other issues. The circuit has appropriate use of sectionalizing and protective devices. No other corrective action is planned beyond the 2018 visual inspection.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 170051
Division: CENTRAL MO
ZIP Codes(s) Served: 65026, 65049, 65065, 65072,
Customers Served: 814
Customer Interruptions (CI): 1650
SAIFI Value: 2.03
SAIDI Value: 186.76

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	<0.01%	1
EQUIPMENT/OH	1551	94.00%	6
EQUIPMENT/UG	2	<0.01%	1
TREE	96	5.82%	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

Two feeder outages accounted for most of the minutes. One was due to tree limb and high winds which was cleared. The other was a recloser on the line that failed to operate correctly. In 2017 the feeder breaker was replaced with a SCADA controlled electronic recloser which provides remote indication and control, plus providing more data on what cause an outage. Additional switches were installed in 2017 to provide sectionalizing of the feeder and one more switch will be installed in 2018 to help with isolation of faulted lines. This will be done before winter of 2018 on WR 27LE038502.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 182001
Division: GATEWAY
ZIP Codes(s) Served: 63119, 63122, 63124
Customers Served: 374
Customer Interruptions (CI): 1181
SAIFI Value: 3.16
SAIDI Value: 288.24

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	391	33.11%	4
TREE	790	66.89%	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 2017. This circuit outage occurred during abnormally switched conditions while being tied to a neighboring circuit at the time of the circuit outage. The outage that occurred was due to a tree branch that made contact with the overhead lines on the neighboring circuit. Division Engineering will review the remaining device outages and transformer outages on this circuit to determine if any additional action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 182007
Division: GATEWAY
ZIP Codes(s) Served: 63119, 63122, 63131
Customers Served: 825
Customer Interruptions (CI): 2312
SAIFI Value: 2.80
SAIDI Value: 490.63

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	977	42.26%	6
LIGHTNING	24	1.04%	1
TREE	1311	56.70%	18

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 account for the majority of the customer interruptions in 2017. One circuit outage was due to a 34kV switch failure. The 34kV switch has been replaced under DOJM 21MT676774. The other circuit outage was due to a tree branch breaking off and making contact with the overhead lines. Maintenance cycle tree trimming is scheduled to be completed in 2019. The remaining device outages and transformer outages due to equipment malfunctions and tree contacts will be reviewed to determine if any additional action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 196002
Division: ARCHVIEW
ZIP Codes(s) Served: 63143
Customers Served: 344
Customer Interruptions (CI): 1336
SAIFI Value: 3.88
SAIDI Value: 395.10

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	1331	99.63%	3
TREE	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

An abnormal switching situation on adjacent feeders on 9/7/2017 led to 74% of the CI (982 out of 1336). Feeder 125-3 was temporarily being fed from feeder 196-2, due to some maintenance work at the Ellendale (125) substation. Feeder 196-2 ordinarily has 344 customers, but since it was temporarily tied to 125-3, many more customers and CI were associated with it (resulting in a high SAIFI). A cycle trim is scheduled for the circuit in 2018. No further actions are required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 196008
Division: ARCHVIEW
ZIP Codes(s) Served: 63119, 63139, 63143, 63144
Customers Served: 571
Customer Interruptions (CI): 1279
SAIFI Value: 2.24
SAIDI Value: 96.87

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	1105	86.40%	4
PUBLIC	174	13.60%	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 second unit was added to the Maplewood (196) substation in 2017 as part of a project to replace the Pernod (87) substation. The new unit was put in service in June and while switching load on 06/29/2017, issues with switch D15666 resulted in 44% of the circuit's CI (564 out of 1279). Another 42% of the circuit's CI (540 out of 1279) were the result of switch D8584 failing on 06/14/2017 (OAS# 171654896 and 171654929). A cycle trim is scheduled for the circuit in 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 202007
Division: ARCHVIEW
ZIP Codes(s) Served: 63105, 63110, 63117
Customers Served: 154
Customer Interruptions (CI): 307
SAIFI Value: 1.99
SAIDI Value: 92.75

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	154	50.16%	1
EQUIPMENT/UG	153	49.84%	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

Unknown fault caused 50% of the feeder interruptions and a loss of 34.5KV feed to the sub caused the other 50%. No further actions are required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 203059
Division: GATEWAY
ZIP Codes(s) Served: 63044
Customers Served: 409
Customer Interruptions (CI): 981
SAIFI Value: 2.40
SAIDI Value: 416.79

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	36	3.67%	1
EQUIPMENT/OH	796	81.14%	3
OTHER	6	<0.01%	1
TREE	142	14.48%	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

This circuit serves 409 customers. The largest outage occurred on June 1st, 2017 from a broken alley arm and the A phase jumper being burned at switch D3163. This was repaired under WR 21MT674511. The second largest outage was caused by a broken tree limb contacting primary in the rear of 4164 Lockport. The primary was repaired under WR 21MT682274. The last tree trimming cycle was completed in 2016 and the mid-cycle trim will be completed in 2018. No further corrective actions are needed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 209052
Division: GATEWAY
ZIP Codes(s) Served: 63044, 63045
Customers Served: 180
Customer Interruptions (CI): 598
SAIFI Value: 3.32
SAIDI Value: 309.59

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	3	<0.01%	3
EQUIPMENT/OH	386	64.55%	5
EQUIPMENT/UG	181	30.27%	1
LIGHTNING	4	<0.01%	4
PUBLIC	2	<0.01%	2
TREE	1	<0.01%	1
UNKNOWN	21	3.51%	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

This circuit serves 178 customers. The largest outages seen on this circuit in 2017 were caused by overhead malfunctions. On March 11, primary was down behind 13501 NW Industrial Dr. and was repaired under DOJM 21MT668795. Other outages were caused by burned jumpers, and a burned insulator. Circuit was patrolled multiple times by Operating, Trouble, and Engineering. As a result of the patrols, WRs 21MT675337, 21MT675322, 21MT672715, and 21MT675533 were created and scheduled to be completed in 2018. Infrared scan of the circuit was completed in July under WR 21MT678271. All problems found from the IR scan are to be resolved under 21MT678609, which is anticipated to be completed in 2018. A project will be submitted in the 1st Quarter budget cycle of 2018 to install 4 'smart' switches at different sections of the feeder to decrease the outage time for customers. This project, if approved, will be completed in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 210055
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63042
Customers Served: 1796
Customer Interruptions (CI): 4730
SAIFI Value: 2.63
SAIDI Value: 230.39

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	120	2.54%	2
EQUIPMENT/OH	2523	53.35%	16
EQUIPMENT/UG	2	<0.01%	1
LIGHTNING	22	<0.01%	1
PUBLIC	1816	38.40%	2
TREE	183	3.87%	4
UNKNOWN	63	1.33%	9

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 2017 that was due to a public vehicle accident that damaged a utility pole. The remaining device outages were largely due to overhead equipment malfunctions, tree contacts, and animals. Division Engineering will review the device outages on this circuit to determine if any additional action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 217051
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63005, 63017, 63038
Customers Served: 280
Customer Interruptions (CI): 855
SAIFI Value: 3.05
SAIDI Value: 659.68

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	2	<0.01%	1
EQUIPMENT/OH	84	9.82%	2
EQUIPMENT/UG	6	<0.01%	2
LIGHTNING	1	<0.01%	1
OTHER	1	<0.01%	1
PUBLIC	274	32.05%	2
TREE	484	56.61%	5
UNKNOWN	3	<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

Over half of CI outages were caused by trees. Cycle tree trimming is scheduled for 2018. 42% of the total 2017 Customer Minute Interruptions (CMI) occurred past recloser R SL32053732 on Wildhorse Creek Rd. This covers a long section of circuit that is along roads and through fields without much sectionalizing. Additional sectionalizing will be added upstream of private-property sections to aid restoration and limit CMI. Work will be done on WR 21MT694389.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 218053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63011
Customers Served: 761
Customer Interruptions (CI): 1550
SAIFI Value: **Y2015** - 1.38; **Y2016** - 2.08; **Y2017** - 2.04
SAIDI Value: 139.22

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	0	9	<0.01%	1
EMPLOYEES	0	0	4	<0.01%	1
EQUIPMENT/OH	187	53	6	<0.01%	1
EQUIPMENT/UG	789	760	763	49.23%	4
OTHER	0	1	0	0.00%	0
PREARRANGED	76	0	0	0.00%	0
PUBLIC	0	764	0	0.00%	0
TREE	0	12	768	49.55%	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) Ellisville 218053 experienced two feeder outages in the 750 AL feeder exit cable. One outage was due to contractor dig-in. An outage several months later was a failure in a different location. Both sections were repaired and replaced. No additional corrective action is planned.

Corrective Actions Planned

Feeder 218-53 has a significant section of underground cable between the substation and the feeder exit terminal pole. Downstream of this section the feeder is mostly built as private-property-rear distribution along a creek. A system of SCADA switchgear will be installed on 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 feeder 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.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 231051
Division: ARCHVIEW
ZIP Codes(s) Served: 63017, 63123, 63129
Customers Served: 2002
Customer Interruptions (CI): 6488
SAIFI Value: 3.24
SAIDI Value: 487.76

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	4	<0.01%	2
EQUIPMENT/OH	2087	32.17%	11
EQUIPMENT/UG	2254	34.74%	7
OTHER	72	1.11%	1
PUBLIC	2070	31.91%	7
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

Three incidents account for 92% of the customer interruptions in 2017. The first was due to an UG primary cable failure that was repaired on WR 21MT678122. The second was due to a public vehicle breaking a pole. The pole was replaced on WR 21MT680519. The third incident was a short outage to clear a pole, to be able to make repairs due to a hardware issue on the pole. That repair was completed on OAS 172833456. A mid-cycle trim will be performed in 2018. An overhead visual inspection and underground detailed inspection are planned for 2018. Repair work identified as a result of the inspections will be completed in accordance with Ameren Missouri's infrastructure inspection policy.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 238006
Division: ARCHVIEW
ZIP Codes(s) Served: 63105, 63112, 63130, 63133
Customers Served: 262
Customer Interruptions (CI): 532
SAIFI Value: 2.03
SAIDI Value: 148.30

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/UG	524	98.50%	2
PUBLIC	8	1.50%	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 feeder outages accounted for over 99% of the customer interruptions on the circuit. Both outages were due to underground cable faults occurring within hours of each other. After the first feeder outage the circuit was patrolled with no issues found and the circuit was put back in service. Within an hour another feeder outage occurred, presumably the same section of cable as the prior outage. The fault was repaired on WR 21MT688918. No further corrective actions are planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 246001
Division: ARCHVIEW
ZIP Codes(s) Served: 63112, 63122
Customers Served: 892
Customer Interruptions (CI): 1923
SAIFI Value: 2.16
SAIDI Value: 141.98

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
CUSTOMER	19	<0.01%	1
EMPLOYEES	25	1.30%	1
EQUIPMENT/OH	69	3.59%	10
OTHER	47	2.44%	2
TREE	1761	91.58%	5
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

The majority of customer interruptions were due to tree contact issues. A cycle trim is scheduled to take place in 2018. No further actions are required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 246004
Division: ARCHVIEW
ZIP Codes(s) Served: 63112
Customers Served: 887
Customer Interruptions (CI): 1787
SAIFI Value: 2.01
SAIDI Value: 195.35

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/UG	1770	99.05%	2
OTHER	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

Two feeder outages accounted for over 99% of the customer interruptions on the circuit. Both outages were due to faulted underground cable. In both cases, the faulted cable was repaired, one repair performed on WR 21MT670961. No further corrective actions are planned.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 252001
Division: ARCHVIEW
ZIP Codes(s) Served: 63108, 63112, 63113
Customers Served: 520
Customer Interruptions (CI): 1585
SAIFI Value: 3.05
SAIDI Value: 357.65

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	1034	65.24%	6
EQUIPMENT/UG	539	34.01%	1
PUBLIC	2	<0.01%	2
TREE	10	<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

A span of 1/0 CU primary came down on 11/21/17 and took out the feeder. It was repaired on WR 21MT687499. An underground primary cable fault took out the feeder on 5/4/17. It was repaired on WR 21MT672818. Both of these outages caused 95% of the circuit's CI (1504 out of 1585). A cycle trim was completed on the circuit in 2017 and an overhead visual inspection is scheduled for 2018.

Repair work identified as a result of inspections will be completed in accordance with Ameren Missouri's infrastructure inspection policy.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 254054
Division: GATEWAY
ZIP Codes(s) Served: 63011, 63021
Customers Served: 1150
Customer Interruptions (CI): 2624
SAIFI Value: 2.28
SAIDI Value: 191.79

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1255	47.83%	8
CUSTOMER	12	<0.01%	1
EQUIPMENT/OH	1316	50.15%	9
EQUIPMENT/UG	2	<0.01%	2
PUBLIC	10	<0.01%	2
TREE	19	<0.01%	3
UNKNOWN	10	<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 were two circuit outages in 2017. One circuit outage was due to an overhead equipment malfunction where an overhead conductor came loose from an insulator on a pole. Repairs to the overhead conductor were made under WR 21MT664949. The second circuit outage was due to an animal that made contact with the overhead lines. Fuses were installed on the overhead tap where the outage due to an animal occurred to help isolate this section of the backbone. Division engineering will perform a circuit patrol in early 2018 and review the device outages due to equipment malfunctions and tree contacts to determine if any additional action is needed.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 255002
Division: ARCHVIEW
ZIP Codes(s) Served: 63107, 63115
Customers Served: 342
Customer Interruptions (CI): 701
SAIFI Value: 2.05
SAIDI Value: 324.89

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	459	65.48%	7
PUBLIC	1	<0.01%	1
TREE	241	34.38%	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

Based on fact findings all OH malfunctions and tree issues have been addressed. No further actions are needed.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 258052
Division: GATEWAY
ZIP Codes(s) Served: 63026, 63088, 63122
Customers Served: 583
Customer Interruptions (CI): 1094
SAIFI Value: **Y2015** - 3.71; **Y2016** - 0.45; **Y2017** - 1.88
SAIDI Value: 148.47

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	0	0	0.00%	0
CUSTOMER	0	0	2	<0.01%	1
EQUIPMENT/OH	29	56	780	71.30%	5
EQUIPMENT/UG	1	0	0	0.00%	0
OTHER	27	2	0	0.00%	0
PREARRANGED	41	0	0	0.00%	0
PUBLIC	577	188	305	27.88%	2
TREE	1460	13	7	<0.01%	4
UNKNOWN	2	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

A 'smart' switch was installed in 2017 under WR 21MT665634 to better sectionalize the circuit. Maintenance cycle tree trimming was completed in 2016.

Corrective Actions Planned

An overhead and underground visual inspection is scheduled to be completed in 2018. The repair work identified as a result of the circuit inspections will be completed in accordance with Ameren Missouri's infrastructure inspection policy by the end of 2019. A mid cycle patrol will be completed in 2018 to identify and perform any necessary hot spot tree trimming in 2018. In addition, division engineering will perform a circuit patrol in early 2018 and review the device outages due to equipment malfunctions and tree contacts to determine if any additional action is needed.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 259058
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63034
Customers Served: 2261
Customer Interruptions (CI): 6832
SAIFI Value: **Y2015** - 0.12; **Y2016** - 3.87; **Y2017** - 3.02
SAIDI Value: 227.00

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	115	230	266	3.89%	4
EQUIPMENT/OH	71	1	3623	53.03%	10
EQUIPMENT/UG	41	208	2667	39.04%	8
OTHER	23	3	0	0.00%	0
PREARRANGED	7	0	0	0.00%	0
PUBLIC	0	5419	1	<0.01%	1
TREE	2	3982	265	3.88%	8
UNKNOWN	1	8	10	<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

Animal guards, transformer fuses, line fuses and several single-phase taps were installed on WR 21MT670270. Circuit coordination was checked as well.

Corrective Actions Planned

Fuses 9990 and 1712 were replaced with 'trip savers' on 21MT694702 to reduce feeder outages.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 259060
Division: GATEWAY
ZIP Codes(s) Served: 63031, 63042
Customers Served: 1949
Customer Interruptions (CI): 5535
SAIFI Value: 2.84
SAIDI Value: 282.54

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	65	1.17%	6
EMPLOYEES	12	<0.01%	1
EQUIPMENT/OH	4764	86.09%	18
EQUIPMENT/UG	42	<0.01%	2
OTHER	27	<0.01%	3
PUBLIC	1	<0.01%	1
TREE	556	10.05%	8
UNKNOWN	67	1.21%	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

Investigate taps on the 3-phase backbone and look for opportunities to install tap fuses, transformer fuses and animal guards to improve reliability on 21MT691704.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 260053
Division: GATEWAY
ZIP Codes(s) Served: 63034
Customers Served: 394
Customer Interruptions (CI): 1880
SAIFI Value: 4.77
SAIDI Value: 615.99

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	10	<0.01%	2
EQUIPMENT/OH	12	<0.01%	4
EQUIPMENT/UG	8	<0.01%	1
PUBLIC	1821	96.86%	1
TREE	25	1.33%	7
UNKNOWN	4	<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

On May 26, 2017, this circuit experienced a sustained outage due to a public vehicle accident which caused 1 span of B-phase to fall over Hwy 367 in Spanish Lake. Power was restored and the B-phase was re-strung on 21MT675122. There are no other recommendations for this circuit at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 266054
Division: GATEWAY
ZIP Codes(s) Served: 63043, 63044, 63045
Customers Served: 67
Customer Interruptions (CI): 175
SAIFI Value: 2.61
SAIDI Value: 573.70

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/UG	163	93.14%	4
UNKNOWN	12	6.86%	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

This circuit serves 68 customers. A majority of outages were caused by underground malfunctions. After the engineering review on OAS 172074581, the largest outage was coded as the Earth City 54 feeder but was actually an outage on the Riverport 51 feeder. This outage did not occur on the Earth City 54 Feeder. The second largest outage was a feeder outage due to a cable fault in a vault west of switch pad 23209. This repair was completed under SAWS 86524. No further corrective actions are needed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 267052
Division: GATEWAY
ZIP Codes(s) Served: 63017, 63146
Customers Served: 1715
Customer Interruptions (CI): 3641
SAIFI Value: 2.12
SAIDI Value: 413.01

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	108	2.97%	7
EMPLOYEES	25	<0.01%	1
EQUIPMENT/OH	134	3.68%	5
EQUIPMENT/UG	11	<0.01%	4
OTHER	9	<0.01%	2
PUBLIC	2167	59.52%	6
TREE	1093	30.02%	20
UNKNOWN	94	2.58%	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

This circuit serves 1,717 customers. A majority of the outages were caused by tree contact. Other larger outage sources included personal equipment. The largest tree related outage occurred on May 1st in the property rear of 14414 Pembury Ct. where a tree had contacted primary that needed to be removed by Forestry. No repairs on the system were needed for this outage. Other tree related outages occurred on January 14th where two spans of primary came down behind recloser R0606. This primary could not be accessed and was ultimately decided to feed customers from a different direction until a solution was found. After an engineering review, a project was put in place to underground a portion of this circuit along Ladue Rd. to bypass the areas that are heavily wooded and non-truck accessible. The project will be completed in June/July 2018. A majority of this year's outages occurred downstream of recloser R6929. After multiple engineering reviews, an old "Power On" project will be submitted to underground the entire Westbury subdivision over three year period starting in 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 280052
Division: ARCHVIEW
ZIP Codes(s) Served: 63017, 63129
Customers Served: 1507
Customer Interruptions (CI): 3187
SAIFI Value: 2.11
SAIDI Value: 485.85

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	107	3.36%	4
EQUIPMENT/OH	1515	47.54%	2
EQUIPMENT/UG	48	1.51%	4
OTHER	8	<0.01%	1
PUBLIC	1508	47.32%	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

Two incidents account for 95% of the customer interruptions in 2017. The first was due to a primary switch burning up, which was replaced on OAS 172072650. The second was due to a public vehicle breaking a pole. The pole was replaced on WR 21MT681170. A mid-cycle trim will be performed in 2018. An overhead visual inspection is planned for 2018. Repair work identified as a result of the 2017 Underground detailed inspection will be completed in accordance with Ameren Missouri's infrastructure inspection policy.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 280056
Division: ARCHVIEW
ZIP Codes(s) Served: 63129
Customers Served: 1649
Customer Interruptions (CI): 3023
SAIFI Value: 1.83
SAIDI Value: 157.76

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	108	3.57%	2
EQUIPMENT/UG	189	6.25%	8
PUBLIC	1076	35.59%	3
TREE	1650	54.58%	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 account for 92% of the customer interruptions in 2017. One was due to a public vehicle hitting a pole, which was replaced on OAS 170624712. A second issue was from a tree clearance issue in high winds. The tree was trimmed on OAS 172800417. The third issue was an underground primary cable failure on a subdivision loop. This cable is being replaced in 2018 on WR 21MT678115. A mid-cycle trim will be performed in 2018 as well as a ground line inspection and an underground visual inspection. Repair work identified as a result the inspections will be completed in accordance with Ameren Missouri's infrastructure inspection policy.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 285055
Division: UNDERGROUND
ZIP Codes(s) Served: 63101, 63102, 63103
Customers Served: 79
Customer Interruptions (CI): 154
SAIFI Value: 1.95
SAIDI Value: 171.77

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	75	48.70%	1
EQUIPMENT/UG	79	51.30%	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 285-55 feeder cable is included in part of the downtown St. Louis revitalization efforts. Currently new conduit is in design to allow for future cable replacement projects on 285-55. The conduit project being designed on WR 21MT674015 has an expected completion date of August 2019. After the conduit project is completed a cable replacement job will be designed and installed in 2020. Additionally there is a project in design which is scheduled for construction completion in December of 2018 which will sectionalize 285-55 into 2 separate feeders. This project is being designed on WR 21MT682684.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 287052
Division: UNDERGROUND
ZIP Codes(s) Served: 63101, 63102
Customers Served: 31
Customer Interruptions (CI): 62
SAIFI Value: 2.00
SAIDI Value: 196.94

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/UG	62	100.0%	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 287-52 circuit will be completely rebuilt, replacing all of the PILC cable on the circuits with EPR cable, upgrading the feeder backbone to largest size 15kV cable, and relocating the 287-52 cables out of congested manholes to recently constructed current standard conduit systems. This rebuild project will be completed under work order JOCCD and the following work requests: cable 21MT673749 and conduits 21MT673750 and 21MT681615. This rebuild project will start in the 3Q2018 and is planned to be completed by the end of 2018; however, the project completion could extend into the 1Q2019.



APPENDIX B

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): 121
SAIFI Value: Y2015 - ; Y2016 - 9.46; Y2017 - 9.31
SAIDI Value: 542.92

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/UG	0	123	121	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 Taken

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

Corrective Actions Planned

The 294-56 circuit will be rebuilt, replacing all of the PILC cable on the circuit with EPR cable. This rebuild project will be designed in 3Q 2019 and would take place once current conduit design projects are complete (expected to complete 2020). The circuit should have all PILC cable removed by 2022.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 295052
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63005, 63011, 63038
Customers Served: 868
Customer Interruptions (CI): 1681
SAIFI Value: Y2015 - 1.66; Y2016 - 2.85; Y2017 - 1.94
SAIDI Value: 261.82

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	52	0	29	1.73%	3
EMPLOYEES	40	0	0	0.00%	0
EQUIPMENT/OH	143	862	869	51.70%	3
EQUIPMENT/UG	10	43	1	<0.01%	1
LIGHTNING	0	1	276	16.42%	3
OTHER	0	3	1	<0.01%	1
PREARRANGED	4	0	0	0.00%	0
PUBLIC	30	1520	214	12.73%	5
TREE	1159	62	289	17.19%	8
UNKNOWN	1	4	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 Taken

(2016) Eatherton 295052 had two feeder outages in 2016. One was due to a car hitting a pole late at night. Clearances are standard and the pole is not considered at risk for vehicles. (2017) Sectionalizing switches, with faulted circuit indicators, and trip-saver reclosers were added in late 2017 on WR 668595. The sectionalizing switches were installed at a drivable access point location in between significant private property sections of the circuit.

Corrective Actions Planned

We will add additional faulted circuit indicators at the northern portion of the circuit, switch D14495 on Orville Rd, where the circuit has road access. WR 21MT694401. A mid-cycle tree trim is planned for 2018.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 295056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63005, 63017, 63038
Customers Served: 583
Customer Interruptions (CI): 1330
SAIFI Value: **Y2015** - 2.12; **Y2016** - 1.49; **Y2017** - 2.28
SAIDI Value: 284.63

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	11	1	18	1.35%	6
EQUIPMENT/OH	219	87	433	32.56%	7
EQUIPMENT/UG	20	9	16	1.20%	4
LIGHTNING	0	0	11	<0.01%	2
PREARRANGED	34	0	0	0.00%	0
PUBLIC	461	464	0	0.00%	0
TREE	490	279	820	61.65%	8
UNKNOWN	0	24	32	2.41%	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

(2015) Unfused taps and CSP transformer on the feeder backbone were fused. WR 21MT644454 completed in 2016. (2015) Cycle tree trimming is planned for 2016 per Vegetation Management.

Corrective Actions Planned

Most outages occurred past a recloser on Rieger Rd near Babler Park Drive. A recloser, several sectionalizing switches and faulted circuit indicators will be added to aid with outage analysis and restoration. Work will be done on WR 21MT694408.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 393051
Division: GATEWAY
ZIP Codes(s) Served: 63121, 63134, 63140
Customers Served: 59
Customer Interruptions (CI): 122
SAIFI Value: 2.07
SAIDI Value: 255.42

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	1	<0.01%	1
EQUIPMENT/UG	63	51.64%	4
PUBLIC	58	47.54%	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 circuit serves 59 customers. The largest outage occurred in August 2017 from a cable fault in switchgear 28350 between switches D14735 and D14557. This cable was repaired under DOJM 21MT680060. Other outages were caused by public vehicles striking underground equipment. This equipment was replaced under DOJM 21MT683537. No further corrective actions are needed at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 393055
Division: GATEWAY
ZIP Codes(s) Served: 63121, 63134
Customers Served: 678
Customer Interruptions (CI): 1623
SAIFI Value: **Y2015** - 1.95; **Y2016** - 2.23; **Y2017** - 2.39
SAIDI Value: 364.13

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	0	66	4.07%	1
CUSTOMER	0	7	0	0.00%	0
EMPLOYEES	7	6	0	0.00%	0
EQUIPMENT/OH	796	648	719	44.30%	2
EQUIPMENT/UG	99	0	0	0.00%	0
OTHER	5	0	0	0.00%	0
PREARRANGED	7	0	0	0.00%	0
PUBLIC	1	689	34	2.09%	1
TREE	425	62	803	49.48%	7
UNKNOWN	21	124	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 Taken

This circuit underwent maintenance cycle tree trimming in 2016. An overhead visual inspection was completed in 2016 under PL201612053 (WRs 21MT660627, 660630, 662077, 662078, 662079, 662080, 662081, 662082 and 668292). The circuit was reviewed and patrolled.

Corrective Actions Planned

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



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 451054
Division: SEMO
ZIP Codes(s) Served: 63622, 63623, 63625, 63650,,
Customers Served: 363
Customer Interruptions (CI): 685
SAIFI Value: **Y2015** - 2.95; **Y2016** - 0.67; **Y2017** - 1.89
SAIDI Value: 564.06

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	13	2	2	<0.01%	2
CUSTOMER	1	2	1	<0.01%	1
EQUIPMENT/OH	567	73	373	54.45%	21
LIGHTNING	39	2	1	<0.01%	1
OTHER	2	1	4	<0.01%	1
PREARRANGED	291	0	0	0.00%	0
TREE	36	144	302	44.09%	18
UNKNOWN	1	15	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 Taken

(2015) An engineering review of the circuit will be completed in 2016. A reliability project will be completed to address reliability and maintenance issues identified and install additional animal guards and switches as needed. This work was completed under WR 28IR041016. Mid-cycle circuit patrol for tree issues was completed in 2017.

Corrective Actions Planned

Tree Trimming Mid-Cycle trim and an Overhead Visual Inspection were completed in 2017. An Underground Detailed Inspection is scheduled to be completed in 2018. Planned actions at this time include the installation of additional reclosers to help reduce outages for tree issues, install additional fuses and switches to minimize the number of customers impacted by an outage, and the installation of additional animal guards wherever deemed necessary. Planned work will be completed by the end of 2018 under WR 28IR042867.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 455053
Division: SEMO
ZIP Codes(s) Served: 63830
Customers Served: 806
Customer Interruptions (CI): 2676
SAIFI Value: 3.32
SAIDI Value: 391.95

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	52	1.94%	4
EQUIPMENT/OH	886	33.11%	7
EQUIPMENT/UG	2	<0.01%	2
LIGHTNING	840	31.39%	2
PUBLIC	805	30.08%	1
TREE	75	2.80%	4
UNKNOWN	16	<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

Additional reclosers will be installed on this circuit to isolate outages on WR 2TSE120485 in 2018.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 456055
Division: SEMO
ZIP Codes(s) Served: 63827, 63840, 63851, 63857
Customers Served: 90
Customer Interruptions (CI): 232
SAIFI Value: **Y2015** - 6.97; **Y2016** - 0.22; **Y2017** - 2.58
SAIDI Value: 203.71

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	0	2	<0.01%	2
EQUIPMENT/OH	606	3	104	44.83%	4
EQUIPMENT/UG	0	0	1	<0.01%	1
LIGHTNING	1	16	0	0.00%	0
OTHER	32	0	95	40.95%	2
PUBLIC	0	1	29	12.50%	1
TREE	1	0	0	0.00%	0
UNKNOWN	0	0	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 Taken

(2015) A Mid Cycle Patrol is planned for 2016.

Corrective Actions Planned

This circuit was exposed to an Entergy 161kV transmission line laying on top of the circuit due to strong storm damage in 2017. No additional work is planned for 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 456057
Division: SEMO
ZIP Codes(s) Served: 63827, 63851, 63857
Customers Served: 128
Customer Interruptions (CI): 736
SAIFI Value: 5.75
SAIDI Value: 719.30

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	2	<0.01%	2
EQUIPMENT/OH	428	58.15%	15
LIGHTNING	56	7.61%	2
OTHER	125	16.98%	1
TREE	125	16.98%	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 reclosers will be installed on this circuit to isolate outages on WR 2TSE120483 in 2018.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 457055
Division: SEMO
ZIP Codes(s) Served: 63837, 63847, 63852, 63862,
Customers Served: 446
Customer Interruptions (CI): 1963
SAIFI Value: **Y2015** - 2.44; **Y2016** - 3.65; **Y2017** - 4.40
SAIDI Value: 511.18

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	8	6	463	23.59%	3
CUSTOMER	1	1	2	<0.01%	2
EMPLOYEES	0	1	0	0.00%	0
EQUIPMENT/OH	71	194	122	6.21%	5
EQUIPMENT/UG	34	0	0	0.00%	0
LIGHTNING	441	486	893	45.49%	2
OTHER	3	21	20	1.02%	4
PREARRANGED	29	0	0	0.00%	0
PUBLIC	11	0	0	0.00%	0
TREE	16	452	463	23.59%	3
UNKNOWN	446	484	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 two incidents where lightning took out the Gibson substation and two other incidents where lightning took the 34kV line out in 2016. There is no planned work on this circuit in 2017.

Corrective Actions Planned

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.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 464054
Division: SEMO
ZIP Codes(s) Served: 63838, 63862, 63866, 63869,,
Customers Served: 887
Customer Interruptions (CI): 2885
SAIFI Value: **Y2015** - 0.56; **Y2016** - 2.50; **Y2017** - 3.25
SAIDI Value: 230.06

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	4	9	18	<0.01%	3
CUSTOMER	1	101	0	0.00%	0
EQUIPMENT/OH	113	1963	12	<0.01%	4
LIGHTNING	46	126	1813	62.84%	6
OTHER	28	5	4	<0.01%	4
PREARRANGED	265	0	0	0.00%	0
PUBLIC	34	12	0	0.00%	0
TREE	6	49	924	32.03%	5
UNKNOWN	21	1	114	3.95%	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) The district replaced a faulty set of three reclosers that caused the major outage on WR 2TSE113258 in 2016. No other work is planned for 2017.

Corrective Actions Planned

Additional reclosers will be installed on this circuit to isolate outages on WR 2TSE120486 in 2018.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 465051
Division: SEMO
ZIP Codes(s) Served: 63877
Customers Served: 497
Customer Interruptions (CI): 1023
SAIFI Value: Y2015 - 2.10; Y2016 - 4.52; Y2017 - 2.06
SAIDI Value: 331.41

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	37	6	2	<0.01%	2
EQUIPMENT/OH	566	1574	1001	97.85%	4
LIGHTNING	12	0	6	<0.01%	1
PREARRANGED	2	0	0	0.00%	0
PUBLIC	10	177	0	0.00%	0
TREE	464	520	14	1.37%	2
UNKNOWN	2	6	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) An additional recloser were installed on this circuit to isolate outages on WR 2TSE116992 in 2017.

Corrective Actions Planned

Additional reclosers will be installed on this circuit to isolate outages on WR 2TSE120487 in 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 475051
Division: SEMO
ZIP Codes(s) Served: 63622, 63623, 63625, 63630,,
Customers Served: 541
Customer Interruptions (CI): 1185
SAIFI Value: 2.19
SAIDI Value: 284.04

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	5	<0.01%	3
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	795	67.09%	25
LIGHTNING	4	<0.01%	4
OTHER	97	8.19%	1
TREE	274	23.12%	11
UNKNOWN	9	<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

Tree Trimming Full Cycle Trim is scheduled to be completed in 2018. An Underground Visual Inspection was completed in 2017. Repair work identified as a result of the inspection will be completed in accordance with Ameren Missouri's infrastructure inspection policy. Other planned actions include the installation of additional reclosers to reduce the number of tree related outages, and the installation of additional fusing and switches on this circuit to better isolate outages and reduce the number of customers impacted during an outage. This work will be completed by the end of 2018 under WR 28IR042866.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 484053
Division: SEMO
ZIP Codes(s) Served: 63664
Customers Served: 604
Customer Interruptions (CI): 1153
SAIFI Value: 1.91
SAIDI Value: 195.71

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	5	<0.01%	5
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	44	3.82%	4
EQUIPMENT/UG	1	<0.01%	1
PUBLIC	1045	90.63%	6
TREE	56	4.86%	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

Work Order# J0FZQ is currently underway reconductoring 2.3 miles of the feeder from Highway 8 out of Potosi along Highway P to address reliability issues. This project is currently scheduled to be completed by the end of April 2018. Over 90% of the outages on this circuit were a result of uncontrollable public incidents. A cycle trim is scheduled to be completed in 2018. Other repair actions include establishing a new single-phase tie along Delbridge Rd with the 019-51 feeder to allow switching to reduce customers out during outage situations on either feeder, the installation of some fuses to isolate taps during outages and to minimize the number of customers impacted, and the installation of some new sectionalizing switches to help limit customer out during outages and/or storm restoration. The planned additional work will be completed by the end of 2018 under WR 28IR042865.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 503056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63084, 63089, 63090
Customers Served: 628
Customer Interruptions (CI): 1328
SAIFI Value: 2.11
SAIDI Value: 198.70

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	45	3.39%	4
EQUIPMENT/OH	630	47.44%	3
EQUIPMENT/UG	5	<0.01%	3
OTHER	1	<0.01%	1
PUBLIC	1	<0.01%	1
TREE	640	48.19%	8
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

A circuit outage on 10/07/2017 accounted for 47% of the customer interruptions. The circuit outage was the result of phases slapping together during a high wind event. This issue was corrected under OAS#172800492. No further work required for this outage. Tree issues resulted in an additional 48% of the outages. Cycle tree trimming was completed in April 2017. Over half of the tree related outages occurred after cycle tree trimming was completed and occurred downstream of Recloser #65. Vegetation Management is planning an additional patrol of the circuit downstream of Recloser #65. No further reliability work is scheduled for this feeder.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 504052
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63039, 63055, 63069
Customers Served: 847
Customer Interruptions (CI): 1970
SAIFI Value: 2.33
SAIDI Value: 148.20

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	11	<0.01%	7
EQUIPMENT/OH	985	50.00%	13
EQUIPMENT/UG	1	<0.01%	1
LIGHTNING	3	<0.01%	3
OTHER	1	<0.01%	1
OVERLOAD	3	<0.01%	1
PUBLIC	6	<0.01%	1
TREE	959	48.68%	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

Two circuit outages accounted for 86% of the 2017 customer interruptions. The first circuit outage occurred on 01/19/2017 as a result of a tree falling on the primary and breaking a crossarm which was repaired under WR 23FR060796. The second circuit outage occurred on 08/16/2017 and was the result of a failed insulator which was replaced under OAS 172286472. Four additional significant events occurred throughout the year and were the result of a broken pole, down primary and tree contacts. These additional events accounted for an additional 12% of the customer interruptions in 2017. All the events except the down primary occurred during inclement weather events (rain, ice or high winds). Tree contact and falling trees/branches accounted for a total of six events during 2017 and resulted in 49% of the total customer interruptions. Mid-Cycle tree trimming was completed in 2107. No other reliability work is scheduled for this feeder. .



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 550051
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63028
Customers Served: 1972
Customer Interruptions (CI): 5306
SAIFI Value: 2.69
SAIDI Value: 235.78

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	2112	39.80%	12
EQUIPMENT/UG	9	<0.01%	1
PUBLIC	1100	20.73%	7
TREE	2009	37.86%	5
UNKNOWN	76	1.43%	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

The 550-51 feeder serves a very large area of the City of Festus. Three separate incidents were responsible for most of the customer interruptions in 2017. On July 26, 2017 a tree limb broke and made contact with the overhead primary. On September 14, 2017 a car went off the roadway and broke a pole causing damage also to adjacent poles, resulting in a set of backbone reclosers to open. On September 23, 2017 a burning switch, J7340, needed to be replaced. The service crew required that the feeder be de-energized to safely make the repairs. The feeder is scheduled for cycle tree trimming in 2018 which should have a positive effect on the reliability. There are no current projects planned to improve the reliability of this circuit.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 550052
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63028
Customers Served: 1510
Customer Interruptions (CI): 6745
SAIFI Value: 4.47
SAIDI Value: 373.21

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	108	1.65%	5
EQUIPMENT/OH	2763	42.16%	23
LIGHTNING	1	<0.01%	1
PUBLIC	1515	23.12%	1
TREE	2133	32.55%	18
UNKNOWN	33	<0.01%	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

This feeder serves the original core area of the City of Festus. Over 50% of the outages were caused by public vehicle incidents and tree related outages. The tree issues should be greatly reduced by the 2017 cycle trim that was performed on the feeder. The public vehicle incident caused a total feeder outage accounting for 23% of the customer interruptions. No additional reliability improvements are proposed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 550056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63019, 63028, 63048
Customers Served: 1444
Customer Interruptions (CI): 2807
SAIFI Value: 1.94
SAIDI Value: 351.67

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	40	1.75%	3
EMPLOYEES	21	<0.01%	6
EQUIPMENT/OH	1502	65.68%	5
TREE	722	31.57%	6
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

The main contributor to the customer interruptions total for 550-56 feeder was a feeder outage on September 16, 2017. Cause of the outage was a splice failed on the A-phase primary line. Another significant outage occurred during a storm on July 27, 2017 when a tree contact caused the overhead primary to fail resulting in a recloser opening on the circuit. The circuit was cycle trimming in 2017. No specific corrective action is planned at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 553056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63016, 63051
Customers Served: 691
Customer Interruptions (CI): 1521
SAIFI Value: 2.20
SAIDI Value: 172.69

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	3	<0.01%	3
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	92	6.05%	7
EQUIPMENT/UG	1	<0.01%	1
LIGHTNING	1	<0.01%	1
PUBLIC	8	<0.01%	1
TREE	1402	92.18%	8
UNKNOWN	13	<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

On the 553-56 feeder, 92% of the customer of the customer interruptions in 2017 were tree related outages. A tree related feeder outage occurred on January 15, 2017, and a tree related device outage occurred on May 17, 2017. This feeder is scheduled for cycle trimming in 2018. No other reliability improvements are scheduled at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 553057
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63016, 63050, 63066
Customers Served: 584
Customer Interruptions (CI): 1695
SAIFI Value: 2.90
SAIDI Value: 465.32

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	3	<0.01%	3
EQUIPMENT/OH	205	12.18%	2
LIGHTNING	1	<0.01%	1
PUBLIC	653	38.80%	3
TREE	235	13.96%	6
UNKNOWN	586	34.82%	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

The majority of customer interruptions on 553-57 feeder in 2017 were caused by two separate feeder outages. The first was on May 1, 2017 when trees came down along Highway BB, which was flooded at the time. This feeder outage was erroneously given an unknown outage cause. The other feeder outage occurred on November 20, 2017 which was caused by a public vehicle accident. The feeder is scheduled for cycle tree trimming in 2018. There are no specific reliability improvements scheduled for this feeder.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 560051
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63026, 63049
Customers Served: 987
Customer Interruptions (CI): 1970
SAIFI Value: 2.00
SAIDI Value: 180.93

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	24	1.22%	2
EQUIPMENT/OH	963	48.88%	3
EQUIPMENT/UG	17	<0.01%	2
TREE	965	48.98%	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

Two feeder outages were responsible for most of the customer interruptions on Brennen feeder 560-51. On May 21, 2017 during a storm an unfused single phase transformer located on the feeder backbone failed, resulting in the feeder breaker opening up. On June 10, 2017 a tree contact caused the overhead conductors to short resulting in the feeder breaker opening up. The feeder was cycle trimmed in 2017. No reliability improvement is scheduled for this feeder.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 560053
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63026, 63049
Customers Served: 1354
Customer Interruptions (CI): 2797
SAIFI Value: **Y2015** - 2.76; **Y2016** - 1.22; **Y2017** - 2.07
SAIDI Value: 245.82

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	29	19	55	1.97%	9
CUSTOMER	2	0	0	0.00%	0
EMPLOYEES	0	7	0	0.00%	0
EQUIPMENT/OH	330	1422	885	31.64%	9
EQUIPMENT/UG	1	0	0	0.00%	0
LIGHTNING	0	23	0	0.00%	0
PREARRANGED	283	0	0	0.00%	0
PUBLIC	1488	46	0	0.00%	0
TREE	1660	196	1857	66.39%	4
UNKNOWN	106	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

(2015) Three feeder outages on this circuit accounted for 73% of the 2015 customer interruptions. One feeder outage on September 17, 2015 was the result of a car accident. The other two feeder outages occurred on August 23, 2015 and were the result of a very large tree falling onto the backbone. Two outages occurred at this time to allow the crew to safely repair the circuit while attempting to restore as many customers as possible. On November 15, 2016 a new set of 600 amp solid blade switches were added to the backbone of the 560-53 feeder on WR 26JF134901 to improve tie capacity options in case of a circuit failure. The trees that caused the outage are located along a hillside, parallel to the circuit. Substantial trimming of these private property trees are not possible since they provide a barrier between homes and Highway 30.

Corrective Actions Planned

There were three feeder outages in 2017 accounting for most of the customer interruptions. One was caused by a vehicle accident and two were tree related. The feeder was cycle trimmed in 2017. WR 26JF139581 budgeted for 2018 to install a large three-phase voltage regulator bank to stabilize the voltage to the customers at the end of the feeder.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 563053
Division: SEMO
ZIP Codes(s) Served: 63628
Customers Served: 1640
Customer Interruptions (CI): 3385
SAIFI Value: 2.06
SAIDI Value: 232.74

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	76	2.25%	4
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	1585	46.82%	9
LIGHTNING	1	<0.01%	1
OTHER	1	<0.01%	1
OVERLOAD	15	<0.01%	1
TREE	1706	50.40%	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

An Overhead Visual Inspection and Mid-Cycle Tree Trimming are scheduled to be completed in 2018. Other planned actions for this feeder include the installation of a number of fuses on three phase taps, single phase taps, and transformers to help minimize the number of customers impacted per outage. Several reclosers will be installed throughout the feeder to help reduce outages caused by tree issues. Some sectionalizing switches will also be installed in a couple of locations to be able to better isolate and reduce the number of customers impacted by outages along with being able to restore customers quicker while repairs are being made. Planned work will be completed by the end of 2018 under WR 28SF042435.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 569057
Division: CENTRAL MO
ZIP Codes(s) Served: 65017, 65037, 65047, 65049,,
Customers Served: 620
Customer Interruptions (CI): 1442
SAIFI Value: 2.33
SAIDI Value: 352.41

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	<0.01%	1
EQUIPMENT/OH	796	55.20%	3
EQUIPMENT/UG	623	43.20%	1
TREE	14	<0.01%	1
UNKNOWN	8	<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 two feeder outages were caused by a bad termination on the underground exit feeder cable and has been replaced. No other work required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 587055
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63010, 63026, 63052
Customers Served: 2115
Customer Interruptions (CI): 4391
SAIFI Value: 2.08
SAIDI Value: 94.93

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	20	<0.01%	2
CUSTOMER	2	<0.01%	2
EQUIPMENT/OH	2176	49.56%	8
EQUIPMENT/UG	72	1.64%	5
LIGHTNING	1	<0.01%	1
OTHER	2	<0.01%	2
TREE	1	<0.01%	1
UNKNOWN	2117	48.21%	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 majority of the customer interruptions on the 587-55 feeder can be attributed to two separate feeder outages. The first occurred on June 14, 2017 when a disconnect switch on the feeder backbone failed resulting in 2,114 customer interruptions. The second feeder outage occurred on July 24, 2017. Although it was raining at the time, no cause was found and the feeder was successfully placed back into service, resulting in 2,117 customer interruptions. This circuit was cycle trimmed in 2017. No additional specific reliability improvements are planned at this time.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 607054
Division: SEMO
ZIP Codes(s) Served: 63736
Customers Served: 289
Customer Interruptions (CI): 691
SAIFI Value: Y2015 - 0.12; Y2016 - 2.77; Y2017 - 2.39
SAIDI Value: 455.89

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	6	0	1	<0.01%	1
EQUIPMENT/OH	23	754	294	42.55%	2
EQUIPMENT/UG	0	1	1	<0.01%	1
LIGHTNING	0	0	104	15.05%	1
PREARRANGED	3	0	0	0.00%	0
PUBLIC	3	0	291	42.11%	1
TREE	0	50	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) Additional phase balancing was completed on this circuit on WR 2TSE116983 in 2017.

Corrective Actions Planned

Additional reclosers will be installed on this circuit to isolate outages on WR 2TSE120499 in 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 613001
Division: CENTRAL MO
ZIP Codes(s) Served: 65081
Customers Served: 369
Customer Interruptions (CI): 743
SAIFI Value: 2.01
SAIDI Value: 240.81

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	742	99.87%	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 feeder outages occurred on the same date. One was caused by guy and anchor problems. The other was caused by a 34 kV pole fire due to a 34 kV electronic recloser failure. Guy wire repaired and recloser replaced. No need for any additional work.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 620052
Division: SEMO
ZIP Codes(s) Served: 63833, 63862, 63870
Customers Served: 200
Customer Interruptions (CI): 435
SAIFI Value: 2.17
SAIDI Value: 241.82

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	<0.01%	1
CUSTOMER	3	<0.01%	3
EQUIPMENT/OH	320	73.56%	8
LIGHTNING	2	<0.01%	1
TREE	109	25.06%	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 reclosers will be installed on this circuit to isolate outages on WR 2TSE120477 in 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 630052
Division: NORTHEAST MO
ZIP Codes(s) Served: 63343
Customers Served: 140
Customer Interruptions (CI): 570
SAIFI Value: 4.07
SAIDI Value: 283.17

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	2	<0.01%	2
EQUIPMENT/OH	9	1.58%	5
LIGHTNING	1	<0.01%	1
TREE	556	97.54%	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

WRs 2WWZ183793 and 2WWZ183768 were created to add fused switches to 7 single-phase transformers and to one single-phase tap off this three-phase circuit. Circuit is being tree trimmed on its cycle tree trim this year.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 656055
Division: SEMO
ZIP Codes(s) Served: 63841
Customers Served: 1039
Customer Interruptions (CI): 2398
SAIFI Value: **Y2015** - 2.08; **Y2016** - 0.23; **Y2017** - 2.31
SAIDI Value: 133.87

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	37	31	84	3.50%	9
CUSTOMER	2	1	1	<0.01%	1
EQUIPMENT/OH	1393	69	32	1.34%	6
EQUIPMENT/UG	57	112	144	6.01%	6
LIGHTNING	55	24	10	<0.01%	1
OTHER	0	0	1	<0.01%	1
PREARRANGED	10	0	0	0.00%	0
PUBLIC	539	1	1042	43.47%	3
TREE	9	2	1083	45.18%	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

(2015) Improved coordination for sections of this circuit will be accomplished by installing additional reclosers to mitigate outages. This work was performed under WR 2TSE113856 in 2016.

Corrective Actions Planned

Additional smart switches will be installed to isolate outages on WRs 2TSE120473, 2TSE120474, 2TSE120475, and 2TSE120476 in 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 658051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63350, 63351
Customers Served: 40
Customer Interruptions (CI): 205
SAIFI Value: 5.13
SAIDI Value: 478.88

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	<0.01%	1
EQUIPMENT/OH	9	4.39%	2
LIGHTNING	2	<0.01%	2
TREE	192	93.66%	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

WRs 2WWZ183881 and 2WWZ183882 have been created to add fused switches on two unfused transformers and two unfused single-phase taps off the backbone feeder. In addition, tree trim request has created to trim several trees on one section of the backbone circuit along W Booneslick Rd.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 672053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63334, 63353
Customers Served: 292
Customer Interruptions (CI): 1004
SAIFI Value: 3.44
SAIDI Value: 207.45

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	684	68.13%	23
EQUIPMENT/UG	15	1.49%	2
LIGHTNING	290	28.88%	2
PUBLIC	6	<0.01%	1
TREE	9	<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

WRs 2WWZ179995 and 2WWZ184275 have been created to add fused switches on nine single-phase transformers on the three-phase circuit. In addition, this circuit is planned to be tree trimmed during the mid-cycle trim this year.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 675052
Division: NORTHEAST MO
ZIP Codes(s) Served: 63304, 63366, 63369
Customers Served: 494
Customer Interruptions (CI): 1573
SAIFI Value: 3.18
SAIDI Value: 486.08

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	12	<0.01%	7
EQUIPMENT/OH	629	39.99%	23
LIGHTNING	107	6.80%	9
TREE	311	19.77%	11
UNKNOWN	514	32.68%	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 2WWZ183769 has been created to add fuse switch to two single-phase taps and one single-phase transformer and add a set of three lightning arrestors at five locations. The circuit will have a cycle tree trim completed this year. In addition, an overhead visual inspection is scheduled for 2019.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 678005
Division: SEMO
ZIP Codes(s) Served: 63845
Customers Served: 379
Customer Interruptions (CI): 759
SAIFI Value: 2.00
SAIDI Value: 69.08

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	11	1.45%	4
EQUIPMENT/UG	2	<0.01%	2
OTHER	1	<0.01%	1
OVERLOAD	743	97.89%	2
TREE	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

The district identified and made corrective overhead repairs on WR 2TSE119410 in 2017. No other work is planned for 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 685057
Division: SEMO
ZIP Codes(s) Served: 63801, 63828, 63867
Customers Served: 132
Customer Interruptions (CI): 252
SAIFI Value: 1.91
SAIDI Value: 272.67

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	182	72.22%	9
LIGHTNING	1	<0.01%	1
PUBLIC	1	<0.01%	1
TREE	65	25.79%	5
UNKNOWN	3	1.19%	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

Additional reclosers will be installed on this circuit to isolate outages and phase balancing will be performed on WR 2TSE120478 in 2018.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 690057
Division: SEMO
ZIP Codes(s) Served: 63841, 63846, 63873
Customers Served: 616
Customer Interruptions (CI): 1441
SAIFI Value: **Y2015** - 2.74; **Y2016** - 0.26; **Y2017** - 2.34
SAIDI Value: 194.58

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	11	33	43	2.98%	7
CUSTOMER	0	2	1	<0.01%	1
EQUIPMENT/OH	1189	40	1324	91.88%	17
EQUIPMENT/UG	4	6	0	0.00%	0
LIGHTNING	7	7	4	<0.01%	4
OTHER	416	1	0	0.00%	0
OVERLOAD	6	0	0	0.00%	0
PREARRANGED	41	0	0	0.00%	0
PUBLIC	1	74	0	0.00%	0
TREE	0	0	69	4.79%	1
UNKNOWN	2	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

(2015) Air spoilers were installed on the 12kV circuit to prevent galloping and additional lightning arresters were installed under WR 2TSE113853 in 2016.

Corrective Actions Planned

Additional smart switches will be installed to isolate circuit outages on WR 2TSE120462, 2TSE120463, 2TSE120464, 2TSE120490 and 2TSE120491 in 2018.



APPENDIX B

Single 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): 3793
SAIFI Value: 3.20
SAIDI Value: 379.32

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	30	<0.01%	11
CUSTOMER	2	<0.01%	2
EQUIPMENT/OH	2483	65.46%	21
LIGHTNING	41	1.08%	7
OTHER	1	<0.01%	1
PUBLIC	1189	31.35%	2
TREE	40	1.05%	6
UNKNOWN	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

WRs 2WWZ178208 and 2WWZ178209 were completed in the fall of 2017 to add two 3-phase 12.5kV automated switches on the circuit. One is located in the 691-51 circuit and the other is located at the tie point between the 691-51 and 674-52. WR 2WWZ183823 has been created 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.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 699051
Division: SEMO
ZIP Codes(s) Served: 63801, 63824
Customers Served: 664
Customer Interruptions (CI): 2249
SAIFI Value: 3.39
SAIDI Value: 224.39

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	35	1.56%	2
CUSTOMER	3	<0.01%	3
EQUIPMENT/OH	724	32.19%	8
EQUIPMENT/UG	131	5.82%	11
LIGHTNING	16	<0.01%	2
OTHER	667	29.66%	3
PUBLIC	6	<0.01%	1
UNKNOWN	667	29.66%	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 district replaced bad underground cable on WRs 2TSE118620 and 2TSE118658 in 2017. No other work is planned for 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 718052
Division: CENTRAL MO
ZIP Codes(s) Served: 64024
Customers Served: 397
Customer Interruptions (CI): 904
SAIFI Value: 2.28
SAIDI Value: 77.12

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	<0.01%	1
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	2	<0.01%	2
EQUIPMENT/UG	14	1.55%	1
OTHER	1	<0.01%	1
TREE	884	97.79%	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

Tree contact is responsible for nearly 98% of customer incidents on this feeder in 2017. Tree trimming cycle last completed in 2014, with next scheduled trim to take place in 2020. Work resulting from 2018 WPC field reviews shall be performed on WR 2HGH052325.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 726054
Division: NORTHEAST MO
ZIP Codes(s) Served: 63366, 63368
Customers Served: 123
Customer Interruptions (CI): 250
SAIFI Value: 2.03
SAIDI Value: 172.54

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/UG	144	94.12%	11
OTHER	9	5.88%	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 patrolled this circuit and there were no apparent reliability or maintenance issues found to address. A significant portion of the 726-54 feeder was switched to a new 724-53 feeder in 2017. With fewer customers and less circuit exposure on the revised 726-54 feeder configuration, greater reliability is expected.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 734053
Division: SEMO
ZIP Codes(s) Served: 63833, 63862
Customers Served: 46
Customer Interruptions (CI): 95
SAIFI Value: 2.07
SAIDI Value: 236.33

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	1	1.05%	1
EQUIPMENT/OH	92	96.84%	2
LIGHTNING	2	2.11%	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 district identified and took corrective measures to replace overhead facilities on WR 2TSE118075 in 2017. No other work is planned for 2018.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 740052
Division: CENTRAL MO
ZIP Codes(s) Served: 64060, 65239, 65270
Customers Served: 1256
Customer Interruptions (CI): 2652
SAIFI Value: 2.11
SAIDI Value: 212.90

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	35	1.32%	5
EQUIPMENT/OH	1356	51.13%	16
LIGHTNING	1250	47.13%	7
OTHER	2	<0.01%	2
TREE	9	<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

Two feeder outages occurred in 2017 on this feeder causing 98% of customer incidents. Both feeder outages were caused during thunderstorms with issues in the overhead primary. One confirmed caused by lightning strike, the other due to broken primary. Previous tree trimming cycle was completed in 2012, with the next scheduled cycle trim to be completed in 2018. Phase balancing and transformer fusing work as a result of a 2018 WPC field review shall be performed on WR 2DLD093661.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 745051
Division: CENTRAL MO
ZIP Codes(s) Served: 65243, 65270, 65278
Customers Served: 560
Customer Interruptions (CI): 1035
SAIFI Value: 1.85
SAIDI Value: 481.33

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	17	1.64%	4
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	716	69.18%	11
PUBLIC	292	28.21%	2
TREE	9	<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 feeder level outage occurred in 2017. A pole was broken during a thunderstorm and replaced causing approximately 38% of customer incidents. Tree trimming was previously completed in 2017 and is next scheduled during 2023. Phase balancing, transforming fusing, closing three phase transformer banks and replacing older aluminum bells with polymer insulators found as on a 2018 WPC field review shall be completed on WR 2DLD093662.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 754002
Division: NORTHEAST MO
ZIP Codes(s) Served: 63452
Customers Served: 288
Customer Interruptions (CI): 584
SAIFI Value: 2.03
SAIDI Value: 217.10

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	581	99.49%	6
OTHER	2	<0.01%	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

Created WR 2HGH052161 to address reliability issues on this circuit. Equipment and hardware issues were identified as a result of a feeder patrol. The work will include fusing unfused CSP transformers on the backbone, fusing unfused taps and animal guarding. At least one of the major outages in 2017 was due to Fuse 2223 failing due to load during summer heat. Mapping corrections were identified during the circuit patrol and phase cuts will balance the loads so that the fuses are sized properly.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 754051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63440, 63452
Customers Served: 75
Customer Interruptions (CI): 152
SAIFI Value: 2.03
SAIDI Value: 191.27

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	151	99.34%	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

Created WR 2HGH052160 to address reliability issues found on this circuit as the result of a feeder patrol in 2018. Other potential improvements will be fusing any unfused CSP transformers on the backbone, fusing unfused taps and animal guarding.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 813051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63501
Customers Served: 583
Customer Interruptions (CI): 1221
SAIFI Value: 2.09
SAIDI Value: 86.54

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	586	47.99%	2
EQUIPMENT/UG	7	<0.01%	1
LIGHTNING	1	<0.01%	1
OTHER	16	1.31%	1
PUBLIC	599	49.06%	3
TREE	12	<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

Created WR 2HGH052290 to address repair equipment and hardware issues as a result of a feeder patrol in 2018. Other potential improvements will be fusing any unfused CSP transformers on the backbone, fusing unfused taps and animal guarding.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 835004
Division: SEMO
ZIP Codes(s) Served: 63740
Customers Served: 121
Customer Interruptions (CI): 243
SAIFI Value: 2.01
SAIDI Value: 130.79

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	241	99.18%	3
TREE	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

The district identified several problem areas on the overhead line and performed corrective measures on WRs 2TSE116740 and 2TSE120146 in 2018. No other work is planned for 2018.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 856052
Division: CENTRAL MO
ZIP Codes(s) Served: 63056, 63068, 63090
Customers Served: 397
Customer Interruptions (CI): 1172
SAIFI Value: **Y2015** - 2.37; **Y2016** - 0.16; **Y2017** - 2.95
SAIDI Value: 328.08

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	3	1	19	1.62%	5
CUSTOMER	0	1	0	0.00%	0
EQUIPMENT/OH	428	6	696	59.39%	8
LIGHTNING	3	13	0	0.00%	0
OTHER	1	3	0	0.00%	0
OVERLOAD	1	0	0	0.00%	0
PREARRANGED	23	0	0	0.00%	0
PUBLIC	53	0	3	<0.01%	1
TREE	403	18	418	35.67%	3
UNKNOWN	6	19	36	3.07%	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

(2015) Wind storm blew tree limbs into line from some distance away from line causing feeder outage. The other feeder outage was taken to safely replace a crossarm that was found split when patrolling the line for the first feeder outage. (2017) Various reliability improvement projects were done to replace CRAPO-style conductor on this circuit. This type conductor requires an outage for safety reasons to affect repairs.

Corrective Actions Planned

One feeder outage was caused by a failed lightning arrester. The second feeder outage was due to large tree that blew into the line. The other major outage was due to broken pole which allowed the lines to blow together and it was replaced the day of the outage. No further work is required.



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): 2
SAIFI Value: **Y2015** - 2.00; **Y2016** - 1.00; **Y2017** - 2.00
SAIDI Value: 107.00

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	0	1	50.00%	1
EQUIPMENT/UG	0	1	0	0.00%	0
OTHER	2	0	0	0.00%	0
TREE	0	0	1	50.00%	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 Taken

An engineering review of the circuit, including a visual field inspection, was completed in 2016. WR 2HGH048739 was created to affect any reliability improvements. However, it was found that the outages were actually customer issues and not Ameren issues. No work was performed with 2HGH048739.

Corrective Actions Planned

The outages in 2015 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. No further work is required.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 858053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63435
Customers Served: 558
Customer Interruptions (CI): 1240
SAIFI Value: 2.22
SAIDI Value: 92.50

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	36	2.90%	10
CUSTOMER	27	2.18%	7
EQUIPMENT/OH	1151	92.82%	12
LIGHTNING	26	2.10%	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

Created WR 2HGH052292 to address equipment and hardware issues found as a result of a feeder patrol in 2018. Other potential improvements will be fusing any unfused CSP transformers on the backbone, fusing unfused taps and animal guarding.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 882073
Division: CENTRAL MO
ZIP Codes(s) Served: 65259, 65270
Customers Served: 118
Customer Interruptions (CI): 251
SAIFI Value: 2.13
SAIDI Value: 343.67

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	123	49.00%	2
EQUIPMENT/OH	125	49.80%	1
LIGHTNING	3	1.20%	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 faults on the 34kV line west of Sparks Substation caused a 'smart' switch outside the Substation to operate leading to a loss of supply to Huntsville Substation (939), which is radially fed from the 882-73 feeder. One outage was caused by an outside phase contacting a guy wire. The primary was sleeved and new insulator installed into the guy wire as a result of this incident. The second outage was due to animal contact. Most of this circuit had tree trimming in 2017 and is to be completed in first quarter 2018. WR 2DLD093658 was created as a result of a field review of the feeder in 2018. Work includes an infrared inspection of a large section of the feeder through private property to identify hot spots on overhead equipment.



APPENDIX B

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 890051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63501
Customers Served: 1304
Customer Interruptions (CI): 2540
SAIFI Value: **Y2015** - 1.93; **Y2016** - 4.04; **Y2017** - 1.95
SAIDI Value: 117.78

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	35	48	60	2.36%	2
CUSTOMER	12	0	0	0.00%	0
EMPLOYEES	7	0	1117	43.98%	1
EQUIPMENT/OH	1085	3860	17	<0.01%	3
EQUIPMENT/UG	0	0	31	1.22%	1
LIGHTNING	110	1276	0	0.00%	0
OTHER	1	0	0	0.00%	0
PREARRANGED	30	0	0	0.00%	0
PUBLIC	1	1	0	0.00%	0
TREE	1201	13	1272	50.08%	6
UNKNOWN	0	17	43	1.69%	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

There was a 2017 project to improve this circuit. WO J0F51 included seven WRs (schemed as HRSN51). The work included: replacing brittle 2/0 copper conductor with 556 AAAC, fusing unfused taps, undergrounding a section of the backbone, changing out 6-ft. crossarms with 8-ft. crossarms and installing two automated switches.

Corrective Actions Planned

One of the feeder outages in 2017 was due to operator error in performing the work. Planned work includes the WO J0F51 from 2017. There are no more planned projects for this feeder at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 890052
Division: NORTHEAST MO
ZIP Codes(s) Served: 63501, 63537, 63549
Customers Served: 1395
Customer Interruptions (CI): 3420
SAIFI Value: 2.45
SAIDI Value: 232.17

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	8	<0.01%	2
CUSTOMER	2	<0.01%	2
EQUIPMENT/OH	3251	95.11%	31
EQUIPMENT/UG	21	<0.01%	10
LIGHTNING	81	2.37%	3
OTHER	1	<0.01%	1
PUBLIC	8	<0.01%	2
TREE	46	1.35%	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

Created WR 2HGH052286 to repair equipment and hardware issues as a result of a feeder patrol in 2018. Other potential improvements will be fusing any unfused CSP transformers on the backbone, fusing unfused taps and animal guarding.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 939052
Division: CENTRAL MO
ZIP Codes(s) Served: 65259
Customers Served: 277
Customer Interruptions (CI): 655
SAIFI Value: 2.36
SAIDI Value: 211.59

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	274	41.83%	1
EQUIPMENT/OH	11	1.68%	3
LIGHTNING	20	3.05%	6
TREE	73	11.15%	2
UNKNOWN	277	42.29%	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

Huntsville (939) Substation is a radially-fed 12kV substation supplied by a 34kV circuit out of Sinnock (882) Substation. 42% of customer incidents were the result of the loss of the 34kV feed from Sinnock for an unknown cause. 41% of customer incidents were due to animal contact, which caused a recloser lockout at Sparks Substation, through which the 34kV supply passes. The faulted equipment in the Sparks Substation was replaced. Next cycle of trim trimming is currently scheduled for 2020. The line was patrolled but no maintenance items were found.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 939053
Division: CENTRAL MO
ZIP Codes(s) Served: 65259, 65270
Customers Served: 576
Customer Interruptions (CI): 1236
SAIFI Value: 2.15
SAIDI Value: 239.09

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	587	47.49%	5
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	19	1.54%	5
EQUIPMENT/UG	576	46.60%	1
PUBLIC	46	3.72%	3
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

Two feeder outages occurred in 2017 on this circuit. One occurred due to a faulted pothead on the underground feeder exit cable, which was replaced and restored; the other was due to a recloser lockout in the 34kV supply caused by animal contact. Previous tree trimming cycle completed in 2017, and is next scheduled to be completed in 2023. A feeder patrol resulted in WR 2DLD093660, which includes fusing transformers, fusing taps due to risk of overgrowth and closing out two pot transformer banks into three pot banks.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 955054
Division: CENTRAL MO
ZIP Codes(s) Served: 65101, 65109
Customers Served: 1219
Customer Interruptions (CI): 2460
SAIFI Value: 2.02
SAIDI Value: 127.80

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	25	1.02%	4
EMPLOYEES	1	<0.01%	1
EQUIPMENT/OH	1	<0.01%	1
EQUIPMENT/UG	32	1.30%	2
LIGHTNING	1	<0.01%	1
PUBLIC	2400	97.56%	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

Two feeder outages caused by public. One with boring contractor and one with vehicle.

No further corrective actions are needed at this time.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 978053
Division: CENTRAL MO
ZIP Codes(s) Served: 63091, 65014, 65066
Customers Served: 545
Customer Interruptions (CI): 973
SAIFI Value: 1.79
SAIDI Value: 177.75

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	35	3.60%	5
EQUIPMENT/OH	47	4.83%	5
EQUIPMENT/UG	4	<0.01%	1
LIGHTNING	55	5.65%	1
PUBLIC	58	5.96%	2
TREE	195	20.04%	1
UNKNOWN	579	59.51%	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

Outages mostly occurred in the area south of Owensville supplied by a cross-country line. Some of these customers are planned to be transferred to different supply in 2018 with project to convert some of the 4 kV area to 12 kV. A separate project to eliminate the cross-country line is planned with lines serving the area to be relocated along existing roadways under WR 2JCP103887 expected to be completed by 12/1/18.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 982051
Division: CENTRAL MO
ZIP Codes(s) Served: 64060, 64062
Customers Served: 62
Customer Interruptions (CI): 165
SAIFI Value: 2.66
SAIDI Value: 310.27

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
OTHER	9	5.45%	4
PUBLIC	155	93.94%	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

Public vehicle struck a pole which took out most of the feeder. This outage accounts for over 90% over total customer incidents on the circuit in 2017. Maintenance tree trimming previously took place in 2015, and is next scheduled to be performed in 2021. A feeder patrol resulted in WR 2HGH052323, which includes fusing transformers on unfused taps, replacing goat arm construction along backbone and coordination changes. A reconductoring project is being proposed for future budget in order to carry 982-55 on 982-51 for switching purposes in the event of an outage.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: 982052
Division: CENTRAL MO
ZIP Codes(s) Served: 64062
Customers Served: 1220
Customer Interruptions (CI): 2658
SAIFI Value: 2.18
SAIDI Value: 281.86

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	32	1.20%	11
CUSTOMER	1	<0.01%	1
EQUIPMENT/OH	1329	50.00%	6
EQUIPMENT/UG	10	<0.01%	2
OTHER	16	<0.01%	3
PUBLIC	1236	46.50%	3
TREE	34	1.28%	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

Two feeder outages occurred in 2017 on this circuit which, together, accounted for over 96% of customer incidents. One feeder outage was due safety to repair a burnt jumper wire and replacement of two underslung switches. The other feeder outage was caused by a public vehicle striking a pole bringing the pole and wires down. Previous tree trimming cycle completed in 2017, and is next scheduled to be completed in 2023. A feeder patrol resulted in WR 2HGH052324, which includes fusing transformers, fusing taps due to risk of overgrowth and replacing in-line switches with underslung switches.



APPENDIX B

Single Year WPC Analysis and Remedial Action Report

Circuit Number: UE1002
Division: ARCHVIEW
ZIP Codes(s) Served: 63137
Customers Served: 2
Customer Interruptions (CI): 5
SAIFI Value: 2.50
SAIDI Value: 914.50

Outage Analysis

Causes	2017 Total CI	2017 % Total CI	2017 # Incidents
EQUIPMENT/OH	3	60.00%	3
PUBLIC	1	20.00%	1
UNKNOWN	1	20.00%	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

All outages concerning this circuit were 34kV related. Repair work was performed at the time of the outages. No other work required on this circuit. Engineering will perform 34kV system outages analysis for any improvements to the 34kV system.

APPENDIX C

Division	Operating Area	Circuit	Volt	Cust	CI	CMI	SAIDI	SAIFI	2015	2016	2017	Years WPC
GATEWAY	ST CHARLES	544055	12	854	1469	169724	199	1.72	WPC	WPC		2
NORTHEAST MO	LOUISIANA	629051	12	484	746	50279	104	1.54	WPC	WPC		2
MERAMEC VALLEY	FRANKLIN	506056	12	934	1313	224472	240	1.41	WPC	WPC		2
SEMO	HAYTI	465056	12	162	205	35929	222	1.27	WPC	WPC		2
SEMO	HAYTI	452053	12	295	364	36352	123	1.23	WPC	WPC		2
SEMO	DEXTER	698007	4	116	129	33729	291	1.11	WPC	WPC		2
MERAMEC VALLEY	ELLISVILLE	115052	12	1698	548	54283	32	0.32	WPC	WPC		2
GATEWAY	BERKELEY	144051	12	95	30	5480	58	0.32	WPC	WPC		2
GATEWAY	BERKELEY	047005	4	368	108	21505	58	0.29	WPC	WPC		2
NORTHEAST MO	WENTZVILLE	673053	12	721	12	1422	2	0.02	WPC	WPC		2
GATEWAY	BERKELEY	140001	4	409	5	1336	3	0.01	WPC	WPC		2



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 047005
Division: GATEWAY
ZIP Codes(s) Served: 63130, 63133
Customers Served: 368
Customer Interruptions (CI): 108
SAIFI Value: Y2015 - 2.16; Y2016 - 2.05; Y2017 - 0.29

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
EMPLOYEES	0	149	20	18.52%	1
EQUIPMENT/OH	3	474	18	16.67%	5
EQUIPMENT/UG	735	0	0	0.00%	0
OTHER	3	8	4	3.70%	2
PUBLIC	0	0	47	43.52%	3
TREE	41	133	19	17.59%	2
UNKNOWN	21	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

The circuit underwent the full cycle tree trimming in 2016 and some underground cable repair were performed under work request number 21MT63598.

Corrective Actions Planned

Corrective actions have been taken under WR 21MT670052 and will be taken under 21MT670050. These actions were developed through engineering field checking reviews, circuit patrol, and tree trimmings.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 115052
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63011, 63017, 63021
Customers Served: 1698
Customer Interruptions (CI): 548
SAIFI Value: Y2015 - 2.69; Y2016 - 2.22; Y2017 - 0.32

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	61	206	308	56.20%	8
CUSTOMER	9	0	0	0.00%	0
EMPLOYEES	0	19	0	0.00%	0
EQUIPMENT/OH	2123	1733	51	9.31%	2
EQUIPMENT/UG	1983	1747	93	16.97%	7
OTHER	0	9	2	<0.01%	2
OVERLOAD	0	0	14	2.55%	1
PREARRANGED	266	0	0	0.00%	0
PUBLIC	0	9	0	0.00%	0
TREE	24	1	0	0.00%	0
UNKNOWN	123	29	80	14.60%	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

In 2016, Baxter 115052 had faulted circuit indicators installed at various overhead and underground points to shorten restoration times. Additional tap fusing was also installed on WR 21MT644345.

Corrective Actions Planned

Major 2016 outages included a pole fire (during rain) and a switchgear fire, items that would appear to be hot-spot related. More than half of the backbone circuit is underground cable between switchgear. Contractor Services performed an infrared inspection of all equipment with the overhead and underground visual inspection in 2014. A mid-cycle IR inspection was considered but not conducted.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 140001
Division: GATEWAY
ZIP Codes(s) Served: 63132, 63141
Customers Served: 409
Customer Interruptions (CI): 5
SAIFI Value: Y2015 - 4.27; Y2016 - 2.03; Y2017 - 0.01

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
CUSTOMER	0	8	0	0.00%	0
EMPLOYEES	0	2	0	0.00%	0
EQUIPMENT/OH	3	817	1	20.00%	1
EQUIPMENT/UG	1	0	0	0.00%	0
OTHER	1	1	0	0.00%	0
PREARRANGED	1	0	0	0.00%	0
TREE	1739	1	3	60.00%	1
UNKNOWN	1	0	1	20.00%	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 Taken

The circuit underwent the full cycle tree trimmings in 2016 and a primary ground static wire repair work was completed under work request number 21MT651816.

Corrective Actions Planned

Corrective actions have been taken under WR 21MT670062. These actions were developed through engineering field checking reviews, circuit patrol, and tree trimming.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 144051
Division: GATEWAY
ZIP Codes(s) Served: 63042, 63044
Customers Served: 95
Customer Interruptions (CI): 30
SAIFI Value: Y2015 - 8.60; Y2016 - 1.96; Y2017 - 0.32

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	0	1	3.33%	1
CUSTOMER	2	182	3	10.00%	2
EQUIPMENT/OH	4	5	23	76.67%	11
EQUIPMENT/UG	6	0	1	3.33%	1
OTHER	748	0	0	0.00%	0
PREARRANGED	3	0	0	0.00%	0
TREE	0	1	2	6.67%	2
UNKNOWN	2	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

The improvement opportunities were indentified under circuit device inspection under packet PL201615852. 10 poles in 2016 were replaced under WRs 21MT654760, 21MT654759, 21MT654758, 21MT654757, 21MT654756, 21MT654755, 21MT654754, 21MT654753, 21MT654752, 21MT654751.

Corrective Actions Planned

Corrective actions have been taken under WR 21MT668253 and will be taken under 21MT670146. These actions were identified through engineering reviews and circuit patrols.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 452053
Division: SEMO
ZIP Codes(s) Served: 63830, 63851, 63877
Customers Served: 295
Customer Interruptions (CI): 364
SAIFI Value: Y2015 - 2.23; Y2016 - 1.97; Y2017 - 1.23

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	4	7	3	<0.01%	3
CUSTOMER	1	0	1	<0.01%	1
EQUIPMENT/OH	542	542	258	70.88%	10
LIGHTNING	3	35	0	0.00%	0
OTHER	1	0	0	0.00%	0
PREARRANGED	25	0	0	0.00%	0
PUBLIC	8	0	0	0.00%	0
TREE	4	9	102	28.02%	1
UNKNOWN	49	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

Air spoilers were installed to prevent galloping on WRs 2TSE110190 and 2TSE110191 in 2015. Air spoilers were installed to prevent galloping on WRs 2TSE113854 and 2TSE113855 in 2016.

Corrective Actions Planned

A project to reductor 4 miles of #6Cu wire along Rt. D from Rt. U to County Road 536 under WO J0FX0 (2TSE117484, 2TSE117550, 2TSE117646, 2TSE117645) was completed in 2017.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 465056
Division: SEMO
ZIP Codes(s) Served: 63877
Customers Served: 162
Customer Interruptions (CI): 205
SAIFI Value: Y2015 - 2.02; Y2016 - 6.29; Y2017 - 1.27

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	50	3	4	1.95%	2
CUSTOMER	0	0	2	<0.01%	1
EQUIPMENT/OH	62	557	180	87.80%	5
EQUIPMENT/UG	0	0	1	<0.01%	1
LIGHTNING	56	180	0	0.00%	0
PUBLIC	0	131	12	5.85%	1
TREE	176	180	6	2.93%	2
UNKNOWN	2	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

Air spoilers and wire spacers were installed to prevent galloping on WRs 2TSE113805 and 2TSE113806 in 2016. Improved coordination for sections of this circuit was accomplished by installing additional reclosers to mitigate outages on WR 2TSE113807 in 2016.

Corrective Actions Planned

An additional recloser was installed on this circuit on WR 2TSE116992 in 2017 to isolate outages.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 506056
Division: MERAMEC VALLEY
ZIP Codes(s) Served: 63090
Customers Served: 934
Customer Interruptions (CI): 1313
SAIFI Value: Y2015 - 2.07; Y2016 - 3.03; Y2017 - 1.41

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	3	13	3	<0.01%	3
EMPLOYEES	0	0	1	<0.01%	1
EQUIPMENT/OH	49	2	3	<0.01%	3
EQUIPMENT/UG	0	0	2	<0.01%	2
LIGHTNING	0	2	0	0.00%	0
OTHER	0	2	1	<0.01%	1
PREARRANGED	6	0	0	0.00%	0
PUBLIC	909	2777	363	27.65%	1
TREE	892	0	940	71.59%	7
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

No work was identified in the 2015 WPC review.

Corrective Actions Planned

This is a multi-year WPC. Upon closer examination of the major outage events on this circuit in 2016, the eight incidents under Public were the result two different vehicle accidents involving two poles being hit at different locations on May 10, 2016 and December 22, 2016 resulting in 936 and 1805 customer interruptions respectfully. These two events account for 98% of all customer interruptions in 2016. In 2015, 892 customer interruptions were the result of a vehicle accident involving a pole and resulted in 48.1% of the customer interruptions in 2015. Public vehicle accidents resulted in 78.5% of all customer interruptions in 2015/16. With the poles being located along city streets with tight right-of-ways through the City of Washington public vehicle damage can be anticipated. At this time no additional work has been identified or planned at this time. The full cycle tree trimming is scheduled for 2018. No other reliability work is scheduled for this feeder.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 544055
Division: GATEWAY
ZIP Codes(s) Served: 63301, 63303
Customers Served: 854
Customer Interruptions (CI): 1469
SAIFI Value: Y2015 - 2.38; Y2016 - 2.35; Y2017 - 1.72

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	0	103	7.01%	4
EMPLOYEES	36	0	0	0.00%	0
EQUIPMENT/OH	157	10	159	10.82%	3
EQUIPMENT/UG	1750	1964	1	<0.01%	1
LIGHTNING	0	36	0	0.00%	0
OTHER	4	0	0	0.00%	0
PREARRANGED	60	0	0	0.00%	0
PUBLIC	1	0	1099	74.81%	1
TREE	26	0	107	7.28%	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

The feeder exit cable failed in 2016. The cable was replaced in new conduit on work request 25SC061897. This work request was completed in October 2016.

Corrective Actions Planned

Patrolled circuit, no additional improvements are planned at this time.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 629051
Division: NORTHEAST MO
ZIP Codes(s) Served: 63330, 63334, 63336, 63353
Customers Served: 484
Customer Interruptions (CI): 746
SAIFI Value: Y2015 - 2.65; Y2016 - 3.08; Y2017 - 1.54

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	0	9	1.21%	2
EQUIPMENT/OH	689	1467	675	90.48%	25
LIGHTNING	39	4	44	5.90%	1
PREARRANGED	38	0	0	0.00%	0
PUBLIC	0	1	0	0.00%	0
TREE	34	42	18	2.41%	7
UNKNOWN	484	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

WRs 2WWZ167444, 2WWZ172232, 2WWZ172264, and 2WWZ172305, all completed in 2016, added fuse switches to 17 pole-mounted transformers and added two sets of three 300 amp switches on the circuit.

Corrective Actions Planned

WR 2WWZ178248, which will add an automated switch in the 629-51 circuit, is expected to be completed in 2018.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 673053
Division: NORTHEAST MO
ZIP Codes(s) Served: 63362, 63379
Customers Served: 721
Customer Interruptions (CI): 12
SAIFI Value: Y2015 - 1.98; Y2016 - 1.98; Y2017 - 0.02

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
ANIMAL	0	4	2	16.67%	2
CUSTOMER	1	0	0	0.00%	0
EQUIPMENT/OH	614	651	1	8.33%	1
EQUIPMENT/UG	0	27	6	50.00%	1
LIGHTNING	630	662	2	16.67%	2
PREARRANGED	20	0	0	0.00%	0
PUBLIC	0	4	0	0.00%	0
UNKNOWN	1	13	1	8.33%	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

WR 2WWZ161051, completed in August 2015, reconductored 0.45 mile of 1-phase 7.2kV circuit along Hampel Road. WRs 2WWZ172008 and 2WWZ172013, completed in March and April 2016, added a fuse switch to 10 transformers, a fuse switch to 3 taps connected to the backbone, and installed 3 sets of lightning arresters.

Corrective Actions Planned

WRs 2WWZ178028, 2WWZ178216, 2WWZ178218, and 2WWZ178219 have been completed. The WRs add 3-phase 12.5kV automated switches on the circuit. Three of these switches are located in the 673-53 feeder and the final switch is located at the tie point between the 673-52 and 673-52 feeders.



APPENDIX D

Multi Year WPC Analysis and Remedial Action Report

Circuit Number: 698007
Division: SEMO
ZIP Codes(s) Served: 63823
Customers Served: 116
Customer Interruptions (CI): 129
SAIFI Value: Y2015 - 2.14; Y2016 - 3.95; Y2017 - 1.11

Outage Analysis

Causes	2015 Total CI	2016 Total CI	2017 Total CI	2017 % Total CI	2017 # Incidents
EMPLOYEES	0	1	0	0.00%	0
EQUIPMENT/OH	125	16	13	10.08%	2
LIGHTNING	0	416	0	0.00%	0
OTHER	2	0	0	0.00%	0
PUBLIC	0	0	116	89.92%	1
TREE	0	17	0	0.00%	0
UNKNOWN	123	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

Additional fuses, reclosers and switches were installed on this circuit to isolate outages in 2015 on WR 2TSE111515.

Corrective Actions Planned

Additional reclosers for improved coordination for this circuit were installed on WRs 2TSE116986 and 2TSE116988 in 2017.