Service Reliability Filing
For 2018 System Performance

(Case 19-E-0169)

March 31, 2019

Executive Summary

This document constitutes Orange and Rockland Utilities, Inc.'s ("O&R", "Orange and Rockland" or "the Company") Service Reliability Filing for its 2018 electric system performance. The Company faced significant reliability challenges in 2018 due primarily to above average precipitation and adverse weather activity throughout its service territory. Despite the challenges posed by unpredictable and increasingly severe weather patterns, the Company met its established reliability targets for 2018 indicating the effectiveness of ongoing efforts to maintain a high level of reliability for its electric delivery system.

The Company's overall 2018 New York System Average Interruption Frequency ("SAIFI") performance of 1.125 bettered the established target of 1.20. The Company's 2018 Customer Average Interruption Duration ("CAIDI") performance of 106.95 minutes met the established target of 111 minutes. The Company experienced six weather events which met the criteria to be excluded from the reliability indices for the year (for reporting purposes, Winter Storm Riley and Winter Storm Quinn were combined as one weather event).

Despite a slight uptick for SAIFI in 2018 from its 2017 level, the Company's performance with respect to this metric continues to exhibit a historically downward trend. Consistent with its historical SAIFI performance improvement, the Company's System Average Interruption Duration Index ("SAIDI") has also been trending downward since the mid-1990's. The downward trend has resulted in a reduction of approximately 15 minutes from the metric since 1996, demonstrating an improvement in the reliability of the Company's electric delivery system. Although New York State does not officially recognize SAIDI as a performance metric target or goal, the index is widely accepted throughout the utility industry as a key indicator of the overall performance of a utility's electric delivery system. The Company will continue to implement its portfolio of reliability programs and specific projects targeted to maintain and improve reliability performance moving forward.

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Acronyms and Abbreviations

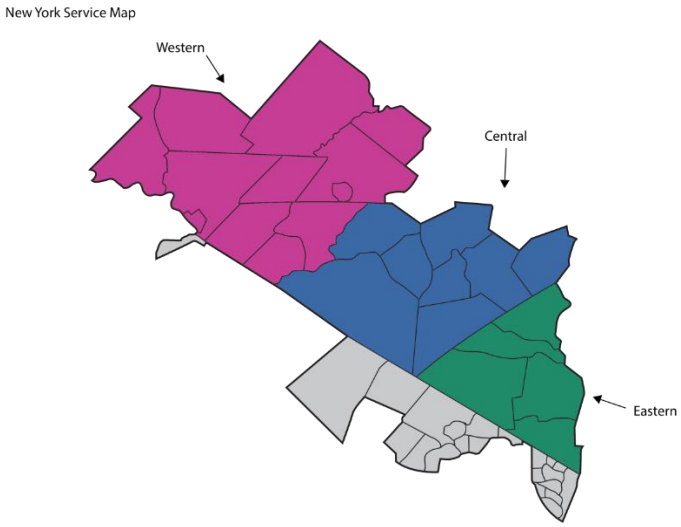
AAAC	All aluminum alloy conductor
AAC	All aluminum conductor
ACSR	Aluminum conductor, steel reinforced
ANSI	American National Standards Institute
CR	County Road
CT	Current transformer
DA	Distribution automation
DC	Direct current
DLRO	Digital low resistance ohmmeter
EHV	Extra high voltage
EIMS	Electric Information Management System
EPR	Ethylene propylene rubber
GOAB	Ground or group operated air break
HMWPE	High molecular weight polyethylene
HP	Horsepower
IR	Infrared
LATE	Lightning, animal, tree, equipment failure
LTC	Load tap changer
MAD	Minimum approach distance
MOAB	Motor operated air break
MVA	Motor vehicle accident
NYISO	New York Independent System Operator
NYPSC	New York Public Service Commission
OCB	Oil circuit breaker
OH	Overhead
OMS	Outage management system
PQ	Power quality
RFI	Radio frequency interference
ROW	Right of way
SCADA	Supervisory control and data acquisition
SIS	
TIMS	Transmission inspection and maintenance system
TLM	Transmission line maintenance

UG	Underground
URD	Underground residential distribution
VM	Vegetation management
WMS	Work management system
WO	Work order
WPC	Worst performing circuit
XLPE	Cross-linked polyethylene

1. OVERVIEW

1.1. Geographic Territory

O&R's service territory is comprised of three distinct geographic areas. For purposes of reliability reporting, the Company apportions these areas into three separate operating divisions: Eastern Division, Central Division and Western Division. The Eastern Division includes all of Rockland County. The Central Division encompasses the southwestern most portion of Orange County, while the Western Division encompasses the northwestern portion of Orange County as well as a section of southern Sullivan County. Individual towns served within each of the operating divisions are listed in the table on the following page.



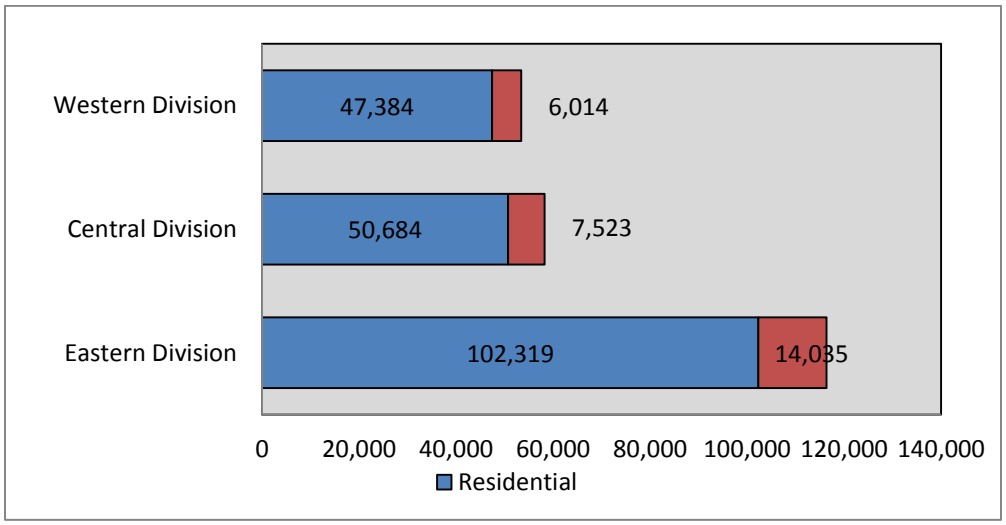
	Square Miles	*(% of State)*	*(% of Company)*
Eastern	195	17.86	14.44
Central	376	34.43	27.85
Western	521	47.71	38.59
Total	1,092	100	80.89

Major Tax Districts (By Division and County)			
Eastern (Rockland)	***Central (Orange)***	***Western (Orange)***	***Western (Sullivan)***
Clarkstown	Blooming Grove	Crawford	Forestburgh
Haverstraw	Chester	Deerpark	Lumberland
Orangetown	Goshen	Greenville	Mamakating
Ramapo	Highlands	Middletown	
Stony Point	Monroe	Minisink	
	Tuxedo	Mount Hope	
	Warwick	Port Jervis	
		Wallkill	
		Wawayanda	

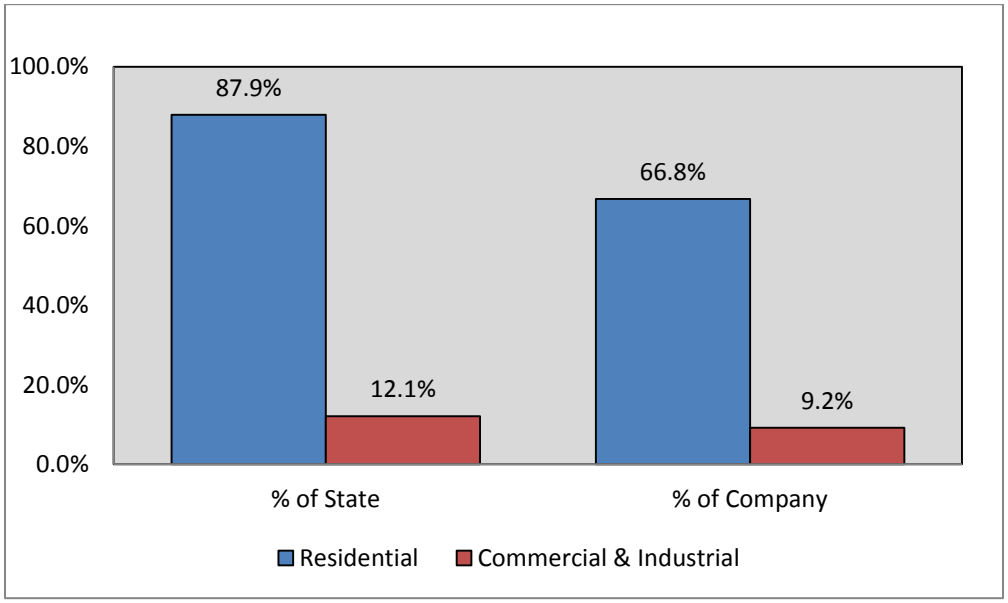
1.2. Customers Served

Shown below are the 2018 customers served for both residential and commercial/industrial ("C&I") rate codes all with corresponding percentages,[1] as of December 31, 2018.

Customers Served



Customers Served (%)



[1] "% of State" refers solely to Orange and Rockland "% of Comp" refers to the entire Orange and Rockland System (i.e., Orange and Rockland and its utility subsidiary, Rockland Electric Company.).

	Residential			Commercial & Industrial			All Customers		
	Customers	% of State	% of Comp	Customers	% of State	% of Comp	Customers	% of State	% of Comp
Eastern Division	102,319	44.9%	34.4%	14,035	6.2%	4.7%	116,354	51.0%	39.1%
Central Division	50,684	22.2%	17.0%	7,523	3.3%	2.5%	58,207	25.5%	19.6%
Western Division	47,384	20.8%	15.9%	6,014	2.6%	2.0%	53,398	23.4%	17.9%
Total New York	200,387	87.9%	67.3%	27,572	12.1%	9.3%	227,959	100.0%	76.6%
Total Company	263,713			36,487			300,200		

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1.3. Field Personnel 10 Year Staffing Levels

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Electric Operations										
31 Mgr. & Staff	0	0	0	0	0	0	0	0	0	0
33 Eastern Line Ops	64	77	75	69	66	63	70	51	65	62
34 Central Line Ops	32	29	30	27	27	26	27	27	27	23
35 Western Line Ops	33	27	24	27	27	26	27	23	20	20
38 Joint Use Facilities	0	0	0	0	0	1	1	1	1	1
51 Trouble Shooters – East	0	0	0	0	0	0	0	9	10	10
62 Trans Dist. Maintenance	0	0	0	0	0	0	0	0	0	0
64 EHV Line Ops	9	9	9	9	9	10	10	9	9	9
76 Eastern Underground	24	27	27	26	24	29	21	26	25	27
77 Central Underground	13	15	13	13	14	10	16	16	16	12
79 Operations Flagperson	2	2	1	1	0	0	0	0	0	0
80 Trouble Shooters – North	0	0	0	0	0	0	0	8	8	7
Total Electric Operations	177	186	179	172	167	165[2]	172[3]	170[3]	181	171
Contractor Linemen	10	16	16	25	37	44	40	45	43[3]	36
Substation Operations										
93 Eastern	16	15	15	20	19	20	17	19	20	19
94 Central & West	11	12	11	11	12	12	11	12	11	12
96 Relay	12	12	12	14	15	14	11	8	13	12
Total Substation Ops	39	39	38	45	46	46	39	39	44	43
Tree Contractors										
Distribution Crews/Workers	20/40	30/66	30/66	36/77	24/81	35/80	33/90	35/76	23/45	25/52
Capital Projects Crews/Workers	4/8	8/17	8/17	8/17	3/10	6/20	8/29	10/25	8/18	10/22
Transmission Crews/Workers	5/20	6/25	10/40	5/25	10/52	5/25	2/7	7/68	6/45	5/30

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[2] Joint Use Facilities, Troubleshooters – East and Troubleshooters – North not included in staffing level table prior to 2017. The addition changes East, Central and West Line Operations and Total Electric Operations staffing reported for 2014, 2015 and 2016.

[3] The contractor line force was reduced significantly after September 2017 when most were released to respond to hurricane damage in Puerto Rico and the Virgin Islands.

1.4. Definitions – General

Customers Served These customers include residential and C&I customers within our electric franchise territory. Excluded from these are all Street Lighting (Municipal Street Lighting, Traffic Lights, all Dusk to Dawn Lighting), and all sales to other utilities.

Interruption (Sustained) An interruption is the loss of service for five minutes or more to one or more customers.

Momentary Interruption The brief loss of power delivery caused by the opening and closing operation of an interrupting device, in most cases to clear a fault. These interruptions are typically 15 to 30 seconds in duration, and may occur multiple times while clearing a fault on a distribution circuit. Multiple operations for a single event are counted only once. Momentary Interruptions that result in a sustained interruption are not included.

Customers Affected Represents the total number of customers affected as a result of an interruption.

Customer - Hours of Interruption Represents the total customer hours of interruption, which is calculated by multiplying the total customers affected during an interruption by the duration (i.e., hours) of the interruption. Hours of interruption are subject to rounding differences.

O/H Distribution (O/H Dist) Represents interruptions caused by incidents occurring on the overhead distribution system.

U/G Distribution (U/G Dist) Represents interruptions caused by incidents occurring on the underground distribution system.

Transmission/Substation (Trans/Sub) Represents interruptions caused by incidents occurring on the transmission system or in a substation.

Storm A period of adverse weather during which the interruptions affect either (a) at least ten percent of the customers served an operating area; (b) results in customers being without electric service for a duration of at least 24 hours; or (c) both.

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1.5. Definitions – Cause of Outages

Interruptions are classified by the cause of the interruption and include the following ten categories.

Animal Contact	Interruptions caused by an animal coming into contact with the electrical equipment, such as a squirrel, bird, snake or raccoon.
Customers Equipment	Interruptions resulting from the failure of customer owned equipment.
Equipment Failure	Interruptions caused by the breakdown or failure of Company owned equipment.
Lightning	Interruptions resulting from lightning.
Non-Company Accident	Interruptions caused by an event outside of the control of the utility, such as a motor vehicle accident or an act of vandalism.
Overload	Interruptions caused when the electrical load on a utility device or conductor exceeds its rated capacity.
Pre-Arranged	Interruptions resulting from actions deliberately taken by the utility with advance notice to the customer(s) affected such as scheduled pre-arranged outages for voltage conversions.
Tree Contact	Interruptions caused by a tree or tree limb coming into contact with the electrical equipment.
Unknown/Other	Interruptions for which no cause can be found, or for which none of the other classifications is appropriate.
Work Error	Interruptions caused by Company or Company contract personnel such as Company hired tree trimmers.

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1.6. Definitions - Reliability Indices

Frequency (SAIFI)[4] Represents the number of times an average customer is affected by an interruption. It is calculated by dividing the total customers affected by the customers served within a specific territory.

Restoration (CAIDI)[5] Represents the time in minutes (hours) it takes to restore electric service to an average customer that is affected by an interruption. It is calculated by dividing the customer minutes (hours) of interruption by the customers affected.

Duration (SAIDI)[6] Represents the time in minutes (hours) that an average customer is without electric service over a specific period of time. It is calculated by dividing the customer minutes (hours) of interruption over a specified period of time by the customers served over the same period of time. For that same defined period of time, this performance ratio can be calculated by the formula SAIFI * CAIDI.

Momentary Interruption Frequency ($MAIFI_e$)[7] Represents the number of times an average customer is affected by a momentary interruption. It is calculated as the result of the total customers affected by all momentary interruptions by the customers served within a specific territory. In this document, a momentary interruption is the number of events where a customer is momentarily interrupted by substation breaker operation.

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[4] SAIFI is the System Average Interruption Frequency Index.
[5] CAIDI is the Customer Average Interruption Duration Index.
[6] SAIDI is the System Average Interruption Duration Index.
[7] $MAIFI_e$ is the Momentary Average Interruption Frequency Index, for an Event.

2. 2018 CORPORATE PERFORMANCE

2.1. Summary of Performance

The Company's 2018 New York SAIFI performance of 1.12 exceeded the previous five-year average of 0.99 by 14% or the equivalent of about 29,635 customers affected. This also represented a 24% increase in the frequency index performance as compared to 2017 when the SAIFI performance was 0.92.

The Company's 2018 CAIDI performance of 103.0 minutes was below the previous five-year average of 108.6 minutes, and better than the New York Public Service Commission's ("NYPSC" or "Commission") goal of 111 minutes. The 2018 CAIDI performance, though slightly higher, was consistent with 2017's performance of 100.8 minutes. The Company experienced five weather events which qualified for exclusion from the reliability indices for 2018. Of the five, three were Company-wide events and two affected just Eastern and Central Division.

In addition to the excludable weather events affecting its performance, the Company faced significant reliability challenges in 2018 due mostly to above average precipitation throughout the year. Rainfall totals were well above the 100-year average; with the total rainfall of 70.34 inches being the third greatest since 1869[8] (only 1983 and 2011 had greater rainfall totals). The result was excessive vegetation growth that had a direct impact on the operation of the electric distribution system. Although the number of vegetation contact outages were down 26% during the year from the 2017 level, the number of customers affected by vegetation was up 34% over the 2017 level and 53% above the 20-year average. Likewise, customer voltage and flicker light complaints were up 33% from their 2017 levels. The Company believes these two factors are indicative of a greater number of vegetation contacts, both transient as well as permanent, along circuit mainline sections of the distribution system. MAIFI also was significantly higher in 2018 than 2017, indicating a greater number of incidental contacts with the system.

Despite the challenges discussed above, the Company's overall 2018 year-end reliability performance was consistent with its previous five-year performance, indicating that its reliability initiatives continue to have a positive impact on the Company's reliability performance over time. There were seven days when greater than 5,000 customers were affected by an interruption (in 2017 there were three days, in 2014 – 2016 there were four days each and in 2012 – 2013 there were five days each respectively). In 2018, the elevated numbers of customers affected on five of

[8] The Company uses several sources, including paid services, for weather forecasting and in estimating weather impact to the service territory. For historical rainfall totals, the Company uses records for Central Park, New York due to the completeness of the records (the company will also use data collected from Teterboro Airport in Teterboro, NJ and Stewart Airport in Newburgh, NY when available).

those days were the result of adverse weather events, three of which were excludable. The remaining two days were the result of non-weather related substation outages.

There were eight days during the year in which there were greater than 10,000 customer-hours of interruption for the day, seven of which occurred on days when inclement weather conditions resulted in an elevated number of incidents impacting the electric delivery system, and the eighth being the result of an extended duration substation outage impacting a radially fed distribution circuit.

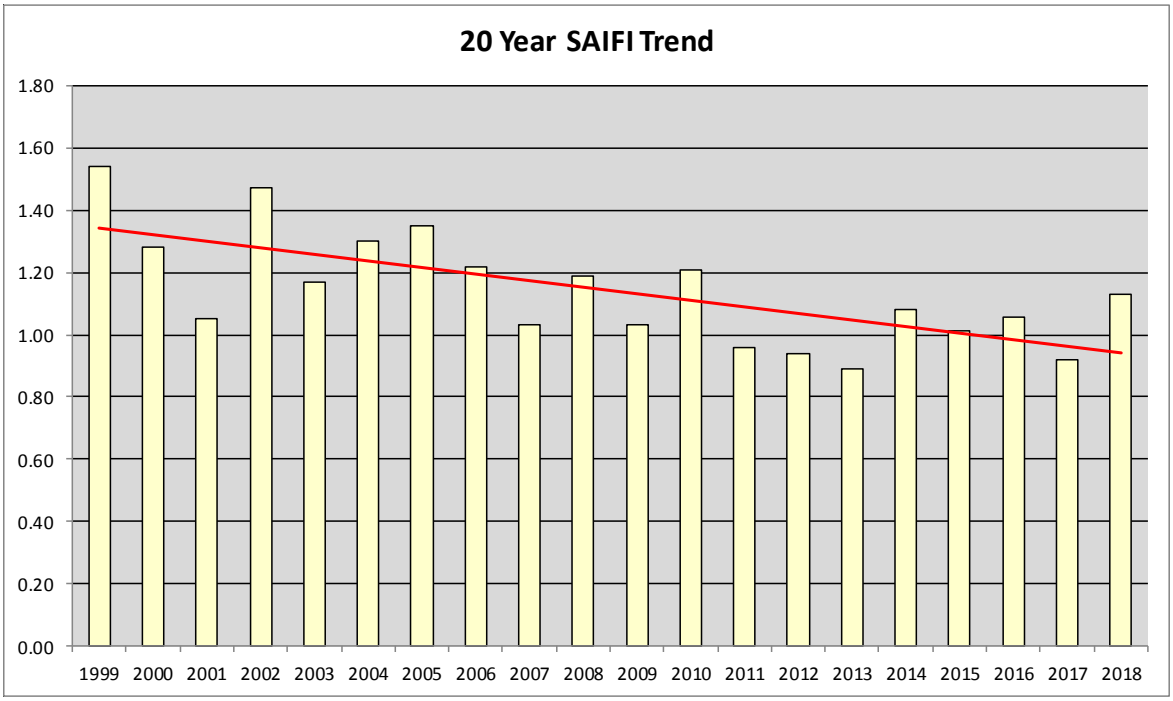

Figure 1

O&R's grid modernization and distribution automation efforts, in addition to many of the Company's other reliability programs, are focused on reducing the number of outages experienced by the typical customer over time, and will continue to play a role in the Company's overall performance that is projected to continue to improve moving forward. The success of these programs can be seen in the downward trend in SAIFI (Figure 1) as well as the downward trend in the number of customers affected per interruption (Figure 2) over time. Conversely, CAIDI has risen steadily over the same time period. This mixed performance can be attributed, in part, to the inverse relationship between SAIFI and CAIDI over the past 20 years and is consistent with expectations and with previous years' performance.

With fewer customers being affected per interruption and distribution automation averting interruptions for large blocks of customers, there are fewer opportunities than in the past to gain

the CAIDI benefit of restoring those large blocks of customers quickly had they experienced an interruption. As a result, over time, CAIDI has been trending upward concurrently with the decrease in SAIFI and customers affected per interruption. This trend can be seen in Figure 3.

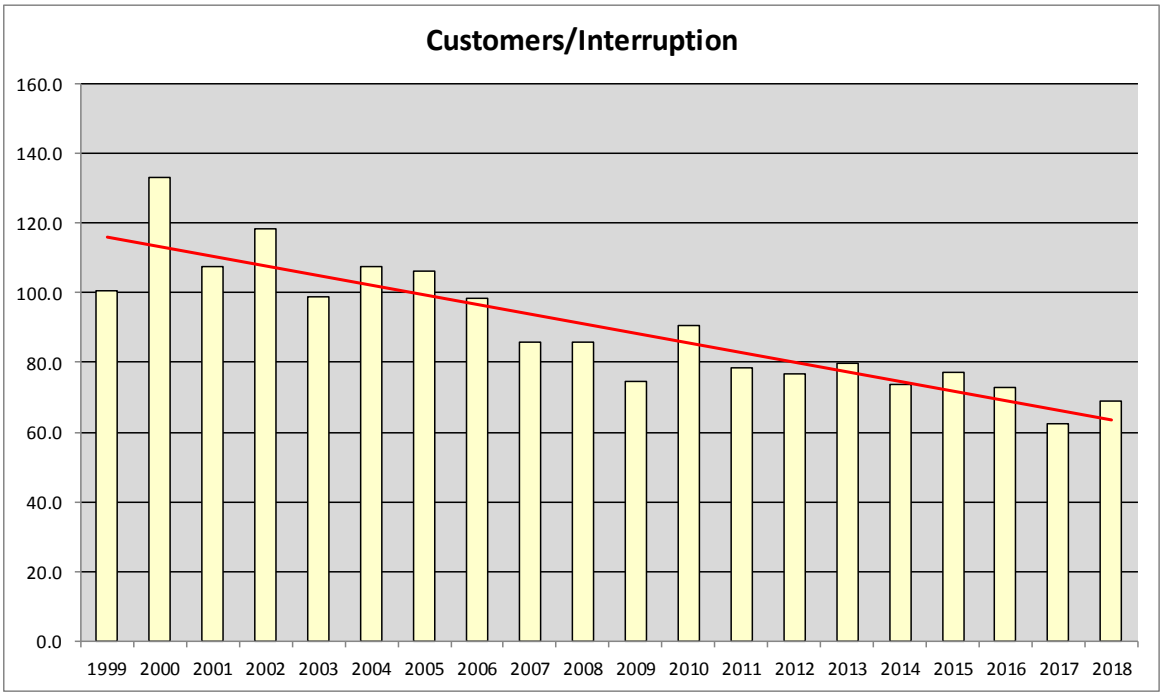

Figure 2

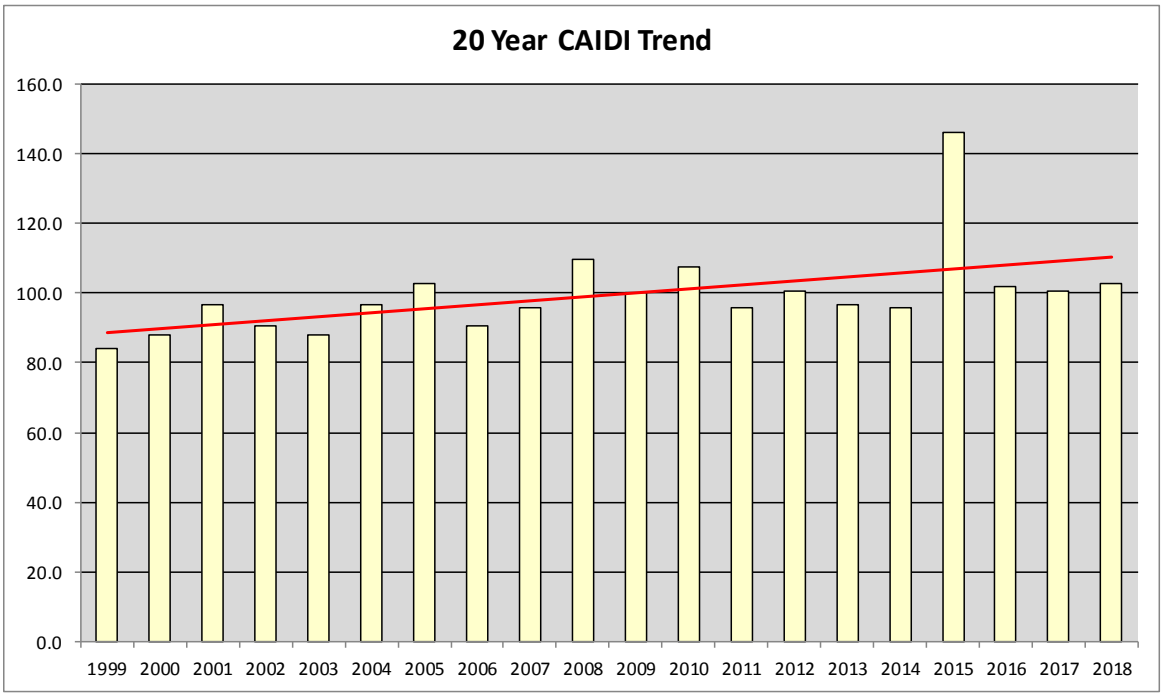

Figure 3

The overall success in the Company's reliability programs is demonstrated by the 20 year downward trend in SAIDI as shown in Figure 4.

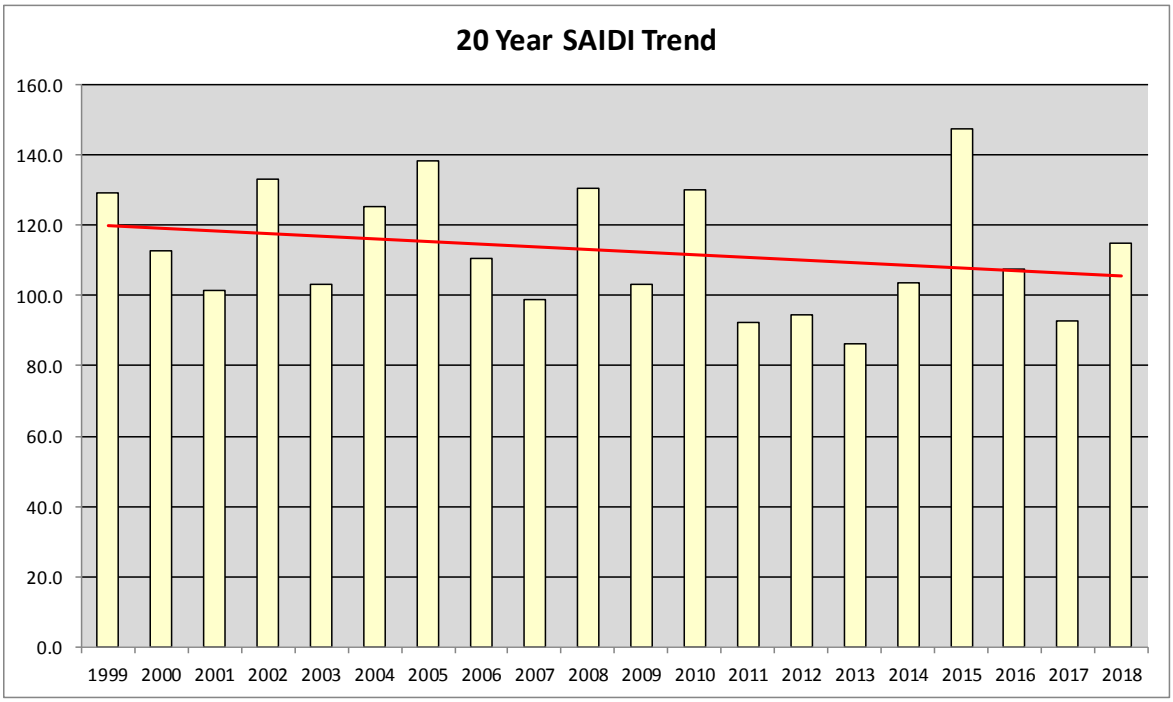

Figure 4

The 2018 increase in SAIFI over the 2017 performance (1.13 versus 0.92) can be attributed to an overall 24% increase in the number of customers affected year over year, with all but one major category seeing an increase (the one exception was non-Company accidents which saw 32% decline in the number of customers affected in 2018 as compared to 2017). Equipment failure interruptions saw the greatest increase in the number of customers affected year over year, and accounted for 63% of the increase in total customers affected for calendar year 2018 as compared to 2017.

Within the equipment failure category, primary wire failures in Eastern Division contributed the most to the increase in SAIFI, accounting for 31% of the increase in customers affected year over year.

The increase in 2018 CAIDI over the 2017 performance (103.0 versus 100.8) can be attributed to a 35% increase in the number of customers-hours of interruption year over year companywide. The increase was uniform throughout the year with no single outage or period of time contributing disproportionately to the Company's performance. In 2018, the total number of customer hours of interruption returned to and was in line with historical norms and Company expectations.

There were 25 days when greater than 1000 customers were affected for the day (excluding storms) as compared to 2016 when there were 34. The number of customers affected per interruption in 2018 increased to 69 from its 2017 level of 62. The 69 customers/interruption is below the five-year average of 73.

The increase in the number of customers affected coupled with the significant increase in the number of customer hours of interruption as compared to 2017 was driven in large part by the inclement weather experienced throughout the year. The number of inclement weather days in 2018 exceeded that in 2017 by 39% (198 versus 142). The number of interruptions/inclement day and the number of customers affected/interruption (which would drive customer-hours as well) on inclement weather days in 2018 were both at least 30% greater than that in 2017. Also, a factor in driving the customer hours performance, was the number of high volume days (defined as being days when greater than 20 interruptions occur, but none of the interruptions qualify for exclusion from the Company's reportable metrics) during the year. The 32 high volume days in 2018 was more than double the number in 2017 as well as the previous five-year average.

There were a comparable number of days in 2018 versus 2017, during which the maximum sustained winds exceeded 30 mph (57 versus 63) and also when the maximum wind gust exceeded 40 mph (12 versus 16).

The performance ratios for all three Divisions and the total Company service territory are shown in Table 2-1. A five-year history and five-year average is tabulated according to the standard reporting that was initiated by the NYPSC in 1989. The standards set by the Commission for each

index are also listed for each of the Divisions that reflect the 2005 revised standard levels, and those overall Company standards that were maintained by the Commission in Case 14-E-0493.

The SAIFI, CAIDI and SAIDI trends by Division are shown graphically in Figures 2-1, 2-2 and 2-3, respectively. Further discussion of these trends is included in each Division's summary of performance.

Figures 2-4, 2-5, and 2-6 show the annual performance trends, from 2013 through 2018, for the Company's three Divisions. Figure 2-4 shows the number of interruptions that occur annually due to all causes, excluding major storms. Figure 2-5 represents the annual number of customers affected. Figure 2-6 shows the annual customer hours of interruption. Detailed analyses of these trends are provided in the individual Division's performance summaries.

The Company would note that the Shoemaker Substation outage in December 2015 significantly impacted the Company's performance metrics for that calendar year, and subsequently all of its five-year performance averages. This impact will be reflected in the five-year averages through the year 2020 performance, after which the 2015 performance will fall out of the measurement range. This is evident in reviewing Figures 2-1 through 2-6.

Figure 2-7 shows a summary, by cause, for the number of interruptions, customers affected, and the customer hours of interruption experienced in 2018. The two major causes of interruptions are equipment failure and tree contact, similar to the previous three years. Tree related interruptions rose for the third year in a row to 1,073 from 969 in 2017, while equipment failure related interruptions rose more significantly (1,287 in 2018 versus 1,057). In 2018, these two categories combined account for approximately 63% of all interruptions and customers affected and 68% of all customer hours of interruption.

Partial power and single customer interruptions were at the second highest level in 20 years and also contributed to a much greater extent to the number of interruptions for tree contact and equipment failure cause codes in 2018 than in 2017. Of the 3,709 total interruptions reported throughout 2018, 371 (10%) were partial power conditions resulting from an equipment failure or tree contact (as compared to 6.5% in 2017). Likewise, 565 (15.2%) out of the 3,709 interruptions for the year involved a single customer interruption resulting from a tree contact or an equipment failure (as compared to 13.2% in 2017).

Table 2-2 shows a summary of the equipment failures, by category, for the Company's entire New York State service territory in 2018 (excluding major storms). For interruptions caused by equipment failure, overhead equipment was responsible for 75% of the interruptions (equaling the 75% in 2017), 76% of the customers affected (down from 83% in 2017), and 67% (down from the 70% in 2016) of the customer-hours of interruption.

The number of equipment failures occurring in 2018 rose by 19% as compared to 2017, coming in at the highest level since 2011. Both overhead and underground secondary connectors and splices drove a large part of this increase, with the aggregated total coming in well above historical levels. The Company will continue to monitor the performance of all equipment to identify trends in any single system component, and to take mitigating actions as necessary.

Figures 2-8, 2-9, and 2-10 show the annual performance trending by major cause, from 2013 through 2018, excluding major storms, for the Company's entire service territory. As was the case in previous years, Figure 2-8 (total number of interruptions), indicates that interruptions caused by equipment failure and tree contact dominate throughout the entire six-year time frame represented. The performance trends relating to tree contacts and equipment failures remain consistent throughout each Operating Division as well.

Table 2-3 demonstrates the effects of removing non-excludable major outage statistics from these indices for 2018 and the prior five-years. A major outage is defined as one event affecting more than 5,000 customers. In 2018, there were two substation events that, aggregated, resulted in an increase of 0.06 to SAIFI (12,222 total customers affected) and an increase of 5.4 minutes to CAIDI.

As shown in Appendix C, there were 2 non-excludable substation incidents affecting 5,000 or more customers which occurred in 2018.

In 2018, $MAIFI_e$ was 11.74 for New York customers, based on 227,959 customers served, and a total of 2,676,012 momentary interruptions experienced by customers. This represented a 63% increase in the number of momentary operations as compared to 2017. Based upon field observations of vegetation growth throughout the year, the increase was most likely was the result of incidental vegetation contacts. Currently, the Company calculates $MAIFI_e$ based on operations from the substation breaker that supply the circuit.

2.2. Worst Performing Circuit Selection

Orange and Rockland has applied its own methodology, instead of that proposed by the NYPSC, for selecting each Division's Worst Performing Circuits. The methodology is outlined in detail in Appendix A. The circuit priority-rating list for each Division is also included in Appendix A.

Orange and Rockland maintains that for the Company's system, this methodology is a superior indicator of poor performance, and identifies areas where corrective measures will have the greatest impact on customer service reliability. It is this methodology that has been used consistently for many years to direct the Company's service reliability improvement programs and establish priorities.

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TABLE 2.1 - ELECTRIC PERFORMANCE RATIOS 2013 THROUGH 2018

Electric Performance Ratios 2013 - 2018

Division	Year	SAIFI - Frequency (Cust Aff / Cust Srvd)	CAIDI - Restoration (Cust - Hrs / Cust Aff)	SAIDI - Duration (Cust - Hrs / Cust Srvd)
Eastern	2013	0.76	1.47	1.12
	2014	0.95	1.47	1.40
	2015	0.65	1.49	0.96
	2016	0.99	1.54	1.53
	2017	0.80	1.46	1.16
5-Yr Average 2013 - 2017		0.83	1.49	1.24
	Standard	1.20	1.50	
	2018	0.79	1.92	1.52
Western	2013	1.31	1.79	2.35
	2014	1.53	1.79	2.74
	2015	1.75	3.76	6.57
	2016	1.16	1.71	1.98
	2017	1.06	1.63	1.73
5-Yr Average 2013 - 2017		1.36	2.26	3.07
	Standard	1.70	2.00	
	2018	1.67	1.69	2.82
Central	2013	0.76	1.64	1.24
	2014	0.92	1.69	1.56
	2015	1.09	1.60	1.74
	2016	1.09	1.98	2.16
	2017	1.03	2.06	2.13
5-Yr Average 2013 - 2017		0.98	1.81	1.77
	Standard	1.40	1.75	
	2018	1.29	1.72	2.23
Company	2013	0.89	1.62	1.44
	2014	1.08	1.62	1.75
	2015	1.02	2.44	2.48
	2016	1.06	1.70	1.79
	2017	0.92	1.68	1.54
5-Yr Average 2013 - 2017		0.99	1.81	1.80
	Standard	1.20	1.85	
	2018	1.13	1.78	2.01

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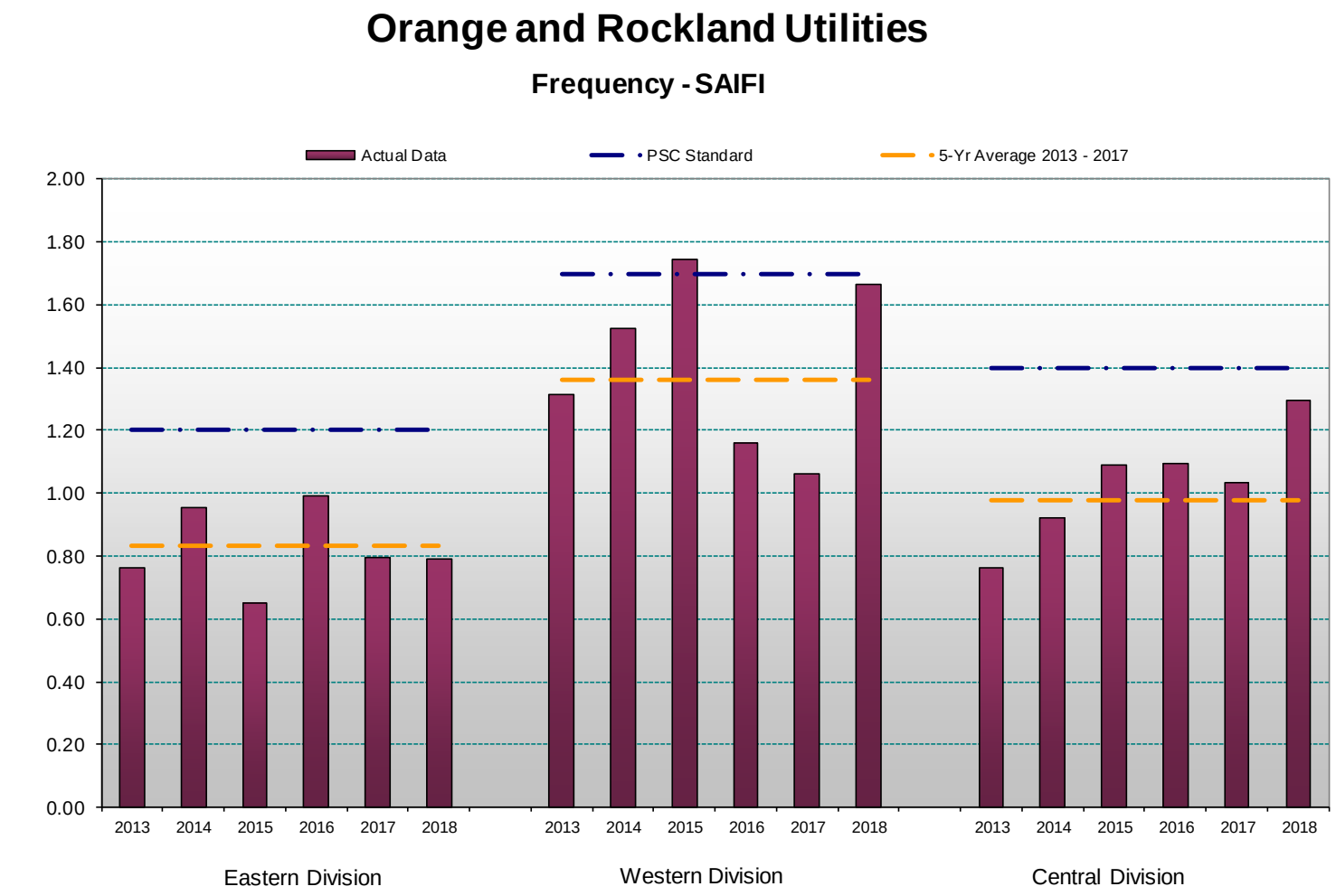
Figure 2.1 - Frequency - SAIFI



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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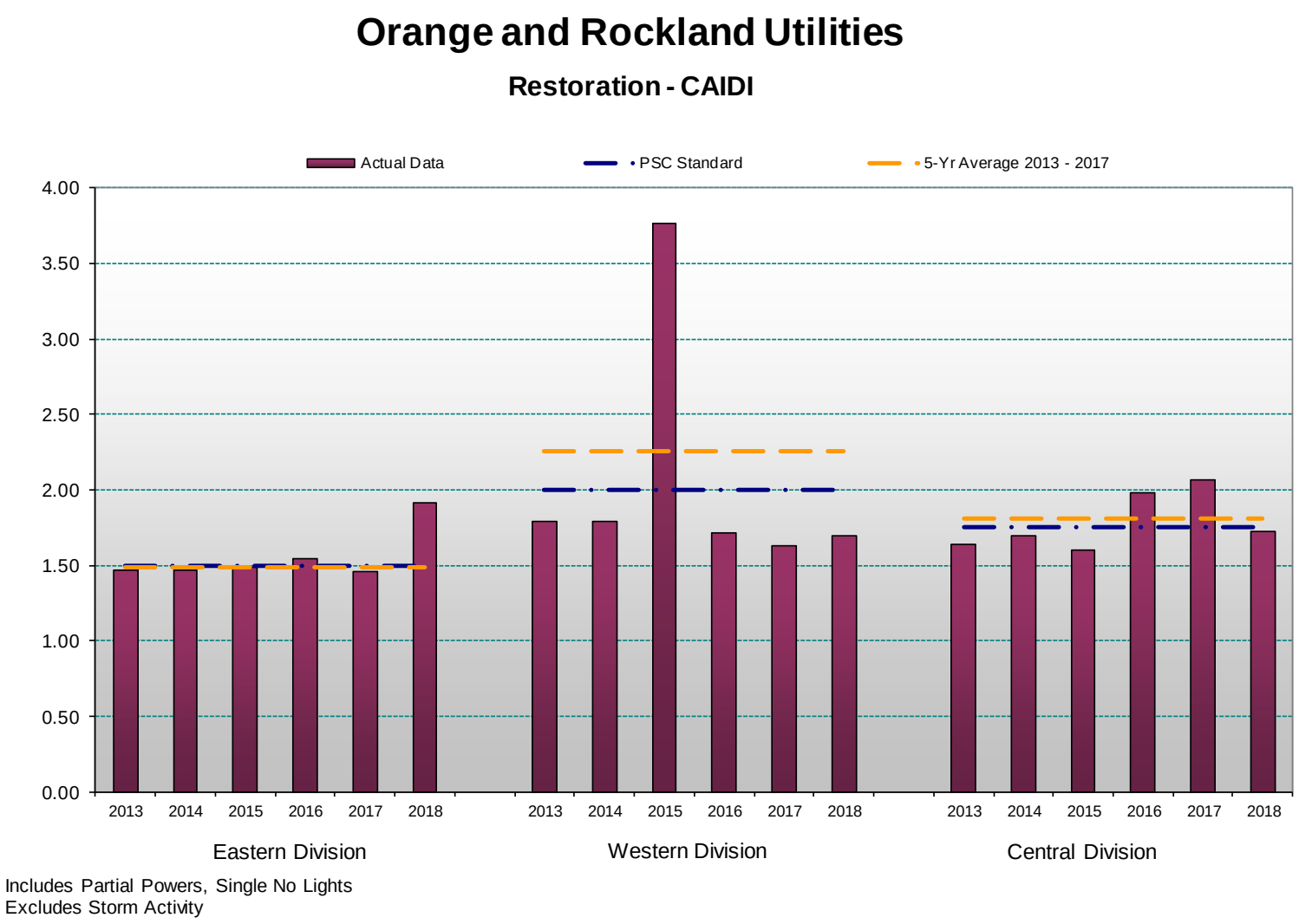
Figure 2.2 - Restoration - CAIDI



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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Figure 2.3 - Duration - SAIDI

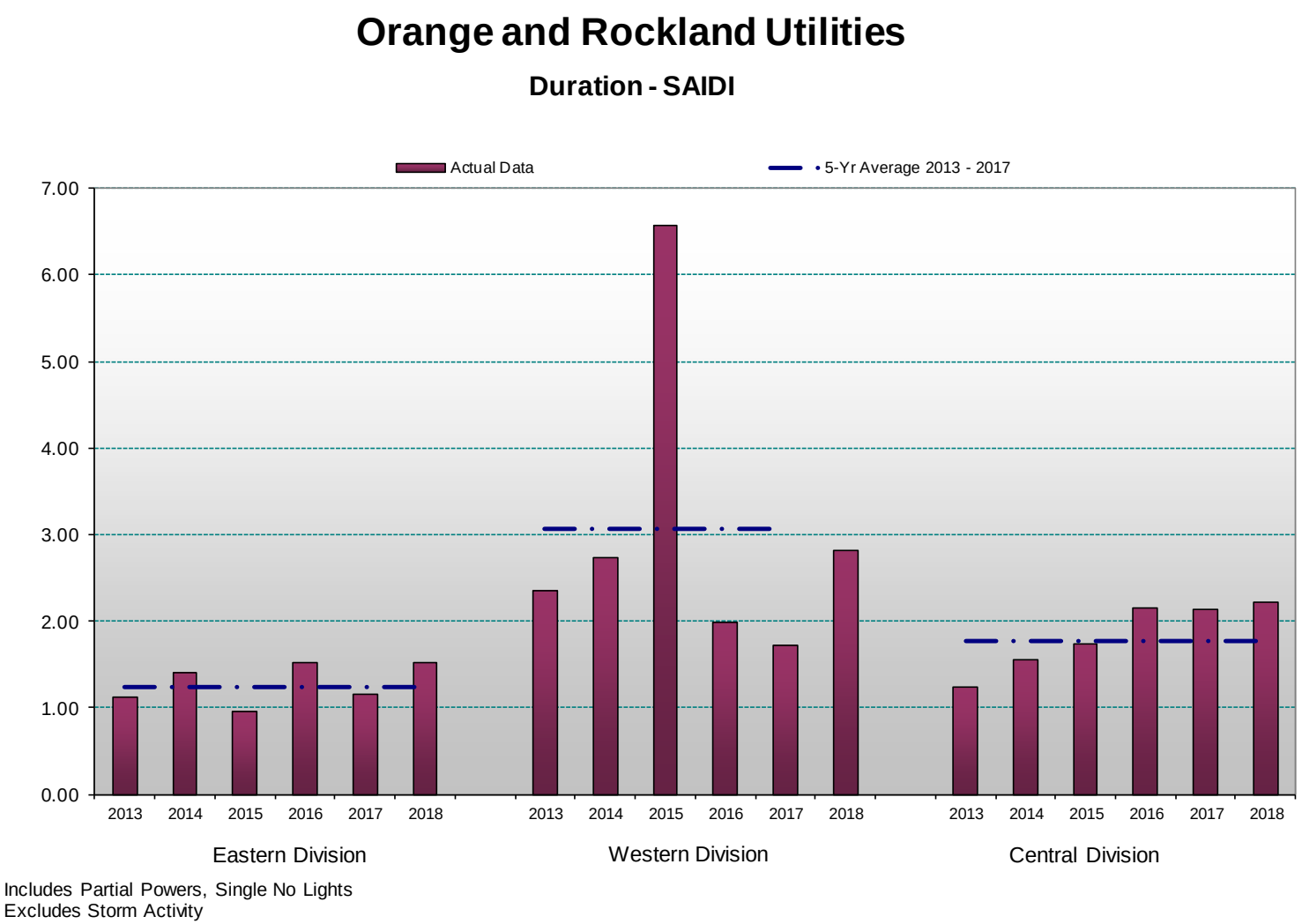

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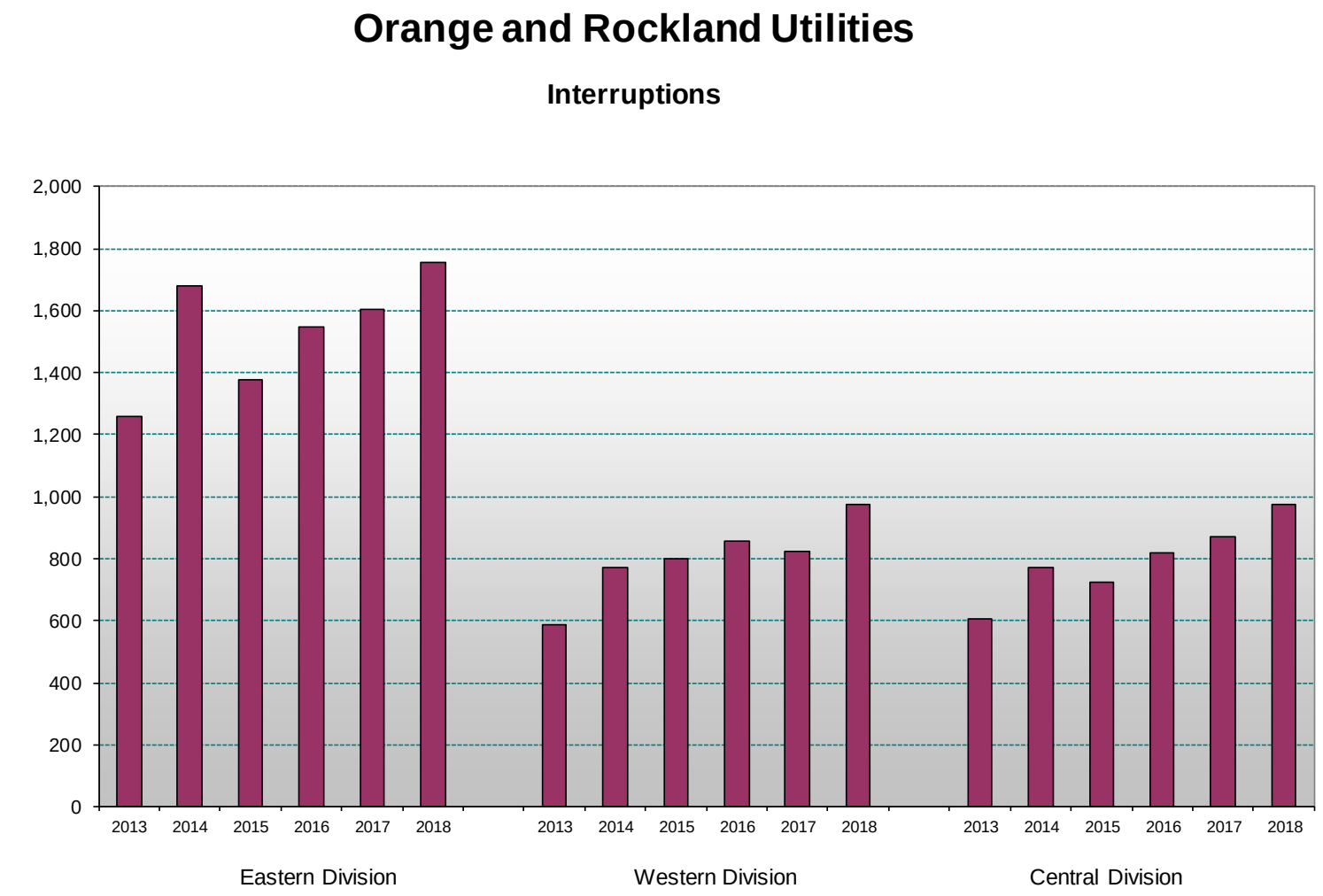
Figure 2.4 - Interruptions



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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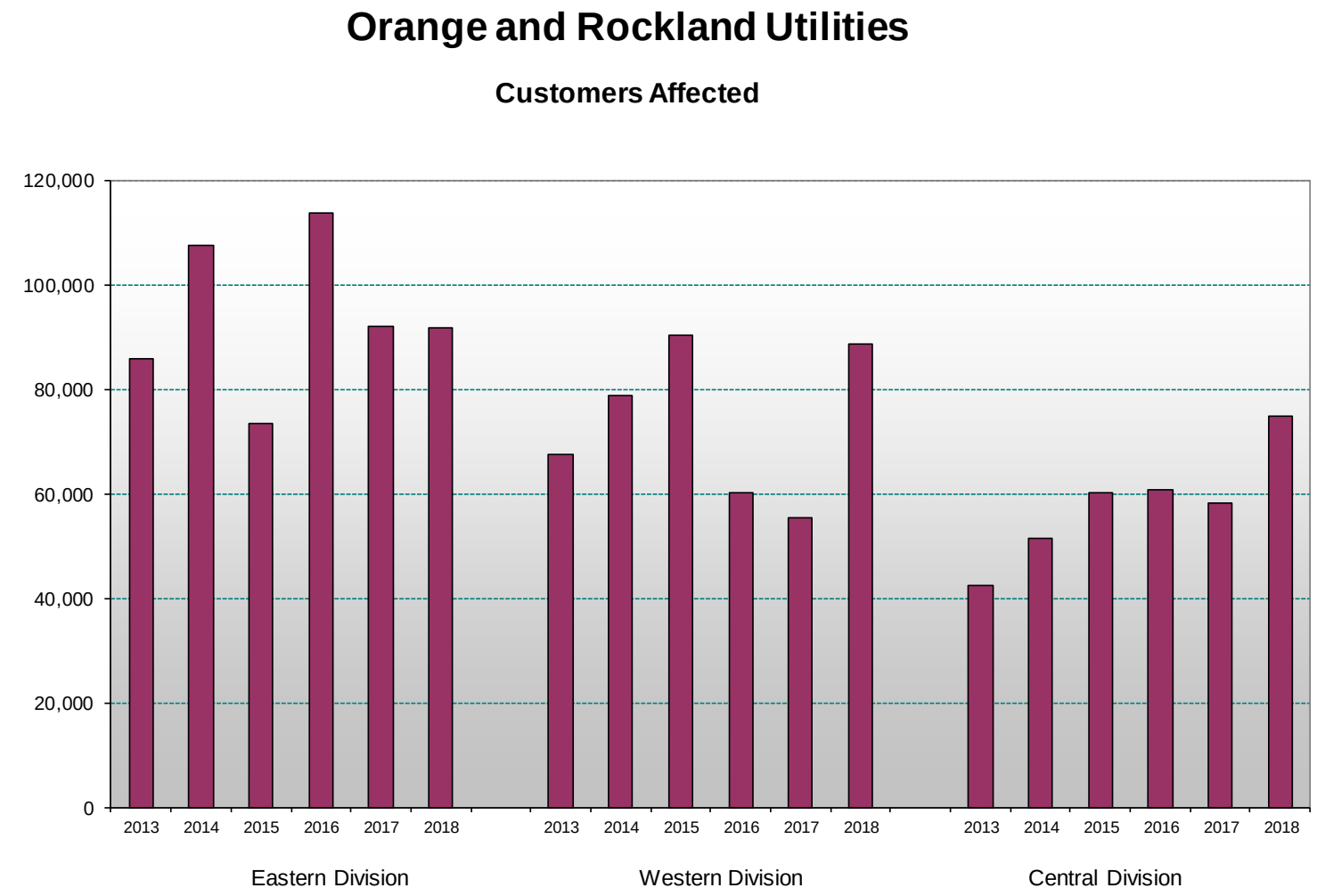
Figure 2.5 - Customers Affected



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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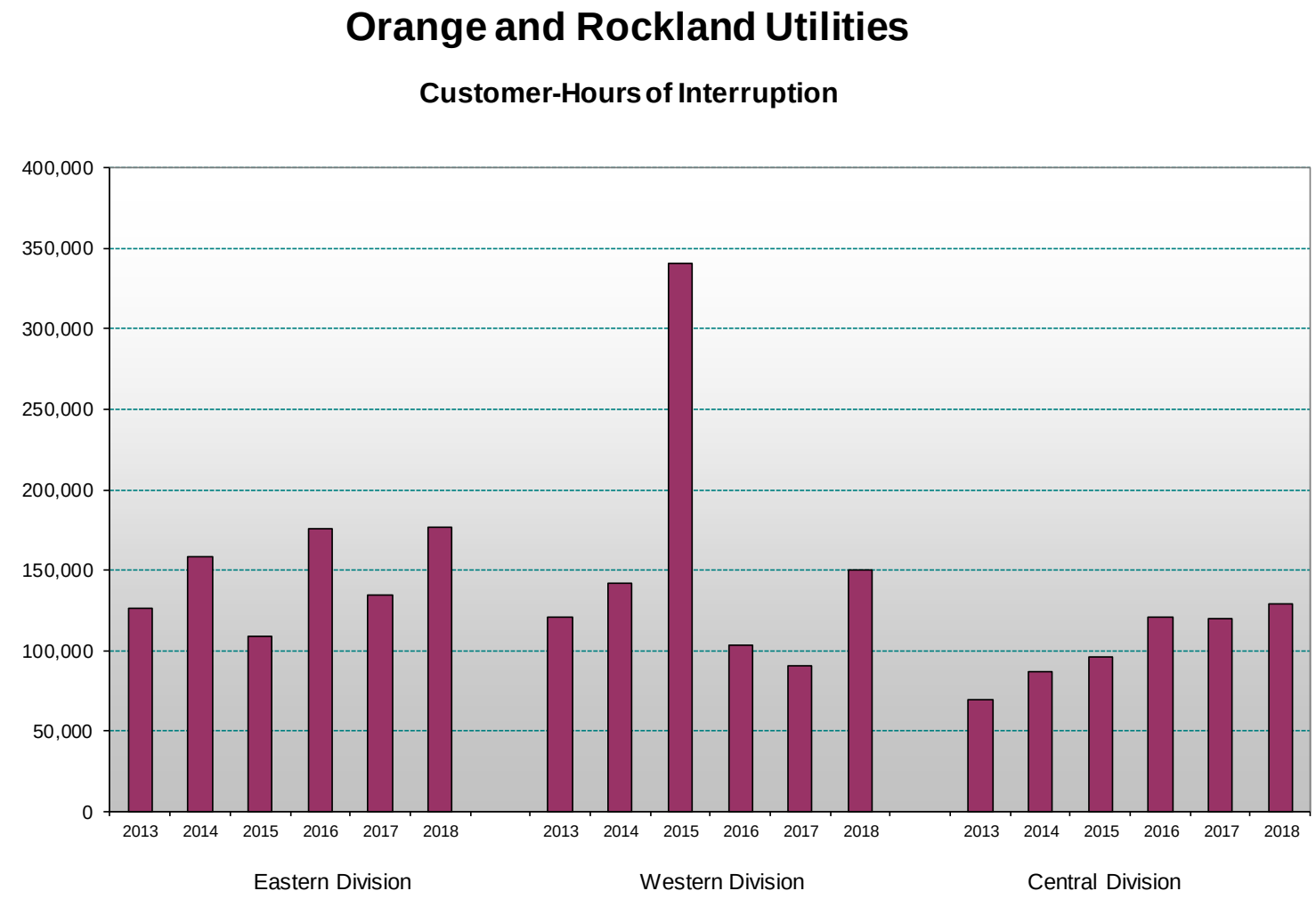
Figure 2.6 - Customer-Hours of Interruption



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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Figure 2.7 - Outage Statistics by Cause (No. of Interruptions, Cust. Affected and Cust-Hrs of Interruption)

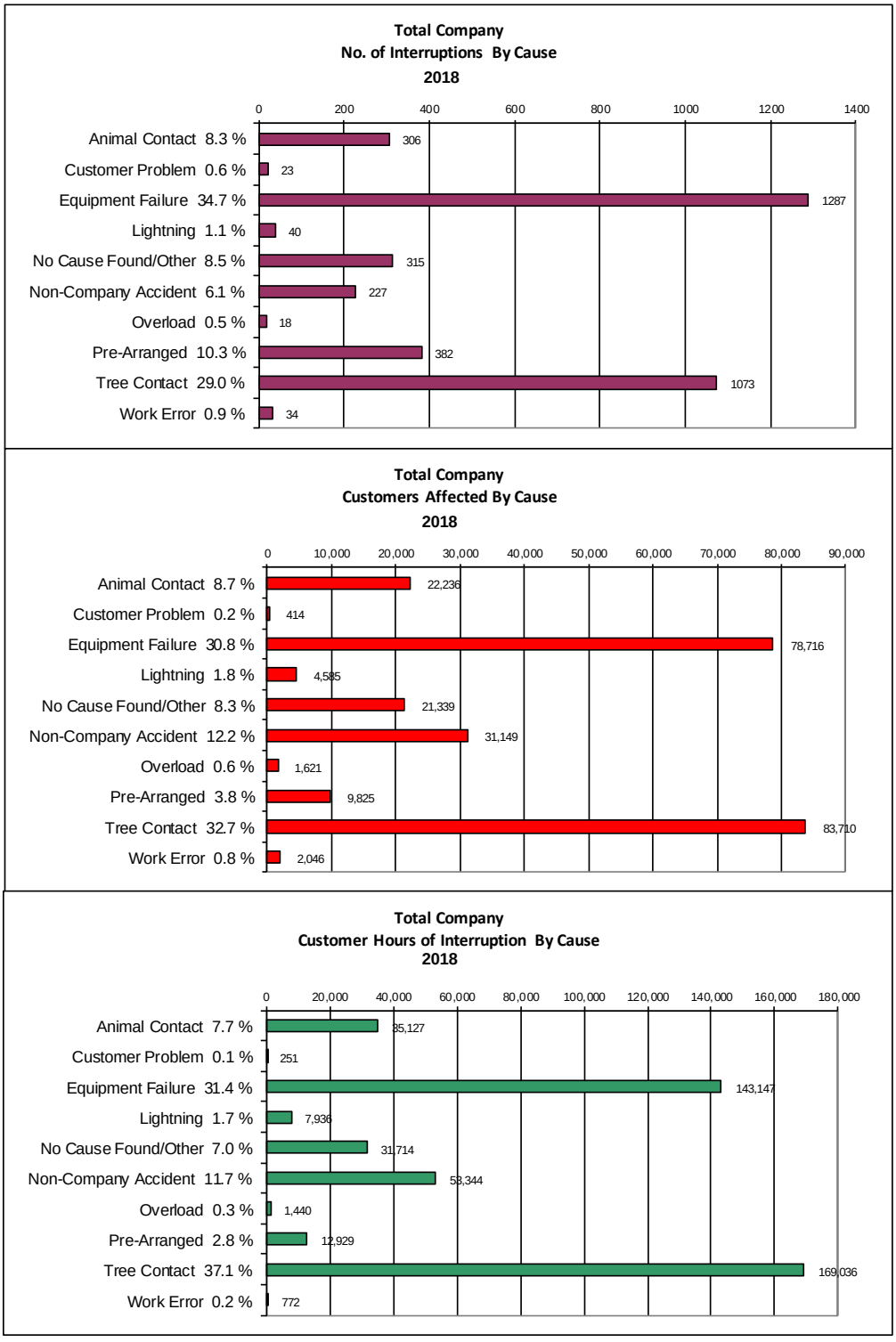

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TABLE 2.2 – 5-YEAR NEW YORK EQUIPMENT FAILURES BY TYPE AND FAILURE CODE

		Number of Interruptions By Year						
		2013	2014	2015	2016	2017	5-Yr Ave	2018
Outage Type	Equipment							
Overhead	Arrester	10	20	10	11	21	14	18
	Capacitor	0	0	1	0	0	0	1
	Connecter/Splice - Pri	66	67	42	91	57	65	65
	Connecter/Splice - Sec	282	365	274	197	225	269	340
	Disconnect	1	1	1	2	0	1	5
	Electric Meter	3	7	4	1	10	5	7
	Fuse/Cutout/Eld	42	56	54	55	65	54	55
	GOAB	2	3	1	2	0	2	2
	Hardware/Pole	59	92	79	65	63	72	75
	Insulator	9	5	7	12	6	8	3
	Not Coded	0	0	0	1	10	2	12
	O/H Step Transf	9	9	7	6	2	7	11
	O/H Transformer	154	192	170	182	157	171	177
	Recloser	2	0	1	1	0	1	5
	Regulator	0	0	1	3	1	1	0
	Riser Pole Cutout	22	11	14	11	9	13	20
	Sectionalizer	0	2	0	1	0	1	0
	Wire/Cable - Pri	42	59	50	76	82	62	62
	Wire/Cable - Sec	71	94	59	69	84	75	102
	Total - OH	774	983	775	786	792	822	960
Trans/Substa	Brkr/Kyle/Switch	7	4	9	5	7	6	4
	Buss	0	0	44	0	0	9	5
	Fuse/ Fuse Holder	0	3	1	0	0	1	0
	Insulator	1	1	0	2	0	1	0
	Not Coded	1	0	0	0	0	0	1
	Relay/Battery/Coil	1	4	0	0	0	1	0
	Transformer	0	4	0	2	0	1	1
	Total - Trans/Substation	10	16	54	9	7	19	11
Underground	Arrester	0	2	0	0	0	0	0
	Boxpad/Silo/Vault	1	3	6	2	2	3	3
	Bushing	0	0	1	0	0	0	2
	Connecter/Splice - Pri	0	0	0	0	0	0	1
	Connecter/Splice - Sec	0	0	0	0	1	0	15
	Elbow	7	7	1	5	6	5	9
	Fuse/Cutout/Eld	0	0	0	0	0	0	1
	Hardware/Pole	0	0	3	1	0	1	5
	Not Coded	0	0	0	0	3	1	3
	O/H Transformer	0	0	0	0	0	0	3
	Padmount Transf	59	65	85	87	74	74	88
	Splice/Junction - Pri	3	4	5	8	1	4	5
	Splice/Junction - Sec	19	27	39	27	31	29	34
	Stress Cone	1	8	5	4	12	6	3
	Submersible Transf	1	0	0	0	0	0	2
	Switch	0	2	1	1	1	1	5
	Wire/Cable - Pri	69	60	67	87	81	73	54
	Wire/Cable - Sec	43	62	52	37	46	48	83
	Total - UG	203	240	265	259	258	245	316
	Total - Year	987	1,239	1,094	1,054	1,057	1,086	1,287

Note: Figures in red denote that the value exceeds the 5-year average

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TABLE 2.2 – 5-YEAR NEW YORK EQUIPMENT FAILURES BY TYPE AND FAILURE CODE (CONT.)

		Customers Affected By Year						
		2013	2014	2015	2016	2017	5-Yr Ave	2018
Outage Type	Equipment							
Overhead	Arrester	205	552	292	590	364	401	540
	Capacitor	0	0	2,328	0	0	466	35
	Connecter/Splice - Pri	7,390	6,102	997	6,156	1,253	4,380	2,192
	Connecter/Splice - Sec	452	612	468	307	506	469	671
	Disconnect	3,104	958	1,094	341	0	1,099	6,270
	Electric Meter	13	11	4	1	11	8	11
	Fuse/Cutout/Eld	1,639	3,426	2,715	1,787	1,799	2,273	1,831
	GOAB	2,194	3,221	1,416	491	0	1,464	2,747
	Hardware/Pole	14,987	18,816	9,266	10,162	9,748	12,596	11,600
	Insulator	1,498	461	592	3,883	253	1,337	48
	Not Coded	0	0	0	1	163	33	2,641
	O/H Step Transf	404	181	998	299	326	442	984
	O/H Transformer	3,380	8,554	6,074	7,475	6,033	6,303	3,932
	Recloser	1,209	0	1	1,393	0	521	4,916
	Regulator	0	0	34	0	482	103	0
	Riser Pole Cutout	709	116	222	528	266	368	419
	Sectionalizer	0	1,274	0	217	0	298	0
	Wire/Cable - Pri	9,221	10,700	10,261	19,945	17,251	13,476	21,681
	Wire/Cable - Sec	278	309	200	251	310	270	1,277
	Total - OH	46,683	55,293	36,962	53,827	38,765	46,306	61,795
Trans/Substa	Brkr/Kyle/Switch	8,045	4,438	5,631	2,796	3,134	4,809	4,318
	Buss	0	0	46,202	0	0	9,240	6,778
	Fuse/ Fuse Holder	0	2,129	1	0	0	426	0
	Insulator	619	885	0	2,068	0	714	0
	Not Coded	2,982	0	0	0	0	596	1,263
	Relay/Battery/Coil	2,245	2,378	0	0	0	925	0
	Transformer	0	7,663	0	1,679	0	1,868	1,146
	Total - Trans/Substation	13,891	17,493	51,834	6,543	3,134	18,578	13,505
Underground	Arrester	0	40	0	0	0	8	0
	Boxpad/Silo/Vault	40	76	134	10	117	75	4
	Bushing	0	0	4	0	0	1	71
	Connecter/Splice - Pri	0	0	0	0	0	0	4
	Connecter/Splice - Sec	0	0	0	0	1	0	44
	Elbow	552	215	785	103	393	410	1,661
	Fuse/Cutout/Eld	0	0	0	0	0	0	54
	Hardeware/Pole	0	0	5	2	0	1	57
	Not Coded	0	0	0	0	14	3	65
	O/H Transformer	0	0	0	0	0	0	21
	Padmount Transf	743	667	1,244	1,279	968	980	959
	Riser Pole Cutout	0	0	0	0	0	0	434
	Splice/Junction - Pri	735	70	113	427	1	269	131
	Splice/Junction - Sec	63	42	63	43	78	58	57
	Stress Cone	121	1,899	42	103	122	457	39
	Submersible Transf	10	0	0	0	0	2	10
	Switch	0	117	1	139	27	57	192
	Wire/Cable - Pri	2,102	1,561	2,160	3,196	3,072	2,418	1,743
	Wire/Cable - Sec	86	120	127	136	67	107	238
	Total - UG	4,452	4,807	4,678	5,438	4,860	4,846	5,784
	Total - Year	65,026	77,593	93,474	65,808	46,759	69,730	81,084

Note: Figures in red denote that the value exceeds the 5-year average

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TABLE 2.2 – 5-YEAR NEW YORK EQUIPMENT FAILURES BY TYPE AND FAILURE CODE (CONT.)

Total Minutes of Interruption By Year

Outage Type	Equipment	2013	2014	2015	2016	2017	5-Yr Ave	2018
Overhead	Arrester	19,915	52,331	50,240	56,695	32,425	42,321	104,179
	Capacitor	0	0	107,088	0	0	21,418	1,400
	Connecter/Splice - Pri	435,568	319,300	92,260	408,603	149,734	281,093	265,982
	Connecter/Splice - Sec	65,187	87,204	67,192	51,996	88,641	72,044	142,187
	Disconnect	121,466	98,827	21,377	24,325	0	53,199	207,966
	Electric Meter	1,450	1,652	437	30	2,245	1,163	1,958
	Fuse/Cutout/Eld	202,757	246,990	267,736	208,902	168,490	218,975	149,297
	GOAB	30,020	232,278	73,066	14,665	0	70,006	95,683
	Hardware/Pole	1,266,179	1,779,562	719,794	529,475	866,992	1,032,400	1,372,189
	Insulator	156,137	51,146	9,666	420,173	26,753	132,775	7,125
	Not Coded	0	0	0	254	14,707	2,992	30,117
	O/H Step Transf	77,764	74,586	199,602	65,507	14,293	86,350	267,959
	O/H Transformer	414,991	811,292	620,454	657,153	431,396	587,057	576,195
	Recloser	45,490	0	30	165,643	0	42,233	264,080
	Regulator	0	0	714	0	2,410	625	0
	Riser Pole Cutout	67,674	9,647	45,760	82,670	28,733	46,897	94,874
	Sectionalizer	0	98,708	0	1,897	0	20,121	0
	Wire/Cable - Pri	897,327	1,504,804	860,460	1,998,282	1,347,172	1,321,609	1,989,480
	Wire/Cable - Sec	52,032	39,667	28,801	45,254	43,132	41,777	252,437
	Total - OH	3,853,957	5,407,994	3,164,677	4,731,524	3,217,123	4,075,055	5,823,108
Trans/Substa	Brkr/Kyle/Switch	1,348,243	431,803	757,406	125,001	154,511	563,393	424,777
	Buss	0	0	14,091,854	0	0	2,818,371	339,554
	Fuse/ Fuse Holder	0	266,131	402	0	0	53,307	0
	Insulator	59,424	14,160	0	54,334	0	25,584	0
	Not Coded	427,355	0	0	0	0	85,471	144,812
	Relay/Battery/Coil	103,469	44,272	0	0	0	29,548	0
	Transformer	0	68,967	0	126,698	0	39,133	101,994
	Total - Trans/Substation	1,938,491	825,333	14,849,662	306,033	154,511	3,614,807	1,011,137
Underground	Arrester	0	16,762	0	0	0	3,352	0
	Boxpad/Silo/Vault	22,360	31,508	50,159	2,710	8,034	22,954	433
	Bushing	0	0	584	0	0	117	16,754
	Connecter/Splice - Pri	0	0	0	0	0	0	348
	Connecter/Splice - Sec	0	0	0	0	337	67	24,234
	Elbow	123,043	59,873	70,710	21,725	97,268	74,524	375,608
	Fuse/Cutout/Eld	0	0	0	0	0	0	13,122
	Hardeware/Pole	0	0	1,242	255	0	299	10,581
	Not Coded	0	0	0	0	5,314	1,063	23,413
	O/H Transformer	0	0	0	0	0	0	2,515
	Padmount Transf	165,504	245,821	278,282	403,628	175,235	253,694	277,579
	Riser Pole Cutout	0	0	0	0	0	0	94,095
	Splice/Junction - Pri	97,676	14,483	46,111	174,473	124	66,573	53,027
	Splice/Junction - Sec	14,409	11,065	29,816	19,077	27,234	20,320	28,066
	Stress Cone	13,528	108,285	5,952	30,905	34,998	38,734	2,778
	Submersible Transf	3,260	0	0	0	0	652	7,005
	Switch	0	14,022	152	26,549	11,475	10,440	48,300
	Wire/Cable - Pri	501,918	435,066	610,151	1,009,882	790,697	669,543	658,079
	Wire/Cable - Sec	41,685	52,008	55,483	45,685	42,251	47,422	118,659
	Total - UG	983,383	988,893	1,148,642	1,734,889	1,192,967	1,209,754	1,754,596
	Total - Year	6,775,831	7,222,220	19,162,981	6,772,446	4,564,601	8,899,616	8,588,841

Note: Figures in red denote that the value exceeds the 5-year average

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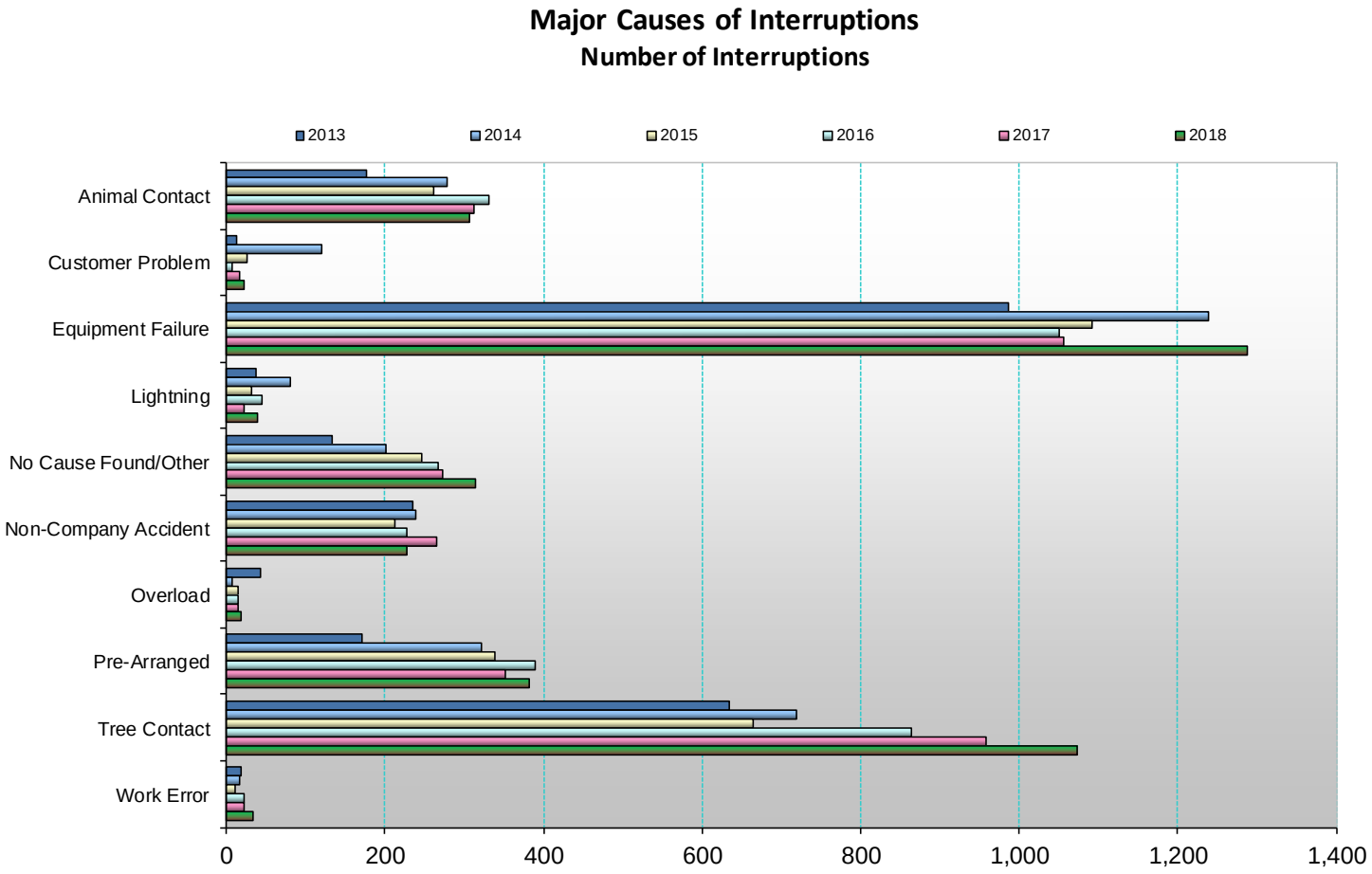
Figure 2.8 - 5-Year Comparison – Number of Interruptions by Cause



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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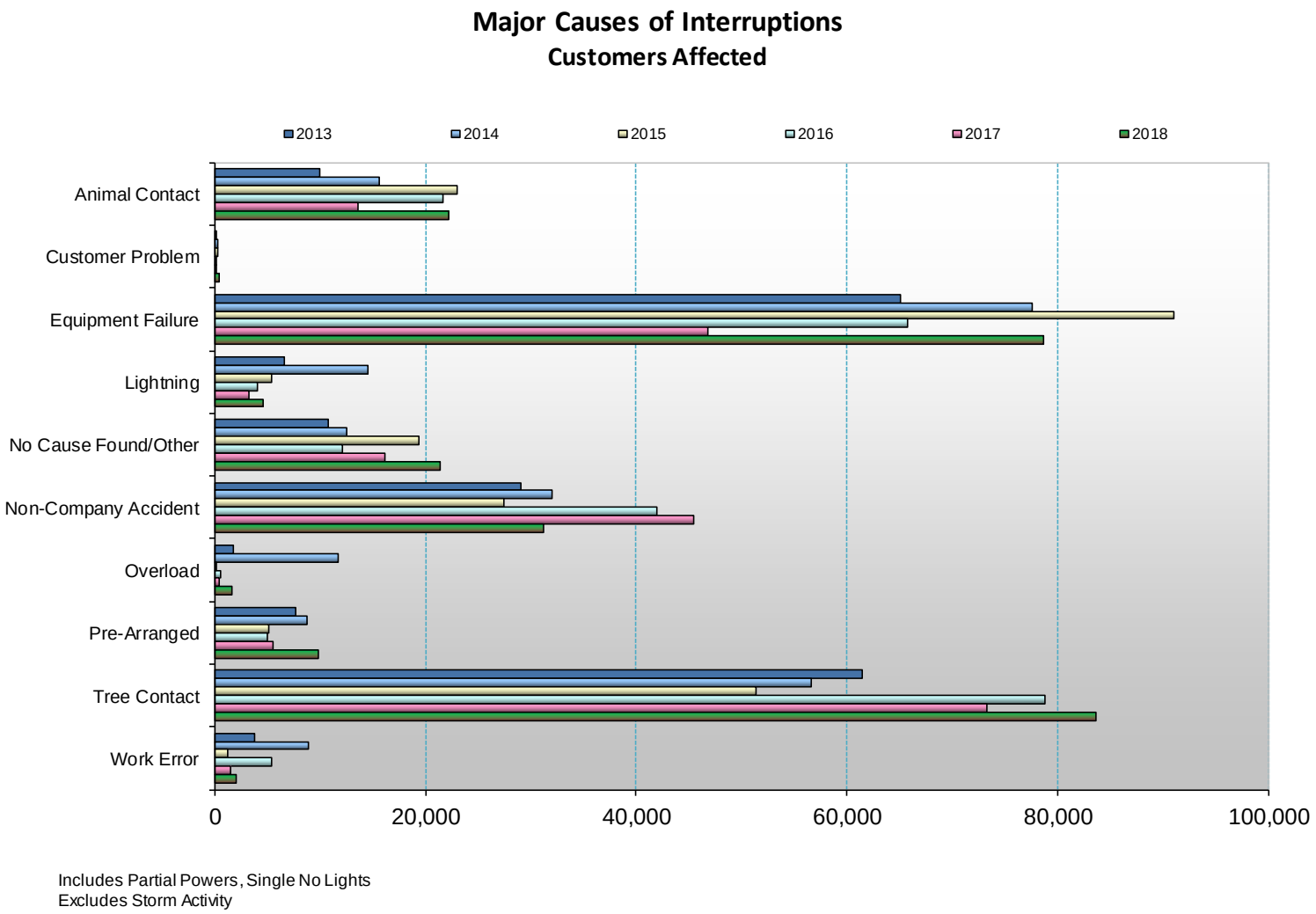
Figure 2.9 - 5-Year Comparison – Customers Affected by Cause



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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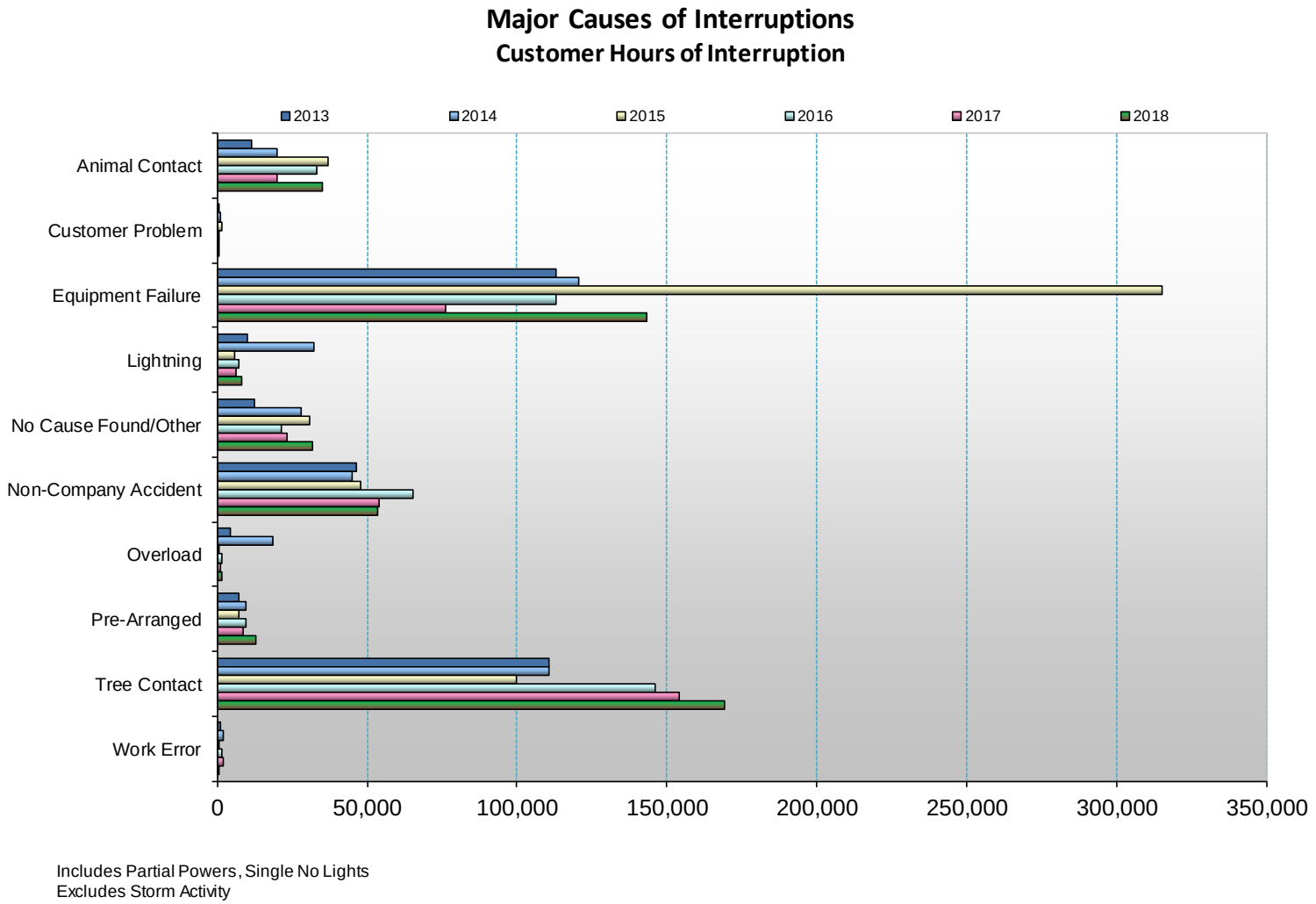
Figure 2.10 - 5-Year Comparison - Customer Hours of Interruption by Major Cause



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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Figure 2.11 - 5-Year Comparison - Customers per Interruption (With and Without Storm)

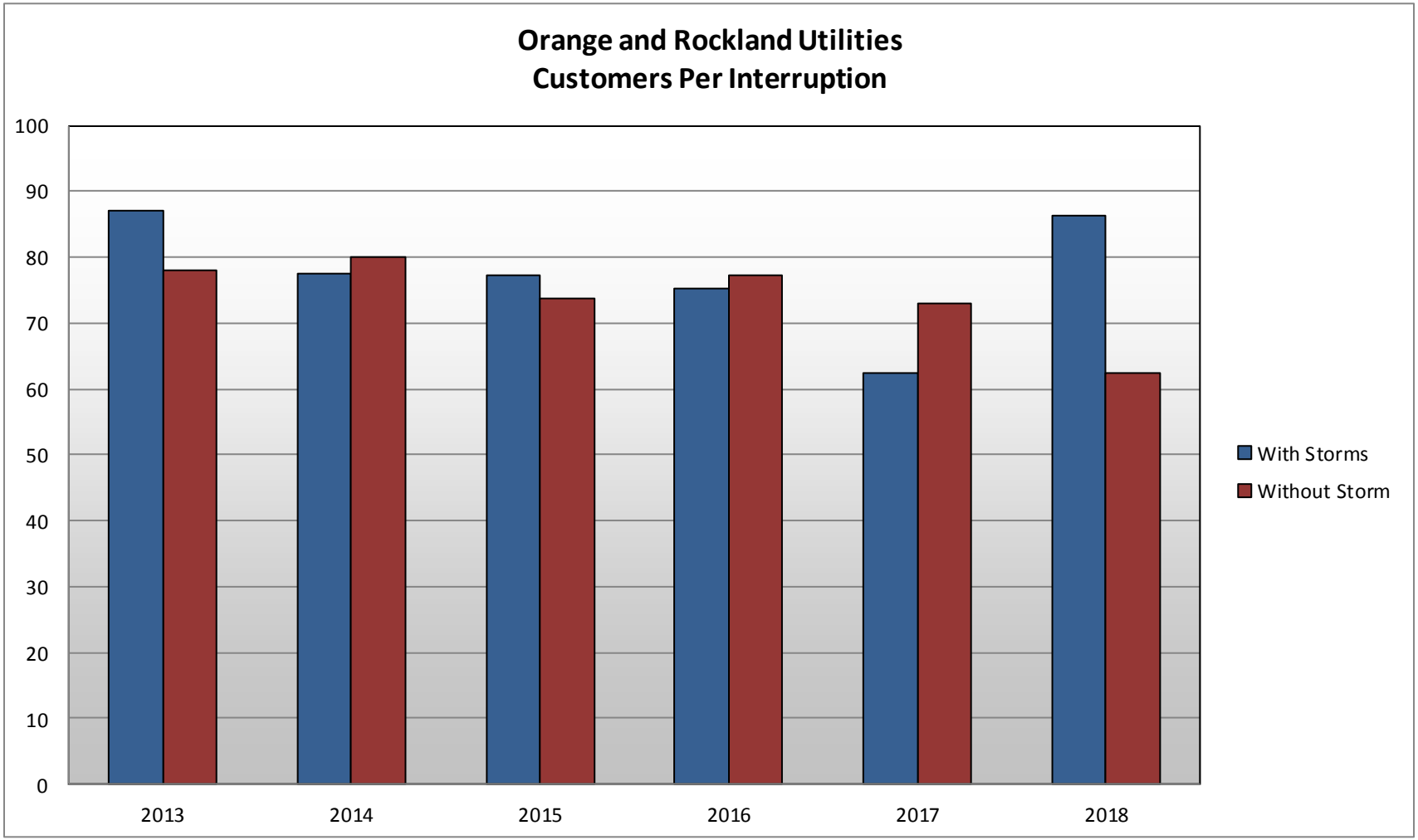

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TABLE 2.3 - 5-YR COMPARISON – LARGE OUTAGE IMPACT ON SAIFI, CAIDI & SAIDI

Company Without Storms
Effect of Interruptions Affecting 5,000 or more Customers

YEAR	CUSTOMERS SERVED (CS)	# OF INTERRUPTIONS	CUSTOMERS AFFECTED (CA)	CUSTOMER MINUTES OF INTERRUPTION (CM)	FREQUENCY (CA/CS)	RESTORATION (CM/CA)	DURATION (CM/CS)
WITHOUT STORMS							
2013	219,695	2,449	195,880	18,989,170	0.89	1.62	1.44
2014	220,722	3,225	238,225	23,220,544	1.08	1.62	1.75
2015	220,280	2,900	224,054	32,748,804	1.02	2.44	2.48
2016	222,510	3,223	234,934	23,937,832	1.06	1.70	1.79
2017	224,402	3,297	205,774	20,707,829	0.92	1.68	1.54
5-Yr Average	**221,522**	**3,019**	**219,773**	**23,920,836**	**0.99**	**1.68**	**1.66**
2018	227,222	3,705	255,641	27,341,380	1.13	1.78	2.01

WITHOUT STORMS - OUTAGES AFFECTING > 5000 CUSTOMERS

YEAR	SERVED	INTERR's	CUST AFF	
2013	219,695	-	-	-
2014	220,722	3	24,496	2,086,440
2015	220,280	3	56,648	15,404,460
2016	222,510	2	10,998	893,520
2017	224,402	-	-	-
5-Yr Average	**221,522**	**1.60**	**18,428**	**3,676,884**
2018	227,222	2	12,222	9,937

WITHOUT STORMS AND WITHOUT THOSE OUTAGES AFFECTING > 5000 CUSTOMERS

2013	219,695	2,449	195,880	18,989,170	0.89	1.62	1.44
2014	220,722	3,222	213,729	21,134,104	0.97	1.65	1.60
2015	220,280	2,897	167,406	17,344,344	0.76	1.73	1.31
2016	222,510	3,221	223,936	23,044,312	1.01	1.72	1.73
2017	224,402	3,297	205,774	20,707,829	0.92	1.68	1.54
5-Yr Average	**221,522**	**3,017**	**201,345**	**20,243,952**	**0.91**	**1.68**	**1.52**
2018	227,222	3,703	243,419	27,331,443	1.07	1.87	2.00

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3. EASTERN DIVISION

3.1. 2018 Divisional Performance

In 2018, the year-end frequency for the Eastern Division was 0.79 customers affected per customer served, consistent with historical norms. This performance result was better than the Division's previous five-year average of 0.83, and better than the NYPSC standard of 1.20. However, the year-end restoration of 1.92 customer hours of interruption per customer-affected was above the division's 1.46 performance in 2017 and also the 1.49 previous five-year average. The performance of these indices on a monthly basis, from 2013 through 2018, is shown in Table 3-1.

Figures 3-1, 3-2, and 3-3, show performance trends, on a rolling 12-month basis, from 2013 through 2018. The monthly number of interruptions has trended slightly upward since the end of 2015 after seeing a peak in 2014 and then a gradual decrease through calendar year 2015. In October 2018, the rolling average eclipsed the 2014 peak by 81 interruptions (1781 versus 1700) and the trend continues upward. The rolling 12-month average number of customers affected remained well below the five-year high reached at the end of 2016 but in August 2018 the customer hours of interruption exceeded the previous 12 month high establish in November 2016 by 10,000 customer hours. The increase in the number of annual customer hours directly mirrors the Company's overall performance in terms of the driving factors (mostly weather related).

Figure 3-4 shows a summary, by cause, for the number of interruptions, customers affected, and the customer hours of interruption experienced in 2018. The two major causes of interruptions were equipment failures and tree contacts, consistent with historical norms. The reporting of partial power and single customer interruptions greatly contributes to the number of interruptions for these two cause codes. Of the 432 interruptions in the tree caused category, 157 (36%) were attributable to partial power or single customer conditions. Of the 696 interruptions in the equipment failure category, 330 (47%) were attributable to partial power or single customer conditions. Both of these results were consistent with the 2015 through 2017 performance of the division.

A graphic representation, by major cause, is depicted in Figures 3-5, 3-6, and 3-7, which show the annual contribution to the number of interruptions, customers affected, and customer hours of interruption, respectively, from 2013 through 2018. With regards to equipment failures, all three metrics increased significantly in 2018 as compared to 2017 in the division. The main driver of the increase was an increase in overhead primary wire failures on mainline spacer construction. Because of the impact that this category of outages had on the division's performance in 2018, the Company is analyze individual outages that occurred in 2018 for any potential commonality

The tree contacts and equipment failures categories swapped position in terms of being the largest contributor to customer-hours of interruption in the division. From 2013 through 2015, the equipment failures category was the largest contributor. For 2016 and 2017, tree contacts were the largest contributor. In 2018, equipment failures again contributed the most to customer hours

of interruption. The driver for the reversal in positions was the increase in primary conductor failures discussed above, which contributed 35% of the customer hours of interruption in the division in 2018.

As shown in Table 3.2, overall equipment failures were up from 2017 levels, when the division experienced five-year lows in the number of failures, the number of customers affected and the number of customer-hours of interruption. The division's performance also exceeded both the previous five-year averages as well. While the number of failures occurring within the division were up slightly, both customers affected and hours of interruption were up significantly, indicating a shift in the impact of failures from spur lines to circuit mainline as discussed above. In addition to analyzing the individual interruptions that drove the customers affected and customer hours up, the Company is also analyzing these results at a higher level to determine if any patterns are emerging that would require a shift in reliability focus.

In 2018, there were no major outages in the Eastern Division that affected more than 5,000 customers. Table 3-3 shows the Eastern Division history from 2013 through 2018. The Company storm statistics and analysis table is shown in Appendix E. In 2018, there were five events that met the major storm criteria for the Eastern Division.

All of the circuits that serve Eastern Division customers are listed in Appendix D, first in the order of decreasing frequency and then by decreasing restoration. There are 94 circuits that serve New York customers in the Eastern Division. 14 circuits were not considered for this evaluation because the number of customers served did not exceed 100, or the number of interruptions did not exceed three. Of the 80 remaining circuits, 62 (66%) met the frequency standard, and 29 (31%) met the restoration standard. This is an improvement from 2017 SAIFI when 58 (69%) met the frequency standard, but a decrease from 2017's CAIDI when 39 (46%) met the restoration standard.

For the Eastern Division, $MAIFI_e$ in 2018 was 13.24 based upon 116,354 customers served and a total of 1,541,568 momentary interruptions experienced by customers. This is a significant change (87% increase) from 2017's performance of 7.07. As discussed in earlier in the report, the Company believes that vegetation was a significant driving factor in the performance of the T&D system in 2018, and that incidental tree or vine contacts with energized conductors drove up the division's $MAIFI_e$. Currently the Company calculates $MAIFI_e$ based on operations from the substation breaker that supply the circuit.

There are 94 circuits serving the Eastern Division. Appendix A details the circuit priority ratings for all of O&R's distribution circuits. Only circuits that serve at least 40% of the Company's New York customers, with respect to its total number of customers served, were considered for evaluation in the worst performing circuit analysis for this report.

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TABLE 3.1 - 5-YEAR COMPARISON – FREQUENCY AND RESTORATION BY MONTH

EASTERN DIVISION - NYS - ALL OUTAGES - WITHOUT STORMS
calculations for calendar year reliability goals

FREQUENCY - CUSTOMERS AFFECTED / CUSTOMERS SERVED

MONTH	2013	2014	2015	2016	2017	5 YR AVG	2018 ACTUAL Monthly	2018 ACTUAL Y-T-D
JAN	0.05	0.07	0.05	0.08	0.02	0.05	0.05	0.05
FEB	0.06	0.08	0.05	0.08	0.07	0.05	0.05	0.11
MAR	0.04	0.03	0.05	0.06	0.15	0.04	0.02	0.13
APR	0.06	0.04	0.05	0.13	0.18	0.06	0.06	0.19
MAY	0.07	0.04	0.03	0.09	0.25	0.05	0.09	0.27
JUN	0.14	0.08	0.07	0.09	0.37	0.08	0.10	0.37
JLY	0.09	0.12	0.09	0.11	0.44	0.08	0.12	0.49
AUG	0.10	0.08	0.05	0.09	0.49	0.06	0.09	0.59
SEP	0.04	0.09	0.09	0.07	0.56	0.06	0.04	0.62
OCT	0.03	0.12	0.04	0.10	0.64	0.06	0.06	0.68
NOV	0.04	0.15	0.03	0.05	0.76	0.05	0.04	0.72
DEC	0.03	0.06	0.04	0.04	0.80	0.04	0.07	0.79
						0.67		
YR END	0.76	0.95	0.65	0.99	0.80	0.83		0.79

RESTORATION - MINUTES OF INTERR / CUST AFFECTED

MONTH	2013	2014	2015	2016	2017	5 YR AVG	2018 ACTUAL Monthly	2018 ACTUAL Y-T-D
JAN	78.86	89.48	59.13	91.55	95.90	63.80	94.87	94.87
FEB	88.05	160.37	69.65	95.56	73.24	82.72	119.82	107.41
MAR	69.75	76.98	61.92	100.58	106.31	61.85	126.28	109.94
APR	122.28	63.62	108.48	53.84	73.95	69.64	106.63	108.85
MAY	53.65	80.40	79.10	85.43	89.09	59.72	94.81	104.45
JUN	94.04	78.43	109.95	105.09	69.77	77.50	97.83	102.71
JLY	102.82	133.35	109.77	125.37	79.08	94.26	118.55	106.66
AUG	82.94	95.99	94.32	89.98	90.47	72.65	160.32	115.15
SEP	83.16	80.87	81.81	82.98	72.40	65.76	139.02	116.53
OCT	79.46	45.76	92.94	88.84	129.51	61.40	139.15	118.60
NOV	84.36	64.10	98.74	116.80	81.79	72.80	99.96	117.58
DEC	102.52	88.02	91.68	106.86	85.98	77.82	88.71	115.07
YR END(Min)	88.09	88.10	89.26	92.50	87.68	89.13		115.07
YR END(Hr)	1.47	1.47	1.49	1.54	1.46	1.49		1.92

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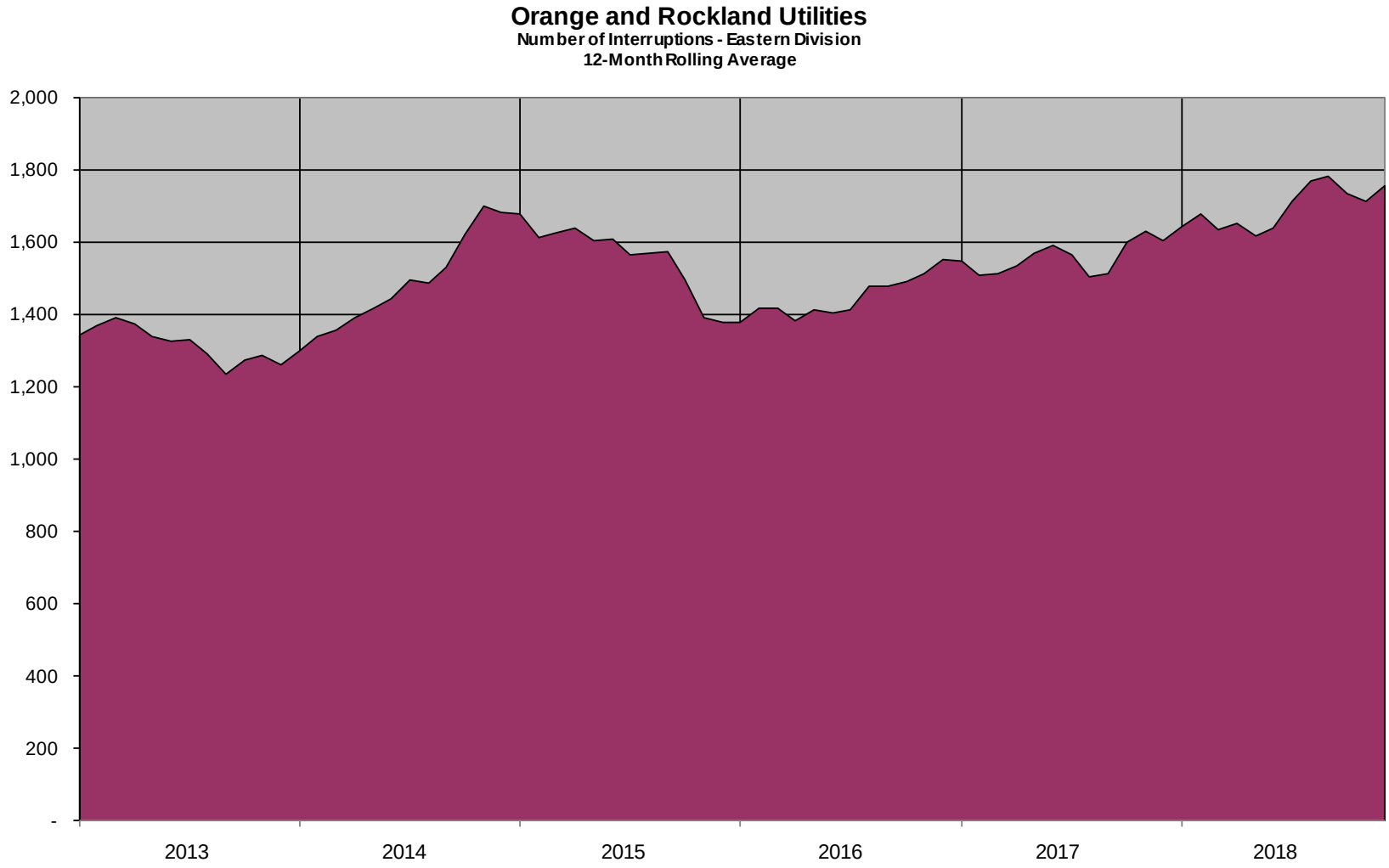
FIGURE 3.1 - 12-MONTH ROLLING AVERAGE – NUMBER OF INTERRUPTIONS



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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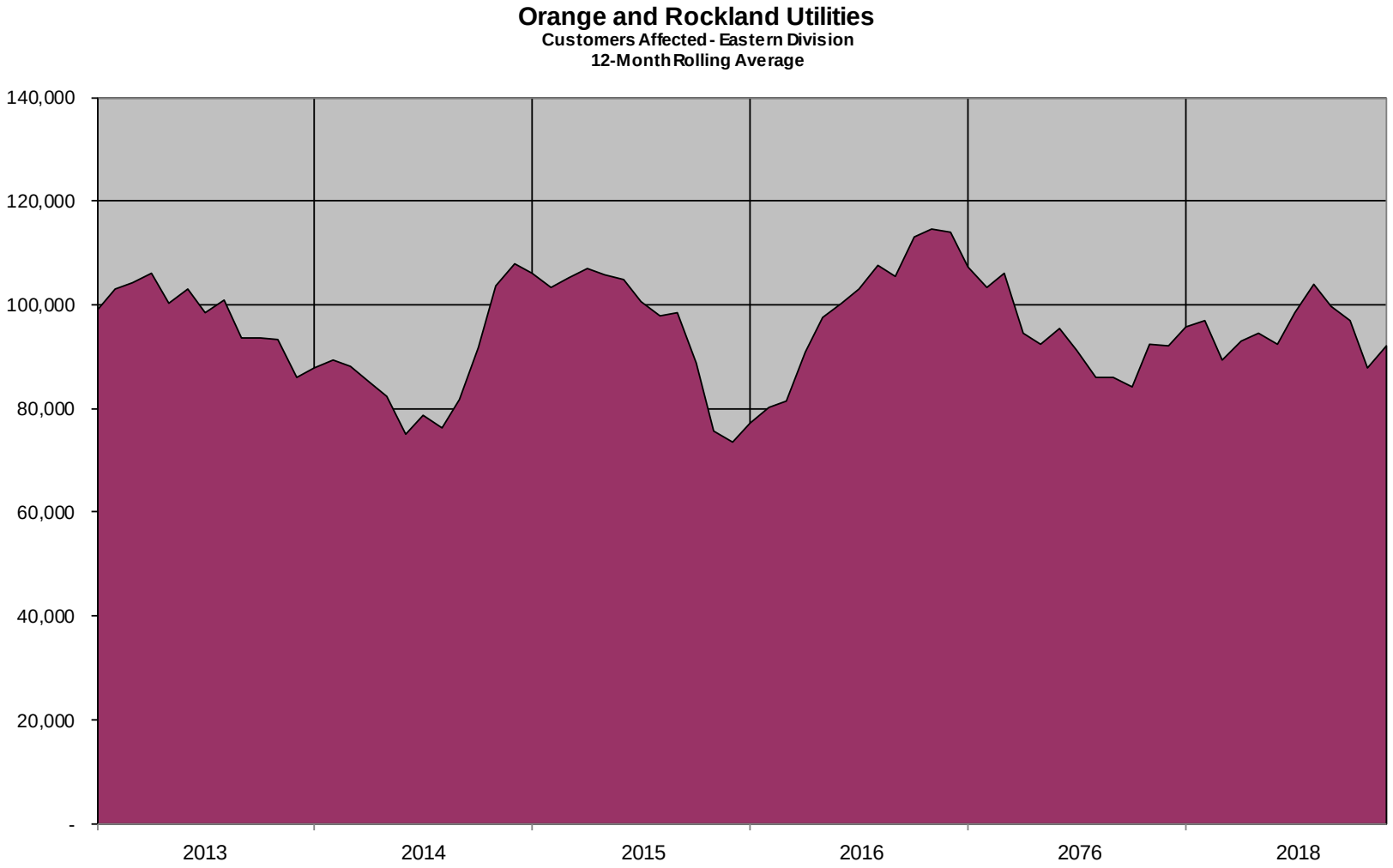
FIGURE 3.2 - 12-MONTH ROLLING AVERAGE – CUSTOMERS AFFECTED



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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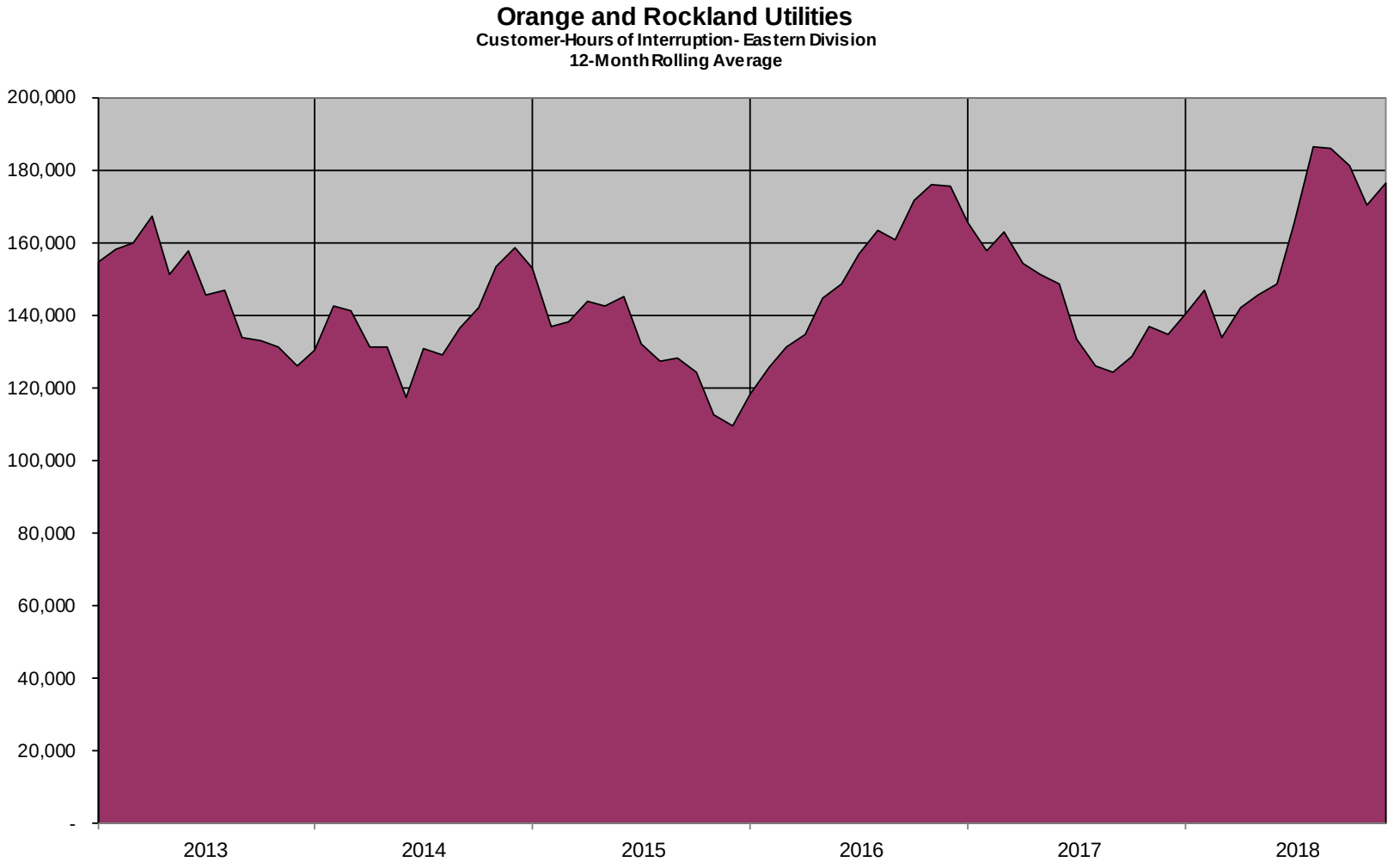
FIGURE 3.3 - 12-MONTH ROLLING AVERAGE – CUSTOMER-HOURS OF INTERRUPTIONS



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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FIGURE 3.4 - OUTAGE STATISTICS BY CAUSE (NO. OF INTERRUPTIONS, CUSTS. AFFECTED AND CUST-HRS OF INTERRUPTION)

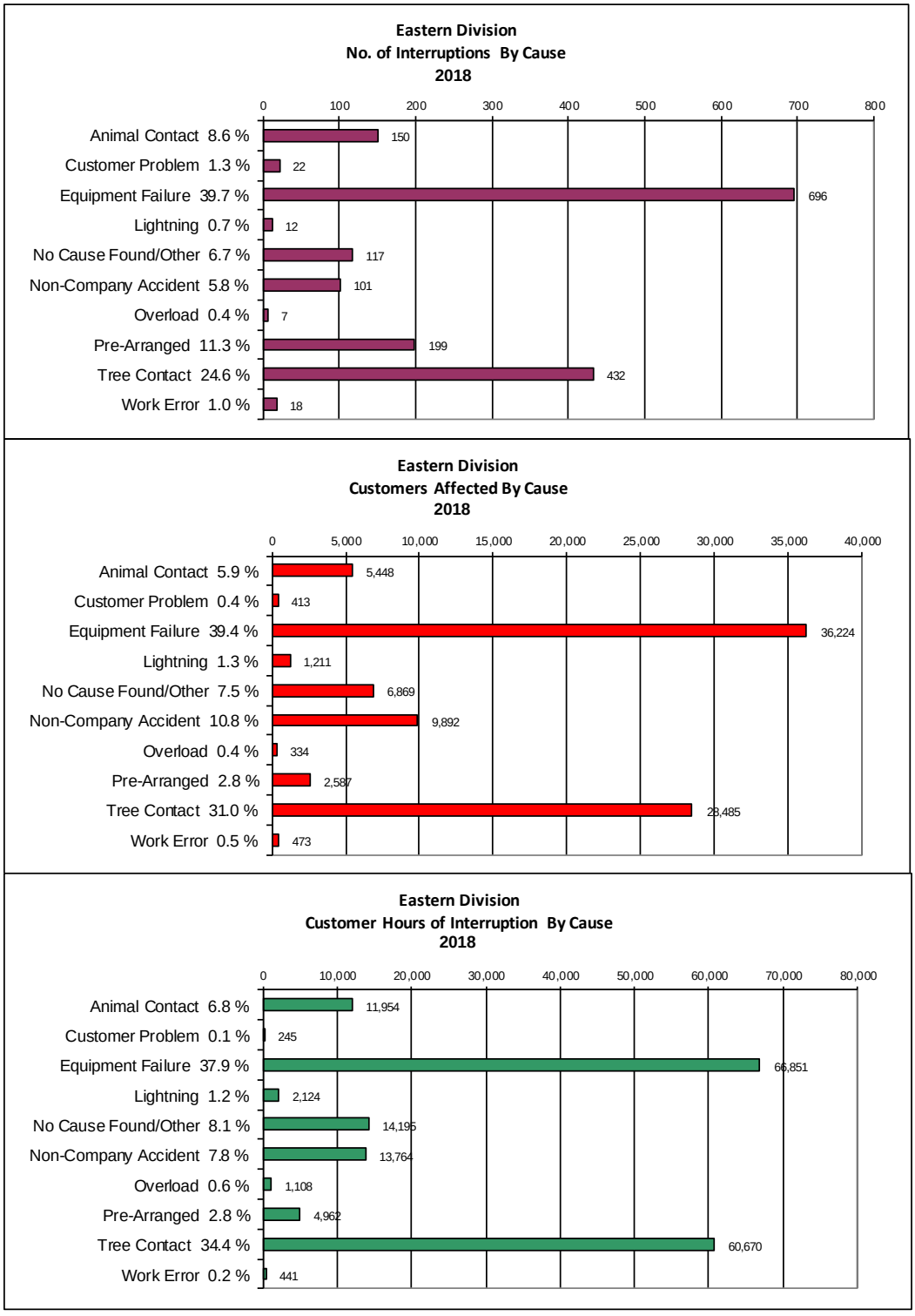

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TABLE 3.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE

		Number of Interruptions By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
	Arrester	9	13	7	7	4	8	7
	Connecter/Splice - Pri	41	36	28	77	51	47	52
	Connecter/Splice - Sec	183	211	160	105	148	161	199
	Disconnect	0	0	1	1	0	0	3
	Electric Meter	2	4	0	0	2	2	6
	Fuse/Cutout/Eld	19	24	36	38	22	28	20
	GOAB	1	2	0	2	0	1	0
	Hardware/Pole	21	47	39	21	25	31	35
	Insulator	5	1	1	2	5	3	1
Overhead	Not Coded	0	0	0	1	10	2	11
	O/H Step Transf	4	3	1	1	0	2	3
	O/H Transformer	73	107	83	79	65	81	79
	Recloser	0	0	1	1	0	0	1
	Regulator	0	0	0	0	1	0	0
	Riser Pole Cutout	12	10	12	7	7	10	10
	Sectionalizer	0	2	0	0	0	0	0
	Wire/Cable - Pri	25	31	22	26	17	24	31
	Wire/Cable - Sec	43	59	25	35	38	40	48
	Total - OH	438	550	416	403	395	440	506
	Brkr/Kyle/Switch	2	2	6	0	3	3	1
	Fuse/ Fuse Holder	0	3	0	0	0	1	0
Trans/Substa	Relay/Battery/Coil	0	4	0	0	0	1	0
	Transformer	0	4	0	2	0	1	1
	Total - Trans/Substa	2	13	6	2	3	5	2
	Arrester	0	1	0	0	0	0	0
	Boxpad/Silo/Vault	1	1	2	1	1	1	0
	Bushing	0	0	1	0	0	0	2
	Connecter/Splice - Pri	0	0	0	0	0	0	1
	Connecter/Splice - Sec	0	0	0	0	0	0	9
	Elbow	5	5	0	1	3	3	5
	Fuse/Cutout/Eld	0	0	0	0	0	0	1
	Hardware/Pole	0	0	2	0	0	0	5
	Not Coded	0	0	0	0	2	0	2
Underground	O/H Transformer	0	0	0	0	0	0	1
	Padmount Transf	32	39	50	48	43	42	49
	Splice/Junction - Pri	2	2	3	7	0	3	4
	Splice/Junction - Sec	12	21	31	18	25	21	23
	Stress Cone	1	4	3	0	7	3	2
	Submersible Transf	1	0	0	0	0	0	2
	Switch	0	1	0	0	1	0	4
	Wire/Cable - Pri	40	44	41	60	55	48	34
	Wire/Cable - Sec	33	43	28	25	32	32	44
	Total - UG	127	161	161	160	169	156	188
	Total - Year	567	724	583	565	567	601	696

Note: Figures in red denote that the value exceeds the 5-year average

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TABLE 3.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE (CONT.)

		Customers Affected By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
	Arrester	203	444	215	391	187	288	252
	Connecter/Splice - Pri	2,951	2,059	525	5,964	1,099	2,520	1,553
	Connecter/Splice - Sec	326	375	318	184	406	322	494
	Disconnect	0	0	1,094	139	0	247	4,063
	Electric Meter	12	8	0	0	2	4	10
	Fuse/Cutout/Eld	727	2,259	1,977	1,397	1,026	1,477	1,172
	GOAB	1,268	71	0	491	0	366	0
	Hardware/Pole	6,217	10,073	6,124	4,867	5,981	6,652	4,351
	Insulator	315	10	1	618	251	239	18
Overhead	Not Coded	0	0	0	1	163	33	2,546
	O/H Step Transf	46	10	5	1	0	12	166
	O/H Transformer	665	4,662	5,578	3,997	3,067	3,594	1,882
	Recloser	0	0	1	1,393	0	279	16
	Regulator	0	0	0	0	482	96	0
	Riser Pole Cutout	371	114	183	196	203	213	114
	Sectionalizer	0	1,274	0	0	0	255	0
	Wire/Cable - Pri	7,521	6,535	2,999	6,411	2,649	5,223	15,553
	Wire/Cable - Sec	218	194	106	125	188	166	1,124
	Total - OH	20,840	28,088	19,126	26,175	15,704	21,987	33,314
	Brkr/Kyle/Switch	3,376	1,476	1,568	0	2,420	1,768	1,158
	Fuse/ Fuse Holder	0	2,129	0	0	0	426	0
Trans/Substa	Relay/Battery/Coil	0	2,378	0	0	0	476	0
	Transformer	0	7,663	0	1,679	0	1,868	1,146
	Total - Trans/Substa	3,376	13,646	1,568	1,679	2,420	4,538	2,304
	Arrester	0	1	0	0	0	0	0
	Boxpad/Silo/Vault	40	38	56	4	13	30	0
	Bushing	0	0	4	0	0	1	71
	Connecter/Splice - Pri	0	0	0	0	0	0	4
	Connecter/Splice - Sec	0	0	0	0	0	0	11
	Elbow	520	103	0	7	163	159	234
	Fuse/Cutout/Eld	0	0	0	0	0	0	54
	Hardware/Pole	0	0	4	0	0	1	57
	Not Coded	0	0	0	0	13	3	63
Underground	O/H Transformer	0	0	0	0	0	0	4
	Padmount Transf	235	298	474	464	784	451	485
	Splice/Junction - Pri	697	28	110	426	0	252	81
	Splice/Junction - Sec	18	36	53	30	49	37	30
	Stress Cone	121	22	31	0	114	58	2
	Submersible Transf	10	0	0	0	0	2	10
	Switch	0	111	0	0	27	28	178
	Wire/Cable - Pri	1,337	893	1,545	1,704	2,255	1,547	951
	Wire/Cable - Sec	61	77	86	59	43	65	103
	Total - UG	3,039	1,607	2,363	2,694	3,461	2,633	2,338
	Total - Year	27,255	43,341	23,057	30,548	21,585	29,157	37,956

Note: Figures in red denote that the value exceeds the 5-year average

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TABLE 3.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE (CONT.)

		Total Minutes of Interruption By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
	Arrester	19,793	35,393	37,974	26,053	11,979	26,238	71,697
	Connecter/Splice - Pri	219,824	83,039	45,706	371,880	136,664	171,423	199,496
	Connecter/Splice - Sec	49,552	55,249	49,541	37,670	66,089	51,620	110,030
	Disconnect	0	0	21,377	2,872	0	4,850	158,391
	Electric Meter	1,249	1,372	0	0	561	636	1,665
	Fuse/Cutout/Eld	83,668	95,673	147,707	153,815	66,917	109,556	59,078
	GOAB	16,484	9,466	0	14,665	0	8,123	0
	Hardware/Pole	331,629	1,118,130	354,372	117,351	466,013	477,499	228,460
	Insulator	63,020	14,990	504	30,792	25,717	27,005	1,962
Overhead	Not Coded	0	0	0	254	14,707	2,992	27,172
	O/H Step Transf	10,902	1,762	1,060	729	0	2,891	75,862
	O/H Transformer	187,509	507,404	524,391	283,351	193,445	339,220	232,941
	Recloser	0	0	30	165,643	0	33,135	3,962
	Regulator	0	0	0	0	2,410	482	0
	Riser Pole Cutout	46,776	9,551	39,239	42,355	13,692	30,323	19,678
	Sectionalizer	0	98,708	0	0	0	19,742	0
	Wire/Cable - Pri	775,324	826,900	316,622	588,631	156,649	532,825	1,562,222
	Wire/Cable - Sec	43,005	21,829	13,096	28,761	26,498	26,638	201,136
	Total - OH	1,848,735	2,879,466	1,551,619	1,864,822	1,181,341	1,865,197	2,953,752
	Brkr/Kyle/Switch	337,474	114,883	123,100	0	144,284	143,948	56,179
	Fuse/ Fuse Holder	0	266,131	0	0	0	53,226	0
Trans/Substa	Relay/Battery/Coil	0	44,272	0	0	0	8,854	0
	Transformer	0	68,967	0	126,698	0	39,133	101,994
	Total - Trans/Substa	337,474	494,253	123,100	126,698	144,284	245,162	158,173
	Arrester	0	148	0	0	0	30	0
	Boxpad/Silo/Vault	22,360	20,064	16,830	1,336	4,108	12,940	0
	Bushing	0	0	584	0	0	117	16,754
	Connecter/Splice - Pri	0	0	0	0	0	0	348
	Connecter/Splice - Sec	0	0	0	0	0	0	4,647
	Elbow	118,483	28,585	0	2,485	29,675	35,846	59,701
	Fuse/Cutout/Eld	0	0	0	0	0	0	13,122
	Hardware/Pole	0	0	1,198	0	0	240	10,581
	Not Coded	0	0	0	0	4,959	992	21,619
Underground	O/H Transformer	0	0	0	0	0	0	464
	Padmount Transf	62,866	93,867	113,572	148,914	133,584	110,561	185,014
	Splice/Junction - Pri	28,592	6,433	45,307	174,027	0	50,872	39,927
	Splice/Junction - Sec	6,416	9,673	25,868	17,139	19,742	15,768	17,719
	Stress Cone	13,528	5,670	4,440	0	33,014	11,330	1,113
	Submersible Transf	3,260	0	0	0	0	652	7,005
	Switch	0	11,766	0	0	11,475	4,648	46,284
	Wire/Cable - Pri	278,373	215,012	393,224	519,482	520,630	385,344	417,677
	Wire/Cable - Sec	32,102	29,813	29,933	27,138	25,672	28,932	57,134
	Total - UG	565,980	421,031	630,956	890,521	782,859	658,269	899,109
	Total - Year	2,752,189	3,794,750	2,305,675	2,882,041	2,108,484	2,768,628	4,011,034

Note: Figures in red denote that the value exceeds the 5-year average

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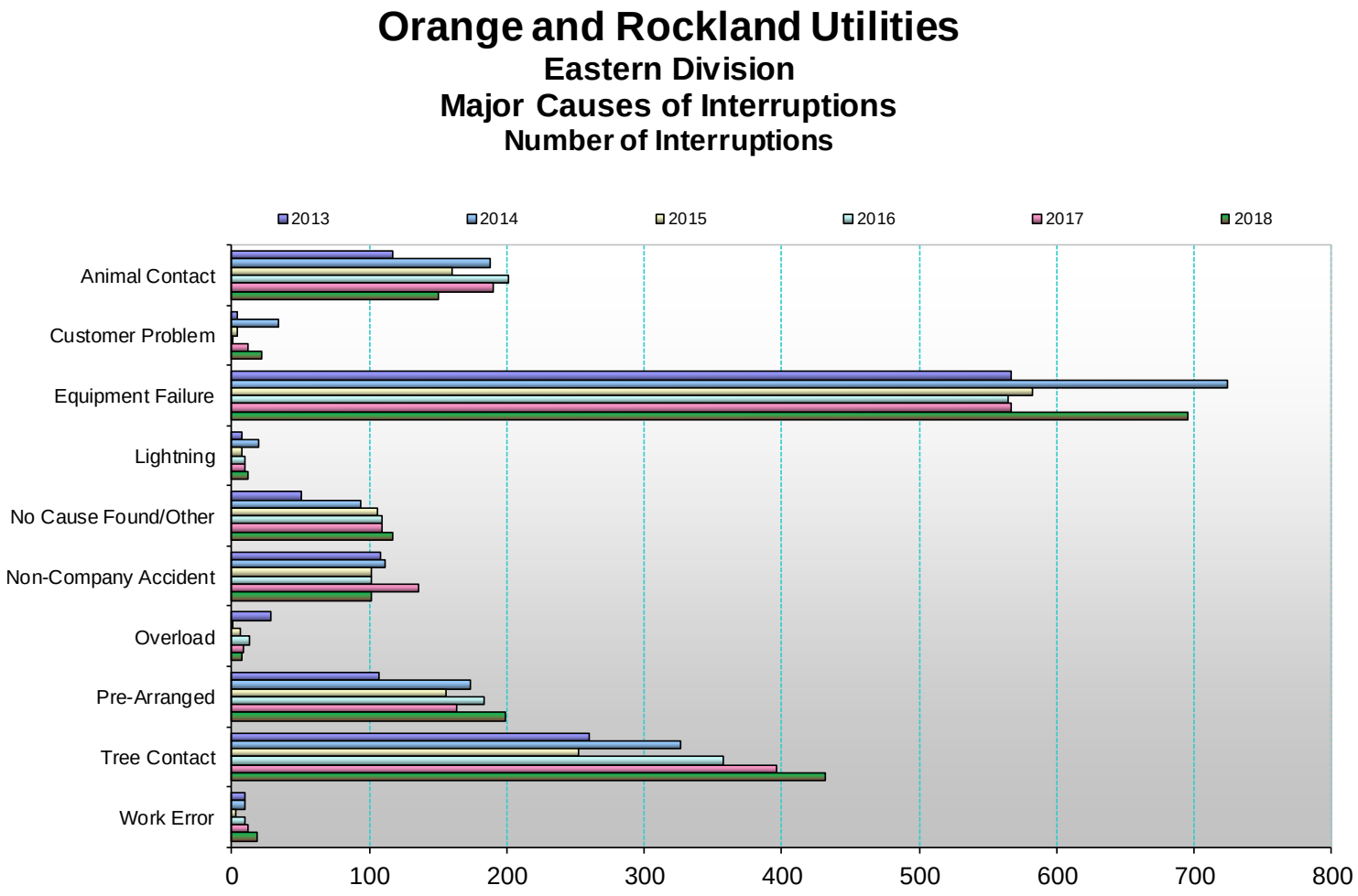
FIGURE 3.5 - 5-YEAR COMPARISON – NUMBER OF INTERRUPTIONS BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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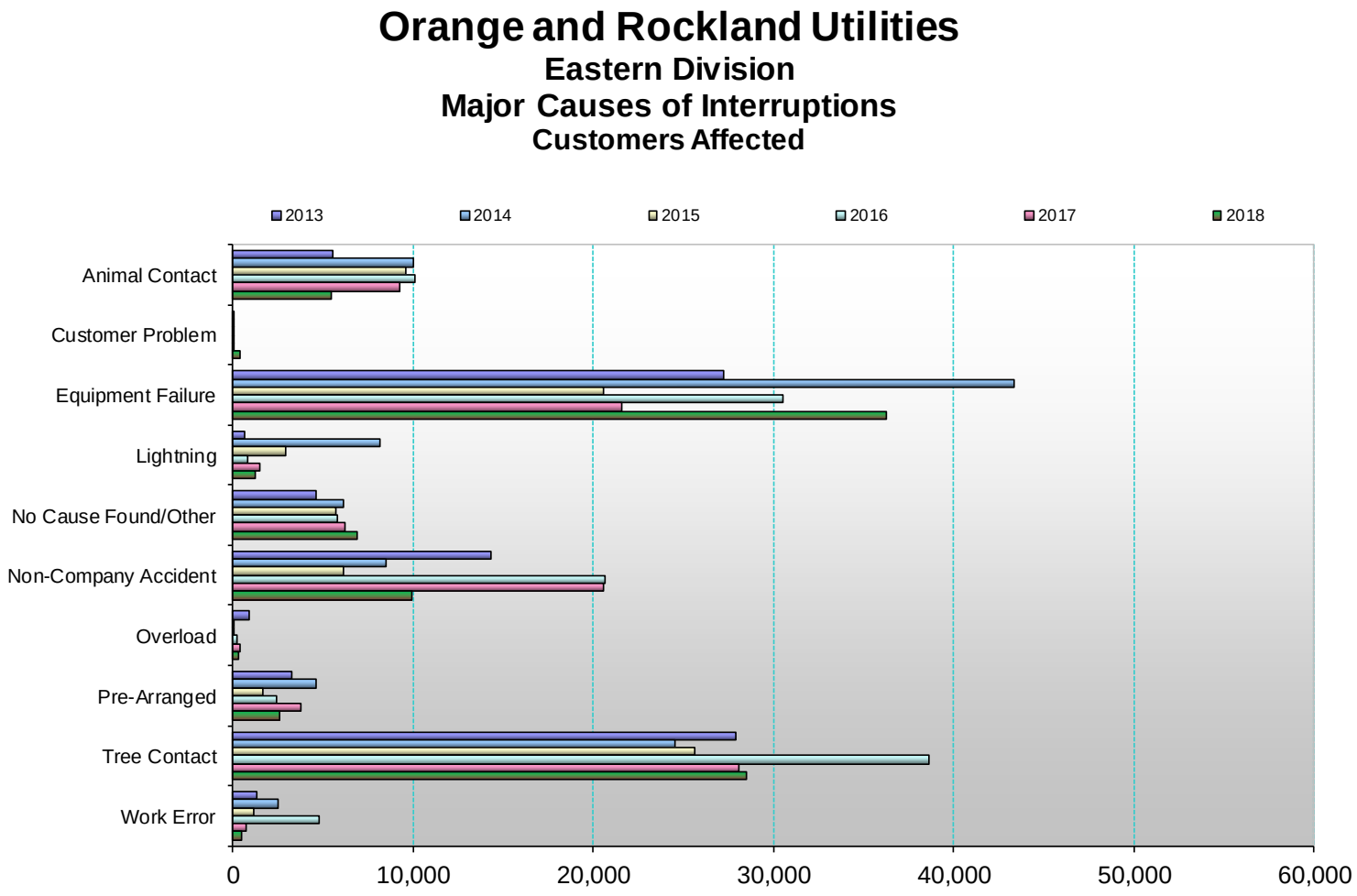
FIGURE 3.6 - 5-YEAR COMPARISON – CUSTOMERS AFFECTED BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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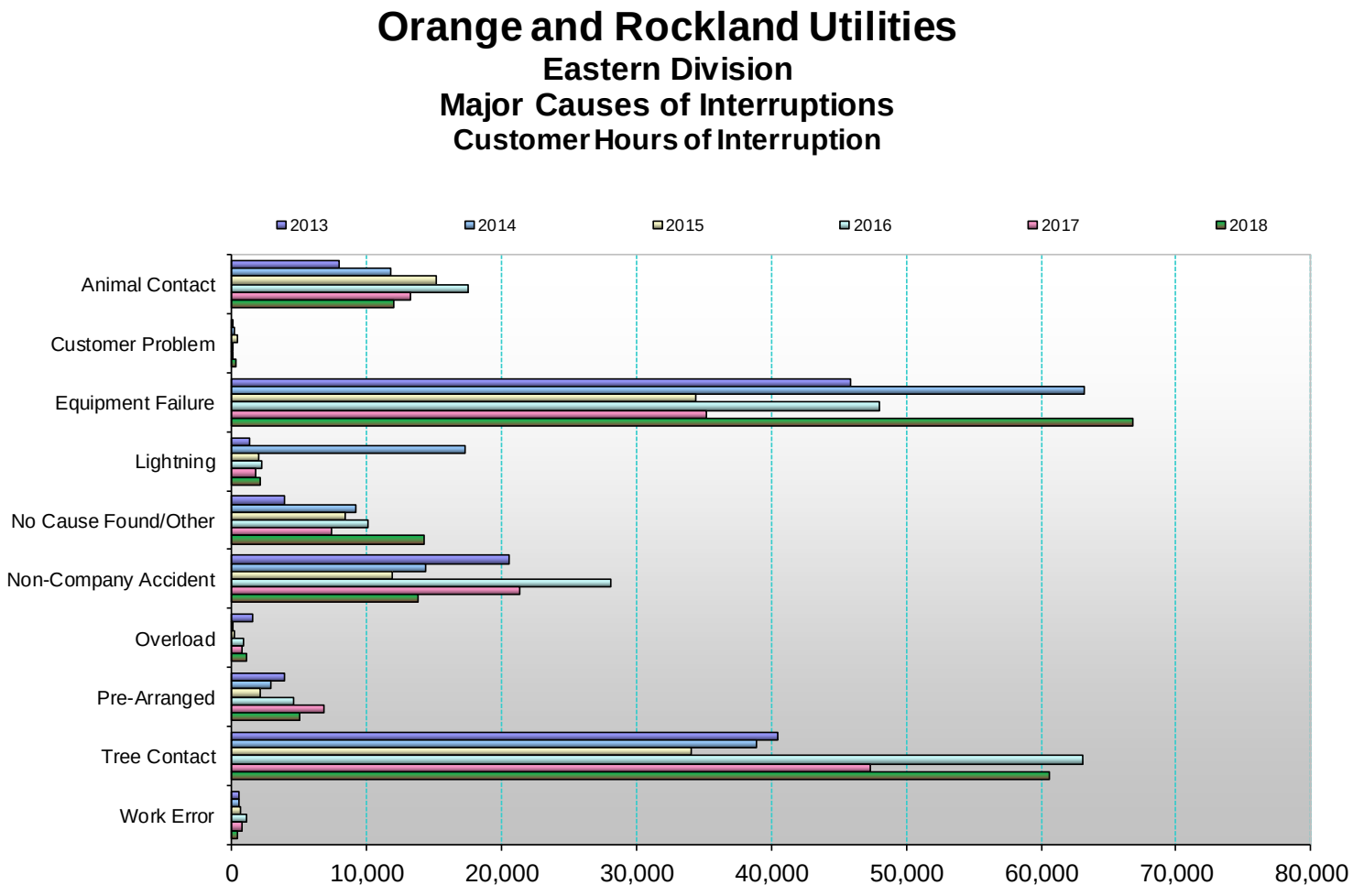
Figure 3.7 - 5-Year Comparison – Customer-Hours of Interruption by Major Cause



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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TABLE 3.3 - 5-YR COMPARISON – LARGE OUTAGE (>5,000 CUSTOMERS) IMPACT ON SAIFI, CAIDI & SAIDI

Eastern Division Without Storms
Effect of Interruptions Affecting 5,000 or more Customers

YEAR	CUSTOMERS SERVED (CS)	# OF INTERRUPTIONS	CUSTOMERS AFFECTED (CA)	CUSTOMER MINUTES OF INTERRUPTION (CM)	FREQUENCY (CA/CS)	RESTORATION (CM/CA)	DURATION (CM/CS)
WITHOUT STORMS							
2013	112,474	1,258	85,863	7,563,946	0.76	1.47	1.12
2014	112,991	1,681	107,814	9,498,414	0.95	1.47	1.40
2015	113,249	1,377	73,420	6,553,685	0.65	1.49	0.96
2016	114,891	1,550	113,870	10,533,244	0.99	1.54	1.53
2017	115,655	1,603	92,084	8,074,079	0.80	1.46	1.16
5-Yr Average	**113,852**	**1,494**	**94,610**	**8,444,674**	**0.83**	**1.46**	**1.21**
2018	116,005	1,755	91,937	10,578,814	0.79	1.92	1.52

WITHOUT STORMS - OUTAGES AFFECTING > 5000 CUSTOMERS

YEAR	SERVED	INTERR's	CUST AFF	
2013	112,474	-	-	-
2014	112,991	2	12,901	998,820
2015	113,249	-	-	-
2016	114,891	2	10,998	893,520
2017	115,655	-	-	-
5-Yr Average	**113,852**	**0.80**	**4,780**	**378,468**
2018	116,005	-	-	-

WITHOUT STORMS AND WITHOUT THOSE OUTAGES AFFECTING > 5000 CUSTOMERS

2013	112,474	1,258	85,863	7,563,946	0.76	1.47	1.12
2014	112,991	1,679	94,913	8,499,594	0.84	1.49	1.25
2015	113,249	1,377	73,420	6,553,685	0.65	1.49	0.96
2016	114,891	1,548	102,872	9,639,724	0.90	1.56	1.40
2017	115,655	1,603	92,084	8,074,079	0.80	1.46	1.16
5-Yr Average	**113,852**	**1,493**	**89,830**	**8,066,206**	**0.79**	**1.46**	**1.15**
2018	116,005	1,755	91,937	10,578,814	0.79	1.92	1.52

Return to Eastern Division List of Tables and Figures

3.3. Circuit 21-13-13

Circuit 21-13-13 was ranked first in the Eastern Division per 2018 priority circuit rating results. The circuit originates from the West Nyack Substation and runs east into the Village of Nyack serving a total of 2,182 customers in New York.

In 2018, there were eleven interruptions, which affected 507 customers that resulted in 1,390 customer-hours of interruption. The tables below identify the outage data, grouped by cause, associated with circuit 21-13-13 on a one and three year basis.

1 Year Summary (1/1/2018 - 12/31/2018) 21-13-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	2	18.2	82	16.2	120.3	8.7
Animal - Squirrel	1	9.1	4	0.8	10.1	0.7
Equipment Failure	3	27.3	223	44.0	325.7	23.4
No Cause Found	1	9.1	36	7.1	64.2	4.6
Pre-Arr - Company	1	9.1	100	19.7	455.0	32.7
Tree Contact	3	27.3	62	12.2	414.8	29.8
Total	11		507		1,390.2	

3 Year Summary (1/1/2016 - 12/31/2018) 21-13-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	4	7.7	146	2.2	335.3	3.3
Animal - Squirrel	3	5.8	42	0.6	89.3	0.9
Equipment Failure	9	17.3	2,814	42.9	3,798.5	37.7
No Cause Found	6	11.5	355	5.4	803.5	8.0
NonCo Acc - MotorVeh	1	1.9	16	0.2	57.5	0.6
NonCo Acc - OH	1	1.9	2	0.0	5.6	0.1
Pre-Arr - Company	10	19.2	172	2.6	561.3	5.6
Tree Contact	18	34.6	3,006	45.9	4,416.9	43.9
Total	52		6,553		10,067.8	

Three of the eleven incidents in 2018 accounted for 952 (68%) of the 1,390 total customer-hours of interruption for the year. The three incidents included one equipment failure, one tree contact and one pre-arranged - company.

The largest event occurred on the morning of May 30th on South Franklin Street, Nyack as a result of a pre-arrange outage. A section of the circuit was de-energized for Vegetation Management to complete tree trimming. The event accounted for 455 (32%) of the total 1,390 customer-hours of interruption.

The second largest event occurred on August 8th on Greenbush Road, West Nyack. The outage was the result of tree contact taking down multiple sections of primary. The event accounted for 290 (21%) of the total 1,390 customer-hours of interruption.

The third largest event occurred on the February 22nd on Waldron Avenue, Nyack. The outage was the result of equipment failure due to a broken primary tap. The event accounted for 206 (16%) of the total 1,390 customer-hours of interruption.

The remaining eight interruptions were the result of three animal contacts, two tree contacts, two equipment failures and one no cause found. These eight events accounted for 438 (32%) of the 1,390 total customer-hours of interruption.

Vegetation Distribution trimming in the Eastern Division is scheduled on a 3 year cycle. Trimming was last completed in 2018 and is currently scheduled to be completed again in 2021.

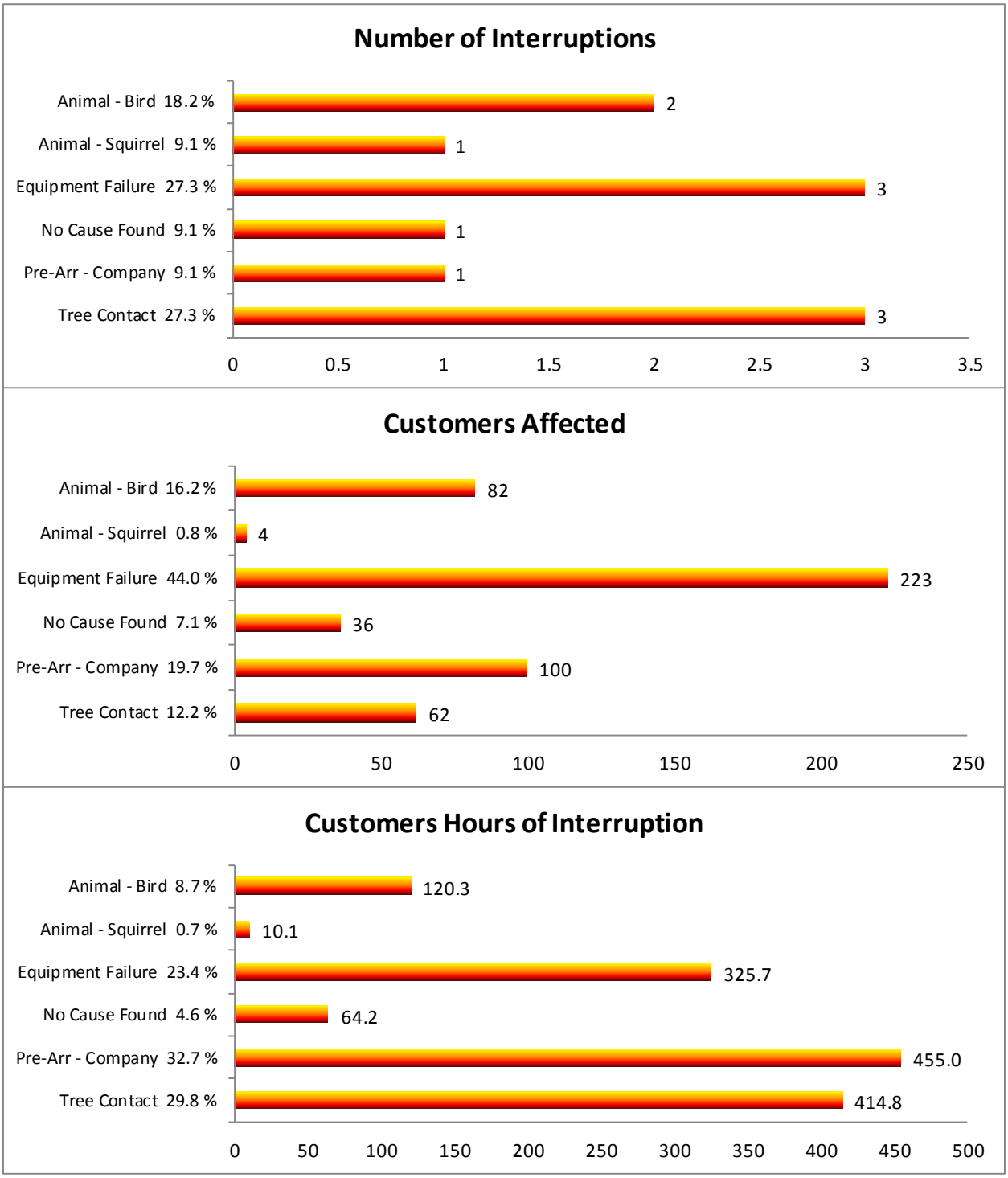
In the spring of 2017, the Company replaced the UG dip along the Route 9W overpass crossing the New York State Thruway. Installation of the new mainline underground primary wire provides increased reliability and longer life expectancy of the cable.

In addition, the Company rerouted overhead conductors on Liberty Street to Hudson Street. The replacement of several defective poles in this area provides system improvement and reliability for the entire circuit.

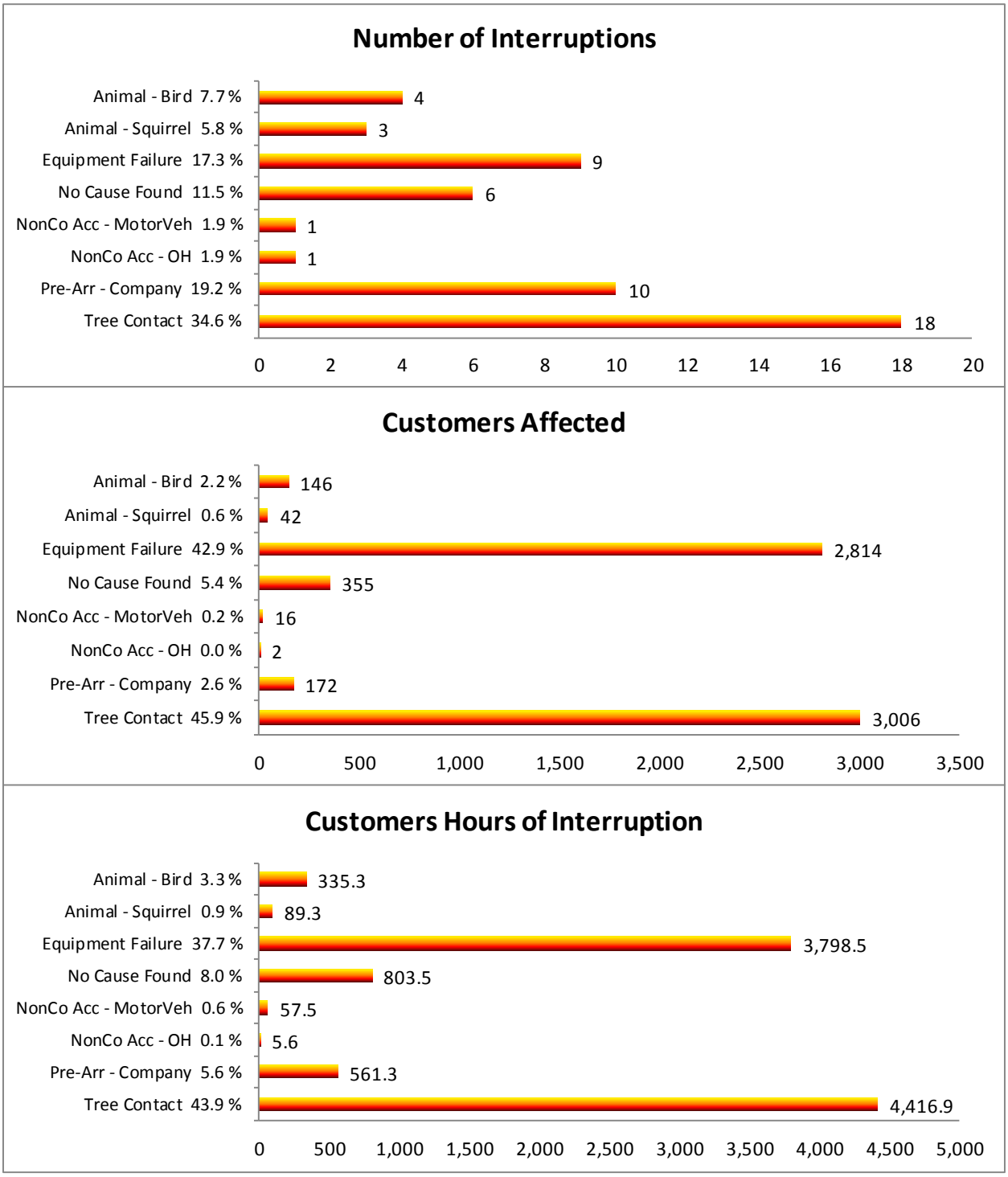
21-13-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	2,184	7	17
Critical Customers	35	1	1
Circuit Miles	16.77	65	140
Customers/Mile	130.2	19	23
Connected kVA	22,843	28	55
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Yes	50-2-13	
Vegetation Management			
Last Cycle Completion	2018		
Next Cycle Scheduled	2021		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 21-13-13 – ONE YEAR PERFORMANCE



CIRCUIT 21-13-13 – THREE YEAR PERFORMANCE



3.4. Circuit 51-6-13

Circuit 51-6-13 was ranked 2nd in the Eastern Division per 2018 priority circuit rating results. The circuit originates from the Tallman Substation in Rockland County, New York and serves a total 1,420 customers in the Town of Ramapo.

In 2018, there were 21 interruptions which affected 3,615 customers and resulted in 6,348 customer-hours of interruption. The tables below identify the outage data, grouped by cause, associated with circuit 51-6-13 on a one and three year basis.

1 Year Summary (1/1/2018 - 12/31/2018) 51-6-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	2	9.5	18	0.5	53.5	0.8
Equipment Failure	8	38.1	1,238	34.3	2,888.6	45.5
No Cause Found	3	14.3	2,240	62.0	3,276.8	51.6
NonCo Acc - MotorVeh	1	4.8	6	0.2	25.8	0.4
Pre-Arr - Company	2	9.5	11	0.3	6.9	0.1
Tree Contact	5	23.81	102	2.82	96.3	1.52
Total	**21**		**3,615**		**6,348.0**	

3 Year Summary (1/1/2016 - 12/31/2018) 51-6-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	0.8	32	0.1	64.0	0.2
Animal - Squirrel	3	2.3	20	0.1	55.9	0.1
Equipment Failure	16	12.3	1,832	7.3	3,502.6	9.1
No Cause Found	5	3.8	3,357	13.3	5,057.0	13.1
NonCo Acc - MotorVeh	6	4.6	2,114	8.4	3,676.9	9.5
NonCo Acc - Other	10	7.7	327	1.3	638.1	1.7
Pre-Arr - Company	24	18.5	4,947	19.6	6,298.4	16.3
Tree Contact	65	50.0	12,629	50.0	19,293.0	50.0
Total	**130**		**25,258**		**38,585.9**	

Although tree contact outages were not a major factor in 2018, they remain the most significant contributor to this circuit's performance over the long term. The most likely reason for the limited impact in 2018 is that cycle trimming was performed early in the year. However, the Route 202 corridor (Haverstraw Road) is lined with mature vegetation growing on hills and rock ledges that is especially prone to falling during periods of inclement weather.

Three of the twenty-one incidents in 2018 accounted for 5,980 (94%) of the 6,348 total customer-hours of interruption for the year. The three incidents included two no cause found and one equipment failure.

The largest event occurred on Saturday January 6th, 2018 on Haverstraw Road, Suffern NY. The outage was the result of equipment failure due to broken primary spacer cable. The event accounted for 2,748 (43%) of the total 6,348 customer-hours of interruption.

The second largest event occurred May 4th, 2018 on Haverstraw Road, Suffern NY. The outage was the result of 3 phases of downed spacer cable where no cause was found. The event accounted for 2,136 (34%) of the 6,348 total customer-hours of interruption.

The third largest event occurred July 23rd at an unknown location on the circuit. The recloser on Lake Road, Suffern locked out and no cause was found when patrolled. The event accounted for 1,095 (17%) 6,348 total customer-hours of interruption.

The remaining eighteen interruptions were the result of five tree contacts, two pre-arranged company, one non-company accident – motor vehicle, one no cause found, seven equipment failures and two animal contact – squirrel. In total, the above outages accounted for 367 (6%) of the 6,348 total customer-hours of interruption.

Vegetation Distribution trimming in the Eastern Division is scheduled on a three year cycle. Trimming was last completed in 2018 and is currently scheduled to be completed in 2021.

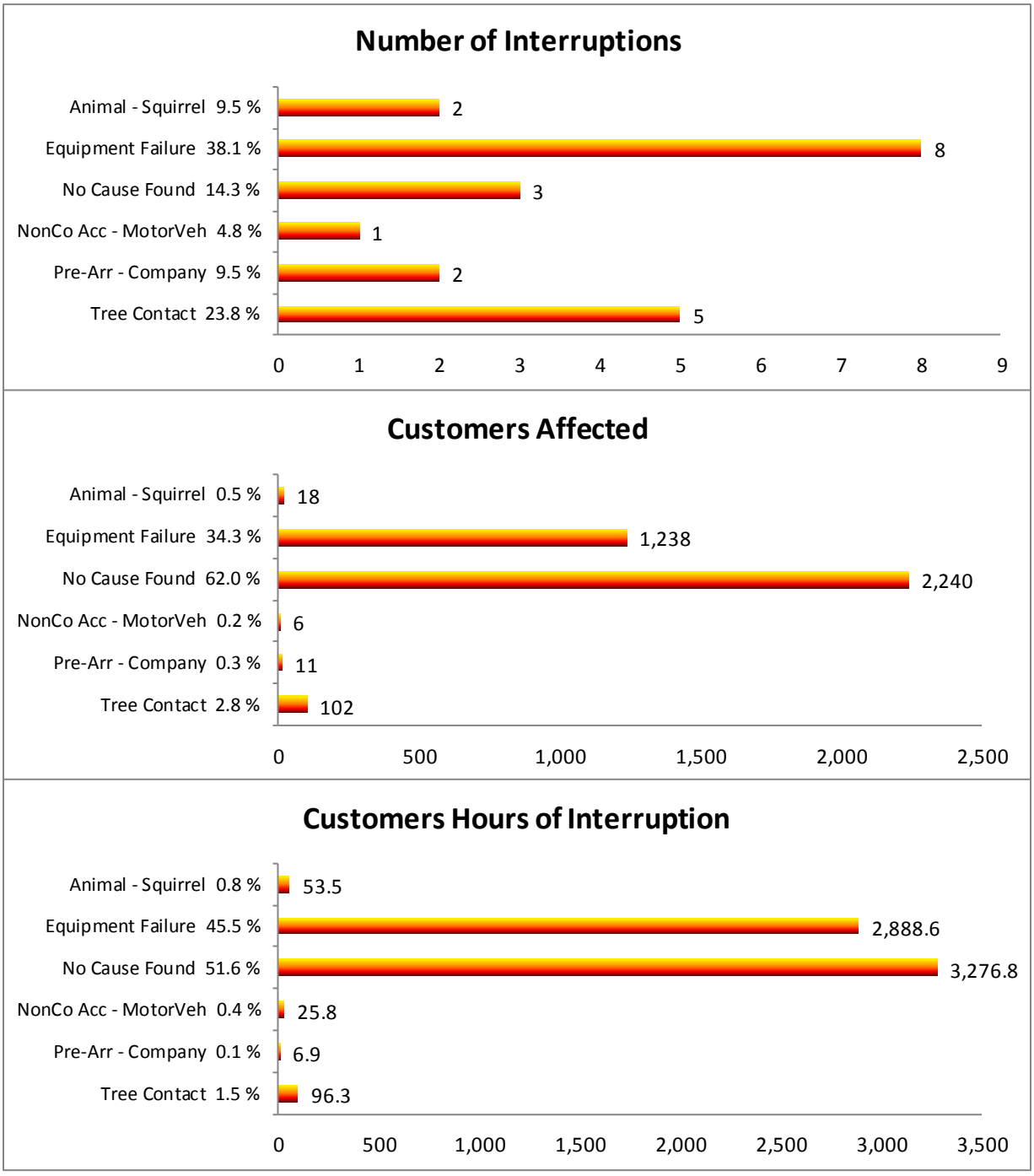
System reliability work on this circuit was completed in 2014 as part of the Storm Hardening Project. Overhead three-phase mainline conductors (1½ miles) on Montebello Road, Suffern were rebuilt as an underground express feeder. The second part of the project involved removal of the original overhead circuit on Montebello Road and was completed in 2015. The final part of the project that completed the system improvement was to replace fourteen poles and re-conductor 1,200 feet of overhead wires.

In 2019, the Company plans to complete a DA project involving six MOABs and four reclosers on the section of the circuit along Haverstraw Road which is most prone to tree contact outages as discussed above. In addition, the Company will be reconfiguring adjacent circuits allowing for better back up capability for the area which, when coupled with the DA project, will reduce customer exposure to extended duration outages.

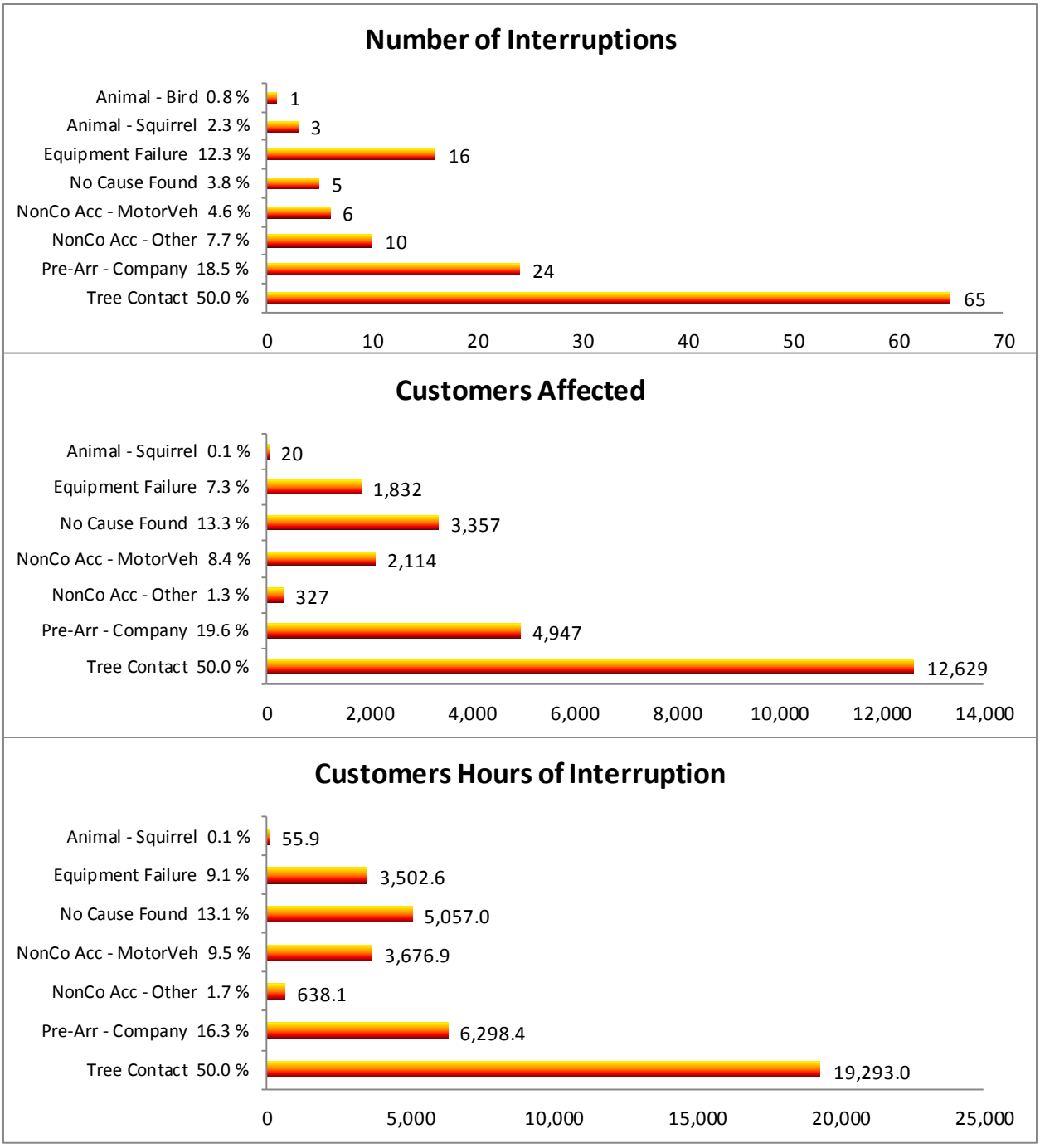
51-6-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1,421	40	80
Critical Customers	9	23	45
Circuit Miles	28.9	14	61
Customers/Mile	49.1	120	157
Connected kVA	15,280	98	156
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	No	N/A	
Vegetation Management			
Last Cycle Completion	2018		
Next Cycle Scheduled	2021		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 51-6-13 – ONE YEAR PERFORMANCE



CIRCUIT 51-6-13 – THREE YEAR PERFORMANCE



3.5. Circuit 23-4-13

Circuit 23-4-13 was ranked 3rd in the Eastern Division per the 2018 priority circuit rating results. The circuit originates from the Stony Point Substation in Stony Point and serves a total 1,358 customers.

In 2018, there were thirty-three interruptions, which affected 5,198 customers that resulted in 16,392 customer-hours of interruption. The tables below identify the one and three year outage data associated with circuit 23-4-13, grouped by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 23-4-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	3	9.1	133	2.6	512.5	3.1
Equipment Failure	11	33.3	1,590	30.6	4,319.5	26.4
No Cause Found	3	9.1	25	0.5	60.3	0.4
NonCo Acc - MotorVeh	2	6.1	932	17.9	1,842.2	11.2
NonCo Acc - Other	1	3.0	557	10.7	492.0	3.0
Pre-Arr - Company	2	6.1	7	0.1	23.5	0.1
Tree Contact	11	33.33	1,954	37.59	9,142.1	55.77
Total	**33**		**5,198**		**16,392.1**	

3 Year Summary (1/1/2016 - 12/31/2018) 23-4-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	1.2	51	0.5	106.3	0.4
Animal - Squirrel	3	3.5	157	1.6	551.3	2.2
Equipment Failure	26	30.2	1,767	17.5	5,409.5	21.9
Lightning - Present	1	1.2	36	0.4	396.6	1.6
No Cause Found	11	12.8	651	6.5	814.6	3.3
NonCo Acc - MotorVeh	5	5.8	1,535	15.2	3,230.6	13.1
NonCo Acc - Other	1	1.2	557	5.5	492.0	2.0
Pre-Arr - Company	3	3.5	17	0.2	64.8	0.3
Pre-Arr - Customer	1	1.2	4	0.0	5.3	0.0
Tree Contact	34	39.5	5,314	52.7	13,602.6	55.1
Total	**86**		**10,089**		**24,673.6**	

At 70.1 miles in length, circuit 23-4-13 is the longest circuit in Eastern Division and the fourth longest in the Company. A good portion of the area it serves is adjacent to Harriman State Park which is heavily forested and relatively low density in terms of customers. The portion of the circuit along Call Hollow Road is subject to numerous tree contact outages throughout the year. Accordingly, tree contact outages were a major factor in 2018 as discussed below, and they remain the most significant contributor to this circuit's performance over the long term.

Four of the thirty-three incidents in 2018 accounted for 12,552 (77%) of the 16,392 total customer-hours of interruption for the year. The four incidents included two tree contacts, one equipment failure and one non-company accident – motor vehicle.

The largest event occurred on the February 25th on Route 210, Stony Point NY. The outage was the result of tree contact that took down multiple sections of three phase spacer cable. Due to the inclement (rain) weather and increased activity, the outage was longer in duration than normal. The event accounted for 6,442 (39%) of the total 16,392 customer-hours of interruption.

The second largest event occurred on October 11th on Mountain Road, Pomona NY. The outage was the result of tree contact bringing down two phases. The event accounted for 2,666 (16%) of the total 16,392 customer-hours of interruption.

The third largest event occurred on the April 29th on Call-Hollow Road, Pomona NY. The outage was the result of equipment failure due to two phases of spacer cable burning up. The event accounted for 1,735 (11%) of the total 16,392 customer-hours of interruption.

The fourth largest event occurred on April 10th on Call-Hollow Road, Pomona NY. The outage was the result of a Non-Company Accident – Motor Vehicle. The event accounted for 1,708 (10%) of the total 16,392 customer-hours of interruption.

The remaining twenty-eight interruptions were the result of three animal contacts – squirrel, ten equipment failures, three no cause found, one non company accident – motor vehicle, one non company accident – other, two pre-arrange company and nine tree contacts. These twenty-nine events accounted for 318 (6.4%) of the 16,392 total customer-hours of interruption.

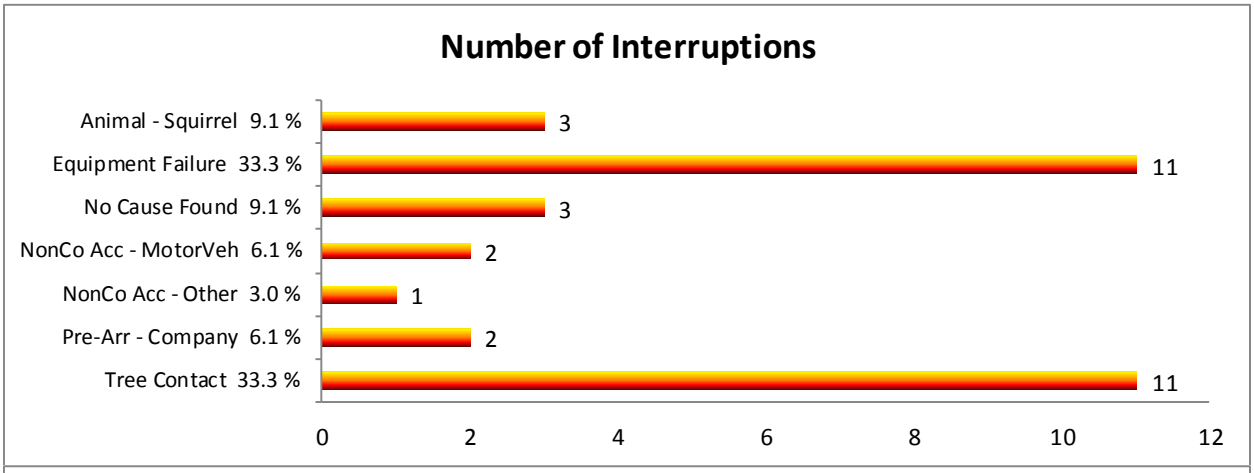
Vegetation Distribution trimming in the Eastern Division is scheduled on a 3 year cycle. Trimming was last completed in June 2015 and is currently scheduled to be completed again in 2019.

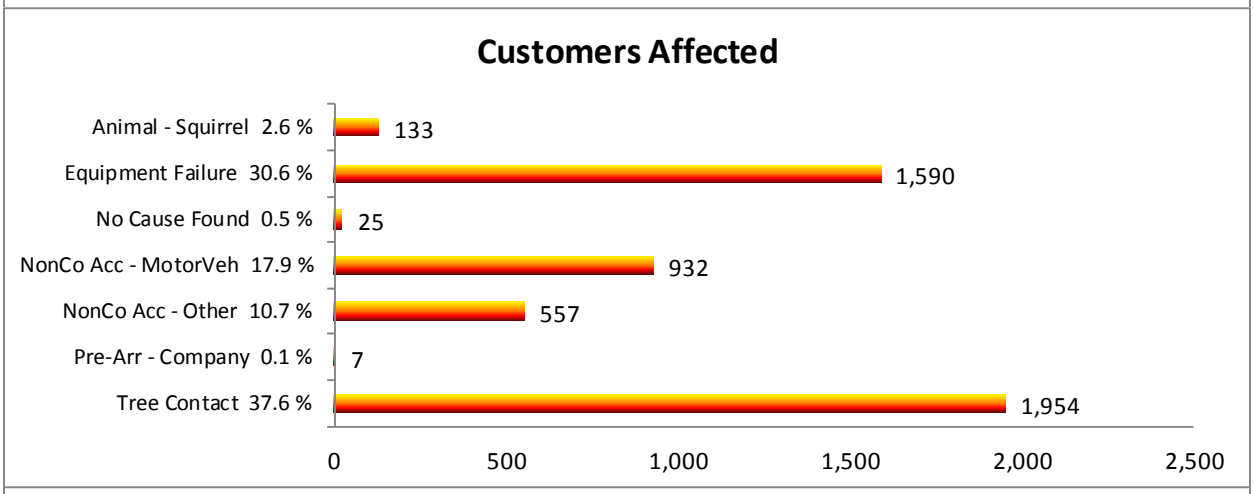
In 2019 the Company will add two MOABs to the circuit along Willow Grove Road. The MOABs will enhance the existing loop configuration of the circuit by assisting with fault isolation and customer restoration, as well as providing enhanced reliability in cases of major storm events.

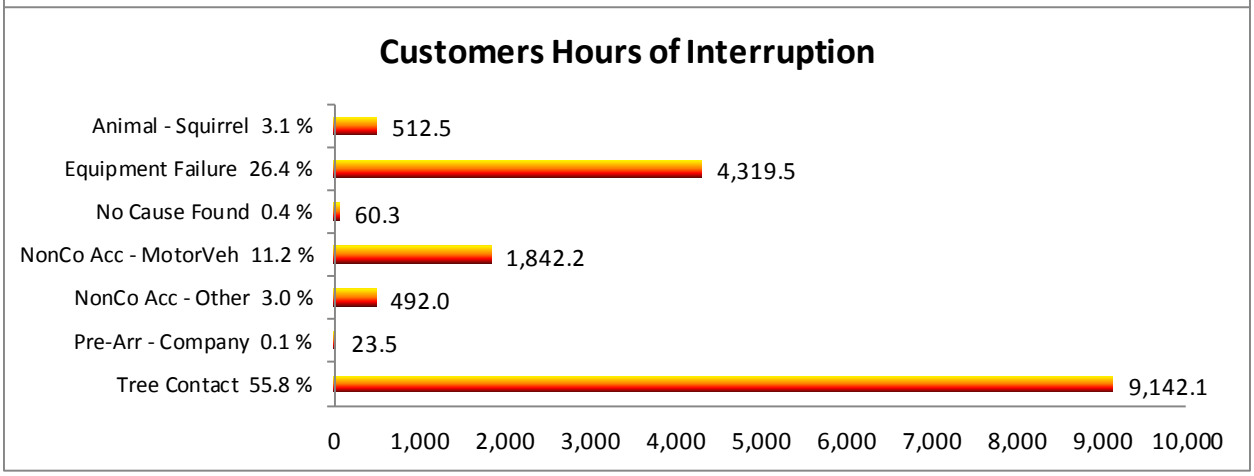
23-4-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1,358	48	90
Critical Customers	11	13	25
Circuit Miles	70.1	1	4
Customers/Mile	19.4	171	269
Connected kVA	21,407	41	74
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Yes	27-6-13	
Vegetation Management			
Last Cycle Completion	2015		
Next Cycle Scheduled	2019		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

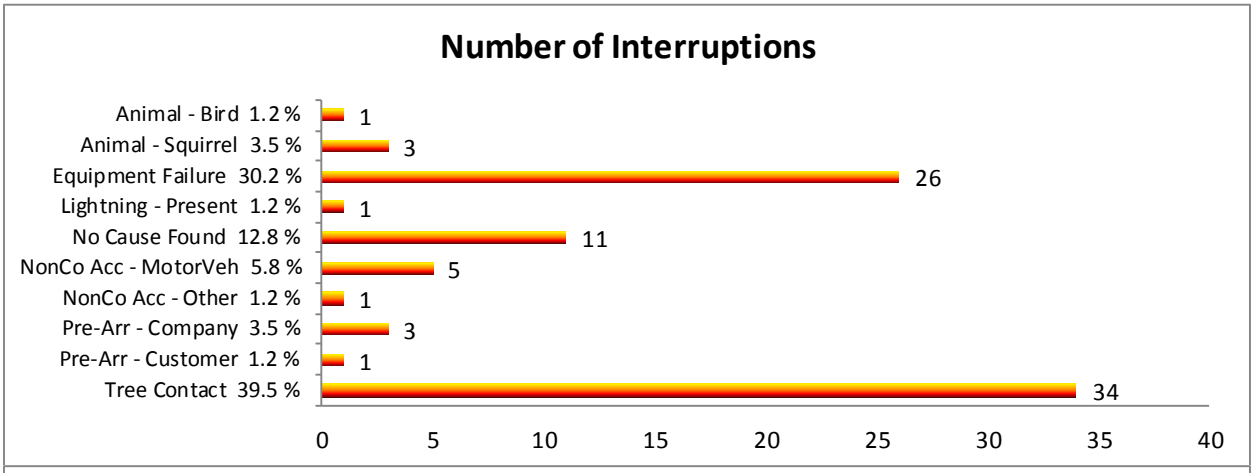
CIRCUIT 23-4-13 – ONE YEAR PERFORMANCE

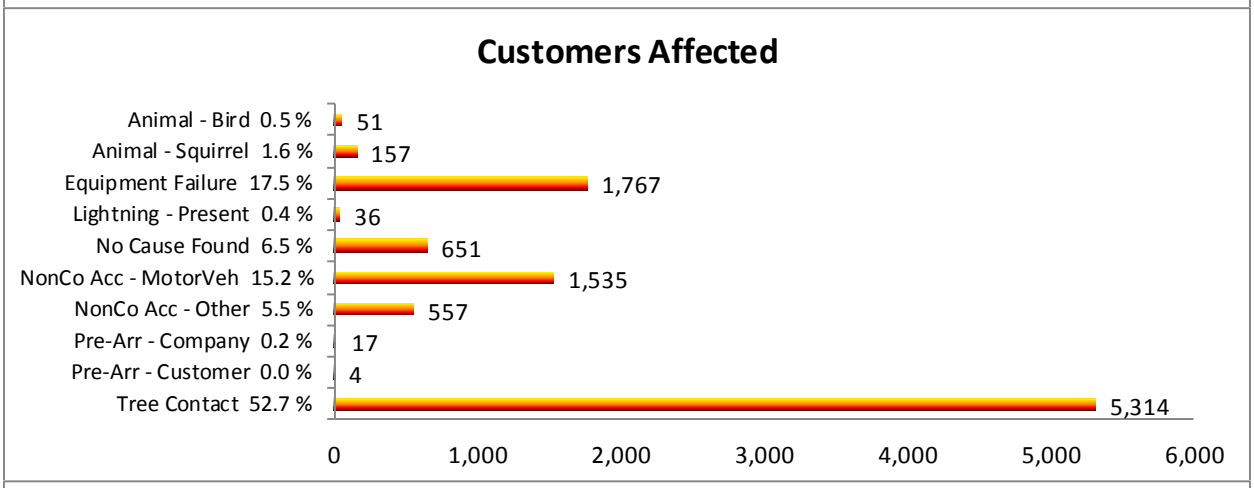


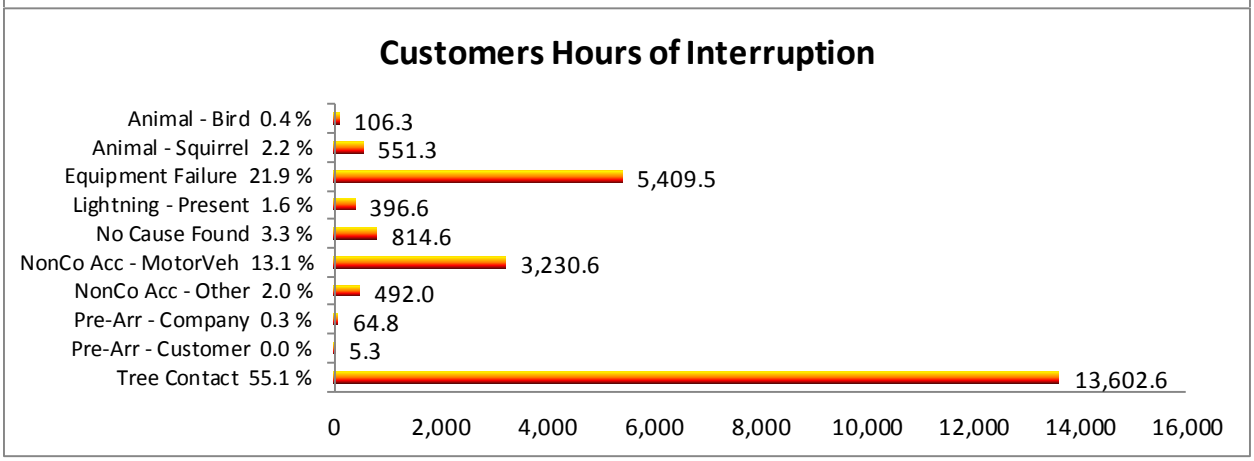




CIRCUIT 23-4-13 – THREE YEAR PERFORMANCE







3.6. Circuit 24-11-13

Circuit 24-11-13 is ranked 4th in the Eastern Division per 2018 priority circuit rating results. The circuit originates from the Snake Hill Substation in Rockland County, New York and serves a total 1,780 customers in New York.

In 2018, there were nineteen interruptions, which affected 1,770 customers and resulted in 3,100 customer-hours of interruption. The tables below identify the one and three year outage data associated with circuit 24-11-13, grouped by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 24-11-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	5.3	329	18.6	427.7	13.8
Equipment Failure	3	15.8	388	21.9	865.1	27.9
Lightning - Present	1	5.3	192	10.9	728.9	23.5
No Cause Found	1	5.3	6	0.3	51.9	1.7
NonCo Acc - MotorVeh	3	15.8	196	11.1	327.1	10.6
Overload - Company	1	5.3	148	8.4	310.8	10.0
Pre-Arr - Company	1	5.3	4	0.2	9.1	0.3
Tree Contact	8	42.1	507	28.6	380.2	12.3
Total	**19**		**1,770**		**3,100.8**	

3 Year Summary (1/1/2016 - 12/31/2018) 24-11-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	2.0	3	0.1	5.7	0.1
Animal - Squirrel	4	8.0	353	8.9	492.9	6.2
Equipment Failure	11	22.0	962	24.2	1,657.8	21.0
Lightning - Present	1	2.0	192	4.8	728.9	9.2
No Cause Found	1	2.0	6	0.2	51.9	0.7
NonCo Acc - MotorVeh	4	8.0	199	5.0	346.9	4.4
Overload - Company	2	4.0	174	4.4	314.3	4.0
Pre-Arr - Company	3	6.0	11	0.3	18.4	0.2
Tree Contact	23	46.0	2,073	52.2	4,296.2	54.3
Total	**50**		**3,973**		**7,912.9**	

Circuit 24-11-13 historically is not a worst performing circuit and 2018 should be considered as an anomalous year.

Five of the twenty one incidents in 2018 accounted for 2,593 (84%) of the 3,100 total customer-hours of interruption for the year. The five incidents included one overload – company, one non-company accident – motor vehicle, one animal contact – squirrel, one equipment failures and one lightning - present.

The largest event occurred on the morning of November 11th on North Midland Avenue, Upper Nyack NY. The outage was the result was an equipment failure due to a failed overhead transformer causing the recloser on the circuit to lock out. The event accounted for 808 (26%) of the total 3,100 customer-hours of interruption.

The second largest event occurred on May 4th on North Broadway, Upper Nyack NY. The outage was the result of a lightning strike burning down a section of primary wire. The event accounted for 728 (24%) of the total 3,100 customer-hours of interruption.

The third largest event occurred on July 9th on Castle Heights Ave, Upper Nyack NY. The outage was the result of animal contact – squirrel which caused the transformer lid to be blown off and spilled oil on the ground. The incident caused the recloser on the circuit to lock out. The event accounted for 427 (14%) of the total 3,100 customer-hours of interruption.

The fourth largest event occurred on June 29th on North Broadway, Upper Nyack NY. The outage was the result of a non-company accident – motor vehicle. The event accounted for 317 (10%) of the total 3,100 customer-hours of interruption.

The fifth largest event occurred on July 1st on Sixth Ave, Nyack NY. The outage was a blown cutout due to overload. The event accounted for 310 (10%) of the total 3,100 customer-hours of interruption.

The remaining fourteen interruptions were the result of two equipment failures, one no cause found, eight tree contacts, two non-company accident – motor vehicle and one pre-arranged – company. These 19 events accounted for 507 (16%) of the 3,100 total customer-hours of interruption.

Vegetation Distribution trimming in the Eastern Division is scheduled on a 3-year cycle, and was last completed in January 2017 and scheduled to be completed again 2020.

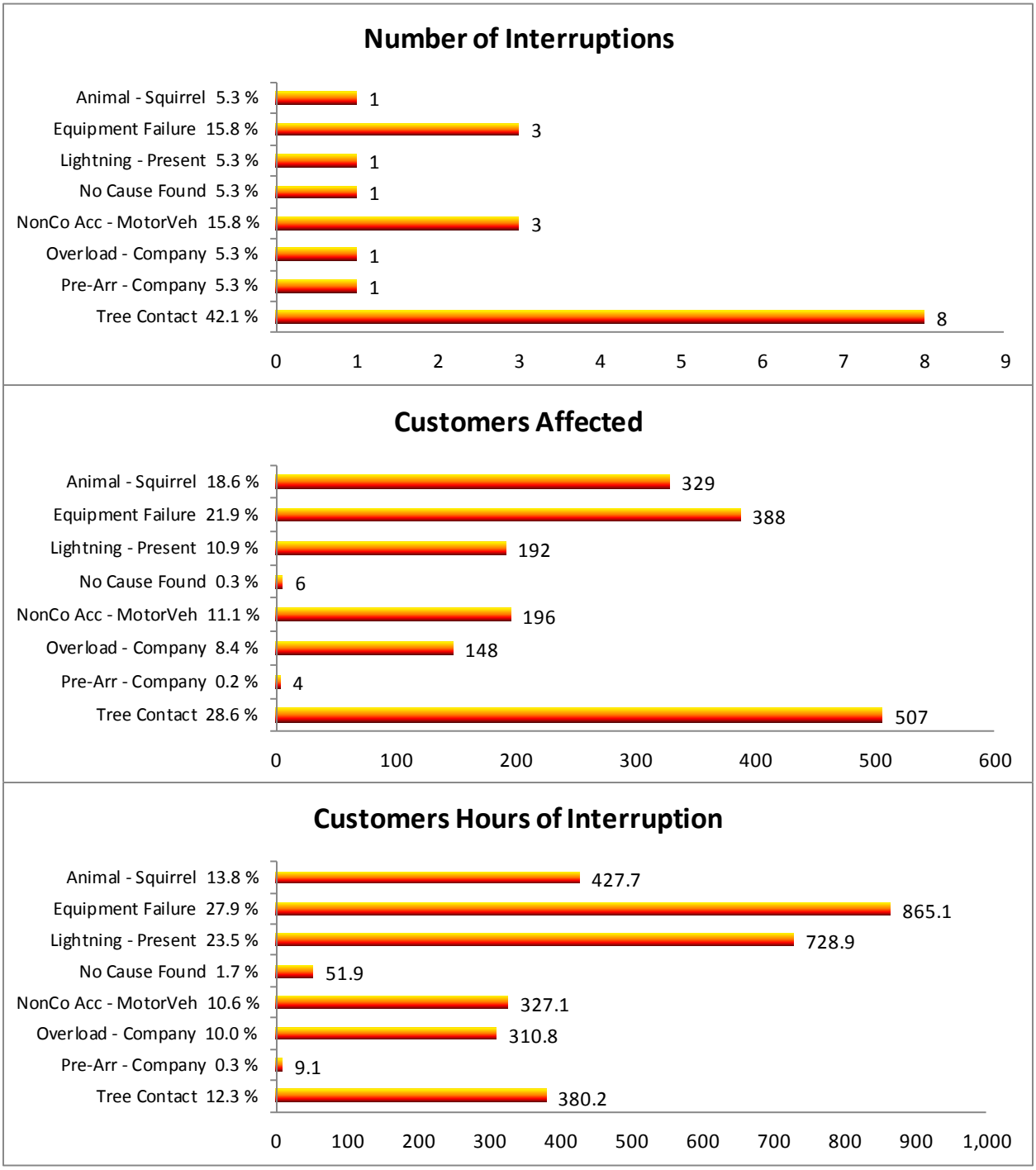
The Company has plans to add distribution automation on the circuit with the installation of three MOABs on Christian Herald Road, possibly in the 2020 budget cycle. This area of the circuit is heavily treed and is prone to a higher incident of outages than other areas of the circuit that have

less exposure to vegetation. The MOABs will assist with isolation and restoration, as well as provide enhanced reliability in cases of major storm events.

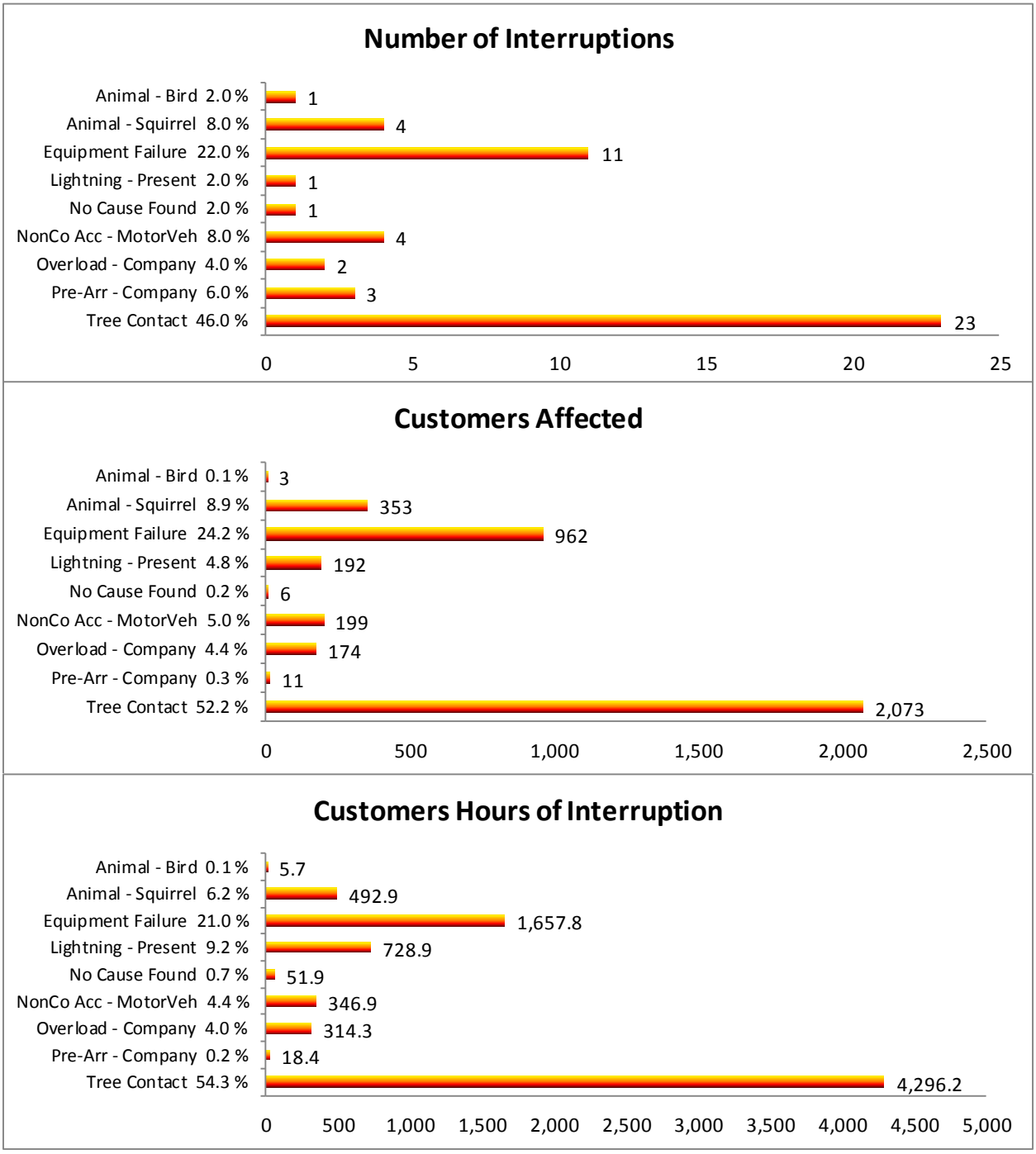
24-11-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1781	19	41
Critical Customers	13	7	14
Circuit Miles	21.3	38	100
Customers/Mile	83.5	47	65
Connected kVA	18,835	66	108
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Y	21-12-13	
Vegetation Management			
Last Cycle Completion	2017		
Next Cycle Scheduled	2020		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 24-11-13 – ONE YEAR PERFORMANCE



CIRCUIT 24-11-13 – THREE YEAR PERFORMANCE



3.7. Circuit 27-3-13

Circuit 27-3-13 is ranked 5th in the Eastern Division per 2018 priority circuit rating results. The circuit originates from the West Haverstraw Substation in Rockland County, New York and serves a total of 2,328 customers in New York.

In 2018, there were seven interruptions, which affected 354 customers that resulted in 650 customer-hours of interruption. The tables below identify the one and three year outage data associated with circuit 51-6-13, grouped by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 27-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	14.3	32	9.0	84.8	13.0
Animal - Squirrel	1	14.3	203	57.3	294.4	45.3
Equipment Failure	5	71.4	119	33.6	270.9	41.7
Total	**7**		**354**		**650.1**	

3 Year Summary (1/1/2016 - 12/31/2018) 27-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	2	6.5	361	5.1	858.0	7.7
Animal - Other	1	3.2	2,310	32.9	4,818.5	43.5
Animal - Squirrel	5	16.1	786	11.2	1,197.0	10.8
Equipment Failure	16	51.6	509	7.2	1,176.5	10.6
No Cause Found	1	3.2	109	1.6	223.5	2.0
NonCo Acc - MotorVeh	3	9.7	2906	41.3	2,725.5	24.6
NonCo Acc - Other	1	3.2	18	0.3	41.3	0.4
Pre-Arr - Company	2	6.5	31	0.4	42.7	0.4
Total	**31**		**7030**		**11,082.9**	

The circuit runs east out of the substation in a double circuit configuration with 27-4-13 and into the Village of Haverstraw. It has been towards the top of the worst performing list every year since 2014. However, with enhancements that have been made to the circuit the past several years (see below), the performance of the circuit has improved dramatically, with 2018 being the best year since 2013. Inclusion on the worst performing list for 2018 is the result of its residual rating from previous years' performance (as discussed in Appendix A, O&R uses a weighted three-year average to determine its annual worst performing circuits).

Three of the seven incidents in 2018 accounted for 478 (74%) of the 650 total customer-hours of interruption for the year. The four incidents included one animal contact – bird, one equipment failure and one animal contact – squirrel.

The largest event occurred on May 28th, 2018 on Jefferson Street, Haverstraw NY. The outage was the result of animal contact - squirrel beyond a fused cutout. The outage affected 203 customers for 87 minutes. The event accounted for 294 (45%) of the total 650 customer-hours of interruption.

The second largest event occurred on May 3rd, 2018 on New Main Street, Haverstraw NY. The outage was the result of a broken primary tap. The event accounted for 99 (15%) of the total 650 customer-hours of interruption.

The third largest event occurred on July 30th, 2018 on Broadway, Haverstraw NY. The outage was the result of animal contact - bird beyond a fused cutout. The event accounted for 85 (13%) of the total 650 customer-hours of interruption.

The remaining interruptions were the result of four equipment failures. These four events accounted for 172 (27%) of the 650 total customer-hours of interruption.

Vegetation Distribution trimming in the Eastern Division is scheduled on a 3 year cycle. Trimming was last completed in 2018 and is currently scheduled to be completed in 2021.

In 2017, O&R installed an additional tie capability between circuits 27-3-13 and 27-4-13 by upgrading a ½ mile section of Route 9W between Gurnee Ave and Westside Ave to mainline construction.

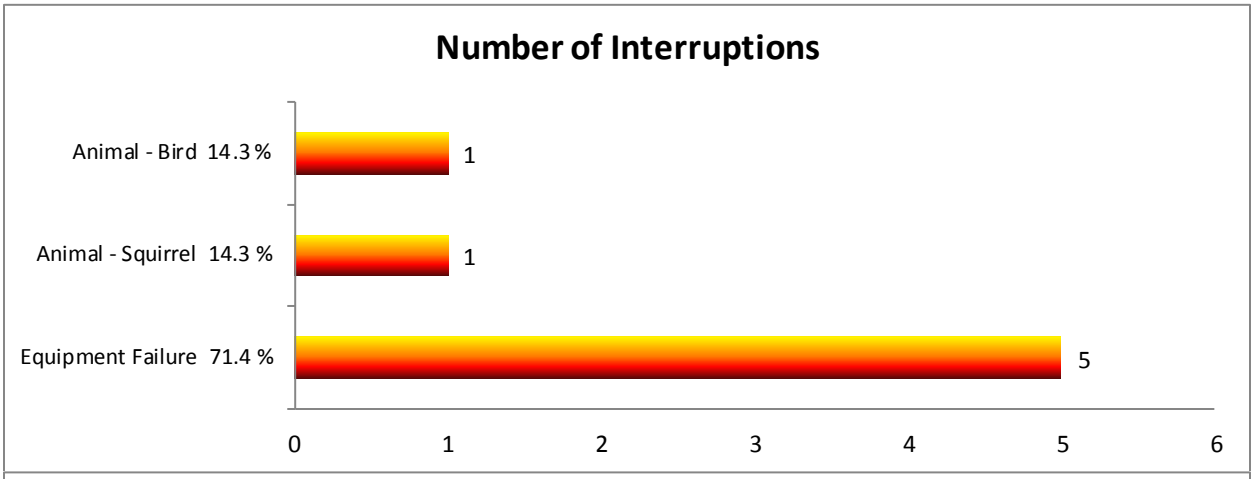
In 2018, the Company added enhanced distribution automation on the circuit. The project required the installation a mid-point recloser and five MOABs. Two of the five MOABs are mainline ties with circuit 27-4-13. The additional switching devices will assist with isolation and restoration as well as provide enhanced reliability in cases of major storm events.

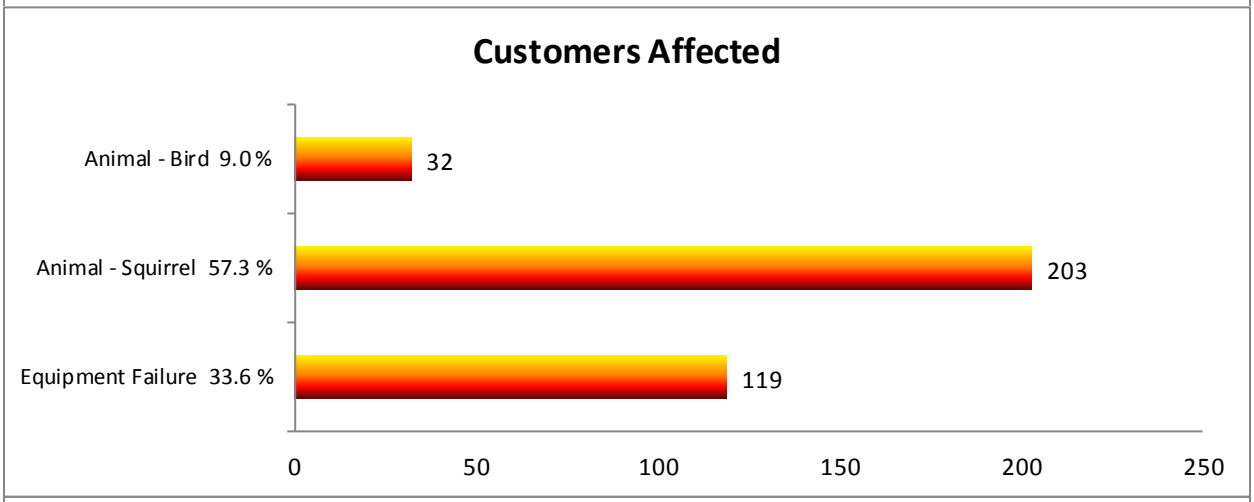
The installation of new mainline ties, distribution automation has drastically improved the performance of the circuit. 2018 marked the lowest year for customer hours of interruption since 2015.

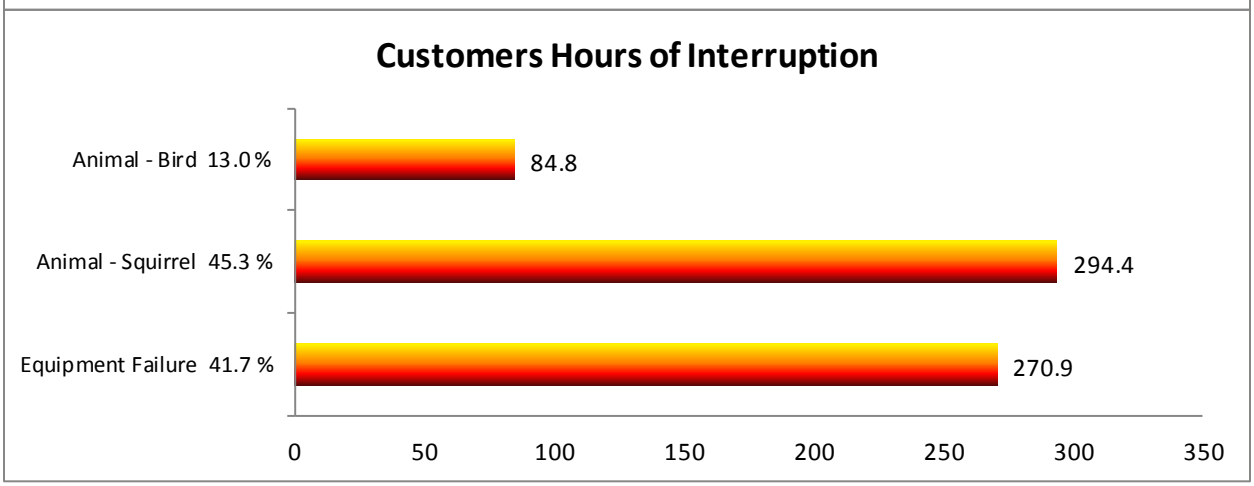
27-3-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	2328	6	14
Critical Customers	18	5	6
Circuit Miles	10.5	115	203
Customers/Mile	221.1	3	5
Connected kVA	23,352	23	51
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Y	27-5-13	
Vegetation Management			
Last Cycle Completion	2018		
Next Cycle Scheduled	2021		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

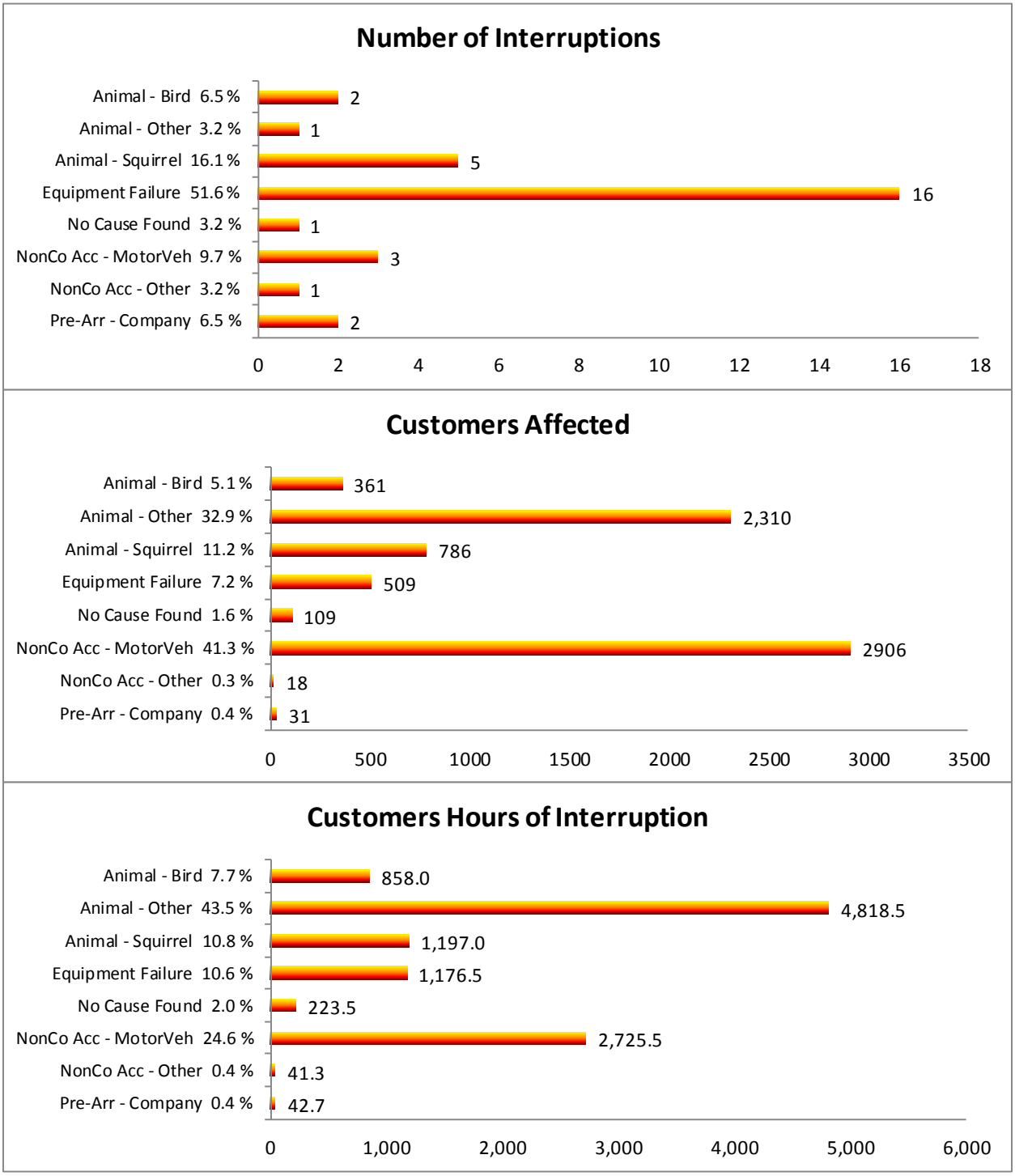
CIRCUIT 27-3-13 – ONE YEAR PERFORMANCE







CIRCUIT 27-3-13 – THREE YEAR PERFORMANCE



4. CENTRAL DIVISION

4.1. 2018 Divisional Performance

In 2018, the year-end SAIFI for the Central Division was 1.29 customers affected per customer served, above the NYPSC standard of 1.15 by 0.14 or approximately 8,054 customers. The 74,992 customers affected in 2018 was the highest level in six years, exceeding the previous five- year average of 54,631 by 37%. The year-end CAIDI for the Central Division was 1.72 customer hours of interruption per customer affected, better than the divisional standard of 1.75 hours and the five-year average of 1.79 hours.

Four substation or transmission related events affected 21% of all customers affected in the division during the year, but even without these events, the number of customers affected would have still exceeded both the 2017 performance and the previous five-year average.

Figures 4-1, 4-2, and 4-3, show performance trends on a rolling 12-month basis, from 2013 through 2018. In 2018, the number of interruptions, the number of customers affected, and the customer-hours of interruption all continued their upward trend that started after hitting five-year lows at the end of 2013 into the beginning of 2014.

Figure 4-4 shows a summary by cause of the interruptions experienced in 2018. Equipment failures were the leading cause interruptions, customers affected and customer hours of interruption, followed by tree contact interruptions. Similar to 2017, pre-arranged outages came in third in the number of interruptions, reflective of ongoing voltage conversion work to improve reliability within the division.

A summary of the Central Division equipment failures for 2018 is shown in Table 4-2. Overall, while the number of failures increased 30%, and exceeded the five-year average, the number of customers affected tripled while the number of customer-hours of interruption more than doubled from their 2017 levels. These increases were driven primarily by failures on the overheard system, which typically accounts for about 70% of all failures in a given year.

The increase in the total number of equipment failure interruptions was not driven any single component of the system, as there were increases in almost every category. Likewise, the increase in the number of customers affected was driven by multiple types of component failures, and similar to Eastern Division, mostly occurring on mainline sections of the distribution system. The result of more of the failures occurring on mainline segments of the distribution system is that Central Division suffered a disproportionate number of customers affected as compared to the rest of the company (37% of all customers affected companywide in 2018 were in Central Division).

In terms of number of interruptions, tree contact interruptions in the division dropped slightly below the all-time high established in 2017, but remained at the second highest level since 2010. Of the 269 interruptions in the tree contact category, 69 (25%) were attributable to partial power/single service customer conditions. Consistent with historical norms, 69 of the 269 tree

contact outages were restored in less than the target of 105 minutes indicating that in these instances, most likely, first responder troubleshooter crews were able to resolve the issues without assistance from additional resources.

Table 4-3 shows the Central Division interruption history from 2013 through 2018, the outages affecting more than 5,000 customers, and the impact on the Division's performance statistics if these events were removed. There was one event impacting greater than 5,000 customers in this Division in 2018.

A graphic representation, by cause, is depicted in Figures 4-5, 4-6, and 4-7, which show the annual contribution of each cause to the number of interruptions, customers affected, and customer hours of interruption, respectively, from 2013 through 2018.

All of the circuits that serve Central Division customers are listed in Appendix D, first in the order of decreasing frequency and then by decreasing restoration. There were 53 circuits that serve New York customers in the Central Division in 2018. 7 circuits were not considered for this evaluation because the number of customers served did not exceed 100 or the number of interruptions did not exceed three. Of the 46 remaining circuits, 34 (64%) met the Frequency standard, and 26 (49%) met the Restoration standard. These results are a decrease in SAIFI from 2017 when 81% met the frequency standard, but an improvement from 2017's CAIDI when 28% met the restoration standard.

The 2018 Company and Division storm statistics and analysis table is shown in Appendix E. There were five major storm events that resulted in interruptions that met criteria for exclusion from reliability reporting in the Central Division.

For the Central Division, $MAIFI_e$ was 10.1, based on 58,207 Central Division New York customers served, and a total of 593,675 momentary interruptions experienced by customers. This represents a 51% increase over the 2017 performance of 6.67. As discussed in earlier in the report, the Company believes that vegetation was a significant driving factor in the performance of the T&D system in 2018, and that incidental tree or vine contacts with energized conductors drove up the division's $MAIFI_e$. Currently the Company calculates $MAIFI_e$ based on operations from the substation breaker that supply the circuit.

There were 53 circuits serving the Central Division. Appendix A details the circuit priority ratings for these and all of O&R's distribution circuits. Only circuits that serve at least 40% of the Company's New York customers, with respect to its total number of customers served, were considered for evaluation in the worst performing circuit analysis for this report.

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TABLE 4.1 - 5-YEAR COMPARISON – FREQUENCY AND RESTORATION BY MONTH

CENTRAL DIVISION - NYS - ALL OUTAGES - WITHOUT STORMS
calculations for calendar year reliability goals

FREQUENCY - CUSTOMERS AFFECTED / CUSTOMERS SERVED

MONTH	2013	2014	2015	2016	2017	5 YR AVG	2018 ACTUAL Monthly	2018 ACTUAL Y-T-D
JAN	0.07	0.03	0.06	0.08	0.04	0.05	0.08	0.07
FEB	0.05	0.03	0.07	0.08	0.09	0.05	0.08	0.02
MAR	0.05	0.03	0.05	0.05	0.13	0.04	0.06	0.02
APR	0.04	0.06	0.05	0.05	0.07	0.04	0.05	0.07
MAY	0.05	0.16	0.18	0.07	0.06	0.09	0.07	0.09
JUN	0.11	0.07	0.27	0.12	0.09	0.11	0.12	0.26
JLY	0.10	0.13	0.04	0.20	0.14	0.09	0.20	0.18
AUG	0.06	0.03	0.22	0.19	0.14	0.10	0.20	0.14
SEP	0.05	0.08	0.08	0.03	0.04	0.05	0.03	0.14
OCT	0.05	0.11	0.05	0.10	0.17	0.06	0.10	0.11
NOV	0.12	0.10	0.01	0.04	0.02	0.05	0.04	0.11
DEC	0.03	0.10	0.02	0.08	0.04	0.04	0.08	0.07
YR END	0.76	0.92	1.09	1.09	1.03	0.98		1.29

RESTORATION - MINUTES OF INTERR / CUST AFFECTED

MONTH	2013	2014	2015	2016	2017	5 YR AVG	2018 ACTUAL Monthly	2018 ACTUAL Y-T-D
JAN	115.34	104.49	55.53	164.85	96.80	88.04	91.82	91.82
FEB	74.77	120.97	97.58	126.44	303.72	83.95	160.13	108.19
MAR	96.04	185.15	118.08	145.87	89.82	109.03	185.01	120.62
APR	87.99	98.73	98.84	101.55	98.27	77.42	138.29	127.91
MAY	128.70	81.43	94.13	120.99	138.07	85.05	121.72	125.77
JUN	111.07	118.81	102.34	111.25	129.36	88.69	63.52	95.28
JLY	89.13	156.63	179.04	152.98	77.14	115.55	105.66	97.92
AUG	79.52	178.78	60.79	92.62	91.45	82.34	116.00	100.85
SEP	123.92	47.57	120.89	122.23	101.68	82.92	103.80	101.26
OCT	102.15	55.31	132.25	77.22	137.87	73.39	106.33	101.78
NOV	90.36	95.30	144.45	141.08	142.89	94.24	87.38	100.45
DEC	61.84	100.07	73.60	84.04	100.80	63.91	150.14	103.27
YR END(Min)	98.18	101.56	95.93	118.64	123.82	107.62		103.27
YR END(Hr)	1.64	1.69	1.60	1.98	2.06	1.79		1.72

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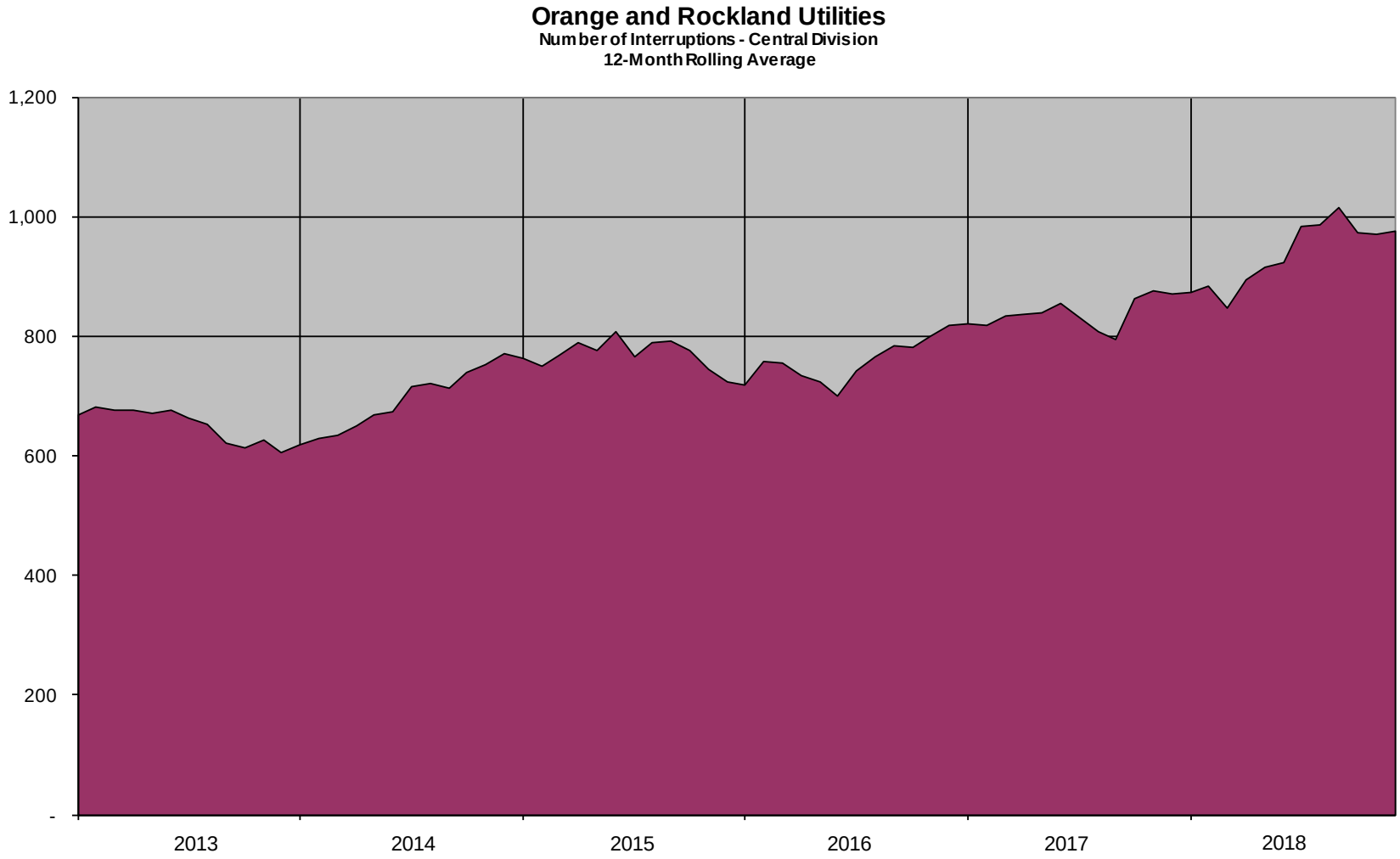
FIGURE 4.1 - 12 MONTH ROLLING AVERAGE – NUMBER OF INTERRUPTIONS



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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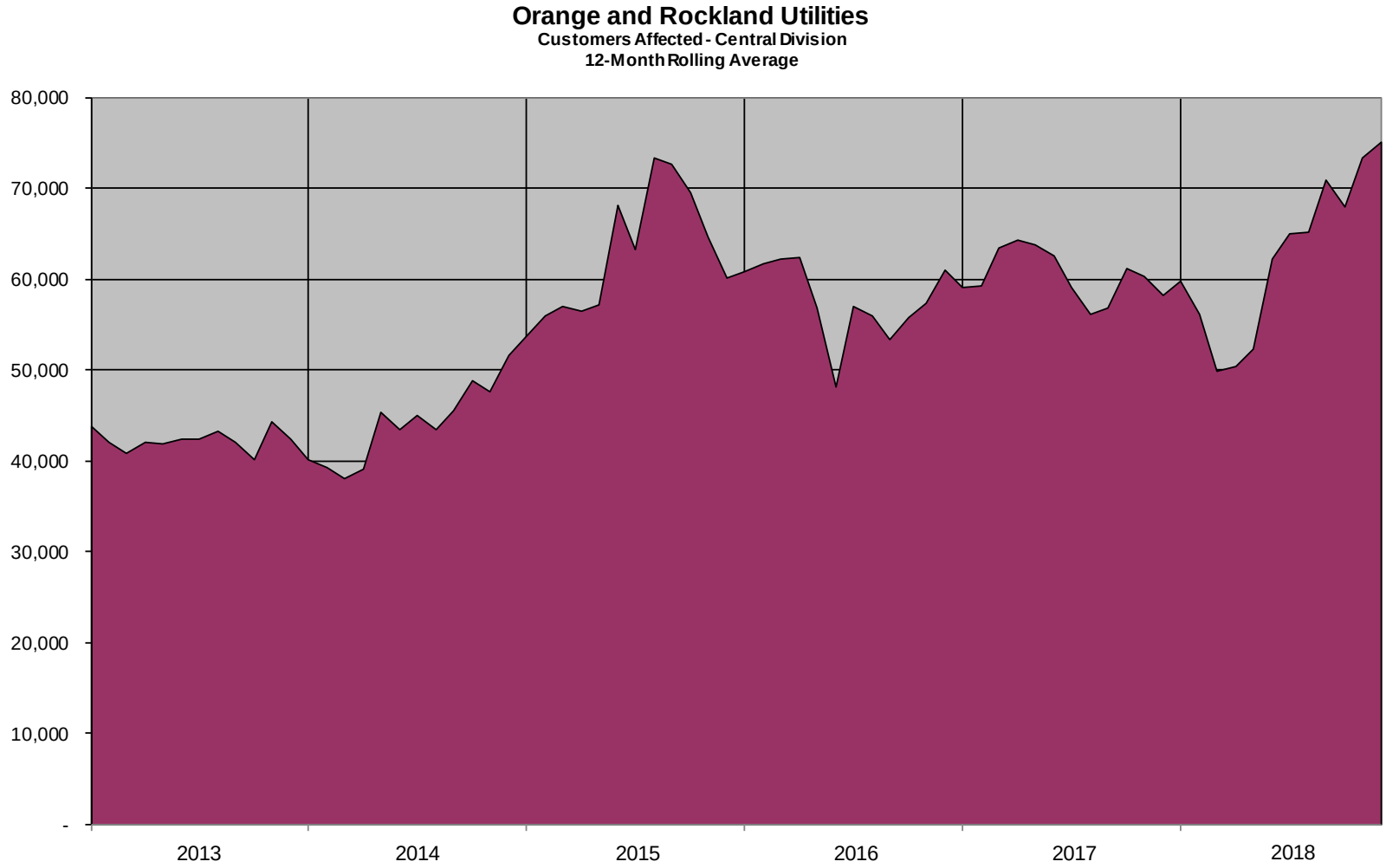
FIGURE 4.2 - 12 MONTH ROLLING AVERAGE – CUSTOMERS AFFECTED



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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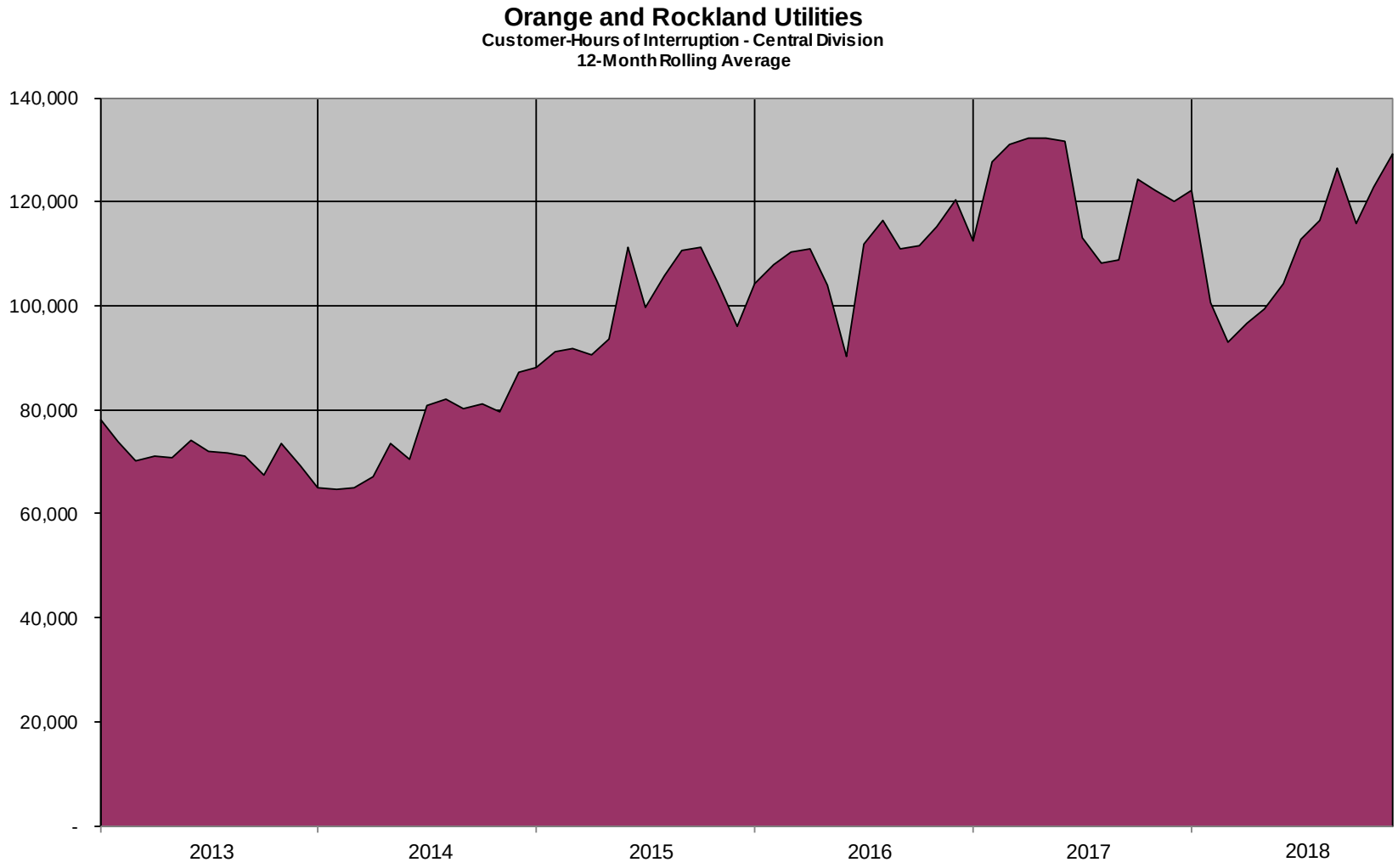
FIGURE 4.3 - 12 MONTH ROLLING AVERAGE – CUSTOMER-HOURS OF INTERRUPTIONS



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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FIGURE 4.4 - OUTAGE STATISTICS BY CAUSE (NO. OF INTERRUPTIONS, CUST. AFFECTED AND CUTS.-HRS OF INTERRUPTION

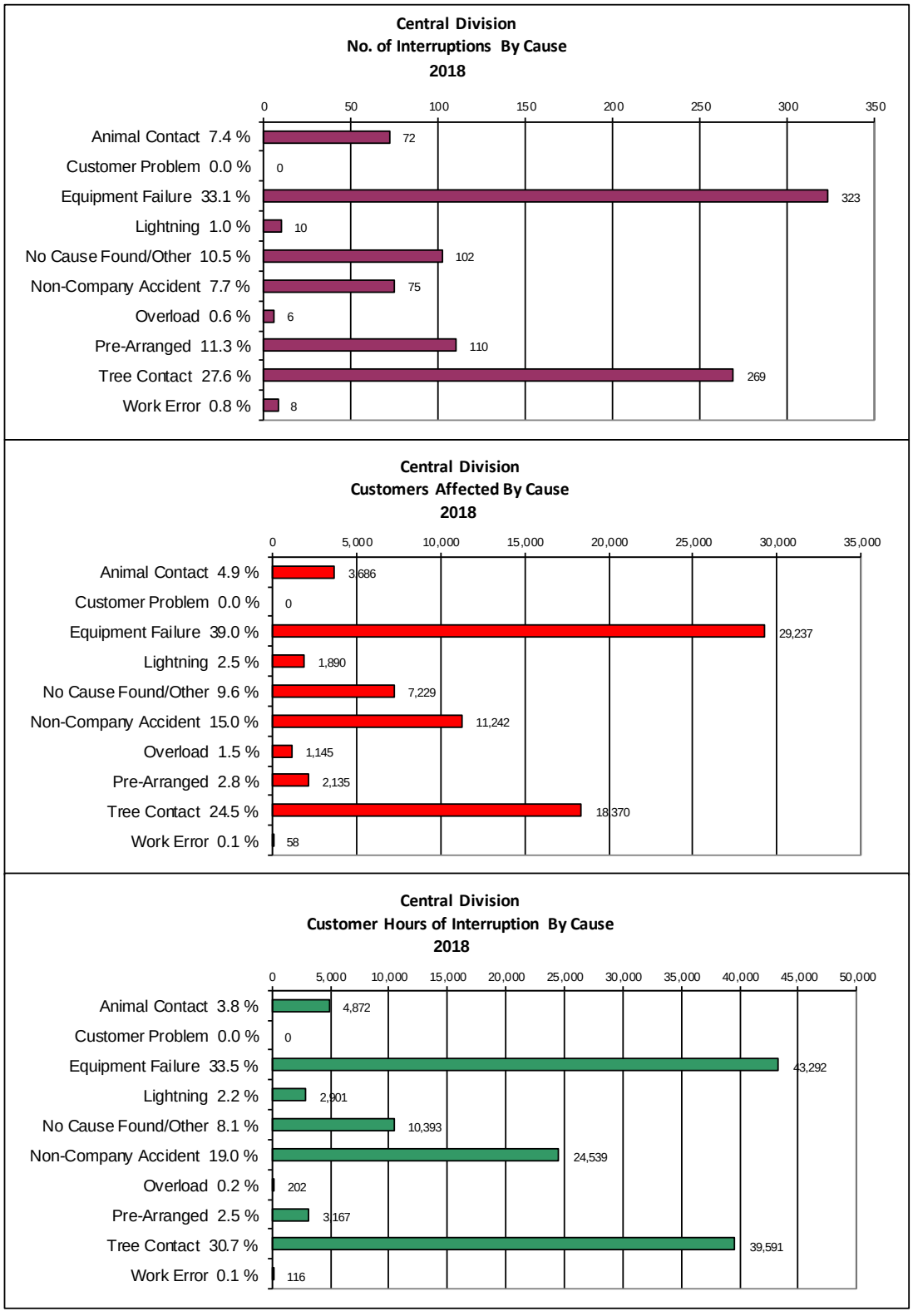

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TABLE 4.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE

		Number of Interruptions By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	**Equipment**							
Overhead	Arrester	0	6	1	3	14	5	4
	Capacitor	0	0	1	0	0	0	0
	Connecter/Splice - Pri	13	9	7	8	3	8	8
	Connecter/Splice - Sec	55	70	54	53	41	55	72
	Disconnect	0	1	0	0	0	0	2
	Electric Meter	0	2	0	0	5	1	0
	Fuse/Cutout/Eld	12	11	10	5	28	13	14
	GOAB	1	0	1	0	0	0	0
	Hardware/Pole	21	27	21	21	16	21	21
	Insulator	1	2	5	7	1	3	1
	Not Coded	0	0	0	0	0	0	1
	O/H Step Transf	3	5	2	3	0	3	4
	O/H Transformer	41	41	25	35	34	35	42
	Recloser	1	0	0	0	0	0	3
	Regulator	0	0	1	0	0	0	0
	Riser Pole Cutout	6	0	1	3	2	2	9
	Sectionalizer	0	0	0	0	0	0	0
	Wire/Cable - Pri	11	17	19	1	31	16	12
	Wire/Cable - Sec	16	14	15	26	20	18	37
	Total - OH	181	205	163	165	195	182	230
Trans/Substa	Brkr/Kyle/Switch	0	0	1	2	3	1	1
	Buss	0	0	0	0	0	0	5
	Fuse/ Fuse Holder	0	0	1	0	0	0	0
	Insulator	0	0	0	2	0	0	0
	Not Coded	1	0	0	0	0	0	1
	Total - Trans/Substa	1	0	2	4	3	2	7
Underground	Arrester	0	1	0	0	0	0	0
	Boxpad/Silo/Vault	0	2	4	1	1	2	3
	Connector/Splice - Sec	0	0	0	0	1	0	3
	Elbow	2	1	1	3	2	2	3
	Hardware	0	0	0	1	0	0	0
	Not Coded	0	0	0	0	1	0	1
	O/H Transformer	0	0	0	0	0	0	2
	Padmount Transf	20	18	15	16	19	18	32
	Splice/Junction - Pri	1	1	2	0	1	1	1
	Splice/Junction - Sec	4	3	4	5	5	4	7
	Stress Cone	0	2	0	3	2	1	1
	Switch	0	0	1	1	0	0	1
	Wire/Cable - Pri	13	7	15	17	11	13	14
	Wire/Cable - Sec	3	10	11	6	7	7	18
	Total - UG	43	45	53	53	50	49	86
	Total - Year	225	250	218	222	248	233	323

Note: Figures in red denote that the value exceeds the 5-year average

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TABLE 4.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE (CONT.)

		Customers Affected By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
Overhead	Arrester	0	107	27	197	162	99	208
	Capacitor	0	0	2,328	0	0	466	0
	Connecter/Splice - Pri	3,975	42	236	165	52	894	462
	Connecter/Splice - Sec	79	86	69	75	54	73	95
	Disconnect	0	958	0	0	0	192	2,207
	Electric Meter	0	2	0	0	5	1	0
	Fuse/Cutout/Eld	727	859	602	104	316	522	75
	GOAB	926	0	1,416	0	0	468	0
	Hardware/Pole	3,167	4,003	1,321	2,984	604	2,416	4,565
	Insulator	319	75	476	3,057	2	786	21
	Not Coded	0	0	0	0	0	0	95
	O/H Step Transf	251	111	569	84	0	203	315
	O/H Transformer	500	1,506	150	635	126	583	186
	Recloser	635	0	0	0	0	127	4,763
	Regulator	0	0	34	0	0	7	0
	Riser Pole Cutout	46	0	2	259	63	74	650
	Sectionalizer	0	0	0	217	0	43	0
	Wire/Cable - Pri	1,117	2,299	6,475	4,999	7,583	4,495	3,839
	Wire/Cable - Sec	36	45	41	73	28	45	76
	Total - OH	11,778	10,093	13,746	12,849	8,995	11,492	17,557
Trans/Substa	Brkr/Kyle/Switch	0	0	1,692	480	697	574	1,462
	Buss	0	0	0	0	0	0	6,778
	Fuse/ Fuse Holder	0	0	1	0	0	0	0
	Insulator	0	0	0	2,068	0	414	0
	Not Coded	2,982	0	0	0	0	596	1,263
	Total - Trans/Substa	2,982	0	1,693	2,548	697	1,584	9,503
Underground	Arrester	0	39	0	0	0	8	0
	Boxpad/Silo/Vault	0	38	78	6	104	45	4
	Connecter/Splice - Sec	0	0	0	0	1	0	3
	Elbow	32	94	785	87	222	244	1,390
	Hardware/Pole	0	0	0	2	0	0	0
	Not Coded	0	0	0	0	1	0	2
	O/H Transformer	0	0	0	0	0	0	15
	Padmount Transf	471	306	601	741	154	455	421
	Splice/Junction - Pri	38	41	3	0	1	17	50
	Splice/Junction - Sec	42	3	5	5	25	16	23
	Stress Cone	0	9	0	101	4	23	37
	Switch	0	0	1	139	0	28	14
	Wire/Cable - Pri	379	391	457	1,212	470	582	552
	Wire/Cable - Sec	15	28	14	61	7	25	89
	Total - UG	977	949	1944	2354	989	1,443	2,600
	Total - Year	15,737	11,042	17,383	17,751	10,681	14,519	29,660

Note: Figures in red denote that the value exceeds the 5-year average

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TABLE 4.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE (CONT.)

		Total Minutes of Interruption By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
Overhead	Arrester	0	16,758	3,375	30,430	17,928	13,698	24,764
	Capacitor	0	0	107,088	0	0	21,418	0
	Connecter/Splice - Pri	175,361	4,160	29,792	34,805	6,502	50,124	44,546
	Connecter/Splice - Sec	9,450	9,010	9,492	8,471	8,896	9,064	15,691
	Disconnect	0	98,827	0	0	0	19,765	49,575
	Electric Meter	0	203	0	0	564	153	0
	Fuse/Cutout/Eld	80,186	76,847	106,855	13,377	64,315	68,316	10,021
	GOAB	13,536	0	73,066	0	0	17,320	0
	Hardware/Pole	263,070	229,666	109,943	294,283	87,837	196,960	473,980
	Insulator	55,524	15,559	7,552	365,810	1,036	89,096	4,074
	Not Coded	0	0	0	0	0	0	2,945
	O/H Step Transf	38,275	45,824	46,765	19,154	0	30,004	33,908
	O/H Transformer	120,210	134,565	23,884	142,626	38,966	92,050	60,536
	Recloser	25,400	0	0	0	0	5,080	248,695
	Regulator	0	0	714	0	0	143	0
	Riser Pole Cutout	11,704	0	420	29,730	15,041	11,379	166,826
	Sectionalizer	0	0	0	1,897	0	379	0
	Wire/Cable - Pri	64,086	127,385	468,841	613,019	547,421	364,150	285,329
	Wire/Cable - Sec	5,649	5,866	6,783	10,943	4,499	6,748	11,228
	Total - OH	862,451	764,670	994,570	1,564,545	793,005	995,848	1,432,118
Trans/Substa	Brkr/Kyle/Switch	0	0	92,528	78,681	6,273	35,496	83,334
	Buss	0	0	0	0	0	0	339,554
	Fuse/ Fuse Holder	0	0	402	0	0	80	0
	Insulator	0	0	0	54,334	0	10,867	0
	Not Coded	427,355	0	0	0	0	85,471	0
	Total - Trans/Substa	427,355	0	92,930	133,015	6,273	131,915	422,888
Underground	Arrester	0	16,614	0	0	0	3,323	0
	Boxpad/Silo/Vault	0	11,444	33,329	1,374	3,926	10,015	433
	Connecter/Splice - Sec	0	0	0	0	337	67	748
	Elbow	4,560	24,988	70,710	18,808	67,321	37,277	299,516
	Hardware/Pole	0	0	0	255	0	51	0
	Not Coded	0	0	0	0	355	71	1,794
	O/H Transformer	0	0	0	0	0	0	1,798
	Padmount Transf	92,207	133,895	129,179	236,581	30,185	124,409	83,068
	Splice/Junction - Pri	69,084	7,986	804	0	124	15,600	13,100
	Splice/Junction - Sec	6,013	475	1,958	670	5,560	2,935	9,152
	Stress Cone	0	3,933	0	30,633	875	7,088	1,665
	Switch	0	0	152	26,549	0	5,340	2,016
	Wire/Cable - Pri	119,245	103,152	151,737	414,209	151,912	188,051	148,669
	Wire/Cable - Sec	4,719	13,776	6,043	13,121	2,743	8,080	33,311
	Total - UG	295,828	316,263	393,912	742,200	263,338	402,308	595,270
	Total - Year	1,585,634	1,080,933	1,481,412	2,439,760	1,062,616	1,530,071	2,450,276

Note: Figures in red denote that the value exceeds the 5-year average

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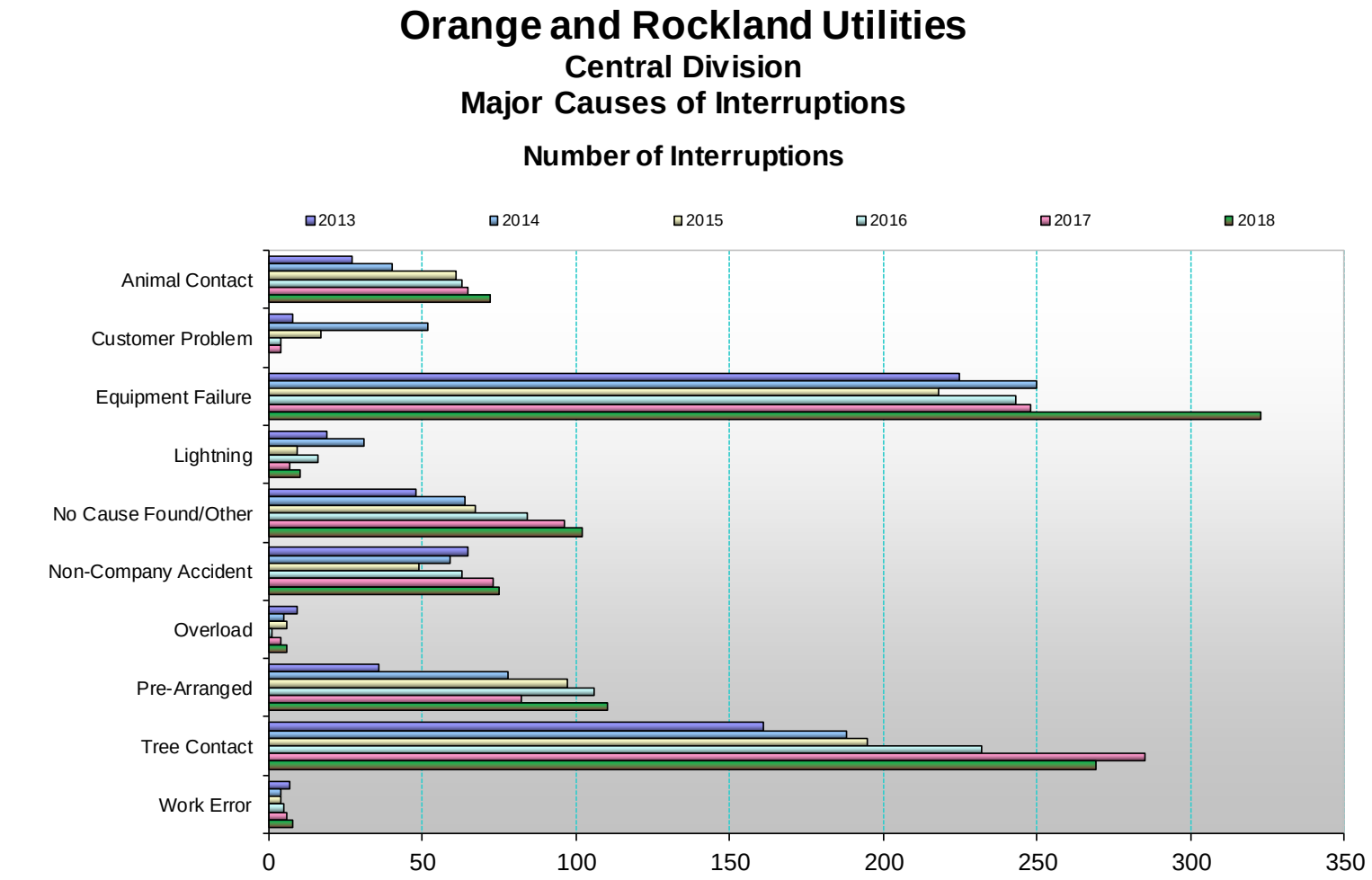
FIGURE 4.5 - 5-YEAR COMPARISON – NUMBER OF INTERRUPTIONS BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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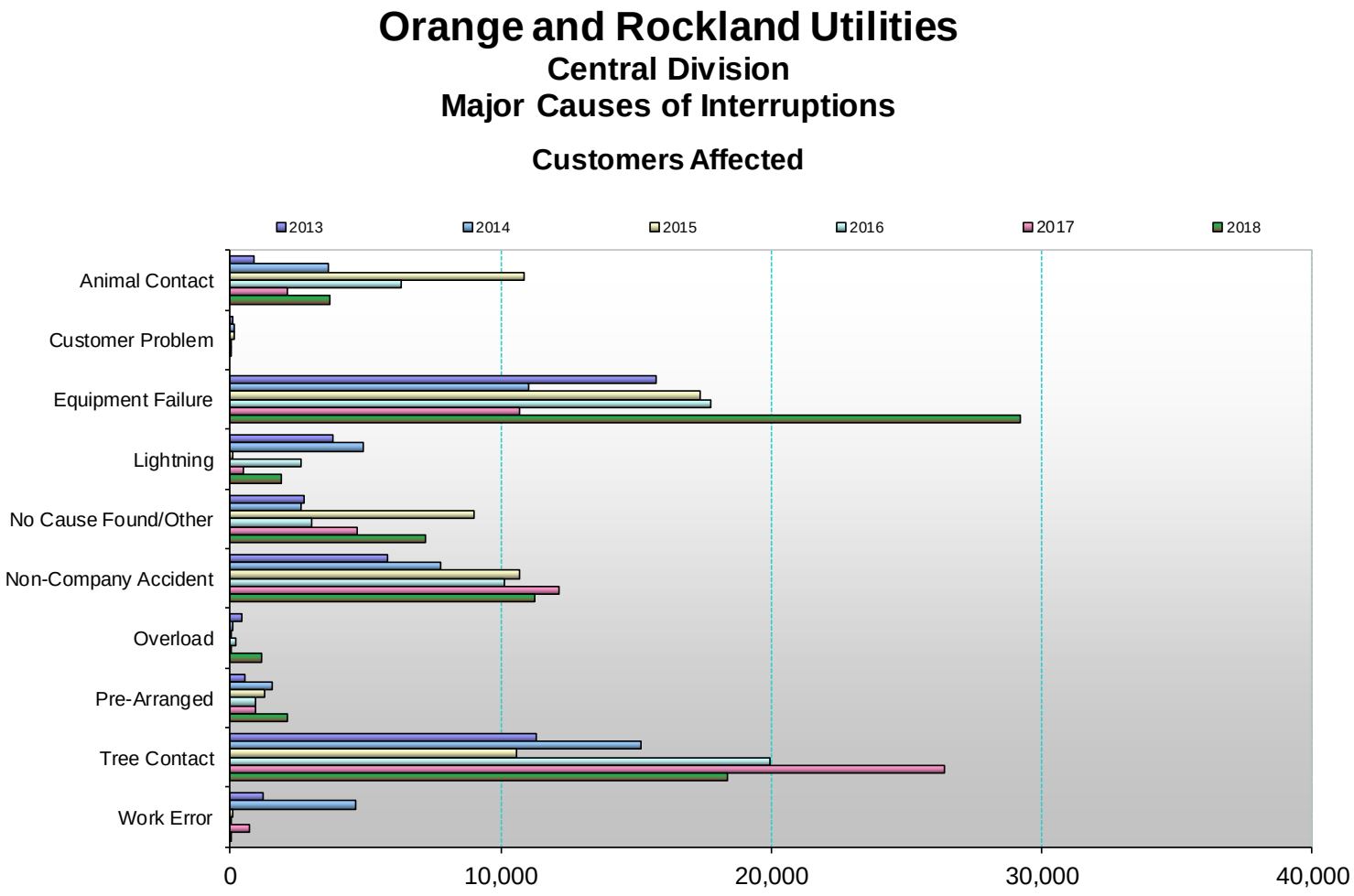
FIGURE 4.6 - 5-YEAR COMPARISON – CUSTOMERS AFFECTED BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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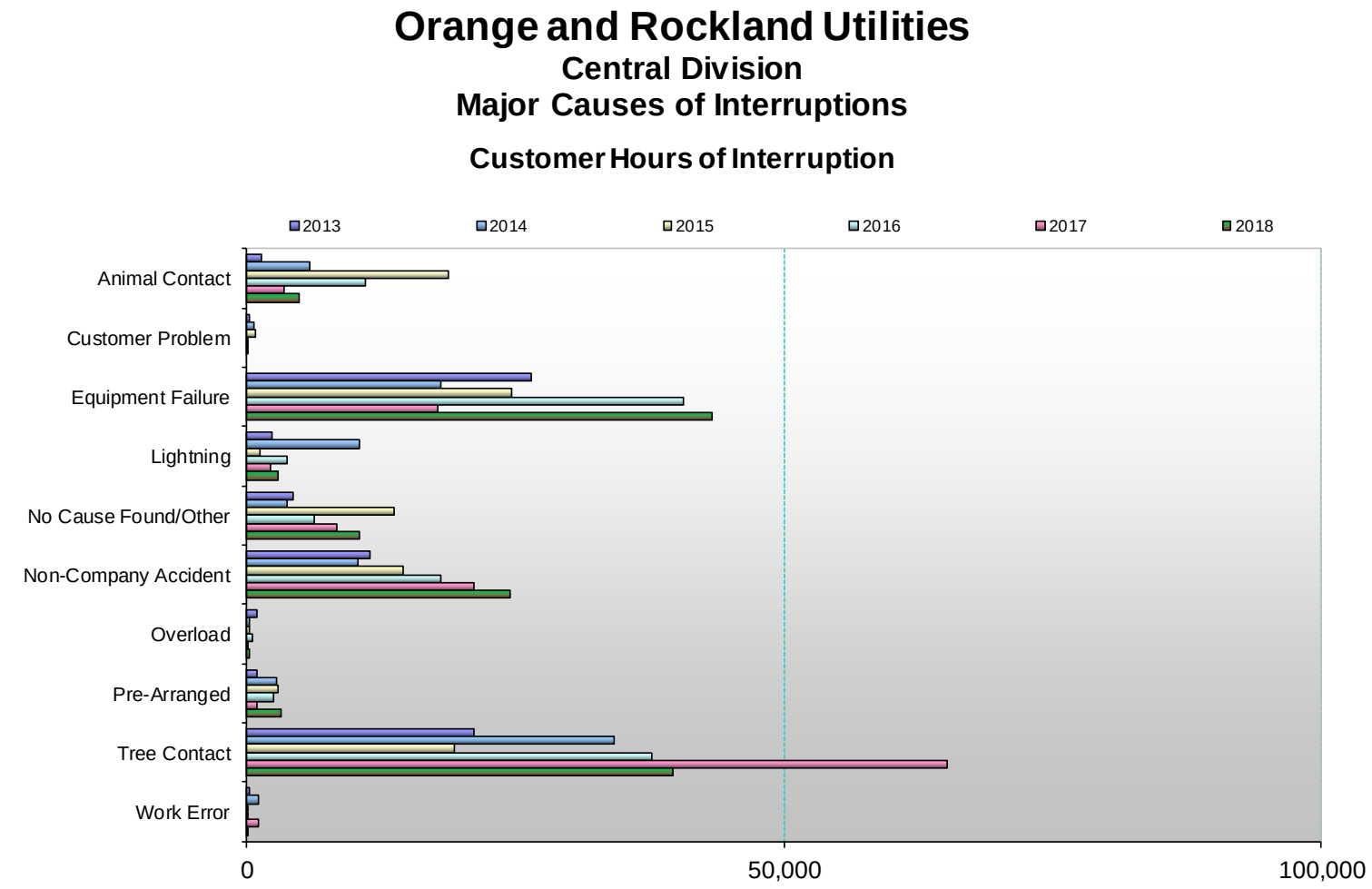
FIGURE 4.7 - 5-YEAR COMPARISON – CUSTOMER-HOURS OF INTERRUPTIONS BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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TABLE 4.3 - 5-YR COMPARISON – LARGE OUTAGE (>5,000 CUSTOMERS) IMPACT ON SAIFI, CAIDI & SAIDI

Central Division Without Storms
Effect of Interruptions Affecting 5,000 or more Customers

YEAR	CUSTOMERS SERVED (CS)	# OF INTERRUPTIONS	CUSTOMERS AFFECTED (CA)	CUSTOMER MINUTES OF INTERRUPTION (CM)	FREQUENCY (CA/CS)	RESTORATION (CM/CA)	DURATION (CM/CS)
WITHOUT STORMS							
2013	55,722	605	42,382	4,160,987	0.76	1.64	1.24
2014	56,049	771	51,547	5,234,937	0.92	1.69	1.56
2015	55,222	723	60,144	5,769,344	1.09	1.60	1.74
2016	55,701	817	60,914	7,226,645	1.09	1.98	2.16
2017	56,353	870	58,169	7,202,401	1.03	2.06	2.13
5-Yr Average	**55,809**	**757**	**54,631**	**5,918,863**	**0.98**	**2.06**	**2.02**
2018	57,976	975	74,992	7,744,345	1.29	1.72	2.23
WITHOUT STORMS - OUTAGES AFFECTING > 5000 CUSTOMERS							
YEAR	SERVED	INTERR's	CUST AFF				
2013	55,722	-	-	-			
2014	56,049	-	-	-			
2015	55,222	2	10,758	1,317,960			
2016	55,701	-	-	-			
2017	56,353	-	-	-			
5-Yr Average	**55,809**	**0.40**	**2,152**	**263,592**			
2018	57,976	1	5,753	3,884			
WITHOUT STORMS AND WITHOUT THOSE OUTAGES AFFECTING > 5000 CUSTOMERS							
2013	55,722	605	42,382	4,160,987	0.76	1.64	1.24
2014	56,049	771	51,547	5,234,937	0.92	1.69	1.56
2015	55,222	721	49,386	4,451,384	0.89	1.50	1.34
2016	55,701	817	60,914	7,226,645	1.09	1.98	2.16
2017	56,353	870	58,169	7,202,401	1.03	2.06	2.13
5-Yr Average	**55,809**	**757**	**52,480**	**5,655,271**	**0.94**	**2.06**	**1.94**
2018	57,976	974	69,239	7,740,461	1.19	1.86	2.23

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4.3. Circuit 71-3-13

Circuit 71-3-13 is the highest ranked in the Central Division in accordance with the Company's 2018 circuit priority rating system. It was also the highest ranking circuit in the division in 2017. The circuit originates from the Harriman Substation in Harriman, New York and serves a total of 2,275 customers over 53 circuit miles. In 2018, there were 39 interruptions on the circuit, which affected 8,685 O&R customers for 15,893 customer-hours of interruption.

The tables below lists the outages affecting circuit 71-3-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 71-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	2.6	8	0.1	16.1	0.1
Equipment Failure	13	33.3	4,462	51.4	9,151.6	57.6
Lightning - Previous	1	2.6	3	0.0	3.9	0.0
No Cause Found	2	5.1	21	0.2	28.6	0.2
NonCo Acc - MotorVeh	5	12.8	2,192	25.2	2,376.2	15.0
NonCo Acc - Tree	1	2.6	3	0.0	12.1	0.1
Pre-Arr - Company	3	7.7	49	0.6	108.6	0.7
Tree Contact	12	30.8	1,945	22.4	4,181.5	26.3
Work Err - Contractor	1	2.6	2	0.0	14.8	0.1
Total	**39**		**8,685**		**15,893.3**	

3 Year Summary (1/1/2016 - 12/31/2018) 71-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	3	3.6	118	0.6	195.8	0.6
Equipment Failure	21	25.3	5,078	25.1	10,533.7	30.8
Lightning - Present	2	2.4	2,255	11.2	2,661.5	7.8
No Cause Found	8	9.6	218	1.1	499.7	1.5
NonCo Acc - MotorVeh	5	6.0	2,192	10.8	2,376.2	7.0
NonCo Acc - Tree	2	2.4	5	0.0	19.0	0.1
Pre-Arr - Company	9	10.8	85	0.4	163.1	0.5
Tree Contact	32	38.6	10,255	50.7	17,714.5	51.8
Work Err - Contractor	1	1.2	2	0.0	14.8	0.0
Total	83		20,208		34,178.2	

Tree contacts and equipment failures continue to have the most significant impact on the circuit performance. The greatest negative impact on circuit performance for the 71-3-13 was the number of equipment failures and the number of customers affected by equipment failure outages. In 2018 there were ten more outages due to equipment failures than in 2017. Two events represented 8,630 customer-hours or 54% of the total customer-hours.

The most significant event was a failed cross arm which triggered a failure in operation of the substation breaker. The substation breaker did not operate properly and line crews had to switch the customers to different circuits while the breaker was repaired. This event accounted for 30% of the customer-hours for the entire year.

The second major event was a failure in operation of the recloser on the circuit. This caused a long duration outage impacting a large number of customers. This event accounted for 24% of the customer-hours for the entire year.

Without the impact of these two major events the customer-hours would have been lower than the 2017 total. Unfortunately, the two significant events are driving the 2018 performance.

In 2018, automation was installed on circuit 71-3-13 in order to make an auto-loop scheme with an adjacent circuit. Vegetation management cycle trimming was started on this circuit in 2017 and was complete in 2018. The circuit was in the 2018 circuit ownership program.

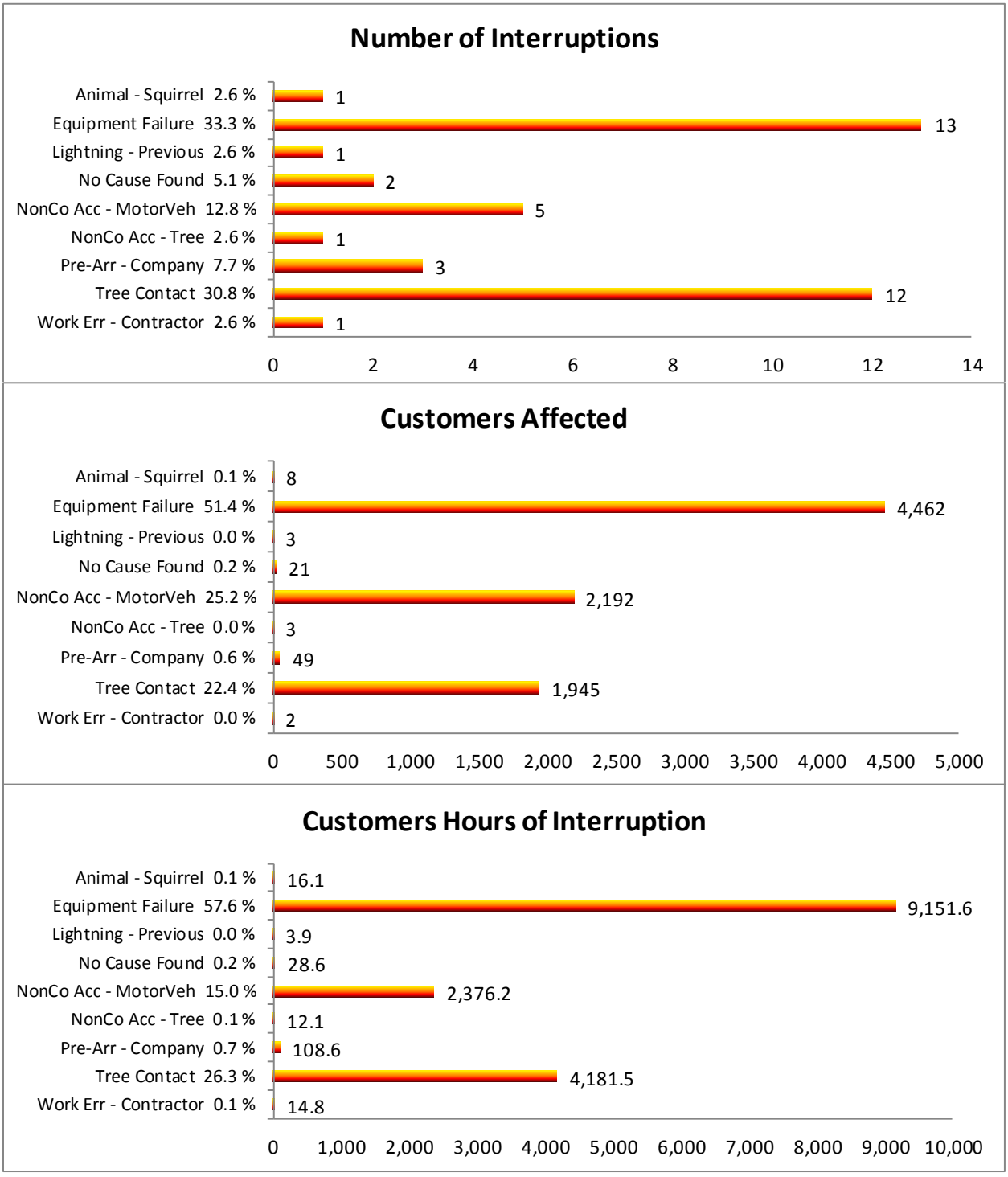
Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will remain in the 2019 circuit ownership program. Despite the recent vegetation management cycle, much of the area served by the circuit has mature trees that are outside of the trim zone and pose a threat to the overhead conductors. As a result, the Company will continue to monitor vegetation in close proximity to the overhead conductors. In the absence of a formal hazard tree removal program, the Company will also evaluate potential hazard trees on a case-by-case basis to help reduce the threat to the reliability of the circuit.

A project to automate the circuit remains on holding pending the completion of the Route 32 road widening project currently under construction by the State of New York and slated for completion at the end of 2019.

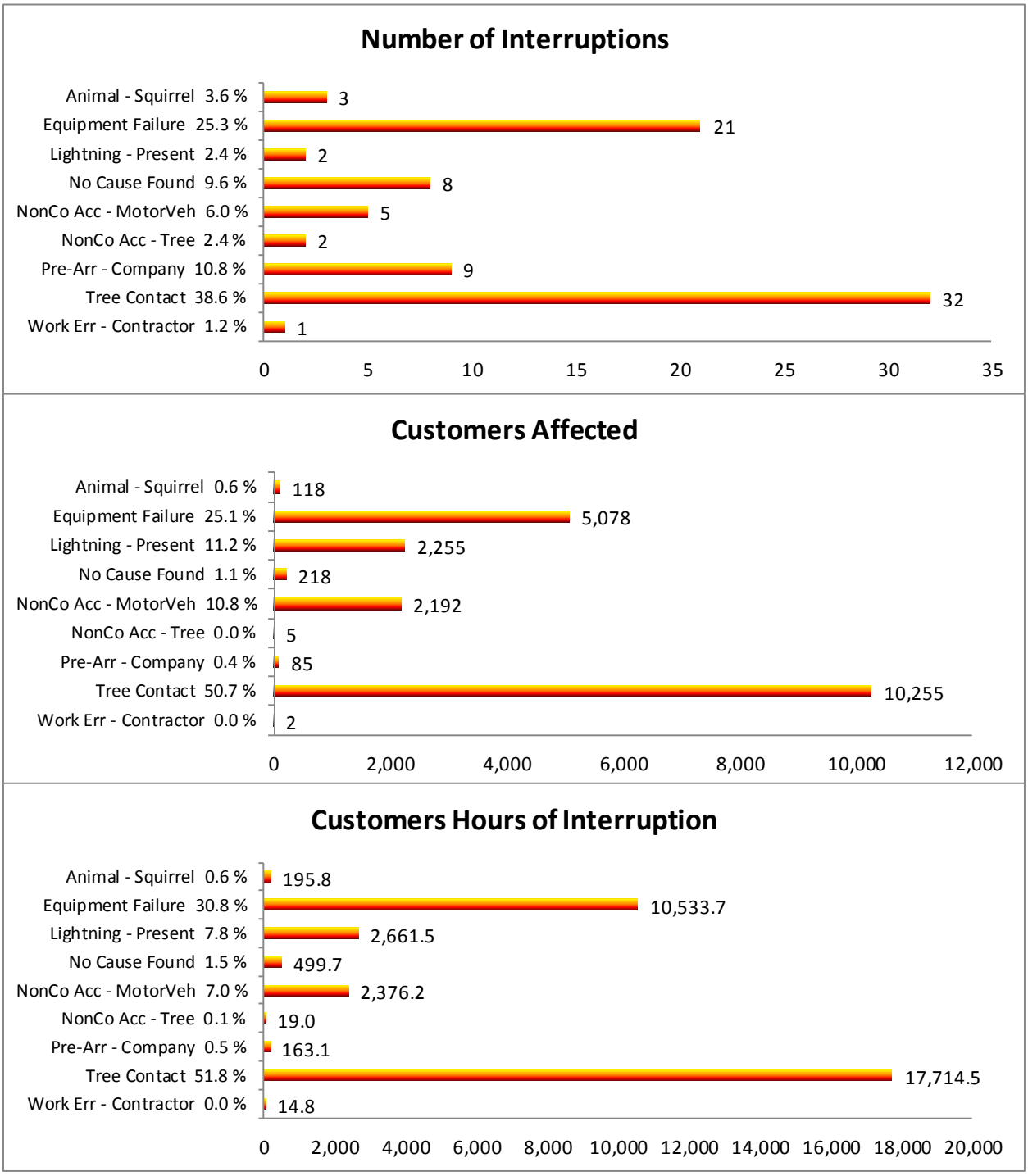
71-3-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	2291	6	15
Critical Customers	15	3	8
Circuit Miles	53.855	4	12
Customers/Mile	42.5	32	183
Connected kVA	29,755	4	15
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	No	N/A	
Vegetation Management			
Last Cycle Completion	2017		
Next Cycle Scheduled	2020		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 71-3-13 – ONE YEAR PERFORMANCE



CIRCUIT 71-3-13 – THREE YEAR PERFORMANCE



4.4. Circuit 80-3-13

Circuit 80-3-13 was ranked second in the Central Division, in accordance with the Company's 2018 circuit priority rating system. Circuit 80-3-13 originates from the Wisner Substation, in Warwick, New York and extends for approximately 74 circuit miles. This is the company's second longest circuit and also has the second most customers with 2,909. In 2018, there were 34 interruptions on the circuit, which affected 6,338 O&R customers for 7,111 customer-hours of interruption.

The tables below lists the outages affecting circuit 80-3-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 80-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	2.9	2	0.0	2.3	0.0
Equipment Failure	11	32.4	3,590	56.6	911.8	12.8
No Cause Found	2	5.9	144	2.3	375.7	5.3
NonCo Acc - MotorVeh	3	8.8	857	13.5	2,465.9	34.7
Pre-Arr - Company	1	2.9	57	0.9	46.6	0.7
Tree Contact	16	47.1	1,688	26.6	3,308.5	46.5
Total	**34**		**6,338**		**7,110.7**	

3 Year Summary (1/1/2016 - 12/31/2018) 80-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	2	1.7	6	0.0	13.1	0.1
Animal - Squirrel	2	1.7	73	0.6	89.9	0.6
Equipment Failure	25	21.7	5,237	40.3	3,017.2	19.4
Lightning - Present	1	0.9	18	0.1	89.1	0.6
No Cause Found	16	13.9	575	4.4	1,804.6	11.6
NonCo Acc - MotorVeh	8	7.0	1,757	13.5	3,970.3	25.5
Pre-Arr - Company	24	20.9	554	4.3	273.8	1.8
Tree Contact	37	32.2	4,786	36.8	6,309.0	40.5
Total	**115**		**13,006**		**15,567.0**	

Due to its length and corresponding exposure to outages the circuit continues to be impacted mostly by tree related outages and motor vehicle accidents. Trees continue to account for the majority of the customer-hours (46%) followed by MVAs (35%) and equipment failures (12%).

The event with the greatest impact was a tree contact that resulted in four sections of primary wire down and extensive cross arm repairs. This event was responsible for 34% of the total customer hours for the year.

The second largest event that had a significant impact on the circuit performance was a motor vehicle accident. The duration of the event was extensive due to environmental factors and mechanical problems the crew had with their work equipment. This event accounted for 30% of the total customer hours for the year.

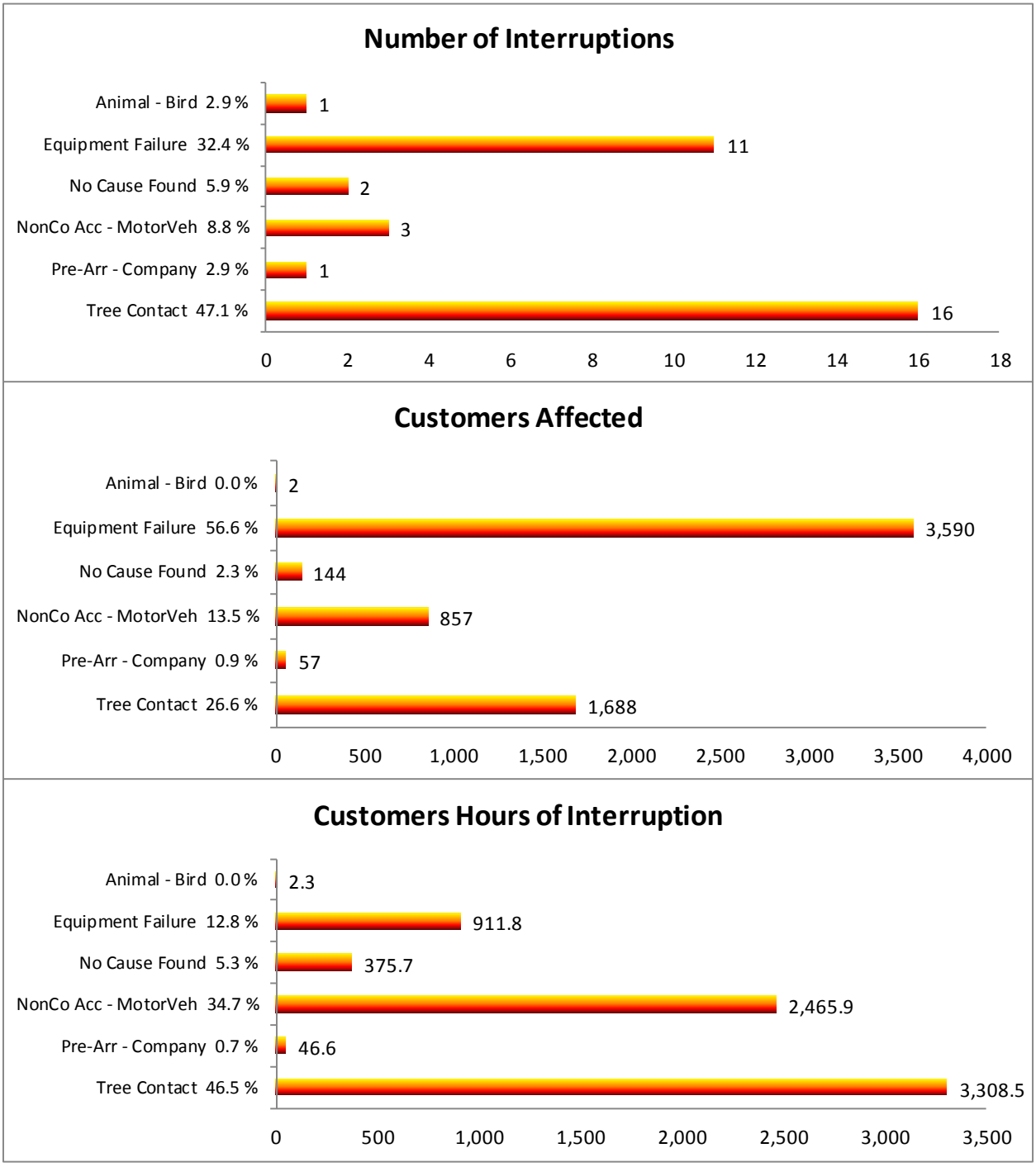
In 2018 the Company increased the frequency of patrols, performed hot spot tree trimming and completed fuse coordination jobs on the circuit. Protection settings were reviewed and updated on the distribution equipment and substation breaker. This circuit was included in the 2018 circuit ownership program and was thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will remain in the 2019 circuit ownership program. Vegetation management cycle trimming is scheduled for this circuit in 2019. Automated switch additions are planned on this circuit in 2019 which will improve the company's ability to minimize the impact of outages. In addition, a cross-function team including representatives from Engineering, Operations and the Control Center has been convened to review the historical performance of this circuit and to recommend alternative that will improve its performance moving forward.

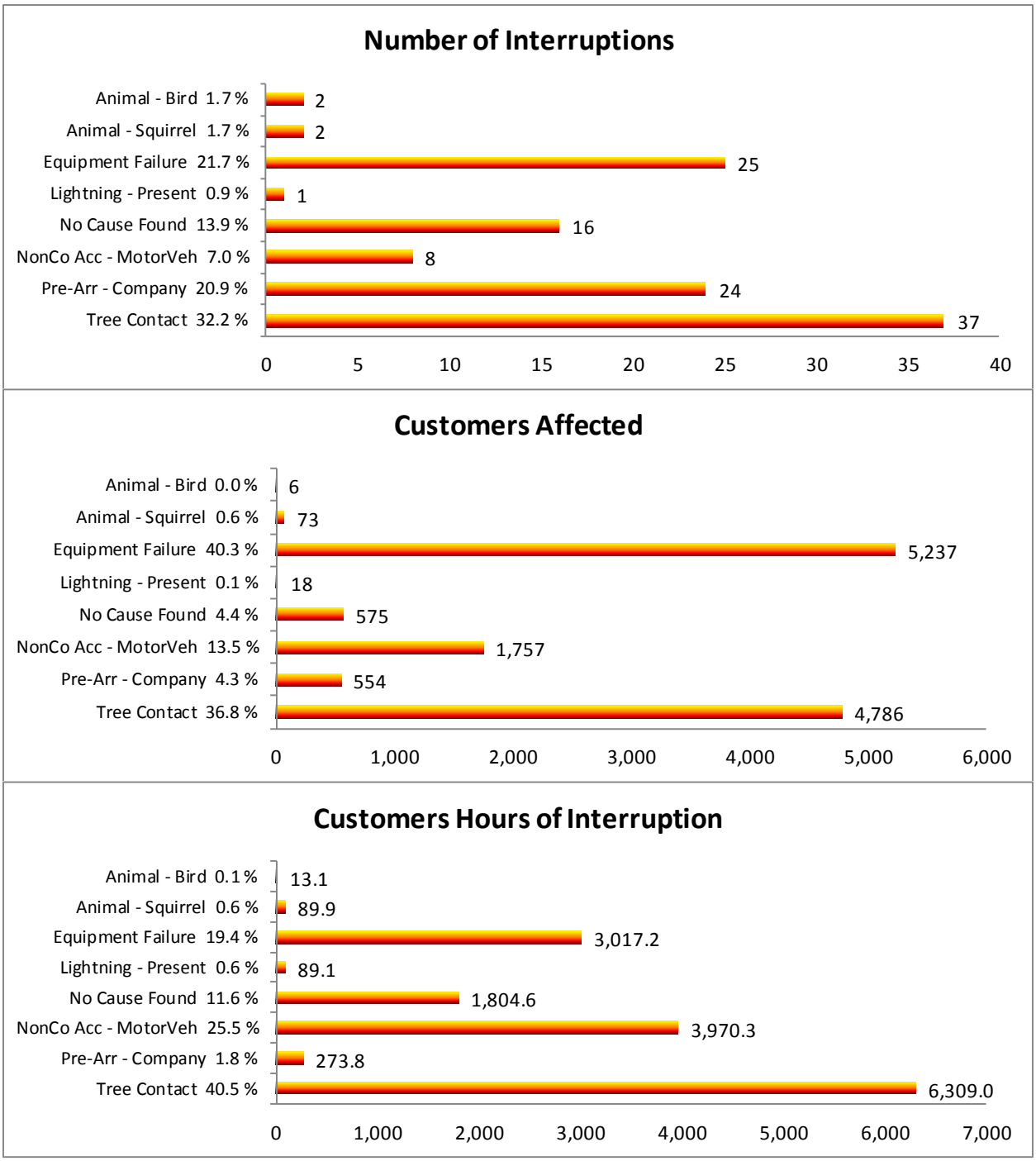
80-3-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	2909	1	2
Critical Customers	11	8	26
Circuit Miles	73.9	1	2
Customers/Mile	39.4	34	193
Connected kVA	39,921	1	4
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	No	N/A	
Vegetation Management			
Last Cycle Completion	2016		
Next Cycle Scheduled	2019		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 80-3-13 – ONE YEAR PERFORMANCE



CIRCUIT 80-3-13 – THREE YEAR PERFORMANCE



4.5. Circuit 84-1-13

Circuit 84-1-13 was ranked third in the Central Division, in accordance with the Company's 2018 circuit priority rating system. Circuit 84-1-13 originates from the Hunt Substation, in Greenwood Lake. This circuit serves 2,166 customers over 50 circuit miles, and is the second longest circuit in the division (13 miles longer than the average length of the company's 100 longest circuits). In 2018 there were 39 interruptions on the circuit, which affected 4,484 O&R customers for 8,590 customer-hours of interruption.

The tables below lists the outages affecting circuit 84-1-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 84-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	2	5.1	12	0.3	16.2	0.2
Equipment Failure	11	28.2	55	1.2	333.6	3.9
No Cause Found	5	12.8	243	5.4	362.9	4.2
NonCo Acc - MotorVeh	2	5.1	331	7.4	652.9	7.6
NonCo Acc - UG	1	2.6	212	4.7	366.9	4.3
Pre-Arr - Company	2	5.1	12	0.3	16.0	0.2
Tree Contact	15	38.46	3,616	80.64	6,826.5	79.47
Work Err - Contractor	1	2.56	3	0.07	14.8	0.17
Total	**39**		**4,484**		**8,589.7**	

3 Year Summary (1/1/2016 - 12/31/2018) 84-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	7	11.3	155	2.7	174.0	1.6
Equipment Failure	16	25.8	726	12.9	1,610.1	14.6
No Cause Found	6	9.7	270	4.8	415.5	3.8
NonCo Acc - MotorVeh	3	4.8	365	6.5	955.5	8.6
NonCo Acc - UG	1	1.6	212	3.8	366.9	3.3
Pre-Arr - Company	3	4.8	15	0.3	20.5	0.2
Tree Contact	25	40.3	3,893	69.0	7,503.4	67.8
Work Err - Contractor	1	1.6	3	0.1	14.8	0.1
Total	**62**		**5,639**		**11,060.7**	

The largest impact on the performance of the 84-1-13 continues to be tree related outages. There were 15 tree related interruptions that accounted for approximately 80% of the customers and

customer-hours on the circuit. There were two large tree related outages recorded on the circuit in 2018; however no single tree event was any more significant than any other.

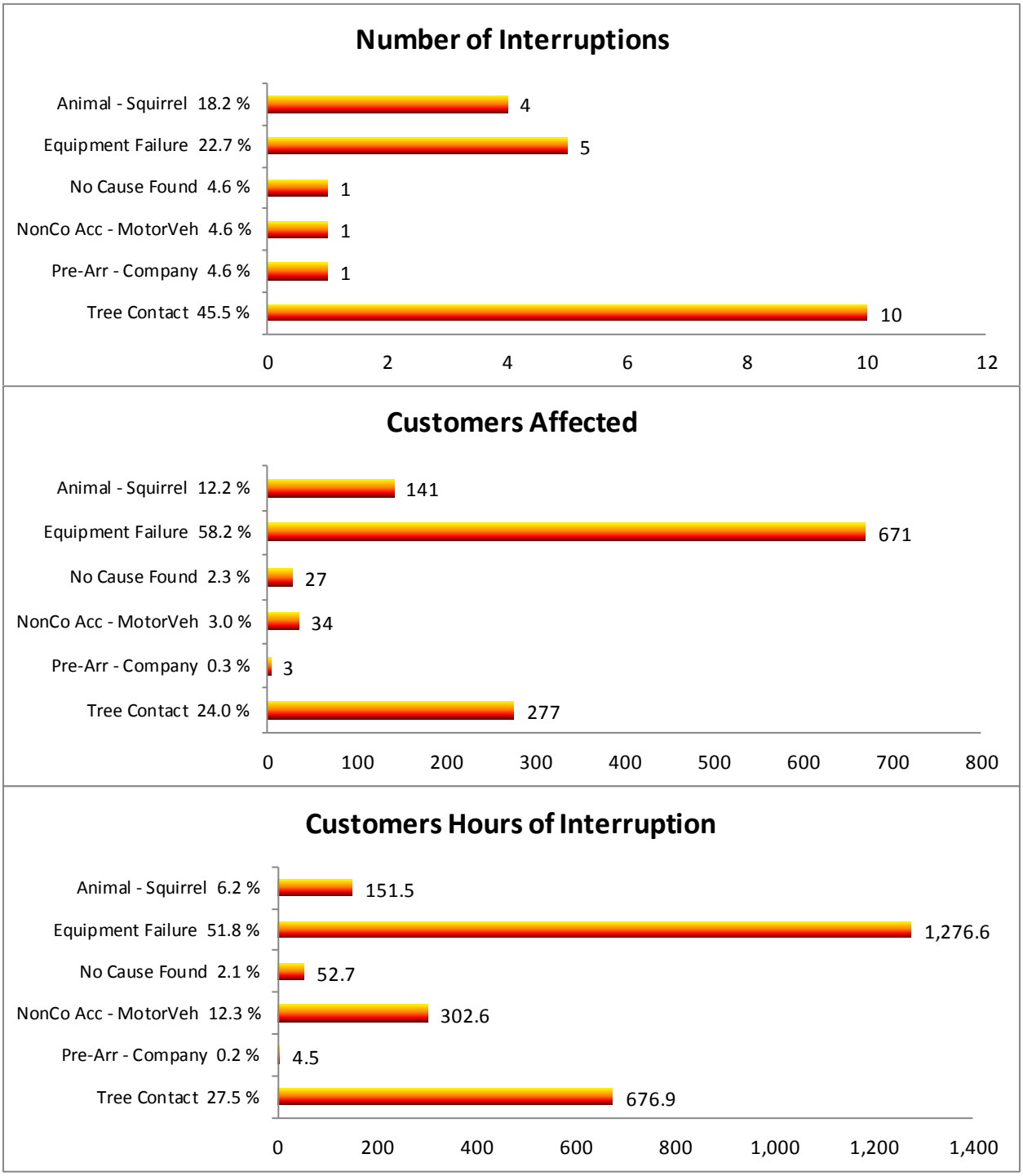
Vegetation management cycle trimming was complete for this circuit in 2018. This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will remain in the 2019 circuit ownership program. The Company will continue to monitor vegetation in close proximity to the overhead conductors. In the absence of a formal hazard tree removal program, the Company will also evaluate potential hazard trees on a case-by-case basis to help reduce the threat to the reliability of the circuit. Automated switch additions are planned on this circuit in 2019 which will improve the company's ability to minimize the impact of outages.

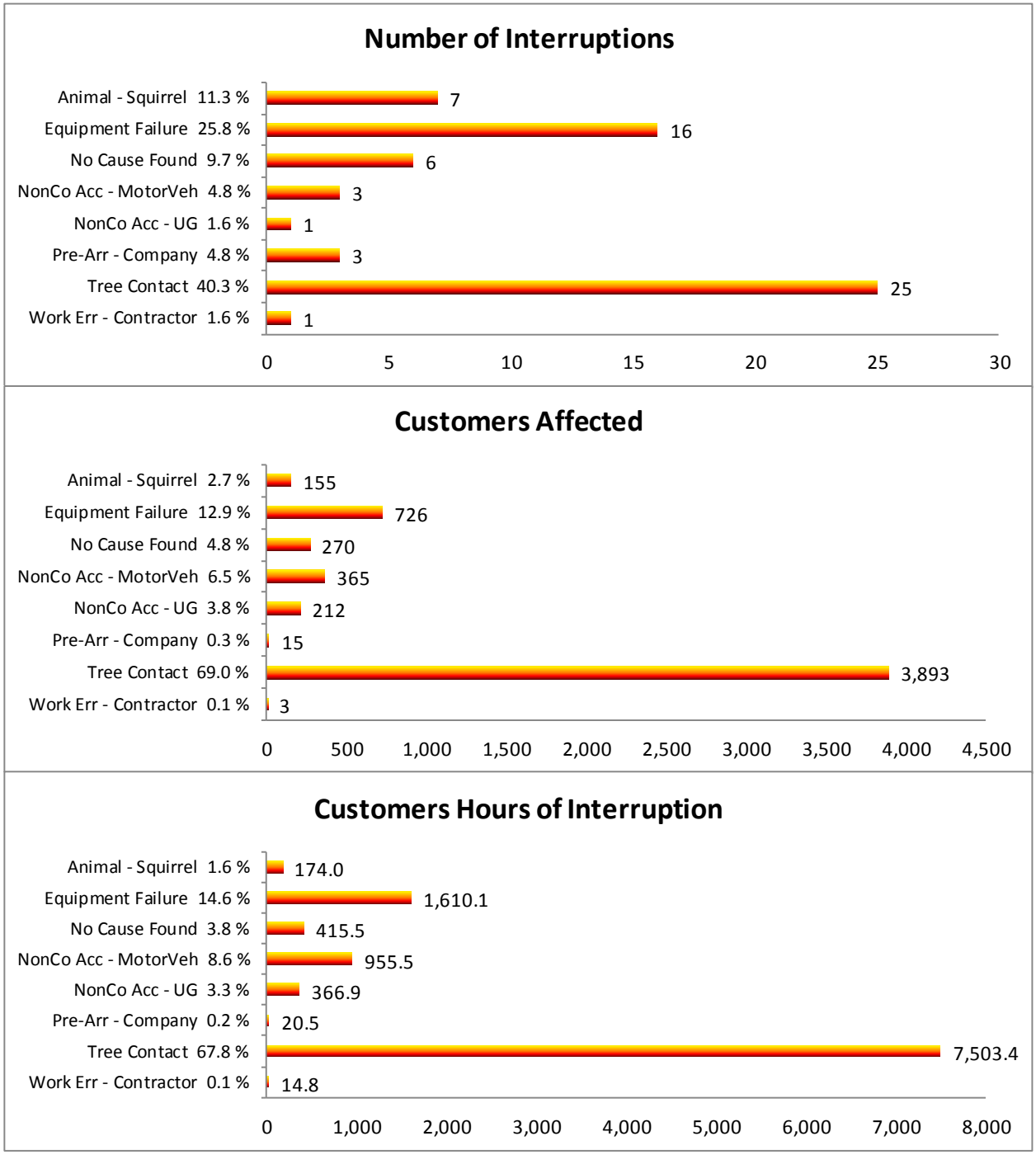
84-1-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	2166	8	19
Critical Customers	11	8	26
Circuit Miles	50.85	7	15
Customers/Mile	42.6	31	182
Connected kVA	18,675	23	113
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Yes	61-6-13	
Vegetation Management			
Last Cycle Completion	2018		
Next Cycle Scheduled	2021		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 84-1-13 – ONE YEAR PERFORMANCE



CIRCUIT 84-1-13 – THREE YEAR PERFORMANCE



4.6. Circuit 84-3-13

Circuit 84-3-13 was ranked fourth in the Central Division, in accordance with the Company's 2018 circuit priority rating system. Circuit 84-3-13 originates from the Hunt Substation and runs south along the eastern shore of Greenwood Lake ending just north of the state line with New Jersey. This circuit serves 1,825 customers over 40 circuit miles, and is three miles longer than the average length of the company's 100 longest circuits. In 2018 there were 19 interruptions on the circuit, which affected 2,286 O&R customers for 3,569 customer-hours of interruption.

The tables below lists the outages affecting circuit 84-3-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 84-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Equipment Failure	5	26.3	364	15.9	325.1	9.1
No Cause Found	3	15.8	73	3.2	180.7	5.1
NonCo Acc - MotorVeh	2	10.5	74	3.2	755.0	21.2
Tree Contact	9	47.4	1,775	77.7	2,308.6	64.7
Total	**19**		**2,286**		**3,569.4**	

3 Year Summary (1/1/2016 - 12/31/2018) 84-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	1.7	30	0.4	63.5	0.6
Equipment Failure	13	22.0	2069	25.0	1,063.7	9.6
No Cause Found	8	13.6	255	3.1	485.3	4.4
NonCo Acc - MotorVeh	3	5.1	223	2.7	1,220.9	11.0
NonCo Acc - Other	1	1.7	2	0.0	13.4	0.1
NonCo Acc - Tree	1	1.7	85	1.0	677.2	6.1
Pre-Arr - Company	1	1.7	8	0.1	14.0	0.1
Tree Contact	30	50.8	5053	61.0	7,298.1	66.0
Work Err - Company	1	1.7	564	6.8	224.0	2.0
Total	**59**		**8289**		**11,060.0**	

The most significant cause of interruptions and related customer-hours on the circuit continue to be tree contacts. The mountainous terrain surrounding Greenwood Lake is not conducive to tree root development resulting in the area being prone to fallen trees even during non-severe weather periods. As a result, tree contact outages continue to account for the majority of the customer-hours (65%) followed by MVAs (21%) and equipment failures (9%). There were nine tree contacts

that accounted for over 65% of the customer-hours, and impacted 77% of the customers on the circuit.

One tree interruption accounted for 33% of the total customer-hours for the year. This incident resulted in phases down in multiple locations, just after the re-closer and required several crews to complete repairs.

Another event in 2018 that had a significant impact on the circuit performance was a motor vehicle accident. The duration of the event was extensive due to environmental factors. This event accounted for 21% of the total customer hours for the year.

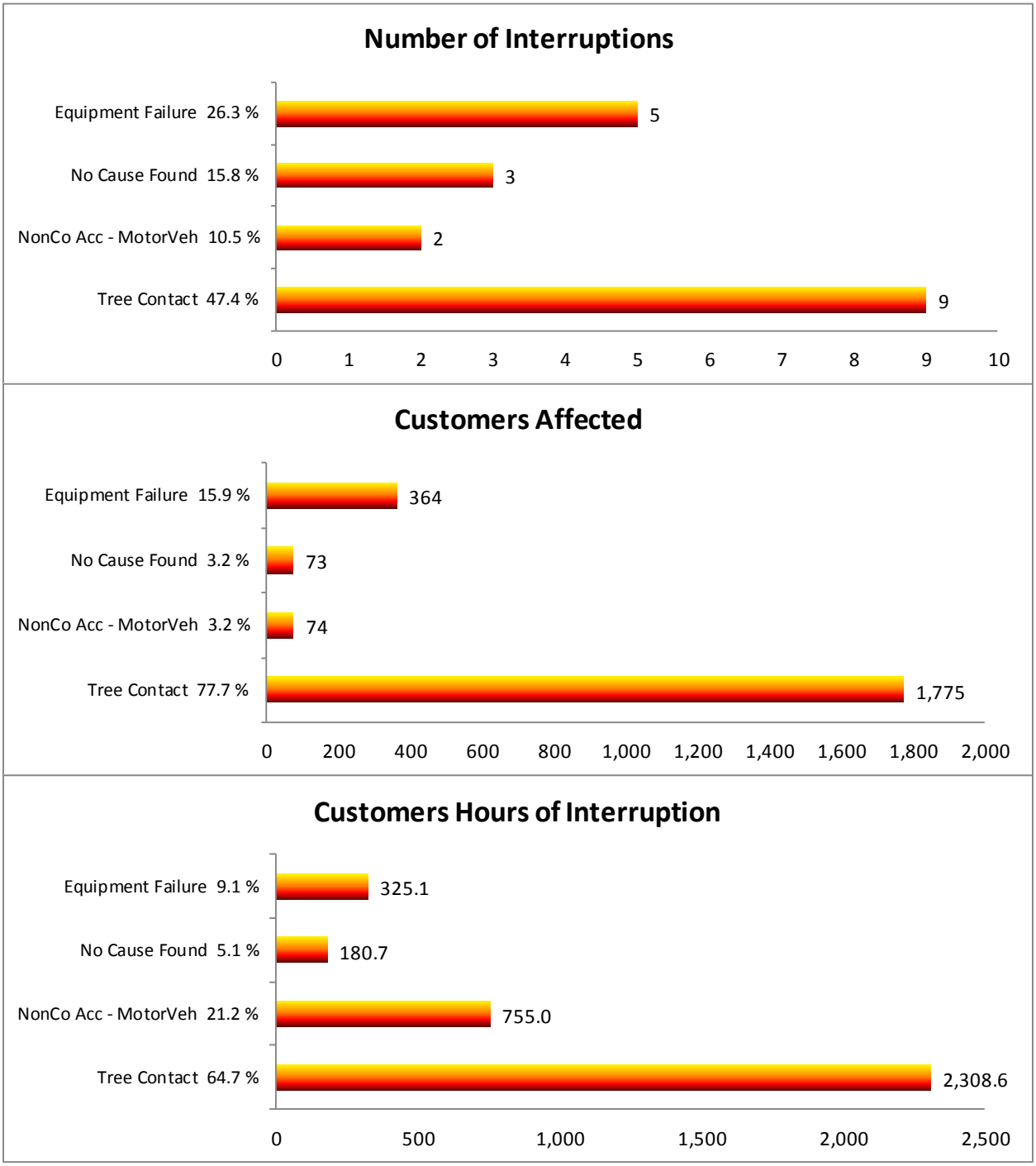
Vegetation management cycle trimming was complete for this circuit in 2018. In 2018, automation was installed on circuit 84-3-13 in order to make a tie with an adjacent circuit. This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will remain in the 2019 circuit ownership program. Automated switch additions are planned on this circuit in 2019 which will improve the company's ability to minimize the impact of outages.

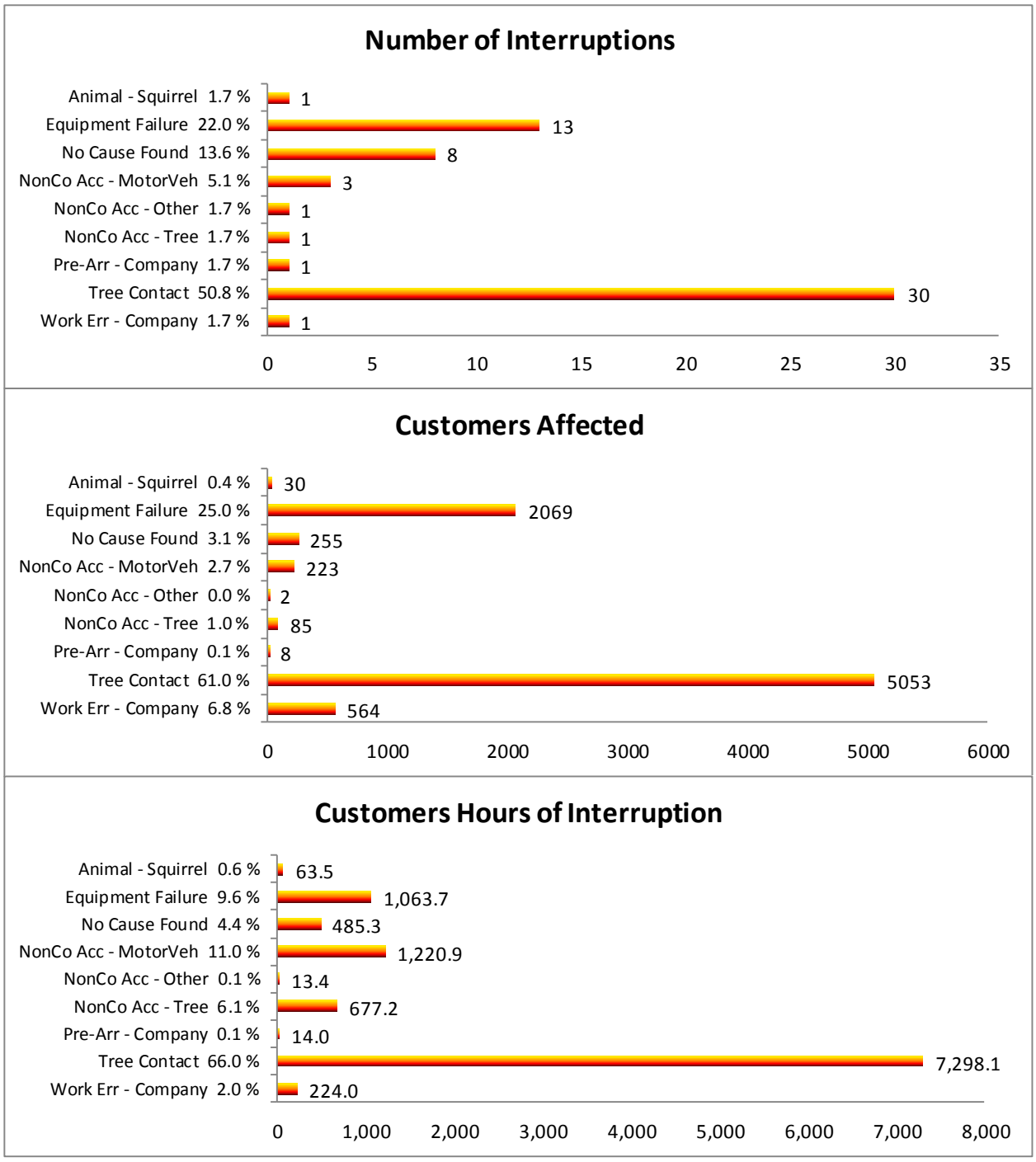
84-3-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1825	15	39
Critical Customers	2	41	192
Circuit Miles	39.57	15	34
Customers/Mile	46.1	26	164
Connected kVA	15,617	28	150
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Yes	79-8-13	
Vegetation Management			
Last Cycle Completion	December 2017		
Next Cycle Scheduled	2020		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 84-3-13 – ONE YEAR PERFORMANCE



CIRCUIT 84-3-13 – THREE YEAR PERFORMANCE



4.7. Circuit 80-5-13

Circuit 80-5-13 was ranked fifth in the Central Division, in accordance with the Company's 2018 circuit priority rating system. Circuit 80-5-13 originates from the Wisner Substation, in Warwick, New York. This circuit serves 1,730 customers from over 61 circuit miles, and is the second longest circuit in the Central Division. In 2018 there were 27 interruptions on the circuit, which affected 2,150 O&R customers for 4,143 customer-hours of interruption.

The tables below lists the outages affecting circuit 80-5-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 80-5-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Other	1	3.7	2	0.1	1.0	0.0
Animal - Squirrel	4	14.8	230	10.7	402.1	9.7
Equipment Failure	6	22.2	1,420	66.1	2,492.5	60.2
Lightning - Previous	1	3.7	2	0.1	10.6	0.3
No Cause Found	5	18.5	145	6.7	308.1	7.4
NonCo Acc - MotorVeh	1	3.7	6	0.3	18.1	0.4
Pre-Arr - Company	3	11.1	12	0.6	5.6	0.1
Tree Contact	6	22.2	333	15.5	904.9	21.8
Total	**27**		**2,150**		**4,143.0**	

3 Year Summary (1/1/2016 - 12/31/2018) 80-5-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Other	1	1.5	2	0.1	1.0	0.0
Animal - Squirrel	10	14.9	631	16.2	898.6	9.7
Equipment Failure	12	17.9	404	10.4	2,231.6	24.0
Lightning - Present	3	4.5	67	1.7	191.3	2.1
Lightning - Previous	1	1.5	2	0.1	10.6	0.1
No Cause Found	17	25.4	620	15.9	1,184.5	12.7
NonCo Acc - MotorVeh	2	3.0	17	0.4	72.2	0.8
NonCo Acc - OH	1	1.5	5	0.1	13.5	0.1
Pre-Arr - Company	3	4.5	8	0.2	7.9	0.1
Tree Contact	17	25.4	2,147	55.0	4,686.4	50.4
Total	**67**		**3,903**		**9,297.6**	

Equipment failure and trees related outages continue to account for the majority of the customer-hours. Equipment failures (60%) followed by tree contact (22%) were the lead causes for outages on the circuit in 2018. Customer hours of interruption due to equipment failure more than doubled the previous year driving the performance in 2018.

An equipment failure event with the greatest impact on customers was an underground outage with a faulted cable on a radial feed. The outage occurred late at night and extended into the next morning due to the lack of an available loop feed.

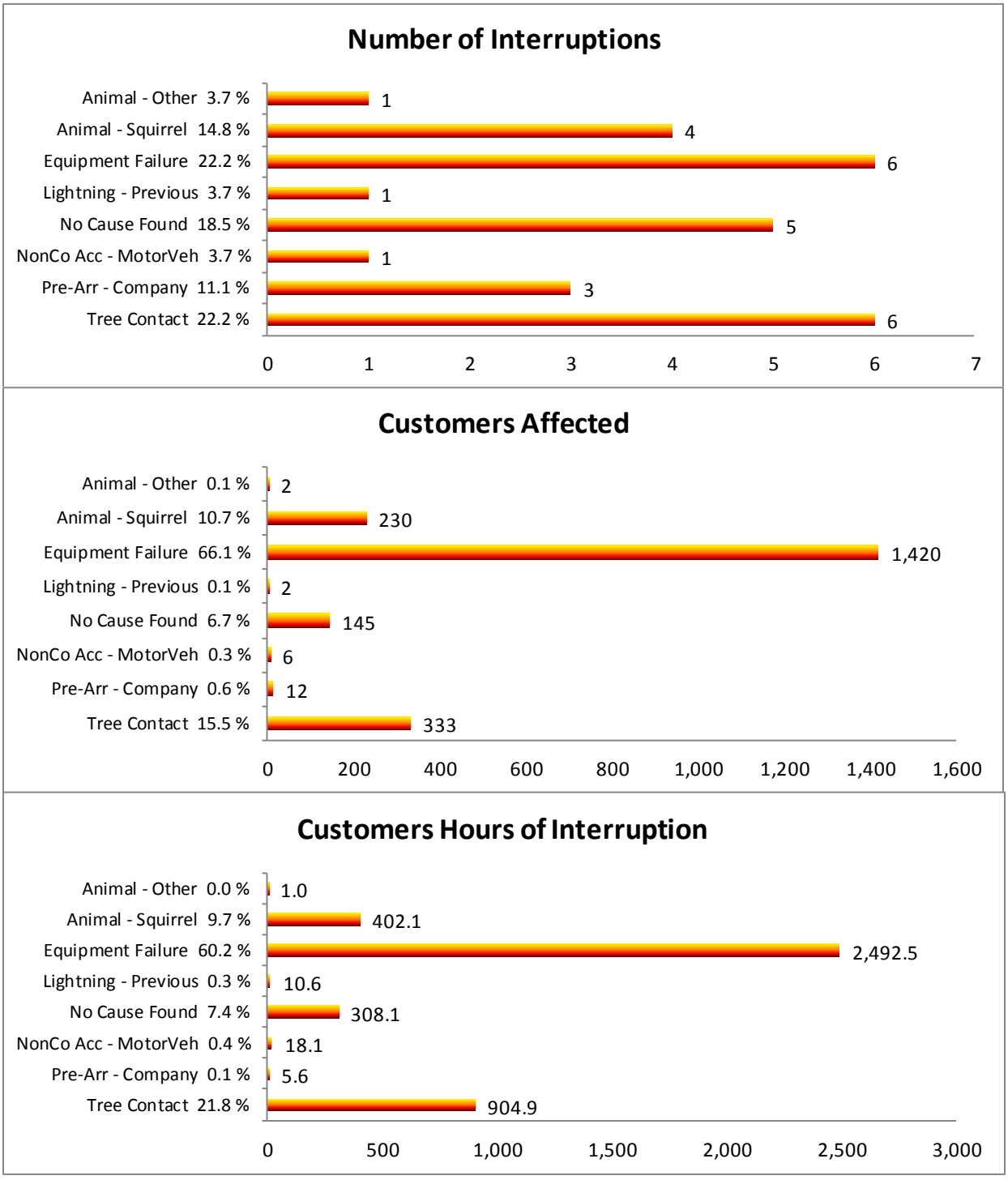
The single event with the greatest impact was a tree contact that resulted in a broken junction pole and primary wire down. The restoration work required was extensive. This event was responsible for 9% of the total customer hours for the year.

Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will be part of the 2019 circuit ownership program. Vegetation management cycle trimming is scheduled for this circuit in 2019. Automated switch additions are planned on this circuit in 2019 which will improve the company's ability to minimize the impact of outages.

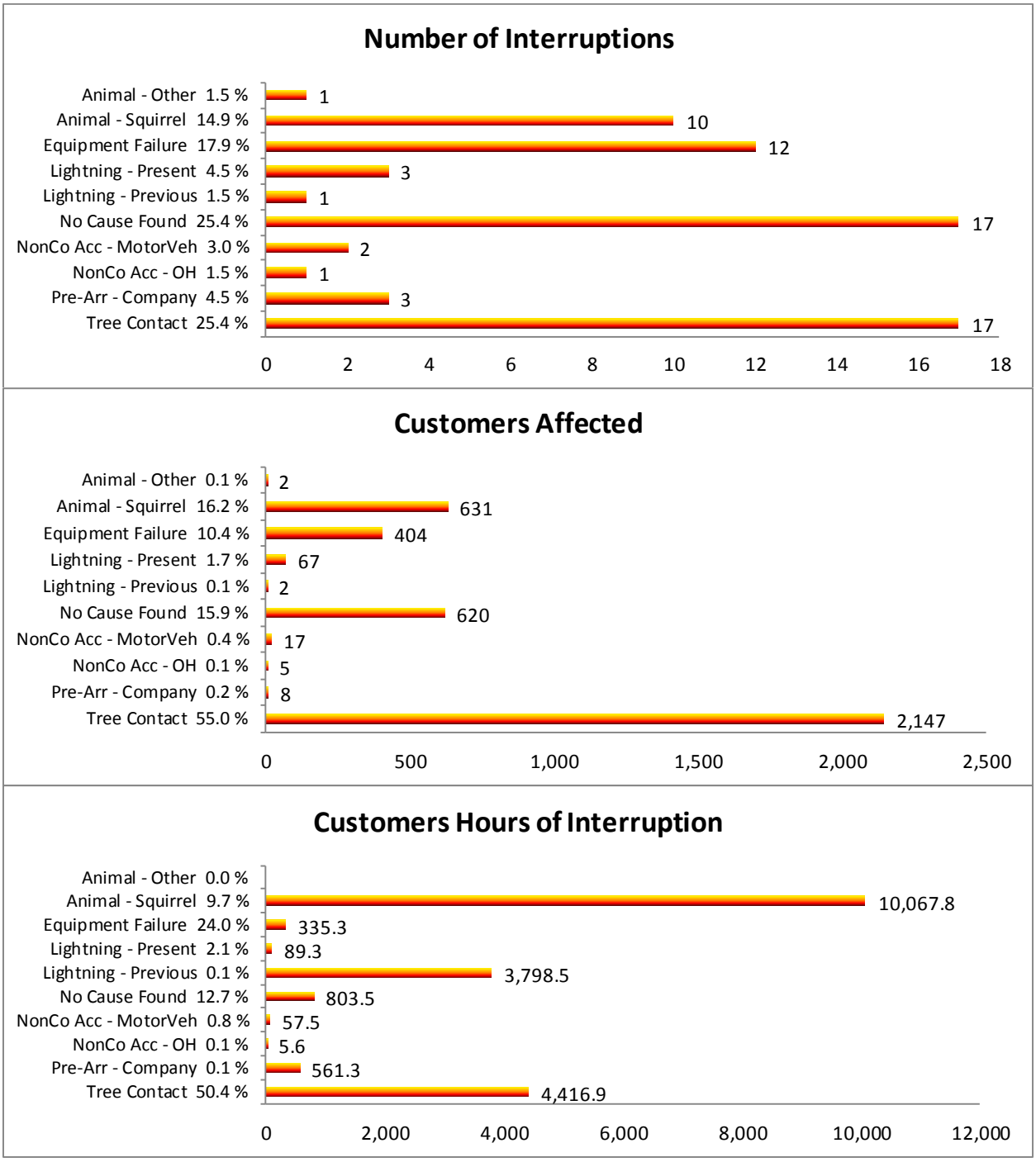
80-5-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1730	17	48
Critical Customers	5	26	116
Circuit Miles	61.67	2	8
Customers/Mile	28.1	46	182
Connected kVA	20,947	18	78
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Yes	80-2-13	
Vegetation Management			
Last Cycle Completion	2016		
Next Cycle Scheduled	2019		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 80-5-13 – ONE YEAR PERFORMANCE



CIRCUIT 80-5-13 – THREE YEAR PERFORMANCE



5. WESTERN DIVISION

5.1. 2018 Divisional Performance

In 2018, the year-end frequency for the Western Division was 1.67 customers affected per customer served, which was better than the divisional standard of 1.70 by 0.03. The year-end restoration for the Western Division was 1.69 customer hours of interruption per customer affected, which was 18.6 minutes better than the divisional standard of 2.00 hours. Mirroring the companywide performance, both SAIFI and CAIDI increased as compared to their respective 2017 numbers. However, with the exception of 2015 when the Shoemaker Substation failure occurred (an event that the Company considers an anomaly), the 2018 SAIFI performance was the highest it has been in 13 years going back to 2006. A large driver of this was the number of mainline faults that resulted in circuit lockouts, which at 43 in 2018, was the highest number since 2000 and was almost double the 20-year average.

Figures 5-1, 5-2, and 5-3, show performance trends on a rolling 12-month basis from 2013 through 2018. The rolling 12-month average number of interruptions continued a five-year trend upward that started at the beginning of 2014. Graphs of both the 12-month rolling number of customers affected and the 12-month rolling customer-hours of interruption continue to be dominated by the December 2015 performance which included the Shoemaker Substation event, thereby masking upward trends on both graphs. Each graph shows a 50% increase in the 12-momth rolling averages from the beginning of 2018 through the end of the year.

A summary by cause for Western Division interruptions experienced in 2018 is shown in Figure 5-4. The two leading causes of interruptions were tree contacts and equipment failures. As with the other operating divisions, the reporting of partial power and single service customer interruptions greatly contributes to the number of interruptions for these two cause codes. Of the 372 interruptions in the tree contact category, 88 (24%), were attributable to partial power or single service conditions. Of the 268 interruptions in the equipment failure category, 139 (52%), were attributable to partial power/single service customer conditions.

A graphical representation, by cause, is depicted in Figures 5-5, 5-6, and 5-7, which show the annual contribution to the number of interruptions, customers affected, and customer hours of interruption, respectively, from 2013 through 2018.

The tree contact category was the largest contributor to the number of interruptions, customers affected and customer-hours of interruption during 2018. Equipment failure was the second largest contributor to all three categories, with animal contacts coming in third in customers affected and customer hours. All other causes were well below tree contact and equipment failures, which are consistent with historical norms.

Although the second largest contributor to customer interruptions in the Western Division in 2018, equipment failures in Western Division were within historical norms for the majority of categories, including primary wire failures, unlike the company-wide and other divisional performances.

Table 5-3 shows the Western Division history from 2013 through 2018, with and without major events. There was one event in the division during the year that impacted greater than 5,000 customers. On May 10th an animal contact in the Shoemaker Substation resulted in a one hour interruptions for 6,403 customers.

All of the circuits that serve customers in the Western Division are listed in Appendix D, first in order of decreasing frequency and then in order of decreasing restoration. Of those 45 circuits, 36 were considered for worst performing circuit identification since they serve over 100 customers or had more than three interruptions for the year. Of the 36 qualifying circuits, 30 (67%) bettered the minimum acceptable level for frequency, and 29 circuits (64%) bettered the minimum acceptable level for restoration.

The 2018 Company storm statistics and analysis table is shown in Appendix E. During 2018, there were three qualifying storms in the Western Division as outlined.

For the Western Division, $MAIFI_e$ was 10.1 based upon 53,398 Western Division New York customers served, and a total of 540,769 momentary interruptions experienced by these customers. This represents a 27% increase over the 2017 $MAIFI_e$ performance of 7.95. Currently, the Company calculates $MAIFI_e$ based on operations from the substation breaker that supply the circuit.

There are 45 circuits serving the Western Division. Appendix A details the circuit priority ratings for all of O&R's distribution circuits. Only circuits that serve at least 40% of the Company's New York customers, with respect to its total number of customers served, were considered for evaluation in the worst performing circuit analysis for this report.

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TABLE 5.1 - 5 YEAR COMPARISON – FREQUENCY AND RESTORATION BY MONTH

WESTERN DIVISION - NYS - ALL OUTAGES - WITHOUT STORMS
calculations for calendar year reliability goals

FREQUENCY - CUSTOMERS AFFECTED / CUSTOMERS SERVED

MONTH	2013	2014	2015	2016	2017	5 YR AVG	2018 ACTUAL Monthly	2018 ACTUAL Y-T-D
JAN	0.11	0.10	0.05	0.03	0.16	0.06	0.18	0.18
FEB	0.03	0.06	0.01	0.04	0.01	0.03	0.14	0.32
MAR	0.11	0.25	0.21	0.09	0.07	0.13	0.04	0.35
APR	0.11	0.03	0.05	0.11	0.03	0.06	0.15	0.50
MAY	0.04	0.17	0.08	0.06	0.10	0.07	0.18	0.68
JUN	0.22	0.11	0.07	0.13	0.12	0.11	0.10	0.78
JLY	0.13	0.23	0.08	0.21	0.07	0.13	0.17	0.95
AUG	0.12	0.09	0.07	0.13	0.11	0.08	0.19	1.14
SEP	0.06	0.05	0.06	0.07	0.14	0.05	0.16	1.30
OCT	0.02	0.12	0.11	0.10	0.12	0.07	0.19	1.49
NOV	0.29	0.08	0.04	0.04	0.10	0.09	0.09	1.58
DEC	0.08	0.25	0.93	0.14	0.03	0.28	0.08	1.67
						1.15		
YR END	1.31	1.53	1.75	1.16	1.06	1.36		1.67

RESTORATION - MINUTES OF INTERR / CUST AFFECTED

MONTH	2013	2014	2015	2016	2017	5 YR AVG	2018 ACTUAL Monthly	2018 ACTUAL Y-T-D
JAN	164.84	90.64	164.39	116.80	80.74	107.33	86.23	86.23
FEB	55.16	205.18	102.44	123.89	150.88	97.33	70.52	79.46
MAR	83.03	94.14	231.74	83.45	152.86	98.47	86.48	80.20
APR	94.27	67.13	140.41	37.79	155.97	67.92	126.79	94.12
MAY	89.85	62.19	100.03	90.41	75.11	68.50	77.30	89.77
JUN	96.96	102.12	204.00	90.29	124.09	98.68	112.05	92.70
JLY	153.32	173.77	83.48	96.95	95.50	101.50	143.29	101.74
AUG	93.15	118.92	92.43	150.13	94.80	90.93	100.01	101.45
SEP	106.73	80.71	109.02	97.78	81.71	78.85	112.41	102.77
OCT	120.81	73.94	88.00	202.85	67.19	97.12	88.48	100.91
NOV	95.02	255.50	81.16	91.06	114.41	104.55	109.66	101.41
DEC	123.85	57.55	298.02	71.78	101.84	110.24	106.34	101.66
YR END(Min)	107.40	107.62	225.72	102.71	97.83	128.26		101.66
YR END(Hr)	1.79	1.79	3.76	1.71	1.63	2.14		1.69

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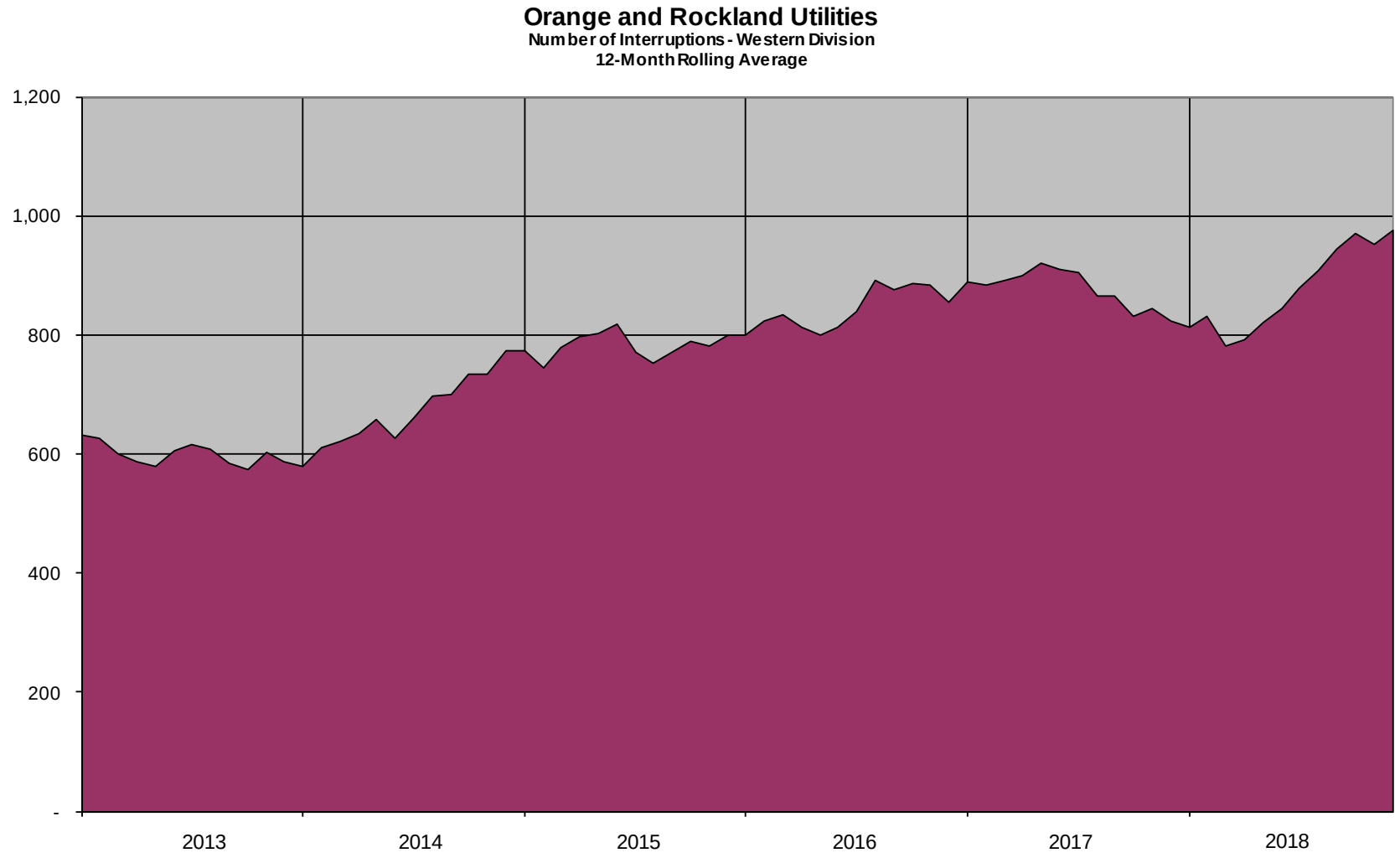
FIGURE 5.1 - 12-MONTH ROLLING AVERAGE – NUMBER OF INTERRUPTIONS



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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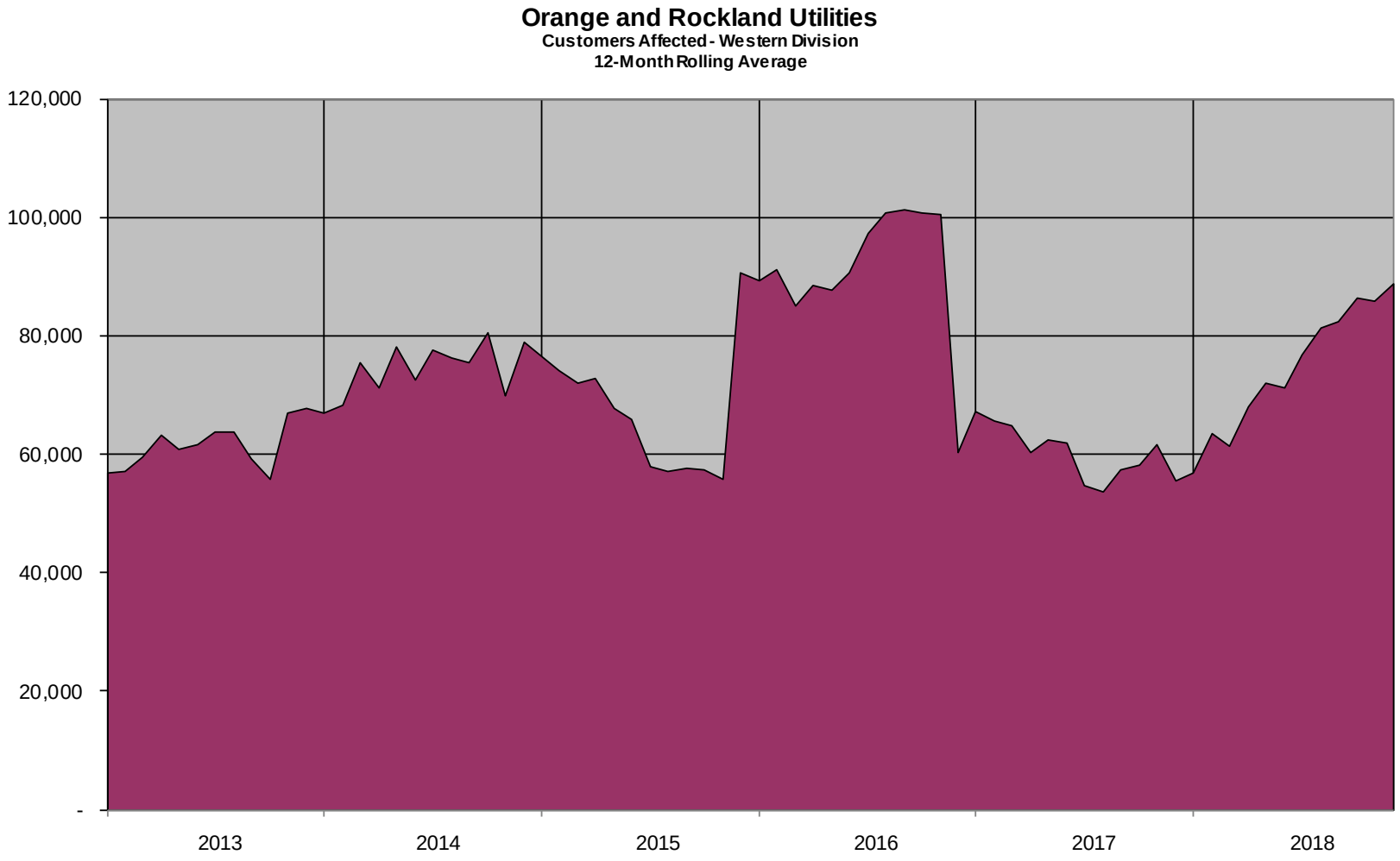
FIGURE 5.2 - 12-MONTH ROLLING AVERAGE – CUSTOMERS AFFECTED



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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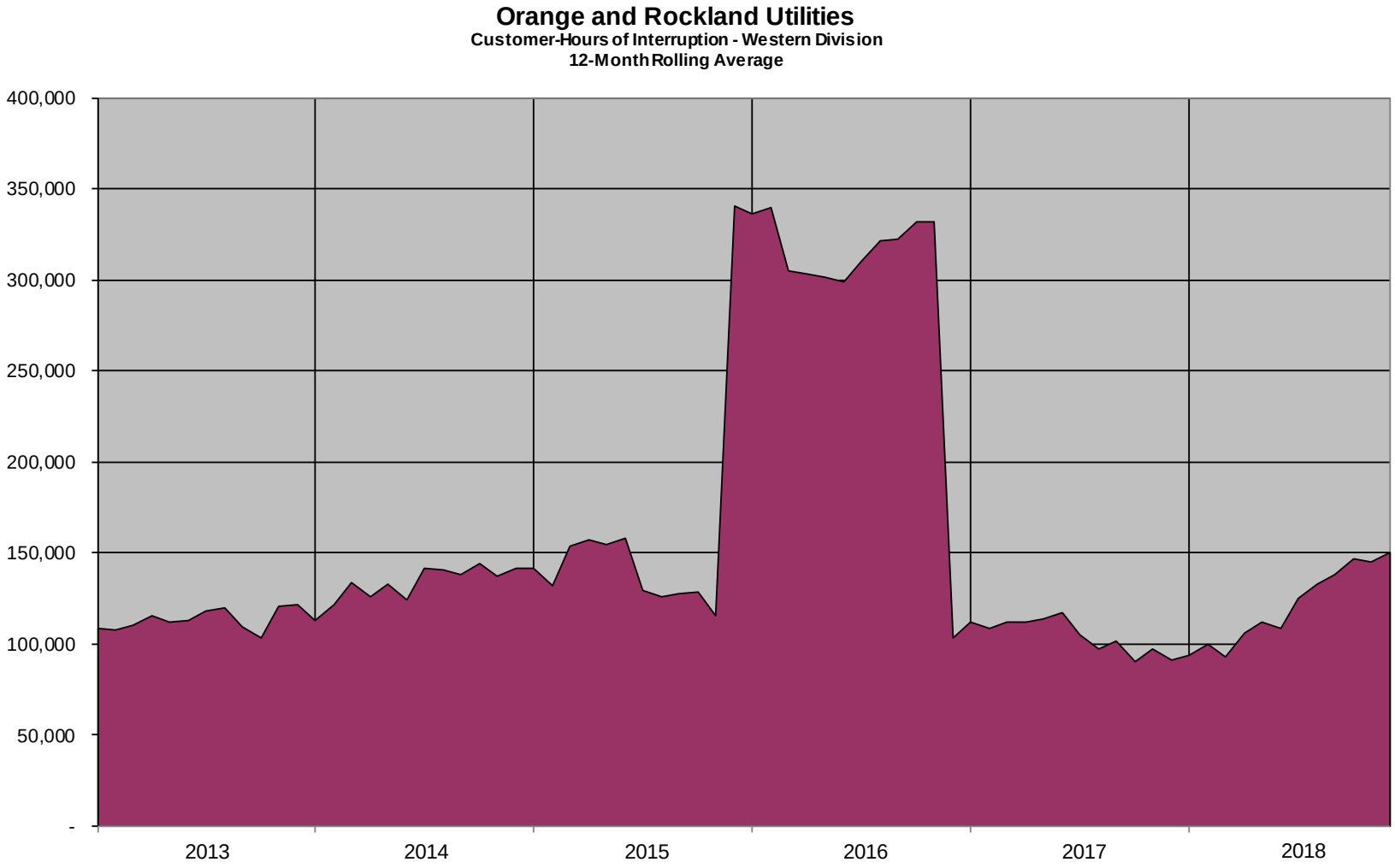
FIGURE 5.3 - 12-MONTH ROLLING AVERAGE – CUSTOMER-HOURS OF INTERRUPTIONS



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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FIGURE 5.4 - OUTAGE STATISTICS BY CAUSE (NO. OF INTERRUPTIONS, CUSTS. AFFECTED AND CUST-HRS OF INTERRUPTION)

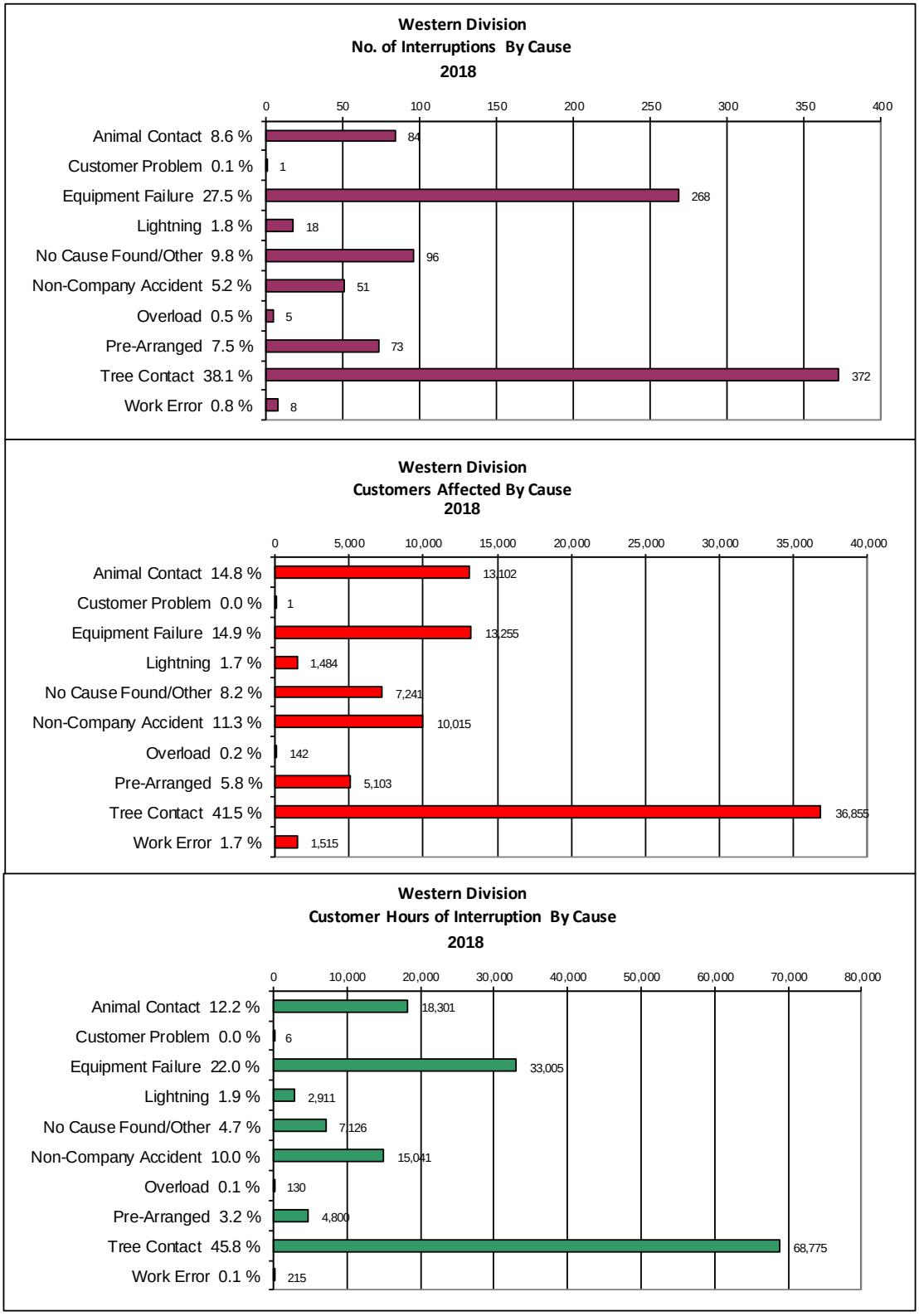

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TABLE 5.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE

		Number of Interruptions By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
	Arrester	1	1	2	1	3	2	7
	Capacitor	0	0	0	0	0	0	1
	Connecter/Splice - Pri	12	22	7	6	3	10	5
	Connecter/Splice - Sec	44	84	60	39	36	53	69
	Disconnect	1	0	0	1	0	0	0
	Electric Meter	1	1	4	1	3	2	1
	Fuse/Cutout/Eld	11	21	8	12	15	13	21
	GOAB	0	1	0	0	0	0	2
Overhead	Hardware/Pole	17	18	19	23	22	20	19
	Insulator	3	2	1	3	0	2	1
	O/H Step Transf	2	1	4	2	2	2	4
	O/H Transformer	40	44	62	68	58	54	56
	Recloser	1	0	0	0	0	0	1
	Riser Pole Cutout	4	1	1	1	0	1	1
	Wire/Cable - Pri	6	11	9	24	34	17	19
	Wire/Cable - Sec	12	21	19	13	26	18	17
	Total - OH	155	228	196	194	202	195	224
	Brkr/Kyle/Switch	5	2	2	3	1	3	2
	Buss	0	0	44*	0	0	0	0
Trans/Substa	Insulator	1	1	0	0	0	0	0
	Relay/Battery/Coil	1	0	0	0	0	0	0
	Total - Trans/Substa	7	3	46	3	1	12	2
	Connecter/Splice - Sec	0	0	0	0	0	0	3
	Elbow	0	1	0	1	1	1	1
	Hardware/Pole	0	0	1	0	0	0	0
	Padmount Transf	7	8	20	23	12	14	7
	Splice/Junction - Pri	0	1	0	1	0	0	0
Underground	Splice/Junction - Sec	3	3	4	4	1	3	4
	Stress Cone	0	2	2	1	3	2	0
	Switch	0	1	0	0	0	0	0
	Wire/Cable - Pri	16	9	11	10	15	12	6
	Wire/Cable - Sec	7	9	13	6	7	8	21
	Total - UG	33	34	51	46	39	41	42
	Total - Year	195	265	293	243	242	248	268

Note: Figures in red denote that the value exceeds the 5-year average

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* The O&R outage data model was designed to report on distribution related outages, with no single outage affecting greater than a single circuit. The Shoemaker Substation outage on December 5, 2015 affected 44 individual circuits, and as such is reported in the model as 44 individual equipment failures. All analyses in this report have taken this factor into account and have been adjusted accordingly to reflect the event as a single outage.

TABLE 5.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE (CONT.)

		Customers Affected By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
	Arrester	2	1	50	2	15	14	80
	Capacitor	0	0	0	0	0	0	35
	Connecter/Splice - Pri	464	4,001	236	27	102	966	177
	Connecter/Splice - Sec	47	151	81	48	46	75	82
	Disconnect	3,104	0	0	202	0	661	0
	Electric Meter	1	1	4	1	4	2	1
	Fuse/Cutout/Eld	185	308	136	286	457	274	584
	GOAB	0	3,150	0	0	0	630	2,747
Overhead	Hardware/Pole	5,603	4,740	1,821	2,311	3,163	3,528	2,684
	Insulator	864	376	115	208	0	313	9
	O/H Step Transf	107	60	424	214	326	226	503
	O/H Transformer	2,215	2,386	346	2,843	2,840	2,126	1,864
	Recloser	574	0	0	0	0	115	137
	Riser Pole Cutout	292	2	37	73	0	81	1
	Wire/Cable - Pri	583	1,866	787	8,535	7,019	3,758	2,289
	Wire/Cable - Sec	24	70	53	53	94	59	77
	Total - OH	14,065	17,112	4,090	14,803	14,066	12,827	11,270
	Brkr/Kyle/Switch	4,669	2,962	2,371	2,316	17	2,467	1,698
	Buss	0	0	46,202	0	0	9,240	0
Trans/Substa	Insulator	619	885	0	0	0	301	0
	Relay/Battery/Coil	2,245	0	0	0	0	449	0
	Total - Trans/Substa	7,533	3,847	48,573	2,316	17	12,457	1,698
	Connecter/Splice - Sec	0	0	0	0	0	0	30
	Elbow	0	18	0	9	8	7	37
	Hardware/Pole	0	0	1	0	0	0	0
	Padmount Transf	37	63	169	74	30	75	55
	Splice/Junction - Pri	0	1	0	1	0	0	0
Underground	Splice/Junction - Sec	3	3	5	8	4	5	4
	Stress Cone	0	1,868	11	2	4	377	0
	Switch	0	6	0	0	0	1	0
	Wire/Cable - Pri	386	277	158	280	347	290	240
	Wire/Cable - Sec	10	15	27	16	17	17	46
	Total - UG	436	2,251	371	390	410	772	412
	Total - Year	22,034	23,210	53,034	17,509	14,493	26,056	13,380

Note: Figures in red denote that the value exceeds the 5-year average

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TABLE 5.2 - EQUIPMENT FAILURES – BY TYPE AND EQUIPMENT FAILURE CODE (CONT.)

		Total Minutes of Interruption By Year						
		2013	2014	2015	2016	2017	5 Yr Ave	2018
Outage Type	Equipment							
	Arrester	122	180	8,891	212	2,518	2,385	7,718
	Capacitor	0	0	0	0	0	0	1,400
	Connecter/Splice - Pri	40,383	232,101	16,762	1,918	6,568	59,546	21,940
	Connecter/Splice - Sec	6,185	22,945	8,159	5,855	13,656	11,360	16,466
	Disconnect	121,466	0	0	21,453	0	28,584	0
	Electric Meter	201	77	437	30	1,120	373	293
	Fuse/Cutout/Eld	38,903	74,470	13,174	41,710	37,258	41,103	80,198
	GOAB	0	222,812	0	0	0	44,562	95,683
Overhead	Hardware/Pole	671,480	431,766	255,479	117,841	313,142	357,942	669,749
	Insulator	37,593	20,597	1,610	23,571	0	16,674	1,089
	O/H Step Transf	28,587	27,000	151,777	45,624	14,293	53,456	158,189
	O/H Transformer	107,272	169,323	72,179	231,176	198,985	155,787	282,718
	Recloser	20,090	0	0	0	0	4,018	11,423
	Riser Pole Cutout	9,194	96	6,101	10,585	0	5,195	60
	Wire/Cable - Pri	57,917	550,519	74,997	796,632	643,102	424,633	141,929
	Wire/Cable - Sec	3,378	11,972	8,922	5,550	12,135	8,391	40,073
	Total - OH	1,142,771	1,763,858	618,488	1,302,157	1,242,777	1,214,010	1,528,928
	Brkr/Kyle/Switch	1,010,769	316,920	541,778	46,320	3,954	383,948	285,264
	Buss	0	0	14,091,854	0	0	2,818,371	0
Trans/Substa	Insulator	59,424	14,160	0	0	0	14,717	0
	Relay/Battery/Coil	103,469	0	0	0	0	20,694	0
	Total - Trans/Substa	1,173,662	331,080	14,633,632	46,320	3,954	3,237,730	285,264
	Connecter/Splice - Sec	0	0	0	0	0	0	18,839
	Elbow	0	6,300	0	432	272	1,401	16,391
	Hardware/Pole	0	0	44	0	0	9	0
	Padmount Transf	10,431	18,059	35,531	18,133	11,466	18,724	9,750
	Splice/Junction - Pri	0	64	0	446	0	102	0
Underground	Splice/Junction - Sec	1,980	917	1,990	1,268	1,932	1,617	1,195
	Stress Cone	0	98,682	1,512	272	1,109	20,315	0
	Switch	0	2,256	0	0	0	451	0
	Wire/Cable - Pri	104,300	116,902	65,190	76,191	118,155	96,148	91,733
	Wire/Cable - Sec	4,864	8,419	19,507	5,426	13,836	10,410	28,214
	Total - UG	121,575	251,599	123,774	102,168	146,770	149,177	166,122
	Total - Year	2,438,008	2,346,537	15,375,894	1,450,645	1,393,501	4,600,917	1,980,314

Note: Figures in red denote that the value exceeds the 5-year average

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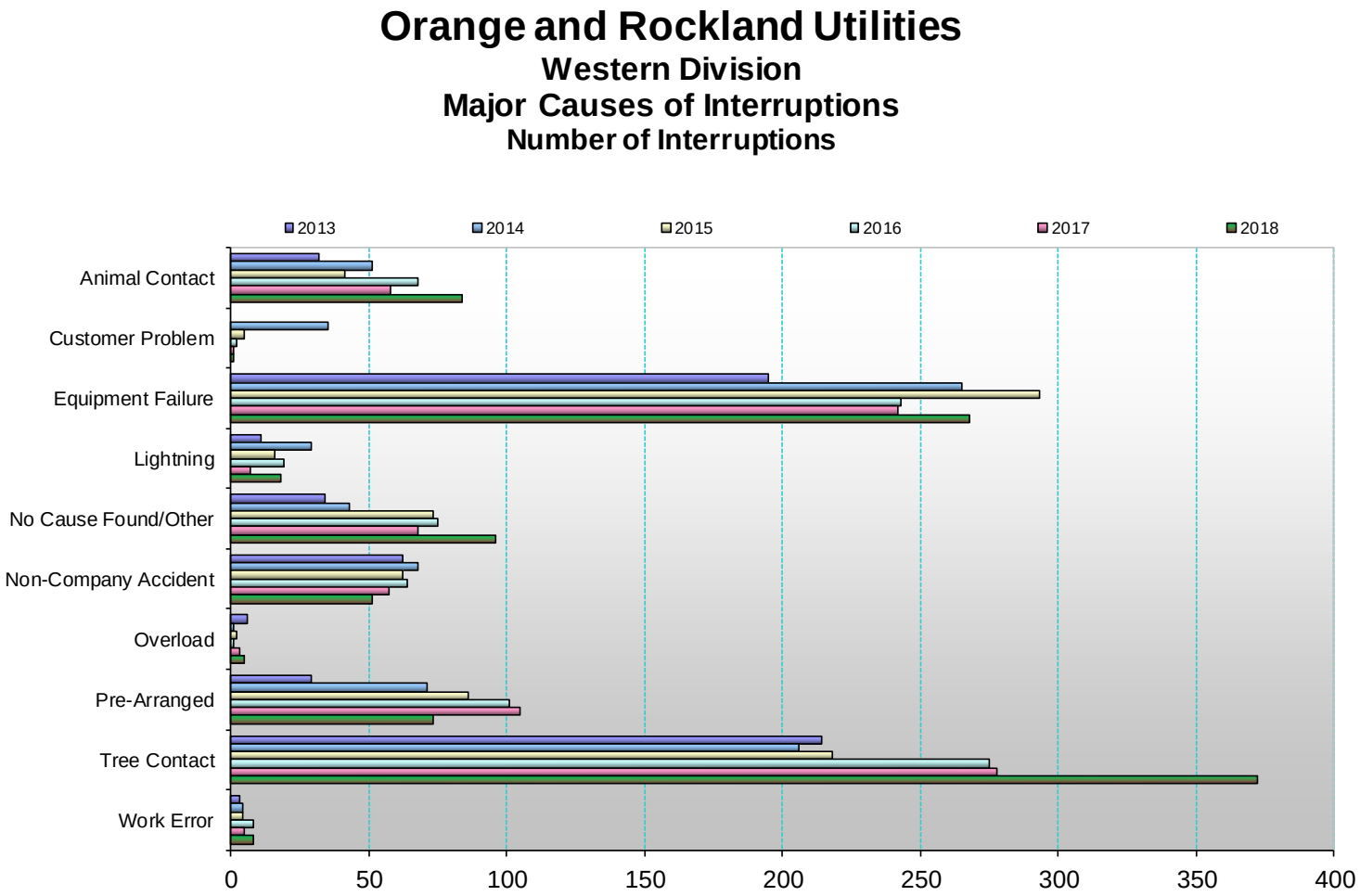
FIGURE 5.5 - 5-YEAR COMPARISON – NUMBER OF INTERRUPTIONS BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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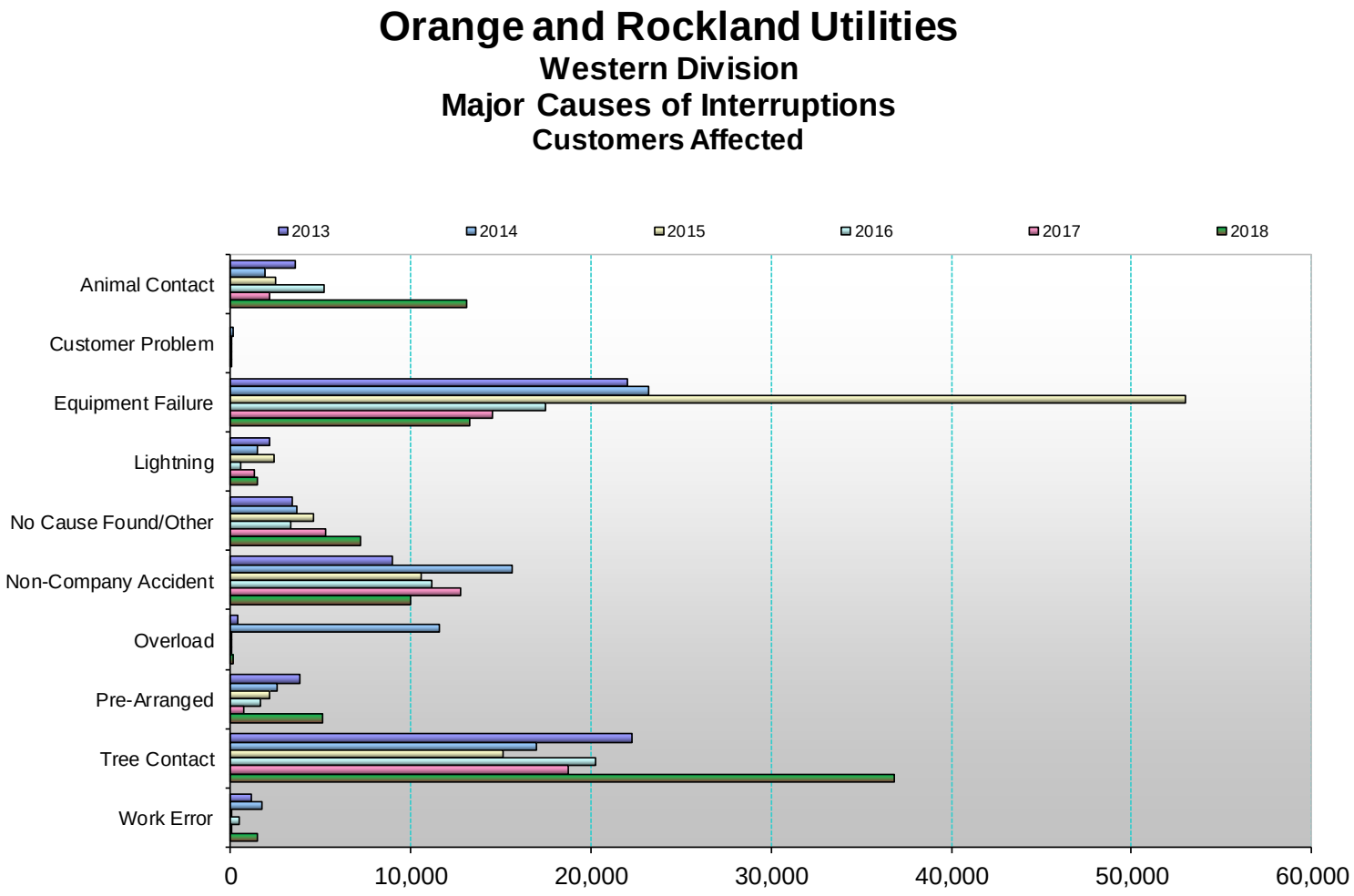
FIGURE 5.6 - 5-YEAR COMPARISON – CUSTOMERS AFFECTED BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

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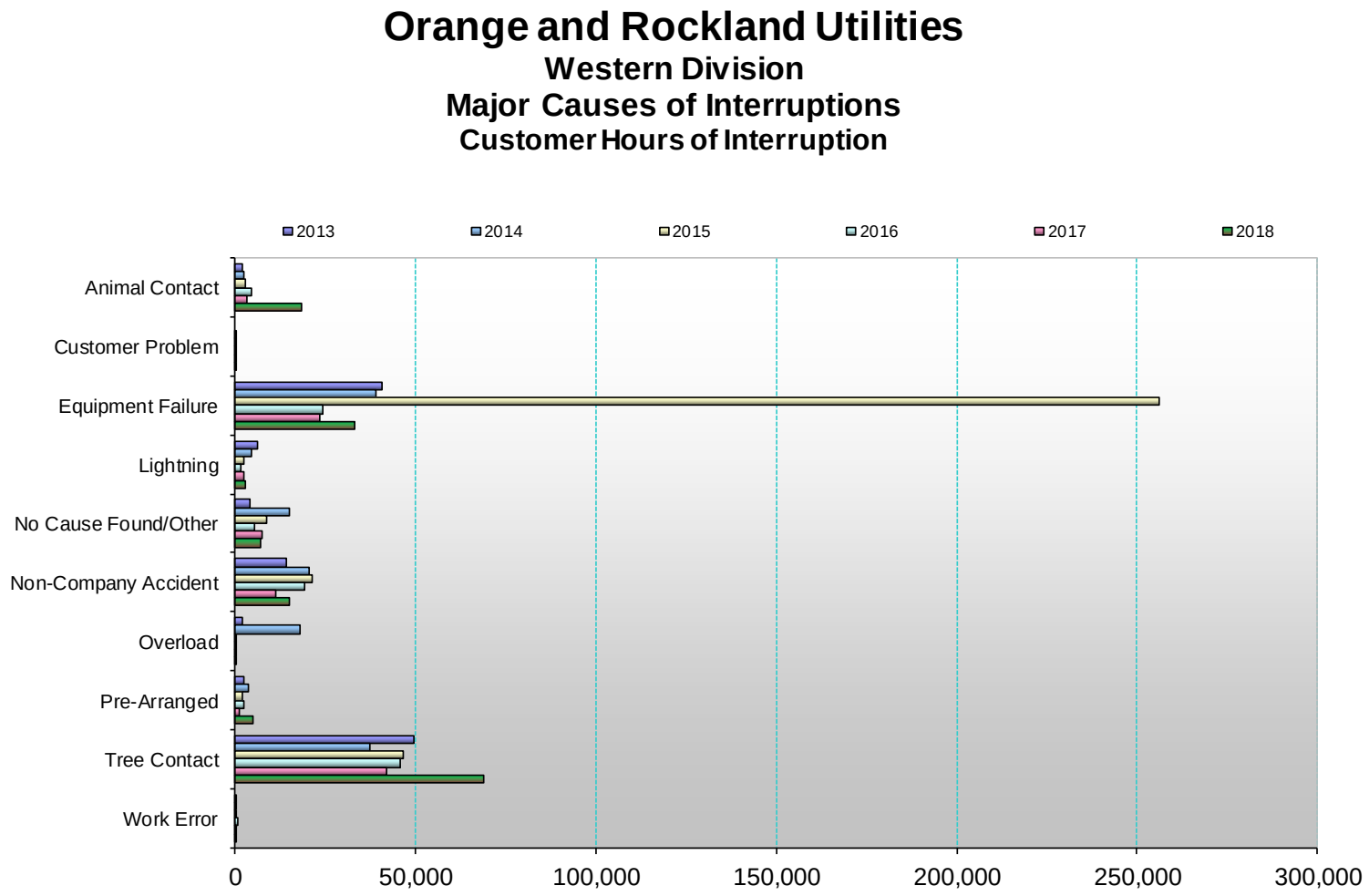
FIGURE 5.7 - 5-YEAR COMPARISON – CUSTOMER-HOURS OF INTERRUPTIONS BY MAJOR CAUSE



Includes Partial Powers, Single No Lights
Excludes Storm Activity

Return to Western Division List of Figures and Tables

TABLE 5.3 - 5-YR COMPARISON – LARGE OUTAGE (>5,000 CUSTOMERS) IMPACT ON SAIFI, CAIDI & SAIDI

Western Division Without Storms
Effect of Interruptions Affecting 5,000 or more Customers

YEAR	CUSTOMERS SERVED (CS)	# OF INTERRUPTIONS	CUSTOMERS AFFECTED (CA)	CUSTOMER MINUTES OF INTERRUPTION (CM)	FREQUENCY (CA/CS)	RESTORATION (CM/CA)	DURATION (CM/CS)
WITHOUT STORMS							
2013	51,499	586	67,635	7,264,237	1.31	1.79	2.35
2014	51,682	773	78,864	8,487,193	1.53	1.79	2.74
2015	51,810	800	90,490	20,425,775	1.75	3.76	6.57
2016	51,919	856	60,150	6,177,943	1.16	1.71	1.98
2017	52,394	824	55,521	5,431,349	1.06	1.63	1.73
5-Yr Average	**51,861**	**768**	**70,532**	**9,557,299**	**1.36**	**1.63**	**2.22**
2018	53,241	975	88,712	9,018,221	1.67	1.69	2.82
WITHOUT STORMS - OUTAGES AFFECTING > 5000 CUSTOMERS							
YEAR	SERVED	INTERR's	CUST AFF				
2013	51,499	-	-	-			
2014	51,682	1	11,595	1,087,620			
2015	51,810	1	45,890	14,086,500			
2016	51,919	-	-	-			
2017	52,394	-	-	-			
5-Yr Average	**51,861**	**0.40**	**11,497**	**3,034,824**			
2018	53,241	1	6,403	357,472			
WITHOUT STORMS AND WITHOUT THOSE OUTAGES AFFECTING > 5000 CUSTOMERS							
2013	51,499	586	67,635	7,264,237	1.31	1.79	2.35
2014	51,682	772	67,269	7,399,573	1.30	1.83	2.39
2015	51,810	799	44,600	6,339,275	0.86	2.37	2.04
2016	51,919	856	60,150	6,177,943	1.16	1.71	1.98
2017	52,394	824	55,521	5,431,349	1.06	1.63	1.73
5-Yr Average	**51,861**	**767**	**59,035**	**6,522,475**	**1.14**	**1.63**	**1.86**
2018	53,241	974	82,309	8,660,749	1.55	1.75	2.71

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5.3. Circuit 12-1-13

Circuit 12-1-13 was ranked first in the Western Division, in accordance with the Company's 2018 circuit priority rating system. Circuit 12-1-13 originates from the Bloomingburg Substation, in Bloomingburg, New York. This circuit serves 1,971 customers over 65 circuit miles. This is seventh longest circuit in the company, with most of the line located in very heavily treed areas. In 2018 there were 51 interruptions on the circuit, which affected 6,881 O&R customers for 9,021 customer-hours of interruption.

The tables below lists the outages affecting circuit 12-1-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 12-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	2.0	26	0.4	55.5	0.6
Animal - Squirrel	6	11.8	463	6.7	1,280.5	14.2
Equipment Failure	12	23.5	2,591	37.7	2,841.2	31.5
Lightning - Present	1	2.0	2	0.0	5.7	0.1
No Cause Found	6	11.8	166	2.4	276.2	3.1
Pre-Arr - Company	1	2.0	10	0.2	1.5	0.0
Tree Contact	24	47.06	3,623	52.65	4,560.7	50.56
Total	**51**		**6,881**		**9,021.2**	

3 Year Summary (1/1/2016 - 12/31/2018) 12-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	0.8	26	0.2	55.5	0.3
Animal - Other	1	0.8	159	1.0	434.6	2.2
Animal - Squirrel	15	11.8	1,154	7.6	2,277.8	11.3
Equipment Failure	18	14.2	2,783	18.3	3,002.9	14.9
Lightning - Present	1	0.8	2	0.0	5.7	0.0
Lightning - Previous	1	0.8	29	0.2	118.9	0.6
No Cause Found	19	15.0	2,358	15.5	1,815.7	9.0
NonCo Acc - MotorVeh	3	2.4	9	0.1	77.6	0.4
Pre-Arr - Company	5	3.9	79	0.5	159.2	0.8
Tree Contact	62	48.8	8,589	56.4	12,168.3	60.4
Work Err - Company	1	0.8	40	0.3	15.3	0.1
Total	**127**		**15,228**		**20,131.4**	

Tree contacts continue to have the most significant impact on the circuit performance accounting for the most customer-hours of interruption (51%) followed by equipment failures (31%). In 2018 the number of outages due to equipment failures increased from 2017, but the overall performance was impacted mostly by two events. Two equipment failures events represented 20% of the total customer hours in 2018. These events were both related to the same location. In early July during an extreme heat condition a 250 kVA step bank failed and was replaced with a new 250 kVA step bank. The following day the new bank failed and had to be replaced with a larger step bank, more adequate for the load. Changing out the step bank was labor intensive and had a significant impact on the customer outage hours.

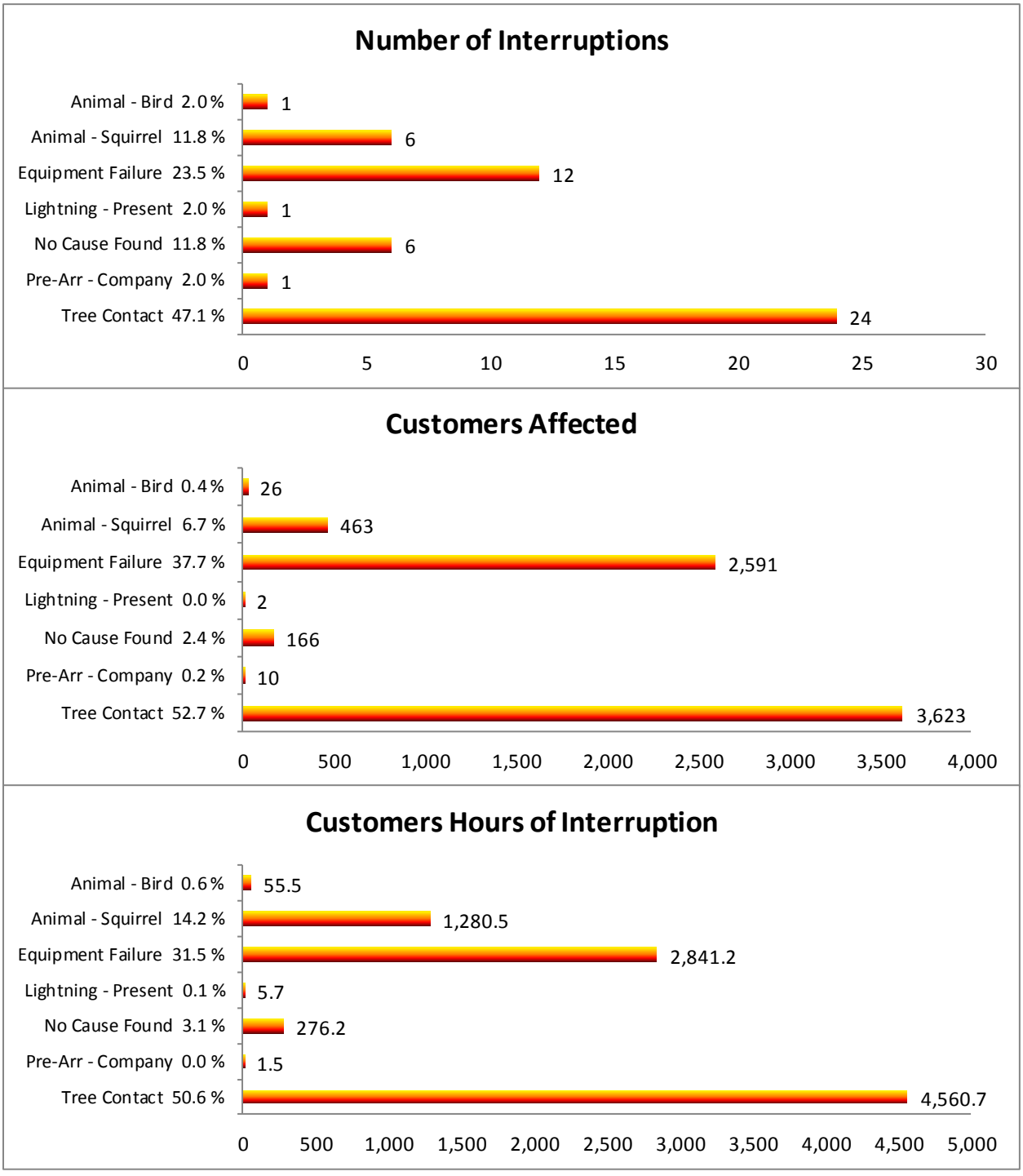
Frequent line patrols were performed on the circuit with minor maintenance items identified and repaired. In addition, hot spot trimming was performed at several locations on the circuit in 2018. This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection.

Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will be part of the 2019 circuit ownership program. Vegetation management cycle trimming is scheduled for this circuit in 2019. The circuit is already part of a loop scheme; however, two additional reclosers planned for 2019 will improve the company's ability to minimize the impact of outages. Automation of nine switch points on the circuit (replacement of GOABs or manually operated disconnects on the circuit with MOABs) is also tentatively planned for 2020. This work once completed, will greatly enhance the Company's ability to minimize the impact of future outages on the circuit.

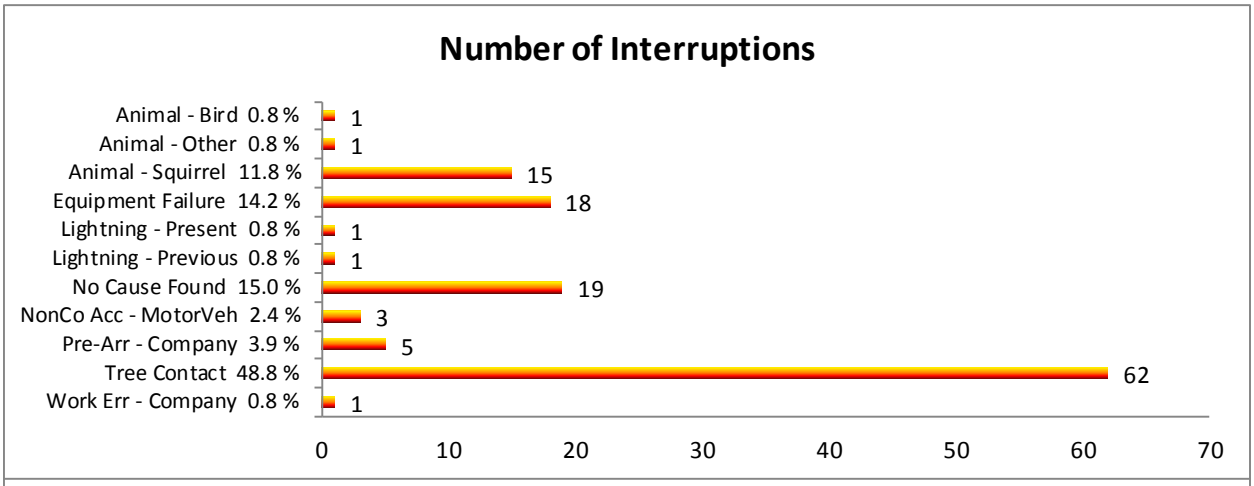
12-1-13 At A Glance

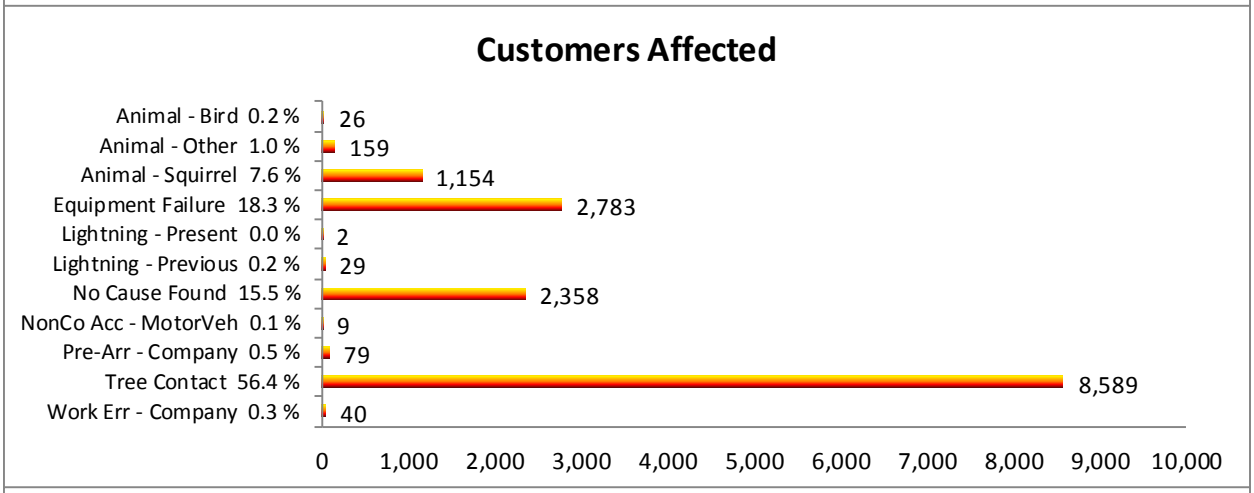
Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1972	5	29
Critical Customers	2	33	192
Circuit Miles	65.24	5	7
Customers/Mile	30.2	25	227
Connected kVA	23,500	14	49
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Yes	102-3-13	
Vegetation Management			
Last Cycle Completion	2016		
Next Cycle Scheduled	2019		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

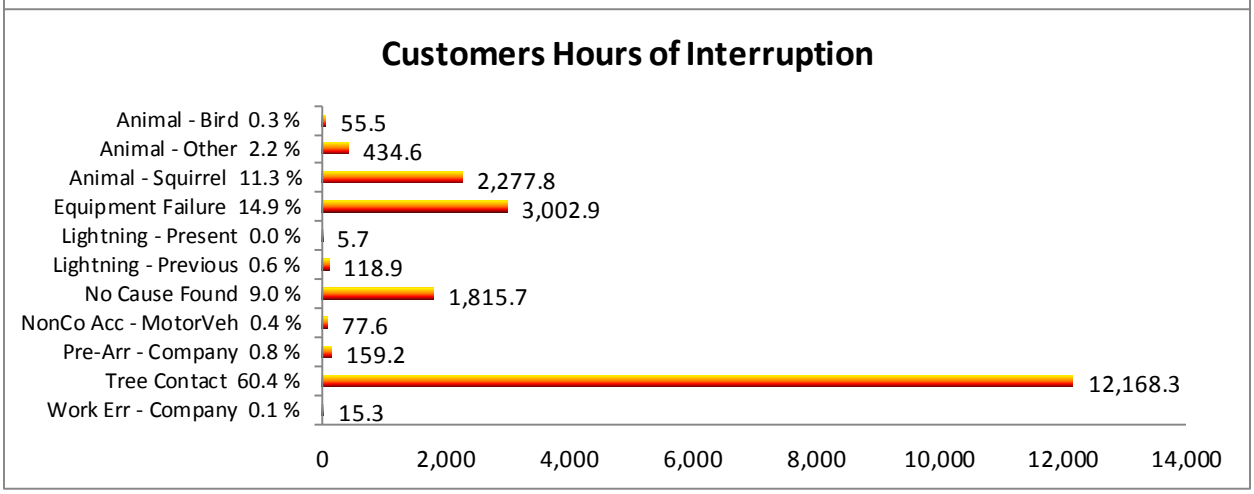
CIRCUIT 12-1-13 – ONE YEAR PERFORMANCE



CIRCUIT 12-1-13 – THREE YEAR PERFORMANCE







5.4. Circuit 5-10-34

Circuit 5-10-34 was ranked second in the Western Division, in accordance with the Company's 2018 circuit priority rating system. Circuit 5-10-34 originates from the Cuddebackville Substation in Cuddebackville and serves 1,673 customers over 69 circuit miles. This is the fifth longest circuit in this Company. In 2018 there were 31 interruptions on the circuit, which affected 2,275 O&R customers for 3,896 customer-hours of interruption.

The tables below lists the outages affecting circuit 5-10-34, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 5-10-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Equipment Failure	6	19.4	707	31.1	565.9	14.5
Lightning - Present	2	6.5	18	0.8	45.6	1.2
No Cause Found	6	19.4	345	15.2	699.9	18.0
NonCo Acc - MotorVeh	1	3.2	2	0.1	11.3	0.3
Pre-Arr - Company	3	9.7	54	2.4	41.8	1.1
Tree Contact	13	41.9	1,149	50.5	2,531.7	65.0
Total	**31**		**2,275**		**3,896.3**	

3 Year Summary (1/1/2016 - 12/31/2018) 5-10-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	0.9	136	1.0	242.5	1.1
Animal - Squirrel	11	9.5	307	2.4	550.3	2.5
Equipment Failure	23	19.8	2,590	19.9	2,315.9	10.7
Lightning - Present	4	3.4	218	1.7	312.1	1.4
No Cause Found	12	10.3	816	6.3	1,285.5	5.9
NonCo Acc - MotorVeh	5	4.3	3,548	27.3	6,399.9	29.6
NonCo Acc - Other	2	1.7	780	6.0	1,097.4	5.1
Pre-Arr - Company	10	8.6	130	1.0	170.9	0.8
Pre-Arr - Customer	1	0.9	60	0.5	141.0	0.7
Tree Contact	46	39.7	4,407	33.9	9,107.9	42.1
Work Err - Contractor	1	0.9	20	0.2	29.7	0.1
Total	**116**		**13,012**		**21,652.9**	

Tree contacts continue to have the most significant impact on the circuit performance. This circuit passes through an area of dense, mature trees that grow well above the 15' primary clearance zone. Despite cycle trimming these sections continue to cause outages as the mature trees lose

branches and fail. Tree contacts accounted for the most customer-hours of interruption (65%) and almost one half of the total interruptions on the circuit for the year.

One single event accounted for 43% of the customer-hours of interruption for the year. This event was the result of a tree coming down on the primary wires on NYS Route 209. The tree broke the primary wires and damaged a transformer, causing a large outage for a significant amount of customers.

The next largest event during the year was an equipment failure occurring in February. This event accounted for 9% of the total customer-hours of interruption for the year. A primary tap failed on the circuit causing an outage. The event impacted a significant amount of customers.

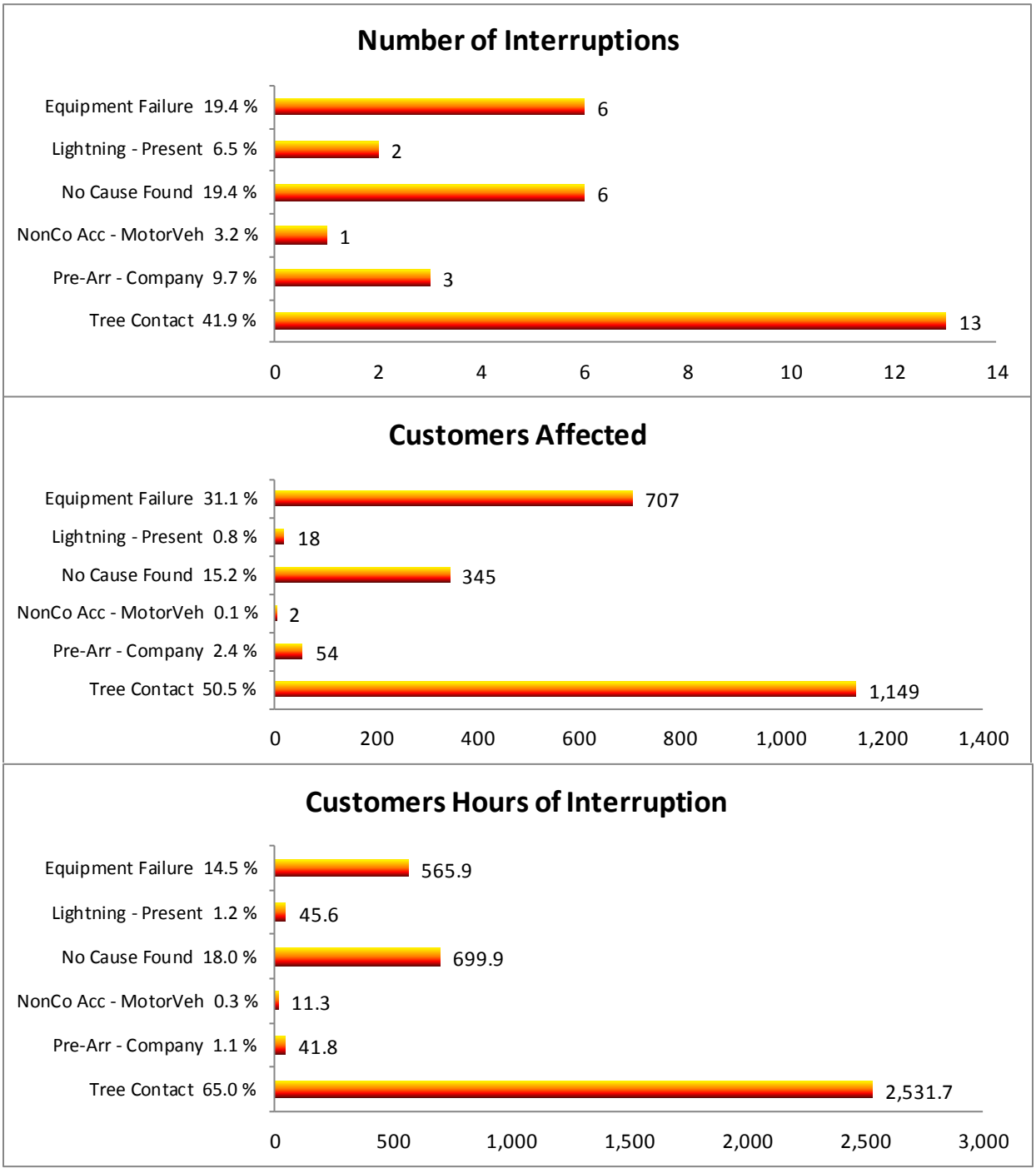
Because the circuit is also used as a 34.5 kV tie between substations, it was patrolled in 2018 as part of the transmission inspection program. Defects are identified during this inspection and repaired based on a priority ranking. In addition, the circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Hot spot trimming was performed at several locations on the circuit in 2018. The new Deerpark substation was placed in service in 2018, reducing some of the exposure on the circuit.

Infrared Thermal Inspection is scheduled on this circuit for 2019. The circuit will be patrolled as part of the transmission inspection program and the circuit will be included in the 2019 circuit ownership program. Vegetation management cycle trimming is scheduled for this circuit in 2019.

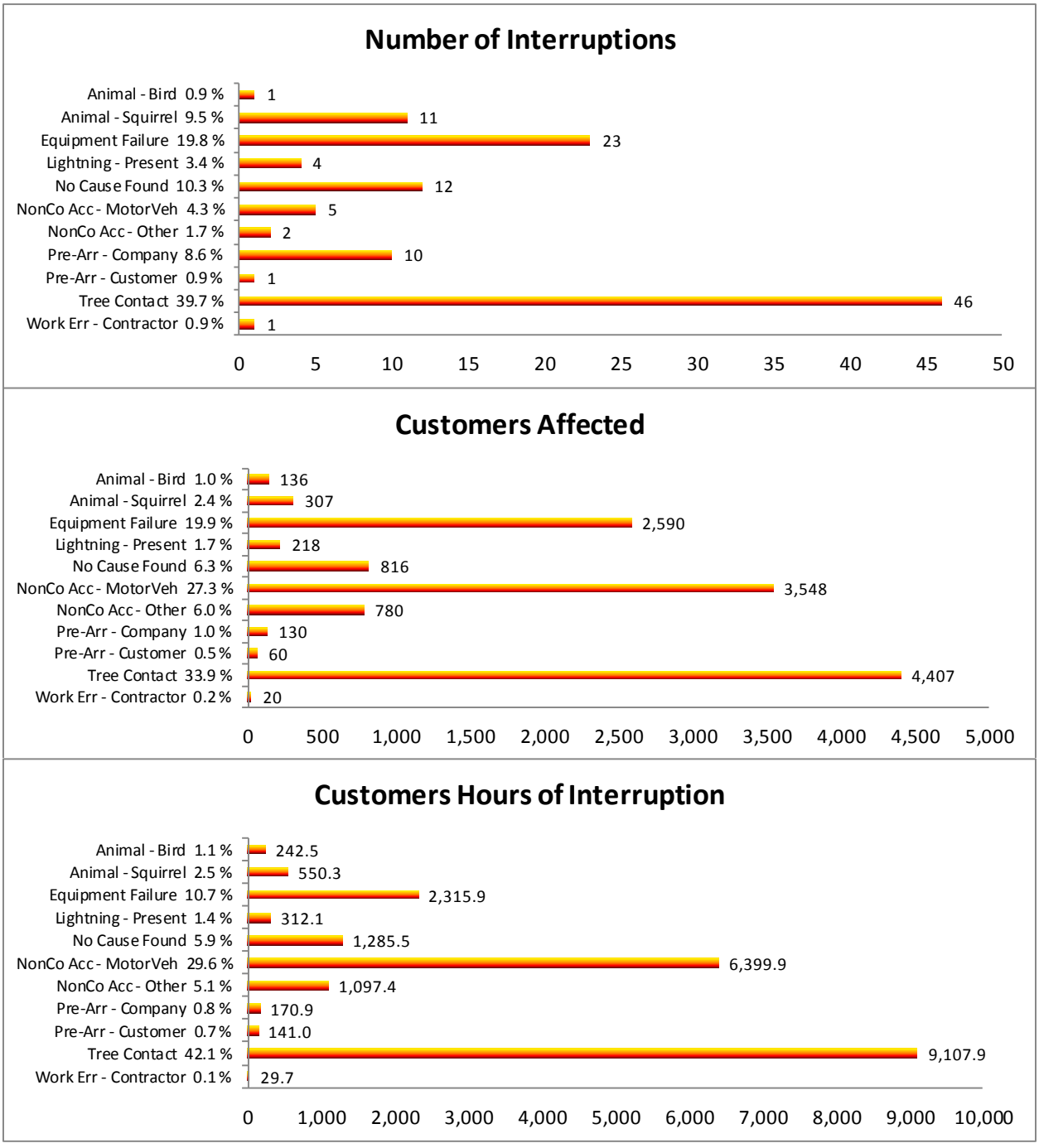
5-10-34 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1673	11	51
Critical Customers	9	9	45
Circuit Miles	69.27	3	5
Customers/Mile	24.2	31	243
Connected kVA	25,859	11	31
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	No	N/A	
Vegetation Management			
Last Cycle Completion	2016		
Next Cycle Scheduled	2019		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 5-10-34 – ONE YEAR PERFORMANCE



CIRCUIT 5-10-34 – THREE YEAR PERFORMANCE



5.5. Circuit 5-3-34

Circuit 5-3-34 was ranked third in the Western Division per 2017 circuit priority rating system. The circuit again ranked third in the Western Division per 2018 priority circuit rating results. Circuit 5-3-34 originates from the Cuddebackville Substation, in Cuddebackville, New York. This circuit serves 1,488 customers over 68 circuit miles. This is the sixth longest circuit in this company, with most of the line located in very heavily treed areas. This circuit is part of a three circuit automatic loop with 11 DSCADA controlled reclosers. In 2018 there were 42 interruptions on the circuit, which affected 3,972 O&R customers for 10,057 customer-hours of interruption.

The tables below lists the outages affecting circuit 5-3-34, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 5-3-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	2	4.8	42	1.1	45.8	0.5
Equipment Failure	9	21.4	160	4.0	453.6	4.5
Lightning - Present	1	2.4	3	0.1	5.5	0.1
No Cause Found	4	9.5	160	4.0	286.8	2.9
NonCo Acc - MotorVeh	3	7.1	951	23.9	1,802.2	17.9
Pre-Arr - Company	1	2.4	3	0.1	3.0	0.0
Tree Contact	22	52.38	2,653	66.79	7,460.0	74.18
Total	**42**		**3,972**		**10,056.8**	

3 Year Summary (1/1/2016 - 12/31/2018) 5-3-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	3	2.9	52	0.5	133.0	0.6
Equipment Failure	19	18.6	916	8.9	2,254.4	9.9
Lightning - Present	2	2.0	643	6.3	1,125.5	5.0
Lightning - Previous	1	1.0	3	0.0	21.9	0.1
No Cause Found	4	3.9	160	1.6	286.8	1.3
NonCo Acc - MotorVeh	8	7.8	2,222	21.6	4,581.2	20.2
Pre-Arr - Company	10	9.8	195	1.9	156.2	0.7
Tree Contact	55	53.9	6,079	59.2	14,103.8	62.2
Total	**102**		**10,270**		**22,662.6**	

In calendar year 2018 there were 42 interruptions affecting 3,972 customers for a total of 10,057 customer-hours. 74% of the customer hours were due to trees, followed by 18% caused by motor vehicle accidents. Similar to the last three years tree contacts and motor vehicle accidents continue

to drive outages on this circuit. The top four outages accounted for 57% of the total customer hours.

The most significant event accounted for 16% of the customer-hours of interruption for the year. This event was motor vehicle accident. The vehicle hit and broke a pole with an underground riser on it. Crews responded to manually switch customer load but because the incident occurred close to the substation there was a significant number of customers impacted.

The next three largest events during the year were tree contacts. These events accounted for 40% of the total customer-hours of interruption for the year. The circuit is due for vegetation cycle trimming this year (2019). We should see a reduction in outages from tree contacts once the trimming is complete.

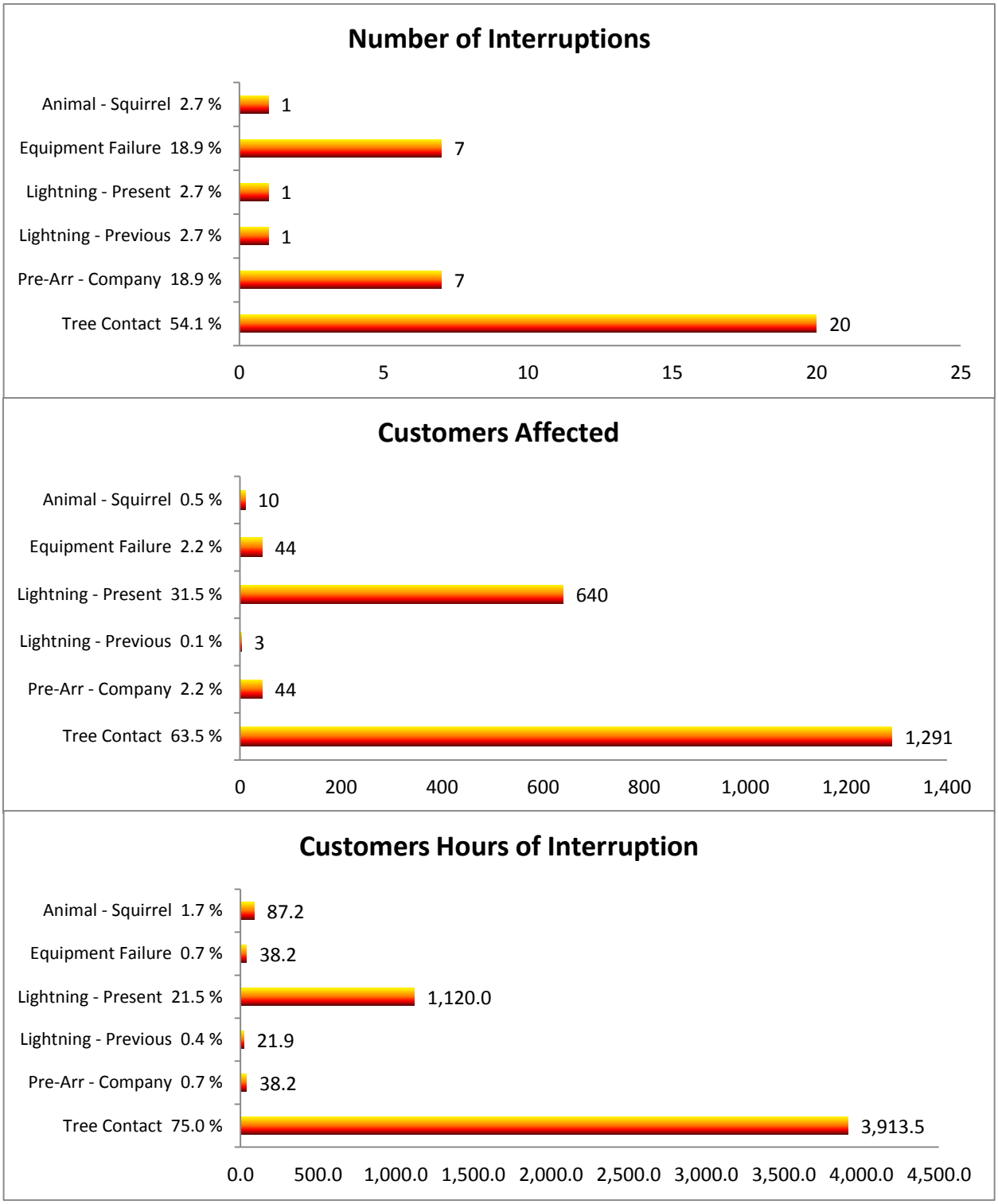
Because the circuit is also used as a 34.5 kV tie between substations, it was patrolled in 2018 as part of the transmission inspection program. Defects are identified during this inspection and repaired based on a priority ranking. In addition, the circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection.

Infrared Thermal Inspection is scheduled on this circuit for 2019. The circuit will be patrolled as part of the transmission inspection program and the circuit will be included in the 2019 circuit ownership program. Vegetation management cycle trimming is scheduled for this circuit in 2019. Motor operated air break switches have been approved and locations are being reviewed for future installation on O&R's 34.5kV system, which will allow for further isolation and reduced customer counts during outages.

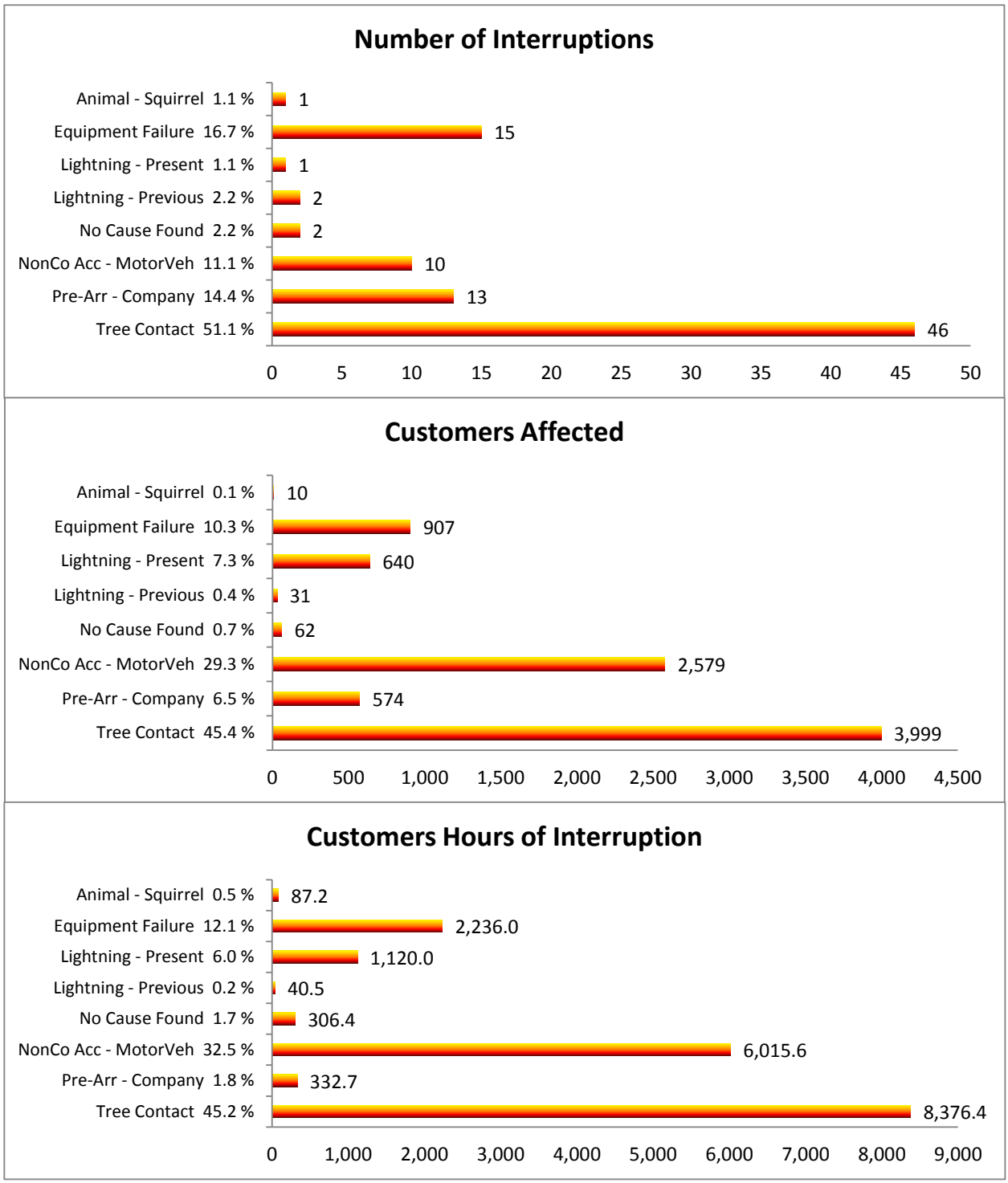
5-3-34 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1511	15	67
Critical Customers	10	7	35
Circuit Miles	68.27	4	6
Customers/Mile	22.1	36	249
Connected kVA	22,763	15	57
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	Yes	109-4-34	
Vegetation Management			
Last Cycle Completion	2016		
Next Cycle Scheduled	2019		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 5-3-34 – ONE YEAR PERFORMANCE



CIRCUIT 5-3-34 – THREE YEAR PERFORMANCE



5.6. Circuit 113-2-13

Circuit 113-2-13 was ranked fourth in the Western Division, in accordance with the Company's 2018 circuit priority rating system. Circuit 113-2-13 originates from the Silver Lake Substation, in Middletown. This circuit serves 1,878 customers over 25 circuit miles. Although relatively short geographically, the circuit is also one of the most heavily loaded serving a large portion of the Route 211 commercial corridor in Middletown. In 2018 there were 13 interruptions on the circuit, which affected 196 O&R customers for 642 customer-hours of interruption.

The tables below lists the outages affecting circuit 113-2-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 113-2-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	7.7	22	11.2	20.9	3.3
Equipment Failure	6	46.2	47	24.0	220.6	34.4
NonCo Acc - UG	1	7.7	2	1.0	11.2	1.7
Pre-Arr - Company	4	30.8	121	61.7	354.1	55.2
Tree Contact	1	7.7	4	2.0	34.8	5.4
Total	**13**		**196**		**641.6**	

3 Year Summary (1/1/2016 - 12/31/2018) 113-2-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	3	7.1	81	1.6	86.9	1.4
Customer Problem	1	2.4	35	0.7	81.1	1.3
Equipment Failure	23	54.8	1,693	33.9	2,957.1	47.6
No Cause Found	3	7.1	116	2.3	193.8	3.1
NonCo Acc - MotorVeh	3	7.1	2,834	56.7	2,298.6	37.0
NonCo Acc - UG	3	7.1	12	0.2	43.2	0.7
Pre-Arr - Company	4	9.5	121	2.4	354.1	5.7
Tree Contact	2	4.8	106	2.1	194.6	3.1
Total	**42**		**4,998**		**6,209.4**	

Over the past three years equipment failures and motor vehicle accidents had the most impact on the circuit performance. In 2018, equipment failures were again an impact but the most significant impact came from pre-arranged company outages.

These outages were prescheduled for system maintenance on underground portions of the circuit.

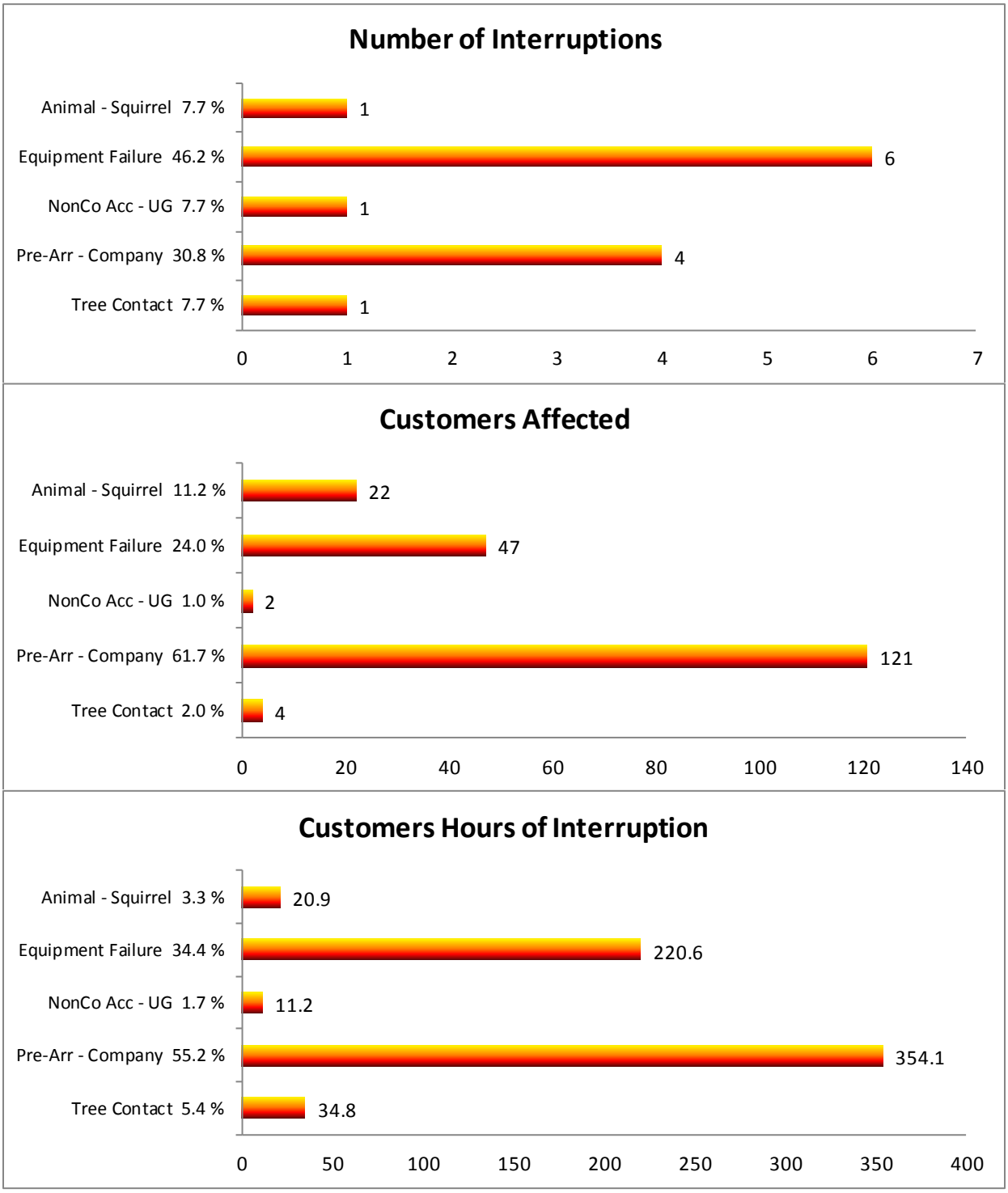
Frequent line patrols were performed on the circuit with minor maintenance items identified and repaired. This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection.

Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will be part of the 2019 circuit ownership program. Vegetation management cycle trimming is scheduled for this circuit in 2019. Automated switch additions are planned on this circuit in 2019 which will improve the company's ability to minimize the impact of outages.

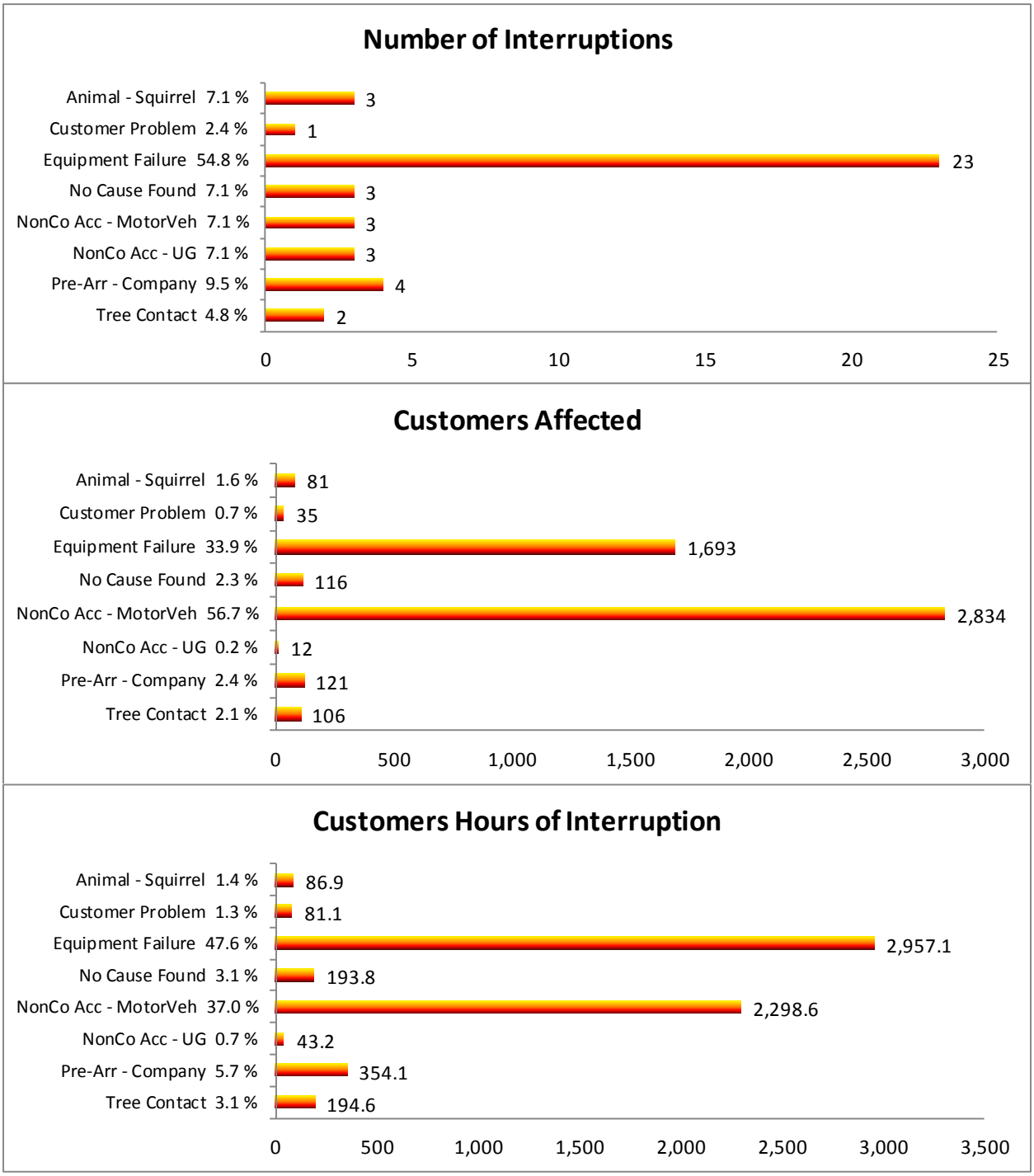
113-2-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1879	7	34
Critical Customers	2	33	192
Circuit Miles	25.69	25	76
Customers/Mile	731.	10	85
Connected kVA	31,233	3	10
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	No	N/A	
Vegetation Management			
Last Cycle Completion	2016		
Next Cycle Scheduled	2019		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2019		

CIRCUIT 113-2-13 – ONE YEAR PERFORMANCE



CIRCUIT 113-2-13 – THREE YEAR PERFORMANCE



5.7. Circuit 6-7-13

Circuit 6-7-13 is ranked fifth in the Western Division per the 2018 priority circuit rating results. The circuit originates from the Port Jervis Substation and serves 1,546 customers over 14.3 miles. In 2018 there were 17 interruptions on the circuit, which affected 1,048 O&R customers for 927 customer-hours of interruption.

The tables below lists the outages affecting circuit 6-7-13, by cause.

1 Year Summary (1/1/2018 - 12/31/2018) 6-7-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	5.9	128	12.2	215.5	23.3
Equipment Failure	3	17.7	10	1.0	51.4	5.6
No Cause Found	2	11.8	17	1.6	39.8	4.3
NonCo Acc - MotorVeh	4	23.5	831	79.3	434.3	46.9
Tree Contact	7	41.2	62	5.9	185.9	20.1
Total	**17**		**1,048**		**926.9**	

3 Year Summary (1/1/2015 - 12/31/2017) 7-2-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	1.7	28	0.5	20.5	0.3
Animal - Squirrel	1	1.7	128	2.3	215.5	2.9
Equipment Failure	8	13.3	279	5.0	525.8	7.0
Lightning - Present	1	1.7	5	0.1	8.6	0.1
No Cause Found	12	20.0	731	13.1	1,315.6	17.5
NonCo Acc - MotorVeh	9	15.0	1,806	32.4	1,484.2	19.7
NonCo Acc - Other	2	3.3	1,541	27.6	693.5	9.2
Pre-Arr - Company	6	10.0	126	2.3	37.0	0.5
Tree Contact	20	33.3	932	16.7	3,235.4	42.9
Total	**60**		**5,576**		**7,536.0**	

Reliability improvements have been implemented over the past several years that have helped improve the circuit's performance. Inclusion on the worst performing list for 2018 is the result of its residual rating from previous years' performance (as discussed in Appendix A, O&R uses a weighted three-year average to determine its annual worst performing circuits).

In calendar year 2018 there were 17 interruptions affecting 1,048 customers for a total of 927 customer-hours. Over the past three years tree contacts and motor vehicle accidents had the most

impact on the circuit performance. In 2018, motor vehicle accidents accounted for the majority of the customer-hours (47%) followed by animal contacts (23%) and tree contacts (20%).

The most significant event accounted for 24% of the customer-hours of interruption for the year. This event was motor vehicle accident. The vehicle hit and broke a pole just down the road from the recloser. Crews responded to manually switch customer load but because the incident occurred close to the recloser there was a significant number of customers impacted.

The next largest event during the year was an animal contact which caused the fuse to operate. This event accounted for 23% of the total customer-hours of interruption for the year.

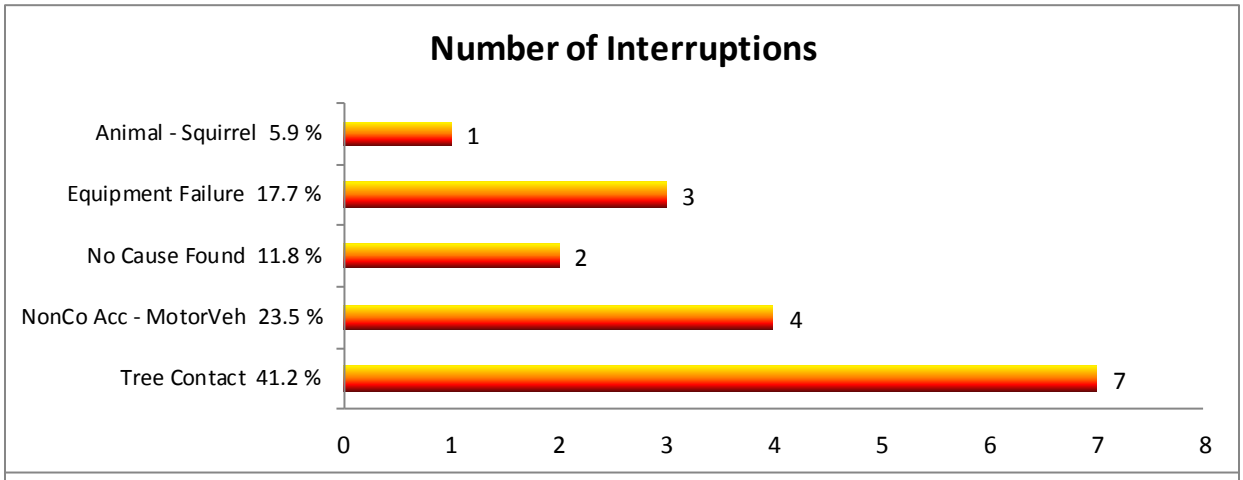
Frequent line patrols were performed on the circuit with minor maintenance items identified and repaired. In addition, hot spot trimming was performed at several locations on the circuit in 2018. This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection.

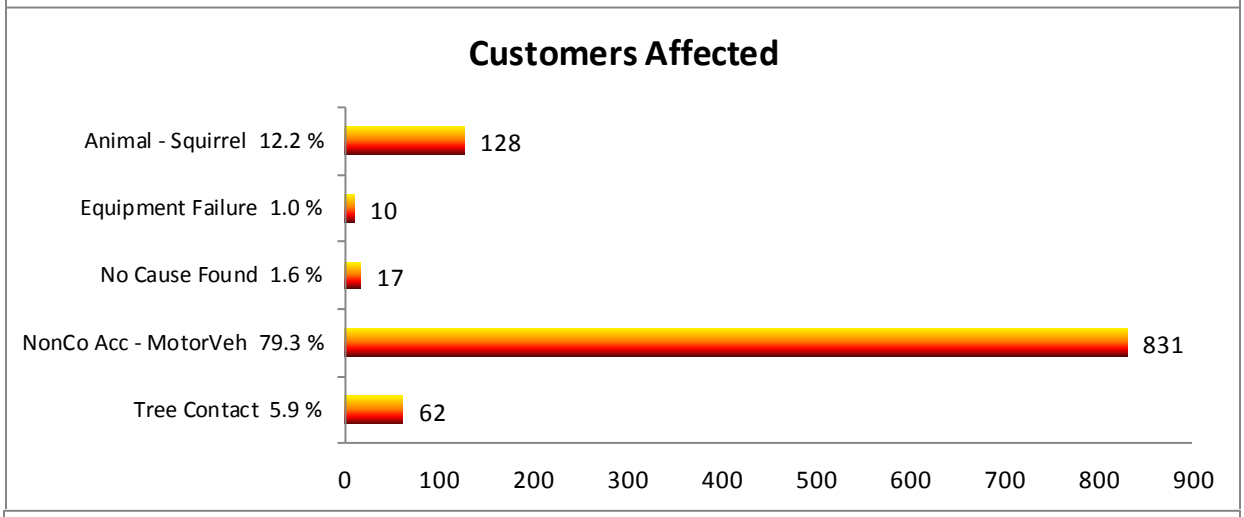
Infrared Thermal Inspection is scheduled on this circuit for 2019 and the circuit will be part of the 2019 circuit ownership program.

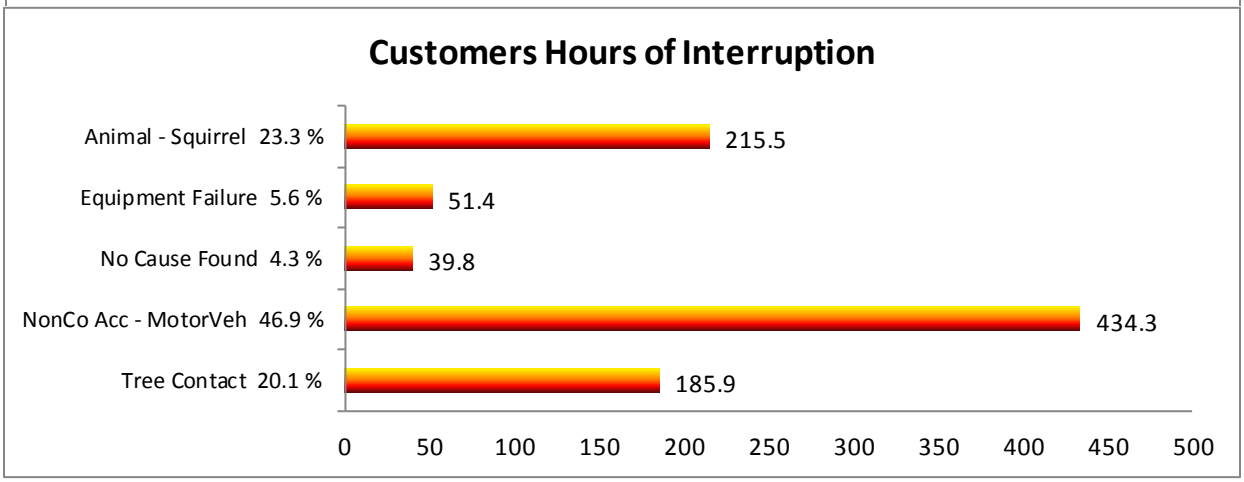
7-2-13 At A Glance

Circuit Stats			
	Count	**Rank Division**	**Rank Company**
Customers	1153	23	119
Critical Customers	8	11	54
Circuit Miles	43.66	13	24
Customers/Mile	26.4	29	237
Connected kVA	16,802	26	136
Automation			
	Y/N	**Sister Circuit**	
Auto-Loop	No	N/A	
Vegetation Management			
Last Cycle Completion	2014		
Next Cycle Scheduled	2017		
Infrared Scanning			
Last Performed	Summer 2017		
Anomalies Identified	None		
Anomalies Corrected	N/A		
Next Scheduled	Summer 2018		

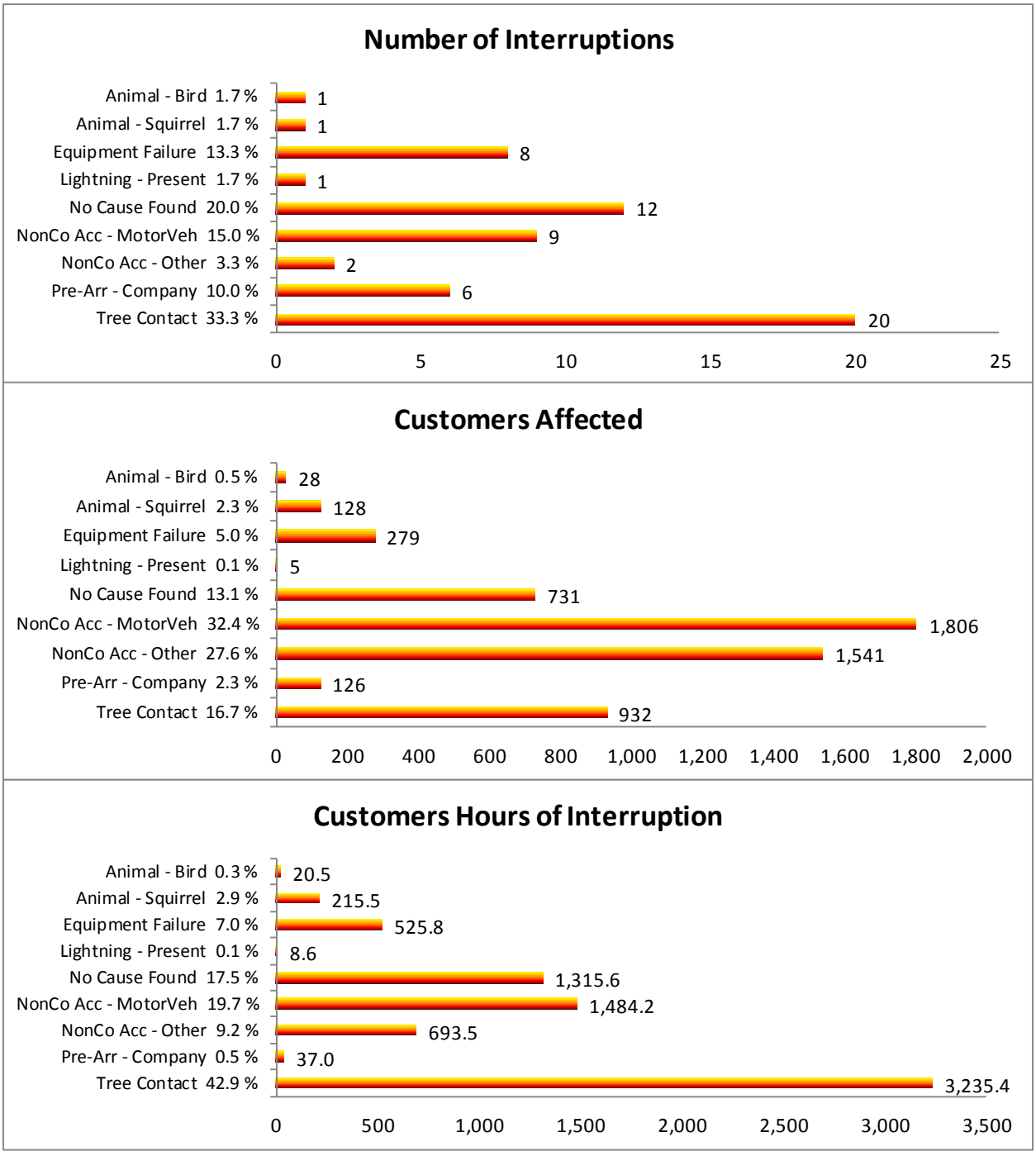
CIRCUIT 7-2-13 – ONE YEAR PERFORMANCE







CIRCUIT 7-2-13 – THREE YEAR PERFORMANCE



6. 2017 WPC Analysis

6.1. Overview

The following section of this Report reviews and discusses the actions taken by the Company in 2018 to improve the performance of circuits identified in 2017 as being the worst performers in each of the Company's three respective operating divisions.

Of the fifteen circuits under consideration, only three saw enough improvement to drop from the list of worst performers. In Central Division, all 5 circuits from 2017 returned to the list in 2018. In Western Division, four of five circuits returned and in Eastern Division, three of five returned. In addition, each division's number one worst performer in 2017 was also the respective division's worst performer in 2018.

Rank	East		Central		West	
	2017	2018	2017	2018	2017	2018
1	21-13-13	21-13-13	71-3-13	71-3-13	12-1-13	12-1-13
2	29-1-13	51-6-13	84-3-13	80-3-13	5-10-34	5-10-34
3	19-11-13	23-4-13	80-3-13	84-1-13	5-3-34	5-3-34
4	27-3-13	24-11-13	84-1-13	84-3-13	113-2-13	113-2-13
5	51-6-13	27-3-13	80-5-13	80-5-13	7-2-13	6-7-13

6.2. Eastern Division

Circuit 21-13-13

Circuit 21-13-13, which was ranked 1st in the Eastern Division per the 2017 priority circuit rating results, ranked 1st in the Eastern Division in 2018. The circuit originates from the West Nyack Substation and runs east into the Village of Nyack.

In 2017, there were 16 interruptions which affected 3,271 customers and resulted in 4,848 customer-hours of interruption. In 2018, there were 11 interruptions which affected 507 customers and resulted in 1,390 customer-hours of interruption. Review of 2017 versus 2018 data identified a decrease of 3,458 (71%) of the 4,848 total customer-hours of interruption. The tables below identify the outage data associated with 21-13-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 11/27/2017) 21-13-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Equipment Failure	4	25.0	1,488	45.5	2,863.7	59.1
No Cause Found	2	12.5	39	1.2	79.1	1.6
NonCo Acc - MotorVeh	1	6.3	16	0.5	57.5	1.2
Pre-Arr - Company	1	6.3	3	0.1	3.0	0.1
Tree Contact	8	50	1,725	52.7	1,845.1	38.1
Total	**16**		**3,271**		**4848.5**	

1 Year Summary (1/1/2018 - 12/31/2018) 21-13-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	2	18.2	82	16.2	120.3	8.7
Animal - Squirrel	1	9.1	4	0.8	10.1	0.7
Equipment Failure	3	27.3	223	44.0	325.7	23.4
No Cause Found	1	9.1	36	7.1	64.2	4.6
Pre-Arr - Company	1	9.1	100	19.7	455.0	32.7
Tree Contact	3	27.3	62	12.2	414.8	29.8
Total	**11**		**507**		**1,390.2**	

Vegetation Distribution trimming in the Eastern Division is scheduled on a 3 year cycle. Trimming was last completed in 2018 and is currently scheduled to be completed in 2021.

In the spring of 2017, the Company replaced the URD dip over the Thruway. In addition, the Company will be rerouting overhead conductors on Liberty Street to Hudson Street in the second half of 2018.

Reliability improvements over the past several that have helped improve the circuit's performance significantly from 2017 to 2018. Inclusion on the worst performing list for 2018 is the result of its residual rating from previous years' performance (as discussed in Appendix A, O&R uses a weighted three-year average to determine its annual worst performing circuits).

Circuit 29-1-13

Circuit 29-1-13, which was ranked second in the Eastern Division per the 2017 priority circuit rating results, improved to eleventh in the Eastern Division in 2018. The circuit originates from the Montvale Substation in Montvale New Jersey and serves a total 1,736 customers in New York. Despite its ranking, circuit 29-1-13 historically is not a worst performing circuit and 2017 should be considered as an anomalous year. In 2017, there were fifteen interruptions, which affected 2,658 customers that resulted in 4,935 customer-hours of interruption. The tables below identify the one and three year outage data associated with circuit 29-1-13, grouped by cause.

In 2017, there were 15 interruptions which affected 2,658 customers and resulted in 4,935 customer-hours of interruption. In 2018, there were 8 interruptions which affected 378 customers and resulted in 755 customer-hours of interruption. Review of 2017 versus 2018 data identified a decrease of 4,180 (85%) of the 4,935 total customer-hours of interruption. The tables below identify the outage data associated with 29-1-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 29-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Tree Contact	2	13.3	1,726	64.9	3,513.8	71.2
Pre-Arr - Company	5	33.3	37	1.4	59.4	1.2
No Cause Found	2	13.3	131	4.9	156.9	3.2
Animal - Squirrel	2	13.3	575	21.6	924.8	18.7
Animal - Bird	4	26.7	189	7.1	280.5	5.7
Total	**15**		**2,658**		**4,935.3**	

1 Year Summary (1/1/2018 - 12/31/2018) 29-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	12.5	25	6.6	39.2	5.2
Equipment Failure	2	25.0	7	1.9	15.0	2.0
No Cause Found	2	25.0	207	54.8	292.3	38.7
NonCo Acc - Other	1	12.5	7	1.9	7.7	1.0
Tree Contact	2	25.0	132	34.9	401.3	53.1
Total	8		378		755.3	

Given that 35% of all interruptions on the circuit in the past three years have been the result of some form of animal contact, not including the May 7th event which was also the result of an

animal contact, the Company is reviewing the wildlife protection for the entire circuit and will make changes/improvements as appropriate. The Company will also review the proximity of trees to conductors in areas where animal contacts have occurred in the past to ensure that adequate clearance is maintained thereby reducing the potential for squirrels to jump from the trees onto the energized conductors.

Circuit 19-11-13

Circuit 19-11-13, which was ranked third in the Eastern Division per the 2017 priority circuit rating results, improved to twelfth in the Eastern Division in 2018. The circuit originates from the Burns Substation in Rockland County and serves a total of 1,711 customers. Despite its ranking, circuit 19-11-13 historically is not a worst performing circuit and 2017 should be considered as an anomalous year.

In 2017, there were 21 interruptions which affected 2,652 customers and resulted in 3,661 customer-hours of interruption. In 2018, there were 24 interruptions which affected 2,218 customers and resulted in 1,719 customer-hours of interruption. Review of 2017 versus 2018 data identified a decrease of 1,942 (53%) of the 3,661 total customer-hours of interruption. The tables below identify the outage data associated with 19-11-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 19-11-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Equipment Failure	10	47.6	681	25.7	1,080.7	29.5
NonCo Acc - MotorVeh	2	9.5	9	0.3	11.7	0.3
NonCo Acc - Other	1	4.8	418	15.8	41.8	1.1
Overload - Company	1	4.8	66	2.5	83.6	2.3
Pre-Arr - Company	3	14.3	35	1.3	20.7	0.6
Tree Contact	4	19.0	1,443	54.4	2,422.9	66.2
Total	**21**		**2,652**		**3,661.3**	

1 Year Summary (1/1/2018 - 12/31/2018) 19-11-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	4.17	5	0.23	6	0.35
Equipment Failure	10	41.7	1,924	86.7	939.9	54.7
No Cause Found	2	8.3	66	3.0	144.1	8.4
NonCo Acc - Other	2	8.3	7	0.3	41.9	2.4
Pre-Arr - Company	5	20.8	43	1.9	105.1	6.1
Tree Contact	4	16.7	173	7.8	482.1	28.1
Total	**24**		**2,218**		**1,719.1**	

Despite its ranking, circuit 19-11-13 historically is not a worst performing circuit and 2017 should be considered as an anomalous year.

Seven of the ten equipment failures that occurred in 2017 were the result of failed primary conductors and/or connections. In reviewing the past three years' performance, the 15 primary conductor related failures on 19-11-13 since the beginning of 2015 are the most of any circuit in the Company. One possibility for these failures is that the circuit may have experienced a high level of electrical stress (possibly one or more lightning strikes) at some time in the past that could have caused weak points at splice locations. In researching the equipment failures on 19-11-13, the Company noted that several other circuits have also experienced an elevated number of primary conductor failures during the past three years.

In 2019, the Company will replace defective cross-arms and defective poles for system improvement.

Circuit 27-3-13

Circuit 27-3-13, which was ranked fourth in the Eastern Division per the 2017 priority circuit rating results, improved to fifth in the Eastern Division in 2018. The circuit originates from the West Haverstraw Substation in Rockland County, New York and serves a total 2,328 customers in New York.

In 2017, there were 11 interruptions which affected 1,390 customers and resulted in 2,047 customer-hours of interruption. In 2018, there were seven interruptions which affected 354 customers and resulted in 650 customer-hours of interruption. Review of 2017 versus 2018 data identified a decrease of 1,397 (68%) of the 2,047 total customer-hours of interruption. The tables below identify the outage data associated with 27-3-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 27-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	9.09	329	23.67	773.2	37.77
Animal - Squirrel	1	9.09	202	14.53	148.1	7.24
Equipment Failure	5	45.45	226	16.26	338.3	16.52
NonCo Acc - MotorVeh	2	18.18	602	43.31	744.9	36.39
Pre-Arr - Company	2	18.18	31	2.23	42.7	2.09
Total	**11**		**1,390**		**2,047.2**	

1 Year Summary (1/1/2018 - 12/31/2018) 27-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	14.3	32	9.0	84.8	13.0
Animal - Squirrel	1	14.3	203	57.3	294.4	45.3
Equipment Failure	5	71.4	119	33.6	270.9	41.7
Total	**7**		**354**		**650.1**	

Reliability improvements over the past several that have helped improve the circuit's performance. Inclusion on the worst performing list for 2018 is the result of its residual rating from previous years' performance (as discussed in Appendix A, O&R uses a weighted three-year average to determine its annual worst performing circuits).

Vegetation Distribution trimming in the Eastern Division is scheduled on a three year cycle. Trimming was last completed in November 2015 and is currently scheduled to be completed in the first quarter of 2019.

In 2017, O&R installed an additional tie capability between circuits 27-3-13 and 27-4-13 by upgrading a half mile section of Route 9W between Gurnee Ave and Westside Ave to mainline construction.

In 2018/2019, the Company will add enhanced distribution automation on the circuit to create an auto-loop with circuit 27-4-13. The project will require the installation a mid-point recloser, a tie recloser and three MOABs. The additional switching devices will assist with isolation and restoration as well as provide enhanced reliability in cases of major storm events.

Circuit 51-6-13

Circuit 51-6-13 which was ranked fifth in the Eastern Division per the 2017 priority circuit rating results, declined to second in the Eastern Division in 2018. The circuit originates from the Tallman Substation in the Village of Airmont and serves a total 1,422 customers in Town of Ramapo. 51-6-13 is not relatively long, however, the bulk of the circuit runs along the Route 202 corridor between Suffern and Pomona, an area that is heavily treed and well known locally for the number of trees that fall annually (regardless of whether they make contact with overhead conductors or not).

In light of these factors, in recent years the Company has installed additional switching devices along Route 202 to allow for a more expeditious restoration to affected customers when trees do make contact with the overhead conductors. The Company also greatly reduced the circuit's exposure to tree contact outages in 2014 by converting the first mile and a half out of the Tallman Substation to underground.

1 Year Summary (1/1/2017 - 12/31/2017) 51-6-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Tree Contact	11	61.1	1,650	75.4	767.5	71.6
Pre-Arr - Company	2	11.1	10	0.5	18.0	1.7
NonCo Acc - MotorVeh	3	16.7	489	22.4	217.2	20.3
Equipment Failure	1	5.6	6	0.3	5.5	0.5
Animal - Bird	1	5.6	32	1.5	64.0	6.0
Total	**18**		**2,187**		**1,072.2**	

1 Year Summary (1/1/2018 - 12/31/2018) 51-6-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	2	9.5	18	0.5	53.5	0.8
Equipment Failure	8	38.1	1,238	34.3	2,888.6	45.5
No Cause Found	3	14.3	2,240	62.0	3,276.8	51.6
NonCo Acc - MotorVeh	1	4.8	6	0.2	25.8	0.4
Pre-Arr - Company	2	9.5	11	0.3	6.9	0.1
Tree Contact	5	23.81	102	2.82	96.3	1.52
Total	**21**		**3,615**		**6,348.0**	

In 2017, there were 18 interruptions which affected 2,187 customers and resulted in 1,072 customer-hours of interruption. In 2018, there were 21 interruptions which affected 3,615

customers and resulted in 6,348 customer-hours of interruption. Review of 2017 versus 2018 data, identified an increase of 5,276 (492%) of the 1,072 total customer-hours of interruption.

Vegetation Distribution trimming in the Eastern Division is scheduled on a three year cycle. Trimming was last completed in April 2015 and is currently scheduled to be completed in 2019.

Infrared Scanning on the circuit was completed in 2017 and no issues were identified.

System reliability work on this circuit was completed in 2014 as part of the Storm Hardening Project. Overhead three-phase mainline conductors (1½ miles) on Montebello Road, Suffern were rebuilt as an underground express feeder. The second part of the project involved removal of the original overhead circuit on Montebello Road and was completed in 2015. The final part of the project that completed the system improvement was to replace fourteen poles and re-conductor 1,200 feet of overhead wires.

In 2019, the Company plans to complete a DA project involving six MOABs and four reclosers on the section of the circuit along Haverstraw Road which is most prone to tree contact outages as discussed above. In addition, the Company will be reconfiguring adjacent circuits allowing for better back up capability for the area which, when coupled with the DA project, will reduce customer exposure to extended duration outages.

6.3. Central Division

Circuit 71-3-13

Circuit 71-3-13 was the highest ranked worst performing circuit in Central Division in 2017. Despite efforts to improve the performance it remained the highest ranked circuit in the division in 2018. The circuit originates from the Harriman Substation in Harriman, New York and serves a total of 2,275 customers over 53 circuit miles.

1 Year Summary (1/1/2017 - 12/31/2017) 71-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Tree Contact	12	42.9	5,903	95.2	9,932.5	94.2
Animal - Squirrel	1	3.6	55	0.9	59.6	0.6
Equipment Failure	3	10.7	13	0.2	32.3	0.3
No Cause Found	6	21.4	197	3.2	471.1	4.5
NonCo Acc - Tree	1	3.6	2	0.0	7.0	0.1
Pre-Arr - Company	5	17.9	31	0.5	44.1	0.4
Total	**28**		**6,201**		**10,546.5**	

1 Year Summary (1/1/2018 - 12/31/2018) 71-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	2.6	8	0.1	16.1	0.1
Equipment Failure	13	33.3	4,462	51.4	9,151.6	57.6
Lightning - Previous	1	2.6	3	0.0	3.9	0.0
No Cause Found	2	5.1	21	0.2	28.6	0.2
NonCo Acc - MotorVeh	5	12.8	2,192	25.2	2,376.2	15.0
NonCo Acc - Tree	1	2.6	3	0.0	12.1	0.1
Pre-Arr - Company	3	7.7	49	0.6	108.6	0.7
Tree Contact	12	30.8	1,945	22.4	4,181.5	26.3
Work Err - Contractor	1	2.6	2	0.0	14.8	0.1
Total	**39**		**8,685**		**15,893.3**	

In 2017, there were 28 interruptions which affected 6,201 customers and resulted in 10,546 customer-hours of interruption. In 2018, there were 39 interruptions which affected 8,685 customers and resulted in 15,893 customer-hours of interruption. Review of the 2017 versus 2018 data identified an increase of 5,347 (50%) of the total customer-hours of interruption. The

tables below identify the outage data associated with 71-3-13 for each of the respective years, grouped by cause.

The main area of concern is the increase in the number of equipment failures and the number of customers affected by equipment failure outages. In 2018 there were ten more outages due to equipment failures than in 2017. Two events represented 8,630 customer hours or 54% of the total customer hours. One of the events was a failed cross arm which triggered a failure in operation of the substation breaker. The breaker did not operate properly and line crews had to switch the customers to different circuits. The second major event was a failure in operation of the re-closer on the circuit. This caused a long duration outage impacting a large number of customers. Without the impact of these two major events the customer-hours would have been lower than the 2017 total. Unfortunately, the two significant events are driving the 2018 performance.

In 2018 a circuit enhancement project was completed. Automated switches were installed to allow for remote operation and the capability to tie with an adjacent circuit. This circuit is included in the circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Vegetation management was completed on this circuit in 2018.

A project to further automate the circuit remains on hold, pending the completion of the Route 32 road widening project currently under construction by the State of New York, and scheduled for completion at the end of 2019.

Circuit 84-3-13

Circuit 84-3-13 was ranked second in the Central Division, in accordance with the Company's 2017 circuit priority rating system. In 2018 Circuit 84-3-13 improved and is now the fourth on the list for Central Division. The 84-3-13 originates from the Hunt Substation and runs south along the eastern shore of Greenwood Lake ending just north of the state line with New Jersey. This circuit serves 1,825 customers over 40 circuit miles, and is three miles longer than the average length of the company's 100 longest circuits.

In 2017, there were 26 interruptions which affected 5,052 customers and resulted in 5,454 customer-hours of interruption. In 2018, there were 19 interruptions which affected 2,286 customers and resulted in 3,569 customer-hours of interruption. Review of the 2017 versus 2018 data identified a decrease of 1,885 (35%) of the total customer-hours of interruption. The tables below identify the outage data associated with 84-3-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 84-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	3.8	30	0.6	63.5	1.2
Equipment Failure	6	23.1	1,682	33.3	643.0	11.8
No Cause Found	3	11.5	97	1.9	172.3	3.2
Pre-Arr - Company	1	3.8	8	0.2	14.0	0.3
Tree Contact	14	53.8	2,671	52.9	4,336.9	79.5
Work Err - Company	1	3.8	564	11.2	224.0	4.1
Total	**26**		**5,052**		**5,453.6**	

1 Year Summary (1/1/2018 - 12/31/2018) 84-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Equipment Failure	5	26.3	364	15.9	325.1	9.1
No Cause Found	3	15.8	73	3.2	180.7	5.1
NonCo Acc - MotorVeh	2	10.5	74	3.2	755.0	21.2
Tree Contact	9	47.4	1,775	77.7	2,308.6	64.7
Total	**19**		**2,286**		**3,569.4**	

The largest improvement on the impact to customer-hours was due to a reduction in tree related outages. There were five fewer outages from tree contacts and that accounted for an

87% reduction in the number of the customer-hours, and impacted 896 fewer customers on the circuit.

The trimming cycle was started in 2017, and was completed in 2018. Automated switches were installed to allow for remote operation and the capability to tie with an adjacent circuit. This should help decrease customers affected in the coming years and improve the performance of the circuit. This circuit is included in the circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

Circuit 80-3-13

Circuit 80-3-13 was ranked third in the Central Division, in accordance with the Company's 2017 circuit priority rating system. In 2018 Circuit 80-3-13 is now the second ranked circuit on the list for Central Division. Circuit 80-3-13 originates from the Wisner Substation, in Warwick, New York and extends for approximately 74 circuit miles. This is the company's second longest circuit and also has the second most customers with 2,909.

In 2017, there were 44 interruptions which affected 5,829 customers and resulted in 5,975 customer-hours of interruption. In 2018, there were 34 interruptions which affected 6,338 customers and resulted in 7,111 customer-hours of interruption. Review of the 2017 versus 2018 data identified an increase of 1,136 (19%) of the total customer-hours of interruption. The tables below identify the outage data associated with 80-3-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 80-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	2.3	64	1.1	72.5	1.2
Equipment Failure	8	18.2	1,337	22.9	1,002.9	16.8
No Cause Found	10	22.7	273	4.7	944.1	15.8
NonCo Acc - MotorVeh	3	6.8	781	13.4	1,211.8	20.3
Pre-Arr - Company	6	13.6	444	7.6	147.3	2.5
Tree Contact	16	36.4	2,930	50.3	2,596.2	43.5
Total	**44**		**5,829**		**5,974.9**	

1 Year Summary (1/1/2018 - 12/31/2018) 80-3-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	2.9	2	0.0	2.3	0.0
Equipment Failure	11	32.4	3,590	56.6	911.8	12.8
No Cause Found	2	5.9	144	2.3	375.7	5.3
NonCo Acc - MotorVeh	3	8.8	857	13.5	2,465.9	34.7
Pre-Arr - Company	1	2.9	57	0.9	46.6	0.7
Tree Contact	16	47.1	1,688	26.6	3,308.5	46.5
Total	**34**		**6,338**		**7,110.7**	

The 2018 performance of the circuit is similar to 2017. The circuit experienced fewer interruptions, however the number of customers affected and the number of customer hours both increased. The number of motor vehicle accidents remained the same, however the customer hours impact doubled. Tree contacts and animal contact remained the same. There

was a reduction in the number of no cause found events and associated customer hours. This is an indication that the use of fault indicators and monitoring devices are providing more intelligence on the circuit activity.

The Company recognizes the 80-3-13 as one of the circuits in Central Division that is complex due to the nature of its physical layout and we continue to explore ways to improve the performance through automation changes, increased patrols after events and more sophisticated circuit monitoring. In 2018 the company increased the frequency of patrols, performed hot spot tree trimming and completed fuse coordination jobs on the circuit. Protection settings were updated on the distribution equipment and substation breaker. This circuit is included in the circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

In addition, a cross-function team including representatives from Engineering, Operations and the Control Center has been convened to review the historical performance of this circuit and to recommend alternative that will improve its performance moving forward.

Circuit 84-1-13

Circuit 84-1-13 was ranked fourth in the Central Division, in accordance with the Company's 2017 circuit priority rating system. In 2018 Circuit 84-1-13 is now the third ranked circuit on the list for Central Division. Circuit 84-1-13 originates from the Hunt Substation, in Greenwood Lake. This circuit serves 2,166 customers over 50 circuit miles, and is 13 miles longer than the average length of the company's 100 longest circuits.

In 2017, there were 23 interruptions which affected 3,900 customers and resulted in 7,009 customer-hours of interruption. In 2018, there were 39 interruptions which affected 4,484 customers and resulted in 8,590 customer-hours of interruption. Review of the 2017 versus 2018 data identified an increase of 1,581 (22%) of the total customer- hours of interruption. The tables below identify the outage data associated with 84-1-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 84-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	3	13.0	14	0.4	22.5	0.3
Equipment Failure	5	21.7	29	0.7	118.5	1.7
No Cause Found	3	13.0	238	6.1	346.7	4.9
NonCo Acc - MotorVeh	2	8.7	331	8.5	652.9	9.3
NonCo Acc - UG	1	4.3	212	5.4	366.9	5.2
Pre-Arr - Company	1	4.3	8	0.2	6.0	0.1
Tree Contact	8	34.8	3,068	78.7	5,496.1	78.4
Total	**23**		**3,900**		**7,009.5**	

1 Year Summary (1/1/2018 - 12/31/2018) 84-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	2	5.1	12	0.3	16.2	0.2
Equipment Failure	11	28.2	55	1.2	333.6	3.9
No Cause Found	5	12.8	243	5.4	362.9	4.2
NonCo Acc - MotorVeh	2	5.1	331	7.4	652.9	7.6
NonCo Acc - UG	1	2.6	212	4.7	366.9	4.3
Pre-Arr - Company	2	5.1	12	0.3	16.0	0.2
Tree Contact	15	38.46	3,616	80.64	6,826.5	79.47
Work Err - Contractor	1	2.56	3	0.07	14.8	0.17
Total	**39**		**4,484**		**8,589.7**	

Tree contact and equipment failure continue to be the greatest cause of outages on this circuit. In 2018 the number of both tree and equipment related outages doubled. The largest impact to customer hours was due to trees. There were 15 tree contacts that accounted for over 79% of the customer-hours, and impacted over 80% of the customers on the circuit.

Cyclical tree trimming on this circuit was completed in 2018. The benefits from the trimming program should be realized in 2019. This circuit is included in the circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

Circuit 80-5-13

Circuit 80-5-13 was ranked fifth in the Central Division, in accordance with the Company's 2017 circuit priority rating system. In 2018 Circuit 80-5-13 has remained in the same position as the fifth ranked circuit on the list for Central Division. Circuit 80-5-13 originates from the Wisner Substation, in Warwick, New York. This circuit serves 1,730 customers from over 61 circuit miles, and is the second longest circuit in the Central Division.

In 2017, there were 26 interruptions which affected 2,372 customers and resulted in 5,314 customer-hours of interruption. In 2018, there were 27 interruptions which affected 2,150 customers and resulted in 4,143 customer-hours of interruption. Review of the 2017 versus 2018 data identified a decrease of 1,171 (22%) of the total customer-hours of interruption. The tables below identify the outage data associated with 80-5-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 80-5-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	4	15.4	269	11.3	359.1	6.8
Equipment Failure	4	15.4	169	7.1	1,124.1	21.2
No Cause Found	8	30.8	335	14.1	637.3	12.0
NonCo Acc - MotorVeh	1	3.8	11	0.5	54.1	1.0
NonCo Acc - OH	1	3.8	5	0.2	13.5	0.3
Pre-Arr - Company	2	7.7	6	0.3	4.3	0.1
Tree Contact	6	23.1	1,577	66.5	3,121.3	58.7
Total	**26**		**2,372**		**5,313.5**	

1 Year Summary (1/1/2018 - 12/31/2018) 80-5-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Other	1	3.7	2	0.1	1.0	0.0
Animal - Squirrel	4	14.8	230	10.7	402.1	9.7
Equipment Failure	6	22.2	1,420	66.1	2,492.5	60.2
Lightning - Previous	1	3.7	2	0.1	10.6	0.3
No Cause Found	5	18.5	145	6.7	308.1	7.4
NonCo Acc - MotorVeh	1	3.7	6	0.3	18.1	0.4
Pre-Arr - Company	3	11.1	12	0.6	5.6	0.1
Tree Contact	6	22.2	333	15.5	904.9	21.8
Total	**27**		**2,150**		**4,143.0**	

The overall performance of the circuit in 2018 was very similar to 2017. The number of customer hours of interruption decreased, but the type of outage driving the performance changed. In 2017 tree related causes were a significant contributor to the customer hours. In 2018 the customer hours of interruption from tree related issues declined. Customer hours of interruption due to equipment failure more than doubled the previous year driving the performance in 2018. The circuit is not currently included in the circuit reliability program. Automation additions are planned on the circuit for 2019. The additional switching capability will further improve reliability.

6.4. Western Division

Circuit 12-1-13

Circuit 12-1-13 was ranked first in the Western Division, in accordance with the Company's 2017 circuit priority rating system. In 2018 circuit 12-1-13 remained the highest ranked circuit in the division in 2018. Circuit 12-1-13 originates from the Bloomingburg Substation, in Bloomingburg, New York. This circuit serves 1,971 customers over 65 circuit miles. This is seventh longest circuit in the company, with most of the line located in very heavily treed areas.

In 2017, there were 44 interruptions which affected 6,232 customers and resulted in 7,498 customer-hours of interruption. In 2018, there were 51 interruptions which affected 6,881 customers and resulted in 9,021 customer-hours of interruption. Review of the 2017 versus the 2018 data identified an increase of 1,523 (20%) of the total customer-hours of interruption. The tables below identify the outage data associated with 12-1-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 12-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	5	11.4	482	7.7	751.4	10.0
Equipment Failure	4	9.1	187	3.0	139.9	1.9
No Cause Found	6	13.6	1,721	27.6	975.2	13.0
NonCo Acc - MotorVeh	2	4.5	6	0.1	49.2	0.7
Pre-Arr - Company	4	9.1	69	1.1	157.7	2.1
Tree Contact	23	52.3	3,767	60.4	5,424.2	72.3
Total	**44**		**6,232**		**7,497.6**	

1 Year Summary (1/1/2018 - 12/31/2018) 12-1-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	2.0	26	0.4	55.5	0.6
Animal - Squirrel	6	11.8	463	6.7	1,280.5	14.2
Equipment Failure	12	23.5	2,591	37.7	2,841.2	31.5
Lightning - Present	1	2.0	2	0.0	5.7	0.1
No Cause Found	6	11.8	166	2.4	276.2	3.1
Pre-Arr - Company	1	2.0	10	0.2	1.5	0.0
Tree Contact	24	47.06	3,623	52.65	4,560.7	50.56
Total	**51**		**6,881**		**9,021.2**	

The 2018 performance was primarily driven by the increase in the number of equipment failures and the number of customers affected by equipment failure outages. In 2018 there were three times as many outages due to equipment failures than in 2017. Two equipment failures events represented 20% of the total customer hours in 2018. In 2018 operations met with engineering and jointly developed a plan to add more automated switching to the circuit. The plan includes replacing some of the critically located existing switches with automated switches and adding additional switches to the circuit.

The addition of more automation and switch points will minimize the impact of outages and improve the overall reliability of the circuit. The switching will be added in 2019. Frequent line patrols were performed on the circuits with minor maintenance items identified and repaired. In addition, hot spot trimming was performed on several occasions in 2018.

This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection.

Circuit 5-10-34

Circuit 5-10-34 was ranked second in the Western Division per 2017 circuit priority rating system. The circuit is still ranked second in the Western Division per 2018 priority circuit rating results. Circuit 5-10-34 originates from the Cuddebackville Substation in Cuddebackville and serves 1,673 customers over 69 circuit miles. This is the fifth longest circuit in this Company.

In 2017, there were 32 interruptions which affected 3,004 customers and resulted in 5,070 customer-hours of interruption. In 2018, there were 31 interruptions which affected 2,275 customers and resulted in 3,896 customer-hours of interruption. Review of the 2017 versus the 2018 data identified a decrease of 1,174 (23%) of the total customer-hours of interruption. The tables below identify the outage data associated with 5-10-34 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 5-10-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	5	15.6	199	6.6	345.3	6.8
Equipment Failure	6	18.8	1,693	56.4	1,537.3	30.3
Lightning - Present	1	3.1	7	0.2	47.7	0.9
No Cause Found	3	9.4	389	12.9	478.0	9.4
Pre-Arr - Company	1	3.1	15	0.5	25.0	0.5
Tree Contact	16	50.0	701	23.3	2,637.1	52.0
Total	**32**		**3,004**		**5,070.4**	

1 Year Summary (1/1/2018 - 12/31/2018) 5-10-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Equipment Failure	6	19.4	707	31.1	565.9	14.5
Lightning - Present	2	6.5	18	0.8	45.6	1.2
No Cause Found	6	19.4	345	15.2	699.9	18.0
NonCo Acc - MotorVeh	1	3.2	2	0.1	11.3	0.3
Pre-Arr - Company	3	9.7	54	2.4	41.8	1.1
Tree Contact	13	41.9	1,149	50.5	2,531.7	65.0
Total	31		2,275		3,896.3	

The overall performance of the circuit in 2018 was very similar to 2017 in terms of the number of interruptions, but the circuit performance improved regarding the number of customers affected and number of customer hours of interruption. Both of these decreased, mainly due to a large reduction in the impact related to equipment failures.

The new Deerpark substation was placed in service in 2018, reducing the exposure on the 5-10-34 circuit. This circuit was included in the 2018 circuit ownership program for 2018 and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection.

Circuit 5-3-34

Circuit 5-3-34 was ranked third in the Western Division per 2017 circuit priority rating system. The circuit again ranked third in the Western Division per 2018 priority circuit rating results. Circuit 5-3-34 originates from the Cuddebackville Substation, in Cuddebackville, New York. This circuit serves 1,488 customers over 68 circuit miles. This is the sixth longest circuit in this company, with most of the line located in very heavily treed areas. This circuit is part of a three circuit automatic loop with 11 DSCADA controlled reclosers.

In 2017, there were 37 interruptions which affected 2,032 customers and resulted in 5,219 customer-hours of interruption. In 2018, there were 42 interruptions which affected 3,972 customers and resulted in 10,057 customer-hours of interruption. Review of the 2017 versus the 2018 data identified an increase of (93%) of the total customer-hours of interruption. The tables below identify the outage data associated with 5-3-34 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 5-3-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	2.7	10	0.5	87.2	1.7
Equipment Failure	7	18.9	44	2.2	38.2	0.7
Lightning - Present	1	2.7	640	31.5	1,120.0	21.5
Lightning - Previous	1	2.7	3	0.1	21.9	0.4
Pre-Arr - Company	7	18.9	44	2.2	38.2	0.7
Tree Contact	20	54.1	1,291	63.5	3,913.5	75.0
Total	**37**		**2,032**		**5,218.9**	

1 Year Summary (1/1/2018 - 12/31/2018) 5-3-34

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	2	4.8	42	1.1	45.8	0.5
Equipment Failure	9	21.4	160	4.0	453.6	4.5
Lightning - Present	1	2.4	3	0.1	5.5	0.1
No Cause Found	4	9.5	160	4.0	286.8	2.9
NonCo Acc - MotorVeh	3	7.1	951	23.9	1,802.2	17.9
Pre-Arr - Company	1	2.4	3	0.1	3.0	0.0
Tree Contact	22	52.38	2,653	66.79	7,460.0	74.18
Total	**42**		**3,972**		**10,056.8**	

Tree contacts continue to be the greatest cause of outages on this circuit. In 2018 the number of tree related outages was similar to 2017; however the impact on customer hours almost doubled. There were 22 tree contacts that accounted for over 74% of the customer-hours affected on the circuit in 2018. Cyclical tree trimming on this circuit was last completed in 2016 and is scheduled again for 2019. Tree related outages continue to drive the performance on this circuit.

This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

Specifications for 35 kV class automated switches are currently being evaluated for inclusion in the Company's approved materials standards. Once approved, the switches will be designed into the system to replace existing manually operated distribution switches on this circuit.

Circuit 113-2-13

Circuit 113-2-13 was ranked fourth in the Western Division, in accordance with the Company's 2017 circuit priority rating system. The circuit is again ranked fourth in the Western Division per 2018 priority circuit rating results. Circuit 113-2-13 originates from the Silver Lake Substation, in Middletown. This circuit serves 1,878 customers over 25 circuit miles.

113-2-13 historically has not been a poor performer, however, due to the weighed nature in which the Company ranks circuit performance, the 2017 performance drove the 2018 ranking. The Company considers the 2017 performance as an anomaly, and expects the circuit to fall off the worst performing list in 2019.

In 2017, there were 16 interruptions which affected 3,874 customers and resulted in 4,194 customer-hours of interruption. In 2018, there were 13 interruptions which affected 196 customers and resulted in 642 customer-hours of interruption. Review of the 2017 versus the 2018 data identified a decrease of 3,552 (85%) of the total customer-hours of interruption. The tables below identify the outage data associated with 113-2-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 113-2-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	6.3	18	0.5	27.0	0.6
Equipment Failure	10	62.5	1,552	40.1	1,987.3	47.4
No Cause Found	2	12.5	65	1.7	108.8	2.6
NonCo Acc - MotorVeh	2	12.5	2,231	57.6	2,043.8	48.7
NonCo Acc - UG	1	6.3	8	0.2	27.1	0.6
Total	**16**		**3,874**		**4,194.0**	

1 Year Summary (1/1/2018 - 12/31/2018) 113-2-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Squirrel	1	7.7	22	11.2	20.9	3.3
Equipment Failure	6	46.2	47	24.0	220.6	34.4
NonCo Acc - UG	1	7.7	2	1.0	11.2	1.7
Pre-Arr - Company	4	30.8	121	61.7	354.1	55.2
Tree Contact	1	7.7	4	2.0	34.8	5.4
Total	**13**		**196**		**641.6**	

The overall performance of the circuit in 2018 was significantly better than 2017. The number of customer hours of interruption decreased by 85% and the number of customers impacted

decreased by 95%. The greatest impact on the 2018 circuit performance was due to pre-arranged company outages on underground portions of the circuit. These outages were prescheduled for system maintenance.

This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

Circuit 7-2-13

Circuit 7-2-13 was ranked fifth in the Western Division, in accordance with the Company's 2017 circuit priority rating system. The circuit is not ranked in the top five in 2018. Circuit 7-2-13 originates from the Otisville Substation, in Otisville. This circuit serves 1,971 customers over 44 circuit miles, and is the 14th longest circuit in the division.

In 2017, there were 15 interruptions which affected 2,779 customers and resulted in 5,232 customer-hours of interruption. In 2018, there were 18 interruptions which affected 2,441 customers and resulted in 2,806 customer-hours of interruption. Review of the 2017 versus the 2018 data identified a decrease of 2,426 (46%) of the total customer-hours of interruption. The tables below identify the outage data associated with 7-2-13 for each of the respective years, grouped by cause.

1 Year Summary (1/1/2017 - 12/31/2017) 7-2-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	6.7	34	1.2	39.1	0.8
Equipment Failure	3	20.0	59	2.1	53.2	1.0
Lightning - Previous	1	6.7	9	0.3	17.1	0.3
No Cause Found	2	13.3	31	1.1	36.1	0.7
NonCo Acc - MotorVeh	3	20.0	1,222	44.0	1,787.3	34.2
Tree Contact	5	33.3	1,424	51.2	3,299.2	63.1
Total	**10**		**1,355**		**1,932.7**	

1 Year Summary (1/1/2018 - 12/31/2018) 7-2-13

Cause	# of Interruptions	% of Interruptions	Customers Affected	% of Customers Affected	Customer Hours	% of Customer Hours
Animal - Bird	1	5.6	15	0.6	31.3	1.1
Animal - Squirrel	1	5.6	33	1.4	24.2	0.9
Equipment Failure	6	33.3	1,556	63.7	2,116.5	75.4
No Cause Found	2	11.1	59	2.4	98.4	3.5
NonCo Acc - MotorVeh	2	11.1	621	25.4	235.1	8.4
Tree Contact	6	33.3	157	6.4	300.3	10.7
Total	**18**		**2,441**		**2,805.8**	

The overall performance of the circuit in 2018 decreased as compared to 2017, the circuit was not included in the top five worst performers in the division due to performance of other circuits. The number of customer hours of interruption decreased and the number of customers affected both increased. The greatest positive impact on the circuit performance was from a

significant reduction in customers impacted and less customer hours impacted from tree related causes. Performance gains related to tree causes were offset by a large increase in both customers affected and customer hours caused by equipment related outages.

This circuit was included in the 2018 circuit ownership program and is thoroughly patrolled for broken and defective components, vegetation contact, missing animal guards and lightning protection. Defects identified are corrected.

APPENDICES

Appendix A

O&R Priority Methodology and Circuit Ratings

Orange and Rockland Utilities Circuit Priority Rating System

DATA SELECTED:

All overhead and underground incidents affecting the distribution system occurring in the past three calendar years (2016 – 2018).

DATA EXCLUDED:

Partial power outages and single no light outages;
Outages affecting only secondaries/services;
Outages associated with regulatory storms; and
Transmission and substation caused distribution outages.

Orange and Rockland's priority rating system methodology was designed to better identify circuit performance and provide more focused results on the causes. The information included in the analysis consists of seven categories of data to calculate the priority rating for each circuit. These include both outage statistics and circuit characteristics.

These categories are as follows:

OUTAGE DATA

Breaker trip and reclose activity;
Number of interruptions;
Customers affected and customer hours of interruption;
Number of customers served by the circuit;
SAIFI for the given circuit; and
Customer outage hours attributed to lightning, animal contact, tree contact and equipment failures.

For each circuit, a score is generated by weighing that circuit's performance in each category over the previous three years. A rank is then determined for each category of outage data. A priority rating is then calculated using the weighted ranking of each category. This rating is then used to rank each circuit in an overall priority list. This list is maintained by the Performance and Operations Engineering group.

An analysis of the performance of each circuit identified in the top five highest priorities in each operating division is conducted for the most recent calendar year (2018). In the absence of a significant improvement over the previous two calendar years, a plan is developed and implemented to improve the circuit's performance over the upcoming calendar year.

The following pages of this appendix detail the priority ratings by circuit for all of Orange and Rockland's distribution circuits.

New York – Eastern Division – 2018 Circuit priority list

Circuit	# of Trips/ Recloses	Rank Trip/ Recl	# of Int.	Rank # of Int	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
21-13-13	9.5	34	17.4	41	2,459.1	11	1,619.3	57	1,962.3	60	1,247.9	40	63.55	104	44.18	15
51-6-13	13.3	17	19.6	26	2,114.7	17	4,865.3	2	3,528.8	22	773.8	57	20.60	139	46.43	17
23-4-13	21.7	3	22.9	18	1,512.4	51	11,866.9	1	10,817.9	1	756.6	58	7.27	144	51.43	23
24-11-13	13.3	17	16.8	46	1,622.7	42	2,705.1	12	2,507.1	41	820.9	53	30.98	130	52.13	25
27-3-13	4.9	63	11.3	94	2,436.3	12	1,153.5	92	1,703.1	72	866.0	52	76.61	90	55.13	32
53-6-13	9.8	30	18.7	32	2,263.7	14	2,611.6	16	2,615.2	36	627.8	73	30.20	131	55.50	35
22-1-13	18.9	6	15.9	56	1,415.9	57	4,095.0	4	4,178.7	14	727.6	62	19.78	141	56.75	36
23-6-13	18.9	6	19.6	27	1,680.8	39	1,536.3	60	1,740.4	68	786.9	55	52.72	112	57.38	38
51-1-13	14.7	13	17.2	42	1,210.8	77	3,855.5	5	2,848.1	31	817.5	54	22.36	138	58.48	39
22-2-13	19.6	5	18.7	33	1,371.8	63	1,873.4	39	2,068.6	56	908.0	51	38.11	129	58.90	40
29-1-13	6.6	53	15.9	55	1,815.4	34	1,050.8	106	1,436.5	85	1,054.0	48	80.67	87	58.90	41
45-8-13	22.4	2	24.3	10	1,618.4	43	4,188.6	3	4,179.3	13	599.8	77	20.15	140	59.15	43
19-11-13	16.8	10	19.2	29	1,759.3	35	1,687.5	54	1,780.6	67	745.8	60	38.68	128	59.88	44
19-10-13	14	15	23.2	15	3,077.9	7	1,202.7	85	1,363.8	88	590.7	78	89.13	79	62.45	46
45-5-13	14.7	13	25.5	7	1,534.2	50	1,780.5	44	1,707.3	71	641.2	71	56.23	110	64.95	49
45-2-13	9.1	35	6.6	132	1,600.1	46	1,100.0	97	1,533.8	78	654.5	69	73.30	93	71.23	56
22-7-13	15.4	11	16.1	52	1,971.6	26	2,332.9	22	2,022.3	58	391.6	99	42.69	119	71.23	56
19-13-13	3.5	69	7.4	120	1,749.1	37	1,922.4	34	2,339.4	47	497.5	86	38.91	127	71.63	58
23-1-13	20.3	4	17.1	43	1,211.4	76	3,582.6	9	3,511.5	23	472.8	89	24.22	137	73.33	60
45-9-13	18.2	9	14.9	63	1,647.3	40	3,593.5	8	2,745.5	32	353.1	103	18.27	142	74.35	61
19-14-13	14	15	20.4	23	1,842.3	30	3,851.5	6	1,477.1	82	349.8	104	42.58	120	74.55	62
44-5-13	12.6	19	18.8	31	1,485.9	53	2,320.7	23	2,343.6	46	397.8	96	26.51	134	75.35	63
27-2-13	14.9	12	21	20	2,017.7	23	1,863.7	40	1,310.5	92	334.0	106	39.85	123	78.60	65
22-5-13	10.5	28	12.3	83	1,609.0	44	1,715.0	51	1,726.9	69	379.7	100	52.56	113	79.88	66
21-11-13	6.3	54	13	77	712.4	121	1,073.9	101	1,589.3	76	783.0	56	63.93	103	80.68	68
45-1-13	18.9	6	17	45	1,327.8	65	2,692.7	14	2,275.4	50	306.5	107	27.41	133	82.13	71

Circuit	# of Trips/ Recloses	Rank Trip/ Recl	# of Int.	Rank # of Int	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
53-1-13	12.6	19	16.6	48	1,554.8	48	2,719.5	11	2,279.6	49	246.8	117	25.35	135	83.43	73
51-5-13	8.4	38	12.8	78	895.2	100	1,112.1	96	1,484.0	80	635.7	72	56.33	109	83.80	74
27-1-13	5.6	58	5.7	144	943.0	97	1,418.4	72	1,824.0	66	603.3	76	51.60	114	83.85	75
50-2-13	12.6	19	17.1	43	1,833.3	31	1,911.4	36	1,939.8	62	208.5	123	42.08	122	85.10	76
50-3-13	9.8	30	20.5	21	967.1	95	1,453.9	67	1,652.5	73	443.0	91	51.59	115	86.73	78
24-4-13	2.8	77	4.5	156	1,503.8	52	1,070.5	103	1,075.5	101	440.0	92	76.45	92	87.23	79
27-8-13	6.3	54	13.1	76	1,389.9	61	937.9	112	1,321.7	90	392.2	98	86.20	81	87.85	80
44-3-13	8.4	38	11.8	87	1,819.2	33	1,093.8	99	1,091.2	100	280.1	111	82.07	85	88.08	81
44-6-13	24.5	1	19.5	28	1,413.4	59	1,748.8	48	1,463.3	83	252.4	115	38.94	126	89.98	84
19-9-13	11.2	23	15.9	56	1,304.5	68	1,255.1	81	946.5	107	371.8	102	64.10	102	90.48	85
51-4-13	5.6	58	4.8	152	1,377.6	62	1,896.1	37	1,302.3	93	276.2	112	45.98	118	92.85	86
22-4-13	11.2	23	11.2	95	971.8	94	2,546.5	18	2,540.1	40	243.2	118	24.80	136	94.25	88
29-3-13	11.2	23	12	86	1,552.7	49	3,830.8	7	3,410.5	24	140.9	149	13.97	143	96.98	90
29-4-13	4.2	67	10.5	103	692.7	122	462.8	148	849.8	112	570.8	80	100.25	71	97.75	93
51-7-13	9.1	35	10.9	99	1,337.8	64	1,356.8	76	1,138.1	96	237.5	120	63.38	105	97.85	94
27-4-13	7	48	14	70	1,752.6	36	1,426.9	71	498.1	138	178.4	131	80.35	88	98.80	95
68-2-13	0	102	7.7	118	241.0	160	3.6	204	719.8	126	704.0	64	142.50	1	99.40	96
17-2-13	9.8	30	14.5	69	1,825.4	32	1,174.4	88	466.5	141	178.3	132	82.42	84	99.58	97
27-6-13	8.4	38	16.4	50	1,086.4	83	892.4	118	968.5	105	301.4	109	69.66	97	99.85	98
24-12-13	7.7	44	16.5	49	1,223.8	75	1,703.8	53	1,722.4	70	176.1	134	49.40	117	101.63	100
50-1-13	7	48	14.6	68	566.0	132	388.5	155	802.1	115	503.1	84	94.84	76	101.70	101
19-8-13	11.2	23	7.3	125	2,102.6	18	2,279.6	25	903.4	109	109.2	156	49.86	116	102.50	103
24-2-13	5.6	58	12.7	79	1,203.4	78	917.7	113	723.9	125	251.2	116	83.54	83	103.33	104
19-15-13	4.9	63	9.4	109	873.7	105	1,123.6	95	1,124.2	97	304.7	108	63.08	106	103.70	105
45-6-13	3.5	69	10.4	104	863.9	106	309.8	164	513.2	135	392.9	97	112.22	62	105.28	108
54-1-13	6.3	54	11.5	91	803.9	115	1,377.2	75	601.4	130	263.7	114	76.52	91	107.53	109
19-12-13	10.5	28	12.3	84	1,271.7	70	1,323.9	77	800.4	116	166.9	138	68.60	99	108.10	111

Circuit	# of Trips/ Recloses	Rank Trip/ Recl	# of Int.	Rank # of Int	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
22-8-13	8.4	38	11.1	97	808.4	114	982.6	109	991.7	103	270.4	113	59.66	107	108.93	112
51-2-13	7.7	44	10.2	105	640.4	126	740.8	128	969.1	104	347.2	105	69.94	96	108.98	113
44-1-13	5.6	58	7.1	128	1,301.9	69	1,860.1	41	1,630.1	74	139.4	150	39.66	125	109.95	114
54-6-13	9.8	30	6.1	139	1,064.8	84	1,397.3	73	1,123.0	98	166.3	140	58.17	108	111.93	116
50-4-13	3.5	69	8.6	113	876.2	103	664.4	131	802.1	114	198.1	125	83.63	82	114.10	118
27-5-13	3.5	69	7.4	120	1,056.4	86	564.4	142	289.5	158	191.2	129	112.43	61	116.08	121
45-7-13	7	48	15	62	815.1	113	2,160.4	29	1,956.2	61	116.4	154	29.42	132	116.85	123
44-4-13	4.2	67	6.3	137	1,570.7	47	1,171.1	91	725.1	124	98.0	159	72.36	95	117.05	125
23-2-13	11.2	23	13.8	71	880.0	102	1,992.8	31	1,482.8	81	105.6	158	39.67	124	117.45	126
45-3-13	7.7	44	7.2	126	1,018.2	91	1,726.1	49	1,120.9	99	87.6	162	42.42	121	122.25	128
24-1-13	11.9	22	7.5	119	1,031.6	89	1,250.2	82	862.9	111	92.1	160	65.13	101	122.73	130
54-7-13	6.3	54	13.2	74	1,064.3	85	583.7	140	340.6	152	145.0	148	102.26	69	122.90	131
54-8-13	3.5	69	10.6	102	989.4	92	328.8	160	369.7	150	157.8	142	118.09	56	123.18	132
27-7-13	2.1	82	10	108	1,428.7	55	755.7	127	255.1	160	85.8	163	109.89	65	124.30	135
54-4-13	7	48	11.8	87	480.7	138	766.4	125	735.6	122	177.1	133	78.92	89	124.43	136
53-3-13	2.8	77	9.1	111	838.6	110	264.4	170	359.4	151	168.8	136	118.36	55	125.50	137
42-3-13	2.8	77	8.9	112	848.1	108	617.7	137	537.9	134	147.7	147	95.10	75	127.08	139
17-1-13	0.7	92	6.6	132	726.4	119	405.2	154	317.9	154	163.2	141	107.16	67	130.35	142
45-4-13	9.1	35	7.2	126	940.9	98	1,217.9	84	775.0	120	58.8	171	69.57	98	130.78	143
53-7-13	3.5	69	6.6	132	846.7	109	1,313.0	79	1,186.5	95	52.1	173	54.39	111	133.18	144
16M-11-13	8.4	38	14.8	66	136.0	171	184.9	180	420.6	143	179.3	130	112.49	60	133.60	145
21-12-13	5.1	62	4.6	154	1,039.0	88	969.8	111	546.8	133	63.5	170	67.19	100	133.90	146
42-2-13	4.9	63	4.4	158	600.0	129	591.8	138	223.2	165	154.7	144	91.14	78	134.23	148
23-3-13	2.1	82	6	140	875.9	104	658.1	132	511.9	136	81.0	166	86.92	80	135.85	150
44-2-13	7.7	44	13.1	75	718.5	120	679.6	130	290.7	157	81.1	165	98.26	73	137.23	153
22-6-13	1.4	88	4.9	149	273.7	156	316.8	162	389.6	148	156.4	143	103.69	68	139.28	154
45-10-13	8.4	38	10.1	107	837.8	111	783.1	123	465.2	142	48.1	175	72.43	94	140.48	155

Circuit	# of Trips/ Recloses	Rank Trip/ Recl	# of Int.	Rank # of Int	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
26-2-13	2.1	82	7.3	124	661.0	125	295.4	168	143.9	173	106.9	157	116.39	57	140.60	156
21-9-13	4.9	63	5.4	146	385.9	143	380.2	157	418.1	144	112.0	155	96.61	74	141.08	157
22-3-13	1.4	88	3.2	165	380.9	145	327.8	161	336.0	153	123.1	153	110.17	64	141.98	158
51-8-13	3.5	69	2.4	172	435.2	140	657.6	133	575.8	131	30.1	178	81.57	86	149.13	161
54-2-13	3.5	69	7.4	120	325.1	153	234.3	173	155.6	171	82.9	164	101.13	70	150.53	162
42-1-13	2.8	77	5.9	142	203.2	164	233.0	174	247.6	161	76.1	167	98.63	72	154.13	165
53-8-13	2.1	82	4.6	154	383.3	144	190.7	179	143.5	174	40.0	176	115.33	58	155.00	166
24-3-13	2.1	82	3.9	160	196.0	168	212.8	177	222.7	166	65.3	169	111.77	63	156.30	167
68-4-13	7	48	6.2	138	365.5	150	306.8	165	183.7	169	19.4	182	107.27	66	156.55	168
16-11-13	0	102	0.5	193	888.3	101	380.2	156	0.0	199	0.0	196	123.39	54	156.68	169
21-16-13	2.1	82	2.9	167	371.0	149	296.7	167	140.6	176	14.9	183	112.71	59	158.58	172
21-15-13	2.8	77	1.3	182	117.1	174	429.2	151	241.8	162	1.5	193	93.11	77	167.13	176
26-6-13	0	102	1.7	179	289.8	155	110.8	184	2.0	197	0.0	196	128.77	51	169.43	178
26-5-13	0	102	1.8	176	5.4	193	36.5	189	33.3	185	0.7	194	131.49	2	170.45	180
54-3-13	0.7	92	1	189	54.1	179	27.2	192	2.0	198	2.0	192	127.16	52	173.43	184
26-1-13	0	102	0	199	0.0	200	5.6	199	0.0	199	0.0	196	131.44	3	175.83	185
53-4-13	0	102	0	199	0.0	200	3.9	203	0.0	199	0.0	196	131.44	3	176.23	186
23-5-13	0	102	0	199	0.0	200	1.5	209	0.0	199	0.0	196	131.44	3	176.83	187
21-6-4	0	102	0	199	0.0	200	1.2	210	0.0	199	0.0	196	131.44	3	176.93	188
21-7-4	0	102	0	199	0.0	200	1.2	210	0.0	199	0.0	196	131.44	3	176.93	188
21-10-13	0	102	0	199	0.0	200	0.3	213	0.0	199	0.0	196	131.44	3	177.23	190
54-5-13	0.7	92	0	199	13.3	189	9.8	197	4.2	195	0.1	195	124.79	53	177.33	191
21-14-13	0	102	0	199	0.0	200	34.2	191	0.0	199	0.0	196	131.29	48	179.53	232
26-10-13	0	102	0	199	0.0	200	1.8	208	0.0	199	0.0	196	131.29	48	181.23	234

New York – Central Division – 2018 Circuit priority list

Circuit	# of Trips/ Recloses	Rank Trip/Recl	# of Inter	Rank # of Interrupt	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
71-3-13	0	102	24.9	8	5,899.2	1	2,282.0	24	9,363.7	2	8,975.3	1	2.58	146	20.60	1
80-3-13	0	102	41.7	1	4,398.3	3	2,905.4	10	5,010.9	10	3,115.5	12	1.51	160	26.58	3
84-1-13	0.4	97	21.2	19	3,102.0	6	2,156.5	30	5,453.1	9	4,439.3	8	1.44	163	27.90	6
84-3-13	0	102	23.6	13	3,898.0	5	1,821.8	43	4,657.0	11	4,040.4	9	2.14	149	28.23	7
80-5-13	0	102	23.7	12	2,035.8	21	1,723.4	50	4,534.7	12	3,811.2	10	1.18	173	35.05	8
76-4-13	0	102	17.6	40	1,941.2	27	1,188.0	86	6,276.0	7	5,122.8	5	1.63	158	36.30	9
89-1-13	0	102	18.1	38	1,601.4	45	1,634.3	56	5,542.7	8	4,728.9	7	0.98	178	39.85	11
89-2-13	0	102	16.3	51	1,428.3	56	1,058.0	105	8,063.0	3	7,241.6	2	1.35	166	43.33	13
13-9-13	1.4	88	14.9	64	2,293.1	13	1,755.0	47	3,797.0	17	1,159.7	41	1.31	169	48.15	20
71-2-13	0	102	20.1	24	1,433.6	54	1,429.8	70	2,672.6	34	2,406.6	18	1.00	177	50.15	22
80-1-13	0	102	24.3	10	1,413.8	58	1,456.3	66	2,886.2	30	2,022.4	23	0.97	179	52.25	26
67-1-13	0	102	28.1	5	1,227.3	74	1,070.8	102	3,668.9	20	3,108.9	13	1.15	174	52.93	29
80-2-13	0	102	14.9	64	1,394.6	60	1,829.0	42	2,577.3	37	2,247.2	21	0.76	196	53.10	30
71-5-13	0	102	11.6	90	2,034.8	22	1,097.9	98	1,843.7	64	1,652.3	32	1.85	153	55.10	31
76-3-13	0	102	16	53	1,748.1	38	2,184.5	28	2,891.7	29	939.0	50	0.81	193	58.98	42
61-9-13	0	102	18.5	34	1,098.5	82	2,386.6	20	2,565.2	39	1,351.1	38	0.46	208	63.60	48
63-8-13	0	102	12.5	81	1,255.7	71	2,363.2	21	2,689.2	33	1,073.5	46	0.53	205	65.38	51
71-8-13	0	102	12.1	85	905.2	99	1,465.8	64	2,426.9	42	1,980.3	25	0.61	203	66.63	53
61-3-13	0	102	18.3	36	862.4	107	2,188.1	27	2,050.9	57	1,692.2	31	0.39	216	68.80	54
63-7-13	0	102	7.4	120	1,978.0	25	1,444.6	68	3,225.3	25	531.7	82	1.38	164	73.15	59
76-2-13	0	102	13.6	72	797.4	116	591.2	139	1,877.4	63	1,492.5	35	1.35	168	80.30	67
61-10-13	0	102	8.1	114	1,136.7	80	1,186.8	87	1,826.1	65	728.7	61	0.96	180	82.05	70
76-1-13	0	102	20.5	21	687.5	123	1,713.7	52	1,617.5	75	1,063.9	47	0.40	215	83.03	72
84-2-13	0	102	7.9	117	560.5	133	1,313.0	80	1,502.2	79	1,116.4	44	0.43	211	88.88	82
71-7-13	0	102	15.4	60	619.2	127	905.9	114	1,345.6	89	1,117.6	43	0.69	201	89.20	83
80-4-13	0	102	5.1	147	501.2	135	548.0	144	1,402.4	86	1,119.5	42	0.91	184	93.53	87

Circuit	# of Trips/ Recloses	Rank Trip/Recl	# of Inter	Rank # of Interrupt	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
13-2-13	0	102	1.8	176	335.4	152	409.1	153	1,437.7	84	1,434.3	36	0.70	199	97.15	91
61-7-13	0	102	9.2	110	600.6	128	1,923.0	33	1,312.0	91	587.2	79	0.32	221	100.95	99
61-2-13	0	102	4.7	153	1,234.1	73	1,430.2	69	3,916.0	16	239.3	119	0.86	188	101.83	102
63-1-13	0	102	12.6	80	257.1	157	692.6	129	779.4	119	723.9	63	0.37	218	110.90	115
63-2-13	0	102	2.7	168	663.2	124	902.3	115	551.1	132	529.8	83	0.73	197	113.30	117
89-10-34	0	102	11.5	91	379.8	146	217.9	176	634.8	129	535.0	81	1.73	156	116.58	122
91-3-13	0	102	8.1	114	203.8	163	782.2	124	718.8	127	646.4	70	0.26	224	117.00	124
65-2-48	0	102	6.6	132	376.0	147	301.0	166	921.8	108	483.5	88	1.25	171	119.35	127
73-1-13	0	102	5.8	143	218.9	162	1,172.4	90	503.0	137	493.8	87	0.19	231	123.48	133
63-4-13	0	102	7	130	242.7	159	898.8	116	475.5	140	426.2	93	0.27	223	127.35	140
91-4-13	0.1	101	5.4	145	201.6	167	476.5	147	490.4	139	470.9	90	0.42	212	129.85	141
89-3-13	0	102	4.9	149	443.7	139	361.5	158	793.2	118	191.8	128	1.23	172	136.48	151
61-8-13	0.7	92	6	141	201.7	166	1,088.9	100	293.0	156	228.1	121	0.19	232	142.28	159
61-6-13	0.4	97	3.2	164	166.8	170	815.9	121	259.5	159	209.0	122	0.21	227	146.13	160
71-4-13	0	102	5	148	131.2	172	316.5	163	237.2	163	192.1	127	0.41	214	151.80	163
73-6-13	0	102	3.1	166	201.8	165	573.3	141	312.1	155	175.7	135	0.36	220	152.05	164
63-6-13	0	102	2.5	171	124.1	173	440.1	150	217.8	167	168.7	137	0.28	222	156.98	170
13-8-13	0	102	6.9	131	101.6	175	536.9	145	206.1	168	166.4	139	0.19	230	157.68	171
61-1-13	0	102	2.6	170	96.9	176	221.1	175	159.9	170	152.5	145	0.44	209	162.65	173
91-2-13	0	102	1.3	181	13.8	188	16.0	195	140.7	175	137.1	151	0.86	186	168.23	177
61-4-13	0	102	1.7	178	187.5	169	1,314.0	78	124.1	178	22.4	179	0.15	233	170.25	179
71-1-13	0	102	0.2	197	22.2	185	252.4	172	132.1	177	132.1	152	0.09	238	171.58	183
13-7-13	0	102	2	174	33.7	183	427.7	152	91.7	180	50.4	174	0.08	240	179.00	231
63-3-13	0	102	1.7	179	23.3	184	111.0	183	102.9	179	53.7	172	0.21	226	180.03	233
65-1-48	0	102	0.3	196	37.5	182	183.7	181	34.0	184	20.9	180	0.20	228	184.15	236
71-6-13	0	102	1.1	185	4.0	196	4.7	201	9.3	193	9.3	186	0.86	187	188.18	238
67-2-13	0	102	0.6	191	4.0	196	45.3	187	12.0	192	12.0	185	0.09	239	191.58	240

Circuit	# of Trips/ Recloses	Rank Trip/Recl	# of Inter	Rank # of Interrupt	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
63-9-34	0	102	1.1	185	8.1	191	16.0	195	18.5	189	0.0	196	0.51	206	192.58	242
13-3-13	0	102	0.2	197	7.6	192	38.3	188	13.3	191	0.0	196	0.19	229	194.88	245
13-4-13	0	102	0.5	193	1.0	199	131.9	182	2.8	196	2.8	190	0.01	245	194.98	246
82-3-13	0	102	0	199	0.0	200	1.0	212	0.0	199	0.0	196	0.00	246	201.43	254
71-3-13	0	102	24.9	8	5,899.2	1	2,282.0	24	9,363.7	2	8,975.3	1	2.58	146	20.60	1
80-3-13	0	102	41.7	1	4,398.3	3	2,905.4	10	5,010.9	10	3,115.5	12	1.51	160	26.58	3
84-1-13	0.4	97	21.2	19	3,102.0	6	2,156.5	30	5,453.1	9	4,439.3	8	1.44	163	27.90	6

New York – Western Division – 2018 Circuit priority list

Circuit	# of Trips/ Recloses	Rank Trip/ Recl	# of Inter	Rank # of Interrupt	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
12-1-13	0	102	39.6	2	4,908.9	2	1,920.8	35	6,283.0	6	5,273.4	4	2.55	147	23.60	2
5-10-34	0	102	36	3	3,964.6	4	1,670.9	55	6,873.1	4	4,909.5	6	2.38	148	26.83	4
5-3-34	0	102	33.6	4	2,808.9	10	1,499.9	61	6,438.0	5	5,459.4	3	1.87	152	27.80	5
113-2-13	0	102	15.9	56	2,990.4	8	1,873.6	38	3,632.4	21	1,986.5	24	1.59	159	38.15	10
6-7-13	0.3	99	23	17	2,819.3	9	1,545.5	59	3,714.7	19	1,857.6	27	1.82	154	40.05	12
7-2-13	0	102	12.5	81	2,001.2	24	1,144.8	93	3,761.2	18	2,472.0	17	1.75	155	43.63	14
11-2-13	0	102	11.7	89	1,628.0	41	2,619.3	15	3,190.5	26	2,288.1	19	0.65	202	45.83	16
109-1-13	0	102	11.5	91	2,075.0	20	2,705.0	13	2,320.0	48	1,826.3	28	0.77	195	47.03	18
109-4-34	0	102	26.4	6	1,850.0	29	1,946.8	32	2,575.6	38	1,784.1	30	0.95	181	47.10	19
109-3-13	0	102	15.7	59	2,140.4	15	2,571.3	17	2,240.1	52	1,528.1	34	0.83	191	48.33	21
11-1-13	0	102	4.9	149	2,078.7	19	1,394.5	74	2,221.4	54	1,785.4	29	1.47	161	52.03	24
11-4-13	0	102	10.8	100	2,128.8	16	1,132.6	94	2,020.4	59	1,601.7	33	4.03	145	52.90	27
6-8-13	0	102	17.8	39	1,250.3	72	1,242.7	83	3,018.5	28	2,909.5	14	1.01	176	52.93	28
9-1-48	0	102	23.1	16	1,022.7	90	1,759.1	46	3,176.7	27	2,756.5	15	0.58	204	55.40	33
103-4-13	0	102	23.5	14	1,322.0	67	1,586.7	58	2,363.9	45	2,076.1	22	0.84	190	55.50	34
3-1N-34	0	102	18.3	36	961.1	96	1,172.8	89	3,984.5	15	3,801.6	11	0.82	192	57.20	37
3-1S-34	0.5	96	18.4	35	1,044.3	87	534.5	146	2,668.0	35	2,514.8	16	1.96	150	60.98	45
103-1-13	0	102	24.4	9	1,882.6	28	1,069.9	104	2,191.9	55	1,027.3	49	1.35	165	62.83	47
102-1-13	0	102	16.7	47	1,109.9	81	643.4	134	2,364.5	44	1,926.4	26	1.73	157	65.13	50
113-5-13	0	102	10.8	101	1,327.6	66	1,495.0	62	2,224.8	53	1,275.5	39	0.89	185	65.83	52
2-1-13	0	102	14.7	67	822.4	112	638.9	136	2,399.7	43	2,255.7	20	1.29	170	70.53	55
12-3-13	0	102	19.9	25	1,196.2	79	887.1	119	1,381.9	87	1,106.2	45	1.35	167	76.53	64
15-6-13	0	102	15.3	61	975.7	93	2,254.9	26	2,256.9	51	676.4	66	0.43	210	81.08	69
10-2-13	0	102	19.2	29	598.2	130	640.9	135	1,533.9	77	1,372.4	37	0.94	182	85.33	77
102-2-13	0	102	13.2	73	796.5	117	1,015.8	108	1,204.2	94	685.8	65	0.78	194	96.63	89
109-2-13	0	102	11.1	97	732.3	118	1,465.0	65	805.9	113	672.8	67	0.50	207	97.23	92

Circuit	# of Trips/ Recloses	Rank Trip/ Recl	# of Inter	Rank # of Interrupt	Cust Aff	Rank Cust Aff	Customers Served	Rank Customers Served	Cust Hrs	Rank Cust Hrs	LATE	Rank LATE	SAIFI	Rank SAIFI	Prty Rating	Rank Prty Rating
7-1-13	0	102	16	53	372.6	148	979.7	110	901.9	110	754.6	59	0.38	217	103.73	106
113-4-13	0.8	91	4.2	159	432.3	141	1,778.4	45	678.8	128	671.6	68	0.21	225	104.85	107
103-3-13	0	102	10.2	105	503.5	134	892.6	117	953.6	106	611.7	75	0.70	200	108.03	110
102-3-13	0	102	8	116	340.8	151	815.5	122	730.6	123	613.4	74	0.42	213	114.75	119
15-1-13	0	102	6.4	136	496.8	136	342.8	159	799.3	117	499.8	85	1.45	162	115.20	120
7-3-13	0	102	3.9	161	394.3	142	208.8	178	748.9	121	421.6	94	1.88	151	122.28	129
6-9-13	0	102	4.4	157	315.6	154	867.9	120	1,011.7	102	412.1	95	0.36	219	124.13	134
66M6-1-13	0	102	11.2	95	230.9	161	2,504.0	19	411.6	147	283.1	110	0.09	236	126.83	138
9-2-48	0	102	2.6	169	245.3	158	262.1	171	386.0	149	375.4	101	0.94	183	134.13	147
103-2-13	0	102	7	129	570.0	131	759.3	126	414.6	146	196.6	126	0.72	198	135.68	149
15-3-13	0	102	3.5	163	482.1	137	448.4	149	415.2	145	204.1	124	1.08	175	136.73	152
113-6-13	0	102	1.8	175	41.3	181	560.7	143	154.8	172	150.8	146	0.07	241	164.43	174
113-8-13	0	102	3.6	162	93.0	177	1,029.1	107	233.0	164	87.9	161	0.09	237	165.25	175
11-3-13	0	102	1	188	57.1	178	1,484.0	63	64.5	182	37.6	177	0.06	242	171.20	182
113-7-13	0	102	0.6	191	41.4	180	278.6	169	74.9	181	72.1	168	0.15	234	177.33	191
1-1-13	0	102	2.1	173	4.2	195	5.0	200	20.5	188	20.5	181	0.84	189	185.03	237
113-1-13	0	102	1.2	183	9.0	190	79.3	185	15.4	190	12.4	184	0.11	235	188.93	239
15-4-13	0	102	1.1	185	4.2	194	74.1	186	24.9	186	4.3	188	0.06	243	192.08	241
15-2-13	0.2	100	0.5	193	1.4	198	35.6	190	6.0	194	5.7	187	0.04	244	193.88	243
15-5-13	0	102	0	199	0.0	200	17.0	193	0.0	199	0.0	196	0.00	246	199.53	247
3-1-34	0	102	0	199	0.0	200	3.0	205	0.0	199	0.0	196	0.00	246	200.73	251
11-5-13	0	102	0	199	0.0	200	2.0	206	0.0	199	0.0	196	0.00	246	200.83	252

Appendix B

2018 Service Reliability Program Descriptions

Service Reliability Programs

In 2018, the Company continued to implement service reliability programs, designed to reduce the frequency of interruptions while minimizing the resultant increases in restoration time (as frequency is improved). These programs are focused on field facilities and customer satisfaction, and are effective in minimizing the probability of an interruption while limiting the number of customers affected per interruption. The major programs in effect during the year are listed below, and reference the appropriate O&M or capital budgets and expenditures as contained in Appendix F:

Operations and Maintenance (click on the links below to jump to the program page in this document)

- Transmission ROW and line maintenance
- Transmission relay maintenance
- Substation maintenance
- Distribution tree trimming
- Distribution line maintenance
    - *Capacitor Maintenance Program*
    - *Regulator Maintenance Program*
    - *Recloser/Sectionalizer Maintenance Program*
    - *Circuit Ownership Program*
    - *Pole Remaining Strength Inspection*
- Infrared Thermal Inspection Program
- Visual inspection programs
- Stray Voltage Testing
- Power Quality

Capital Programs

- Underground Cable Rehab and Rebuild Program

Title: **TRANSMISSION RIGHT-OF-WAY AND LINE MAINTENANCE**
Subject: NYPSC Delivery System Program Review
Transmission Right-Of-Way and Line Maintenance

Item Description:

Examination of the transmission right-of-way (ROW) and line maintenance programs and spot check ROW and lines to validate that maintenance is adequate.

Orange and Rockland Program:

A. TRANSMISSION LINE MAINTENANCE: The program is based on standards and specifications for Ground and Helicopter Patrols. Periodic inspections of overhead transmission lines are performed on the lines that are owned and/or operated by the Company. It includes the following types of inspections performed on all overhead transmission lines in the three Orange and Rockland's Divisions.

The following is a summary of the type and frequency of these inspections:

- Ground patrol
  - Annual (semi-annual for 500 kV and 345 kV Lines)
    - Includes annual stray voltage/visual inspection
    - Every 5-years stray voltage testing is conducted during this inspection
    - As required for emergency patrols
- Helicopter patrol
  - Bi-monthly (monthly for 500 kV and 345 kV lines)
  - As required for emergency patrols
- Climbing inspections
  - Below 345 kV
    - As required
  - 345 kV and above
    - Every five-years
- Emergency patrol
- As required
- Ground resistance measurements
  - Below 345kV
    - As required
  - 345 kV and above

        - Five-years, until structure passes two consecutive tests, then every ten years.
    - Infrared inspection
        - Twice a year, spring and summer
        - Each abnormality is photographed
    - Wood pole inspection
        - Annual
            - Identify transmission facilities requiring maintenance or replacement.
            - Includes visual and mechanical sound and bore (as needed).

B. Transmission line ROW maintenance:

The transmission ROWs are maintained based on Orange and Rockland's "Long Range Transmission Right Of Way Vegetation Management Plan" that is filed with the NYPSC. The document is updated whenever modifications or changes are made to the program, and was recently updated on January 1, 2017. Annually, a summary of the previous year's maintenance and a summary of the next year's schedule is prepared and submitted to the NYPSC under the provisions of Case 27605.

References:

The helicopter patrol records, foot patrol records, infrared thermal vision records and all other pertinent maintenance records related to transmission line maintenance are kept on file for a minimum period of three years, at Orange and Rockland's T&D Maintenance offices in Blooming Grove, New York. O&R presently maintains ground and wood pole inspections in the Osmose Online Viewer and it transitioning to an internal database, the Electric Inspection Maintenance System (EIMS).

For scheduled preventive transmission vegetation ROW maintenance, the Orange and Rockland schedules for each year, listed by corridor number and treatment technique, are kept on file in our T&D Maintenance offices in Blooming Grove, as well as being sent to the NYPSC in accordance with the provisions of Case 27605.

Return to Service Reliability Program Main Page

Title: **TRANSMISSION RELAY MAINTENANCE**
Subject: NYPSC Delivery System Program Review
Transmission Relay Maintenance

Item Description:

Examine individual utility transmission relay maintenance programs so that proper and timely maintenance is being performed.

Orange and Rockland Program:

All protection systems for bulk power system are maintained periodically, at a four- to six-year interval, in accordance to regulatory guidance under frequency relay settings are verified on an annual basis and the automatic under-frequency load shedding protection system is maintained on four to ten year interval, in accordance with regulatory guidance requirements. Maintenance of protection system includes performing bench test of protective relays, per manufacture requirements, to verify the operation of protective elements is within specification. In addition, the protective functions of the relays operate as per the specified logic.

Breaker trip coil and DC continuity test for bulk power system are performed periodically, at four to six year interval, in accordance with regulatory guidance requirements.

The substation battery banks and charger testing for bulk power system are maintained in accordance with regulatory guidance requirements.

Orange and Rockland utilizes automated relay testing with the Doble Engineering program. Our experience has proven it to be substantially more accurate than previous test sets and is giving us more repeatable and thus reliable results.

References:

Settings and performance records of the relays are stored on laptop computers, with backup files on both the O&R network and the computer hard drives. Relay maintenance reports, as well as the reports for the past two years are kept on file at the Spring Valley Operations Center.

The System Operations and Transmission and Substation Engineering Departments generate a report for all mis-operations on the bulk power system and equipment. These reports are kept on file by Transmission and Substation Engineering, as well as are being forwarded to the NYISO.

Return to Service Reliability Program Main Page

Title: **SUBSTATION MAINTENANCE**
Subject: NYPSC Delivery System Program Review
Substation Maintenance

Item Description:

Examine individual utility substation maintenance programs to validate proper maintenance procedures and verify that maintenance is being performed. Review recent operating data to verify that no adverse trends exist.

Orange and Rockland Program:

The following details the different class inspections and maintenance programs performed by the Substation Operations Department, and their associated time cycles. Intervals vary depending on equipment type, style and maintenance history.

CLASS #1 INSPECTION - Monthly

- Visual inspection of transformers and oil breakers for oil leaks, oil levels, nitrogen pressure, connections, condition of bushings and Oil Circuit Breaker (OCB) operating mechanism.
- Visual inspection of battery banks, chargers, control board indicating lights, control house lights, yard lights.
- Visual inspection of minor equipment including potential transformers (PTs), current transformers (CTs), capacitive coupled potential devices (CCPDs), disconnect switches and bus connections.
- Visual inspection of all structures, fences/gates and yard surfaces.
- Counter readings taken of OCBs, gas circuit breakers (GCBs), reclosers and tap changers.

STATION BATTERY TESTS – Annually/Monthly visual inspections

Measure specific gravity and cell voltage. Test with battery impedance testing equipment. Clean batteries.

FANS, PUMPS, HEATERS AND COMPRESSORS - Annually

Check for proper operation prior to winter for heaters and compressors and prior to summer for fans and pumps.

TRANSFORMER GAS-IN-OIL ANALYSIS – Quarterly, semi-annually or annually

Take oil sample from each power transformer compartment and analyze for combustible gas content.

DOBLE POWER FACTOR TEST - Every two - five-years

Use Doble instrument to measure the integrity of the insulating medium of certain device.

CIRCUIT BREAKER TIMING - Every three - ten years

Check the time it takes for each operation of certain breakers.

RELAY MAINTENANCE - Every four years, electromechanical; six years microprocessor based, with self-check.

Clean, test and calibrate as required all relays involved in protective relay schemes. After testing and calibrating, perform a trip test to verify proper operation.

CLASS #3 INSPECTIONS - Every four - ten years

The Class #3 inspection on transformers is to include, but is not limited to the following items:

1. Test oil
2. TTR - Test, Megger test;
3. Inspect all connectors, bushings;
4. Inspect for leaks (oil - nitrogen);
5. Check CT connections, alarm systems on banks; and
6. Doble Power Factor Test.

<u>Transformers with Load Tap Changers</u>

7. Test Oil in LTC cabinet; and
8. Test LTC control for proper operation.

The Class #3 inspection on OCB's is to include, but is not limited to the following items:

1. Test Oil
2. DLRO (Ductor Test) before and after
3. Inspect and clean control cabinet;
4. Inspect and clean pneumatic-hydraulic or spring charged operating system; and
5. Operational test.

The Class #3 inspection on reclosers is to include, but is not limited to the following items:

1. Test oil
2. DLRO (Ductor Test) before and after;
3. Control cabinet clean, checkout and operational test; and

Reclosers with Vacuum Bottles

4. Hi-pot test.

The Class #3 inspection on ACB's is to include, but is not limited to the following items:

1. DLRO (Ductor Test) before and after;
2. Inspect all contacts (action to be taken, if needed);
3. Inspect and test all micro and aux. contacts (close and trip circuit); and
4. Operational testing

CLASS #4 INSPECTIONS – Every ten years or as necessitated by Class #3 Inspection results or as dictated by Gas in Oil analysis

The Class #4 inspection consists of a thorough inspection and testing of the apparatus listed below.

The Class #4 also includes all inspections included in a Class #3.

Transformers with Load Tap Changer

1. Drain oil from LTC cabinet, inspect all contacts;
2. Inspect and tighten all connections;
3. Clean complete LTC cabinet;
4. Filter or replace oil; and
5. Test LTC control for proper operation.

The Class #4 inspection on OCB's is to include, but is not limited to the following items:

1. DLRO (Ductor test) before and after;
2. Drop tanks - inspect and tighten all connections. Clean all parts and tanks;
3. Test and filter or replace oil;
4. Inspect and clean control cabinet;
5. Inspect and clean pneumatic-hydraulic or spring charged operating systems; and
6. Operational Test.

The Class #4 inspection on reclosers is to include, but is not limited to the following items:

1. Drop tank (filter or replace oil);
2. Inspect all contacts - repair or replace (depending on the condition);
3. Check and tighten all connections;
4. Control cabinet, clean and checkout;
5. DLRO (Ductor Test) before and after; and
6. Operational Test.

Recloser with Vacuum Bottles

Hi-Pot test.

The Class #4 inspection on ACB's is to include, but is not limited to the following items:

1. DLRO (Ductor Test) before and after;
2. Inspect all contacts - clean and put protective grease coating on;
3. Inspect and clean all arc chutes;
4. Inspect and test all micro and auxiliary contacts (close and trip circuit);
5. Check and tighten all connections; and
6. Operational Test.

References:

All inspection and maintenance records are retained as a hard copy for one year at Orange and Rockland's main Operating Division headquarters. These records are also retained electronically on a work management system. Repeated callouts and equipment failures that show an abnormal trend are flagged by the work management system.

The Doble power factor testing, transformer gas in oil analysis and infrared inspection records are stored electronically on the Substation Information System (SIS). OCB timing maintenance records are presently kept on a separate electronic storage system that is provided with the test equipment.

Return to Service Reliability Program Main Page

Title: **DISTRIBUTION VEGETATION MANAGEMENT**
Subject: NYPSC Delivery System Program Review
Distribution Tree Trimming

Item Description:

Examination of the distribution vegetation management (VM) programs and spot check of distribution lines to validate that maintenance is adequate.

Orange and Rockland Program:

The distribution VM program is a vegetation clearance and control methodology based upon a 4-year cycle. The circuits to be maintained each year are selected using the normal scheduled maintenance cycle. A tree-related outage spreadsheet, derived from OMS and Performance and Operational Engineering, is used to monitor circuits based on vegetation-related outage performance. Patrols are completed as VM supervisors and other company personnel move throughout the service territory. Any identified vegetation issues requiring attention to prevent service interruptions are reported for further investigation and remediation by the VM Department. Beginning in April 2017, Nelson Tree Service and Trees, Inc., have been retained by the Company to complete the scheduled distribution VM programs. This contract is for a three-year period and will expire in March 2020.

Production reports and reverse billing is managed through Environmental Consultants, Inc.'s, computer program entitled Trim Evaluation and Report System ("TRES"). This computer system is the main component in tracking production and costs and is the system used to reconcile weekly costs between the Company and the vendor prior to the billing and invoicing process.

References:

The Company maintains VM records for each substation worked, with completion dates and mileage maintained. Audits are performed by the Company VM Supervisor or Company contractor representative on the circuits as the vegetation work proceeds, so as to maintain the quality of work and the clearance specifications. Additionally, Contractor Field Observation Reports are completed monthly. These observations, completed by Company VM Supervisors and Company contractor representatives, are also performed on the contractors performing the work and focus on work quality as well as several safety-related items.

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Title: DISTRIBUTION LINE MAINTENANCE

Item Description:

Examination of the distribution line maintenance programs (excluding tree trimming) and spot check lines to validate that maintenance is adequate.

Orange and Rockland Program:

The following details all of the distribution line maintenance programs performed by Orange and Rockland's Overhead and Underground Electric Operations Departments.

CAPACITOR MAINTENANCE PROGRAM

All capacitor banks are inspected in accordance with the Capacitor Maintenance Procedure. Maintenance schedules have been set by the divisions and are tailored to best meet the divisions' needs.

REGULATOR MAINTENANCE PROGRAM

Regulator inspections and functional tests are performed annually in accordance with the Regulator Maintenance Procedure. As system conditions allow, deficiencies are corrected prior to the system peak period.

RECLOSER SECTIONALIZER MAINTENANCE PROGRAM

Recloser/Sectionalizer inspections and functional tests are performed in accordance with the Recloser/Sectionalizer Maintenance Procedure. A visual inspection of all line units is performed annually, and functional tests are performed every three years.

CIRCUIT OWNERSHIP PROGRAM

This program was modified in 2013 to target our worst performing circuits that have a relatively poor performance based on their impact on Customers Affected and Customer Hours of interruption. The circuits are patrolled routinely to look for any immediate issues that may adversely affect its reliability.

POLE REMAINING STRENGTH INSPECTION

Orange and Rockland is on a 10-12 year inspection cycle as required by the National Electric Safety Code. The program began in 2007 and to date 131,413 (96.2%) of the 136,611 poles have been inspected. In 2018, 7,896 poles were inspected and of these 161 (2%) failed. Of the failures, 33 (20.5%) required replacement and 128 (80%) required trussing.

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Title: INFRARED THERMAL INSPECTION PROGRAM

This program is normally administered annually on all three-phase overhead facilities, and on a three-year cycle for all single-phase overhead facilities. Necessary repairs are prioritized by temperature rise and completed as follows:

- Priority 1 - 101^0 C - or More - Repair Immediately as system conditions permit;
- Priority 2 - 51^0 - 100^0 C - Repair in 14 Days as system conditions permit; and
- Priority 3 - 1^0 - 50^0 C (all others) - Repair as resources allow and/or monitor in next IR cycle.

This program is also administered on the transmission system. Two cycles of inspection are conducted. One in the spring as part of summer preparations plan to ensure system readiness, then another in the summer under full load conditions. These are conducted and maintained as identified in the above Transmission Right-Of-Way and Line Maintenance Program description.

The infrared inspection program was not conducted in 2018.

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Title: VISUAL INSPECTION PROGRAM

By Order issued on January 5, 2005, with subsequent revisions issued on July 21, 2005, December 15, 2008, March 22, 2013 and January 13, 2015 in Case 04-M-0159, the Commission required that Orange and Rockland initiate a Visual Inspection Program encompassing 20% of all O&R facilities annually, such that within five-years all facilities have been visually inspected. Consistent with the Order, O&R initiated the visual inspection program in 2005 and continues to do so annually.

O&R conducts separate visual inspections of its transmission and distribution systems. A non-company contractor labor force performs the majority of the work. Electric Operations located in West Nyack, New York, administers the Distribution Visual Inspection Program. Distribution visual inspection records are stored with the inspection vendor and O&R's Electric Information Management System (EIMS). Transmission inspections are conducted on and maintained as identified in the above Transmission Right-Of-Way and Line Maintenance Program description.

In 2018, approximately 20% of the T&D system was visually inspected. 30 Level 1 deficiencies were identified on the distribution system and no Level 1 deficiencies were identified on the transmission system. All Level 1 deficiencies have been permanently repaired.

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Title: STRAY VOLTAGE TESTING PROGRAM

By Order issued on January 5, 2005, with subsequent revisions issued on July 21, 2005, December 15, 2008, March 22, 2013 and January 13, 2015 in Case 04-M-0159, the Commission required that Orange and Rockland initiate a stray voltage testing program encompassing annual inspection of 20% of O&R facilities capable of conducting electricity, third party facilities bonded electrically to the O&R system, and all municipal street and traffic light systems. Consistent with the Order, O&R has conducted stray voltage testing in 2018.

O&R conducts separate stray voltage testing of its transmission and distribution systems. A non-company contractor labor force performs the majority of the work. Electric Operations located in West Nyack, New York, administers the Distribution Visual Inspection Program. Inspections records are stored with the vendor and O&R's Electric Information Management System (EIMS). Transmission stray voltage testing are conducted and maintained as identified in the above Transmission Right-Of-Way and Line Maintenance Program description. Stray voltage testing was performed on all transmission structures and substation fences in 2016. As per the Safety Standards, stray voltage testing for transmission was not needed in 2018 and is required to be performed again in 2021. Transmission structures are tested on a 5 year cycle.

During the 2018 testing cycle, one stray voltage condition >= 1.0 volt was identified on a streetlight. The voltage condition was mitigated and no injuries were associated with the finding.

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Title: UNDERGROUND CABLE REHAB AND REBUILD PROGRAM

All underground system outage statistics are analyzed on an individual subdivision basis and a priority listing developed. From this listing it is determined if the cable is to be rehabilitated or rebuilt. Where multiple cable failures have occurred on the same cable section, cables are replaced with Ethylene-Propylene Rubber (EPR) insulated cable.

On older cable subdivisions, that have not had multiple cable failure, a less expensive rehabilitation process is considered. Rehabilitation is accomplished by injecting a patented silicone based fluid into the interstices of the cable, which impregnates the insulation and fills the voids. This process restores the dielectric properties of the deteriorated cable.

Developments that are serviced by underground facilities are selected for cable rehabilitation based upon the following criteria:

1. Is not a three-phase system with three-phase dependent loads;
2. The U/G facilities incorporates a loop-feed scheme;
3. The cable is rated 15 kV; and
4. The cable is either 175 mil. or 220 mil., HMWPE or XLPE insulated.

The Rehabilitation Program is more of a proactive measure to increase customer reliability and therefore focuses on older underground developments that fit the rehabilitation criteria and have experienced a small number of outages due to cable failure. If there have been multiple outages within a cable section due to cable failures, it is usually more cost effective to rebuild the faulted sections.

Developments that are serviced by underground facilities are selected for cable replacement based upon their frequency of cable failures and either do not fit the criteria for rehabilitation or have been unsuccessfully rehabilitated. Outage statistics are used as an initial guide in identifying underground developments that experience frequent outages. From this selection process, further outage analysis is required to isolate outages that occur only as a result of cable failure. A priority list is then constructed, which ranks URD developments according to outage frequency, customers affected, and load.

References:

The scope of work job write-ups for all of the service reliability maintenance projects are maintained on Orange and Rockland's work management system. The individual Operating Divisions maintain the overall records including the circuits that have been addressed and the project timing. These Departments, along with Distribution Engineering, review the circuit statistics and performance to prioritize the circuits which need to be addressed or revisited as part of this program.

The scope of work and completion records for all of the underground cable rehabilitation and rebuild projects is maintained on the work management system. The Underground Operating Department also maintains hard copy records of this program.

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Title: **POWER QUALITY**
Subject: NYPSC Delivery System Program Review

In 2017, Orange and Rockland continued its Power Quality (PQ) Initiative to help C&I customers better understand and manage energy usage. A number of services were available to customers, including:

- Monitoring of customer facilities including equipment placement, data collection and interpretation.
- Full site analysis yielding comprehensive protective measures and recommendations.
- Revenue meter pulse data can be made directly available to customers upon request.

Power Quality Complaint Resolution

Orange and Rockland's systems track power quality issues in three categories: Flickering Lights, High Voltage, and Low Voltage. Each of the complaints in the following table was investigated, and the origin of each problem is identified in table below.

Summary of Power Quality Problems – 2018

Description		Divisions			Grand Total
Problem	Cause	Eastern	Central	Western	
Flickering Lights	Company	249	121	122	
	Customer	23	19	16	
	No Problem Found	73	60	38	
Flickering Lights Total		345	200	176	721
High Voltage	Company	18	13	10	
	Customer	2	3	5	
	No Problem Found	17	8	8	
High Voltage Total		37	24	23	84
Low Voltage	Company	33	23	38	
	Customer	5	5	3	
	No Problem Found	27	7	15	
Low Voltage Total		65	35	56	156
Grand Total		447	259	255	961

In addition to the above incidents, the following power quality and voltage investigations were conducted.

Power Quality Investigations - Eastern Division

1. 241 Hungry Hollow Rd Spring Valley NY – Radio frequency interference – resolved issue by changing connections at weather head.
2. 64 N De-Baun Ave, Airmont, NY - Radio frequency interference – RFI contractor identified that this was an internal issue.

Power Quality Investigations - New York – Western

1. 18 Oak Street, Wurtsboro – Flickering lights, intermittent outages. Power quality meter installed. Circuit patrolled and circuit performance history was reviewed with customer; no utility problems found.
2. 29 Westbrook Road, Mamakating – Radio frequency interference. RFI contractor identified corrective items, repairs made; problem resolved.

Power Quality Investigations - New York – Central

1. 101 Covered Bridge Road, Warwick - Flickering lights, intermittent outages. Power quality meter installed. Circuit patrolled and circuit performance history was reviewed with customer; Identified hot spot trimming made minor repairs on the customer's phase of the circuit, performed fuse coordination jobs.

Voltage Investigations - Eastern Division

1. 441 Piermont Ave, Piermont NY – upgrade transformer on pole to resolve low voltage condition
2. Laura Drive, Monsey NY– upgrade transformer on pole to resolve low voltage condition
3. 5 Polhemus Street, Nyack NY– Installed voltage recorder, no utility problems found.
4. 9 Hudson-View Street, Garnerville NY– upgrade transformer on pole and upgrade triplex to 1/0 wire
5. 280 Old Orangeburg Road, Orangeburg NY - Installed voltage recorder, no utility problems found.
6. 43 Lake Road, Valley Cottage NY - Installed voltage recorder, no utility problems found; also, completed tree trimming and transformer upgrades to resolve recurring outage conditions
7. Greenwood Drive, New City – replace transformer to resolve recurring outage conditions

Voltage – New York - Central

1. 8 Burton Lane, Warwick – Voltage Issues. Installed power quality meter. Voltage within allowable range under normal operating conditions. Could be low voltage during heavy load. A new transformer was installed and follow up job was written to extend primary in 2019.
2. 10 Point of View, Warwick - Low Voltage complaint. Measured voltage, Job designed to extend primary and upgrade transformer.
3. 167 Wee Wah Road, Tuxedo Park – High Voltage complaint. Determined to be a grounding/neutral issue. Revised grounding at transformer and added grounding on riser; problem was resolved.

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Appendix C

2018 Major Outages

Orange and Rockland Utilities
New York State Only
Major Incidents
2018

Non-Excludable Incidents Affecting 5,000 or more Customers

Division	Date	Customers Affected	Cust. Min. of Interruption	Cause
Eastern		No incidents in Eastern Division		
Western	5/10/2018	6,469	6,053	Loss of Shoemaker Substation
Central	6/28/2018	5,753	3,884	Loss of Blooming Grove Substation

Appendix D

2018 Circuit Performance Frequency and Restoration

Eastern Division 2018 Reliability Data – Excludes storms – Sorted by Frequency

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
23-4-13	31	5191	1358	16,371.2	13,950.8	3.82	3.15	12.06
51-6-13	19	3605	1420	6,341.1	3,038.5	2.54	1.76	4.47
45-1-13	27	2548	1138	3,403.3	2,563.9	2.24	1.34	2.99
22-4-13	16	2090	975	3,221.7	3,209.0	2.14	1.54	3.30
51-1-13	21	2318	1103	5,034.5	2,887.3	2.10	2.17	4.56
45-7-13	10	2125	1029	2,612.6	2,581.5	2.07	1.23	2.54
22-8-13	12	1713	960	994.2	716.1	1.78	0.58	1.04
45-9-13	26	2799	1683	4,415.4	3,105.9	1.66	1.58	2.62
22-2-13	28	2004	1270	2,132.5	1,570.6	1.58	1.06	1.68
21-15-13	4	257	165	542.5	341.8	1.56	2.11	3.29
44-5-13	18	2324	1529	2,668.4	2,510.2	1.52	1.15	1.75
22-1-13	27	1928	1321	5,284.4	4,877.0	1.46	2.74	4.00
29-3-13	16	2875	2048	4,594.3	4,484.5	1.40	1.60	2.24
23-2-13	16	1354	1012	2,424.5	1,915.5	1.34	1.79	2.40
45-3-13	11	1794	1360	1,881.0	1,408.7	1.32	1.05	1.38
19-11-13	24	2218	1733	1,719.1	1,428.0	1.28	0.78	0.99
23-1-13	29	1678	1314	4,559.0	4,140.9	1.28	2.72	3.47
27-1-13	8	1046	844	1,660.2	1,498.8	1.24	1.59	1.97
42-1-13	4	254	205	242.5	234.1	1.24	0.95	1.18
54-1-13	9	992	816	1,620.3	341.5	1.22	1.63	1.99
54-4-13	10	413	346	948.5	537.5	1.19	2.30	2.74
27-2-13	21	2927	2497	1,596.9	1,082.9	1.17	0.55	0.64
51-4-13	8	1583	1367	2,052.4	1,449.8	1.16	1.30	1.50
19-13-13	5	1860	1607	2,059.0	1,879.6	1.16	1.11	1.28
45-10-13	12	1078	947	715.5	434.9	1.14	0.66	0.76
42-2-13	7	709	647	568.2	97.2	1.10	0.80	0.88
51-2-13	11	584	533	829.7	819.5	1.10	1.42	1.56
44-6-13	35	1859	1724	1,795.8	1,500.7	1.08	0.97	1.04
50-3-13	14	781	729	1,766.9	1,720.4	1.07	2.26	2.42
54-2-13	5	391	374	175.5	84.3	1.05	0.45	0.47
53-1-13	18	1987	1914	3,069.3	2,653.8	1.04	1.54	1.60
19-15-13	7	815	786	1,304.1	990.1	1.04	1.60	1.66
24-11-13	19	1771	1780	3,100.8	2,401.8	0.99	1.75	1.74
44-1-13	8	1391	1513	2,020.1	2,020.1	0.92	1.45	1.34
19-14-13	20	1767	1930	4,641.7	1,136.9	0.92	2.63	2.41
45-8-13	32	1764	1958	5,150.1	5,033.5	0.90	2.92	2.63
51-5-13	12	848	981	1,168.2	1,168.2	0.86	1.38	1.19
21-11-13	9	511	617	1,271.3	1,137.0	0.83	2.49	2.06

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
53-7-13	5	881	1109	1,496.9	1,440.5	0.79	1.70	1.35
53-6-13	14	1592	2013	2,876.0	2,708.9	0.79	1.81	1.43
17-1-13	1	434	592	325.5	0.0	0.73	0.75	0.55
21-12-13	7	1020	1425	777.6	685.4	0.72	0.76	0.55
50-1-13	10	325	493	343.1	302.8	0.66	1.06	0.70
45-4-13	13	707	1209	1,221.3	704.4	0.58	1.73	1.01
24-12-13	11	614	1137	1,956.9	1,922.1	0.54	3.19	1.72
27-6-13	12	582	1081	817.1	777.9	0.54	1.40	0.76
50-2-13	18	1057	2075	1,840.3	1,719.3	0.51	1.74	0.89
21-9-13	7	218	453	352.4	349.4	0.48	1.62	0.78
50-4-13	5	401	878	571.6	571.6	0.46	1.43	0.65
23-6-13	27	812	1791	1,416.0	1,140.6	0.45	1.74	0.79
45-5-13	21	630	1411	1,944.3	1,161.0	0.45	3.09	1.38
19-9-13	16	710	1627	1,094.9	737.4	0.44	1.54	0.67
51-8-13	5	256	588	761.4	761.4	0.44	2.97	1.29
22-6-13	2	118	279	332.1	332.1	0.42	2.81	1.19
19-8-13	16	1192	2915	2,012.4	1,080.5	0.41	1.69	0.69
24-1-13	17	442	1096	1,309.9	1,010.7	0.40	2.96	1.20
54-6-13	14	518	1327	1,429.0	1,360.8	0.39	2.76	1.08
22-5-13	15	545	1504	1,808.8	1,717.1	0.36	3.32	1.20
29-4-13	6	148	457	464.1	378.0	0.32	3.14	1.02
22-7-13	22	617	2075	2,446.3	2,276.0	0.30	3.96	1.18
19-12-13	15	426	1518	1,242.1	853.2	0.28	2.92	0.82
23-3-13	3	262	1026	500.5	500.5	0.26	1.91	0.49
24-3-13	3	54	219	209.8	183.3	0.25	3.88	0.96
44-3-13	12	495	2011	704.4	348.9	0.25	1.42	0.35
44-2-13	11	199	835	497.4	266.7	0.24	2.50	0.60
21-13-13	11	507	2182	1,390.2	871.0	0.23	2.74	0.64
45-2-13	13	430	1870	803.6	730.2	0.23	1.87	0.43
29-1-13	8	378	1744	755.3	455.4	0.22	2.00	0.43
51-7-13	13	345	1739	1,195.9	1,142.9	0.20	3.47	0.69
24-4-13	4	237	1307	971.6	896.9	0.18	4.10	0.74
17-2-13	14	439	2432	620.5	334.7	0.18	1.41	0.26
24-2-13	8	225	1355	731.7	619.2	0.17	3.25	0.54
44-4-13	6	280	1693	953.7	882.5	0.17	3.41	0.56
27-4-13	10	375	2347	1,031.8	405.3	0.16	2.75	0.44
54-5-13	1	3	19	6.1	6.1	0.16	2.02	0.32
42-3-13	4	168	1067	423.4	423.4	0.16	2.52	0.40
27-3-13	7	354	2328	650.1	650.1	0.15	1.84	0.28

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
68-4-13	10	71	504	226.7	219.9	0.14	3.19	0.45
21-16-13	3	68	508	206.7	171.9	0.13	3.04	0.41
53-8-13	3	51	453	79.5	73.5	0.11	1.56	0.18
27-8-13	9	165	1517	697.2	492.5	0.11	4.23	0.46
45-6-13	5	73	706	143.9	94.0	0.10	1.97	0.20
27-5-13	5	111	1175	308.8	35.1	0.09	2.78	0.26
53-3-13	4	39	462	80.1	72.7	0.08	2.05	0.17
22-3-13	2	36	491	257.7	257.7	0.07	7.16	0.52
54-7-13	9	94	1373	247.6	228.2	0.07	2.63	0.18
19-10-13	20	183	2948	478.6	372.9	0.06	2.62	0.16
26-2-13	3	51	883	42.2	42.2	0.06	0.83	0.05
27-7-13	3	107	1880	278.9	9.1	0.06	2.61	0.15
54-8-13	5	30	804	123.5	48.9	0.04	4.12	0.15
54-3-13	1	2	73	7.5	0.0	0.03	3.75	0.10
68-2-13	0	0	18	0.0	0.0	0.00	0.00	0.00
26-6-13	0	0	412	0.0	0.0	0.00	0.00	0.00
16-11-13	0	0	1269	0.0	0.0	0.00	0.00	0.00

Eastern Division 2018 Reliability Data – Excludes storms – Sorted by Restoration

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
22-3-13	2	36	491	257.7	257.7	0.07	7.16	0.52
27-8-13	9	165	1517	697.2	492.5	0.11	4.23	0.46
54-8-13	5	30	804	123.5	48.9	0.04	4.12	0.15
24-4-13	4	237	1307	971.6	896.9	0.18	4.10	0.74
22-7-13	22	617	2075	2,446.3	2,276.0	0.30	3.96	1.18
24-3-13	3	54	219	209.8	183.3	0.25	3.88	0.96
54-3-13	1	2	73	7.5	0.0	0.03	3.75	0.10
51-7-13	13	345	1739	1,195.9	1,142.9	0.20	3.47	0.69
44-4-13	6	280	1693	953.7	882.5	0.17	3.41	0.56
22-5-13	15	545	1504	1,808.8	1,717.1	0.36	3.32	1.20
24-2-13	8	225	1355	731.7	619.2	0.17	3.25	0.54
68-4-13	10	71	504	226.7	219.9	0.14	3.19	0.45
24-12-13	11	614	1137	1,956.9	1,922.1	0.54	3.19	1.72
23-4-13	31	5191	1358	16,371.2	13,950.8	3.82	3.15	12.06
29-4-13	6	148	457	464.1	378.0	0.32	3.14	1.02
45-5-13	21	630	1411	1,944.3	1,161.0	0.45	3.09	1.38
21-16-13	3	68	508	206.7	171.9	0.13	3.04	0.41
51-8-13	5	256	588	761.4	761.4	0.44	2.97	1.29
24-1-13	17	442	1096	1,309.9	1,010.7	0.40	2.96	1.20
45-8-13	32	1764	1958	5,150.1	5,033.5	0.90	2.92	2.63
19-12-13	15	426	1518	1,242.1	853.2	0.28	2.92	0.82
22-6-13	2	118	279	332.1	332.1	0.42	2.81	1.19
27-5-13	5	111	1175	308.8	35.1	0.09	2.78	0.26
54-6-13	14	518	1327	1,429.0	1,360.8	0.39	2.76	1.08
27-4-13	10	375	2347	1,031.8	405.3	0.16	2.75	0.44
21-13-13	11	507	2182	1,390.2	871.0	0.23	2.74	0.64
22-1-13	27	1928	1321	5,284.4	4,877.0	1.46	2.74	4.00
23-1-13	29	1678	1314	4,559.0	4,140.9	1.28	2.72	3.47
54-7-13	9	94	1373	247.6	228.2	0.07	2.63	0.18
19-14-13	20	1767	1930	4,641.7	1,136.9	0.92	2.63	2.41
19-10-13	20	183	2948	478.6	372.9	0.06	2.62	0.16
27-7-13	3	107	1880	278.9	9.1	0.06	2.61	0.15
42-3-13	4	168	1067	423.4	423.4	0.16	2.52	0.40
44-2-13	11	199	835	497.4	266.7	0.24	2.50	0.60
21-11-13	9	511	617	1,271.3	1,137.0	0.83	2.49	2.06
54-4-13	10	413	346	948.5	537.5	1.19	2.30	2.74
50-3-13	14	781	729	1,766.9	1,720.4	1.07	2.26	2.42
51-1-13	21	2318	1103	5,034.5	2,887.3	2.10	2.17	4.56

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
21-15-13	4	257	165	542.5	341.8	1.56	2.11	3.29
53-3-13	4	39	462	80.1	72.7	0.08	2.05	0.17
54-5-13	1	3	19	6.1	6.1	0.16	2.02	0.32
29-1-13	8	378	1744	755.3	455.4	0.22	2.00	0.43
45-6-13	5	73	706	143.9	94.0	0.10	1.97	0.20
23-3-13	3	262	1026	500.5	500.5	0.26	1.91	0.49
45-2-13	13	430	1870	803.6	730.2	0.23	1.87	0.43
27-3-13	7	354	2328	650.1	650.1	0.15	1.84	0.28
53-6-13	14	1592	2013	2,876.0	2,708.9	0.79	1.81	1.43
23-2-13	16	1354	1012	2,424.5	1,915.5	1.34	1.79	2.40
51-6-13	19	3605	1420	6,341.1	3,038.5	2.54	1.76	4.47
24-11-13	19	1771	1780	3,100.8	2,401.8	0.99	1.75	1.74
23-6-13	27	812	1791	1,416.0	1,140.6	0.45	1.74	0.79
50-2-13	18	1057	2075	1,840.3	1,719.3	0.51	1.74	0.89
45-4-13	13	707	1209	1,221.3	704.4	0.58	1.73	1.01
53-7-13	5	881	1109	1,496.9	1,440.5	0.79	1.70	1.35
19-8-13	16	1192	2915	2,012.4	1,080.5	0.41	1.69	0.69
54-1-13	9	992	816	1,620.3	341.5	1.22	1.63	1.99
21-9-13	7	218	453	352.4	349.4	0.48	1.62	0.78
19-15-13	7	815	786	1,304.1	990.1	1.04	1.60	1.66
29-3-13	16	2875	2048	4,594.3	4,484.5	1.40	1.60	2.24
27-1-13	8	1046	844	1,660.2	1,498.8	1.24	1.59	1.97
45-9-13	26	2799	1683	4,415.4	3,105.9	1.66	1.58	2.62
53-8-13	3	51	453	79.5	73.5	0.11	1.56	0.18
53-1-13	18	1987	1914	3,069.3	2,653.8	1.04	1.54	1.60
19-9-13	16	710	1627	1,094.9	737.4	0.44	1.54	0.67
22-4-13	16	2090	975	3,221.7	3,209.0	2.14	1.54	3.30
44-1-13	8	1391	1513	2,020.1	2,020.1	0.92	1.45	1.34
50-4-13	5	401	878	571.6	571.6	0.46	1.43	0.65
44-3-13	12	495	2011	704.4	348.9	0.25	1.42	0.35
51-2-13	11	584	533	829.7	819.5	1.10	1.42	1.56
17-2-13	14	439	2432	620.5	334.7	0.18	1.41	0.26
27-6-13	12	582	1081	817.1	777.9	0.54	1.40	0.76
51-5-13	12	848	981	1,168.2	1,168.2	0.86	1.38	1.19
45-1-13	27	2548	1138	3,403.3	2,563.9	2.24	1.34	2.99
51-4-13	8	1583	1367	2,052.4	1,449.8	1.16	1.30	1.50
45-7-13	10	2125	1029	2,612.6	2,581.5	2.07	1.23	2.54
44-5-13	18	2324	1529	2,668.4	2,510.2	1.52	1.15	1.75
19-13-13	5	1860	1607	2,059.0	1,879.6	1.16	1.11	1.28

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
22-2-13	28	2004	1270	2,132.5	1,570.6	1.58	1.06	1.68
50-1-13	10	325	493	343.1	302.8	0.66	1.06	0.70
45-3-13	11	1794	1360	1,881.0	1,408.7	1.32	1.05	1.38
44-6-13	35	1859	1724	1,795.8	1,500.7	1.08	0.97	1.04
42-1-13	4	254	205	242.5	234.1	1.24	0.95	1.18
26-2-13	3	51	883	42.2	42.2	0.06	0.83	0.05
42-2-13	7	709	647	568.2	97.2	1.10	0.80	0.88
19-11-13	24	2218	1733	1,719.1	1,428.0	1.28	0.78	0.99
21-12-13	7	1020	1425	777.6	685.4	0.72	0.76	0.55
17-1-13	1	434	592	325.5	0.0	0.73	0.75	0.55
45-10-13	12	1078	947	715.5	434.9	1.14	0.66	0.76
22-8-13	12	1713	960	994.2	716.1	1.78	0.58	1.04
27-2-13	21	2927	2497	1,596.9	1,082.9	1.17	0.55	0.64
54-2-13	5	391	374	175.5	84.3	1.05	0.45	0.47
68-2-13	0	0	18	0.0	0.0	0.00	0.00	0.00
26-6-13	0	0	412	0.0	0.0	0.00	0.00	0.00
16-11-13	0	0	1269	0.0	0.0	0.00	0.00	0.00

Eastern Division Circuit Analysis

Total Circuits	94	
SAIFI Goal	0.99	
Meets SAIFI Goal	62	77%
CAIDI Goal (hrs)	1.5	
Meets CAIDI Goal	29	36%

Eastern Division circuits with less than 100 customers or less than 3 interruptions in 2018

Circuit	# of Interruptions	Customers Served
68-2-13	0	18
54-5-13	1	19
54-3-13	1	73
16-11-13	0	1,269
26-6-13	0	412
17-1-13	1	592
22-3-13	2	491
22-6-13	2	279
21-16-13	3	508
23-3-13	3	1,026
24-3-13	3	219
26-2-13	3	883
27-7-13	3	1,880
53-8-13	3	453

Central Division 2018 Reliability Data – Excludes storms – Sorted by Frequency

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
71-5-13	16	4644	1110	4,485.8	4,131.3	4.18	0.97	4.04
71-3-13	39	8687	2315	15,893.3	13,353.1	3.75	1.83	6.87
65-1-48	7	654	182	951.0	607.8	3.59	1.45	5.23
61-10-13	8	2712	1201	2,810.3	2,793.3	2.26	1.04	2.34
65-2-48	12	668	298	1,007.1	890.0	2.24	1.51	3.38
80-3-13	34	6341	2926	7,110.7	4,222.6	2.17	1.12	2.43
89-10-34	9	449	214	709.5	622.6	2.10	1.58	3.32
91-4-13	7	997	477	817.5	476.8	2.09	0.82	1.71
13-2-13	6	1020	509	1,001.1	827.6	2.00	0.98	1.97
67-1-13	36	1891	1077	6,131.8	2,805.1	1.76	3.24	5.69
80-4-13	8	890	551	3,779.0	2,574.6	1.62	4.25	6.86
63-4-13	9	1412	945	2,530.0	251.6	1.49	1.79	2.68
80-1-13	31	1984	1468	3,224.4	2,169.1	1.35	1.63	2.20
61-2-13	10	1899	1489	2,692.8	2,472.7	1.28	1.42	1.81
63-3-13	3	143	113	187.4	173.6	1.27	1.31	1.66
84-3-13	19	2287	1839	3,569.4	2,633.7	1.24	1.56	1.94
91-3-13	6	965	782	1,111.1	837.2	1.23	1.15	1.42
71-8-13	10	1788	1515	2,075.8	1,599.8	1.18	1.16	1.37
61-9-13	33	2859	2456	7,319.8	1,952.8	1.16	2.56	2.98
76-4-13	19	1270	1191	2,628.8	2,005.1	1.07	2.07	2.21
76-1-13	18	1737	1765	2,203.8	976.4	0.98	1.27	1.25
89-2-13	33	1046	1070	2,734.7	686.3	0.98	2.61	2.56
13-7-13	4	388	433	103.9	61.0	0.90	0.27	0.24
63-8-13	11	1850	2358	2,630.3	451.4	0.78	1.42	1.12
89-3-13	5	253	365	309.5	251.5	0.69	1.22	0.85
13-8-13	10	346	544	1,448.7	733.1	0.64	4.19	2.66
61-6-13	11	509	821	564.8	354.5	0.62	1.11	0.69
80-2-13	19	1093	1840	1,745.5	1,219.8	0.59	1.60	0.95
63-1-13	17	413	706	1,089.2	695.1	0.58	2.64	1.54
61-7-13	7	1150	2126	4,521.5	4,138.9	0.54	3.93	2.13
76-2-13	16	315	590	926.9	878.4	0.53	2.94	1.57
84-1-13	22	1153	2167	2,464.8	2,105.0	0.53	2.14	1.14
71-7-13	14	425	911	2,147.9	1,939.3	0.47	5.05	2.36
13-9-13	13	809	1764	7,389.7	7,223.4	0.46	9.13	4.19
80-5-13	22	765	1736	1,805.3	1,475.5	0.44	2.36	1.04
91-2-13	2	6	16	6.4	2.6	0.38	1.06	0.40
61-8-13	12	409	1093	1,312.5	445.8	0.37	3.21	1.20
61-4-13	5	500	1394	751.8	31.3	0.36	1.50	0.54

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
63-7-13	11	504	1472	862.9	771.8	0.34	1.71	0.59
63-6-13	8	117	442	295.2	285.1	0.26	2.52	0.67
76-3-13	17	578	2184	2,285.6	1,858.7	0.26	3.95	1.05
89-1-13	12	380	1620	721.8	699.7	0.23	1.90	0.45
84-2-13	9	305	1322	512.6	164.1	0.23	1.68	0.39
61-3-13	9	314	2168	914.8	850.4	0.14	2.91	0.42
67-2-13	1	6	42	58.0	0.0	0.14	9.67	1.38
63-2-13	5	124	907	212.1	173.6	0.14	1.71	0.23
71-2-13	9	167	1432	671.2	533.8	0.12	4.02	0.47
73-6-13	4	60	574	176.7	117.1	0.10	2.95	0.31
73-1-13	4	119	1173	452.2	409.1	0.10	3.80	0.39
13-3-13	1	3	39	11.7	0.0	0.08	3.90	0.30
61-1-13	2	6	229	18.8	18.8	0.03	3.13	0.08
13-4-13	1	2	134	3.3	3.3	0.01	1.63	0.02
71-4-13	1	2	336	5.9	5.9	0.01	2.95	0.02

Central Division 2018 Reliability Data – Excludes storms – Sorted by Restoration

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
67-2-13	1	6	42	58.0	0.0	0.14	9.67	1.38
13-9-13	13	809	1764	7,389.7	7,223.4	0.46	9.13	4.19
71-7-13	14	425	911	2,147.9	1,939.3	0.47	5.05	2.36
80-4-13	8	890	551	3,779.0	2,574.6	1.62	4.25	6.86
13-8-13	10	346	544	1,448.7	733.1	0.64	4.19	2.66
71-2-13	9	167	1432	671.2	533.8	0.12	4.02	0.47
76-3-13	17	578	2184	2,285.6	1,858.7	0.26	3.95	1.05
61-7-13	7	1150	2126	4,521.5	4,138.9	0.54	3.93	2.13
13-3-13	1	3	39	11.7	0.0	0.08	3.90	0.30
73-1-13	4	119	1173	452.2	409.1	0.10	3.80	0.39
67-1-13	36	1891	1077	6,131.8	2,805.1	1.76	3.24	5.69
61-8-13	12	409	1093	1,312.5	445.8	0.37	3.21	1.20
61-1-13	2	6	229	18.8	18.8	0.03	3.13	0.08
71-4-13	1	2	336	5.9	5.9	0.01	2.95	0.02
73-6-13	4	60	574	176.7	117.1	0.10	2.95	0.31
76-2-13	16	315	590	926.9	878.4	0.53	2.94	1.57
61-3-13	9	314	2168	914.8	850.4	0.14	2.91	0.42
63-1-13	17	413	706	1,089.2	695.1	0.58	2.64	1.54
89-2-13	33	1046	1070	2,734.7	686.3	0.98	2.61	2.56
61-9-13	33	2859	2456	7,319.8	1,952.8	1.16	2.56	2.98
63-6-13	8	117	442	295.2	285.1	0.26	2.52	0.67
80-5-13	22	765	1736	1,805.3	1,475.5	0.44	2.36	1.04
84-1-13	22	1153	2167	2,464.8	2,105.0	0.53	2.14	1.14
76-4-13	19	1270	1191	2,628.8	2,005.1	1.07	2.07	2.21
89-1-13	12	380	1620	721.8	699.7	0.23	1.90	0.45
71-3-13	39	8687	2315	15,893.3	13,353.1	3.75	1.83	6.87
63-4-13	9	1412	945	2,530.0	251.6	1.49	1.79	2.68
63-7-13	11	504	1472	862.9	771.8	0.34	1.71	0.59
63-2-13	5	124	907	212.1	173.6	0.14	1.71	0.23
84-2-13	9	305	1322	512.6	164.1	0.23	1.68	0.39
13-4-13	1	2	134	3.3	3.3	0.01	1.63	0.02
80-1-13	31	1984	1468	3,224.4	2,169.1	1.35	1.63	2.20
80-2-13	19	1093	1840	1,745.5	1,219.8	0.59	1.60	0.95
89-10-34	9	449	214	709.5	622.6	2.10	1.58	3.32
84-3-13	19	2287	1839	3,569.4	2,633.7	1.24	1.56	1.94
65-2-48	12	668	298	1,007.1	890.0	2.24	1.51	3.38
61-4-13	5	500	1394	751.8	31.3	0.36	1.50	0.54
65-1-48	7	654	182	951.0	607.8	3.59	1.45	5.23

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
63-8-13	11	1850	2358	2,630.3	451.4	0.78	1.42	1.12
61-2-13	10	1899	1489	2,692.8	2,472.7	1.28	1.42	1.81
63-3-13	3	143	113	187.4	173.6	1.27	1.31	1.66
76-1-13	18	1737	1765	2,203.8	976.4	0.98	1.27	1.25
89-3-13	5	253	365	309.5	251.5	0.69	1.22	0.85
71-8-13	10	1788	1515	2,075.8	1,599.8	1.18	1.16	1.37
91-3-13	6	965	782	1,111.1	837.2	1.23	1.15	1.42
80-3-13	34	6341	2926	7,110.7	4,222.6	2.17	1.12	2.43
61-6-13	11	509	821	564.8	354.5	0.62	1.11	0.69
91-2-13	2	6	16	6.4	2.6	0.38	1.06	0.40
61-10-13	8	2712	1201	2,810.3	2,793.3	2.26	1.04	2.34
13-2-13	6	1020	509	1,001.1	827.6	2.00	0.98	1.97
71-5-13	16	4644	1110	4,485.8	4,131.3	4.18	0.97	4.04
91-4-13	7	997	477	817.5	476.8	2.09	0.82	1.71
13-7-13	4	388	433	103.9	61.0	0.90	0.27	0.24

Central Division Circuit Analysis

Total Circuits	53	
SAIFI Goal	1.15	
Meets SAIFI Goal	34	64%
CAIDI Goal	1.75	
Meets CAIDI Goal	26	49%

Central Division Circuits with less than 100 customers or less than 3 interruptions in 2018

Circuit	# of Interrupt	Customers Served
91-2-13	2	16
13-3-13	1	39
67-2-13	1	42
13-4-13	1	134
71-4-13	1	336
61-1-13	2	229
63-3-13	3	113

Western Division 2018 Reliability Data – Excludes storms – Sorted by Frequency

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
3-1S-34	32	2293	532	8,461.8	8,269.3	4.31	3.69	15.91
12-1-13	51	6884	1973	9,022.8	8,743.5	3.49	1.31	4.57
2-1-13	29	2178	649	14,117.9	13,702.8	3.36	6.48	21.75
6-8-13	17	3974	1255	7,527.8	5,287.2	3.17	1.89	6.00
7-1-13	15	2781	988	2,155.7	1,208.9	2.81	0.78	2.18
3-1N-34	27	3172	1179	7,746.1	6,301.3	2.69	2.44	6.57
103-4-13	36	4273	1594	7,381.6	6,460.6	2.68	1.73	4.63
11-4-13	20	4175	1583	7,534.4	6,520.5	2.64	1.80	4.76
5-3-34	42	3976	1510	10,068.5	7,976.5	2.63	2.53	6.67
5-10-34	31	2278	893	3,896.3	3,143.3	2.55	1.71	4.36
102-3-13	20	1837	822	3,359.4	2,482.3	2.23	1.83	4.09
7-2-13	18	2442	1152	2,805.8	2,472.3	2.12	1.15	2.44
9-1-48	31	3292	1781	5,658.0	4,574.1	1.85	1.72	3.18
102-2-13	17	1812	1017	1,828.0	960.0	1.78	1.01	1.80
103-3-13	17	1746	1000	1,473.5	1,136.9	1.75	0.84	1.47
103-2-13	17	1177	780	1,101.2	973.3	1.51	0.94	1.41
12-3-13	17	1308	899	2,047.4	1,885.3	1.45	1.57	2.28
11-2-13	8	3821	2840	3,901.1	3,786.0	1.35	1.02	1.37
15-6-13	15	2758	2265	4,957.4	212.4	1.22	1.80	2.19
15-1-13	7	403	348	1,006.4	989.7	1.16	2.50	2.89
113-5-13	9	1674	1514	678.2	490.1	1.11	0.41	0.45
10-2-13	22	691	642	1,654.1	1,586.3	1.08	2.39	2.58
102-1-13	15	691	646	1,950.9	1,867.4	1.07	2.82	3.02
11-5-13	1	2	2	1.0	0.0	1.00	0.50	0.50
113-1-13	1	74	80	38.2	38.2	0.93	0.52	0.48
11-1-13	5	1197	1389	1,224.5	1,129.8	0.86	1.02	0.88
113-8-13	4	919	1086	1,681.3	84.4	0.85	1.83	1.55
109-3-13	12	2056	2591	4,153.7	3,709.8	0.79	2.02	1.60
109-2-13	12	1089	1464	955.2	429.7	0.74	0.88	0.65
6-7-13	17	1048	1557	926.9	452.8	0.67	0.88	0.60
9-2-48	8	146	274	417.3	395.6	0.53	2.86	1.52
109-4-34	24	872	1963	1,797.2	1,539.5	0.44	2.06	0.92
113-6-13	4	239	563	1,086.3	925.1	0.42	4.55	1.93
6-9-13	7	365	870	440.4	398.4	0.42	1.21	0.51
1-1-13	1	2	5	8.4	0.0	0.40	4.22	1.69
103-1-13	9	241	612	220.9	194.0	0.39	0.92	0.36
7-3-13	1	50	207	97.7	97.7	0.24	1.95	0.47
109-1-13	8	430	2722	215.4	215.4	0.16	0.50	0.08
113-4-13	7	178	1519	571.3	413.5	0.12	3.21	0.38
113-2-13	13	197	1888	634.6	276.3	0.10	3.22	0.34
15-3-13	3	28	446	72.6	63.3	0.06	2.59	0.16
15-4-13	1	2	75	5.5	0.0	0.03	2.77	0.07
11-3-13	2	29	1737	36.0	36.0	0.02	1.24	0.02
15-5-13	0	0	17	0.0	0.0	0.00	0.00	0.00

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
113-7-13	0	0	280	0.0	0.0	0.00	0.00	0.00

Western Division 2018 Reliability Data – Excludes storms – Sorted by Restoration

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
2-1-13	29	2178	649	14,117.9	13,702.8	3.36	6.48	21.75
113-6-13	4	239	563	1,086.3	925.1	0.42	4.55	1.93
1-1-13	1	2	5	8.4	0.0	0.40	4.22	1.69
3-1S-34	32	2293	532	8,461.8	8,269.3	4.31	3.69	15.91
113-2-13	13	197	1888	634.6	276.3	0.10	3.22	0.34
113-4-13	7	178	1519	571.3	413.5	0.12	3.21	0.38
9-2-48	8	146	274	417.3	395.6	0.53	2.86	1.52
102-1-13	15	691	646	1,950.9	1,867.4	1.07	2.82	3.02
15-4-13	1	2	75	5.5	0.0	0.03	2.77	0.07
15-3-13	3	28	446	72.6	63.3	0.06	2.59	0.16
5-3-34	42	3976	1510	10,068.5	7,976.5	2.63	2.53	6.67
15-1-13	7	403	348	1,006.4	989.7	1.16	2.50	2.89
3-1N-34	27	3172	1179	7,746.1	6,301.3	2.69	2.44	6.57
10-2-13	22	691	642	1,654.1	1,586.3	1.08	2.39	2.58
109-4-34	24	872	1963	1,797.2	1,539.5	0.44	2.06	0.92
109-3-13	12	2056	2591	4,153.7	3,709.8	0.79	2.02	1.60
7-3-13	1	50	207	97.7	97.7	0.24	1.95	0.47
6-8-13	17	3974	1255	7,527.8	5,287.2	3.17	1.89	6.00
113-8-13	4	919	1086	1,681.3	84.4	0.85	1.83	1.55
102-3-13	20	1837	822	3,359.4	2,482.3	2.23	1.83	4.09
11-4-13	20	4175	1583	7,534.4	6,520.5	2.64	1.80	4.76
15-6-13	15	2758	2265	4,957.4	212.4	1.22	1.80	2.19
103-4-13	36	4273	1594	7,381.6	6,460.6	2.68	1.73	4.63
9-1-48	31	3292	1781	5,658.0	4,574.1	1.85	1.72	3.18
5-10-34	31	2278	893	3,896.3	3,143.3	2.55	1.71	4.36
12-3-13	17	1308	899	2,047.4	1,885.3	1.45	1.57	2.28
12-1-13	51	6884	1973	9,022.8	8,743.5	3.49	1.31	4.57
11-3-13	2	29	1737	36.0	36.0	0.02	1.24	0.02
6-9-13	7	365	870	440.4	398.4	0.42	1.21	0.51
7-2-13	18	2442	1152	2,805.8	2,472.3	2.12	1.15	2.44
11-1-13	5	1197	1389	1,224.5	1,129.8	0.86	1.02	0.88
11-2-13	8	3821	2840	3,901.1	3,786.0	1.35	1.02	1.37
102-2-13	17	1812	1017	1,828.0	960.0	1.78	1.01	1.80
103-2-13	17	1177	780	1,101.2	973.3	1.51	0.94	1.41
103-1-13	9	241	612	220.9	194.0	0.39	0.92	0.36
6-7-13	17	1048	1557	926.9	452.8	0.67	0.88	0.60
109-2-13	12	1089	1464	955.2	429.7	0.74	0.88	0.65
103-3-13	17	1746	1000	1,473.5	1,136.9	1.75	0.84	1.47
7-1-13	15	2781	988	2,155.7	1,208.9	2.81	0.78	2.18
113-1-13	1	74	80	38.2	38.2	0.93	0.52	0.48
109-1-13	8	430	2722	215.4	215.4	0.16	0.50	0.08
11-5-13	1	2	2	1.0	0.0	1.00	0.50	0.50
113-5-13	9	1674	1514	678.2	490.1	1.11	0.41	0.45
15-5-13	0	0	17	0.0	0.0	0.00	0.00	0.00

Circuit	# of Interruptions	Cust Aff	Customers Served	Cust Hrs	LATE	SAIFI	CAIDI	SAIDI
113-7-13	0	0	280	0.0	0.0	0.00	0.00	0.00

Western Division Circuit Analysis

Total Circuits	45	
SAIFI Goal	1.73	
Meets SAIFI Goal	30	67%
CAIDI Goal	2.00	
Meets CAIDI Goal	29	64%

Western Division Circuits with less than 100 customers or less than 3 interruptions in 2018

Circuit	# of Interrupt	Customers Served
11-5-13	1	2
1-1-13	1	5
15-5-13	0	17
15-4-13	1	75
113-1-13	1	80
113-7-13	0	280
7-3-13	1	207
11-3-13	2	1737
15-3-13	3	446

Appendix E

2018 Storm Analysis Table

2018 Storm Analysis
Orange & Rockland – Company

Company			
Date	# of Interrupts	Customers Affected	Cust-Hrs of Interruption
3/2 – 3/12	474	72,532	1,642,840
5/15 – 5/20	258	51,411	908,419
8/3 – 8/6	46	3,640	17,483
8/17 – 8/19	38	4,822	16,161
11/3 – 11/4	40	6,192	15,808
Eastern Division			
Date	# of Interrupts	Customers Affected	Cust-Hrs of Interruption
3/2 – 3/12	235	33,900	728,885
5/15 – 5/20	99	8,079	150,840
8/3 – 8/6	27	1,532	5,203
8/17 – 8/19	18	178	795
11/3 – 11/4	16	518	1,666
Central Division			
Date	# of Interrupts	Customers Affected	Cust-Hrs of Interruption
3/2 – 3/12	99	9,421	112,634
5/15 – 5/20	72	17,111	287,867
8/3 – 8/6	19	2,108	12,280
8/17 – 8/19	20	4,644	15,366
11/3 – 11/4	11	126	433
Western Division			
Date	# of Interrupts	Customers Affected	Cust-Hrs of Interruption
3/2 – 3/12	140	29,211	801,322
5/15 – 5/20	87	26,221	469,712
11/3 – 11/4	13	5,548	13,710

Appendix F

2018 Service Reliability Program Expenditures

O&R Electric Service Reliability Programs ($000's)

		Budget				
		2014	2015	2016	2017	2018
Transmission Line Maintenance						
Aerial Patrol	O&M	82.1	75.4	231.7	127.6	121.0
Tower Inspection (TIMS)	O&M	-	-	-	-	
Transmission Line R.O.W. (Vegetation)	O&M	2,000.4	2,564.4	2,200.0	2,270.0	2,330.0
Transmission Line Maintenance (TLM)	O&M	167.9	142.8	75.6	124.8	115.2
Distribution Tree Trimming	O&M	4,596.3	5,949.8	5,929.0	6,333.4	6,424.4
Distribution Line Maintenance	O&M	-	-	-	-	
Infrared Thermal Inspection Program	O&M	111.4	104.7	214.5	172.9	164.5
Stray Voltage Program	O&M	3,820.8	2,030.4	1,832.1	1,790.2	1,829.0
Total O&M		**10,778.9**	**10,867.5**	**10,482.9**	**10,818.9**	**10,984.1**
Midpoint Recloser/Sectionalizer Program	Capital	1,491.4	1,504.7	1,506.4	4,510.3	5,965.2
Underground Gasification/Rehab Program	Capital	266.2	269.9	270.6	273.7	500.0
Underground Rebuild Program	Capital	1,765.4	1,791.8	1,847.5	1,816.2	1,800.0
Total Capital		**3,523.0**	**3,566.4**	**3,624.5**	**6,600.2**	**8,265.1**

O&R Electric Service Reliability Programs ($000's)

		Budget				
		2014	2015	2016	2017	2018
Transmission Line Maintenance						
Aerial Patrol	O&M	112.4	58.0	86.1	73.8	81.7
Tower Inspection (TIMS)	O&M	-	-	-	-	
Transmission Line R.O.W. (Vegetation)	O&M	2,814.4	2,816.2	2,996.4	2,449.7	1,828.6
Transmission Line Maintenance (TLM)	O&M	-	-	-	-	
Distribution Tree Trimming	O&M	5,453.7	6,768.9	5,182.5	4,822.5	6,398.3
Distribution Line Maintenance	O&M	-	-	-	-	
Infrared Thermal Inspection Program	O&M	146.1	62.1	203.4	201.8	5.2
Stray Voltage Program	O&M	2,139.0	951.9	1,499.9	1,324.2	280.6
Total O&M		**10,665.5**	**10,657.0**	**9,968.3**	**8,872.0**	**8,594.4**
Midpoint Recloser/Sectionalizer Program	Capital	779.6	710.0	1,293.4	4,762.6	6,020.7
Underground Gasification/Rehab Program	Capital	-	-	189.0	259.6	306.9
Underground Rebuild Program	Capital	343.3	923.0	964.0	2,070.4	3,115.8
Total Capital		**1,122.9**	**1,633.0**	**2,446.4**	**7,092.6**	**9,443.4**

Appendix G

2018 Distribution Capital Investment

Eastern Division

Project: Monsey, Carlton Road (Part 1)
Cost: $348k (WO# 1702005244)
Completion: December 2018

DESCRIPTION

The project (Carlton Road) will provide a mainline distribution path for one Tallman circuit (53-3-13) to serve a portion of the Monsey area to reduce loading on circuit (44-6-13) that is heavily loaded (476 amps) and serves 1,650 customers. The feeder continues to grow with an additional 160 condominium units currently under construction on the corner of NYS Rt. 306 and Kearsing Parkway. In addition, there is a second vacant property (approximately 30 acres) located on Monsey Viola Road that has the potential to be developed for future housing (400 units) as identified in the local media. This is the first of three projects (Carlton road upgrade, Maple Ave, and Mountain Road), at the completion of all three projects will provide load relief, enhance our switching capability and improve overall system reliability.

There are 474 customers Carlton Road that will benefit from creating a new mainline tie and additional 138 customers on W Maple Ave. The project will provide enhanced switching capabilities for Carlton Road and West Maple Ave and upgrade for future anticipated load growth on Maple Voila Road (between Carlton Road and Viola Road). In 2016, both on West Maple (segment# 03-0336) and Carlton Road (segment# 03-0324), customers experience seven (7) outages as a result of equipment failure, tree or animal contact. On the tail end of circuit 44-6-13 there is a large condominium project that is currently under construction. The project will address aging infrastructure, improve storm resiliency, enhance system efficiency and support future load growth.

The scope of the project is to re-conductor (2,400 feet) of existing three phase # 2 ACSR with three phase 477 AAC, replace existing open wire secondary will be replaced with 4/0 triplex that will also serve as our mainline system neutral. The re-conductoring project will begin on pole# 57074/40750 and end on pole# 57049/40927. The project also includes the installation of two Moab's to enhance existing distribution automation for the circuit. In total the project will improve reliability for 615 customers initially, and will enhance our switching capability, provide load relief, and improve overall reliability to the area. Installing an underground distribution is not cost effective as the area is predominately an overhead distribution system.

Project: Monsey, West Maple Ave
Cost: $336k (WO# 1702005232)
Completion: December 2018

DESCRIPTION

This is the second of three projects designed to create main line distribution path for Tallman circuit 51-3-13 and Monsey circuit 44-6-13 on West Maple Ave between Highview Ave and Carlton Road in Monsey. There will be subsequent project that will be completed on Mountain Ave in Monsey. The purpose of this project is to provide a mainline distribution path for one Tallman circuit (53-3-13) to serve a portion of the Monsey area to reduce loading on circuit 44-6-13 that is heavily loaded (476amps) and serves 1,650 customers. The feeder continues grow with an additional 160 condominium units currently under construction on the corner of NYS Rt. 306 and Kearsing Parkway. In addition to the Kearsing Parkway project there is another vacant property (approximately 30 acres) located on Monsey Viola Road that has the potential to be developed for future housing (400units) as identified in the local media. With the completion of all three projects, the project will provide load relief, enhance our switching capability and improve overall system reliability.

Currently there are 141 customers on Maple Ave that are supplied by radial feed, and on Carlton Road there are 474 customers that will both benefit from creating this new distribution tie. This project will provide enhanced switching capabilities for Carlton Road and for future anticipated load growth along on Monsey Viola Road (between Carlton Road and Viola Road). In 2016, both on West Maple (segment# 03-0336) and Carlton Road (segment# 03-0324), customer experience seven outages as a result of equipment failure, tree or animal contact. This project and with the completed project on Carlton Road and the future Mountain Road project will reduce the overall number of interruptions on the both segments, enhance our capability to sectionalize and improve overall restoration on the feeder. In addition upon completion of all three projects, in the event of a problem on Blauvelt Road, the projects will provide an alternate source to back feed the tail end of the feeder, especially during peak load periods.

The scope of the project is to re-conductor (1,800 feet) of existing three-phase 3/0 AAC with three phase 477 AAC including a dedicated system neutral. All open wire secondary will be replaced with 4/0 triplex. The re-conductoring project will begin on pole# 57074/40750 and end on pole# 57049/40927. The project will include the installation of two Moab's to enhance existing distribution automation for the circuit. The project will improve reliability for 615 customers initially, and will benefit our switching capabilities between 51-3-13, 44-6-13, and 44-4-13, and provide load relief.

Project: Tappan, Kings Highway
Cost: $125k (WO# 1702005299)
Completion: January 2018

DESCRIPTION

This is the second of two part storm hardening projects designed to create main line distribution tie between Sparkill circuit 50-4-13 and Orangeburg circuit 54-8-13 on Kings Highway between Rt. 340 and Rt. 303in Tappan. The first project completed (2016) was an overhead reconductor (Hendrix Project) between Rt. 340 to the Palisades Interstate Parkway overpass. Currently 325 customers supplied via a radial overhead feed from circuit 50-4-13 on Kings Highway (east of the Palisades Interstate parkway). In addition there are another 78 customers on a radial feed from circuit 54-8-13 on Kings Highway (west of the Palisades Interstate Parkway). This new underground project will fill in the gap between Rt. 340 and Rt. 303 to create a new system tie.

The Sparkill Substation is a single bank substation supplying four 13.2kV distribution circuits. In the event of an outage on Bank 150, this additional circuit tie will facilitate restoration and enhance reliability to the area by providing more flexibility for either a substation bank and/or circuit contingency.

This project requires the installation of 500 feet of new 750mcm cu. underground distribution system. The Palisades Interstate Parkway Bridge is a 400 ft. span; installing overhead conductor was not an option and is not permitted. No other engineering option was considered as this project is needed for improved reliability in the area. The new distribution tie will provide switchable back up to customers in the Sparkill, Orangeburg, and Piermont areas.

Project: West Nyack, 4kV conversion – Bank 321 removal
Cost: $75k (WO# 1702005229)
Completion: September 2018

DESCRIPTION

Project designed to permanently off load 4kV Bank 321 located in West Nyack Substation to prepare for a future transmission project and upgrade existing circuit to 13.2kV.

Currently West Nyack Substation bank 321 serves two 4kV circuits' (21-6-4kV & 21-7-4kV), with the recently constructed Snake Hill Substation the two largest customers loads (Tilcon Quarries & United Water Plant) are now served from that new substation. The remaining customers including O&R's West Nyack facility are currently fed from either the 21-6-4kV or 21-7-4kV.

The two 4kV circuits are constructed in a double circuit configuration. This project converted those remaining customers to 13.2kV and will be served from either the 21-9-13 or 24-12-13 with an open GOAB between the two circuits.

Central Division

Project: Tuxedo, Route 17A (Part 1 & 2)
Cost: $616k (WO# 1708007077 & 1708007078)
Completion: December 2018

DESCRIPTION

Project designed to relocate existing poles, wires and equipment in difficult to access ROW along Rt. 17A in Tuxedo New York. Circuit 67-1-3 was the second worst performing circuit ranked in the Central Division in accordance with the Company's 2016 circuit priority rating system. The circuit originates from the Sterling Forest Substation in Tuxedo, New York and serves 1,100 customers over 47 miles. This project was divided into two separate projects to relocate off road pole line out of the woods to the road.

The existing pole line on Rt. 17A spans approximately 4,000 feet (30 poles) between Rt. 17 and Long Meadow Road. The existing overhead main line pole line is located up on a hill (approximately 30 feet up a rock ledge embankment) and is not accessible by vehicles. The existing pole line is prone to tree multiple contacts, resulting in multiple feeder lock outs that have occurred over the years. This is evident as the area has multiple automatic sleeves indicating previous repairs. The pole line was installed in 1969 as a result of Rt. 17A road widening project. As a result, routine repairs and pole replacement are difficult to complete, as no vehicle can access the area and rock drilling is impossible. When repairs are scheduled or emergency repairs, both situations would require an extended outage that may affect up to 65 residential and commercial customers for a number of hours. This portion of the main line is located at the head end of the circuit (67-1-13) and any damage in this area affects approximately 1100 customers for a period of time. The feeder has an existing auto-loop, which transfers 500 customers to an alternate circuit. This project is located between station breaker and a sectionalizing recloser.

This project will install approximately 4,000 feet of 3-phase 477aac open wire plus system neutral (477aac), approximately 20 poles along the road on Rt. 17A in Tuxedo NY. As part of these two projects three SCADA control MOAB switching devices will be installed.

Project: Pine Island – Liberty Corners
Cost: $585k (WO# 1702005239)
Completion: October 2018

DESCRIPTION

The Pine Island Station contains a single 3MVA, 34.5/4.8kV transformer with (2) – 4.8kV delta circuit exits. The station serves 511 customers and is supplied on a radial feed from South Goshen circuit 89-10-34. Due to the length of the radial 34.5kV sub transmission line, the station has experienced poor reliability. For a bank contingency at South Goshen, the only backup for the Pine Island is Chester Bank 363. For this contingency at peak times, maintaining adequate voltage from Chester can be a challenge. There is no SCADA communication with the Pine Island Station for monitoring/control and minimum approach distance (MAD) issues in the station require it to be offloaded to perform maintenance. The 4.8kV distribution system voltage and limited distribution ties has prevented the deployment of automation in the area. The two closest circuit ties (from Wisner & Westtown) are over 8 miles from the Pine Island station.

To improve reliability in the area and allow the retirement of the Pine Island Station/Line 90 (89-10-34) a series of distribution projects need to be constructed. These projects are a combination of 'fill in the gap' type projects as well as conversion/reconductoring. The first of these projects is designed to convert Liberty Corners Road from the existing step bank to the intersection of CR1 and Pulaski Highway.

The completed project was designed to convert Liberty Corners Road, sections of County RT 1 and associated side spurs from 4.8kV to 13.2kV. The project replaced approximately 9,300 feet of existing primary with (3) - 477 AAAC, 13.2kV open wire construction with 4/0AAAC neutral along County RT 1 and Liberty Corners Road. The conversion will end before the intersection of CR 1 & Pulaski Highway where (3) – 500kVA, 13.2/4.8kV step transformers will be installed. The conversion will also stop on CR 1 before Brozdowski Lane where a set of (3) – 250kVA, 13.2/4.8kV step transformers will be installed.

Project: Goshen – Pulaski Highway conversions
Cost: $790k (WO# 1705006154)
Completion: November 2018

DESCRIPTION

Pulaski Highway in Goshen is supplied from South Goshen Circuit 89-2-13. The area south of Pumpkin Swamp Road is a radial feed of approximately 250 customers supplied from (3) – 500kVA, 13.2/4.8kV step transformers. Modeling results indicate peak loading on the step is 83.0% of transformer nameplate rating and the current on the 4.8kV side of the step is near the rating of the cutouts. In addition, the 4.8kV radial feed is very long (approximately 20,000 feet). Due to the loading, smaller primary conductor size, and 4.8kV distribution voltage, the area experiences below standard voltage at peak system loads. Although there are regulators located downstream of the step bank, they cannot provide sufficient voltage support for the length of the entire spur.

Recently, a new customer applied for service that will increase the load on the 4.8kV system by an additional 300kW. This additional load will cause the step bank to exceed nameplate rating at peak time and worsen voltage conditions in the area. To improve power quality and meet ANSI C84.1 range 'A' voltage requirements, a project to convert approximately 8,200 feet of Pulaski Highway has been proposed. Modeling results indicate this will reduce load on the step by an average of 134kVA per phase. In addition, multiple spans of the 4.8kV primary along Pulaski Highway are located in close proximity to the front of several houses and encroaching above others. To eliminate the aerial trespass, the line will be rebuilt on the west side of Pulaski Highway.

This project is designed to convert approximately 8,200 feet of Pulaski Highway from 4.8kV to 13.2kV. To improve voltage in the area new 250kVA regulators will be installed at/near 48361/49117. The existing 477AAC primary conductor along Pulaski Highway shall be re-used and converted to 13.2kV (where applicable). Primary conductor along Pulaski Highway smaller than 477AAC shall be replaced with 477AAC.

Project: Warwick – Bellvale Road
Cost: $227k (WO# 1709007299)
Completion: November 2018

DESCRIPTION

Church Communities NY, Inc. is a customer located off of Gibson Hill Road in Chester, NY. They have notified Orange and Rockland Utilities that they are increasing their load at the campus and will be installing a 120 HP motor on their property. Church Communities NY, Inc is currently supplied from Chester circuit 63-1-13 through (3) – 250kVA, 13.2kV to 4.8kV step down transformers followed by a section of three-phase 4.8kV primary to (3) – 50kVA, 4.8kV to 13.2kV step up transformers. Although the circuit can accommodate the additional load, the bank of (3) - 50kVA, 4.8kV to 13.2kV step up transformers are under sized. In addition, the impedance from the two step banks severely restricts motor starting capability. In order to accommodate the new load and the motor start of the 120 HP motor, upgrades to the distribution circuit which feed this load are required. The 13.2kV to 4.8kV step down transformer along Lake Station Road must be removed and Bellvale Road must be converted three-phase 13.2kV.

This distribution project is designed to convert a section of the existing three-phase 63-1-13 distribution circuit from 4.8kV to 13.2kV along Bellvale Road in Chester NY. This will help accommodate new load and the starting capability of a proposed 120 HP motor. This project will begin at pole 51511/47316 on Lake Station Road and continue along Bellvale Road. It will then branch off to two new separate single-phase, 250kVA, 7.62kV to 4.8kV step down transformers. The first step down transformer will be located at pole 51729/47038 on Gibson Hill Road, and the second step down transformer will be located at pole 51652/46996 on Bellvale Lake Road. The (3) – 250kVA, 13.2kV to 4.8kV step transformers at pole 51511/47316 on Lake Station Road, and the (3) – 50kVA, 4.8kV to 13.2kV step transformers at pole 51711/46990 will be removed and Bellvale Road will be converted to 13.2kV from the step down bank at pole 51511/47316 to the step up bank at pole 51711/46990. Approximately 4,200 feet of (1) – 4/0 AAC system neutral cable will need to be installed along Bellvale Road and Gibson Hill Road from pole 51521/47321 to pole 51711/46990.

Western Division

Project: Swinging Bridge to County Route 43
Cost: $452k (WO# 1701005097)
Completion: October 2018

DESCRIPTION

Mongaup Substation is a single bank/circuit station with one 7.5MVA, 69/13.2kV transformer serving approximately 631 customers with a 2016WN load of 1.3MVA. Since the station has no distribution ties, it fails the Distribution Design Standard for bank and circuit backup. Recently, a large development has been proposed on the Mongaup circuit that will significantly increase the customer count over the next several years.

The Swinging Bridge Substation is also single bank/circuit station with no distribution ties. The station transformer is a 2.5MVA, 69/13.2kV bank that serves the O&R conference center and station service for the Eagle Creek hydroelectric plant.

Even though the Swinging Bridge is a 2.5MVA substation, it is capable of backing up Mongaup and potentially the end of the 3-1N-34 (Mohican Lake). This will allow both Mongaup and Swinging Bridge to pass the Design Standard and improve reliability to the Mohican Lake area.
This is one of three projects designed to create a 13.2kV mainline tie between Swinging Bridge Substation and Mongaup Substation.

This project is designed to construct approximately 575 feet of (3) – 477 AAAC open wire with 477 AAAC neutral & 5,750 feet (3) - 477 AAAC 13.2kV Hendrix Spacer Cable construction with 477AAAC neutral along the Swinging Bridge access Road from the substation to County Route 43. Since Bank 41 at Swinging Bridge is a non-LTC bank, a set of (3) 250kVA regulators will be installed on the overhead exit. A Hendrix system was selected to storm harden the new feed in this area.

Project: Swinging Bridge Exit to Plank Road
Cost: $544k (WO# 1703005530)
Completion: October 2018

DESCRIPTION

Mongaup Substation is a single bank/circuit station with one 7.5MVA, 69/13.2kV transformer serving approximately 631 customers with a 2016WN load of 1.3MVA. Since the station has no distribution ties, it fails the Distribution Design Standard for bank and circuit backup. Recently, a large development has been proposed on the Mongaup circuit that will significantly increase the customer count over the next several years.

The Swinging Bridge Substation is also single bank/circuit station with no distribution ties. The station transformer is a 2.5MVA, 69/13.2kV bank that serves the O&R conference center and station service for the Eagle Creek hydroelectric plant. Despite the small transformer size at Swinging Bridge, it is still large enough to provide backup for Mongaup and potentially the end of the 3-1N-34 (Mohican Lake).

This is second of three projects designed to create a 13.2kV mainline distribution tie between Swinging Bridge Substation and Mongaup Substation. This will allow both Mongaup and Swinging Bridge to pass the Design Standard and improve reliability to the Mohican Lake area. The first project (already designed - see WMS#1607002710) will build a 13.2kV mainline circuit path along CR 43 from CR 42 to Plank Road. This project will begin at Plank Road and extend the three phase mainline to the access road for the Swinging Bridge Substation. To maintain adequate voltage along North Road, the existing 250kVA regulator at 38167/56649 will be removed and a new 167kVA regulator will be installed at/near 38069/56891.

This project is designed to construct approximately 7,550 feet (3) - 477 AAAC 13.2kV Hendrix Spacer Cable system with 4/0AAAC neutral along County RT 43 from the Swinging Bridge Substation access road to the intersection of Plank Road at pole 38306/56728. The portion of County Route 43 operating at 2.4kV will be converted to 13.2kV as part of this project. A new 250kVA, 13.2/2.4kV step transformer will be installed on North Road allowing North Road and associated side spurs to remain at 2.4kV. This will complete the mainline tie between Swinging Bridge and Mongaup. A Hendrix system was selected for this section of the project to storm harden the new feed in this area.

Project: Deerpark Substation Exit
Cost: $90k (WO# 1605002133)
Completion: October 2018

DESCRIPTION

Deerpark Substation was energized May 2018. Initially, four (4) – 34.5kV circuits and one (1) – 13.2kV circuit will be placed in service with three (3) – 13.2kV circuits reserved for future use. This project is designed to construct approximately 1,600 feet of (3) - 477 AAAC 34.5kV open wire construction with 477AAAC neutral along the L111/L14 right of way from the Dick's concrete access road to Canal Street. This line shall be constructed approximately 30 feet south of the centerline of L111/14 and shall mirror existing line 5-10-34 (which is currently on the north side of the transmission line). Two 34.5kV riser poles with 600 amp disconnects will be installed to serve as UG risers at each end of the new overhead. One will be located on a new dead-end riser pole on the west side of Canal Street (within the transmission ROW) the other will be located on a new tangent pole on the west side of the Dick's concrete access road (also within the transmission ROW).

As part of this project a new 34.5kV riser pole with 600 amp disconnect switches will be installed tangent to existing 5-10-34 on the west side of the Dick's concrete access road within the transmission ROW. This riser will be used to re-feed the 5-10-34 (to Port Jervis) from the Deerpark Substation.