2017 ELECTRIC RELIABILITY PERFORMANCE REPORT

Electric Distribution Systems

Office of Electric, Gas, and Water

June 2018

Case 18-E-0153

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EXECUTIVE SUMMARY

The attached report presents the assessment by Department of Public Service Staff (Staff) of electric reliability performance in New York State for 2017. The Public Service Commission (Commission) primarily relies on two metrics commonly used in the industry to measure reliability performance: the System Average Interruption Frequency Index (SAIFI or frequency) and the Customer Average Interruption Duration Index (CAIDI or duration).[1] Frequency is influenced by factors such as system design, capital investment, maintenance, and weather.[2] Decisions made by utilities today on capital expenditures and maintenance policies, however, can take several years before being fully reflected in the frequency measure. Duration, on the other hand, is affected by work force levels, management of the workforce, and geography. Several means have been established to monitor the levels of service. First, utilities are required to submit detailed monthly interruption data to the Commission.[3] Next, the Commission adopted Service Standards, which among other things, set minimum performance levels for both the frequency and duration of service interruptions for each major electric utility's operating divisions. Each utility's performance is then compared with its Reliability Performance Mechanisms (RPMs), which is established in the most recent rate order for that utility. The RPMs include company-wide targets for outage frequency and duration; some RPMs have additional measures to address specific concerns unique to an

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[1] SAIFI is the average number of times that a customer is interrupted for five minutes or more during a year. CAIDI is the average interruption duration time in hours for those customers that experience an interruption during the year.

[2] For example, because the system of Consolidated Edison Company of New York, Inc. (Con Edison) includes many large, highly concentrated underground distribution networks that are generally less prone to interruptions than overhead systems, its interruption frequency is extremely low (better) as compared with other utilities.

[3] The regulated electric utilities consist of Con Edison, Central Hudson Gas & Electric Corporation (Central Hudson), New York State Electric & Gas Corporation (NYSEG), Niagara Mohawk Power Corporation, d/b/a National Grid (National Grid), Rochester Gas and Electric Corporation (RG&E), and Orange & Rockland Utilities, Inc. (Orange & Rockland). PSEG-LI provides interruption data that is used to calculate statewide performance in this report.

individual company. RPMs are designed such that companies are subject to negative revenue adjustments for failing to meet electric reliability targets excluding major storms.

In addition to Staff's review, the utilities are required to perform a reliability analysis. The utilities must submit a report by March 31 of each year containing detailed assessments of performance, including historic performance for the preceding five years, outage trends in the utility's various geographic regions, reliability improvement projects, analyses of worst-performing feeders, and, where needed, corrective action plans. Recent data is also compared with historic performance to identify positive or negative trends.

By compiling the interruption data provided by the individual utilities, the average statewide frequency and duration of interruptions can be reviewed to assess the overall reliability of electric service in New York State. Excluding major storms, the statewide interruption frequency for 2017 improved compared to the previous year and is consistent with the statewide five-year average (as shown in Figure 1, page 9).[4] Statewide, the three major causes for interruptions excluding storms were equipment failures, tree contacts, and accidents or events not under the utility's control. Combined these three categories account for approximately 84% of all interruptions. Equipment failures were the main drivers of interruptions for Con Edison, RG&E, Orange & Rockland and PSEG-LI; the second leading cause for these companies was tree contacts. NYSEG and Central Hudson reported tree contacts followed by accidents as the main drivers for interruptions in their service territories. National Grid reported tree contacts followed by equipment failures as their main drivers for interruptions.

In 2017, the statewide duration performance, excluding major storms, was consistent with 2016 and the statewide five-year average (as shown in Figure 3, page 11). All utilities met their duration targets. Con Edison's system-wide duration performance

[4] Major Storm is defined as any storm which causes service interruptions of at least ten percent of customers in an operating area, or if the interruptions last for 24 hours or more. To balance between service interruptions under a utility's control, such as equipment failures, and those which a utility's control is more limited, such as an ice storm, Staff reviews reliability data both including and excluding severe weather events.

declined from 2016. National Grid, Orange & Rockland, RG&E, and Central Hudson's duration performance improved compared to 2016. PSEG-LI also showed improvement when compared to its five-year average but declined 1.8% from 2016. NYSEG's duration performance was worse than its performance last year and five-year averages but better than their RPM target.

With respect to major storms, 2017 had more customer hours of interruption when including major storms than 2016. Combined, the electric utilities experienced 73 major storm events in 2017 approximately 11% more events than 2016. Sustained interruptions associated with major storms in 2017, which is increased 73% over 2016. The storms generally affected upstate service territories. The March 8, 2017 windstorm (March 2017 Windstorm) caused the majority of storm related outages during 2017 affecting RG&E, NYSEG, and National Grid performances. Sustained winds of 50 to 70 miles per hour uprooted and snapped trees, which in turn caused significant damage to the electric infrastructure. NYSEG, RG&E, and National Grid reported that more than 250,000 customers experienced a loss of power during the windstorm, with peak outages of approximately 123,000 and 48,000 for RG&E and NYSEG, respectively. Restoration took until March 13, 2017 for NYSEG and March 15, 2017 for RG&E. Customer outages for National Grid peaked at 113,000 and complete restoration was accomplished on March 12, 2017. Because of the extended length of restoration and deficiencies observed at the time of the event, Staff initiated an investigation. Staff's investigation found that in several instances, NYSEG and RG&E did not follow their emergency response plan; a violation of Commission regulations. Findings and recommendations of our investigation are in a document titled "March 2017 Windstorm: A Report on NYSEG and RG&E Electric Restoration and Communication Efforts".[5] On November 16, 2017, the Commission issued an Order Instituting Proceeding and to Show Cause as to why the Commission should not commence an administrative penalty action for violations of

[5] Case 17-E-0594, Proceeding on Motion of the Commission to Investigate the March 2017 Windstorm, Related Power Outages, and Rochester Gas and Electric and New York State Electric & Gas Restoration Efforts, March 2017 Windstorm: A Report on NYSEG and RGE Electric Restoration and Communication Efforts (filed November 2017).

Commission order and regulations.[6] As a result of that order, NYSEG and RG&E propose in a joint proposal to the Commission to address the 12 alleged violations for improperly responding to the windstorm that occurred on March 8, 2017. As proposed, the Companies would settle the matters for a total of $3,900,000.[7]

All utilities met their frequency and duration targets, except PSEG-LI, which, while showing improvement slightly missed its frequency target. Con Edison met its frequency RPM target for its radial distribution system; this performance is better than last year and the five-year average. Con Edison also met its RPM target for system-wide network frequency even though its network performance declined from its 2016 performance. Frequency performance for both Central Hudson and Orange & Rockland improved from 2016 and was better than their five-year averages. National Grid and PSEG-LI performed better than last year regarding frequency, but still underperformed compared to their five-year averages. RG&E's frequency performance was consistent with last year and better than its five-year average. Unlike the investor-owned utilities, PSEG-LI does not have rate orders or RPMs set by the Commission, however, its reliability performance metrics are set in its Operating Service Agreement. PSEG-LI's frequency performance improved from last year's performance, however, its performance did not meet the target, although PSEG-LI met its target for duration.[8]

While NYSEG narrowly met its RPM target this year, the company's frequency performance has markedly suffered over the last three years. Frequency has remained flat over the past three years while duration has declined steadily during the same period. Despite decreased outages in 2016 and 2017, NYSEG's response to its poor frequency performance has at best been adequate. NYSEG has been unable to show improvement in its frequency performance and should begin developing tools to drive reliability gains in both frequency and duration. Staff requested that NYSEG perform a

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[6] Case 17-E-0594, supra, Order Instituting Proceeding and To Show Cause (issued November 16, 2017).

[7] Case 17-E-0594, supra.

[8] The estimated impact has not been agreed upon by LIPA, Staff, and PSEG-LI.

self-assessment to identify the actions and tools to improve its reliability performance and to file the self-assessment with Staff by August 31, 2018.

INTRODUCTION

The Commission's regulations require utilities delivering electricity in New York State to collect and submit information to the Commission regarding electric service interruptions on a monthly basis.[9] The Commission also adopted electric service standards addressing the reliability of electric service provided to end-use customers in New York. The standards contain minimum acceptable performance levels for both the frequency and duration of service interruptions for each major electric utility's operating divisions.[10] Then, company-wide performance expectations are set in RPMs established by the Commission in rate orders for each utility, except for PSEG-LI, which are set in the Operating Service Agreement. The RPMs are designed such that companies are subjected to negative revenue adjustments for failing to meet the associated reliability targets.

The interruption data the utilities provided enables Staff to calculate two primary performance metrics: SAIFI or frequency and CAIDI or duration. The information is grouped into 10 categories that delineate the nature of the cause of interruption (cause code).[11] Analysis of the cause code data enables the utilities and Staff to identify areas where increased capital investment or maintenance is needed. As an example, if a circuit were shown to be prone to lightning-caused interruptions, arrestors

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[9] 16 NYCRR Part 97, Notification of Interruption of Service, requires utilities to keep detailed back-up data for six years.

[10] There are no revenue adjustments for failure to meet a minimum level under the electric service standards; utilities are, however, required to include a corrective action plan as part of the annual report.

[11] 16 NYCRR Part 97, Notification of Interruption of Service, specifies and defines the following ten cause codes that reflect the nature of the interruptions: major storms, tree contacts, overloads, operating errors, equipment failures, accidents, prearranged interruptions, customers equipment, lightning, and unknown. There are an additional seven cause codes used exclusively for Con Edison's underground network system.

could be installed on that circuit to try to minimize the effect of future lightning strikes. In general, most of a utility's interruptions are a result of major storms, tree contacts, equipment failures, and accidents.[12] Staff maintains interruption data from 1989 to the present in a database, which enables the observation of trends. The utilities must submit a formal reliability report by March 31 of each year that compares data against both the system-wide RPM targets and the operating division targets established in the Commission's Service Standards.

The RPMs include company-wide targets for outage frequency and duration. Some RPMs have additional measures to address specific concerns unique to an individual company.[13] All investor-owned electric utilities met both their frequency and duration RPM targets in 2017. PSEG-LI met its duration metric, but failed to meet its frequency metric. It should be noted that PSEG-LI performed better with respect to frequency in 2017 than in 2016.

2017 RELIABILITY PERFORMANCE

The following sections provide a summary discussion of the reliability performance statewide and for each of the major utilities. Individual company discussions identify issues or actions within each company that influenced performance levels for 2017 and indicate company-specific trends where applicable. Each year, Staff prepares an Interruption Report summarizing the monthly interruption data submitted by New York's utilities. The 2017 Interruption Report contains detailed interruption data for each utility and statewide statistics for the past five years. The Interruption Report for 2017 is attached as an Appendix to this Memorandum.

Interruption data is presented in two ways in this report – with major storms excluded and with major storms included. A major storm is defined in the Commission's

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[12] The accident cause code covers events not entirely within in the utilities' control including vehicular accidents, sabotage, and animal contacts. Lightning is reported under a separate cause code.

[13] National Grid has a project estimating target, which it missed, resulting in a $4 million negative revenue adjustment for 2017.

regulations as any storm which causes service interruptions of at least 10 percent of customers in an operating area and/or interruptions with duration of 24 hours or more. Major storm interruptions are excluded from the data used in calculating performance levels for service standards and reliability performance mechanisms. This exclusion achieves a balance between service interruptions under a utility's control, such as equipment failures and line maintenance, and those over which a utility's control is more limited, such as a severe ice storm or a heavy wet snowstorm. Reliability performance data inclusive of major storms reflects the overall customer experience during a year.

Statewide

For many years, Staff has combined individual utility performance statistics into overall statewide statistics. By doing so, Staff is able to evaluate the level of reliability provided statewide and identify statewide trends. Since Con Edison's system includes many large, highly concentrated distribution networks that are generally less prone to interruptions than overhead systems, its interruption frequency is extremely low (better) compared to the other utilities. This, combined with the fact that it serves the largest number of customers in the state, typically results in a skewing of the performance measures. As a result, Staff examines and presents aggregated data both including and excluding Con Edison's data.

Statewide, as shown in Figure 1, the frequency of interruptions excluding major storms was 0.62 in 2017, which is better than 2016 and is consistent with the statewide five-year average of 0.61. The frequency performance in 2017, for all utilities other than Con Edison, was 1.01, which is better than 2016 and is slightly worse than the five-year average of 0.98. Recent extensive major storms had a negative effect on reliability in New York. When including major storms, the 2017 statewide frequency performance was 0.85 and 1.40 for utilities other than Con Edison, indicating the effect major storms had on the upstate utilities. The March 2017 Windstorm caused the majority of storm related outages during 2017 affecting RG&E, NYSEG, and National Grid. Sustained winds of 50 to 70 miles per hour uprooted and snapped trees, which in turn caused severe damage to the electric infrastructure, resulting in 3,769 interruptions;

1,899 for RG&E, 1,492 for National Grid, and 378 for NYSEG. Peak outages were approximately 123,000 for RG&E, 48,000 for NYSEG, and 113,000 for National Grid. Restoration took until March 15, 2017 for RG&E; March 13, 2017 for NYSEG; and March 12, 2017 for National Grid. Because the outages lasted for more than three days and deficiencies were observed at the time of the event Staff initiated an investigation. In addition, RG&E, NYSEG, and National Grid were required to file with the Commission a storm report and scorecard.[14] Staff's investigation found that, in several instances, NYSEG and RG&E did not follow their emergency response plan; a violation of Commission regulations requiring emergency response plan compliance. Findings and recommendations of our investigation are in a document titled "March 2017 Windstorm: A Report on NYSEG and RG&E Electric Restoration and Communication Efforts".[15] On November 16, 2017, the Commission issued an Order Instituting Proceeding and to Show Cause.[16] As a result of that order, NYSEG and RG&E proposed in a joint proposal to the Commission to address the 12 alleged violations for improperly responding to the windstorm that occurred on March 8, 2017. As proposed, the Companies would settle the matters for a total of $3,900,000.

In 2017, major storms accounted for approximately 70% of the total customer-hours of interruptions and 27% of the overall number of customers affected. The weather events dominating the headlines recently indicate weather patterns are producing more frequent and powerful events. As a result, this reliability category is expected to decline given the number of significant weather events that have occurred in 2018 such as Winter Storm Riley, Winter Storm Quinn, and the May 15 Tornado.

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[14] 16 NYCRR §105.4(c), requires utilities to file reports reviewing all aspects of its preparation and system restoration performance for outages lasting longer than three days. These reports, as well as Staff's may be found on the Department's website: http://www.dps.ny.gov. See, Case 17–E-0594, supra, Order Approving the Scorecard for Use by the Commission as a Guidance Document to Assess Electric Utility Response to Significant Outages (issued December 23, 2013).

[15] Case 17-E-0594, supra, March 2017 Windstorm: A Report on NYSEG and RGE Electric Restoration and Communication Efforts (filed November 2017).

[16] Case 17-E-0594, supra, Order Instituting Proceeding and To Show Cause (issued November 16, 2017).

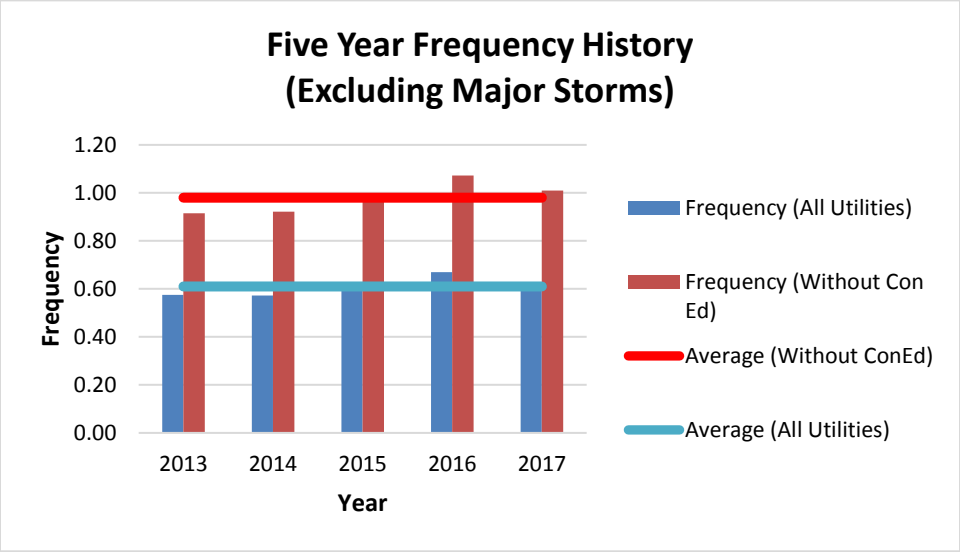

Figure 1: Statewide Frequency Performance

Statewide frequency performance modestly improved in 2017 compared to 2016, however, frequency was still elevated when compared to historical levels. Approximately one third of outages statewide in 2017 were due to tree contacts. As shown in Figure 2, the frequency of tree related interruptions continues an upward trend over the last four years for Central Hudson, NYSEG, and National Grid. The largest contributors to tree related interruptions were limbs and trees from outside the clearance zone; trees affected by invasive species and diseases; and weather conditions such as rain, wind, and/or lightning.

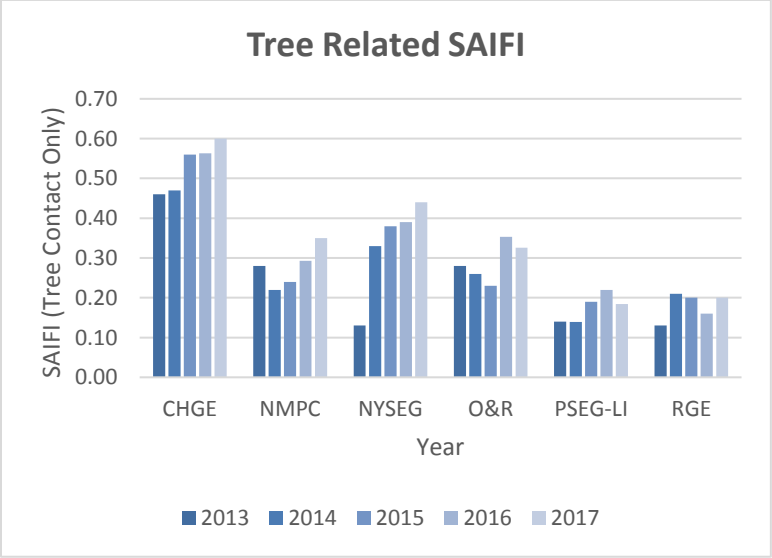

Figure 2: Tree Related SAIFI

Several companies have taken proactive measures to address this worsening trend in the frequency of tree related interruptions. For example, Central Hudson and National Grid have both developed and implemented emerald ash borer danger tree removal programs. This invasive insect decimates native Ash tree populations causing the death of Ash trees. In Case 17-E-0250, Central Hudson was allowed to defer up to $2 million to implement its Emerald Ash Borer (EAB) Danger Tree Program.[17] Under this program, the company would identify and remove danger Ash trees posing an imminent threat from outside the clearance zone to electric distribution infrastructure. National Grid's EAB program was adopted by the Commission in the 2018 Rate Order and identifies circuits for removal of Ash trees based on a circuit prioritization and field information on known infestations. National Grid started the EAB program in 2017 and will continue its mitigation efforts in future years as outlined in the company's approved rate plan.[18] In its current rate proceeding, Orange & Rockland seeks funding to implement an Ash Tree Mitigation Program in its service area.[19] These initiatives will supplement each company's standard vegetation management activities. PSEG-LI has improved its tree trimming program over the last four years to increase the clearance between vegetation and overhead wires, and increase the removal of hazard trees. In addition, PSEG-LI completed its four-year cycle of enhanced tree trimming in 2017 and reported positive effects on reliability.

Figure 3, below, shows the historical statewide interruption duration index, excluding major storms. The 2017 overall statewide interruption duration index of 1.88

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[17] Case 17-E-0250, Central Hudson - Deferral Accounting Authority for Incremental Funding for Distribution Hazard Tree and Electric Transmission Trimming Program and for Relief from the 2016 SAIFI Service Quality Performance Metric Violation and Expedited Treatment, Order Denying, in Part, Deferral Accounting and Recovery of Additional Distribution and Transmission Vegetation Management Funds and Relief From the 2016 Frequency Performance Metric (issued September 18, 2017).

[18] Cases 17-E-0238 and 17-G-0239, National Grid - Rates, Order Adopting Terms of Joint Proposal and Establishing Electric and Gas Rate Plans (issued March 15, 2018).

[19] Case 18-E-0067, Orange & Rockland – Electric Rates.

hours is worse than 2016 duration index of 1.85 hours and slightly better than the statewide five-year average of 1.90 hours. The statewide interruption duration index, excluding Con Edison, was 1.81 hours in 2017, which is consistent with the 2016 duration index of 1.79 hours and slightly better than the statewide five-year average of 1.82 hours.

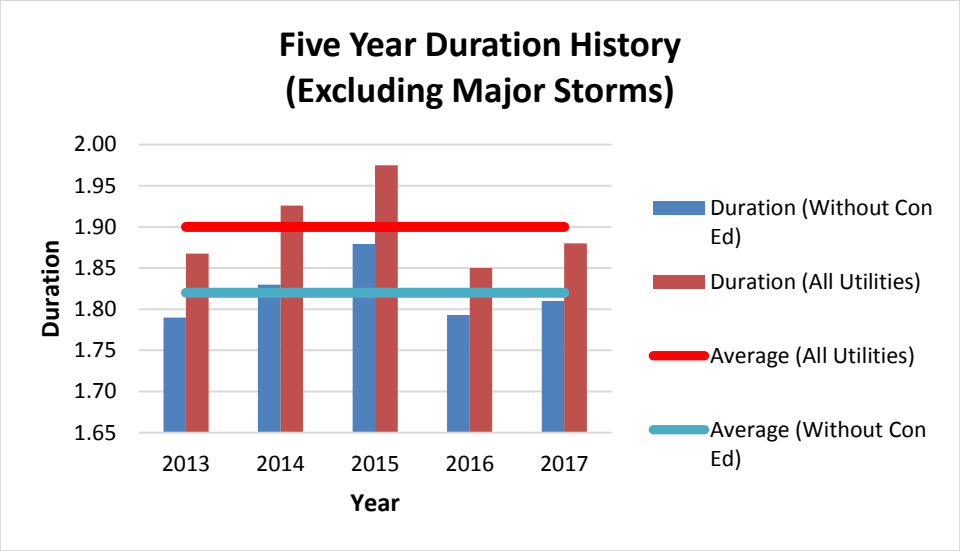


Figure 3: Statewide Duration Performance

As can be seen in Figure 4, calendar year 2017 had more customer hours of interruption when including major storms than calendar year 2016. As previously discussed, the March 2017 Windstorm accounted for the majority of the change in performance. Additionally, numerous fronts passed through the state in 2017 resulting in damaging winds, thunder storms, heavy snow, and ice. Combined, the electric utilities experienced 73 events in 2017 that qualified as major storms; approximately 11% more events than 2016. Of the 73 major storm events, 21 impacted NYSEG, 17 impacted National Grid, 12 impacted RG&E, eight impacted Central Hudson, six impacted Con Edison, five impacted PSEG-LI, and four impacted Orange & Rockland. Sustained interruptions associated with major storms in 2017 increased approximately 73% over 2016. The storms generally affected upstate service territories more than downstate as Con Edison had a similar experience to 2016 and PSEG-LI service territory experienced fewer storms in 2017 than it did in 2016.

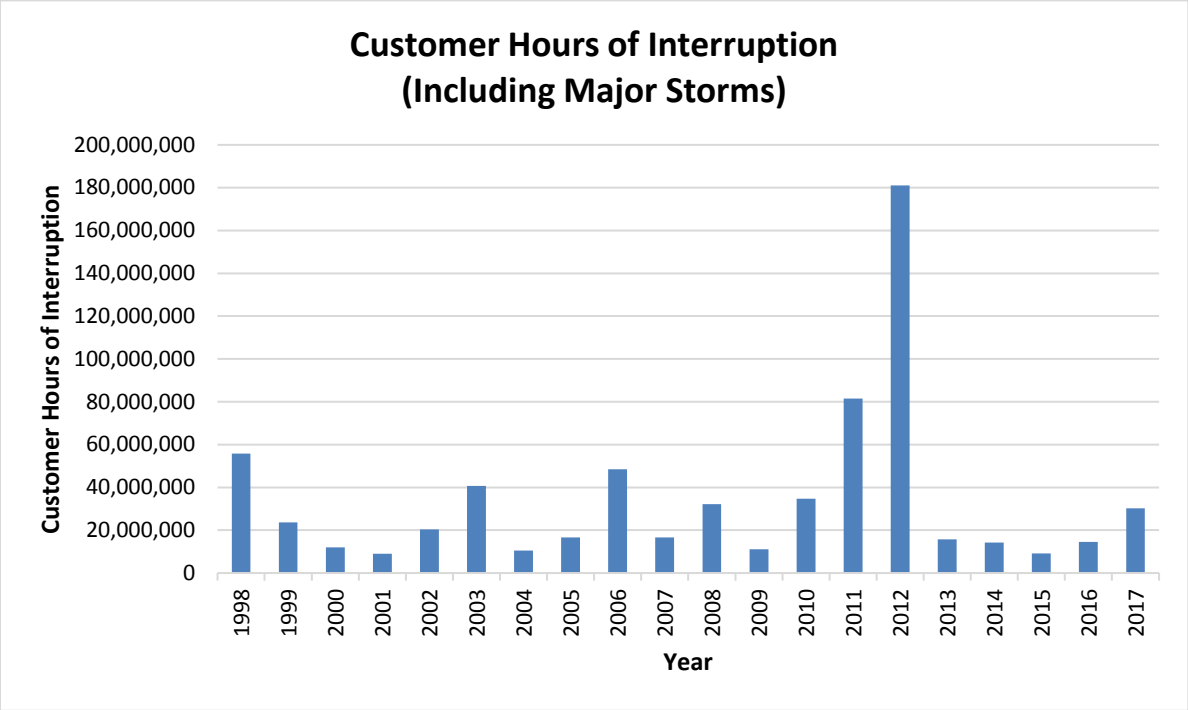


Figure 4: Customer Hours of Interruption (Including Major Storms)

CON EDISON

Table 1: Con Edison's Historic Performance Excluding Major Storms

Performance Metric	2013	2014	2015	2016	2017	Current RPM Target	Five-Year Average
Network Systems							
Frequency Customer Interruptions per 1,000 Customers	2.17	2.36	2.30	2.26	2.32	2.50	2.28
Duration Avg Interruption Hours	4.20	4.92	4.58	4.16	4.61	4.70	4.49
Radial System							
Frequency (SAIFI)	0.40	0.33	0.35	0.43	0.36	0.495	0.373
Duration (CAIDI)	2.02	1.83	1.95	1.89	1.92	2.04	1.92

Note: Data presented in red represents a failure to meet the RPM target for a given year.

Con Edison serves approximately 3.4 million customers in New York City and Westchester County. Electricity is supplied to 2.5 million customers by network systems, while the remaining 900,000 customers are supplied by radial systems. The network system is mostly underground wires housed in conduits, whereas the radial system is the typical overhead configuration. The two systems are subject to different reliability metrics specifically designed for their configurations. The number of interruptions per 1,000 customers served and average interruption duration is used to gauge network performances, while the radial system is measured in the same manner as other utilities.

Network Systems Performance

For network outage frequency, Con Edison met its RPM target of 2.50 in 2017, with a performance of 2.32. For network outage duration, the Company met its RPM target of 4.70 with a performance of 4.61. Con Edison's network performance for duration in 2017 declined from its performance last year, however, it was still below the company's RPM performance target. The company's network frequency performance was consistent with last year and the five-year average. On a divisional level, when compared to 2016 performance, all divisions experienced more frequent outages, and two

divisions experienced an increase in outage durations. Outage duration decreased in the Bronx, Westchester, and Manhattan, while outage duration increased in Brooklyn and Queens.

To maintain or improve reliability, Con Edison constructs new feeders, installs new underground equipment, installs vented manhole and service box covers, and rebuilds underground secondary distribution structures. Con Edison continues to carry out its reliability improvement action plan, which includes temporarily relocating crews to the Cleveland Street yard. This provides outage restoration support in the southeastern part of Brooklyn and Queens and reduces travel time to outage jobs while the Company works on its permanent location. The improvement action plan also calls for daily and monthly meetings, monitoring, and analyzing outage jobs to identify efficiency measures that can be implemented and other solutions to reduce the duration of outages. Through this effort, the Company identified and institutionalized the use of construction crews to help emergency crews respond to customer outages. According to Con Edison, the use of construction crews reduced the average crew dispatch time from 2015 to 2017 by 4%. Additionally, Con Edison states the monitoring efforts and increased use of shunts and bridges to quickly restore power have helped increase the number of outage jobs restored in two hours or less by 7%, compared to 2015.

Radial Performance

On its radial system, Con Edison met its system-wide RPM frequency target of 0.495 and its duration performance target of 2.04 with performances of 0.357 and 1.93, respectively. Con Edison's frequency performance was 16% better than last year, while its duration performance was consistent with recent performance. As shown in Figure 5, the majority of interruptions were caused by company equipment failure. The next leading contributors were tree contacts, and accidents outside the company's control.

For Con Edison's Bronx, Westchester, and Brooklyn divisions, the frequency performance improved by 12%, 26% and 50%, respectively, since 2016. Queens had the greatest increase in radial outage frequency, with a 14% increase from the 2016 value, while Staten Island had a 5% increase in frequency.

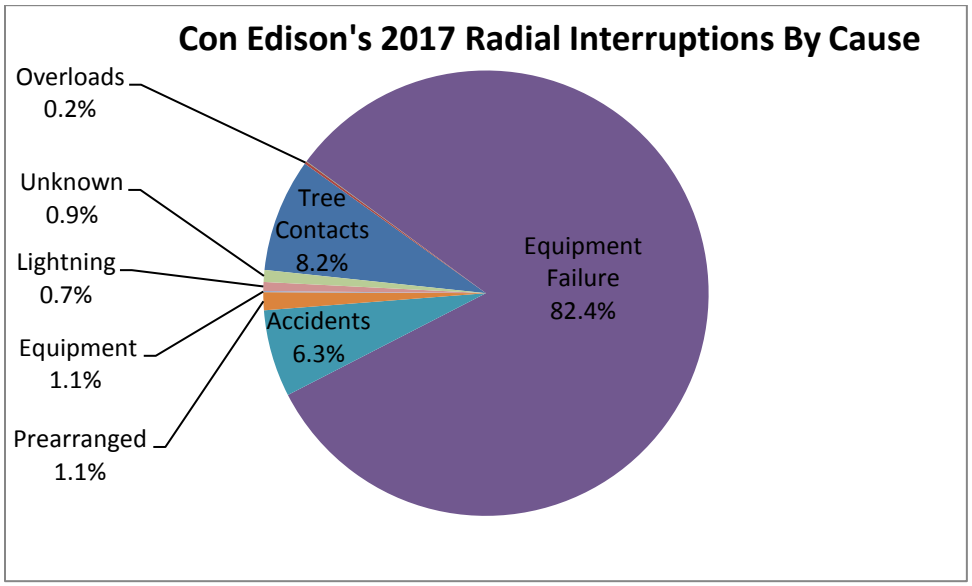


Figure 5: Con Edison's 2017 Radial Interruptions by Cause (Excluding Major Storms)

In Westchester, Queens, and the Bronx, outage durations improved by 2%, 4%, and 11%, respectively. In Brooklyn and Staten Island, the company's 2017 radial duration performance was not as good as its 2016 performance. The decline in radial duration performance in Brooklyn was primarily driven by equipment failure and an accident. Staten Island's decline in radial duration performance was primarily caused by equipment failure, followed by accidents and tree contacts. To maintain the reliability of its system, Con Edison continues to implement its tree trimming program, replace circuits and poles as needed, conduct feeder load relief work, and establish new circuits.

NATIONAL GRID

Table 2: National Grid's Historic Performance Excluding Major Storms

Performance Metric	2013	2014	2015	2016	2017	Current RPM Target	Five-Year Average
Frequency (SAIFI)	0.99	0.96	1.02	1.05	1.03	1.13	1.01
Duration (CAIDI)	1.96	1.94	2.04	2.02	1.99	2.05	1.99

National Grid's electric territory in New York is composed of eight divisions: Capital, Central, Frontier, Genesee, Mohawk Valley, Northeast, Northern, and Southwest. National Grid serves a total of approximately 1.6 million customers. For 2017, the Company met both the frequency and duration RPM reliability targets. The 2017 frequency level of 1.03 is consistent with recent performances and below the RPM target of 1.13. The 2017 duration performance of 1.99 hours is an improvement over the previous year and is the same as the five-year average.

At the division level, the company's actual frequency results for the Frontier and Genesee divisions were better than the targets. For the Capital, Central, Mohawk Valley, Northeast, Southwest, and Northern divisions, the Company missed its frequency targets. Only the Genesee Division performed satisfactorily with respect to both the frequency and duration targets, while the Capital, Northeast and Southwest were the only divisions in which the company missed both frequency and duration targets for the divisions.

As shown in Figure 6, tree contacts at 34.1%, equipment failure at 27.3% and accidents at 15.9% are the predominant causes of interruptions throughout National Grid's service territory. Historically, the leading cause of interruptions has been either equipment failure or tree contacts, with each accounting for approximately 30% of total customer interruptions. With respect to tree contact interruptions, fallen trees accounted for 73% and tree limbs accounted for 23% of the total interruptions caused by tree contact. The company attributed the 9% increase in tree contacts from 2016 to 2017 to more wind and severe weather impacting its service territory. National Grid continues to address tree contact issues through its vegetation management program, which includes

the aggressive removal of hazardous trees found outside the normal trim area in divisions with the highest tree densities and its proactive EAB program, discussed above.

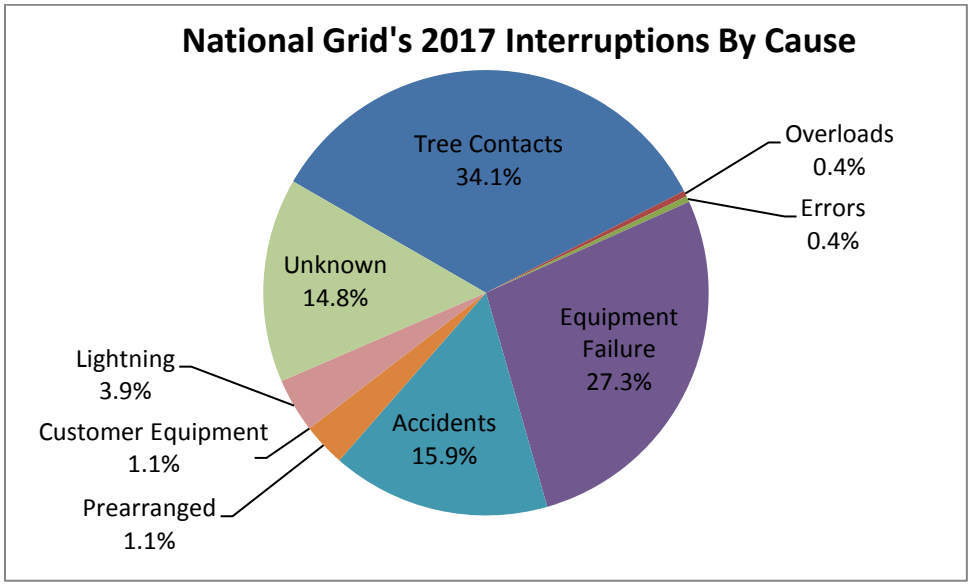


Figure 6: National Grid's 2016 Interruptions by Cause (Excluding Major Storms)

To improve reliability in specific trouble areas, National Grid identifies the worst performing feeders in each division. Each of these feeders is analyzed by the company to determine the root cause of unsatisfactory performance and a corrective action plan is developed. The following is a brief list of some of the actions taken and or planned by National Grid:

- additional pole top recloser installations;
- tree trimming, hazard tree removal, and EAB tree removal;
- lightning protection installations; and,
- reconductoring sections of circuits.

These actions are expected to increase feeder reliability and reduce the number of customers affected by future equipment failures. National Grid also uses its Inspection and Maintenance Program to identify and correct equipment issues. Although accidents continue to be the third largest cause of interruptions, instances were down in 2017 compared to 2016 and the five-year average. National Grid investigates all poles that are involved in vehicle accidents to identify hazardous locations and relocates poles if

considered necessary. Finally, to improve reliability and decrease equipment related interruptions, while performing maintenance work the company installs animal guards on transformers impacted by animals and all new transformers have animal guards preinstalled.

NYSEG

Table 3: NYSEG's Historic Performance Excluding Major Storms

Performance Metric	2013	2014	2015	2016	2017	Current RPM Target	Five-Year Average
Frequency (SAIFI)	1.09	1.03	1.17	1.19	1.18	1.20	1.13
Duration (CAIDI)	1.93	1.97	1.97	2.02	2.06	2.08	1.99

NYSEG serves approximately 884,000 customers across upstate New York and some areas of Westchester and Putnam counties. The company serves a primarily rural area that covers approximately 40% of New York. NYSEG's Divisions are Auburn, Binghamton, Brewster, Elmira, Geneva, Hornell, Ithaca, Lancaster, Liberty, Lockport, Mechanicville, Oneonta, and Plattsburgh. For reliability reporting purposes, the Lockport Division is combined with Lancaster.

Although NYSEG met both its frequency and duration RPM targets in 2017, the company has experienced a decrease in reliability over the last three years. NYSEG should develop tools to drive reliability gains in both frequency and duration to address these failures. For 2017, the company's frequency performance of 1.18 is worse than the five-year average of 1.13. The duration performance of 2.06 is also worse than NYSEG's five-year average of 1.99. The company attributes its poor performance on frequency and duration to minor storm events that did not meet the major storm requirements and motor vehicle accidents. NYSEG experienced 28 minor storm events and 12 motor vehicle accidents that impacted over 1,000 customers. Even so, more needs to be done by NYSEG to reverse the stagnant reliability performance and improve these measures. As a result of these concerns, Staff requested that NYSEG perform a self-

assessment to identify the actions and tools to improve its reliability performance and to file the self-assessment with Staff by August 31, 2018.

At the division level, the frequency and duration performances of Lancaster, Lockport, Liberty, and Plattsburgh divisions all were better than the targets established for the company. The Binghamton, Geneva, Hornell, and Mechanicville divisions also reported frequency performances better than the targets, but with duration performances worse than the targets. The Auburn, Brewster, and Elmira divisions each had a duration performance better than the targets, but their frequency performances were failed to meet the targets. Ithaca and Oneonta divisions both had frequency and duration performances worse than their targets.

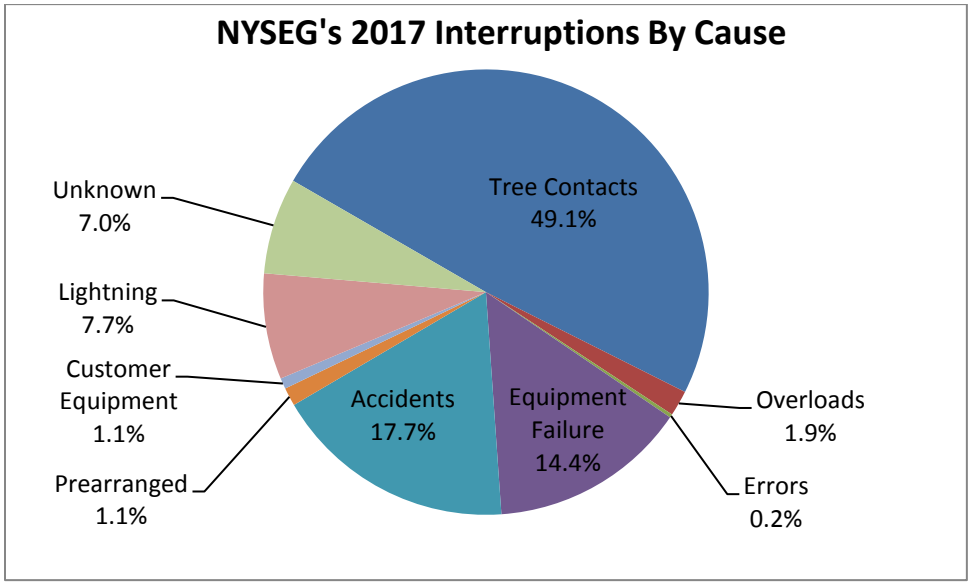


Figure 7: NYSEG's 2017 Interruptions by Cause (Excluding Major Storms)

As shown in Figure 7, above, for 2017, tree contacts, accidents, and equipment failure were the predominant causes of interruptions throughout NYSEG's twelve divisions. Historically, trees have the greatest impact on NYSEG's frequency rate compared to the other New York State utilities, with nearly half of all interruptions caused by tree contacts. Although the company met its corporate frequency and duration targets, NYSEG should consider, as part of the self-assessment discussed above, a more aggressive approach in mitigating tree contacts and equipment failures. The Company

should also consider how to implement a more aggressive danger-tree plan focused on identifying and removing danger trees, which pose a risk to electric distribution infrastructure from outside the clearance zone.

The Brewster and Liberty divisions continue to be focus areas for NYSEG due to the tree density in these areas. NYSEG is two years into its five-year trimming cycle in the Brewster division. In 2017, the company completed trimming trees in proximity to 13 circuits and has scheduled trimming on an additional 12 circuits in Brewster and five in the Liberty divisions during 2018. NYSEG continues to trim trouble areas in the other divisions, however, its self-assessment must focus more tree trimming efforts in Binghamton, Ithaca, Lancaster, and Oneonta Divisions specifically as these divisions experienced a high number of tree contact interruptions in 2017. Regarding automobile accidents, NYSEG continues to review accident data to determine if changes or modifications to its systems can help mitigate accident-related outages. Brewster, Elmira, Lancaster, Mechanicville, and Oneonta all experienced high number of automobile accident related interruptions. The company informed Staff that it is looking to relocate poles or add reflective tape around poles to make them more visible high accident-prone locations.

RG&E

Table 4: RG&E's Historic Performance Excluding Major Storms

Performance Metric	2013	2014	2015	2016	2017	Current RPM Target	Five-Year Average
Frequency (SAIFI)	0.73	0.76	0.75	0.58	0.59	0.90	0.68
Duration (CAIDI)	1.82	1.74	1.82	1.79	1.77	1.90	1.79

RG&E serves approximately 375,000 customers over its franchise area, located in and around Rochester, NY. The Company's territory is comprised of four divisions: Canandaigua, Genesee Valley, Lakeshore, and Rochester, with the Rochester division accounting for approximately 80% of its customer base. Accordingly, RG&E's system-wide reliability statistics generally parallel those of the Rochester division.

For the past five years, RG&E has consistently maintained high levels of electric service reliability for both frequency and duration. In 2017, RG&E outperformed its RPM targets of 0.90 for frequency and 1.90 for duration. While RG&E met its reliability targets at the corporate level in 2017, only the Rochester division satisfied both the frequency and duration targets at the division level. The Canandaigua, Genesee and Lakeshore divisions all had frequency performances better than the targets, but duration performances did not meet the targets. The Genesee and Canandaigua divisions' duration performances both declined from 2016.

Overall, the three major causes for interruptions throughout RG&E's divisions were equipment failures, tree contacts, and accidents, as shown in Figure 8. With regard to tree interruptions, RG&E will continue trimming distribution and transmission lines for hot spot and maintenance clearing. Regarding equipment failures, RG&E has historically used thermographic equipment to inspect equipment on an as needed basis. However, RG&E needs to evaluate the implementation of a yearly thermographic inspection cycle program. RG&E states that it continues to review accidents to determine if changes or modifications to its systems can help mitigate accident-related outages. In high accident locations, RG&E informed Staff that it is looking to relocate poles or add reflective tape around poles to make them more visible.

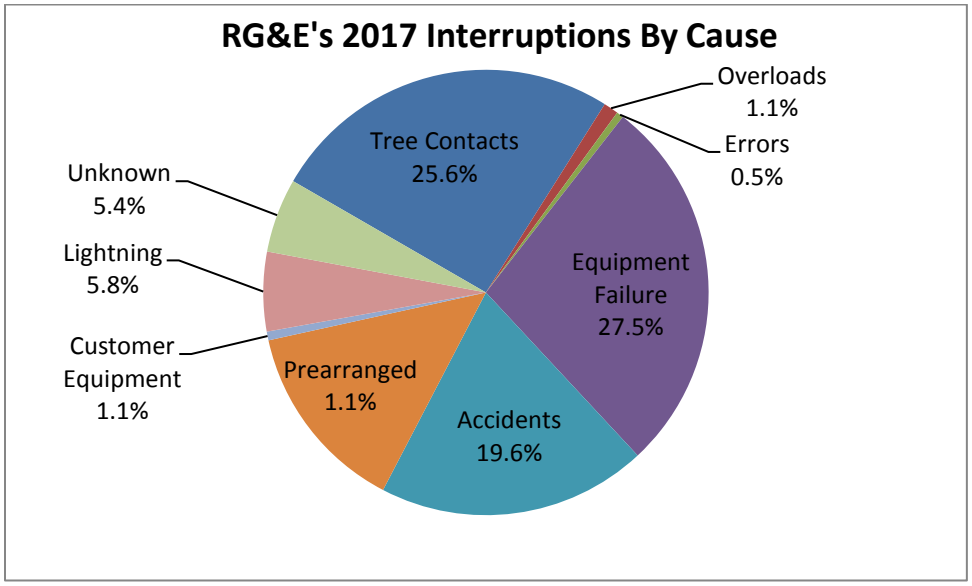


Figure 8: RG&E's 2017 Interruptions by Cause (Excluding Major Storms)

CENTRAL HUDSON

Table 5: Central Hudson's Historic Performance Excluding Major Storms

Performance Metric	2013	2014	2015	2016	2017	Current RPM Target	Five-Year Average
Frequency (SAIFI)	1.02	1.24	1.28	1.34	1.18	1.30	1.21
Duration (CAIDI)	2.30	2.27	2.07	2.33	2.20	2.50	2.24

Central Hudson serves approximately 300,000 customers in parts of the Hudson Valley Region. Central Hudson's divisions are Catskill, Fishkill, Kingston, Newburgh, and Poughkeepsie. About 70% of Central Hudson's territory is within the Kingston, Newburgh, and Poughkeepsie divisions.

For 2017, Central Hudson met its RPM targets for both frequency and duration. The Company's frequency level of 1.18 in 2017 is improved compared to its performance in 2014, 2015, and 2016 as well as its five-year average. Central Hudson's duration performance in 2017 was 2.20, which is better than three of the preceding four years and its five-year average.

At the division level, the Poughkeepsie, Fishkill, and Newburgh divisions had frequency indices which were better than their established targets of 1.20. The Catskill and Kingston divisions had frequency indices over their target of 1.00. The Catskill division exceeded its frequency target by 24% primarily due to tree contacts and accidents not under the utilities control. The Kingston division continues a worsening trend and exceeded its frequency target by 83%, mainly due to tree contacts. Distribution line clearance work is planned for 25 circuits in the Kingston division during 2018. This line clearance work is expected to improve the tree related frequency in the division. Additionally, the Kingston division is the center of activity for the Emerald Ash Borer in the company's territory. Through this program, the company expects additional improvement in frequency performance of the Kingston division.

The Kingston and Newburgh divisions both met their duration targets in 2017. The remaining divisions, Catskill, Poughkeepsie, and Fishkill duration performances were worse than their established individual targets. Tree related outages

were the main driver increasing duration hours in these divisions. Central Hudson's duration performance was better than 2016 and consistent with its five-year average.

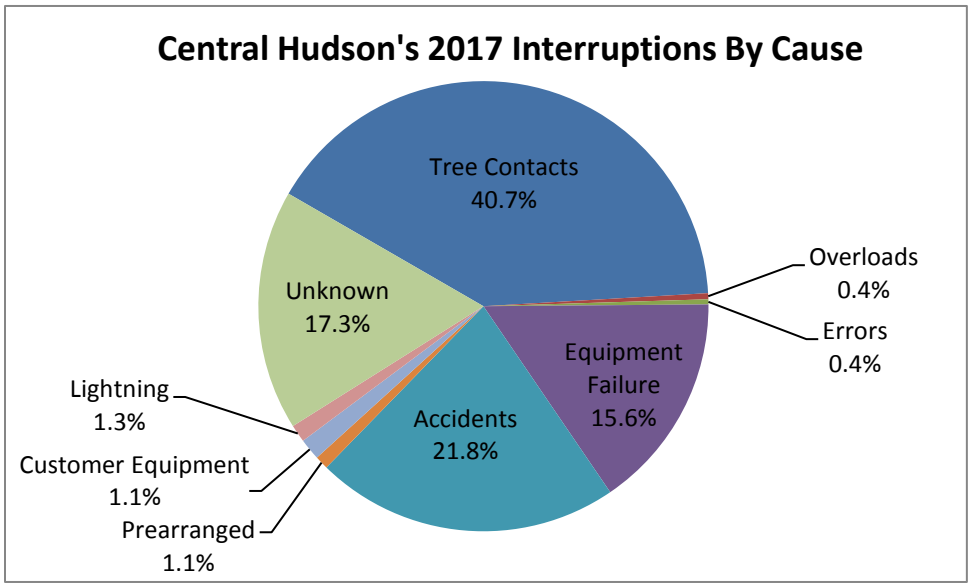


Figure 9: Central Hudson's 2017 Interruptions by Cause (Excluding Major Storms)

Figure 9, above, shows that the majority of interruptions are caused by tree contacts. Tree contact interruptions continue to increase when compared with previous years and are approximately 13% higher than the five-year average. The largest contributors to tree contact interruptions continue to be limbs and trees outside the clearance zone, danger trees and diseases affecting trees, and weather conditions such as rain, wind, and/or lightning. Tree interruptions have historically been the greatest driver of Central Hudson's electric service reliability. To mitigate the impacts of tree related outages, the company continues to perform distribution line clearance, which is aimed at improving tree related reliability on its distribution system. Outages resulting from vehicle accidents remain at historically high levels, however, decreased by 14% when compared with 2016. Animal contacts decreased by 2% compared to 2016 and is primarily due to Central Hudson continuing installation of animal guards and electronic reclosers. Equipment failures decreased by 36% when compared to 2016 and is an improvement of 32% over its five-year average. Central Hudson continues to push

multiple programs and projects to increase its reliability performance and system resiliency.

ORANGE & ROCKLAND

Table 6: Orange & Rockland's Historic Performance Excluding Major Storms

Performance Metric	2013	2014	2015	2016	2017	Current RPM Target	Five-Year Average
Frequency (SAIFI)	0.89	1.08	1.01	1.06	0.92	1.20	0.99
Duration (CAIDI)	1.62	1.62	2.44	1.70	1.68	1.85	1.81

Note: Data presented in red represents a failure to meet the RPM target for a given year.

Orange & Rockland serves approximately 224,000 customers in three New York counties along the New Jersey and Pennsylvania border. In 2017, the company's frequency performance of 0.92 was better than the established target and was the second-best frequency performance by the company in the past 20 years. The company's duration performance was also better than the established target and below the five-year average.

As shown in Figure 10, equipment failures and tree contacts continue to be the major causes of interruptions. Tree related interruptions increased for the second year in a row while equipment failure related interruptions remained consistent with 2016's performance. Combined, in 2017, these two categories account for approximately 61% of all interruptions, customers affected, and customer hours of interruption. Motor vehicle accidents had a more significant impact on system performance in 2017 than in previous years.

The total number of equipment failure interruptions for the past three years are above the five-year average. While the company did not attribute this to the failure rate of any single component of its system, primary and secondary wire failure rates in both the overhead and underground systems were above historical levels. The company states that it will continue to monitor the performance of all equipment to identify trends in any single system component, and take mitigating actions as necessary. Orange &

Rockland continues to address tree contact issues through its vegetation management and is proposing a proactive EAB ash tree mitigation removal program.

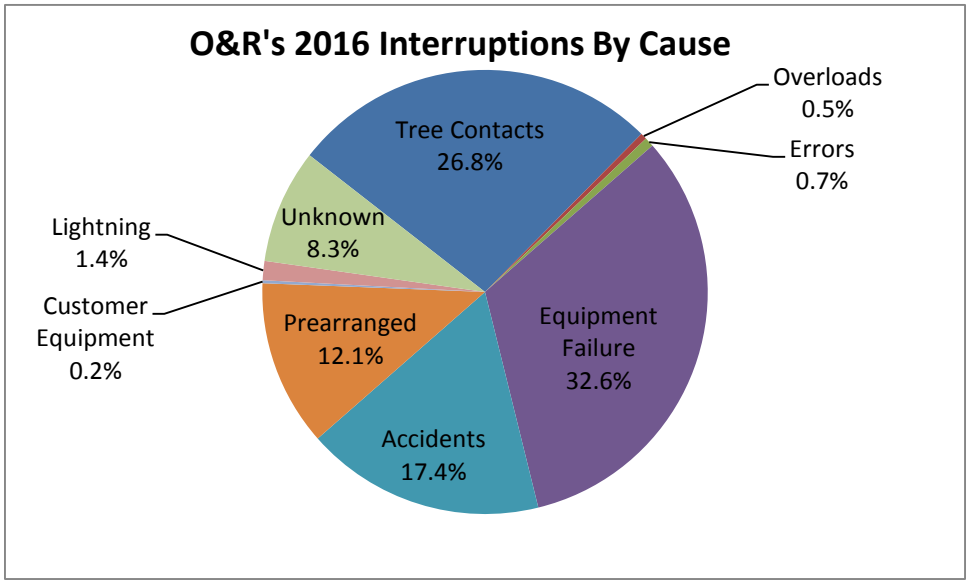


Figure 10: Orange & Rockland's 2017 Interruptions by Cause (Excluding Major Storms)

The performance trends related to tree contacts and equipment failures remained consistent for each division. The year-end frequency for the Eastern division was better than the division's five-year average and better than the established target. The Eastern division's duration performance was its best since 2009. The Central division met its frequency target, but duration performances were worse than the target; the second year in a row that duration increased over the previous year. In the Western division both frequency and duration improved over 2016, with frequency being the best since 2012 and duration, matching the 2011 performance, which was being the best over the last 21 years. The two major causes of interruption for all three divisions were equipment failure and tree contacts. In the Central division tree contacts were at their highest level since 2009.

Overall, the Orange & Rockland performed well in 2017. It exceeded both the frequency and duration corporate RPM target metrics. Frequency performance was 23% better than the target and duration performance was 9.3% better than the target, however, outages caused by tree contact increased in 2017 by approximately 12%.

PSEG-LI

Table 7: PSEG-LI's Historic Performance Excluding Major Storms

Performance Metric	2013	2014	2015	2016	2017	Current OSA Target	Five-Year Average
Frequency (SAIFI)	0.71	0.72	0.84	1.11	0.95	0.92	0.87
Duration (CAIDI)	1.13	1.36	1.31	1.14	1.16	1.42	1.22

PSEG-LI serves approximately 1,122,000 customers on Long Island. The utility's territory includes Nassau County, Suffolk County, and the Rockaway Peninsula. PSEG-LI began operating and maintaining the electric system on Long Island on January 1, 2014. Prior to PSEG-LI, National Grid operated the system and it supplied interruption data to the Department to assist in its statewide analysis. Unlike the other utilities, the Commission does not issue rate orders for PSEG-LI, thus the Commission has not imposed an RPM on it. Instead, performance metrics were set as part of PSEG-LI's Amended Operating Service Agreement (OSA) with the Long Island Power Authority.[20]

In 2017, PSEG-LI met its OSA duration target but slightly missed its frequency target. PSEG-LI's frequency level of 0.95, while an improvement over last year, still does not achieve the OSA target. This is the second straight year that PSEG-LI failed to meet the OSA frequency target. The financial impact of the missed OSA target will be calculated once PSEG-LI formally submits its year-end metrics performance report. PSEG-LI's duration performance of 1.16 hours, is well below the current OSA target, better than the five-year average, but slightly worse than last year. Figure 11, below, shows equipment failures are by far the leading cause of interruptions followed by tree contacts, and accidents.

[20] Amended and Restated Operations Services Agreement between Long Island Lighting Company d/b/a LIPA and PSEG Long Island LLC, Dated as of December 31, 2013. (http://www.lipower.org/papers/agreements.html)

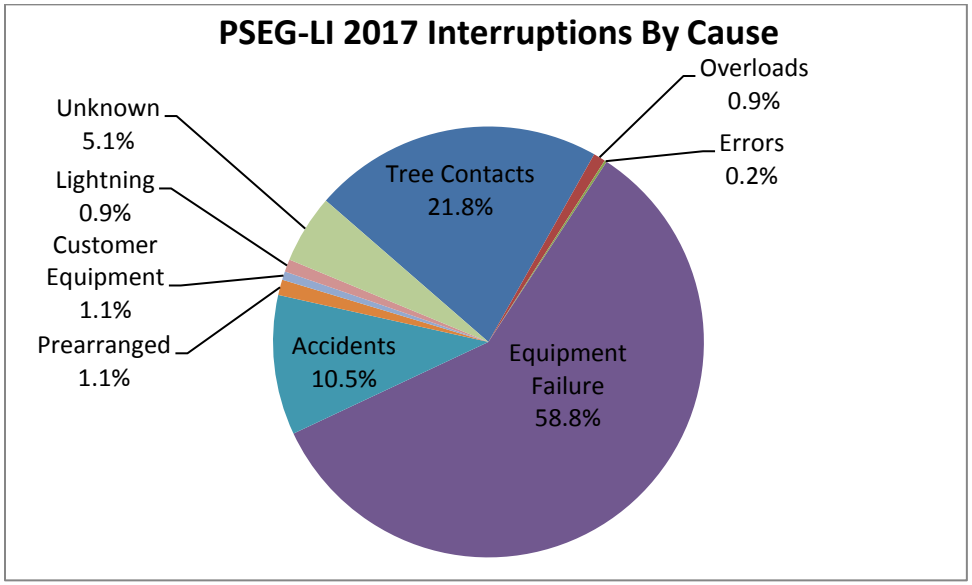


Figure 11: PSEG-LI's 2017 Interruptions by Cause (Excluding Major Storms)

PSEG-LI reports that it continues to target reliability enhancements through various programs and initiatives. Reliability enhancement focused initiatives include programs such as a Circuit Improvement Program, Multiple Device Operations Program, Multiple Customer Outages Program, Underground Distribution Cable Replacement Program, and a Pole Inspection Program. During 2018, PSEG-LI states that it will also implement over $423 million in capital projects to improve the transmission and distribution (T&D) system and over $46 million on preventative maintenance programs, including tree trimming. Finally, PSEG-LI continues to implement a $729 million Federal Emergency Management Agency (FEMA) Storm Hardening Program that consists of raising substation equipment in flood prone areas, reconstructing over 1,000 miles of main-line distribution using stronger poles, shorter cross arms and tree-resistant wire, and installing additional automated sectionalizing devices to minimize customers interrupted in the event of a fault.

Over the last four years, PSEG-LI has enhanced its tree trimming program by increasing the clearance to overhead wires and increasing the removal of hazard trees. In 2017, 221 circuits and 2,251 circuit miles were trimmed; PSEG-LI plans to complete work on 364 circuits and 3,000 miles in 2018. PSEG-LI completed its first four-year cycle of enhanced tree trimming in 2017 and reported some positive effects. Specifically,

when excluding major storms, for circuits with at least one year of history since being trimmed to the new specification there has been a 40% reduction, on average, in customers interrupted and a 33% reduction in customer minutes.

APPENDIX

The 2017 Interruption Report

Office of Electric, Gas, and Water
June 2018

ATTACHMENT
Definitions and Explanations of Terms Used in The Statewide Electric Service Interruption Report

Interruption is the loss of service for five minutes or more.

Customer Hours is the time a customer is without electric service.

Customers Affected is the number of customers without electric service.

Customer Served is the number of customers as of the last day of the current year. For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

Frequency (SAIFI) measures the average number of interruptions experienced by customers served by the utility. It is the customers affected divided by the customers served at the end of the previous year.

Duration (CAIDI) measures the average time that an affected customer is out of electric service. It is the customer hours divided by the customers affected.

Availability (SAIDI) is the average amount of time a customer is out of service during a year. It is the customer hours divided by the number of customers served at the end of the year. Mathematically it is SAIFI multiplied by CAIDI.

Interruptions per 1,000 Customers Served is the number of interruptions divided by the number of customers served at the end of the previous year, divided by 1,000.

Major Storm is defined as any storm which causes service interruptions of at least ten percent of customers in an operating area, or if the interruptions last for 24 hours or more.

Operating Area is the geographical subdivision of each electric utilities franchise territory. These are also called regions, divisions, or districts.

Most of the data is presented in two ways, with major storms included and major storms excluded. Major storms tend to distort a utility's performance trend. Tables and graphs that exclude major storms illustrate interruptions that are under a utility's control. It portrays a utility's system facilities under normal conditions, although this can be misleading because interruptions during "normal" bad weather are included and it is difficult to analyze from year to year.

The first two tables show frequency and duration indices for the last five years for each utility and Statewide with and without Con Edison data. Much of the Con Edison distribution system consists of a secondary network. In a secondary network, a customer is fed multiple supplies, significantly reducing the probability of interruptions.

COMPARISON OF SERVICE RELIABILITY INDICES
(EXCLUDING MAJOR STORMS)

	2013	2014	2015	2016	2017	5 YR AVG
CHGE						
FREQUENCY	1.02	1.24	1.28	1.34	1.18	1.21
DURATION	2.30	2.27	2.07	2.33	2.20	2.24
CONED						
FREQUENCY	0.12	0.11	0.11	0.13	0.11	0.12
DURATION	2.67	3.02	3.11	2.49	2.77	2.81
PSEG-LI *						
FREQUENCY	0.71	0.72	0.84	1.11	0.95	0.87
DURATION	1.13	1.36	1.31	1.14	1.16	1.22
NAT GRID						
FREQUENCY	0.99	0.96	1.02	1.05	1.03	1.01
DURATION	1.96	1.94	2.04	2.02	1.99	1.99
NYSEG						
FREQUENCY	1.10	1.03	1.17	1.19	1.18	1.13
DURATION	1.93	1.97	1.97	2.02	2.06	1.99
O&R						
FREQUENCY	0.89	1.08	1.01	1.06	0.92	0.99
DURATION	1.62	1.62	2.44	1.70	1.68	1.81
RG&E						
FREQUENCY	0.73	0.76	0.75	0.58	0.59	0.68
DURATION	1.82	1.74	1.82	1.79	1.77	1.79
STATEWIDE (WITHOUT CON EDISON)						
FREQUENCY	0.92	0.92	1.00	1.07	1.01	0.98
DURATION	1.79	1.83	1.88	1.79	1.81	1.82
STATEWIDE (WITH CONEDISON)						
FREQUENCY	0.57	0.57	0.62	0.67	0.62	0.61
DURATION	1.87	1.93	1.97	1.85	1.88	1.90

COMPARISON OF SERVICE RELIABILITY INDICES
(INCLUDING MAJOR STORMS)

	2013	2014	2015	2016	2017	5 YR AVG
CHGE						
FREQUENCY	1.06	1.62	1.38	1.45	1.54	1.41
DURATION	2.36	3.74	2.09	2.51	3.24	2.79
CONED						
FREQUENCY	0.13	0.11	0.11	0.14	0.12	0.12
DURATION	2.71	3.09	3.14	2.67	2.90	2.91
PSEG-LI *						
FREQUENCY	0.89	0.76	1.00	1.34	1.10	1.02
DURATION	1.65	1.42	1.95	1.46	1.70	1.64
NAT GRID						
FREQUENCY	1.39	1.17	1.06	1.18	1.42	1.24
DURATION	3.61	2.87	2.07	2.41	4.14	3.02
NYSEG						
FREQUENCY	1.41	1.34	1.28	1.57	1.83	1.48
DURATION	2.34	2.97	2.14	2.89	3.98	2.86
O&R						
FREQUENCY	1.02	1.19	1.01	1.21	1.06	1.10
DURATION	2.06	2.40	2.44	1.96	2.10	2.19
RG&E						
FREQUENCY	0.91	0.85	0.87	0.70	1.34	0.93
DURATION	2.75	2.32	2.14	2.09	18.32	5.52
STATEWIDE (WITHOUT CON EDISON)						
FREQUENCY	1.19	1.10	1.09	1.28	1.40	1.21
DURATION	2.76	2.67	2.08	2.25	4.60	2.87
STATEWIDE (WITH CON EDISON)						
FREQUENCY	0.73	0.68	0.67	0.79	0.85	0.74
DURATION	2.75	2.70	2.16	2.28	4.50	2.88

STATEWIDE (WITHOUT CON EDISON)

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	52,863	53,723	53,551	57,960	56,766	54,973
Number of Customer-Hours	7,321,410	7,535,845	8,408,508	8,636,377	8,223,141	8,025,056
Number of Customers Affected	4,090,130	4,117,993	4,474,728	4,815,522	4,555,618	4,410,798
Number of Customers Served	4,466,568	4,480,215	4,494,878	4,517,887	4,543,176	4,500,545
Average Duration Per Customer Affected (CAIDI)	1.79	1.83	1.88	1.79	1.81	1.82
Average Duration Per Customers Served	1.64	1.69	1.88	1.92	1.82	1.79
Interruptions Per 1000 Customers Served	11.83	12.03	11.95	12.89	12.56	12.25
Number of Customers Affected Per Customer Served (SAIFI)	0.92	0.92	1.00	1.07	1.01	0.98

STATEWIDE (WITH CON EDISON)

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	66,804	69,760	70,017	71,704	72376	70,132
Number of Customer-Hours	8,380,016	8,624,342	9,582,883	9,710,475	9275141	9,114,571
Number of Customers Affected	4,487,270	4,478,047	4,852,363	5,246,331	4935045	4,799,811
Number of Customers Served	7,815,448	7,842,410	7,880,054	7,928,059	7,978,073	7,888,809
Average Duration Per Customer Affected (CAIDI)	1.87	1.93	1.97	1.85	1.88	1.90
Average Duration Per Customers Served	1.07	1.10	1.22	1.23	1.17	1.16
Interruptions Per 1000 Customers Served	8.56	8.93	8.93	9.10	9.13	8.93
Number of Customers Affected Per Customer Served (SAIFI)	0.57	0.57	0.62	0.67	0.62	0.61

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

STATEWIDE (WITHOUT CON EDISON)

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	63,885	62,009	56,723	66,790	71,951	64,272
Number of Customer-Hours	14,653,454	13,143,570	10,190,618	12,917,487	29,114,338	16,003,893
Number of Customers Affected	5,315,365	4,930,250	4,892,482	5,738,707	6,329,697	5,441,300
Number of Customers Served	4,466,568	4,480,215	4,494,878	4,517,887	4,543,176	4,500,545
Average Duration Per Customer Affected (CAIDI)	2.76	2.67	2.08	2.25	4.60	2.87
Average Duration Per Customers Served	3.28	2.94	2.27	2.87	6.44	3.56
Interruptions Per 1000 Customers Served	14.30	13.88	12.66	14.86	15.93	14.33
Number of Customers Affected Per Customer Served (SAIFI)	1.19	1.10	1.09	1.28	1.40	1.21

STATEWIDE (WITH CON EDISON)

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	78,024	78,436	73,468	80,994	88,151	79,815
Number of Customer-Hours	15,785,340	14,300,945	11,381,657	14,148,142	30,293,340	17,181,885
Number of Customers Affected	5,732,710	5,304,278	5,271,638	6,199,042	6,735,617	5,848,657
Number of Customers Served	7,815,448	7,842,410	7,880,054	7,928,059	7,978,073	7,888,809
Average Duration Per Customer Affected (CAIDI)	2.75	2.70	2.16	2.28	4.50	2.88
Average Duration Per Customers Served	2.02	1.83	1.45	1.80	3.82	2.18
Interruptions Per 1000 Customers Served	9.99	10.04	9.37	10.28	11.12	10.16
Number of Customers Affected Per Customer Served (SAIFI)	0.73	0.68	0.67	0.79	0.85	0.74

** Customer Served is the number of customers as of the last day of the current year. For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

CENTRAL HUDSON

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	5,497	6,608	6,387	7,407	7,129	6,606
Number of Customer-Hours	708,055	844,753	797,184	938,066	785,105	814,633
Number of Customers Affected	307,889	371,442	384,364	402,140	357,572	364,681
Number of Customers Served	299,591	300,225	300,647	302,432	302,187	301,016
Average Duration Per Customer Affected (CAIDI)	2.30	2.27	2.07	2.33	2.20	2.24
Average Duration Per Customers Served	2.36	2.82	2.66	3.12	2.60	2.71
Interruptions Per 1000 Customers Served	18.29	22.06	21.27	24.64	23.57	21.97
Number of Customers Affected Per Customer Served (SAIFI)	1.02	1.24	1.28	1.34	1.18	1.21

CENTRAL HUDSON

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	5,665	8,160	6,587	7,802	8,344	7,312
Number of Customer-Hours	751,644	1,810,447	867,550	1,096,082	1,512,967	1,207,738
Number of Customers Affected	318,352	483,848	414,932	436,716	466,830	424,136
Number of Customers Served	299,591	300,225	300,647	302,432	302,187	301,016
Average Duration Per Customer Affected (CAIDI)	2.36	3.74	2.09	2.51	3.24	2.79
Average Duration Per Customers Served	2.50	6.04	2.89	3.65	5.00	4.02
Interruptions Per 1000 Customers Served	18.85	27.24	21.94	25.95	27.59	24.31
Number of Customers Affected Per Customer Served (SAIFI)	1.06	1.62	1.38	1.45	1.54	1.41

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

CON EDISON (SYSTEM)

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	13,941	16,037	16,466	13,744	15,610	15,160
Number of Customer-Hours	1,058,605	1,088,498	1,174,375	1,074,098	1,052,001	1,089,515
Number of Customers Affected	397,140	360,054	377,635	430,809	379,427	389,013
Number of Customers Served	3,348,880	3,362,195	3,385,176	3,410,172	3,434,897	3,388,264
Average Duration Per Customer Affected (CAIDI)	2.67	3.02	3.11	2.49	2.77	2.81
Average Duration Per Customers Served	0.32	0.33	0.35	0.32	0.31	0.32
Interruptions Per 1000 Customers Served	4.18	4.79	4.90	4.06	4.58	4.50
Number of Customers Affected Per Customer Served (SAIFI)	0.12	0.11	0.11	0.13	0.11	0.12

CON EDISON (SYSTEM)

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	14,139	16,427	16,745	14,204	16,200	15,543
Number of Customer-Hours	1,131,886	1,157,376	1,191,039	1,230,655	1,179,002	1,177,992
Number of Customers Affected	417,345	374,028	379,156	460,335	405,920	407,357
Number of Customers Served	3,348,880	3,362,195	3,385,176	3,410,172	3,434,897	3,388,264
Average Duration Per Customer Affected (CAIDI)	2.71	3.09	3.14	2.67	2.90	2.91
Average Duration Per Customers Served	0.34	0.35	0.35	0.36	0.35	0.35
Interruptions Per 1000 Customers Served	4.23	4.91	4.98	4.20	4.75	4.61
Number of Customers Affected Per Customer Served (SAIFI)	0.13	0.11	0.11	0.14	0.12	0.12

CON EDISON (NETWORK)

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	7,574	10,080	10,523	6,980	9,462	8,924
Number of Customer-Hours	348,433	543,158	569,966	348,053	441,055	450,133
Number of Customers Affected	45,294	63,013	67,966	46,918	62,005	57,039
Number of Customers Served	2,461,468	2,473,101	2,497,705	2,510,320	2,545,351	2,497,589
Average Duration Per Customer Affected (CAIDI)	7.69	8.62	8.39	7.42	7.11	7.85
Average Duration Per Customers Served	0.14	0.22	0.23	0.14	0.18	0.18
Interruptions Per 1000 Customers Served	3.09	4.10	4.25	2.79	3.77	3.60
Number of Customers Affected Per Customer Served (SAIFI)	0.018	0.026	0.027	0.019	0.025	0.02

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

CON EDISON (RADIAL)

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	6,367	5,957	5,943	6,764	6148	6,236
Number of Customer-Hours	710,171	545,339	604,408	726,044	610945	639,381
Number of Customers Affected	351,846	297,041	309,669	383,891	317422	331,974
Number of Customers Served	887,412	889,094	887,471	899,852	889,546	890,675
Average Duration Per Customer Affected (CAIDI)	2.02	1.84	1.95	1.89	1.92	1.92
Average Duration Per Customers Served	0.80	0.61	0.68	0.82	0.68	0.72
Interruptions Per 1000 Customers Served	7.20	6.71	6.68	7.62	6.83	7.01
Number of Customers Affected Per Customer Served (SAIFI)	0.40	0.33	0.35	0.43	0.35	0.37

CON EDISON (RADIAL)

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	6,565	6,347	6,222	7,224	6738	6,619
Number of Customer-Hours	783,452	614,218	621,073	882,602	737947	727,858
Number of Customers Affected	372,051	311,015	311,190	413,417	343915	350,318
Number of Customers Served	887,412	889,094	887,471	899,852	889,546	890,675
Average Duration Per Customer Affected (CAIDI)	2.11	1.97	2.00	2.13	2.15	2.07
Average Duration Per Customers Served	0.89	0.69	0.70	0.99	0.82	0.82
Interruptions Per 1000 Customers Served	7.42	7.15	7.00	8.14	7.49	7.44
Number of Customers Affected Per Customer Served (SAIFI)	0.42	0.35	0.35	0.47	0.38	0.39

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

NATIONAL GRID

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	14,160	13,271	13,385	13,978	13,743	13,707
Number of Customer-Hours	3,102,175	2,979,765	3,343,062	3,398,634	3,333,796	3,231,486
Number of Customers Affected	1,585,651	1,537,355	1,640,947	1,684,257	1,671,096	1,623,861
Number of Customers Served	1,607,502	1,608,164	1,609,787	1,622,512	1,635,856	1,616,764
Average Duration Per Customer Affected (CAIDI)	1.96	1.94	2.04	2.02	1.99	1.99
Average Duration Per Customers Served	1.93	1.85	2.08	2.11	2.05	2.01
Interruptions Per 1000 Customers Served	8.83	8.26	8.32	8.68	8.47	8.51
Number of Customers Affected Per Customer Served (SAIFI)	0.99	0.96	1.02	1.05	1.03	1.01

NATIONAL GRID

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	19,069	16,377	13,789	16,104	18,881	16,844
Number of Customer-Hours	8,047,050	5,374,356	3,543,893	4,597,543	9,513,770	6,215,322
Number of Customers Affected	2,232,186	1,874,011	1,711,850	1,906,370	2,296,097	2,004,103
Number of Customers Served	1,607,502	1,608,164	1,609,787	1,622,512	1,635,856	1,616,764
Average Duration Per Customer Affected (CAIDI)	3.61	2.87	2.07	2.41	4.14	3.02
Average Duration Per Customers Served	5.02	3.34	2.20	2.86	5.86	3.86
Interruptions Per 1000 Customers Served	11.89	10.19	8.57	10.00	11.64	10.46
Number of Customers Affected Per Customer Served (SAIFI)	1.39	1.17	1.06	1.18	1.42	1.24

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

NYSEG

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	10,022	9,925	10,628	10,375	10,441	10,278
Number of Customer-Hours	1,814,646	1,738,911	1,992,932	2,108,879	2,141,108	1,959,295
Number of Customers Affected	940,750	884,683	1,012,506	1,042,453	1,037,330	983,544
Number of Customers Served	855,347	867,392	875,383	879,066	884,136	872,265
Average Duration Per Customer Affected (CAIDI)	1.93	1.97	1.97	2.02	2.06	1.99
Average Duration Per Customers Served	2.11	2.03	2.30	2.41	2.44	2.26
Interruptions Per 1000 Customers Served	11.68	11.60	12.25	11.85	11.88	11.85
Number of Customers Affected Per Customer Served (SAIFI)	1.10	1.03	1.17	1.19	1.18	1.13

NYSEG

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	11,729	12,332	11,203	13,025	14,289	12,516
Number of Customer-Hours	2,830,224	3,391,684	2,381,242	3,977,003	6,390,928	3,794,216
Number of Customers Affected	1,210,993	1,143,341	1,110,385	1,374,336	1,604,622	1,288,735
Number of Customers Served	855,347	867,392	875,383	879,066	884,136	872,265
Average Duration Per Customer Affected (CAIDI)	2.34	2.97	2.14	2.89	3.98	2.86
Average Duration Per Customers Served	3.30	3.97	2.75	4.54	7.27	4.36
Interruptions Per 1000 Customers Served	13.66	14.42	12.92	14.88	16.25	14.43
Number of Customers Affected Per Customer Served (SAIFI)	1.41	1.34	1.28	1.57	1.83	1.48

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

PSEG-LI

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	17,672	17,721	17,214	20,139	19,009	18,351
Number of Customer-Hours	890,558	1,096,866	1,222,162	1,408,373	1,229,618	1,169,515
Number of Customers Affected	791,039	805,693	934,097	1,237,719	1,064,452	966,600
Number of Customers Served	1,115,781	1,113,474	1,116,191	1,118,963	1,122,011	1,117,284
Average Duration Per Customer Affected (CAIDI)	1.13	1.36	1.31	1.14	1.16	1.22
Average Duration Per Customers Served	0.80	0.98	1.10	1.26	1.10	1.05
Interruptions Per 1000 Customers Served	15.80	15.88	15.46	18.04	16.99	16.43
Number of Customers Affected Per Customer Served (SAIFI)	0.71	0.72	0.84	1.11	0.95	0.87

PSEG-LI

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	21,401	18,586	19,061	23,292	21,288	20,726
Number of Customer-Hours	1,648,627	1,210,719	2,166,956	2,183,379	2,092,168	1,860,370
Number of Customers Affected	997,229	853,209	1,111,055	1,495,619	1,228,334	1,137,089
Number of Customers Served	1,115,781	1,113,474	1,116,191	1,118,963	1,122,011	1,117,284
Average Duration Per Customer Affected (CAIDI)	1.65	1.42	1.95	1.46	1.70	1.64
Average Duration Per Customers Served	1.47	1.09	1.95	1.96	1.87	1.67
Interruptions Per 1000 Customers Served	19.13	16.66	17.12	20.87	19.02	18.56
Number of Customers Affected Per Customer Served (SAIFI)	0.89	0.76	1.00	1.34	1.10	1.02

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

ORANGE & ROCKLAND

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	2,449	3,226	2,900	3,223	3,287	3,017
Number of Customer-Hours	316,486	387,054	545,813	398,964	345,072	398,678
Number of Customers Affected	195,880	238,230	224,054	234,934	205,585	219,737
Number of Customers Served	220,813	221,579	221,542	223,048	224,400	222,276
Average Duration Per Customer Affected (CAIDI)	1.62	1.62	2.44	1.70	1.68	1.81
Average Duration Per Customers Served	1.44	1.75	2.46	1.80	1.55	1.80
Interruptions Per 1000 Customers Served	11.13	14.61	13.09	14.55	14.74	13.62
Number of Customers Affected Per Customer Served (SAIFI)	0.89	1.08	1.01	1.06	0.92	0.99

ORANGE & ROCKLAND

Including Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	2,570	3,398	2,900	3,547	3,533	3,190
Number of Customer-Hours	460,209	633,345	545,813	523,975	496,654	531,999
Number of Customers Affected	223,754	263,634	224,054	267,191	236,698	243,066
Number of Customers Served	220,813	221,579	221,542	223,048	224,400	222,276
Average Duration Per Customer Affected (CAIDI)	2.06	2.40	2.44	1.96	2.10	2.19
Average Duration Per Customers Served	2.09	2.87	2.46	2.37	2.23	2.40
Interruptions Per 1000 Customers Served	11.67	15.39	13.09	16.01	15.84	14.40
Number of Customers Affected Per Customer Served (SAIFI)	1.02	1.19	1.01	1.21	1.06	1.10

** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2017, customers served is the number of customers as of December 31, 2017. For indices using customers served, the previous year is used.

RG&E

Excluding Major Storms

	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	3,063	2,972	3,037	2,838	3,157	3,013
Number of Customer-Hours	489,490	488,496	507,355	383,461	388,442	451,449
Number of Customers Affected	268,921	280,590	278,760	214,019	219,583	252,375
Number of Customers Served	367,534	369,381	371,328	371,866	374,586	370,939
Average Duration Per Customer Affected (CAIDI)	1.82	1.74	1.82	1.79	1.77	1.79
Average Duration Per Customers Served	1.34	1.33	1.37	1.03	1.04	1.22
Interruptions Per 1000 Customers Served	8.36	8.09	8.22	7.64	8.49	8.16
Number of Customers Affected Per Customer Served (SAIFI)	0.73	0.76	0.75	0.58	0.59	0.68

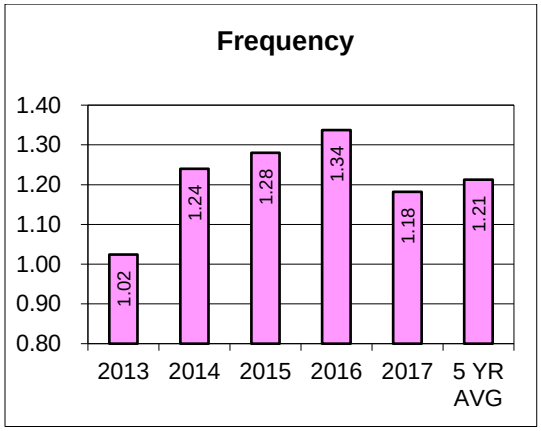
RG&E

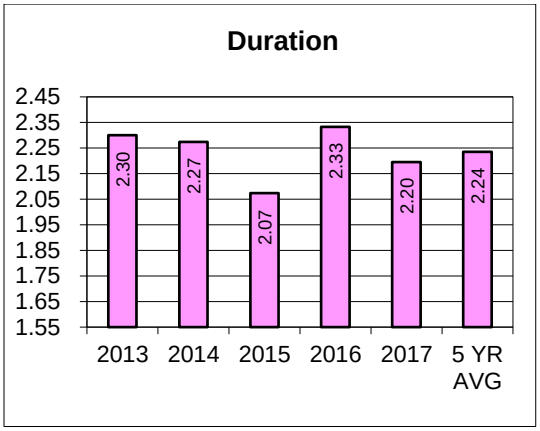
Including Major Storms

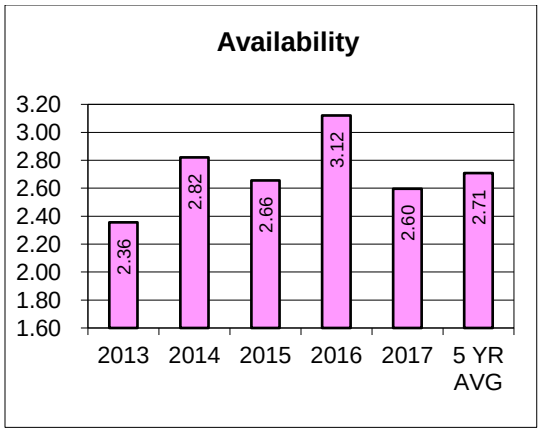
	2013	2014	2015	2016	2017	5 YR AVG
Number of Interruptions	3,451	3,156	3,183	3,020	5,616	3,685
Number of Customer-Hours	915,700	723,019	685,163	539,505	9,107,851	2,394,248
Number of Customers Affected	332,851	312,207	320,206	258,475	497,116	344,171
Number of Customers Served	367,534	369,381	371,328	371,866	374,586	370,939
Average Duration Per Customer Affected (CAIDI)	2.75	2.32	2.14	2.09	18.32	5.52
Average Duration Per Customers Served	2.50	1.97	1.85	1.45	24.49	6.45
Interruptions Per 1000 Customers Served	9.42	8.59	8.62	8.13	15.10	9.97
Number of Customers Affected Per Customer Served (SAIFI)	0.91	0.85	0.87	0.70	1.34	0.93

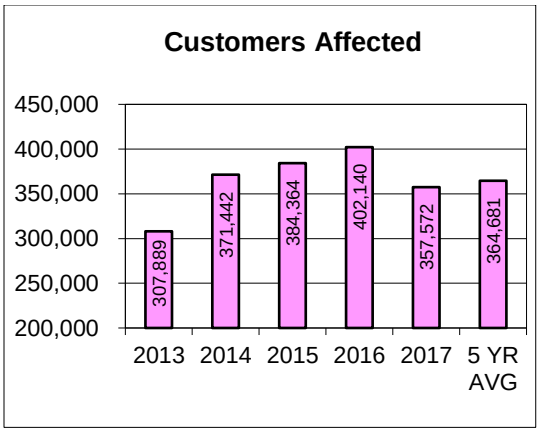
** Customer Served is the number of customers as of the last day of the current year.
For example, for the calendar year of 2016, customers served is the number of customers as of December 31, 2016. For indices using customers served, the previous year is used.

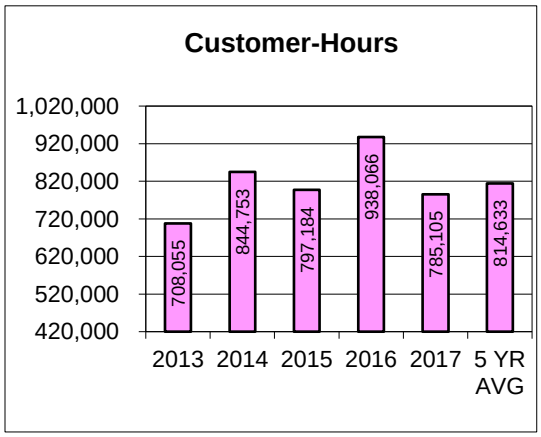
Central Hudson Gas and Electric
(Excluding Major Storms)

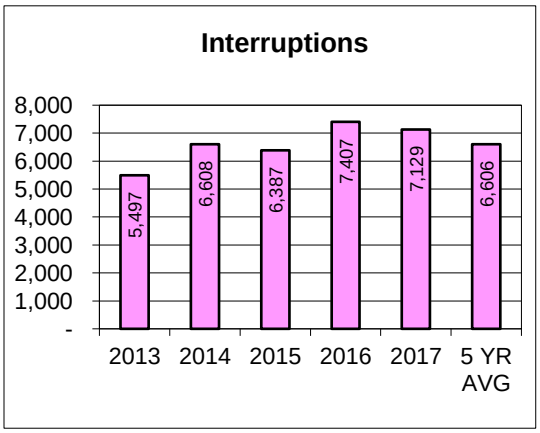




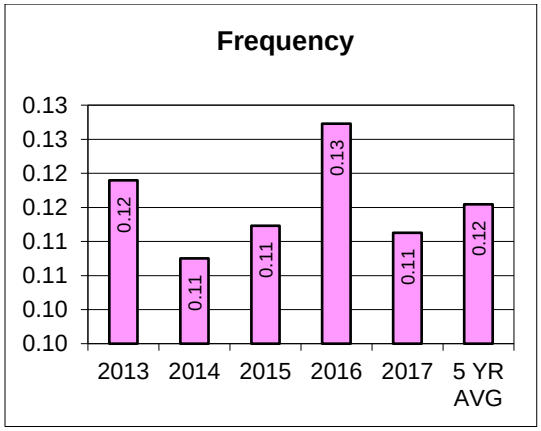


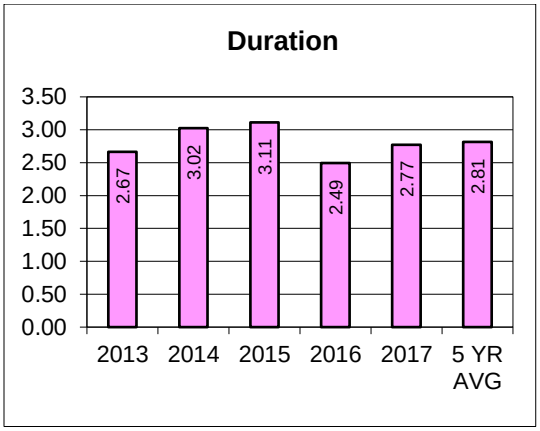


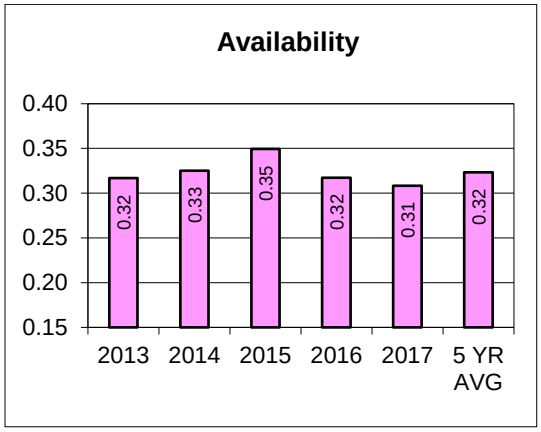


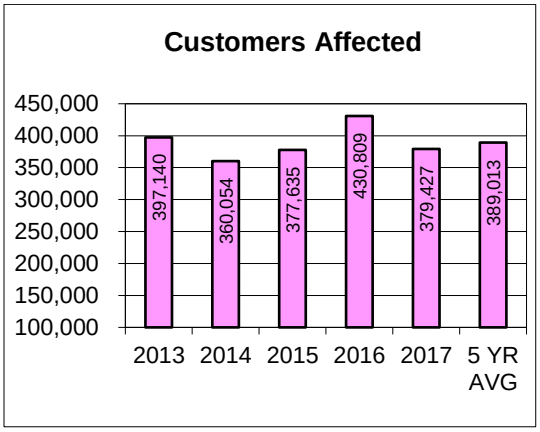


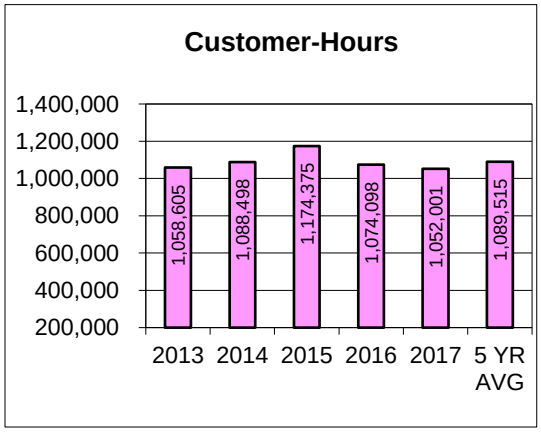
Con Edison – System
(Excluding Major Storms)

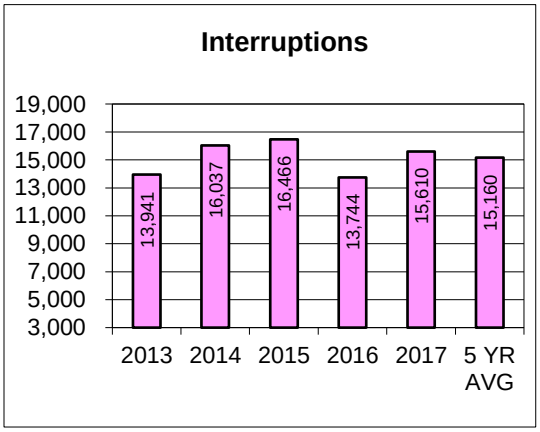




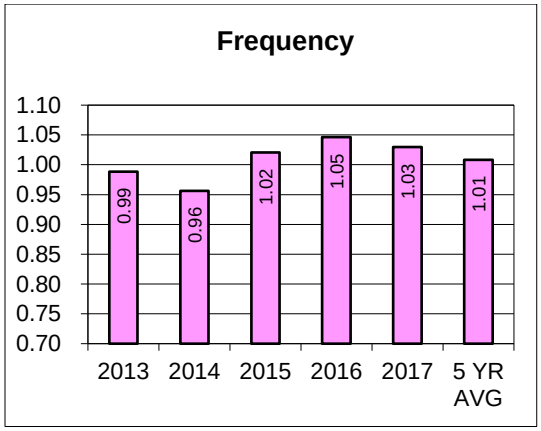


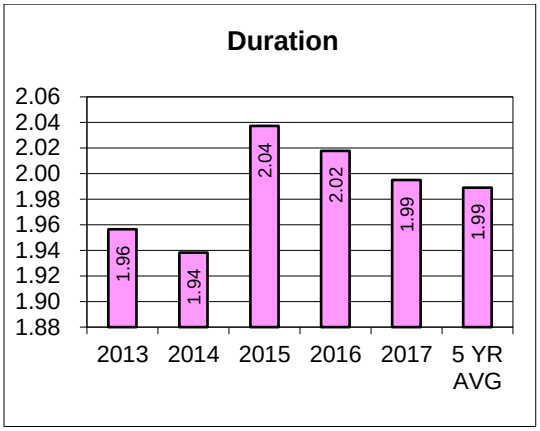


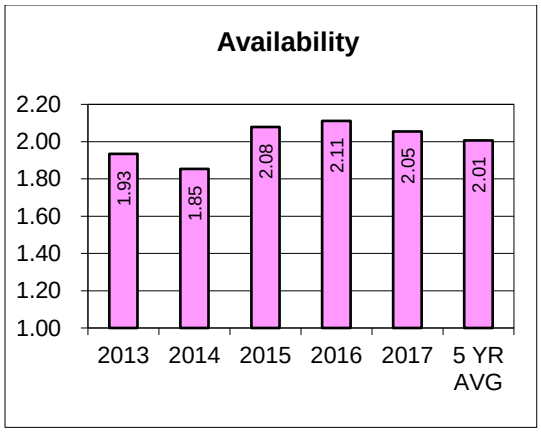


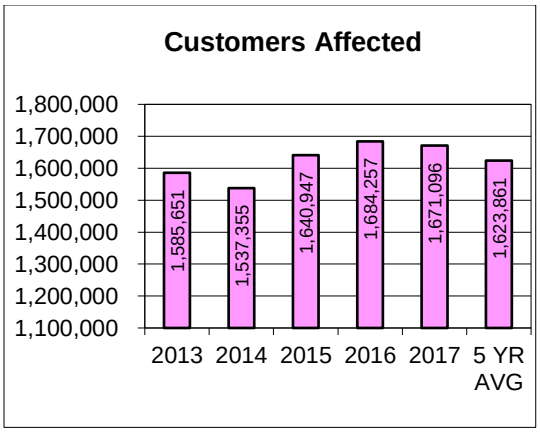


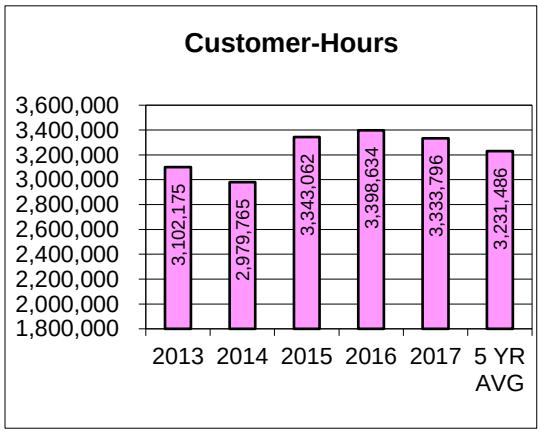
National Grid
(Excluding Major Storms)

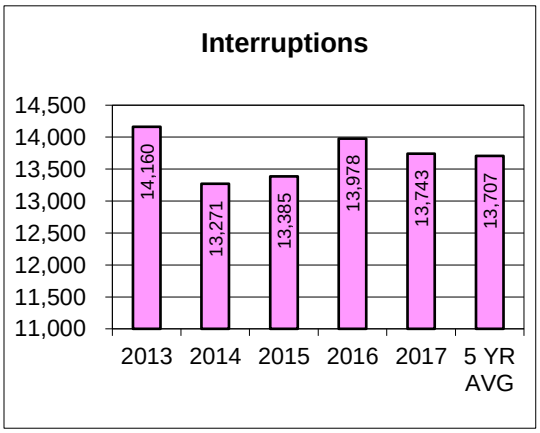




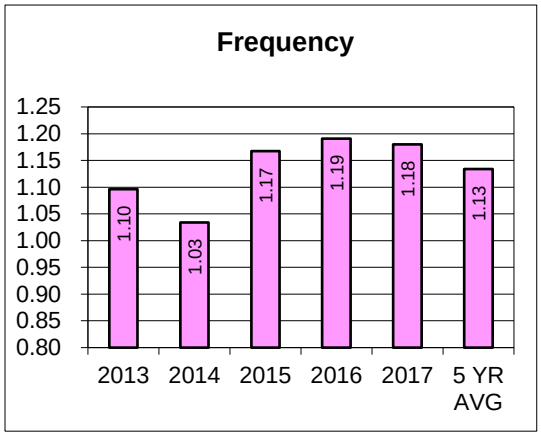


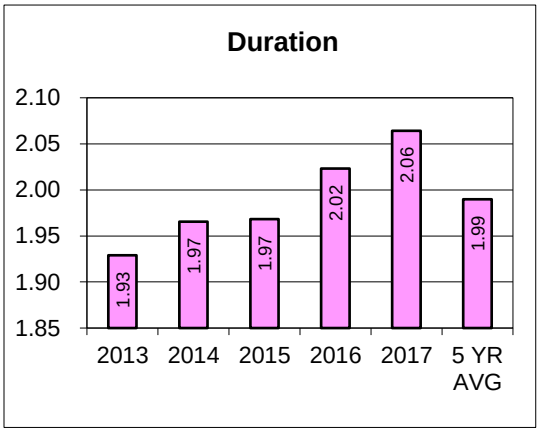


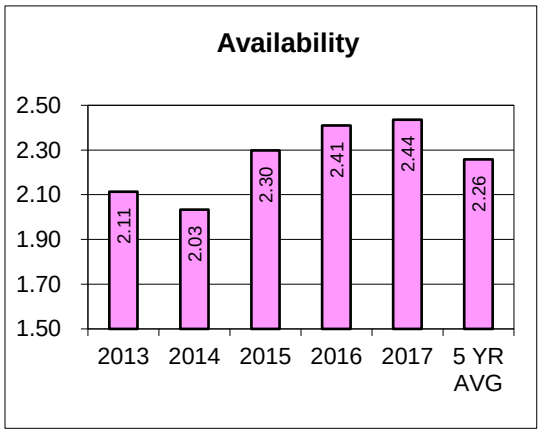


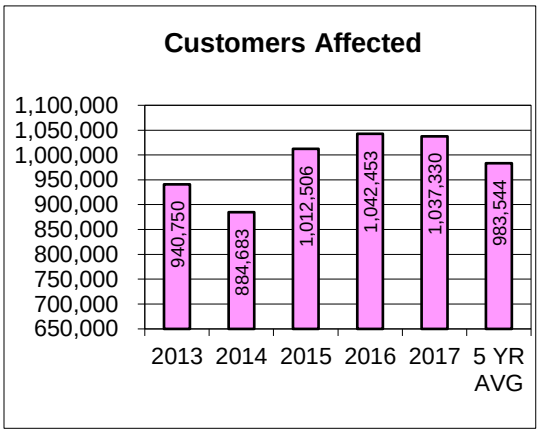


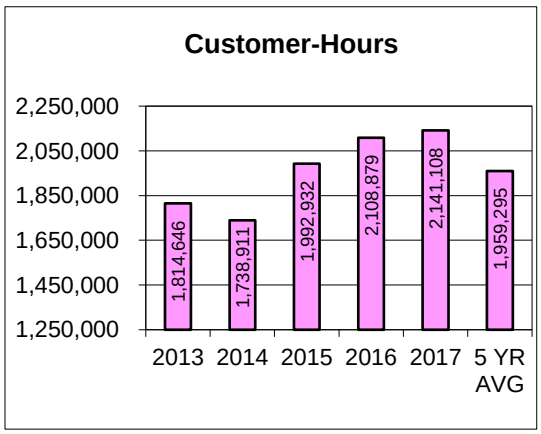
NYSEG
(Excluding Major Storms)

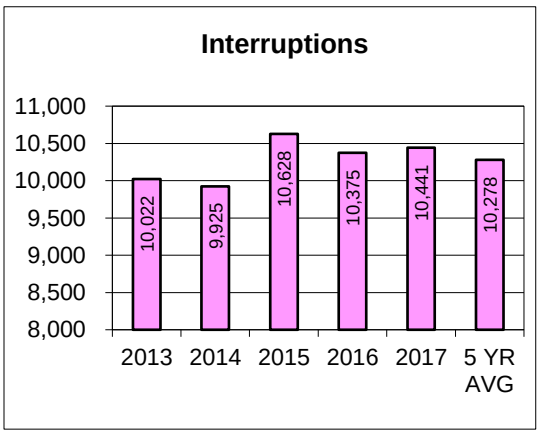




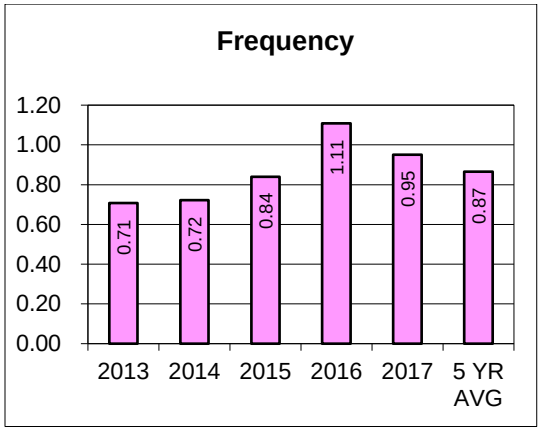


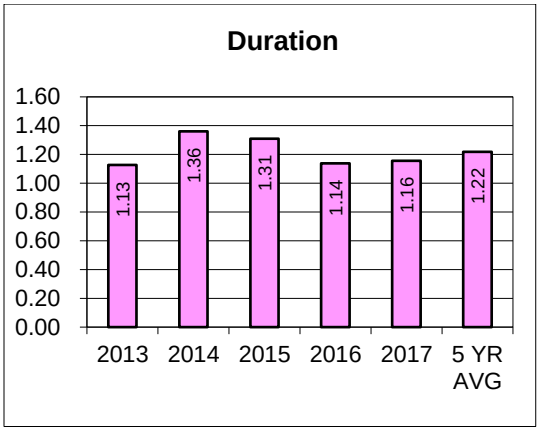


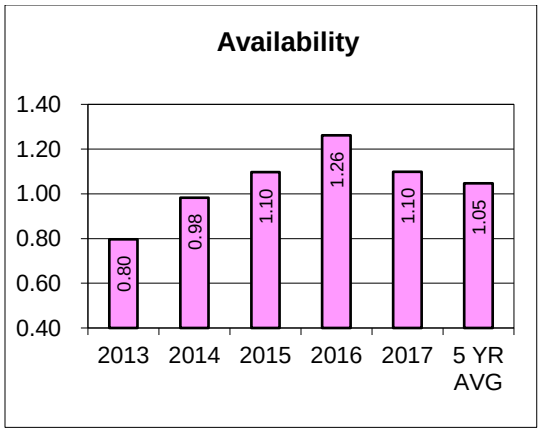


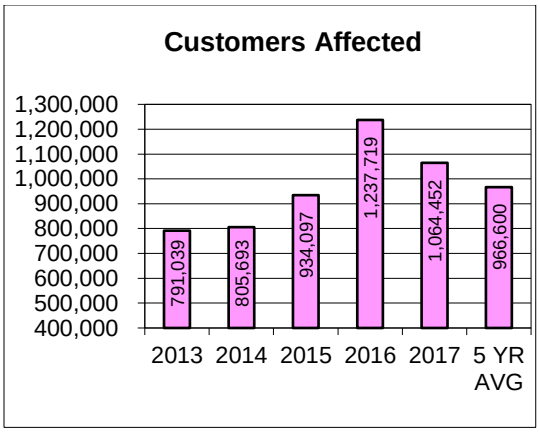


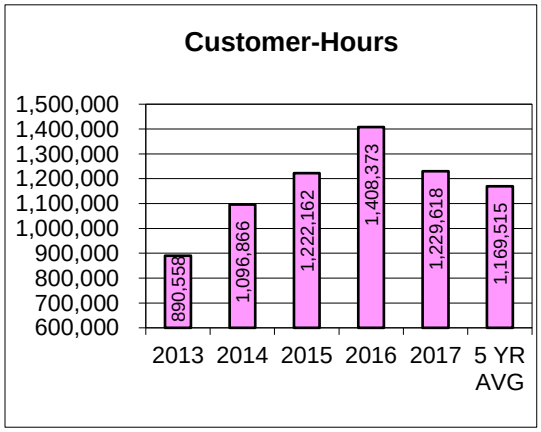
PSEG-LI
(Excluding Major Storms)

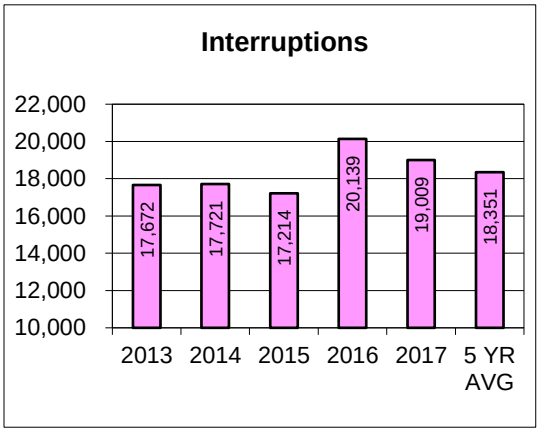




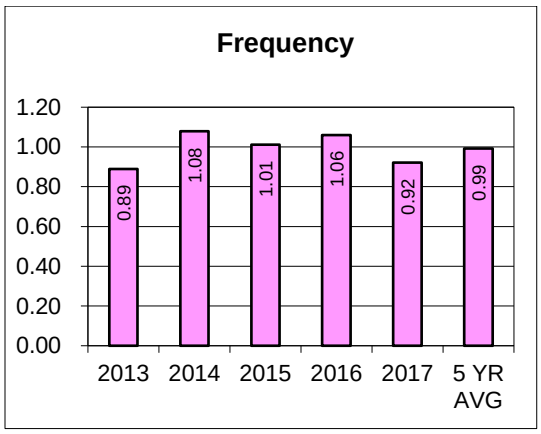


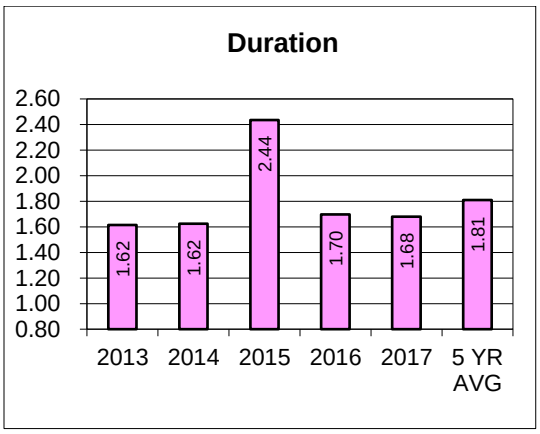


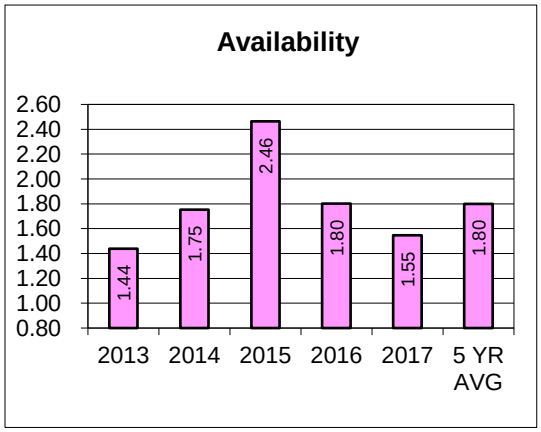


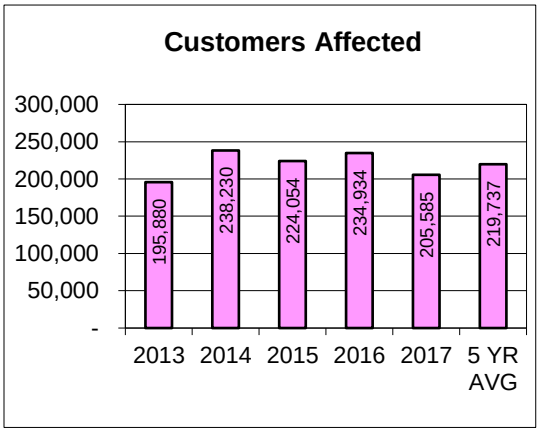


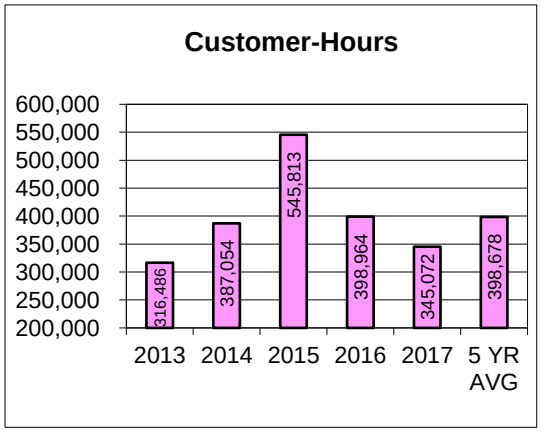
Orange & Rockland
(Excluding Major Storms)

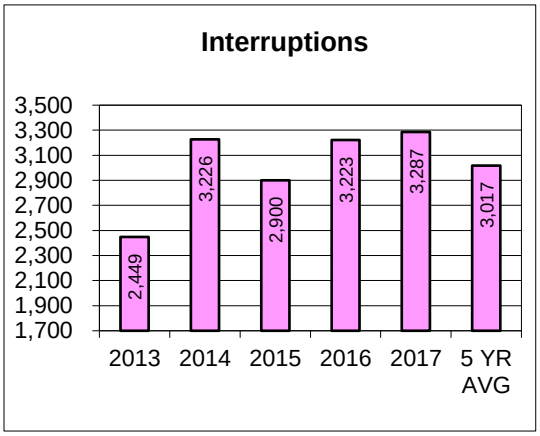
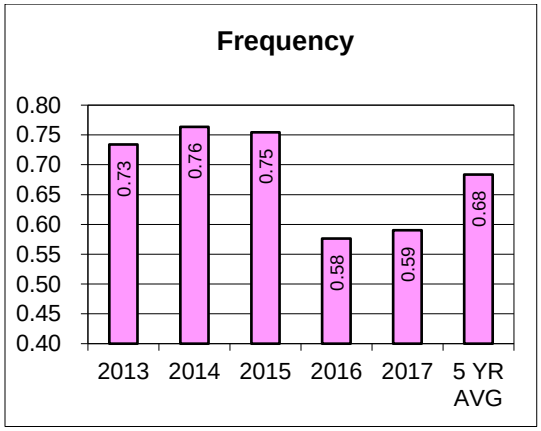
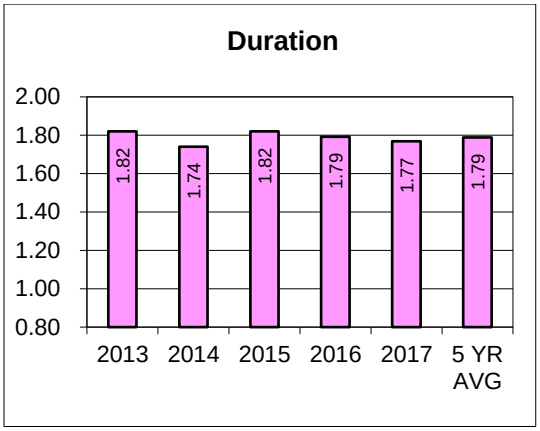
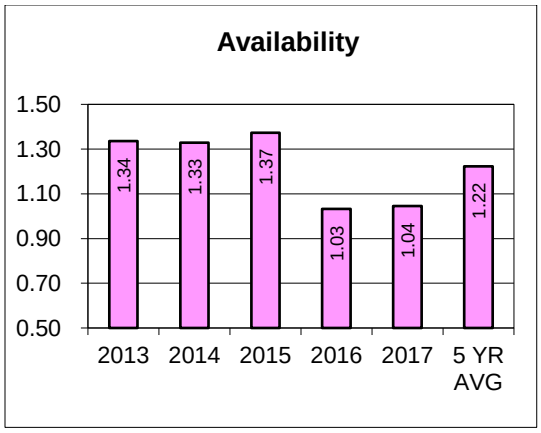
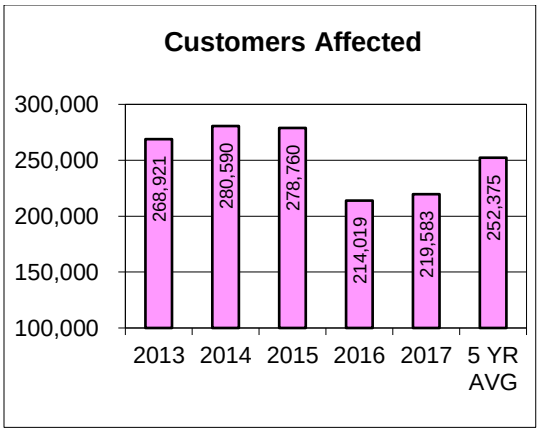
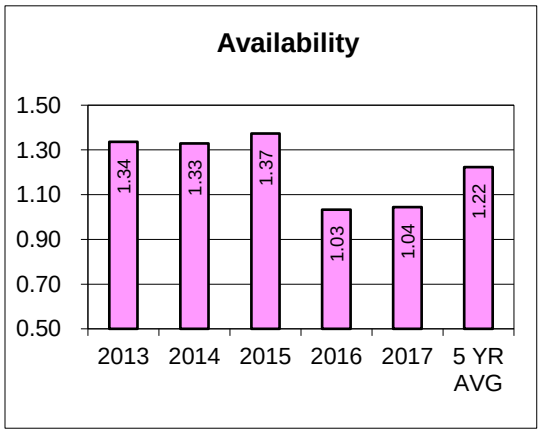
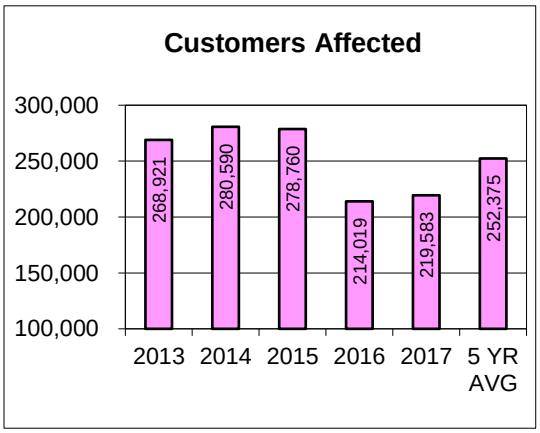












RG&E
(Excluding Major Storms)