



## **2019 ELECTRIC RELIABILITY PERFORMANCE REPORT**

**Office of Resilience and Emergency Preparedness**

**June 2020**

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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 2019. 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).<sup>1</sup> Frequency is influenced by factors such as system design, capital investment, maintenance, and weather. 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.<sup>2</sup> 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 individual company. RPMs are designed such that companies are subject to negative revenue adjustments for failing to meet electric reliability targets excluding major storms.<sup>3</sup> Unlike the investor-owned utilities, PSEG LI does not have

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<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> Negative revenue adjustments are paid by shareholders and not by rate payers.

rate orders or RPMs set by the Commission but does have performance metrics associated with reliability set as part of an Operating Service Agreement.<sup>4</sup>

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 2019 is the same as last year and the statewide five-year average (as shown in Figure 1, page 6).<sup>5</sup> Statewide, the three major causes for interruptions, excluding storms, were equipment failures, tree contacts, and accidents or events not under the utility's control. These three categories combined account for approximately 83 percent of all interruptions.

Excluding major storms, the statewide interruption duration for 2019 was 2.05 hours (as shown in Figure 2, page 7). This is longer than the 2018 duration index of 1.96 hours and longer than the statewide five-year average of 1.94 hours. This change accounts for approximately 6 minutes. The statewide interruption duration index, excluding Con Edison, was 1.88 hours in 2019, which is the same as 2018 and nearly the same as the statewide five-year average of 1.85 hours.

With respect to major storms, 2019 had approximately 35 percent fewer customers interrupted and approximately 72 percent fewer customer hours of interruption

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<sup>4</sup> 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>).

<sup>5</sup> 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.

than 2018. The state experienced 33 separate major storm events in 2019; the largest storm occurred on Halloween. Strong winds and rain developed over eastern New York. Five inches of rain fell in parts of the Mohawk Valley and Southern Adirondacks washing out roads and flooding buildings. Strong winds arrived after the rain, gusting up to 63 mph, resulting in downed trees and additional power outages. As a result, electric utilities incurred peak outages of approximately 570,000 statewide. National Grid had approximately 50 percent of affected customers restored the first day of restoration and over 98 percent of customers restored in less than 68 hours. Once crews were able to gain access to the remaining damage locations final restoration occurred on November 5 at approximately 9:00 p.m. NYSEG had almost 60 percent of customers restored the first day of restoration and over 99 percent restored in less than 72 hours; final restoration was on November 4 at approximately 7:30 a.m.

All electric utilities met their RPM targets, except Con Edison and NYSEG. The primary reason Con Edison did not perform adequately was due to outage events in the summer. On July 13, 2019, the Company experienced the loss of six networks, which interrupted approximately 72,000 customers in Manhattan. Customer outages lasted between three and five hours. Con Edison also failed to meet its frequency and duration targets because on July 21, 2019, it de-energized customers in Brooklyn at the end of a heat wave. This action impacted approximately 30,000 customers for an average duration of approximately 11.50 hours. Department Staff is currently investigating these outage events and developing recommendations for improvements that will decrease the likelihood of similar events occurring in the future. NYSEG failed to meet its RPM target for frequency. Tree contacts and equipment failures accounted for 68 percent of all interruptions for NYSEG.

## 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.<sup>6</sup> 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.<sup>7</sup> 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).<sup>8</sup> 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 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, equipment failures, tree contacts, and accidents.<sup>9</sup> 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

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<sup>6</sup> 16 NYCRR Part 97, Notification of Interruption of Service, requires utilities to keep detailed back-up data for six years.

<sup>7</sup> 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.

<sup>8</sup> 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.

<sup>9</sup> 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.

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.

## **2019 RELIABILITY PERFORMANCE**

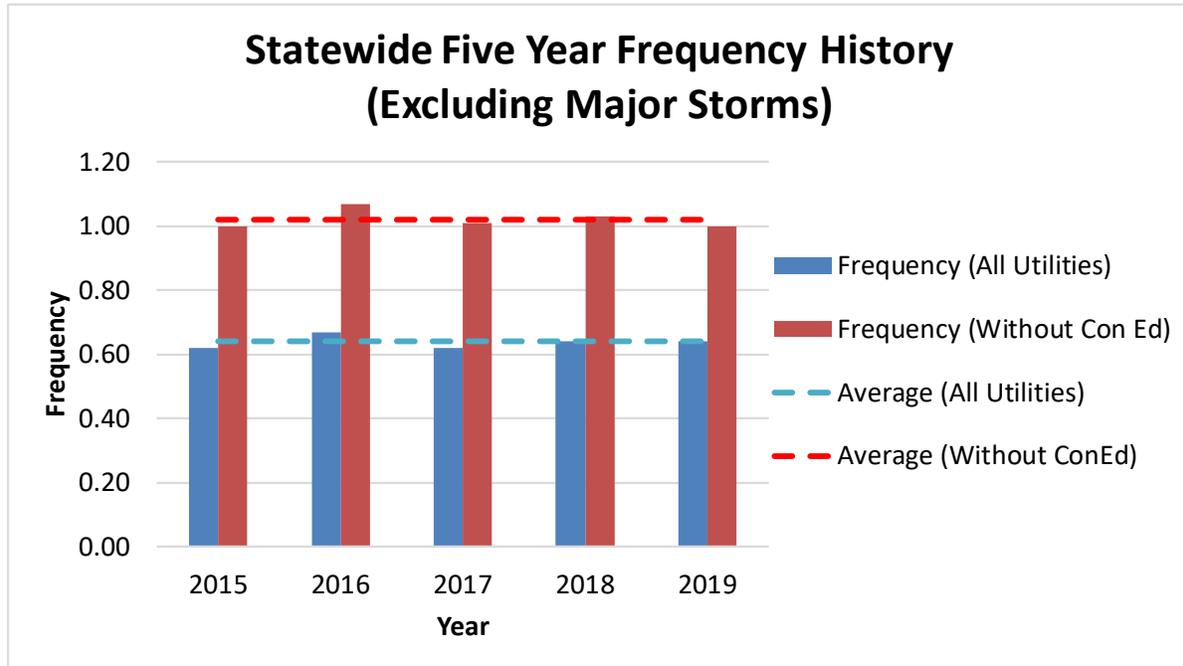
The following sections provide a summary discussion of the reliability performance statewide and for each of the major utilities. Individual company discussions identify issues or actions within each company that influenced performance levels for 2019 and indicate company-specific trends where applicable. Each year, Staff prepares an Interruption Report summarizing the monthly interruption data submitted by New York's utilities. The 2019 Interruption Report contains detailed interruption data for each utility and statewide statistics for the past five years. The Interruption Report for 2019 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. 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 - Excluding Major Storms**

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 may be 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.



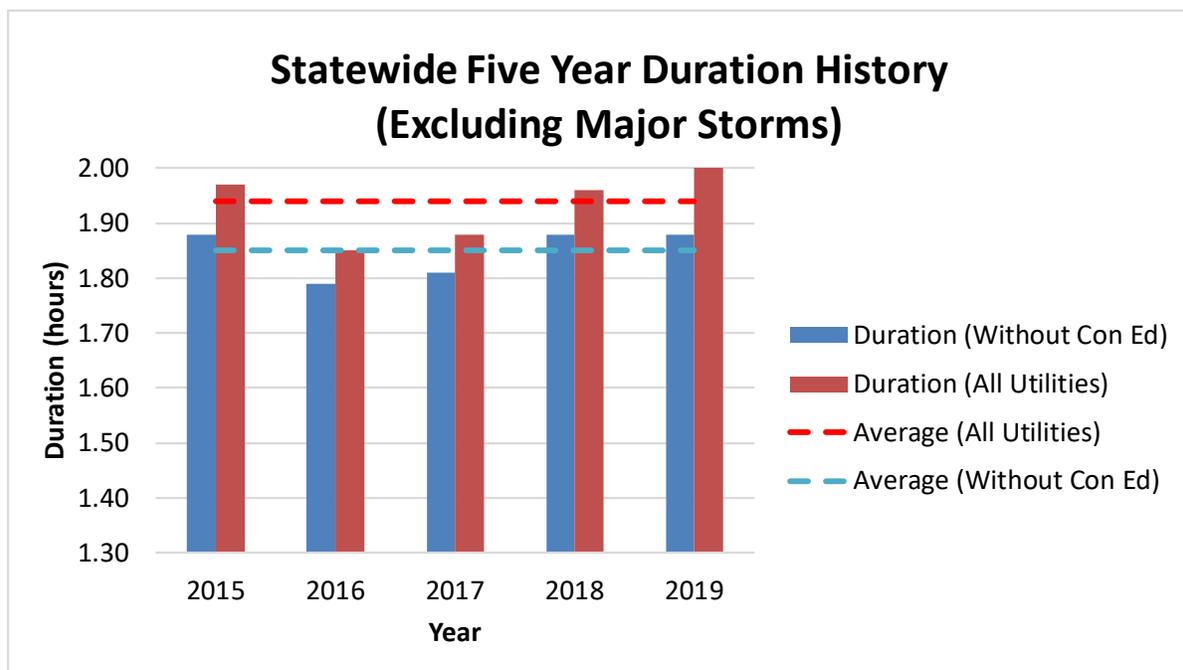
**Figure 1: Statewide Frequency Performance**

Statewide, as shown in Figure 1, the frequency of interruptions excluding major storms was 0.64 in 2019, which is the same as 2018 and the statewide five-year average. The frequency performance in 2019, for all utilities other than Con Edison, was 1.00, which is better than 2018 and the five-year average of 1.03 and 1.02 respectively. When including major storms, the 2019 statewide frequency performance was 0.88 and 1.40 for utilities other than Con Edison, indicating the effect major storms had on the utilities.

The major causes for interruptions excluding storms were equipment failures, tree contacts, and accidents. To reduce the frequency of interruptions, the utilities invest in numerous capital projects, inspections, and maintenance activities. Projects targeted at reducing equipment failures include adding, updating, or replacing equipment and strengthening transmission and distribution lines. For example, to reduce

the possibility of outages, reclosers and other protective devices are being installed on circuits. More detailed projects descriptions can be found in the utility specific sections.

Figure 2, below, shows the historical statewide interruption duration index, excluding major storms. The 2019 overall statewide interruption duration index of 2.05 hours is 5.40 minutes longer than the 2018 duration index of 1.96 hours and 6.60 minutes longer than the statewide five-year average of 1.94 hours. Con Edison, Central Hudson, and RG&E’s duration performance declined from 2018 contributing to the overall statewide decline. The statewide interruption duration index, excluding Con Edison, was 1.88 hours in 2019, which is the same as 2018 and 1.80 minutes longer than the statewide five-year average of 1.85 hours, showing how much of an impact Con Edison’s performance has on the statewide statistics. NYSEG, Orange & Rockland, and National Grid’s performance improved and PSEG LI’s duration remained the same.



**Figure 2: Statewide Duration Performance**

Including major storms both the statewide interruption duration index and statewide interruption duration index excluding Con Edison improved indicating the utilities responded to storms quicker. The 2019 overall statewide interruption duration index excluding Con Edison of 3.22 hours is two hours and 39 minutes shorter than the

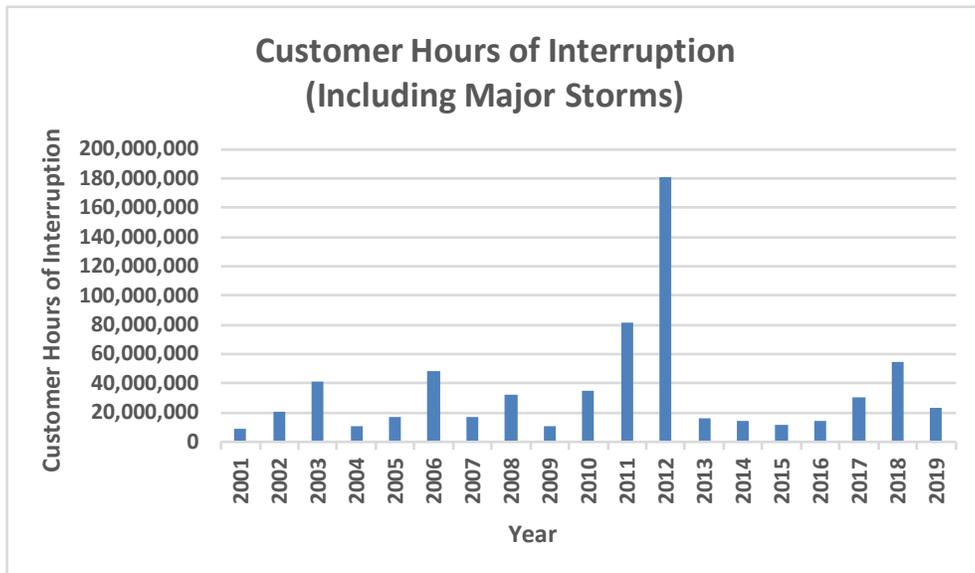
2018 duration index of 5.87 hours and 22.8 minutes shorter than the statewide five-year average of 3.60 hours. The statewide interruption duration index was 3.25 hours in 2019, which is three hours and 34 minutes shorter than the 2018 duration index of 6.81 and 33 minutes shorter than the statewide five-year average of 3.80 hours. Indicating the effect Con Edison had on the statewide duration performance.

### STATEWIDE - Including Major Storms

Numerous fronts passed through the state in 2019 resulting in damaging winds, rain, thunderstorms, snow, and/or ice. The state experienced 33 separate events in 2019 that qualified as major storms, which generally affected upstate service territories more than downstate. Of the 33 major storm events, 32 impacted National Grid, 15 impacted NYSEG, 10 impacted Con Edison, eight impacted PSEG LI, seven impacted RG&E, seven impacted Central Hudson, and five impacted Orange & Rockland. Customer interruptions associated with major storms in 2019 decreased approximately 35 percent from 2018, which had multiple winter and spring storms that impacted electric service. Customer hours of interruption were down by approximately 72 percent from 2018.

The largest storm in 2019 occurred on Halloween. Strong winds and rain developed over eastern New York. Five inches of rain fell in parts of the Mohawk Valley and Southern Adirondacks washing out roads and flooding buildings. Strong winds arrived after the rain, gusting up to 63 mph, resulting in downed trees and additional power outages. As a result, electric utilities incurred peak outages of approximately 570,000 statewide. National Grid had approximately 50 percent of affected customers restored the first day of restoration. In less than 48 hours National Grid restored more than 90 percent of the total affected customers. The Company made steady progress with restoration to 98 percent of customers in less than 68 hours. National Grid crews could not gain access to customers whose restoration exceeded 72 hours until early on November 4; final restoration was on November 5 at 9:15 p.m. NYSEG had approximately 60 percent of customers restored in 20 hours and over 99 percent restored in less than 72 hours; final restoration was on November 4 at 7:22 a.m. Because of the

extended restoration time associated with National Grid and NYSEG, the Commission required them to file a report detailing storm-specific restoration activities taken during the Halloween storm.<sup>10</sup> Despite the number of events, the effect of major storms on customers in 2019 was more typical than those experienced in 2018. This can be seen easily in Figure 3.



**Figure 3: Customer Hours of Interruption (Including Major Storms)**

<sup>10</sup> Matter Number 19-02578 In the Matter of the October 31, 2019 to November 4, 2019 Wind and Rain Event. National Grid filed January 6, 2020 and NYSEG filed January 14, 2020

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

Performance Metric	2015	2016	2017	2018	2019	Current RPM Target	Five-Year Average
Network Systems							
Frequency (SAIFI)	0.027	0.019	0.025	0.023	0.056	N/A <sup>11</sup>	0.030
Duration (CAIDI)	8.39	7.42	7.11	7.29	5.29	N/A <sup>11</sup>	7.10
Radial System							
Frequency (SAIFI)	0.35	0.43	0.36	0.40	0.53	0.495	0.41
Duration (CAIDI)	1.95	1.89	1.92	1.99	2.73	2.04	2.10

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

Con Edison serves approximately 3.5 million customers in New York City and Westchester County. Electricity is supplied to 2.6 million customers by a network system, while the remaining 900,000 customers are supplied by a radial system. 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 metric targets specific to each configuration.

#### Network Systems Performance

The 2019 network outage frequency performance is more than double the 2018 performance and almost double the five-year average. Conversely, Con Edison's network performance for duration in 2019 improved over the 2018 performance and the five-year average. The primary reason Con Edison did not perform well with respect to frequency was due to an outage event on July 13. The event began at 6:47 p.m. and caused the loss of six electric networks, resulting in interruptions to approximately 72,000 customers in Manhattan.<sup>12</sup> Customer outages lasted between three and five hours; electricity was fully restored by midnight. Due to the large number of customers

<sup>11</sup> Con Edison uses alternative calculation metrics in its RPM for network performance that include the number of outages per 1,000 customers and the average outage duration.

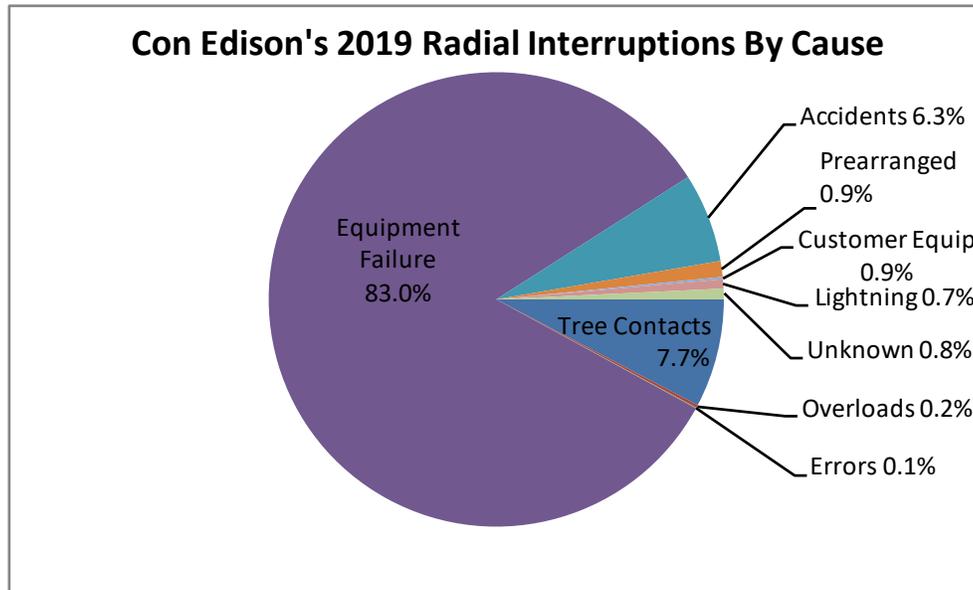
<sup>12</sup> The July 13 outage event triggered the Network Major Outage Event metric. A Network Major Outage Event is defined as the interruption of service to 15 percent or more of the customers in any network for any period of three hours or more, as established in Con Edison's previous rate plan in Case 16-E-0060. The Company is subject to a revenue adjustment based on outage duration.

interrupted and the short outage durations, this event impacted both Con Edison's network outage frequency and duration performances. Department Staff is currently investigating the circumstances surrounding this outage event and developing recommendations for additional improvements that will decrease the likelihood of a similar event.

Con Edison continues to improve the reliability of its underground distribution systems through its network relief and reliability programs. These programs are implemented systemwide to reduce both network outage frequency and duration. The Company targets susceptible network feeders for reinforcement projects such as transferring load between feeders and establishing new feeders. Additionally, Con Edison is installing underground sectionalizers to split existing feeders into smaller segments to enable a portion of the feeder to remain in service and continue to supply customers. Con Edison also continues to improve the reliability of the network system through the replacement of poorly performing components, such as vintage cable types, outdated splices and joints, and first-generation underground switches.

#### Radial Performance

On its radial system, Con Edison did not meet its system-wide RPM frequency target of 0.495 and its duration performance target of 2.04 hours with performance values of 0.526 and 2.73 hours, respectively. These values represent an increase of approximately 33 percent in outage frequency and 45 minutes in outage duration over 2018 values. As shown in Figure 4 below, most interruptions were caused by company equipment failure. The next leading contributors were tree contacts and accidents outside the company's control. When compared to 2018 performance, Queens had less frequent outages, while Brooklyn, the Bronx, Staten Island, and Westchester had more frequent outages; Staten Island had an improved duration, while Brooklyn, the Bronx, Queens, and Westchester had worsened durations.



**Figure 4: Con Edison's 2019 Radial Interruptions by Cause  
(Excluding Major Storms)**

The primary reason Con Edison did not meet its radial frequency and duration targets was due to outages related to heatwaves that occurred in late July. On July 21, after a week of high temperature and humidity had already put significant stress on Con Edison's electric system, multiple distribution feeders failed on the Flatbush network in Brooklyn. The Company manually de-energized approximately 30,000 customers served by the Flatbush 4kV grid in an effort to prevent equipment damage and the possible need for a complete network shutdown that would have left an additional 100,000 customers out of service. The de-energization, along with other customer outages in the Flatbush area, resulted in over 34,000 customer outages. The complete restoration of all customers did not occur until early morning on July 23. As with the Manhattan network outages, this incident is also being investigated by the Department.

Con Edison aims to improve the reliability of its radial system to reduce customer and system impact in the event of equipment failures through several programs. These programs include the replacement of vintage cable and failure-prone equipment, the installation of switching devices on distribution cables, and the improvement of monitoring capabilities, and the upgrading of substation relays. Con Edison will also continue to address the reliability and resiliency of its radial system through its Non-Network Reliability program. As a result of the March 2018 winter storms, Con Edison

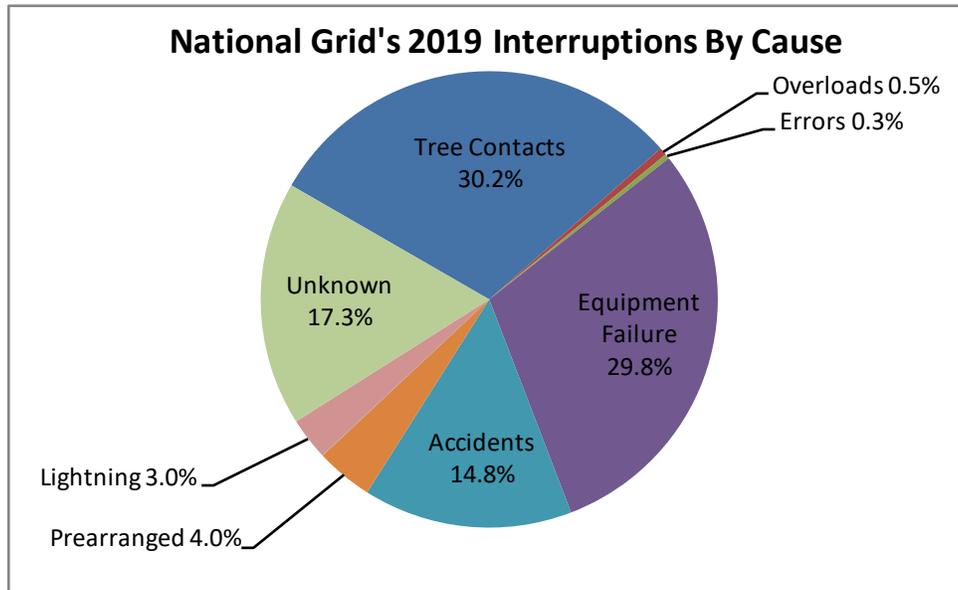
proposed an initiative to spend \$100 million through 2022 in Westchester County to fortify its radial system against severe storms like Riley and Quinn. Under this project, Con Edison will perform storm hardening on auto-loops by splitting current loops into smaller ones, adding poles and spans of cable on current loops for better segmentation, or even establishing new loops. Con Edison also plans to continue replacing high-failure aerial cable throughout Westchester and the rest of its distribution system. In the most recent Con Edison rate plan, the Commission established a new RPM metric to ensure storm hardening activities are on schedule.

NATIONAL GRID

**Table 2: National Grid’s Historic Performance Excluding Major Storms**

<b>Performance Metric</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Current RPM Target</b>	<b>Five-Year Average</b>
Frequency (SAIFI)	1.02	1.05	1.03	1.02	1.02	1.13	1.03
Duration (CAIDI)	2.04	2.02	1.99	2.04	2.03	2.05	2.02

National Grid serves approximately 1.65 million customers across upstate New York. The Company’s territories include metropolitan areas, such as Albany, Buffalo, and Syracuse, as well as many rural areas in northern New York and the Adirondacks. For 2019 the Company met both the frequency and duration reliability targets. The 2019 frequency level of 1.02 is six percent below the target and comparable to last year and the five-year average. The 2019 duration performance of 2.03 hours is better than the RPM target of 2.05 and about the same as 2018 and the five-year average.



**Figure 5: National Grid's 2019 Interruptions by Cause  
(Excluding Major Storms)**

As shown in Figure 5, three causes were responsible for approximately 75 percent of the interruptions: tree contacts, equipment failures, and accidents. Historically, the leading cause of interruptions has been either tree contacts or equipment failure. In 2019, tree contacts accounted for 30.8 percent of interruptions this is a decrease of approximately three percent from 2018. The number of customers interrupted by tree contacts, however, increased by 20 percent. National Grid attributes this to an increase in minor storm events that did not result in major storm exclusions.

National Grid uses six subcodes to further breakdown the cause of tree contact interruptions excluding major storms: tree fell, broken limb, growth, vines, EAB tree fell, and EAB broken limb. Tree fell interruptions accounted for approximately 70 percent of all tree interruptions in 2019 followed by broken limbs at 25 percent, growth at 2.3 percent, vines at 1.2 percent, and combined EAB subcodes at 1.5 percent. The volume of tree fell, and broken limb interruptions indicates the importance of a hazard tree program. In addition to the subcodes, National Grid uses inspections, number of customers served, and circuit configuration to identify and prioritize feeders for removal of hazards trees. The small number of interruptions related to growth and vines indicates the current pruning cycle is effective in minimizing interruptions. Lastly, the small

number of EAB related interruptions indicates the effectiveness of National Grid's EAB program.

Equipment failures accounted for 29.8 percent of interruptions in 2019. National Grid has a number of capital and maintenance programs in place to help ensure reliability on the electric system is maintained. Each year several circuits are selected from the worst performing circuit list for an Engineering Reliability Review (ERR). The ERR is an in-depth analysis of the circuit characteristics and performance. Examples of improvements identified and implemented through these efforts include adding fault indicators, feeder ties, capacitor banks, switches, reclosers, load balancing, and reconductoring. National Grid has also begun the installation of cutout mounted reclosers in 2019 that are aimed at reducing the number of sustained interruptions related to temporary faults on fused portions of the distribution system. These actions are expected to improve 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.

Accidents accounted for 14.7 percent of interruptions this is a decrease of approximately 16 percent from 2018. Motor Vehicle Accidents continue to be one of the largest causes of interruptions. National Grid investigates all poles that are involved in vehicle accidents to identify hazardous locations and relocates poles if considered necessary.

National Grid successfully met its CAIDI metric for the fourteenth consecutive year in 2019 and is continuing its efforts to maintain reliability. These efforts include distribution patrols, maintenance programs, recloser installations, protection coordination studies, lightning protection, and tree trimming programs. The Company believes all of these programs and corrective actions not only will reduce the number of interruptions but also reduce the restoration times. The Company will continue to stay on schedule for tree trimming and believes that this will reduce both the incidence and duration of tree related interruptions. National Grid also expanded the use temporary generation to allow necessary repair work while preventing high impact and/or potentially long-duration outages.

NYSEG**Table 3: NYSEG’s Historic Performance Excluding Major Storms**

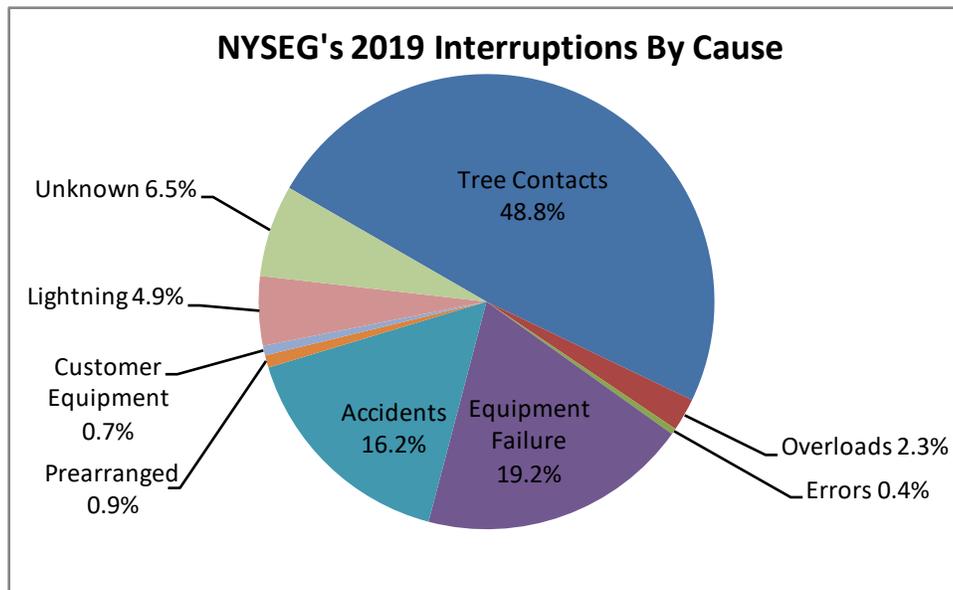
Performance Metric	2015	2016	2017	2018	2019	Current RPM Target	Five-Year Average
Frequency (SAIFI)	1.17	1.19	1.18	1.20	1.36	1.20	1.22
Duration (CAIDI)	1.97	2.02	2.06	2.17	1.93	2.08	2.03

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

NYSEG serves approximately 894,000 electric customers across upstate New York and some areas of Westchester and Putnam Counties. The Company serves a primarily rural area that covers approximately 40 percent of New York, including 42 counties and 379 towns. Cities served by NYSEG include Auburn, Binghamton, Geneva, Hornell, Ithaca, Lockport, Mechanicville, Oneonta, and Plattsburgh.

NYSEG failed to meet its 2019 frequency target, with a SAIFI of 1.35. Despite recent efforts to address aging infrastructure, the number of customers affected by interruptions increased by approximately 144,000 or 13.5 percent in 2019 over 2018. Equipment failures were the primary driver for this jump; increasing by approximately 120,000 customers or 47 percent.

As shown in Figure 6, tree contacts, equipment failure, and accidents were the predominant causes of interruptions throughout NYSEG’s service territory. Historically, trees have had the greatest impact on NYSEG’s frequency rate and with equipment failures up in 2019; they combined for approximately, 68 percent of all interruptions.



**Figure 6: NYSEG's 2019 Interruptions by Cause  
(Excluding Major Storms)**

For 2020, NYSEG has implemented a series of programs and procedures to reduce the number of interruptions and improve its frequency performance. Tree trimming remains one of NYSEG's primary focus areas. The Brewster and Liberty Divisions continue to be the focus areas for tree trimming due to their high tree densities. Brewster is currently in its second its five-year cycle. Based on its recent performance, NYSEG has also established plans to increase its tree trimming efforts in other divisions. In 2019, NYSEG trimmed approximately 4,250 miles system wide an increase of approximately 750 miles over 2018. NYSEG will continue to increase its distribution line clearance and hot spot trimming miles in 2020. Within the Company's pending rate case, NYSEG has proposed to implement a distribution vegetation reclamation program.<sup>13</sup> The program will focus on circuits that have not been trimmed in over five years and those that have the worst performance with regard to tree interruptions.

In addition, NYSEG is focusing on multiple programs to help replace and correct equipment issues before they fail. In 2020, NYSEG is planning to replace roughly 80 substation circuit breakers that are deemed to be near the end of their useful life. NYSEG has also established a program to start in 2020, which will address the

<sup>13</sup> Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of New York State Electric & Gas Corporation for Electric Service. Case number 19-E-0378

backlog of deficiencies that have been found during its Distribution Line Inspection program. With respect to motor vehicle accidents, NYSEG continues to review accident data to determine if changes or modifications to its systems can help mitigate these incidents. Potential solutions include relocating poles or adding reflective tape to increase visibility. In addition, based on the results from its distribution facility inspection program, there will be more investments to maintain equipment and improve reliability.

NYSEG saw an 11 percent improvement in its duration performance in 2019. On a divisional level, NYSEG's duration continues to improve with 10 divisions scoring better in 2019 than their 5-year average and the Brewster Division recording its best duration in six years. NYSEG was able to improve its duration performance by implementing a company-wide program consisting of process improvements designed to reduce overall duration times. In addition, NYSEG is relocating distribution lines from remote locations and building tie lines where appropriate. These improvements are all part of the Company's increased efforts to strengthen its system both at substations and on distribution lines; examples include the installation of automated switches and reclosers, circuit breaker replacements, tree trimming and increased focus on danger tree removals. Since circuit breaker failures result in longer interruptions, NYSEG plans to replace 240 circuit breakers over the next three years. Going forward, NYSEG plans to continue to increase these efforts in 2020 and beyond as it has requested increased funding for these projects and in other areas that will help harden their system under its on-going rate case.

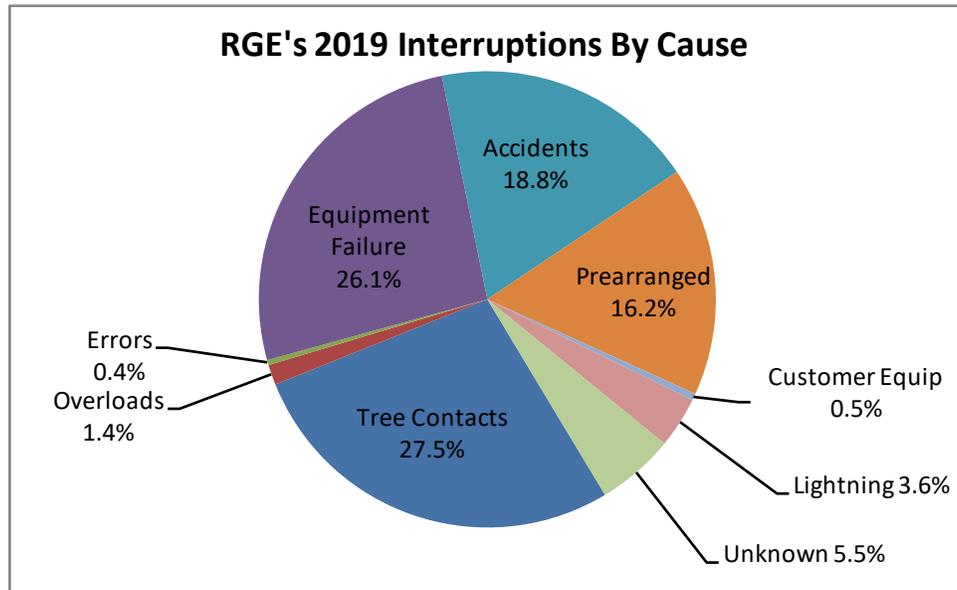
RG&E**Table 4: RG&E's Historic Performance Excluding Major Storms**

<b>Performance Metric</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Current RPM Target</b>	<b>Five-Year Average</b>
Frequency (SAIFI)	0.75	0.58	0.59	0.75	0.73	0.90	0.68
Duration (CAIDI)	1.82	1.79	1.77	1.79	1.84	1.90	1.80

RG&E serves approximately 379,000 electric customers over its franchise area, located in and around Rochester. The Company's territory is comprised of four divisions: Canandaigua, Genesee Valley, Lakeshore, and Rochester, with the Rochester Division accounting for approximately 80 percent of its customer base.

For the past five years, RG&E has consistently maintained high levels of electric service reliability for both frequency and duration. In 2019, RG&E surpassed 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 2019, the Canandaigua, Genesee, and Lakeshore Divisions did not meet their duration performances targets. The Genesee and Lakeshore Divisions' duration indices, however, improved in 2019 when compared to 2018.

Overall, the three major causes for interruptions throughout RG&E's service territory were tree contacts, equipment failures, and accidents, as shown in Figure 7. RG&E is relying on its Distribution Line Inspection program data and thermographic inspection program to reduce its high rate of equipment failures. Regarding tree related interruptions, RG&E will continue its hot spot trimming and cycle maintenance clearing. RG&E is also implementing corrective actions to reduce the number of motor vehicle accidents such as relocating poles and installing reflectors on poles to increase visibility.



**Figure 7: RG&E’s 2019 Interruptions by Cause (Excluding Major Storms)**

CENTRAL HUDSON

**Table 5: Central Hudson’s Historic Performance Excluding Major Storms**

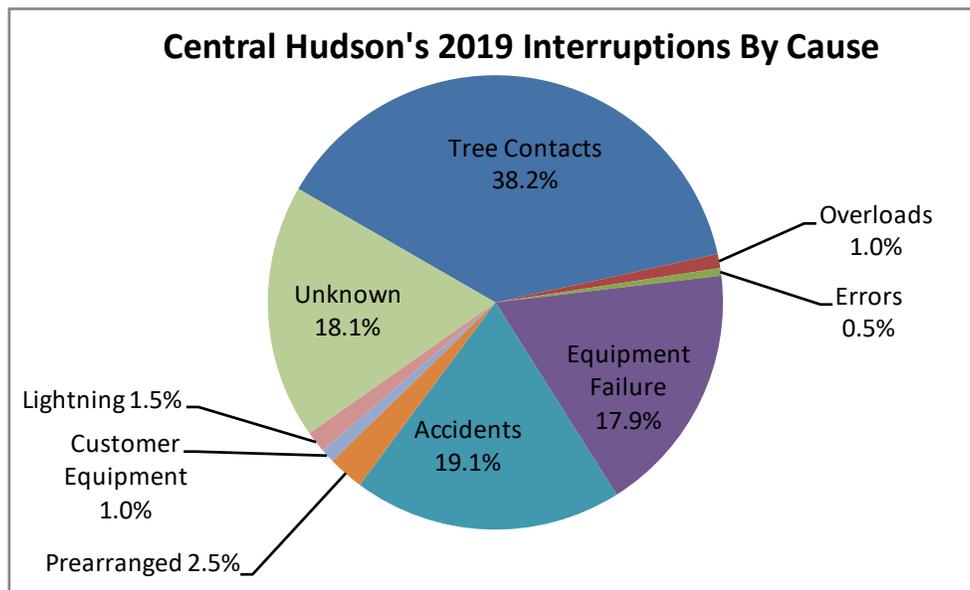
Performance Metric	2015	2016	2017	2018	2019	Current RPM Target	Five-Year Average
Frequency (SAIFI)	1.28	1.34	1.18	1.50	1.25	1.34	1.31
Duration (CAIDI)	2.07	2.33	2.20	2.04	2.37	2.50	2.20

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

Central Hudson serves approximately 300,000 customers in parts of eight counties of New York’s Mid-Hudson River Valley. Counties served by Central Hudson include Albany, Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, and Ulster. Central Hudson’s five divisions are Catskill, Fishkill, Kingston, Newburgh, and Poughkeepsie. About 70 percent of Central Hudson’s territory is within the Kingston, Newburgh, and Poughkeepsie Divisions.

In 2019, Central Hudson’s frequency performance of 1.25 shows improvement and is better than the RPM target of 1.34. Three causes were responsible for 78 percent of the interruptions: tree contacts, equipment failures, and accidents or

events not under the utility control (accidents). Tree contacts were the number one cause of interruptions for 2019. The frequency of tree contact interruptions dropped nine percent from last year and eight percent from the five-year average. Central Hudson reports the largest contributor to tree contact interruptions were danger trees or limbs and trees from outside the clearance zone. Compared to 2018, the frequency of interruptions caused by danger trees decreased by 6.3 percent in 2019 due to a targeted hazard tree program. This program prioritized hazard tree removal for three-phase circuits with the greatest potential to positively influence system frequency performance. A 30 percent improvement was seen for tree related frequency in 2019 on circuits where the targeted hazard tree program was completed in 2018.



**Figure 8: Central Hudson’s 2019 Interruptions by Cause (Excluding Major Storms)**

Equipment failures were the second leading cause of interruptions for 2019. Even though interruptions due to equipment failures improved since last year, it was four percent above the five-year average. Conductor failures, cutouts, and crossarms caused 50 percent of the interruptions due to equipment failures. Central Hudson has expanded its thermal scanning program to include winter peaking/heavily loaded circuits and spur lines with large customer counts. The thermal scanning program identifies hotspots on equipment such as conductors, cutouts, connectors, and arrestors. Central Hudson also

plans to add spur lines with large customer counts to this year's summer scans. These measures are expected to reduce equipment failures by proactively identifying and replacing or repairing compromised equipment.

Accidents were the third largest driver of interruptions in 2019. Accidents decreased by 35 percent between 2018 and 2019 and decreased by 27 percent when compared to the five-year average. Vehicle pole hits decreased by 32 percent and outages caused by squirrels decreased by 24 percent when compared to the five-year average. Central Hudson credits the national focus on distracted driving and their awareness campaign for the reduction in vehicle pole hits. To improve reliability for customers on circuits impacted by squirrels, Central Hudson installed squirrel guards and covered tap wire on problem transformers in affected areas. Central Hudson also continues its use of electronic reclosers to create more robust feeders, which are less susceptible to transient outages.

Central Hudson's duration performance of 2.37 hours met the established target of 2.50 hours. However, the customer average outage duration increased by 10.2 minutes when compared to the five-year average. The increase was driven by the 14 percent longer repair times due to tree contacts when compared to the five-year average. Central Hudson is working to improve its duration performance by scheduling additional crews to respond to outages at the end of the day or after hours and weekends based on the weather forecast. In addition, repair time are being improved through additional switching opportunities. Central Hudson is also using business intelligence software to collect and analyze data to identify opportunities to improve response time and/or repair time.

ORANGE & ROCKLAND

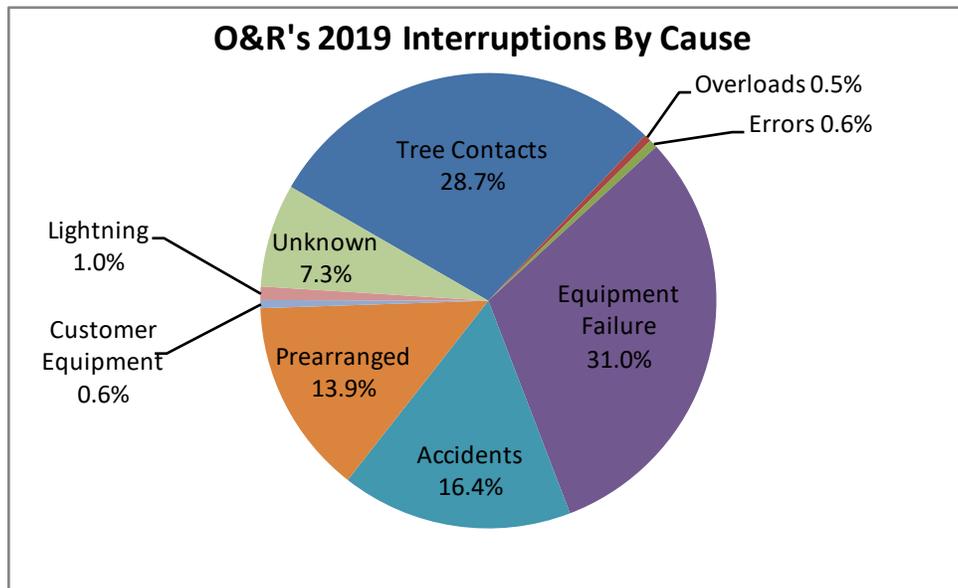
**Table 6: Orange & Rockland’s Historic Performance Excluding Major Storms**

Performance Metric	2015	2016	2017	2018	2019	Current RPM Target	Five-Year Average
Frequency (SAIFI)	1.01	1.06	0.92	1.14	1.09	1.20	1.04
Duration (CAIDI)	2.44	1.70	1.68	1.82	1.71	1.85	1.87

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

Orange & Rockland serves approximately 300,000 customers in New York and New Jersey northwest of New York City. For reliability purposes in New York, the Company collects data in Orange, Rockland, and Sullivan counties. Orange & Rockland met both its established frequency and duration targets for 2019. The Company’s frequency performance of 1.09 was better than the established target of 1.20 but slightly worse than the five-year average of 1.04. The Company’s duration performance of 1.74 was better than both the established target of 1.85 and the five-year average of 1.87.

As shown in Figure 9, equipment failures and tree contacts continue to be the major cause of interruptions for the Orange & Rockland. In 2019, these two categories accounted for approximately 60 percent of all interruptions, 71 percent of all customers affected, and 75 percent of all customer hours of interruption. Accidents continue to be the third leading cause of interruptions.



**Figure 9: Orange & Rockland’s 2019 Interruptions by Cause (Excluding Major Storms)**

In 2019, interruptions due to equipment failure decreased by approximately four percent when compared to 2018. While the Company did not attribute this to the failure rate of any single equipment type, secondary and primary connector and splice failures still are the most common causes in the category. The failure rate in underground systems increased above historical levels; this was primarily attributed to pad mounted transformers failures. The Company will continue to monitor the performance of all equipment types to identify any potential failures, identify trends, and take mitigation measures as necessary.

In 2020, Orange & Rockland will again perform infrared thermal inspections. Orange & Rockland's Infrared Thermal Inspection Program is employed each year on all three-phase overhead facilities and one third of the single-phase overhead facilities. The program is also employed on the transmission system, once in the spring to ensure system readiness during the summer months and in the summer during full load conditions. Infrared inspection quickly locates problems and determines the severity of the problem. This leads to reduced maintenance costs, fewer equipment failures, improved system reliability, and improved power quality.

Orange & Rockland is also continuing its deployment of smart meters and Advanced Metering Infrastructure (AMI) across its service territory. Orange & Rockland is using the smart meters and AMI to proactively monitor network health and discover indications of problems before they cause interruptions. Data from AMI is also being compared with Outage Management System (OMS) data to validate interruption data. This effort will improve outage reporting accuracy, increases the accuracy of the OMS network, and improve reliability metrics.

In 2019, the Company faced tree related reliability challenges with near record rainfall, resulting in accelerated vegetation growth and significantly impacting the length of pruning cycles. Despite that, vegetation contact outages were slightly down in 2019, as compared to 2018 level. Orange & Rockland will continue to address tree contact issues through distribution trimming. Orange & Rockland's 2019 capital budget also includes a distribution automation program. This is a multi-year initiative focuses on the installation and upgrading of field devices that will improve the resiliency and the

reliability of the system. Examples of distribution automation devices includes reclosers, automatic switches, and motor-operated air brakes (MOAB) switches. These devices are typically used in an auto-loop design, which are tied into alternative power sources. These loop distribution systems are designed to circle through the service area and several substations before terminating at the point of origin. The strategic placement of switches permits the Company to supply power to customers from either direction. If one power source fails, switches are opened or closed to obtain a power source. In 2019, the Company installed 2 auto-loops, 17 reclosers, 71 MOABs, and 9 smart capacitors. This equipment combined with auto-loop design reduces customer outage duration and provides the control center with immediate notification of system issues. These programs will have a positive impact on both the frequency and duration of interruptions in the coming years.

### PSEG LI

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

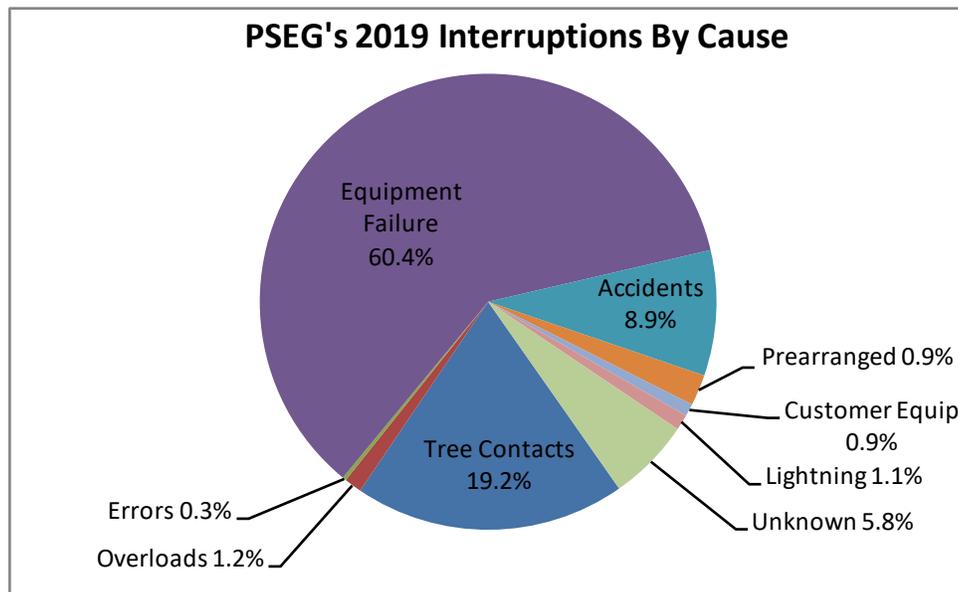
<b>Performance Metric</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Current OSA Target</b>	<b>Five-Year Average</b>
Frequency (SAIFI)	0.84	1.11	0.95	0.86	0.67	0.92	0.89
Duration (CAIDI)	1.31	1.14	1.16	1.27	1.27	1.42	1.23

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

PSEG LI serves approximately 1,129,000 customers on Long Island. The utility's territory includes Nassau County, Suffolk County, and the Rockaway Peninsula in Queens County. PSEG LI began operating and maintaining the electric system on Long Island on January 1, 2014. PSEG LI operates the system on behalf of the Long Island Power Authority (LIPA), and it supplies 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 LIPA.<sup>14</sup>

In 2019, PSEG LI met its OSA targets for both outage duration and frequency. PSEG LI's outage frequency level improved for the third consecutive year in 2019. The Company's 2019 frequency performance was also significantly better than its five-year average. While PSEG LI's duration performance of 1.27 hours achieved the current OSA target, it was 2.4 minutes longer than the five-year average and has not improved since last year. Figure 10, below, shows equipment failures are by far the leading cause of interruptions, followed by tree contacts, and accidents.



**Figure 10: PSEG LI's 2019 Interruptions by Cause (Excluding Major Storms)**

Every year, as part of their Circuit Improvement Program, PSEG LI inspects hundreds of miles of electric distribution lines to make sure the equipment is in good working order. PSEG LI also upgrades poles, wires, and other equipment to make circuits more reliable and better able to withstand extreme weather such as heat waves and storms. In 2019, 134 new automated switches were installed through the Circuit Improvement Program. PSEG LI plans to install an additional 150 automated switches

<sup>14</sup> 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>)

by the end of 2022. The strategic placement of these switches allows the Company to supply power to customers from multiple sources. PSEG LI reports a 28 percent reduction in the number of customer interruptions through the use of automated switches.

PSEG LI's enhanced tree trimming program is having a positive effect on reliability for those circuits that are being trimmed under the increased clearance specification. Specifically, for the circuits with a full year of history of being trimmed to the new specification there has been a 44.6 percent reduction, on average, in customers interrupted and a 28.8 percent reduction in customer minutes interrupted, including major storms. PSEG LI prioritizes the circuit to be trimmed based on historical reliability performance under tree caused interruptions and circuit patrol observations.

PSEG LI will also complete its \$729 million Federal Emergency Management Agency (FEMA) Storm Hardening Program this year. Construction began in October 2015 and involved upgrading approximately 1,025 miles of three-phase overhead circuits and installing 894 reclosers. This represents approximately 41 percent of the three-phase mileage on PSEG LI's system. Comparing upgraded circuits to non-upgraded circuits, PSEG LI reports a 43 percent reduction in the number of interruptions excluding major storms. When including major storms, PSEG LI reports a 25 percent reduction in the number of interruptions. Upon completion of the FEMA program, PSEG LI will continue its efforts to storm harden the system using the same standards. Through the end of 2021, 60 circuits and 163 miles of three-phase overhead circuits will be upgraded.

**APPENDIX**

The 2019  
Interruption  
Report

Office of Resilience and Emergency Preparedness  
June 2020

**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 2018, customers served is the number of customers as of December 31, 2018. 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)**

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
<b>CHGE</b>						
FREQUENCY	1.28	1.34	1.18	1.50	1.26	1.31
DURATION	2.07	2.33	2.20	2.04	2.38	2.20
<b>CONED</b>						
FREQUENCY	0.11	0.13	0.11	0.12	0.18	0.13
DURATION	3.11	2.49	2.77	2.75	3.33	2.89
<b>PSEG LI *</b>						
FREQUENCY	0.84	1.11	0.95	0.86	0.68	0.89
DURATION	1.31	1.14	1.16	1.27	1.27	1.23
<b>NAT GRID</b>						
FREQUENCY	1.02	1.05	1.03	1.02	1.03	1.03
DURATION	2.04	2.02	1.99	2.04	2.02	2.02
<b>NYSEG</b>						
FREQUENCY	1.17	1.19	1.18	1.20	1.36	1.22
DURATION	1.97	2.02	2.06	2.17	1.93	2.03
<b>Orange &amp; Rockland</b>						
FREQUENCY	1.01	1.06	0.92	1.14	1.09	1.04
DURATION	2.44	1.70	1.68	1.82	1.71	1.87
<b>RG&amp;E</b>						
FREQUENCY	0.75	0.58	0.59	0.75	0.73	0.68
DURATION	1.82	1.79	1.77	1.79	1.84	1.80
<b>STATEWIDE (WITHOUT CONED)</b>						
FREQUENCY	1.00	1.07	1.01	1.03	1.00	1.02
DURATION	1.88	1.79	1.81	1.88	1.88	1.85
<b>STATEWIDE (WITH CONED)</b>						
FREQUENCY	0.62	0.67	0.62	0.64	0.64	0.64
DURATION	1.97	1.85	1.88	1.96	2.05	1.94

**COMPARISON OF SERVICE RELIABILITY INDICES  
(INCLUDING MAJOR STORMS)**

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
<b>CHGE</b>						
FREQUENCY	1.38	1.45	1.54	2.59	1.55	1.71
DURATION	2.09	2.51	3.24	8.14	3.15	3.83
<b>CONED</b>						
FREQUENCY	0.11	0.14	0.12	0.20	0.20	0.15
DURATION	3.14	2.67	2.90	17.01	3.51	5.85
<b>PSEG LI *</b>						
FREQUENCY	1.00	1.34	1.10	1.13	0.98	1.11
DURATION	1.95	1.46	1.70	2.24	2.91	2.05
<b>NAT GRID</b>						
FREQUENCY	1.06	1.18	1.42	1.53	1.49	1.34
DURATION	2.07	2.41	4.14	4.34	3.64	3.32
<b>NYSEG</b>						
FREQUENCY	1.28	1.57	1.83	2.31	1.91	1.78
DURATION	2.14	2.89	3.98	9.18	3.13	4.27
<b>Orange &amp; Rockland</b>						
FREQUENCY	1.01	1.21	1.06	1.76	1.38	1.28
DURATION	2.44	1.96	2.10	7.78	2.49	3.35
<b>RG&amp;E</b>						
FREQUENCY	0.87	0.70	1.34	1.00	0.93	0.97
DURATION	2.14	2.09	18.32	3.64	2.43	5.72
<b>STATEWIDE (WITHOUT CONED)</b>						
FREQUENCY	1.09	1.28	1.40	1.62	1.40	1.36
DURATION	2.08	2.25	4.60	5.87	3.22	3.60
<b>STATEWIDE (WITH CONED)</b>						
FREQUENCY	0.67	0.79	0.85	1.01	0.88	0.84
DURATION	2.16	2.28	4.50	6.81	3.25	3.80

**STATEWIDE (WITHOUT CON ED)**

Excluding Major Storms

	2015	2016	2017	2018	2019	5 YR AVG
Number of Interruptions	53,551	57,960	56,766	61,441	57,657	57,475
Number of Customer-Hours	8,408,508	8,636,377	8,223,141	8,838,401	8,560,007	8,533,287
Number of Customers Affected	4,474,728	4,815,522	4,555,618	4,689,214	4,565,064	4,620,029
Number of Customers Served	4,494,878	4,517,887	4,543,176	4,577,274	4,595,216	4,545,686
Average Duration Per Customer Affected (CAIDI)	1.88	1.79	1.81	1.88	1.88	1.85
Average Duration Per Customers Served	1.88	1.92	1.82	1.95	1.87	1.89
Interruptions Per 1000 Customers Served	11.95	12.89	12.56	13.52	12.60	12.71
Number of Customers Affected Per Customer Served (SAIFI)	1.00	1.07	1.01	1.03	1.00	1.02

**STATEWIDE (WITH CON ED)**

Excluding Major Storms

	2015	2016	2017	2018	2019	5 YR AVG
Number of Interruptions	70,017	71,704	72,376	78,098	73,929	73,225
Number of Customer-Hours	9,582,883	9,710,475	9,275,141	9,983,360	10,625,692	9,835,510
Number of Customers Affected	4,852,363	5,246,331	4,935,045	5,105,730	5,185,626	5,065,019
Number of Customers Served	7,880,054	7,928,059	7,978,073	8,042,233	8,100,203	7,985,724
Average Duration Per Customer Affected (CAIDI)	1.97	1.85	1.88	1.96	2.05	1.94
Average Duration Per Customers Served	1.22	1.23	1.17	1.25	1.32	1.24
Interruptions Per 1000 Customers Served	8.93	9.10	9.13	9.79	9.19	9.23
Number of Customers Affected Per Customer Served (SAIFI)	0.62	0.67	0.62	0.64	0.64	0.64

**STATEWIDE (WITHOUT CON ED)**

Including Major Storms

	2015	2016	2017	2018	2019	5 YR AVG
Number of Interruptions	56,723	66,790	71,951	89,665	77,483	72,522
Number of Customer- Hours	10,190,618	12,917,487	29,114,338	43,261,363	20,598,728	23,216,507
Number of Customers Affected	4,892,482	5,738,707	6,329,697	7,373,442	6,398,344	6,146,534
Number of Customers Served	4,494,878	4,517,887	4,543,176	4,577,274	4,595,216	4,545,686
Average Duration Per Customer Affected (CAIDI)	2.08	2.25	4.60	5.87	3.22	3.60
Average Duration Per Customers Served	2.27	2.87	6.44	9.52	4.50	5.12
Interruptions Per 1000 Customers Served	12.66	14.86	15.93	19.74	16.93	16.02
Number of Customers Affected Per Customer Served (SAIFI)	1.09	1.28	1.40	1.62	1.40	1.36

**STATEWIDE (WITH CON ED)**

Including Major Storms

	2015	2016	2017	2018	2019	5 YR AVG
Number of Interruptions	73,468	80,994	88,151	113,241	94,714	90,114
Number of Customer- Hours	11,381,657	14,148,142	30,293,340	54,866,948	23,018,645	26,741,746
Number of Customers Affected	5,271,638	6,199,042	6,735,617	8,055,529	7,087,711	6,669,907
Number of Customers Served	7,880,054	7,928,059	7,978,073	8,042,233	8,100,203	7,985,724
Average Duration Per Customer Affected (CAIDI)	2.16	2.28	4.50	6.81	3.25	3.80
Average Duration Per Customers Served	1.45	1.80	3.82	6.88	2.86	3.36
Interruptions Per 1000 Customers Served	9.37	10.28	11.12	14.19	11.78	11.35
Number of Customers Affected Per Customer Served (SAIFI)	0.67	0.79	0.85	1.01	0.88	0.84

**CENTRAL HUDSON**

Excluding Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	6,387	7,407	7,129	8,011	7,316	7,250
Number of Customer- Hours	797,184	938,066	785,105	926,783	908,953	871,218
Number of Customers Affected	384,364	402,140	357,572	454,343	382,350	396,154
Number of Customers Served	300,647	302,432	302,187	304,382	307,024	303,334
Average Duration Per Customer Affected (CAIDI)	2.07	2.33	2.20	2.04	2.38	2.20
Average Duration Per Customers Served	2.66	3.12	2.60	3.07	2.99	2.88
Interruptions Per 1000 Customers Served	21.27	24.64	23.57	26.51	24.04	24.01
Number of Customers Affected Per Customer Served (SAIFI)	1.28	1.34	1.18	1.50	1.26	1.31

**CENTRAL HUDSON**

Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	6,587	7,802	8,344	11,334	8,517	8,517
Number of Customer- Hours	867,550	1,096,082	1,512,967	6,380,295	1,490,509	2,269,480
Number of Customers Affected	414,932	436,716	466,830	783,881	473,130	515,098
Number of Customers Served	300,647	302,432	302,187	304,382	307,024	303,334
Average Duration Per Customer Affected (CAIDI)	2.09	2.51	3.24	8.14	3.15	3.83
Average Duration Per Customers Served	2.89	3.65	5.00	21.11	4.90	7.51
Interruptions Per 1000 Customers Served	21.94	25.95	27.59	37.51	27.98	28.19
Number of Customers Affected Per Customer Served (SAIFI)	1.38	1.45	1.54	2.59	1.55	1.71

**CON ED (SYSTEM)**

Excluding Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	16,466	13,744	15,610	16,657	16,272	15,750
Number of Customer- Hours	1,174,375	1,074,098	1,052,001	1,144,959	2,065,685	1,302,223
Number of Customers Affected	377,635	430,809	379,427	416,516	620,562	444,990
Number of Customers Served	3,385,176	3,410,172	3,434,897	3,464,959	3,504,987	3,440,038
Average Duration Per Customer Affected (CAIDI)	3.11	2.49	2.77	2.75	3.33	2.89
Average Duration Per Customers Served	0.35	0.32	0.31	0.33	0.60	0.38
Interruptions Per 1000 Customers Served	4.90	4.06	4.58	4.85	4.70	4.62
Number of Customers Affected Per Customer Served (SAIFI)	0.11	0.13	0.11	0.12	0.18	0.13

**CON ED (SYSTEM)**

Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	16,745	14,204	16,200	23,576	17,231	17,591
Number of Customer- Hours	1,191,039	1,230,655	1,179,002	11,605,586	2,419,917	3,525,240
Number of Customers Affected	379,156	460,335	405,920	682,087	689,367	523,373
Number of Customers Served	3,385,176	3,410,172	3,434,897	3,464,959	3,504,987	3,440,038
Average Duration Per Customer Affected (CAIDI)	3.14	2.67	2.90	17.01	3.51	5.85
Average Duration Per Customers Served	0.35	0.36	0.35	3.38	0.70	1.03
Interruptions Per 1000 Customers Served	4.98	4.20	4.75	6.86	4.97	5.15
Number of Customers Affected Per Customer Served (SAIFI)	0.11	0.14	0.12	0.20	0.20	0.15

**CON ED (NETWORK)**

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	10,523	6,980	9,462	9,187	8,648	8,960
Number of Customer- Hours	569,966	348,053	441,055	434,540	765,764	511,876
Number of Customers Affected	67,966	46,918	62,005	59,620	144,678	76,237
Number of Customers Served	2,497,705	2,510,320	2,545,351	2,568,843	2,600,719	2,544,588
Average Duration Per Customer Affected (CAIDI)	8.39	7.42	7.11	7.29	5.29	7.10
Average Duration Per Customers Served	0.23	0.14	0.18	0.17	0.30	0.20
Interruptions Per 1000 Customers Served	4.25	2.79	3.77	3.61	3.37	3.56
Number of Customers Affected Per Customer Served (SAIFI)	0.027	0.019	0.025	0.023	0.056	0.03

**CON ED (RADIAL)**

Excluding Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	5,943	6,764	6148	7,470	7,624	6,790
Number of Customer- Hours	604,408	726,044	610945	710,418	1,299,921	790,347
Number of Customers Affected	309,669	383,891	317422	356,896	475,884	368,752
Number of Customers Served	887,471	899,852	889,546	896,116	904,268	895,451
Average Duration Per Customer Affected (CAIDI)	1.95	1.89	1.92	1.99	2.73	2.10
Average Duration Per Customers Served	0.68	0.82	0.68	0.80	1.45	0.89
Interruptions Per 1000 Customers Served	6.68	7.62	6.83	8.40	8.51	7.61
Number of Customers Affected Per Customer Served (SAIFI)	0.35	0.43	0.35	0.40	0.53	0.41

**CON ED (RADIAL)**

Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	6,222	7,224	6738	14,389	8,583	8,631
Number of Customer- Hours	621,073	882,602	737947	11,171,045	1,654,153	3,013,364
Number of Customers Affected	311,190	413,417	343915	622,467	544,689	447,136
Number of Customers Served	887,471	899,852	889,546	896,116	904,268	895,451
Average Duration Per Customer Affected (CAIDI)	2.00	2.13	2.15	17.95	3.04	5.45
Average Duration Per Customers Served	0.70	0.99	0.82	12.56	1.85	3.38
Interruptions Per 1000 Customers Served	7.00	8.14	7.49	16.18	9.58	9.68
Number of Customers Affected Per Customer Served (SAIFI)	0.35	0.47	0.38	0.70	0.61	0.50

**NATIONAL GRID**

Excluding Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	13,385	13,978	13,743	14,447	13,747	13,860
Number of Customer- Hours	3,343,062	3,398,634	3,333,796	3,408,167	3,426,393	3,382,010
Number of Customers Affected	1,640,947	1,684,257	1,671,096	1,670,265	1,692,764	1,671,866
Number of Customers Served	1,609,787	1,622,512	1,635,856	1,650,922	1,656,128	1,635,041
Average Duration Per Customer Affected (CAIDI)	2.04	2.02	1.99	2.04	2.02	2.02
Average Duration Per Customers Served	2.08	2.11	2.05	2.08	2.08	2.08
Interruptions Per 1000 Customers Served	8.32	8.68	8.47	8.83	8.33	8.53
Number of Customers Affected Per Customer Served (SAIFI)	1.02	1.05	1.03	1.02	1.03	1.03

**NATIONAL GRID**

Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	13,789	16,104	18,881	22,653	21,177	18,521
Number of Customer- Hours	3,543,893	4,597,543	9,513,770	10,882,228	8,946,922	7,496,871
Number of Customers Affected	1,711,850	1,906,370	2,296,097	2,510,027	2,459,557	2,176,780
Number of Customers Served	1,609,787	1,622,512	1,635,856	1,650,922	1,656,128	1,635,041
Average Duration Per Customer Affected (CAIDI)	2.07	2.41	4.14	4.34	3.64	3.32
Average Duration Per Customers Served	2.20	2.86	5.86	6.65	5.42	4.60
Interruptions Per 1000 Customers Served	8.57	10.00	11.64	13.85	12.83	11.38
Number of Customers Affected Per Customer Served (SAIFI)	1.06	1.18	1.42	1.53	1.49	1.34

**NYSEG**

Excluding Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	10,628	10,375	10,441	11,349	11,051	10,769
Number of Customer- Hours	1,992,932	2,108,879	2,141,108	2,310,303	2,329,587	2,176,562
Number of Customers Affected	1,012,506	1,042,453	1,037,330	1,063,122	1,207,533	1,072,589
Number of Customers Served	875,383	879,066	884,136	891,168	895,050	884,961
Average Duration Per Customer Affected (CAIDI)	1.97	2.02	2.06	2.17	1.93	2.03
Average Duration Per Customers Served	2.30	2.41	2.44	2.61	2.61	2.47
Interruptions Per 1000 Customers Served	12.25	11.85	11.88	12.84	12.40	12.24
Number of Customers Affected Per Customer Served (SAIFI)	1.17	1.19	1.18	1.20	1.36	1.22

**NYSEG**

Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	11,203	13,025	14,289	20,937	15,500	14,991
Number of Customer- Hours	2,381,242	3,977,003	6,390,928	18,716,707	5,323,921	7,357,960
Number of Customers Affected	1,110,385	1,374,336	1,604,622	2,038,575	1,699,146	1,565,413
Number of Customers Served	875,383	879,066	884,136	891,168	895,050	884,961
Average Duration Per Customer Affected (CAIDI)	2.14	2.89	3.98	9.18	3.13	4.27
Average Duration Per Customers Served	2.75	4.54	7.27	21.17	5.97	8.34
Interruptions Per 1000 Customers Served	12.92	14.88	16.25	23.68	17.39	17.02
Number of Customers Affected Per Customer Served (SAIFI)	1.28	1.57	1.83	2.31	1.91	1.78

**PSEG-LI**

Excluding Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	17,214	20,139	19,009	20,697	18,578	19,127
Number of Customer- Hours	1,222,162	1,408,373	1,229,618	1,223,074	966,360	1,209,917
Number of Customers Affected	934,097	1,237,719	1,064,452	963,985	760,091	992,069
Number of Customers Served	1,116,191	1,118,963	1,122,011	1,124,900	1,128,693	1,122,152
Average Duration Per Customer Affected (CAIDI)	1.31	1.44	1.16	1.27	1.27	1.23
Average Duration Per Customers Served	1.10	1.26	1.10	1.09	0.86	1.08
Interruptions Per 1000 Customers Served	15.46	18.04	16.99	18.45	16.52	17.09
Number of Customers Affected Per Customer Served (SAIFI)	0.84	1.11	0.95	0.86	0.68	0.89

**PSEG-LI**

Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	19,061	23,292	21,288	26,277	24,220	22,828
Number of Customer- Hours	2,166,956	2,183,379	2,092,168	2,847,012	3,204,176	2,498,738
Number of Customers Affected	1,111,055	1,495,619	1,228,334	1,271,447	1,102,036	1,241,698
Number of Customers Served	1,116,191	1,118,963	1,122,011	1,124,900	1,128,693	1,122,152
Average Duration Per Customer Affected (CAIDI)	1.95	1.46	1.70	2.24	2.91	2.05
Average Duration Per Customers Served	1.95	1.96	1.87	2.54	2.85	2.23
Interruptions Per 1000 Customers Served	17.12	20.87	19.02	23.42	21.53	20.39
Number of Customers Affected Per Customer Served (SAIFI)	1.00	1.34	1.10	1.13	0.98	1.11

**O&R**

Excluding Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	2,900	3,223	3,287	3,709	3,669	3,358
Number of Customer- Hours	545,813	398,964	345,072	465,474	424,497	435,964
Number of Customers Affected	224,054	234,934	205,585	255,706	248,317	233,719
Number of Customers Served	221,542	223,048	224,400	227,959	229,180	225,226
Average Duration Per Customer Affected (CAIDI)	2.44	1.70	1.68	1.82	1.71	1.87
Average Duration Per Customers Served	2.46	1.80	1.55	2.07	1.86	1.95
Interruptions Per 1000 Customers Served	13.09	14.55	14.74	16.53	16.09	15.00
Number of Customers Affected Per Customer Served (SAIFI)	1.01	1.06	0.92	1.14	1.09	1.04

**O&R**

Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	2,900	3,547	3,533	4,571	4,306	3,771
Number of Customer- Hours	545,813	523,975	496,654	3,069,852	783,968	1,084,052
Number of Customers Affected	224,054	267,191	236,698	394,557	314,613	287,423
Number of Customers Served	221,542	223,048	224,400	227,959	229,180	225,226
Average Duration Per Customer Affected (CAIDI)	2.44	1.96	2.10	7.78	2.49	3.35
Average Duration Per Customers Served	2.46	2.37	2.23	13.68	3.44	4.83
Interruptions Per 1000 Customers Served	13.09	16.01	15.84	20.37	18.89	16.84
Number of Customers Affected Per Customer Served (SAIFI)	1.01	1.21	1.06	1.76	1.38	1.28

**RG&E**

Excluding Major Storms

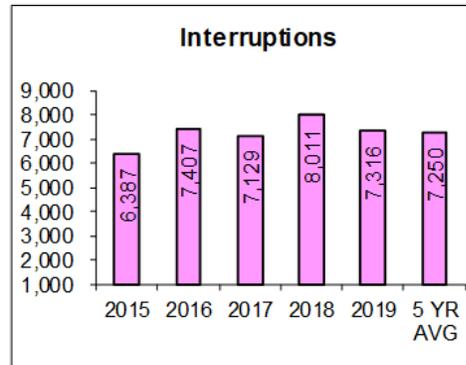
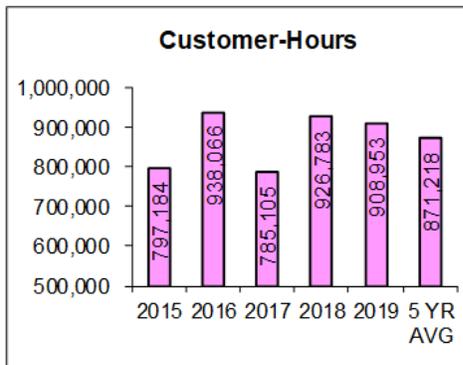
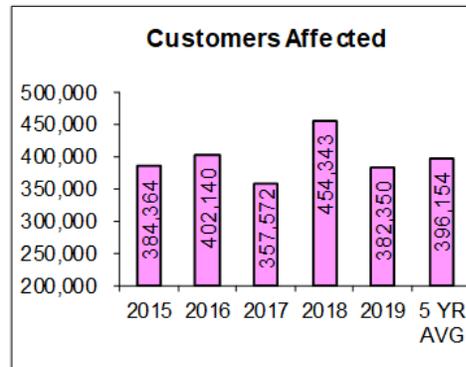
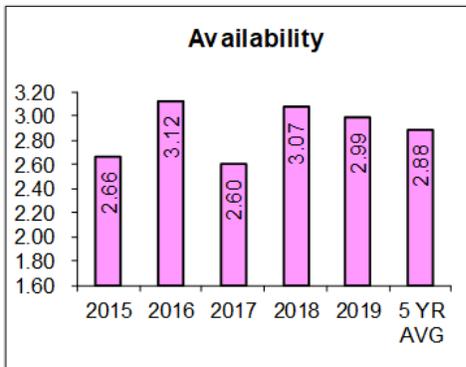
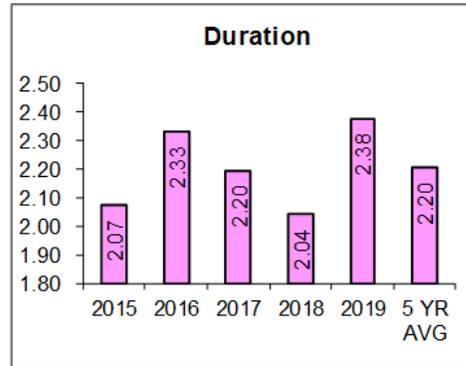
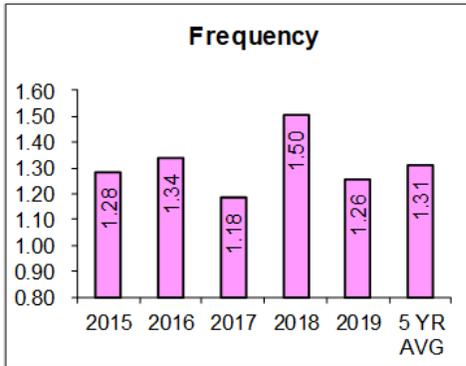
	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	3,037	2,838	3,157	3,228	3,296	3,111
Number of Customer- Hours	507,355	383,461	388,442	504,600	504,217	457,615
Number of Customers Affected	278,760	214,019	219,583	281,793	274,009	253,633
Number of Customers Served	371,328	371,866	374,586	377,943	379,141	374,973
Average Duration Per Customer Affected (CAIDI)	1.82	1.79	1.77	1.79	1.84	1.80
Average Duration Per Customers Served	1.37	1.03	1.04	1.35	1.33	1.23
Interruptions Per 1000 Customers Served	8.22	7.64	8.49	8.62	8.72	8.34
Number of Customers Affected Per Customer Served (SAIFI)	0.75	0.58	0.59	0.75	0.73	0.68

**RG&E**

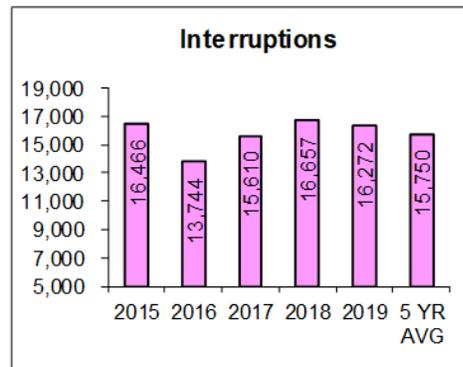
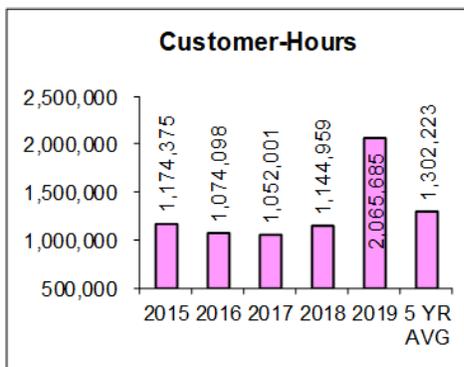
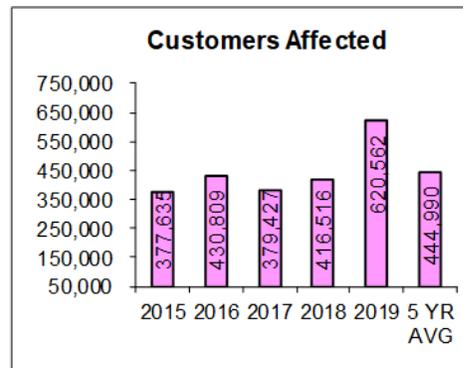
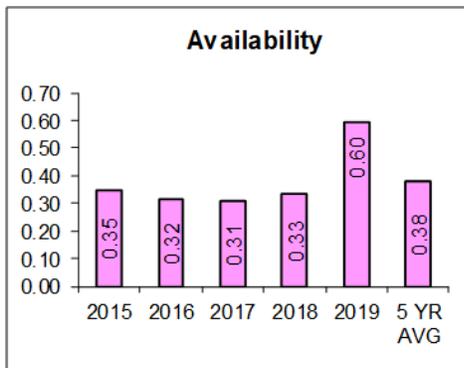
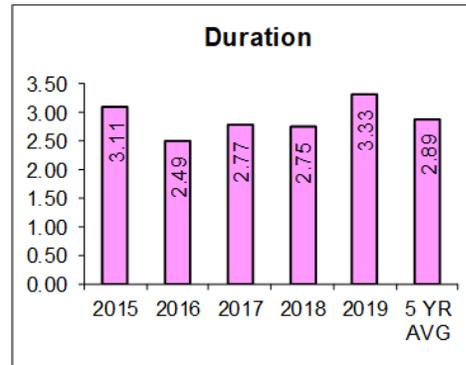
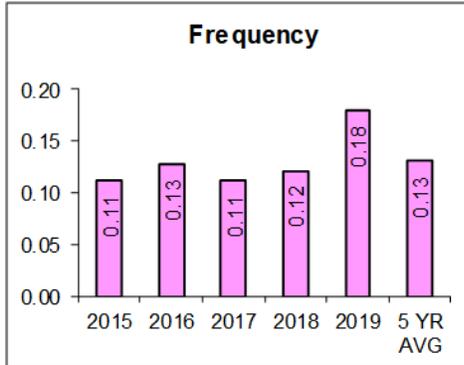
Including Major Storms

	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>5 YR AVG</b>
Number of Interruptions	3,183	3,020	5,616	3,893	3,763	3,895
Number of Customer- Hours	685,163	539,505	9,107,851	1,365,269	849,232	2,509,404
Number of Customers Affected	320,206	258,475	497,116	374,955	349,862	360,123
Number of Customers Served	371,328	371,866	374,586	377,943	379,141	374,973
Average Duration Per Customer Affected (CAIDI)	2.14	2.09	18.32	3.64	2.43	5.72
Average Duration Per Customers Served	1.85	1.45	24.49	3.64	2.25	6.74
Interruptions Per 1000 Customers Served	8.62	8.13	15.10	10.39	9.96	10.44
Number of Customers Affected Per Customer Served (SAIFI)	0.87	0.70	1.34	1.00	0.93	0.97

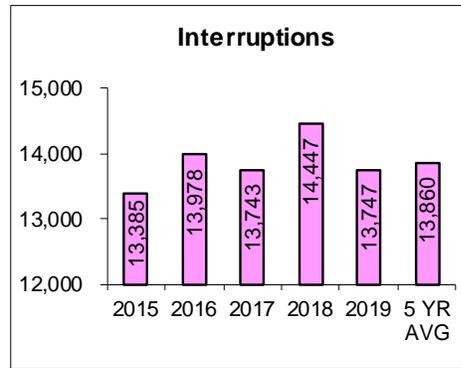
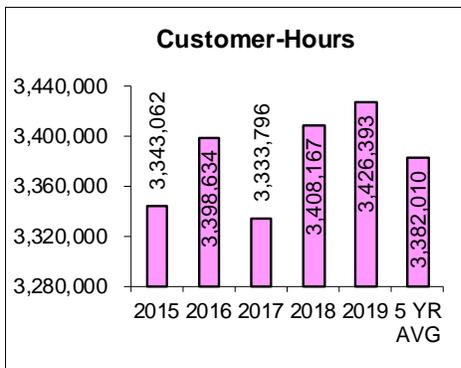
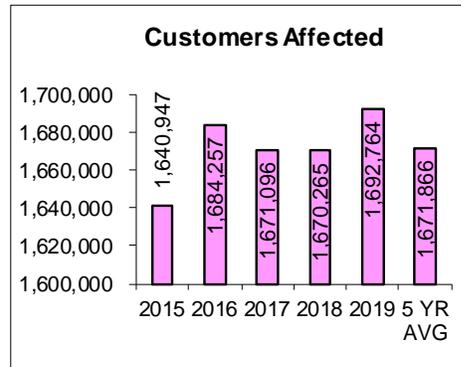
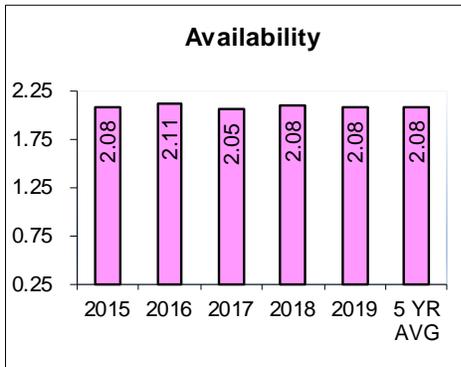
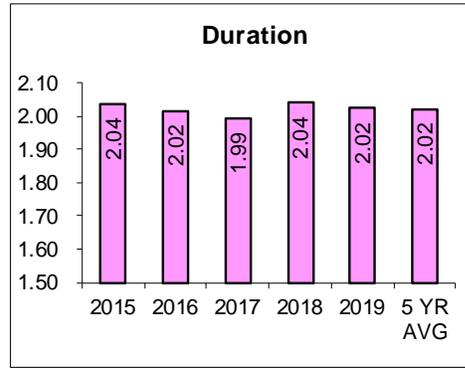
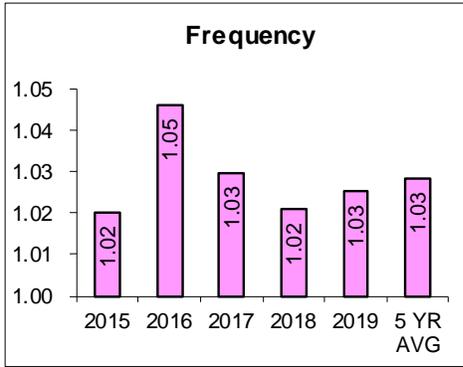
### Central Hudson Gas and Electric (Excluding Major Storms)



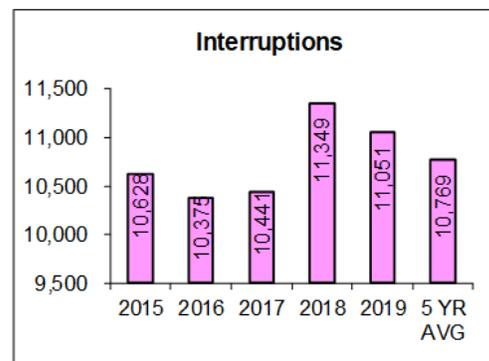
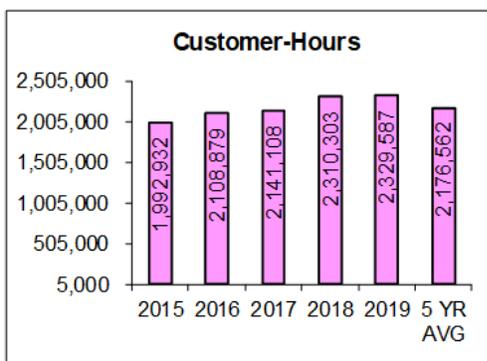
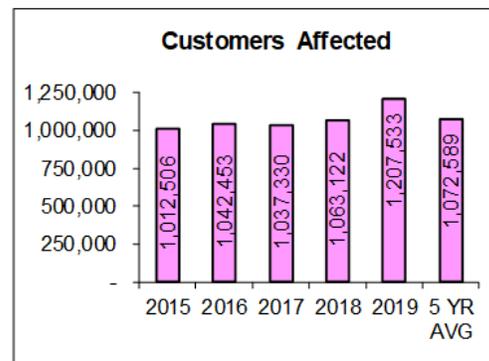
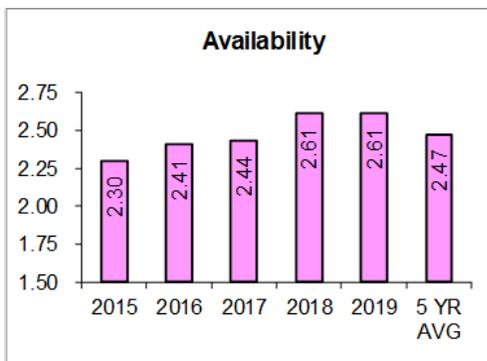
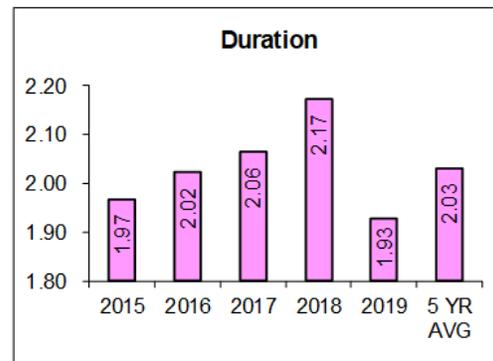
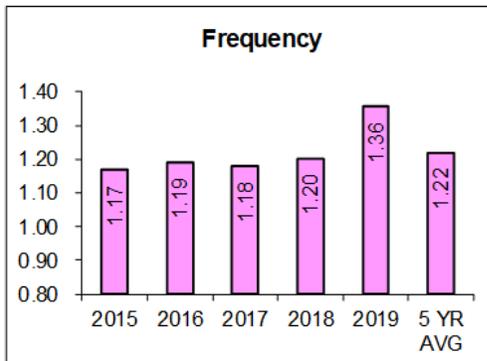
### Consolidated Edison - System (Excluding Major Storms)



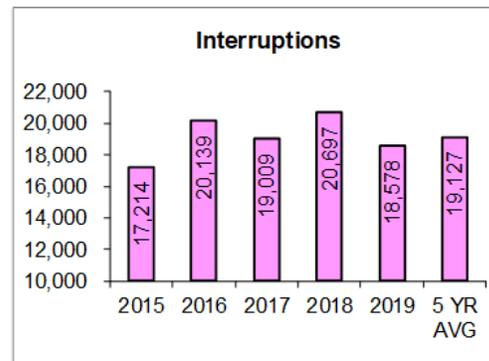
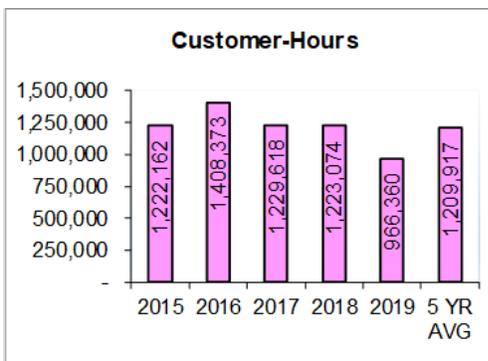
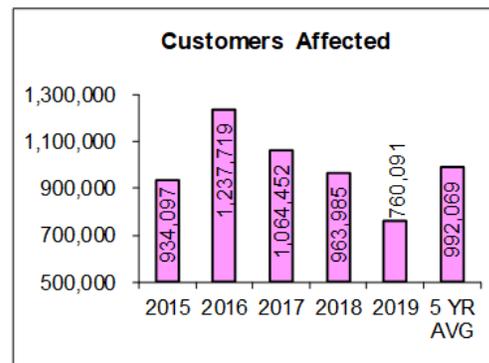
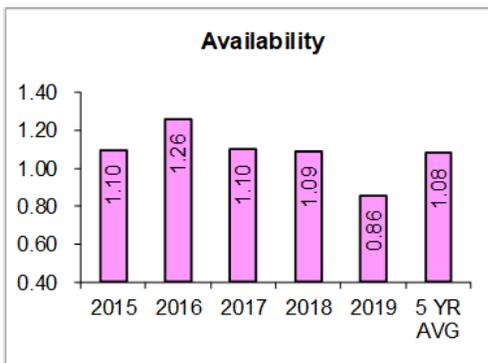
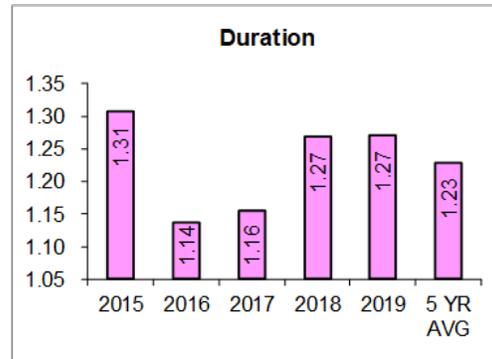
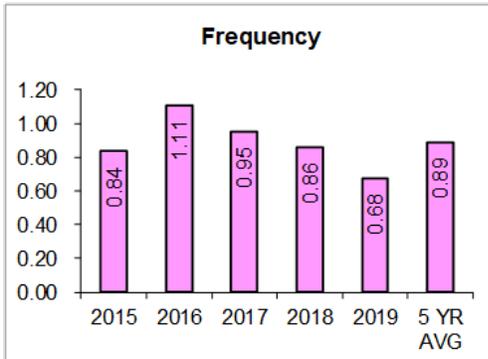
### National Grid (Excluding Major Storms)



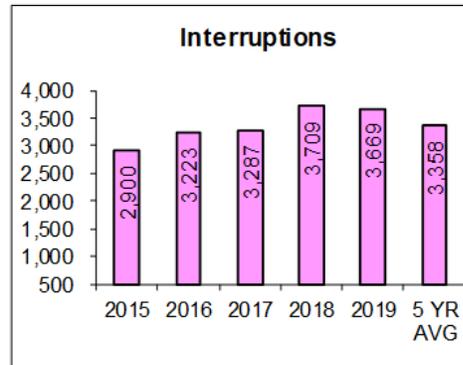
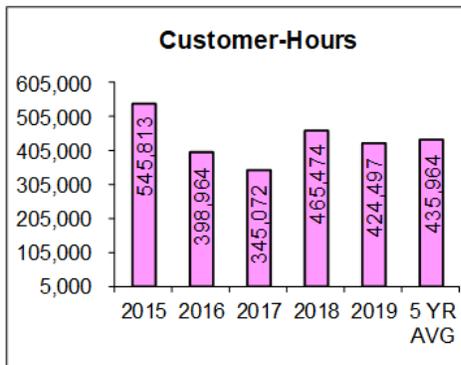
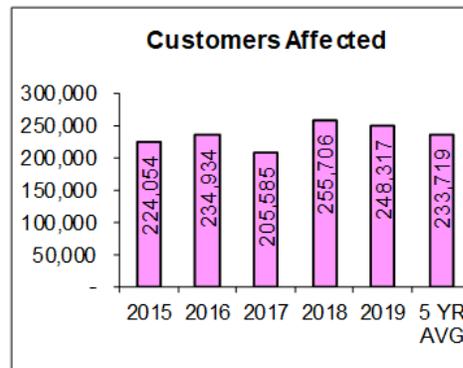
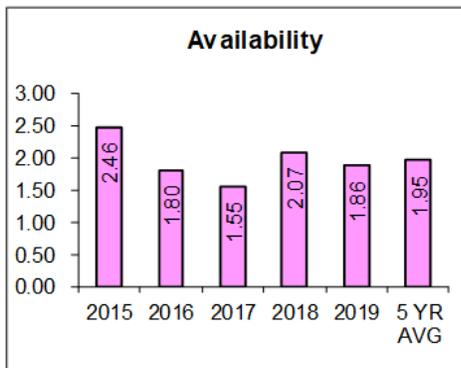
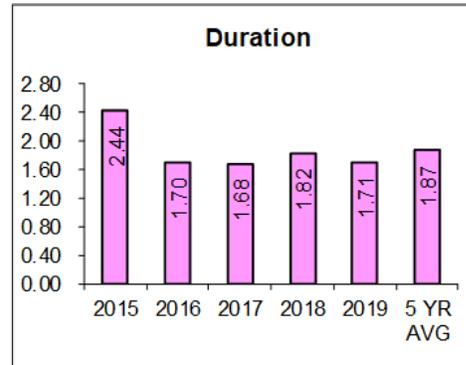
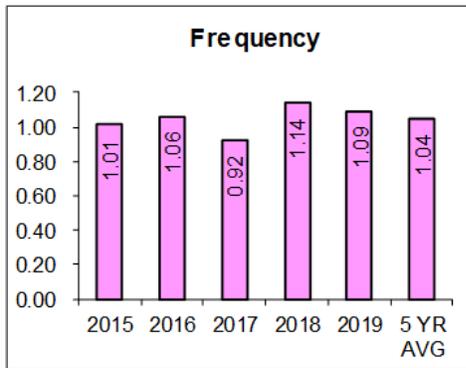
### New York State Electric and Gas (Excluding Major Storms)



### PSEG-LI (Excluding Major Storms)



### Orange and Rockland Utilities (Excluding Major Storms)



### Rochester Gas and Electric (Excluding Major Storms)

