



2021 ELECTRIC RELIABILITY PERFORMANCE REPORT

Office of Resilience and Emergency Preparedness

June 2022

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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 2021. 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. 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 level of service provided to New York State customers. First, utilities are required to submit detailed monthly interruption data to the Commission.² 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 are 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.³ Unlike the investor-owned utilities, PSEG-LI does not have rate orders or RPMs set by the Commission but does have performance metrics associated with reliability set as part of an Operating Service Agreement.⁴

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 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.

³ Negative revenue adjustments are paid by shareholders and not by rate payers.

⁴ Amended and Restated Operations Services Agreement between Long Island Lighting Company d/b/a LIPA and PSEG Long Island LLC, Dated as of April 1, 2022. (<https://www.lipower.org/wp-content/uploads/2022/04/2nd-AR-OSA-in-effect-on-4-1-2022.pdf>).

In addition to Staff's review, the utilities are required to perform a reliability analysis. Each utility 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 2021 remained the same as last year and is slightly worse than the statewide five-year average (as shown in Figure 1, page 6).⁵ The 2021 frequency performance for all utilities other than Con Edison was worse than last year and the five-year average. Statewide, the three major causes for interruptions, excluding storms, were equipment failures, tree contacts, and accidents or events not under the utility's control.⁶ These three categories combined account for approximately 80 percent of all interruptions.

Excluding major storms, the statewide interruption duration was the same as the 2020 duration index but approximately 2.5 minutes longer than the five-year average (as shown in Figure 2, page 7). The statewide interruption duration index, excluding Con Edison,⁷ was slightly shorter than 2020 and approximately 2.0 minutes longer than the statewide five-year average.

The state experienced 38 separate storm events that qualified as major storms in 2021. While this is nine more events than 2020, customers affected by major storms decreased 54 percent and customer hours of interruption decreased 86 percent. From the customers' viewpoint, 2021 was one of the best years regarding impacts of major storms on electric service since 2016.

Con Edison, National Grid, Orange & Rockland, and PSEG-LI indicated they met their reliability targets in 2021. NYSEG failed its target for frequency for the third consecutive

⁵ 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.

⁶ 16 CRR-NY 97.5NY-CRR defines accidents or events not under utility's control as interruptions resulting from events not under the control of the utility or its employees or contractors, such as house fires not caused by the utility's service; gun fire; crane contacts; automobile accidents; squirrel, bird, or other animal contacts; sabotage; customer tree fellings; etc.

⁷ Con Edison's underground system is less prone to interruptions than overhead systems and Con Edison serves approximately a third of the state's electric customers. This combination can skew the statewide metrics.

year, incurring a negative revenue adjustment of \$7 million. NYSEG's frequency was 1.46, higher than the performance target of 1.20. Trees continue to be the single largest contributor to interruptions for NYSEG; accounting for 49 percent of interruptions. The Commission, in the 2020 Rate Order,⁸ authorized NYSEG to implement two new tree-related programs aimed at improving system reliability. The first program will reclaim circuits that have not been trimmed in over five years and the second will proactively address danger trees outside of the distribution right-of-way. NYSEG, however, does not appear to be utilizing these programs efficiently as it continues to perform poorly. NYSEG should be more focused on prioritizing worst performing areas in an effort to reduce customer impacts associated with vegetation.

For the past 20 years, RG&E has consistently maintained high levels of electric service reliability for both frequency and duration. In 2021, RG&E met its target for duration but failed to meet its frequency target, incurring a negative revenue adjustment of \$5 million. Prearranged interruptions jumped from the fourth leading cause for interruptions in 2020 to the top cause in 2021, most of these interruptions were due to the broadband expansion work in the area, that included pole replacements. Staff expects these outages will diminish over time once the broadband network is deployed.

Central Hudson experienced outage frequency and duration higher than the performance targets primarily due to tree contacts during minor storms. Central Hudson's 2021 frequency and duration performance were the worst performance in the past four years. As a result, Central Hudson will incur a negative revenue adjustment of approximately \$5.2 million. Tree contact interruptions were approximately seven percent higher than the 2020 level. Approximately 70 percent of tree contact interruptions were caused by limbs and trees from outside the clearance zone. In order to address tree contact interruptions, Central Hudson will modify its 2022 routine trimming schedule and shift resources to areas where they will have the most impactful effects on the frequency of interruptions. In addition, Central Hudson identified 21 circuits for hazard tree removals in 2022. Circuits demonstrating good reliability performance in 2021 will be trimmed in 2023.

⁸ Case 19-E-0378, Order Approving Electric and Gas Rate Plans in Accord with Joint Proposal, with Modifications (issued November 19, 2020), p. 82

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 The Commission then sets, company-wide performance expectations by establishing RPMs in rate orders for each utility. PSEG-LI is the exception, its performance expectations 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 submitted by the utilities enables Staff to calculate two primary performance metrics: SAIFI or outage frequency and CAIDI or outage duration. The utilities group frequency data into 10 categories that delineate the cause of the 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 could be installed on that circuit to minimize the effect of future lightning strikes. In general, utility interruptions typically result from major storms, equipment failures, tree contacts, 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.

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. Con Edison exclusively uses an additional seven cause codes for its underground network system.

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.

Some RPMs have additional measures to address specific concerns unique to an individual company.

2021 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 2021 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 2021 Interruption Report contains detailed interruption data for each utility and statewide statistics for the past five years. The Interruption Report for 2021 is attached as an Appendix to this report

This report presents interruption data in two ways – 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 can 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.

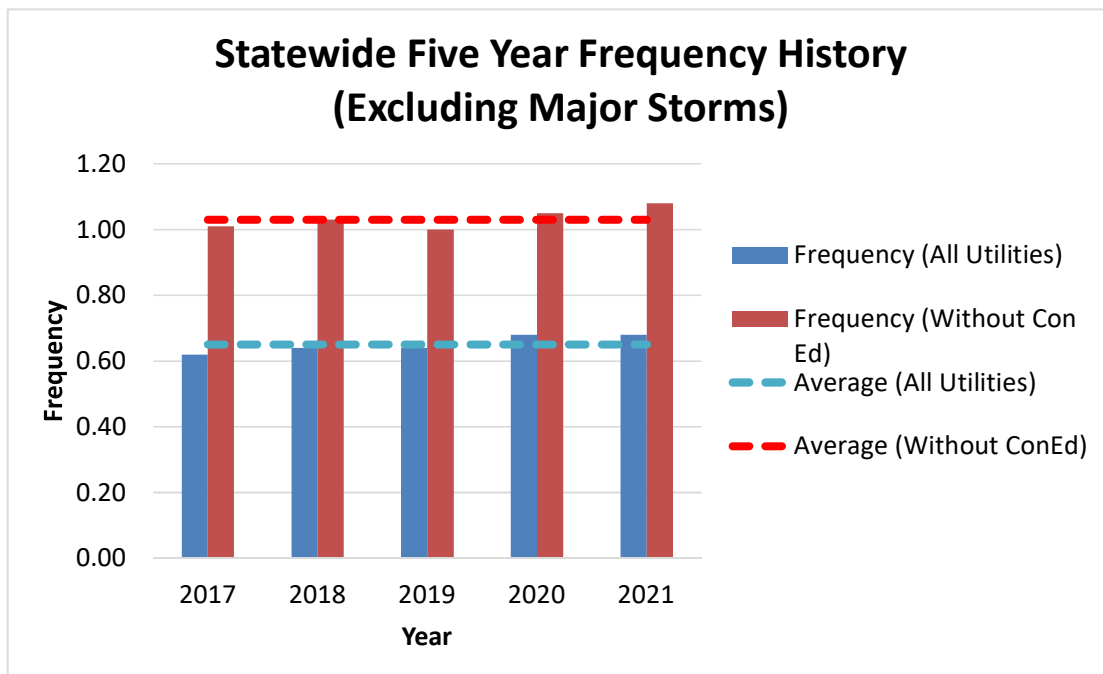


Figure 1: Statewide Frequency Performance

Statewide, as shown in Figure 1, the frequency of interruptions was the same as 2020 and slightly worse than 2019. Excluding major storms, the frequency was 0.68 in 2021, which remained the same as 2020 and is slightly worse than the five-year average. The frequency performance in 2021, for all utilities other than Con Edison, was 1.08, which is approximately three percent higher than the performance in 2020 of 1.05 and five percent higher than the five-year average performance 1.03. When including major storms, the statewide frequency performance was 0.85 and 1.38 for utilities other than Con Edison, indicating the effect major storms had on the utilities in 2021.

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 to reduce equipment failures include adding, updating, or replacing equipment and strengthening transmission and distribution lines. For example, to reduce the possibility of outages, utilities install reclosers and other protective devices on circuits. Detailed project descriptions aimed at lowering the frequency of interruptions can be found in the utility specific sections.

Figure 2, below, shows the historical statewide interruption duration index, excluding major storms. The 2021 overall statewide interruption duration index of 1.99 hours is

the same as the previous year and 2.4 minutes longer than the statewide five-year average of 1.95 hours. National Grid’s, PSEG-LI’s and Orange & Rockland’s duration performance improved from 2020. The statewide interruption duration index, excluding Con Edison, was 1.88 hours in 2021, which is 36 seconds better than 2020 but 1.8 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.

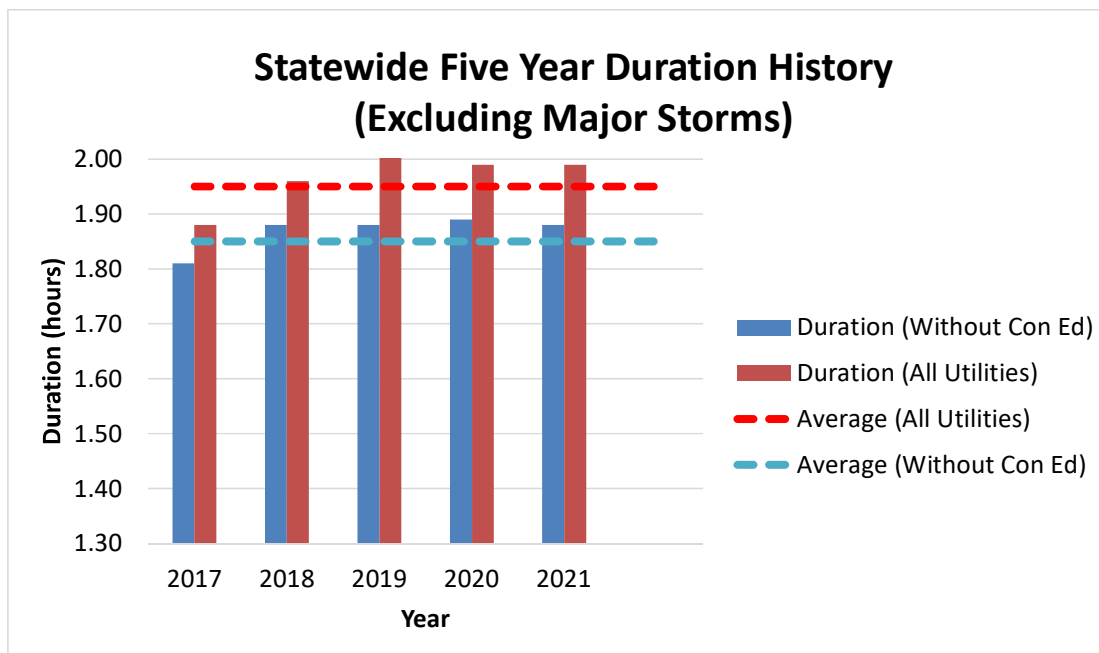


Figure 2: Statewide Duration Performance

Including major storms both the statewide interruption duration index and the statewide interruption duration index excluding Con Edison improved. This indicates that major storms caused less damage in 2021. The 2021 overall statewide interruption duration index excluding Con Edison of 2.71 hours is four hours and 19 minutes shorter than the 2020 duration index of 7.03 hours and one hour and 53 minutes shorter than the statewide five-year average of 4.59 hours. The statewide interruption duration index was 2.79 hours in 2021, which is five hours and 47 minutes shorter than the 2020 duration index of 8.58 hours and two hours and 17 minutes shorter than the statewide five-year average of 5.08 hours. The half increase in the average overall interruption duration also demonstrates Con Edison’s effect on the statewide duration performance.

STATEWIDE - Including Major Storms

The state experienced 38 separate storm events that qualified as major storms in 2021. These storms subjected the electric system to damaging winds, rain, thunderstorms, snow, and/or ice. While this is nine more events than 2020, customers affected by major storms decreased 54 percent and customer hours of interruption decreased 86 percent. As can be seen easily in Figure 3, 2021 was one of the best years from the customers' viewpoint regarding service interruptions caused by major storms since 2016.

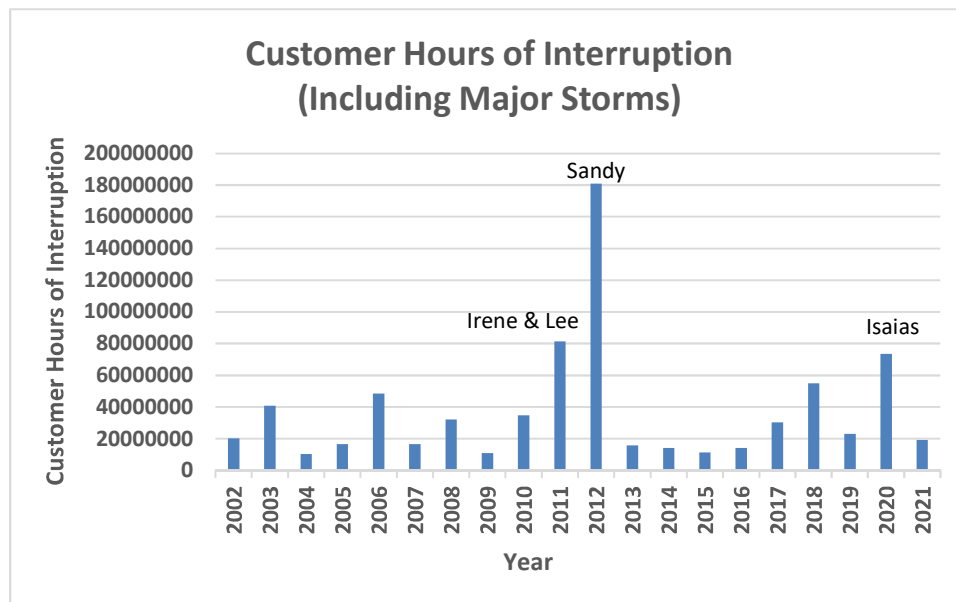


Figure 3: Customer Hours of Interruption (Including Major Storms)

The most significant storm in 2021 occurred on December 11. Strong damaging wind struck the Capital, Central New York, Mohawk Valley, North Country, and Southern Tier Regions. The National Weather Service issued high wind warnings for 18 counties and wind advisories for an additional 22 counties. The second most significant storm occurred on June 21 during which the National Weather Service issued severe thunderstorm watches for much of Central and Northern New York. Four tropical storms impacted the state between July 9 and September 2. Tropical Storm Ida, on September 1, had the most impact on the electric system. Ida produced record rainfall over a short time period across New York City and Long Island resulting in flash flooding. On August 22, Tropical Storm Henri made landfall on the New England coast then tracked west into the mid-Hudson Valley causing outages in Central Hudson's Catskill, Fishkill, Kingston, Poughkeepsie, and Newburgh Divisions. Tropical Storms Elsa on

July 9 and Fred on August 18 had limited impacts on the electric system. Combined, the four impactful storms were responsible for approximately eight percent of major storm exclusions in 2021. While all these storms were excluded from the reliability performance calculations because they are circumstances over which the utilities have limited control, some spillover effect in the periods following the storms may have impacted overall performance.

CON EDISON

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

Performance Metric	2017	2018	2019	2020	2021	Current Target	Five-Year Average
Network Systems							
Frequency (SAIFI)	0.025	0.023	0.056	0.09	0.017	0.0176 ¹³	0.043
Duration (CAIDI)	7.11	7.29	5.29	4.03	6.57	6.89	6.23
Radial System							
Frequency (SAIFI)	0.35	0.40	0.53	0.47	0.49	0.495	0.44
Duration (CAIDI)	1.92	1.99	2.73	2.02	1.93	2.04	2.11

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

Con Edison serves approximately 3.5 million customers in New York City and Westchester County. Con Edison supplies electricity to 2.6 million customers by a network system, while it supplies the remaining 900,000 customers 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 2021 network frequency performance significantly improved over the 2020 performance and is almost half the five-year average. For network duration, Con Edison also met its target of 6.89 hours with a performance of 6.57 hours. Con Edison's network performance for duration in 2021 worsened compared to its 2020 performance and is also worse than the five-year average. However, when excluding a sizable outage event on August 7, 2020, from the 2020

¹³ In addition to the previously defined Major Storms, as per Con Edison's most recent RPM, established as part of Case 19-E-0065, snow/ice events affecting the underground system, and customers impacted by a storm who are served via overhead lines connected to the underground network system, are also excluded from network system reliability target calculations. Appendix values do not reflect these exclusions.

data, Con Edison's 2021 frequency performance would have worsened slightly, and its duration performance would have improved when compared to 2020.¹⁴ When compared to their 2020 performance, network systems in Queens, Bronx, and Manhattan experienced less frequent outages, while duration improved in the Brooklyn, Queens, Bronx, and Westchester network systems.

The largest contributing events that impacted Con Edison's network performance continue to be underground equipment failures. During the summer months heat, humidity, and increased demand for electricity to power air conditioners can cause underground cables to overheat and lead to outages. From June 7 through June 9, Con Edison's service territory experienced one of the first heat waves of the season, with temperatures into the 90s and humidity resulting in heat indices ranging from 95 to 100 across the region. During this heat event, 2,974 customers were interrupted with an average duration of 11.11 hours. Three weeks later, June 28 through June 30, high heat and humidity returned, with temperatures in the mid-90s. Outages affected 4,043 customers and the average outage duration was 10.84 hours. Before and during heat waves, Con Edison takes steps such as managing voltage levels, cooling transformers, and deploying generators to prevent outages and reduce their duration and scope. Con Edison also invested \$1.5 billion on equipment such as cables, transformers, network protectors, and substation equipment to prepare for the summer of 2021 and improve reliability.

Salt spread to minimize ice buildup on roads can also damage underground equipment and cause customer outages. When snowmelt and road salt wash into the underground system, the combination can damage wire insulation and generate heat, causing the insulation to burn. The burning insulation can ignite gas and cause a manhole fire or an explosion. As part of our analysis, we noticed an increase of salt related outages in 2021 compared to previous years. While New York City endured several storms over the winter of 2021, including receiving 26 inches of snow during February; Con Edison did not clearly identify why salt related outages increased significantly in 2021. This information is needed to put the facts into context and to

¹⁴ In 2020, Con Edison's network frequency was higher than the performance target primarily due to the Rainey transmission switching station event. This event occurred on August 7 and interrupted approximately 187,000 customers located in the Central Park, Harlem, and Lenox Hill areas of Manhattan for an average duration of 25.2 minutes. Due to the large number of customers interrupted and the short outage durations, this event had a negative impact on Con Edison's network frequency performance and resulted in improved duration performance.

identify activities that can mitigate similar failures going forward. As a result, we have requested additional data from Con Edison including analysis and corrective actions.

Con Edison works to improve the reliability of its underground distribution systems through its network relief and reliability programs. Con Edison implements these programs system-wide to reduce both network outage frequency and duration. Along with more general programs that replace poorly performing equipment, such as vintage cable types, outdated splices and joints, and obsolete underground switches, the company also employs specialized programs to target specific areas of their network distribution system. One such program is the company's Remote Monitoring System Program. Through this program, the company feeds load information into computer models, which provide operators with system performance information and forecasts on the next worst contingency. The Remote Monitoring System also provides the company with greater visibility, allowing it to identify equipment that requires replacement before it fails. Likewise, the program has the capability to detect when one or more network protectors, or protective devices, do not operate. With this level of insight, Con Edison can expedite their feeder restoration process, return network customers back to service, and prevent further cascading outage events.

Radial Performance

On its radial system, Con Edison achieved its system-wide frequency target of 0.495 and its duration performance target of 2.04 hours with performance values of 0.490 and 1.93 hours, respectively. The 2021 radial outage frequency performance worsened by approximately four percent compared to 2020 and is also worse than the five-year average. The 2021 radial outage duration performance, on the other hand, improved by approximately three minutes compared to 2020 and is approximately five minutes better than the five-year average. When compared to 2020 performance, Brooklyn and the Bronx had less frequent outages, while outage duration improved in the Queens, Bronx and Staten Island radial systems.

As shown in Figure 4 below, the leading causes of interruptions to Con Edison's radial system continue to be company equipment failures, followed by tree contacts and accidents outside the company's control. The number of interruptions due to equipment failure increased when compared to 2020 values, while the number of interruptions due to tree contacts and accidents decreased. One such equipment failure that greatly impacted both the company's

outage frequency and duration performance occurred on February 9 in Staten Island when, due to a disturbance to the company's electric transmission system, nearly 18,000 customers lost service for less than 10 minutes. This outage event negatively impacted the company's outage frequency performance while improving its outage duration performance. Staff notes, that the initial event caused a momentary power interruption to an additional 15,000 customers.¹⁵ As a result of Con Edison's reliability and automation efforts, the system automatically reconfigured around the fault to an alternative power source, with only short customer interruptions for switching.

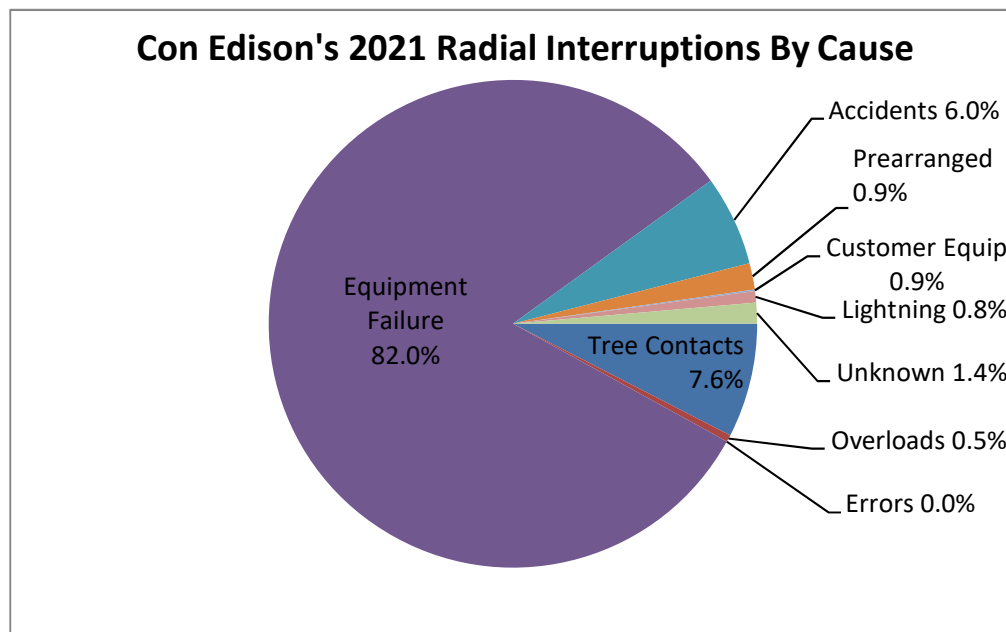


Figure 4: Con Edison's 2021 Radial Interruptions by Cause (Excluding Major Storms)

Con Edison continues to implement new programs to improve the reliability and resiliency of its radial system. In 2021, Con Edison initiated a pilot program to underground selected portions of its radial system. As part of this pilot, Con Edison has successfully moved portions of overhead primary and secondary distribution cable underground within the Middle Village section of Queens. Con Edison proposed the project, named the Juniper Valley Undergrounding Pilot Program, after it determined the area was vulnerable to interruptions due to its high tree density. A total of 19 outages were reported on the targeted cable segment since 2012, with over 8,000 customers interrupted. Con Edison completed the project in January of

¹⁵ Momentary interruptions are defined as outages of less than five minutes. Momentary power interruptions do not count toward a utility's outage frequency performance.

2022, undergrounding services to 495 customers with a total cost of approximately \$4 million. Con Edison is also in the process of undergrounding approximately 2,200 feet of cable in the Yorktown section of Westchester. This project will underground an overhead spur with a history of tree related outages. The company is in the construction stage of the Yorktown project, which should be completed by mid-2022.

NATIONAL GRID

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

Performance Metric	2017	2018	2019	2020	2021	Current Target	Five-Year Average
Frequency (SAIFI)	1.03	1.02	1.03	1.05	1.06	1.08	1.03
Duration (CAIDI)	1.99	2.04	2.02	2.03	1.89	2.10	2.02

National Grid serves approximately 1.68 million customers across upstate New York. The company's territory includes metropolitan areas, such as Albany, Buffalo, and Syracuse, as well as many rural areas in northern New York and the Adirondacks. For 2021, the company met both the frequency and duration reliability targets. The 2021 frequency level of 1.06 is two percent below the target, and one percent above the level of last year, and three percent higher than the five-year average. The 2021 duration performance of 1.89 hours is better than the target of 2.10 hours, the 2020 performance of 2.03 hours, and the five-year average of 2.02 hours.

As shown in Figure 5, four causes were responsible for approximately 90 percent of National Grid's interruptions. Tree contacts caused 34 percent of interruptions, equipment failures caused 25 percent, and the unknown and accidents categories tied for third place at approximately 15 percent each. While the number of tree contact events decreased by four percent, the number of customers affected by tree contacts increased by 23 percent. National Grid attributes this to an increase in adverse weather and minor storm events.

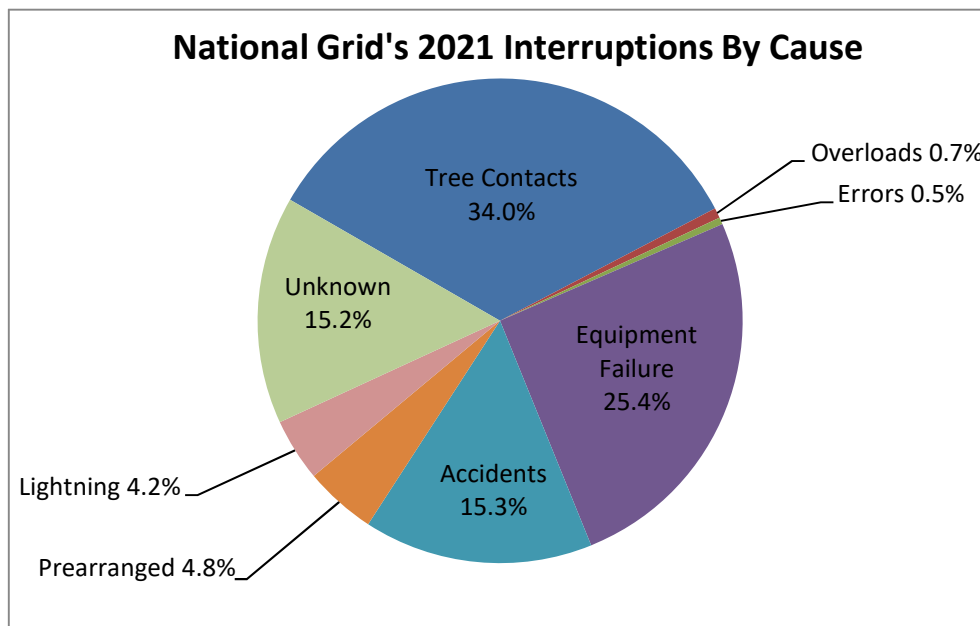


**Figure 5: National Grid's 2021 Interruptions by Cause
(Excluding Major Storms)**

National Grid uses six subcodes to further breakdown the cause of tree contact interruptions excluding major storms: tree fell, broken limb, growth, vines, Emerald Ash Borer (EAB) tree fell, and EAB broken limb. Within tree contact interruptions, tree fell accounted for nearly 75 percent of the customer interruptions in 2021, followed by broken limbs at 22 percent. The volume of tree fell and broken limb interruptions demonstrates the importance of a robust hazard tree program. The small number of tree and vine growth interruptions indicate that the current pruning cycle and specifications are effective in minimizing interruptions related to vegetation growth. 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.

To lessen the impact of EAB infestation on the electric system, National Grid successfully implemented an Ash Tree Removal Program in 2017. The number of Ash tree removals has exceeded National Grid's original estimates; approximately 37,000, 42,000, 49,000 and 34,000 ash trees were removed in 2018, 2019, 2020, and 2021 respectively. National Grid expects to remove an additional 33,000 Ash trees in 2022. EAB tree fell and EAB limb failures accounted for two percent combined, indicating the program is successful. The Ash Tree Removal Program also includes an outage follow-up process to monitor the number of interruptions caused by Ash trees. This will aid in distributing vegetation management resources

appropriately if the interruptions decrease, remain stable, or if they begin to escalate due to EAB infestation.

Equipment failures accounted for 25 percent of interruptions in 2021. National Grid has a number of capital and maintenance programs in place to ensure it maintains reliability on the electric system. Each year, National Grid selects several circuits from the worst performing circuit list for an Engineering Reliability Review (ERR). The ERR is an 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 also began, through the TripSaver Installation Program, installing cutout mounted reclosers system-wide in 2019. The goal of the program is to reduce the number of sustained interruptions related to temporary faults on fused portions of the distribution system. These actions 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 15 percent of interruptions; this is a decrease of approximately two percent from 2020. 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 necessary. Unknown causes were the fourth largest cause of interruptions in 2021 at 15 percent. Interruptions due to unknown causes were down 15 percent over 2020, and down four percent over the five-year average. Other National Grid efforts to improve reliability include distribution patrols, maintenance programs, protection coordination studies, lightning protection, and tree trimming programs.

NYSEG

Table 3: NYSEG's Historic Performance Excluding Major Storms

Performance Metric	2017	2018	2019	2020	2021	Current Target	Five-Year Average
Frequency (SAIFI)	1.18	1.20	1.36	1.37	1.46	1.20	1.26
Duration (CAIDI)	2.06	2.17	1.93	1.98	2.02	2.08	2.03

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

NYSEG serves approximately 905,000 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 149 small cities and villages. Cities served by NYSEG include Auburn, Binghamton, Geneva, Hornell, Ithaca, Lockport, Mechanicville, Oneonta, and Plattsburgh.

NYSEG failed to meet its frequency target for a third straight year, with an outage frequency of 1.46 in 2021, its worst performance out of the most recent five years. Tree contacts continued to be the single largest contributor to system interruptions in 2021; accounting for 49 percent of the interruptions and affecting approximately 475,000 customers. As part of the 2020 Rate Order, the Commission authorized an expanded distribution vegetation management budget for NYSEG to fund additional trimming¹⁶ The 2020 Rate Order also authorized a Reclamation Program focused on trimming areas that NYSEG had not trimmed in over five years and a Danger Tree Program to address danger trees outside of NYSEG's distribution right-of-way. Despite this additional available funding over the past two years, tree related outages have not decreased. NYSEG failed to provide rationale for why these programs are not reducing tree related outages. NYSEG does not appear to be utilizing these programs efficiently as they continue to perform poorly. NYSEG should be more focused on prioritizing worst performing areas in an effort to reduce customer impacts associated with vegetation.

As shown in Figure 6, tree contacts, equipment failure, and accidents were the predominant causes of interruptions throughout NYSEG's service territory. These three causes were responsible for approximately 82 percent of all interruptions. Tree contacts increased less than one percent while equipment failures decreased by less than one percent. Accidents

¹⁶ Case 19-E-0378, Order Approving Electric and Gas Rate Plans in Accord with Joint Proposal, with Modifications (issued November 19, 2020) (2020 Rate Order), p. 82

decreased by three percent while prearranged interruptions and lightning increased by three percent and one percent respectively.

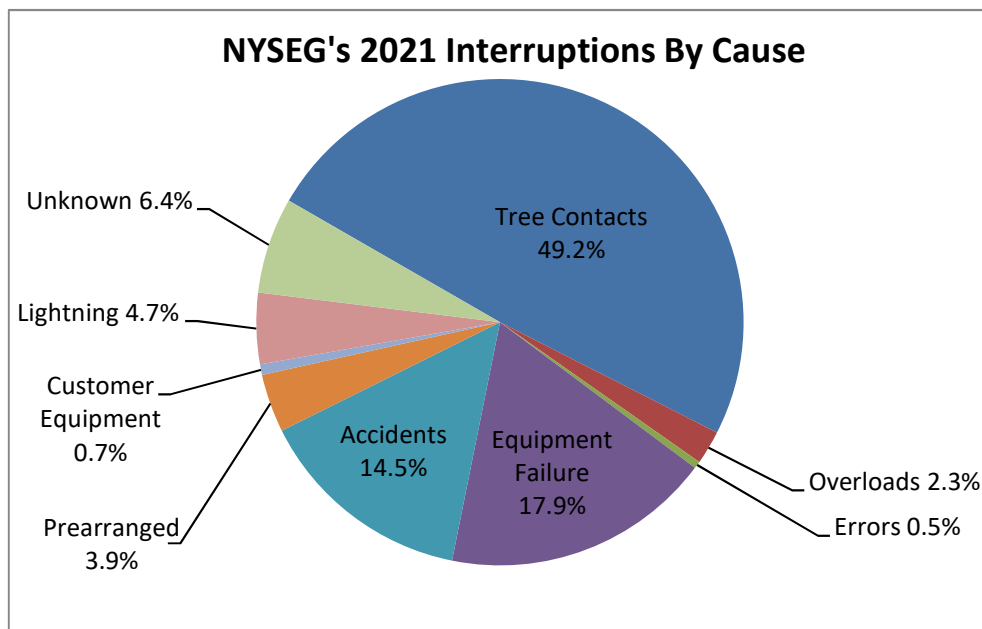


**Figure 6: NYSEG's 2021 Interruptions by Cause
(Excluding Major Storms)**

NYSEG has been administering a series of programs and procedures to reduce the number of interruptions and improve its frequency performance. As discussed earlier, tree trimming/vegetation management remains one of NYSEG's primary focus areas. In addition to the two new programs, NYSEG has updated its distribution design standards and specifications to expand the use of tree wire and increase the strength requirements for poles.¹⁷ NYSEG has also focused on multiple programs to help replace and correct equipment issues before they fail. For example, since circuit breaker failures typically result in larger and longer duration outages NYSEG started a program in 2015 to replace circuit breakers in poor condition. Through the Circuit Breaker Replacement Program, NYSEG has replaced over 430 circuit breakers. NYSEG also has a program to address its inventory of Level II deficiencies found during its distribution line inspections.¹⁸ Additionally, NYSEG designed the Distribution Line Deficiency Program to inspect the electric system, prioritize repair on a circuit-by-circuit basis, and most efficiently use

¹⁷ Tree wire eliminates temporary faults due to minor tree contact.

¹⁸ Case 06-M-1467 – Petition of Orange and Rockland Utilities, Inc. to Modify Its Stray Voltage Testing Program, Order Adopting Changes to Electric Safety Standards, issued December 15, 2008, Appendix A Attachment 3 p. 10

workers. NYSEG started the program in 2019 and is expects it to continue through 2022. NYSEG also continues to review the data related to each motor vehicle accident to determine if changes or modifications to its systems can help mitigate reoccurrence. Potential solutions considered thus far include relocating poles or adding reflective tape to increase poles' visibility. NYSEG expected that these programs would have a positive effect and reduce the number of customers interrupted going forward. Yet based on NYSEG's worsening frequency performance, these programs are failing to deliver the necessary results to provide customers with appropriate service. Staff will be focused on modifying or developing programs to improve NYSEG's reliability as part of its recently filed rate case.

NYSEG's Distribution Circuit Resiliency and Hardening Program consists of three programs. First, NYSEG plans to harden infrastructure through more robust construction practices and materials that will increase the ability of the electric system to withstand severe storms. Second, aggressive removal of hazard trees will also increase the ability of the electric system to withstand severe storms. Third NYSEG will implement changes to circuit design to allow it to isolate outages and restore power more quickly through actions such as adding or upgrading lines, increasing feeder ties, and increasing automation. Automation includes the installation of SCADA switches, tie switches, and reclosers to segment long circuits into multiple sections. Sections can be isolated automatically to limit the number of customers that lose power during an event. Sectionalizing also reduces the time required to restore power to those customers who do lose power. NYSEG started construction on 11 resiliency projects in 2021. NYSEG has also engineered, designed, and scheduled construction in 2022 for 10 resiliency projects. Since 2019, NYSEG has completed resiliency projects on 25 circuits.

NYSEG successfully met its duration metric in 2021 by implementing a company-wide program consisting of process improvements designed to reduce overall duration times. For example, NYSEG uses reclosers to protect customers from long duration outages by automatically clearing transient faults. In addition, NYSEG is relocating distribution lines from remote locations and building tie lines/looped feeders where appropriate. Looped feeders consist of at least two feeders interconnected through normally open tie points. Under normal conditions, electricity does not flow through the tie point. Switching during outages allows power to flow on looped feeders from alternate paths, which reduces the impacts of a fault by isolating it. These

improvements are all part of the company's increased efforts to strengthen its system both at substations and on distribution lines.

RG&E

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

Performance Metric	2017	2018	2019	2020	2021	Current Target	Five-Year Average
Frequency (SAIFI)	0.59	0.75	0.73	0.89	1.13	0.90	0.71
Duration (CAIDI)	1.77	1.79	1.84	1.78	1.81	1.90	1.79

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

RG&E serves approximately 384,000 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 20 years, RG&E has consistently maintained high levels of electric service reliability for both outage frequency and duration. In 2021, RG&E met its company-wide target for duration but failed to meet its frequency target. The Canandaigua Division met both its frequency and duration performance targets, while Genesee Valley and Lakeshore Divisions exceeded both frequency and duration targets. The Rochester Division met its duration target and exceeded its frequency target.

Overall, the three major causes for interruptions throughout RG&E's service territory were prearranged interruptions, tree contacts, and equipment failures, as shown in Figure 7. Last year, prearranged interruptions was the fourth leading cause for interruptions. Prearranged interruptions jumped from 426 in 2020 to 1,967 in 2021, mostly due to the broadband expansion work in the area, that included pole replacements. Customers were notified before the prearranged outages so they could plan accordingly. In these cases, a postcard was sent to the affected customers indicating there would be work in the area that would impact electric service. RG&E expects these outages will diminish over time as the outages will not need to occur once the broadband network is deployed. In addition, RG&E instructed engineers to reduce prearranged outages within engineering designs whenever possible.

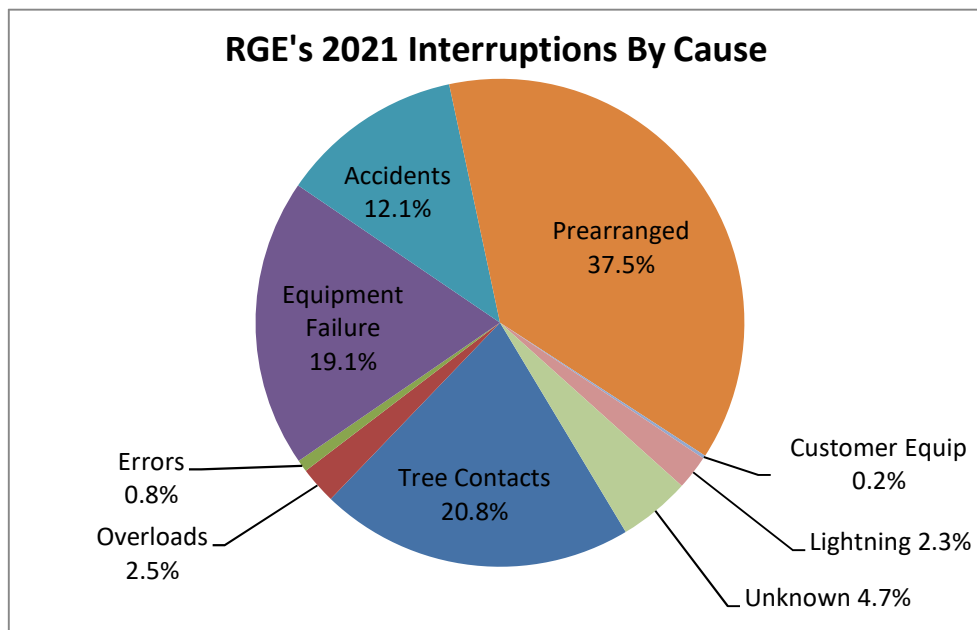


**Figure 7: RG&E's 2021 Interruptions by Cause
(Excluding Major Storms)**

RG&E and NYSEG are both subsidiaries of Avangrid Inc. and as a result implement many of the same programs and procedures to reduce the number of interruptions, reduce overall duration times, and improve reliability. Examples include vegetation management, Circuit Breaker Replacement Program, Distribution Line Inspection Program, Distribution Line Deficiency Program, and Distribution Circuit Resiliency and Hardening Program. RG&E started construction on nine resiliency projects in 2021. RG&E has also engineered, designed, and scheduled construction in 2022 for eight resiliency projects. Since 2019 RG&E completed resiliency projects on seven circuits.

Underground equipment failure was the leading frequency driver within the equipment failure cause. Programs that reduce the number of interruptions on the underground system include Underground Manhole and Handhole Inspection Program, Network Maintenance Program, and Distribution Padmount Transformer Maintenance Program. RG&E also uses a technology called cable injection to proactively reduce Underground Residential Distribution (URD) outages. This technology focuses on the injection of a silicon-based fluid into the strands of aging cables. The injection modifies the properties of the insulation and extends the cable's life. RG&E is also plans to introduce a new URD program, which will provide a long-term solution to evaluate, prioritize, and rebuild underground cables.

On its overhead system, RG&E has been relying on its Distribution Line Inspection program data and other inspection programs to find, prioritize and repair equipment issues. Regarding tree related interruptions, RG&E completed nearly 1,150 miles of tree trimming in 2021 and expects to complete over 850 miles of trimming in 2022. Additionally, RG&E has prioritized worst performing circuits, those that impact reliability to a greater degree. The company's planned work in the Rochester Division will also focus on back lot circuits.

CENTRAL HUDSON

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

Performance Metric	2017	2018	2019	2020	2021	Current Target	Five-Year Average
Frequency (SAIFI)	1.18	1.50	1.26	1.30	1.43	1.30	1.32
Duration (CAIDI)	2.20	2.04	2.38	2.37	2.67	2.50	2.26

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

Central Hudson serves approximately 312,000 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.

Central Hudson failed both its outage frequency and duration targets for 2021. Central Hudson's 2021 outage frequency and duration are its worst performance over the past four years. More than twice the number of minor storms occurred in 2021 when compared to the average of the previous four years. As a result, tree contacts occurring during these minor storms were the primary driver for Central Hudson exceeding both its reliability targets in 2021. Central Hudson's frequency performance of 1.43 exceeds both the established target of 1.30 and the five-year average of 1.32. The company's duration performance of 2.67 hours was 10.2 minutes longer than the established target of 2.50 hours and 24.6 minutes longer than the five-year average of 2.26 hours. As shown in Figure 8, four causes were responsible for approximately 95 percent of the 2021 interruptions: tree contacts, accidents or events not under the utility control (accidents), unknown, and equipment failures.

Tree contact interruptions continue to increase when compared to previous years. Tree contact interruptions were approximately seven percent higher than the 2020 level. Central Hudson reports that 68 percent of tree contact interruptions were caused by limbs and trees from outside the clearance zone. Central Hudson continues to address tree contact issues through regular distribution trimming and the targeted hazard tree removal program that the company started in 2018. This program prioritizes hazard tree removal for three-phase circuits with the greatest potential to have a positive impact on system frequency performance. However, in 2021, due to the high number of minor storms that occurred, the positive impact these programs typically have on frequency performance were not realized. Accordingly, the company is focusing on vegetation management to improve its outage frequency and duration performance.

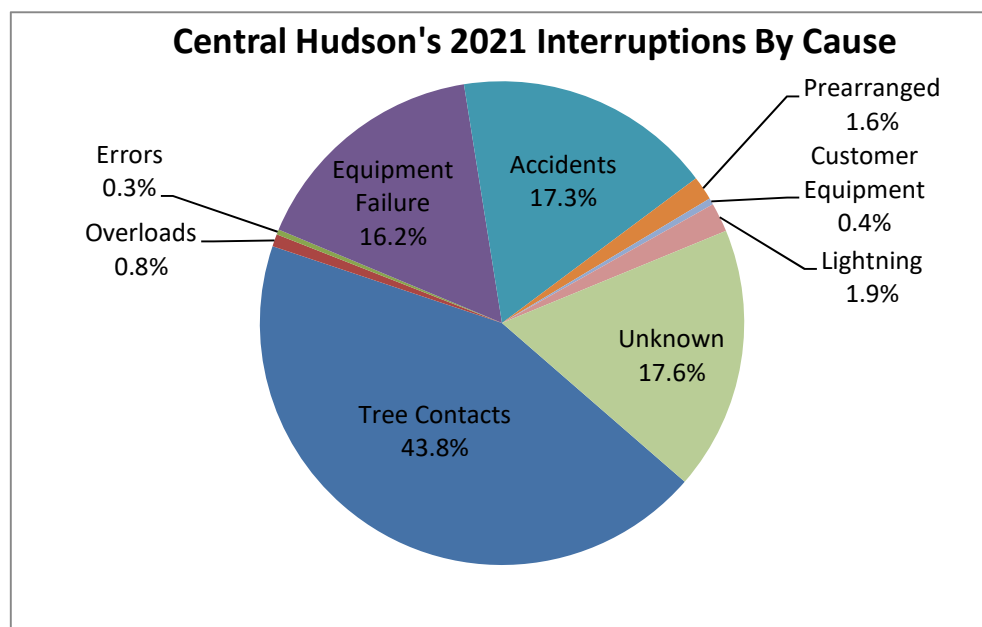


**Figure 8: Central Hudson's 2021 Interruptions by Cause
(Excluding Major Storms)**

Central Hudson has modified its routine trimming schedule by shifting resources to areas with the most impactful effects on outage frequency to the beginning of 2022. For example, circuits out of the Kerhonkson and Highland Substations, planned for trimming in 2023, have been accelerated for trimming in 2022 based on their poor performance. Conversely, circuits demonstrating good reliability performance in 2021 will be trimmed in 2023. Through its hazard tree program, the company also identified 21 circuits for hazard tree removals in 2022. Central Hudson completed hazard tree removal on 42 circuits in 2021, the benefits of which will be

realized in 2022 and beyond. Central Hudson is in the process of securing a consultant to evaluate the company's routine trimming and hazard tree programs and provide recommendations for improvement.

Interruptions caused by accidents or events not under the utilities control and unknown causes tied for the second highest frequency drivers. Interruptions due to unknown causes, which are approximately 18 percent of Central Hudson's interruptions are down two percent from 2020.¹⁹ Interruptions caused by accidents are down approximately seven percent from the 2020 level. The biggest driver was poles hit by vehicles accounting for 39 percent of accidents. There were 27 percent fewer animal-related outages when compared to the five-year average. This success was driven by the installation of animal guards, which mitigate the impact of birds and squirrels on electric distribution circuits. The company has been and will continue to install animal guards and closely follow ongoing research led by the Electric Power Research Institute (EPRI) on the effectiveness of various animal guards. The company plans to take note of recommendations from the EPRI research and upgrade its electric distribution system as necessary.

Interruptions as a result of equipment failures increased approximately two percent from the 2020 level. The biggest driver for equipment failure was conductor/cable failure. These failures are typically attributed to age and loss of strand connections, which cause gradual overheating during normal loading cycles. The second-largest equipment failure driver in 2021 was cutouts, followed by transformers. Central Hudson has expanded its infrared thermal inspection program to include winter peaking/heavily loaded circuits and spur lines with large customer counts, and heavily loaded single-phase and two-phase lines. The infrared thermal inspection program identifies equipment such as conductors, cutouts, connectors, and arrestors with poor connections that can lead to thermal failure. Central Hudson expects these measures to reduce equipment failure frequency by allowing it to proactively identify and replace/repair equipment that is near failure.

Central Hudson's duration performance of 2.67 hours is longer than the last five years. This was primarily driven by the unusually high number of minor storm events during 2021. Central Hudson will continue to work on improving its duration performance by using

¹⁹ Unknown is defined as interruption for which no cause can be found, or for which none of the other classifications are appropriate.

distribution switching to restore customers after an outage, using business intelligence software to collect and analyze data to identify opportunities to improve response time and/or repair time, and scheduling additional crews to respond to outages at the end of the day or after hours and weekends based on the weather forecast.

ORANGE & ROCKLAND

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

Performance Metric	2017	2018	2019	2020	2021	Current Target	Five-Year Average
Frequency (SAIFI)	0.92	1.14	1.09	0.97	1.16	1.20	1.04
Duration (CAIDI)	1.68	1.82	1.71	1.67	1.57	1.85	1.71

Orange & Rockland serves approximately 234,000 customers in Orange, Rockland, and Sullivan Counties in southern New York. For operational purposes, the company separates these areas into three divisions: Central, Eastern, and Western. Orange & Rockland met both its established outage frequency and duration targets for 2021. The company's outage frequency performance of 1.16 was lower than the established target of 1.20 but higher than the five-year average of 1.04. The company's outage duration performance of 1.57 hours was better than both the established target of 1.85 hours and the five-year average of 1.71 hours. Orange & Rockland attributes this improvement in outage duration performance to the rapid restoration of several large outages through distribution automation and remote switching.

As shown in Figure 9, equipment failures and tree contacts continue to be the major cause of interruptions for Orange & Rockland. In 2021, these two categories accounted for approximately 60 percent of all interruptions and 65 percent of all customers affected.²⁰ Prearranged or scheduled outages were the third leading cause of interruptions.

²⁰ These percentages were based on Figure 2.7 - Outage Statistics by Cause, page 32, Orange & Rockland Service Reliability Filing For 2021 System Performance

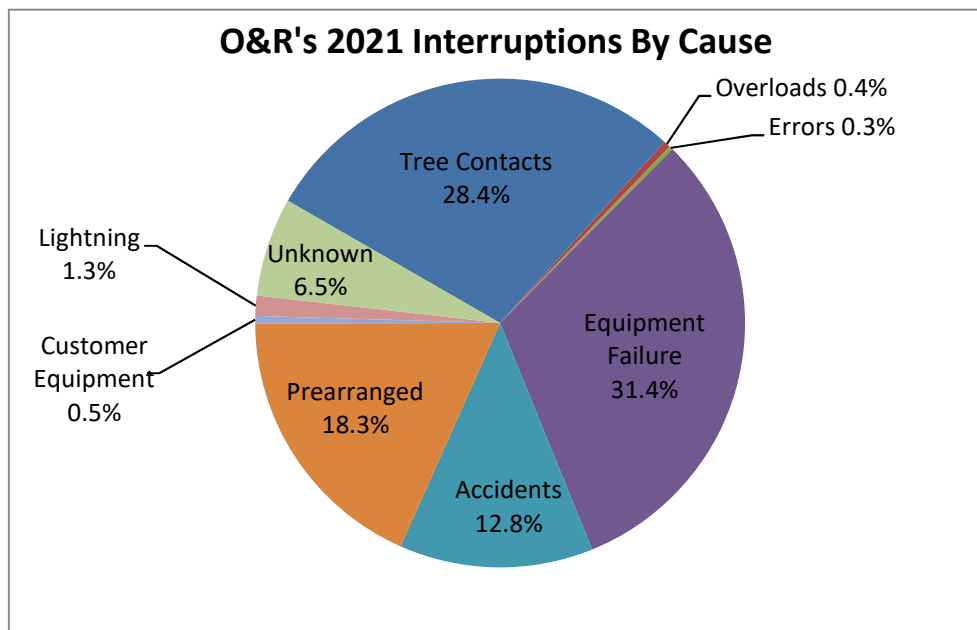


Figure 9: Orange & Rockland's 2021 Interruptions by Cause (Excluding Major Storms)

When compared to 2020, interruptions caused by equipment failures decreased slightly in 2021. For the company's overhead system, primary and secondary cable failures were the most common causes of equipment failure interruptions. For the underground system, the equipment failure rate was above historical levels, primarily due to cable and splice failures. Padmount transformers failures were above the five-year average for the third straight year.²¹ This is primarily due to a large number of leaking padmount transformers that Orange & Rockland identified during inspections in 2018 and 2019. The company has been and will continue to replace these transformers as operation conditions permit.

Orange & Rockland's service reliability programs are designed to reduce interruption frequency and duration through inspection and maintenance of equipment installed on the transmission and distribution system. These programs define activities that will cost effectively meet customer reliability needs. Reliability programs establish inspection intervals; minimum component testing; minimum performance requirements; and maintenance procedures to be performed during each inspection. Orange & Rockland will monitor the performance of all equipment types to detect any potential failures, identify trends, and take mitigation measures as necessary.

²¹ Padmount transformers are used with underground electric power distribution lines at service drops, to step down the primary voltage on the line to the lower secondary voltage supplied to utility customers.

The number of tree contact interruptions continues to increase in 2021, driven by the high amount of rainfall the service territory has experienced over the last four years. Rainfall during the peak growing period contributed to accelerated vegetation growth. This drove up vegetation contacts on the system, both from trees entering the clearance zone and vines growing up utility poles during the summer months. Orange & Rockland continues to address tree contact issues through its Distribution Vegetation Management Program. Orange & Rockland's engineers designed a tree-related outage spreadsheet, from its Outage Management System, to monitor circuits based on vegetation-related outage performance. Company personnel complete patrols as they move throughout the service territory. They report any identified vegetation issues requiring attention to prevent service interruptions are reported for further investigation and remediation.

Orange & Rockland also continues to perform its distribution automation program, which is a multi-year initiative focused on the installation and upgrading of field devices that will improve the resiliency and the reliability of the system. This program includes three main categories: circuit optimization, field automation, and centralized automation control. Circuit optimization involves the use of smart capacitors and power quality sensors to make the distribution system more efficient. Examples of field automation devices include motorized air brake (MOAB) switches, reclosers, and automatic switches that are used in auto-loop designs. 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 an alternate power source. Centralized automation control facilitates the monitoring and control of automatic devices from the company's distribution control center. In 2021, Orange & Rockland installed two auto-loops, 103 MOABs, 14 reclosers, and four smart capacitors.

PSEG-LI

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

Performance Metric	2017	2018	2019	2020	2021	Current Target	Five-Year Average
Frequency (SAIFI)	0.95	0.86	0.68	0.80	0.68	0.92	0.88
Duration (CAIDI)	1.16	1.27	1.27	1.38	1.34	1.42	1.24

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

PSEG-LI serves approximately 1,138,000 customers on Long Island. Its territory includes Nassau County, Suffolk County, and the Rockaway Peninsula in Queens County. PSEG-LI began operating and maintaining the electric system for the Long Island Power Authority (LIPA) on January 1, 2014. To assist the Department in its statewide analysis, PSEG-LI supplies annual interruption data. Unlike the other utilities, the Commission does not issue rate orders for PSEG-LI as a result the Commission has not imposed an RPM on the company. Instead, performance metrics were set as part of PSEG-LI's Amended Operating Service Agreement (OSA) with the LIPA.²²

PSEG-LI met both its outage frequency and duration OSA targets in 2021. The outage frequency level of 0.68 was lower than the OSA target of 0.92 and below the five-year average of 0.88. PSEG-LI's duration performance of 1.34 achieved the 2021 OSA target of 1.42 and was better than the 2020 performance by 2.4 minutes. However, it falls short of five-year average performance by 6.6 minutes. As shown in Figure 10, equipment failures, tree contacts, and accidents continue to be the major cause of interruptions for PSEG-LI. These three categories accounted for approximately 87 percent of all interruptions.

²² Amended and Restated Operations Services Agreement between Long Island Lighting Company d/b/a LIPA and PSEG Long Island LLC, Dated as of April 1, 2022. (<https://www.lipower.org/wp-content/uploads/2022/04/2nd-AR-OSA-in-effect-on-4-1-2022.pdf>).

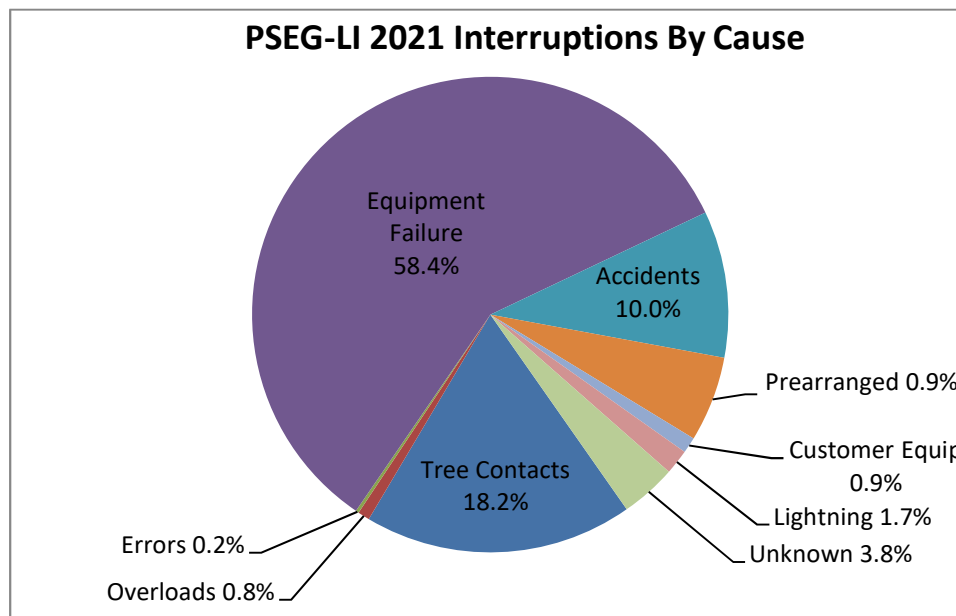


**Figure 10: PSEG-LI's 2021 Interruptions by Cause
(Excluding Major Storms)**

Interruptions caused by equipment failures decreased by two percent in 2021. The top three equipment failure drivers remain the same as last year, which are downed primary wires, underground primary cable failures, and broken primary line taps. Every year, as part of PSEG-LI's Circuit Improvement Program, hundreds of miles of distribution lines are inspected, prioritized, and repaired to ensure the equipment is in good working order. PSEG-LI's Circuit Improvement Program will focus on 42 separate branch lines during 2022 to improve reliability. As part of the Circuit Improvement Program, PSEG-LI will take various actions to improve reliability including identification and remediation of substandard equipment conditions, installation of series fuses and fault indicators, and review of branch lines serving approximately 150 or more customers. Lines whose performance impacts reliability performance most will be walked by a designer to develop a custom solution.

The percent of interruptions due to tree contacts decreased by four percent when compared to 2020. Tree related outages remain the second leading cause of interruptions in 2021. PSEG-LI continues to address tree contact issues through its Enhanced Vegetation Management Program, which considers historical reliability performance and field observations when prioritizing circuits. The Enhanced Vegetation Management Program is having a positive effect on reliability for those circuits that are being trimmed under the increased distribution line clearance specification. Specifically for the circuits trimmed with a full year of history of being

trimmed to the new specification there has been a 37 percent reduction, on average, in customers interrupted (including major storms) after the first year. Interruptions caused by accidents increased when compared to 2020 and were the third leading cause of interruption in 2021.

In 2021, PSEG-LI completed 55 circuits included as part of its ongoing PowerOn Program. The PowerOn Program consist of storm hardening improvements and targets the entire mainline for circuits with poor performance.²³ Storm-hardening improvements include stronger poles that are capable of withstanding storm force winds. In addition, to help wires deflect falling branches and limbs, stronger cross arms and conductors with more insulation will be installed on poles. The program also allows for the installation of up to 1,300 automatic switches and the upgrade or replacement of deteriorated equipment as necessary.

²³ The PowerOn Program is an extension of the completed Federal Emergency Management Agency (FEMA) overhead mainline hardening program that was completed in 2020.

APPENDIX

**The 2021
Interruption
Report**

**Office of Resilience and Emergency Preparedness
June 2022**

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)**

	2017	2018	2019	2020	2021	5 YR AVG
CHGE						
FREQUENCY	1.18	1.50	1.26	1.30	1.43	1.32
DURATION	2.20	2.04	2.38	2.37	2.67	2.26
CONED						
FREQUENCY	0.11	0.12	0.18	0.19	0.15	0.15
DURATION	2.77	2.75	3.33	2.75	2.99	2.82
PSEG-LI *						
FREQUENCY	0.95	0.86	0.68	0.80	0.68	0.88
DURATION	1.16	1.27	1.27	1.38	1.34	1.24
NAT GRID						
FREQUENCY	1.03	1.02	1.03	1.05	1.06	1.03
DURATION	1.99	2.04	2.02	2.03	1.89	2.02
NYSEG						
FREQUENCY	1.18	1.20	1.36	1.37	1.46	1.26
DURATION	2.06	2.17	1.93	1.98	2.02	2.03
O&R						
FREQUENCY	0.92	1.14	1.09	0.97	1.16	1.04
DURATION	1.68	1.82	1.71	1.67	1.57	1.71
RG&E						
FREQUENCY	0.59	0.75	0.73	0.89	1.13	0.71
DURATION	1.77	1.79	1.84	1.78	1.81	1.79
STATEWIDE (WITHOUT CONED)						
FREQUENCY	1.01	1.03	1.00	1.05	1.08	1.03
DURATION	1.81	1.88	1.88	1.89	1.88	1.85
STATEWIDE (WITH CONED)						
FREQUENCY	0.62	0.64	0.64	0.68	0.68	0.65
DURATION	1.88	1.96	2.05	1.99	1.99	1.95

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

	2017	2018	2019	2020	2021	5 YR AVG
CHGE						
FREQUENCY	1.54	2.59	1.55	2.17	1.82	1.86
DURATION	3.24	8.14	3.15	7.15	3.44	4.84
CONED						
FREQUENCY	0.12	0.20	0.20	0.32	0.16	0.19
DURATION	2.90	17.01	3.51	18.83	3.70	8.99
PSEG-LI *						
FREQUENCY	1.10	1.13	0.98	1.43	0.73	1.20
DURATION	1.70	2.24	2.91	12.22	1.54	4.11
NAT GRID						
FREQUENCY	1.42	1.53	1.49	1.51	1.32	1.43
DURATION	4.14	4.34	3.64	5.06	2.82	3.92
NYSEG						
FREQUENCY	1.83	2.31	1.91	2.08	2.18	1.94
DURATION	3.98	9.18	3.13	5.41	2.81	4.92
O&R						
FREQUENCY	1.06	1.76	1.38	1.91	1.30	1.46
DURATION	2.10	7.78	2.49	10.47	1.77	4.96
RG&E						
FREQUENCY	1.34	1.00	0.93	1.06	1.38	1.00
DURATION	18.32	3.64	2.43	1.99	3.40	5.69
STATEWIDE (WITHOUT CONED)						
FREQUENCY	1.40	1.62	1.40	1.63	1.38	1.47
DURATION	4.60	5.87	3.22	7.03	2.71	4.59
STATEWIDE (WITH CONED)						
FREQUENCY	0.85	1.01	0.88	1.06	0.85	0.92
DURATION	4.50	6.81	3.25	8.58	2.79	5.08

STATEWIDE (WITHOUT CON ED)

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	56,766	61,441	57,657	62,595	62,839	59,284
Number of Customer-Hours	8,223,141	8,838,401	8,560,007	9,094,328	9,410,601	8,670,451
Number of Customers Affected	4,555,618	4,689,214	4,565,064	4,816,965	4,999,962	4,688,477
Number of Customers Served	4,543,176	4,577,274	4,595,216	4,618,770	4,647,421	4,570,465
Average Duration Per Customer Affected (CAIDI)	1.81	1.88	1.88	1.89	1.88	1.85
Average Duration Per Customers Served	1.82	1.95	1.87	1.98	2.04	1.91
Interruptions Per 1000 Customers Served	12.56	13.52	12.60	13.62	13.61	13.04
Number of Customers Affected Per Customer Served (SAIFI)	1.01	1.03	1.00	1.05	1.08	1.03

STATEWIDE (WITH CON ED)

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	72,376	78,098	73,929	76,677	78,461	74,557
Number of Customer-Hours	9,275,141	9,983,360	10,625,692	10,932,269	10,948,854	10,105,387
Number of Customers Affected	4,935,045	5,105,730	5,185,626	5,486,038	5,515,006	5,191,754
Number of Customers Served	7,978,073	8,042,233	8,100,203	8,154,220	8,146,146	8,040,558
Average Duration Per Customer Affected (CAIDI)	1.88	1.96	2.05	1.99	1.99	1.95
Average Duration Per Customers Served	1.17	1.25	1.32	1.35	1.34	1.26
Interruptions Per 1000 Customers Served	9.13	9.79	9.19	9.47	9.62	9.34
Number of Customers Affected Per Customer Served (SAIFI)	0.62	0.64	0.64	0.68	0.68	0.65

STATEWIDE (WITHOUT CON ED)

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	71,951	89,665	77,483	92,523	74,176	79,682
Number of Customer-Hours	29,114,338	43,261,363	20,598,728	52,580,256	17,229,084	31,694,434
Number of Customers Affected	6,329,697	7,373,442	6,398,344	7,474,848	6,368,352	6,663,008
Number of Customers Served	4,543,176	4,577,274	4,595,216	4,618,770	4,647,421	4,570,465
Average Duration Per Customer Affected (CAIDI)	4.60	5.87	3.22	7.03	2.71	4.59
Average Duration Per Customers Served	6.44	9.52	4.50	11.44	3.73	6.96
Interruptions Per 1000 Customers Served	15.93	19.74	16.93	20.13	16.06	17.52
Number of Customers Affected Per Customer Served (SAIFI)	1.40	1.62	1.40	1.63	1.38	1.47

STATEWIDE (WITH CON ED)

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	88,151	113,241	94,714	113,885	91,010	98,197
Number of Customer-Hours	30,293,340	54,866,948	23,018,645	73,733,264	19,351,098	39,212,068
Number of Customers Affected	6,735,617	8,055,529	7,087,711	8,597,929	6,941,133	7,335,166
Number of Customers Served	7,978,073	8,042,233	8,100,203	8,154,220	8,146,146	8,040,558
Average Duration Per Customer Affected (CAIDI)	4.50	6.81	3.25	8.58	2.79	5.08
Average Duration Per Customers Served	3.82	6.88	2.86	9.10	2.37	4.89
Interruptions Per 1000 Customers Served	11.12	14.19	11.78	14.06	11.16	12.29
Number of Customers Affected Per Customer Served (SAIFI)	0.85	1.01	0.88	1.06	0.85	0.92

CENTRAL HUDSON

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	7,129	8,011	7,316	7,738	7,525	7,520
Number of Customer-Hours	785,105	926,783	908,953	946,420	1,181,259	901,065
Number of Customers Affected	357,572	454,343	382,350	399,149	442,323	399,111
Number of Customers Served	302,187	304,382	307,024	309,262	311,785	305,057
Average Duration Per Customer Affected (CAIDI)	2.20	2.04	2.38	2.37	2.67	2.26
Average Duration Per Customers Served	2.60	3.07	2.99	3.08	3.82	2.97
Interruptions Per 1000 Customers Served	23.57	26.51	24.04	25.20	24.33	24.79
Number of Customers Affected Per Customer Served (SAIFI)	1.18	1.50	1.26	1.30	1.43	1.32

CENTRAL HUDSON

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	8,344	11,334	8,517	10,616	8,925	9,323
Number of Customer-Hours	1,512,967	6,380,295	1,490,509	4,756,359	1,939,104	3,047,242
Number of Customers Affected	466,830	783,881	473,130	664,830	564,376	565,077
Number of Customers Served	302,187	304,382	307,024	309,262	311,785	305,057
Average Duration Per Customer Affected (CAIDI)	3.24	8.14	3.15	7.15	3.44	4.84
Average Duration Per Customers Served	5.00	21.11	4.90	15.49	6.27	10.03
Interruptions Per 1000 Customers Served	27.59	37.51	27.98	34.58	28.86	30.72
Number of Customers Affected Per Customer Served (SAIFI)	1.54	2.59	1.55	2.17	1.82	1.86

CON ED (SYSTEM)

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	15,610	16,657	16,272	14,082	15,622	15,273
Number of Customer-Hours	1,052,001	1,144,959	2,065,685	1,837,941	1,538,254	1,434,937
Number of Customers Affected	379,427	416,516	620,562	669,073	515,044	503,277
Number of Customers Served	3,434,897	3,464,959	3,504,987	3,535,450	3,498,725	3,470,093
Average Duration Per Customer Affected (CAIDI)	2.77	2.75	3.33	2.75	2.99	2.82
Average Duration Per Customers Served	0.31	0.33	0.60	0.52	0.44	0.42
Interruptions Per 1000 Customers Served	4.58	4.85	4.70	4.02	4.42	4.44
Number of Customers Affected Per Customer Served (SAIFI)	0.11	0.12	0.18	0.19	0.15	0.15

CON ED (SYSTEM)

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	16,200	23,576	17,231	21,362	16,834	18,515
Number of Customer-Hours	1,179,002	11,605,586	2,419,917	21,153,009	2,122,014	7,517,634
Number of Customers Affected	405,920	682,087	689,367	1,123,081	572,781	672,158
Number of Customers Served	3,434,897	3,464,959	3,504,987	3,535,450	3,498,725	3,470,093
Average Duration Per Customer Affected (CAIDI)	2.90	17.01	3.51	18.83	3.70	8.99
Average Duration Per Customers Served	0.35	3.38	0.70	6.04	0.60	2.16
Interruptions Per 1000 Customers Served	4.75	6.86	4.97	6.09	4.76	5.38
Number of Customers Affected Per Customer Served (SAIFI)	0.12	0.20	0.20	0.32	0.16	0.19

CON ED (NETWORK)

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	9,462	9,187	8,648	6,987	8,632	8,253
Number of Customer-Hours	441,055	434,540	765,764	973,079	685,954	592,498
Number of Customers Affected	62,005	59,620	144,678	241,562	72,670	110,957
Number of Customers Served	2,545,351	2,568,843	2,600,719	2,623,892	2,593,235	2,569,825
Average Duration Per Customer Affected (CAIDI)	7.11	7.29	5.29	4.03	9.44	6.23
Average Duration Per Customers Served	0.18	0.17	0.30	0.37	0.26	0.23
Interruptions Per 1000 Customers Served	3.77	3.61	3.37	2.69	3.29	3.25
Number of Customers Affected Per Customer Served (SAIFI)	0.025	0.023	0.056	0.093	0.028	0.043

CON ED (RADIAL)

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	6,148	7,470	7,624	7,095	6,990	7,020
Number of Customer-Hours	610,945	710,418	1,299,921	864,862	852,299	842,438
Number of Customers Affected	317,422	356,896	475,884	427,511	442,374	392,321
Number of Customers Served	889,546	896,116	904,268	911,558	905,490	900,268
Average Duration Per Customer Affected (CAIDI)	1.92	1.99	2.73	2.02	1.93	2.11
Average Duration Per Customers Served	0.68	0.80	1.45	0.96	0.93	0.94
Interruptions Per 1000 Customers Served	6.83	8.40	8.51	7.85	7.67	7.84
Number of Customers Affected Per Customer Served (SAIFI)	0.35	0.40	0.53	0.47	0.49	0.44

CON ED (RADIAL)

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	6,738	14,389	8,583	14,375	8,202	10,262
Number of Customer-Hours	737,947	11,171,045	1,654,153	20,179,929	1,436,059	6,925,135
Number of Customers Affected	343,915	622,467	544,689	881,519	500,111	561,201
Number of Customers Served	889,546	896,116	904,268	911,558	905,490	900,268
Average Duration Per Customer Affected (CAIDI)	2.15	17.95	3.04	22.89	2.87	9.63
Average Duration Per Customers Served	0.82	12.56	1.85	22.32	1.58	7.71
Interruptions Per 1000 Customers Served	7.49	16.18	9.58	15.90	9.00	11.46
Number of Customers Affected Per Customer Served (SAIFI)	0.38	0.70	0.61	0.97	0.55	0.63

PSEG-LI

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	19,009	20,697	18,578	21,176	19,555	19,920
Number of Customer-Hours	1,229,618	1,223,074	966,360	1,246,625	1,037,492	1,214,810
Number of Customers Affected	1,064,452	963,985	760,091	901,830	773,082	985,615
Number of Customers Served	1,122,011	1,124,900	1,128,693	1,134,141	1,138,340	1,125,742
Average Duration Per Customer Affected (CAIDI)	1.16	1.27	1.27	1.38	1.34	1.24
Average Duration Per Customers Served	1.10	1.09	0.86	1.10	0.91	1.08
Interruptions Per 1000 Customers Served	16.99	18.45	16.52	18.76	17.24	17.75
Number of Customers Affected Per Customer Served (SAIFI)	0.95	0.86	0.68	0.80	0.68	0.88

PSEG-LI

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	21,288	26,277	24,220	35,462	20,366	26,108
Number of Customer-Hours	2,092,168	2,847,012	3,204,176	19,756,921	1,276,823	6,016,731
Number of Customers Affected	1,228,334	1,271,447	1,102,036	1,616,774	827,804	1,342,842
Number of Customers Served	1,122,011	1,124,900	1,128,693	1,134,141	1,138,340	1,125,742
Average Duration Per Customer Affected (CAIDI)	1.70	2.24	2.91	12.22	1.54	4.11
Average Duration Per Customers Served	1.87	2.54	2.85	17.50	1.13	5.34
Interruptions Per 1000 Customers Served	19.02	23.42	21.53	31.42	17.96	23.25
Number of Customers Affected Per Customer Served (SAIFI)	1.10	1.13	0.98	1.43	0.73	1.20

NATIONAL GRID

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	13,743	14,447	13,747	15,134	14,883	14,210
Number of Customer-Hours	3,333,796	3,408,167	3,426,393	3,512,446	3,334,033	3,415,887
Number of Customers Affected	1,671,096	1,670,265	1,692,764	1,732,491	1,767,661	1,690,175
Number of Customers Served	1,635,856	1,650,922	1,656,128	1,663,214	1,673,962	1,645,726
Average Duration Per Customer Affected (CAIDI)	1.99	2.04	2.02	2.03	1.89	2.02
Average Duration Per Customers Served	2.05	2.08	2.08	2.12	2.00	2.09
Interruptions Per 1000 Customers Served	8.47	8.83	8.33	9.14	8.95	8.69
Number of Customers Affected Per Customer Served (SAIFI)	1.03	1.02	1.03	1.05	1.06	1.03

NATIONAL GRID

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	18,881	22,653	21,177	20,782	18,559	19,919
Number of Customer-Hours	9,513,770	10,882,228	8,946,922	12,629,772	6,177,279	9,314,047
Number of Customers Affected	2,296,097	2,510,027	2,459,557	2,494,794	2,190,203	2,333,369
Number of Customers Served	1,635,856	1,650,922	1,656,128	1,663,214	1,673,962	1,645,726
Average Duration Per Customer Affected (CAIDI)	4.14	4.34	3.64	5.06	2.82	3.92
Average Duration Per Customers Served	5.86	6.65	5.42	7.63	3.71	5.68
Interruptions Per 1000 Customers Served	11.64	13.85	12.83	12.55	11.16	12.17
Number of Customers Affected Per Customer Served (SAIFI)	1.42	1.53	1.49	1.51	1.32	1.43

NYSEG

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	10,441	11,349	11,051	11,807	11,774	11,005
Number of Customer-Hours	2,141,108	2,310,303	2,329,587	2,419,098	2,658,719	2,261,795
Number of Customers Affected	1,037,330	1,063,122	1,207,533	1,224,028	1,317,127	1,114,893
Number of Customers Served	884,136	891,168	895,050	899,315	905,005	889,747
Average Duration Per Customer Affected (CAIDI)	2.06	2.17	1.93	1.98	2.02	2.03
Average Duration Per Customers Served	2.44	2.61	2.61	2.70	2.96	2.55
Interruptions Per 1000 Customers Served	11.88	12.84	12.40	13.19	13.09	12.43
Number of Customers Affected Per Customer Served (SAIFI)	1.18	1.20	1.36	1.37	1.46	1.26

NYSEG

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	14,289	20,937	15,500	16,859	15,963	16,122
Number of Customer-Hours	6,390,928	18,716,707	5,323,921	10,051,986	5,509,346	8,892,109
Number of Customers Affected	1,604,622	2,038,575	1,699,146	1,859,509	1,958,103	1,715,238
Number of Customers Served	884,136	891,168	895,050	899,315	905,005	889,747
Average Duration Per Customer Affected (CAIDI)	3.98	9.18	3.13	5.41	2.81	4.92
Average Duration Per Customers Served	7.27	21.17	5.97	11.23	6.13	10.04
Interruptions Per 1000 Customers Served	16.25	23.68	17.39	18.84	17.75	18.21
Number of Customers Affected Per Customer Served (SAIFI)	1.83	2.31	1.91	2.08	2.18	1.94

O&R

Excluding Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	3,287	3,709	3,669	3,546	3,858	3,487
Number of Customer-Hours	345,072	465,474	424,497	371,083	418,697	401,018
Number of Customers Affected	205,585	255,706	248,317	222,505	267,493	233,409
Number of Customers Served	224,400	227,959	229,180	231,512	234,333	227,220
Average Duration Per Customer Affected (CAIDI)	1.68	1.82	1.71	1.67	1.57	1.71
Average Duration Per Customers Served	1.55	2.07	1.86	1.62	1.81	1.78
Interruptions Per 1000 Customers Served	14.74	16.53	16.09	15.47	16.66	15.48
Number of Customers Affected Per Customer Served (SAIFI)	0.92	1.14	1.09	0.97	1.16	1.04

O&R

Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	3,533	4,571	4,306	5,245	4,127	4,240
Number of Customer-Hours	496,654	3,069,852	783,968	4,585,941	529,830	1,892,078
Number of Customers Affected	236,698	394,557	314,613	437,942	299,986	330,200
Number of Customers Served	224,400	227,959	229,180	231,512	234,333	227,220
Average Duration Per Customer Affected (CAIDI)	2.10	7.78	2.49	10.47	1.77	4.96
Average Duration Per Customers Served	2.23	13.68	3.44	20.01	2.29	8.34
Interruptions Per 1000 Customers Served	15.84	20.37	18.89	22.89	17.83	18.80
Number of Customers Affected Per Customer Served (SAIFI)	1.06	1.76	1.38	1.91	1.30	1.46

RG&E

Excluding Major Storms

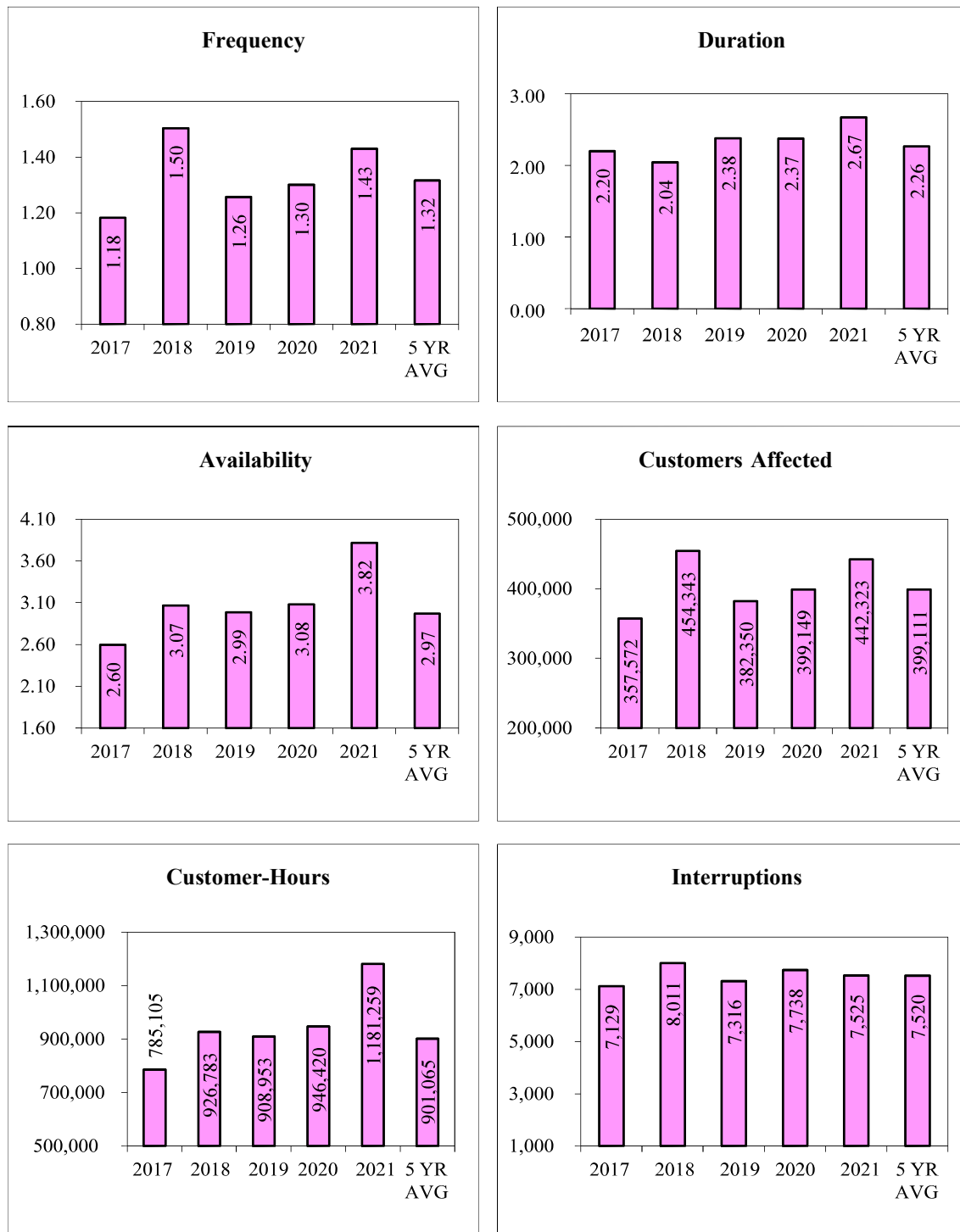
	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	3,157	3,228	3,296	3,194	5,244	3,143
Number of Customer-Hours	388,442	504,600	504,217	598,656	780,401	475,875
Number of Customers Affected	219,583	281,793	274,009	336,962	432,276	265,273
Number of Customers Served	374,586	377,943	379,141	381,326	383,996	376,972
Average Duration Per Customer Affected (CAIDI)	1.77	1.79	1.84	1.78	1.81	1.794
Average Duration Per Customers Served	1.04	1.35	1.33	1.58	2.05	1.267
Interruptions Per 1000 Customers Served	8.49	8.62	8.72	8.42	13.75	8.379
Number of Customers Affected Per Customer Served (SAIFI)	0.59	0.75	0.73	0.89	1.13	0.707

RG&E

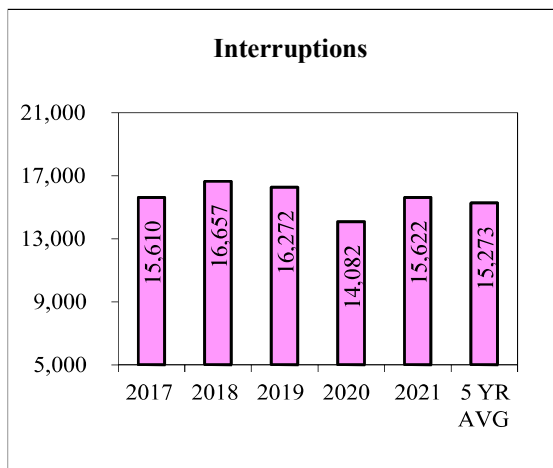
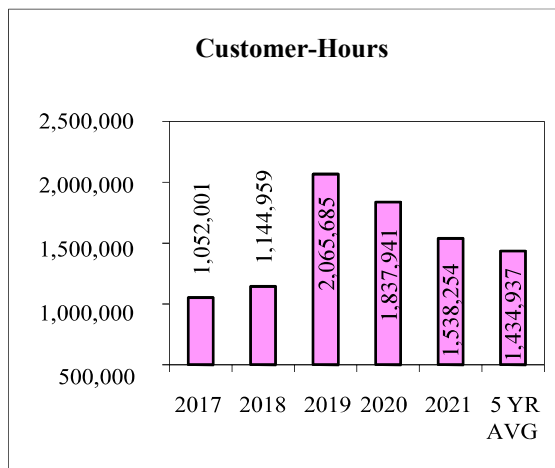
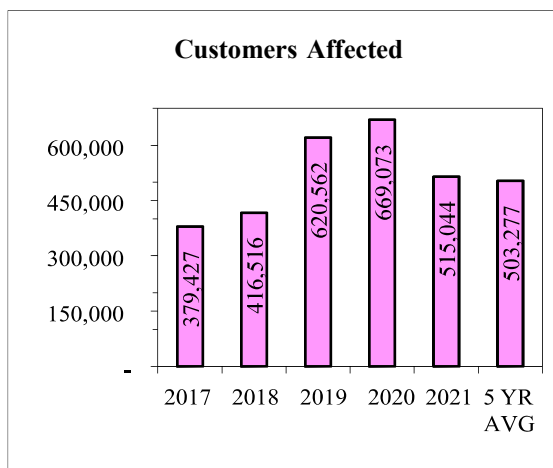
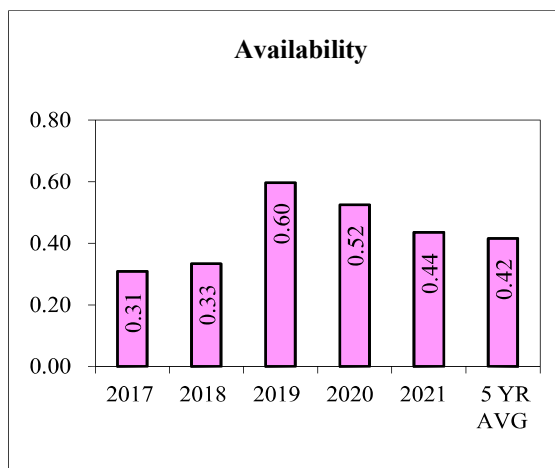
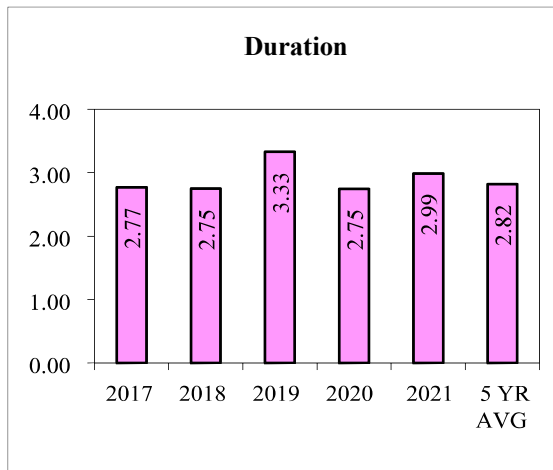
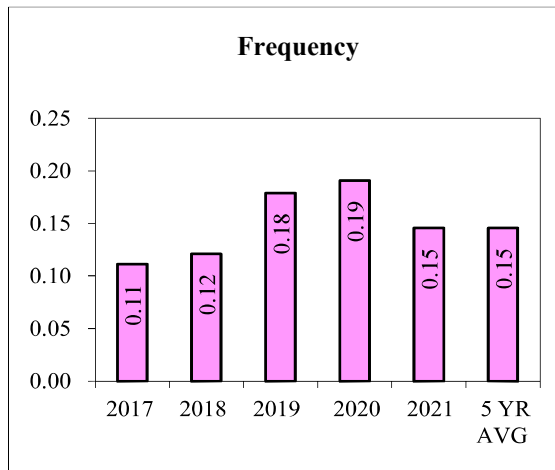
Including Major Storms

	2017	2018	2019	2020	2021	5 YR AVG
Number of Interruptions	5,616	3,893	3,763	3,559	6,236	3,970
Number of Customer-Hours	9,107,851	1,365,269	849,232	799,277	1,796,702	2,532,227
Number of Customers Affected	497,116	374,955	349,862	400,999	527,880	376,281
Number of Customers Served	374,586	377,943	379,141	381,326	383,996	376,972
Average Duration Per Customer Affected (CAIDI)	18.32	3.64	2.43	1.99	3.40	5.69
Average Duration Per Customers Served	24.49	3.64	2.25	2.11	4.71	6.79
Interruptions Per 1000 Customers Served	15.10	10.39	9.96	9.39	16.35	10.59
Number of Customers Affected Per Customer Served (SAIFI)	1.34	1.00	0.93	1.06	1.38	1.00

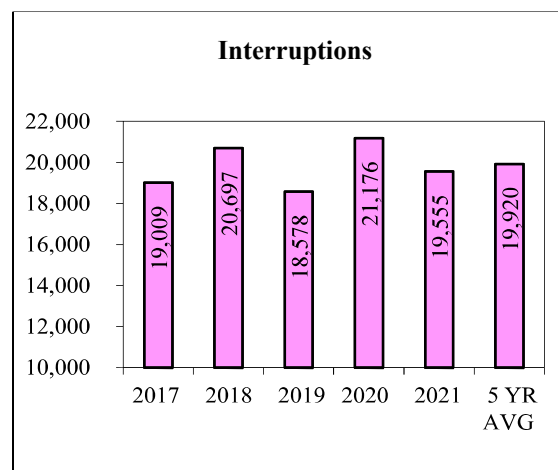
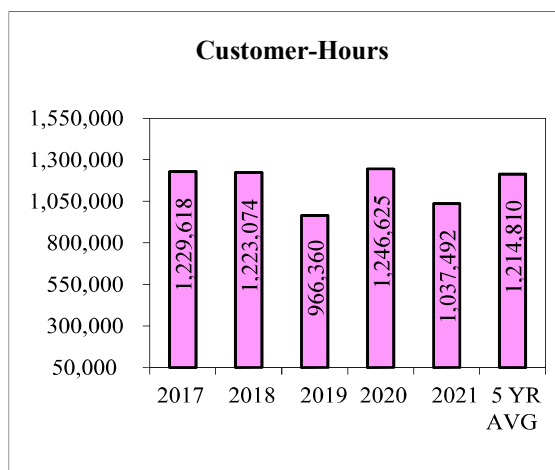
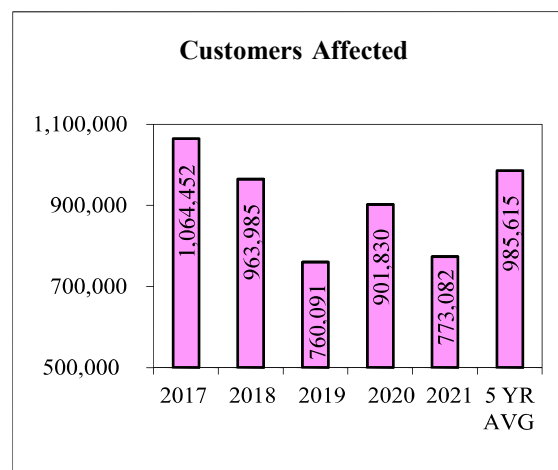
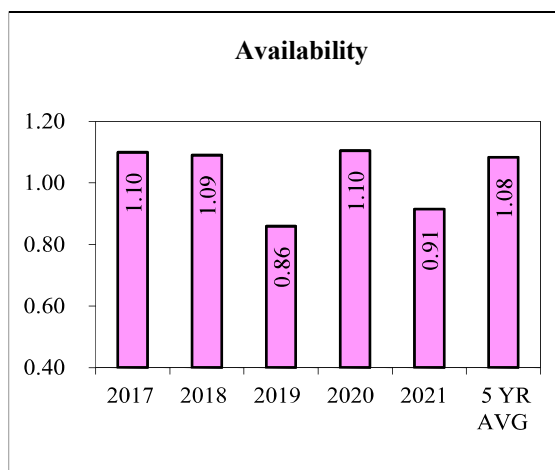
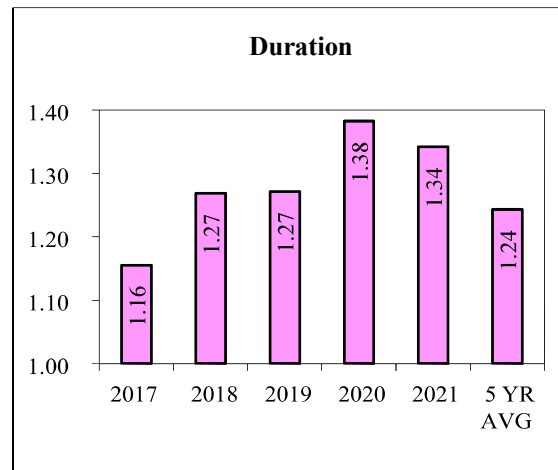
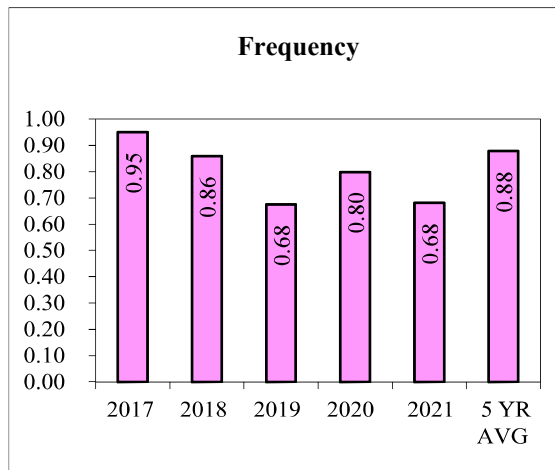
Central Hudson Gas and Electric (Excluding Major Storms)



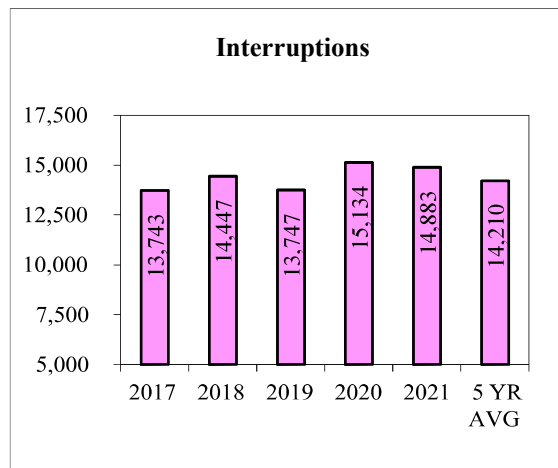
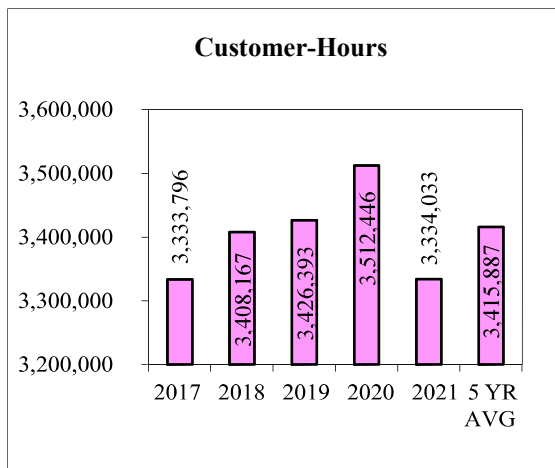
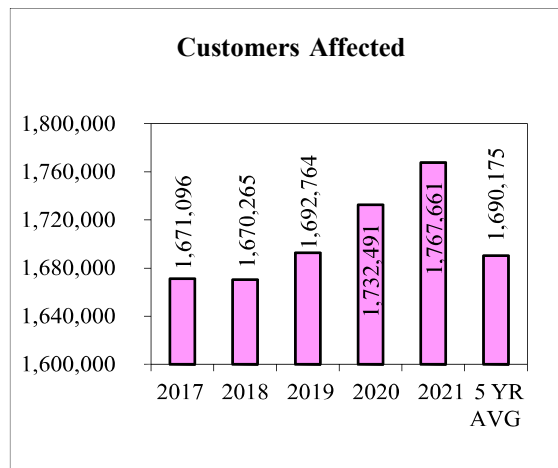
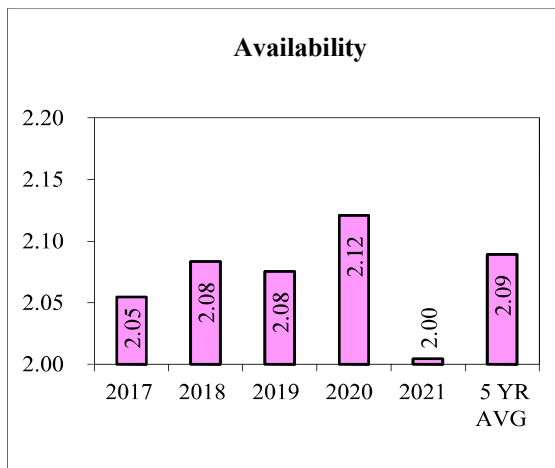
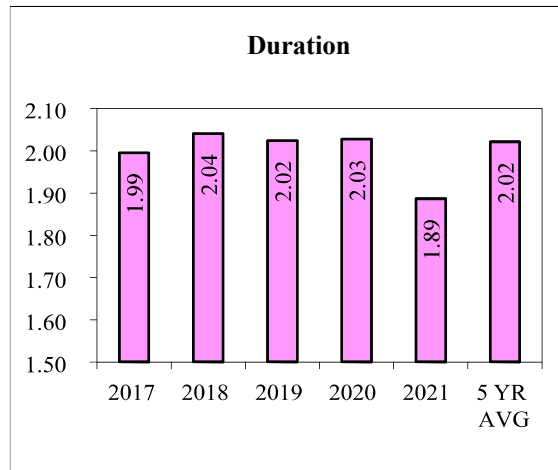
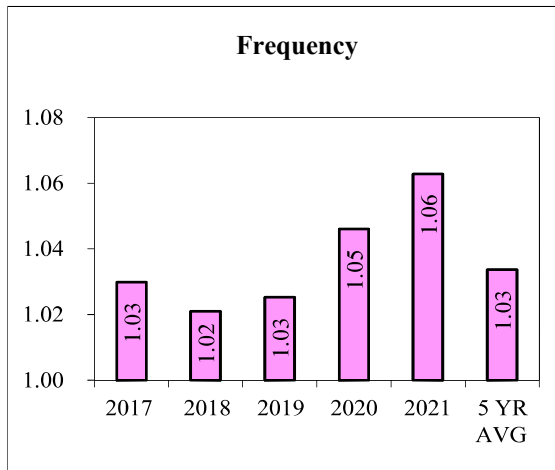
Consolidated Edison - System (Excluding Major Storms)



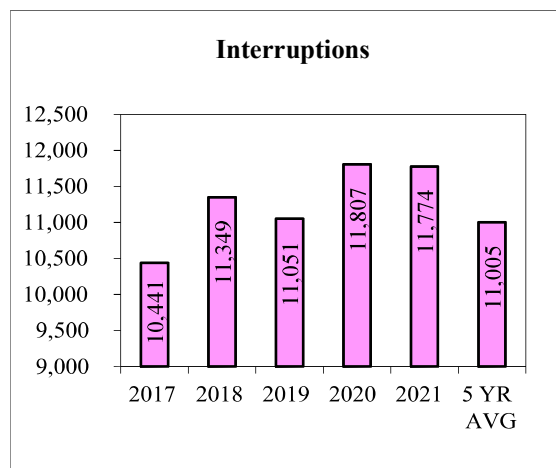
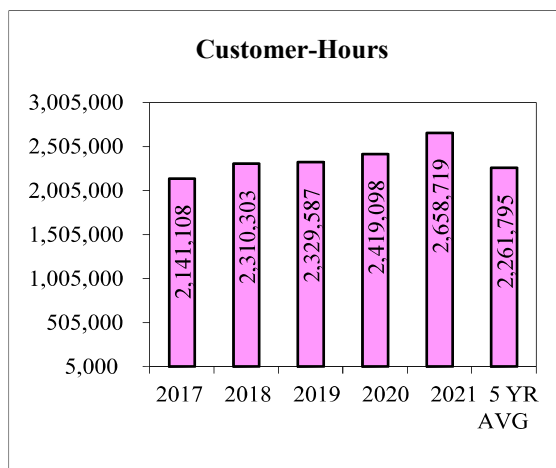
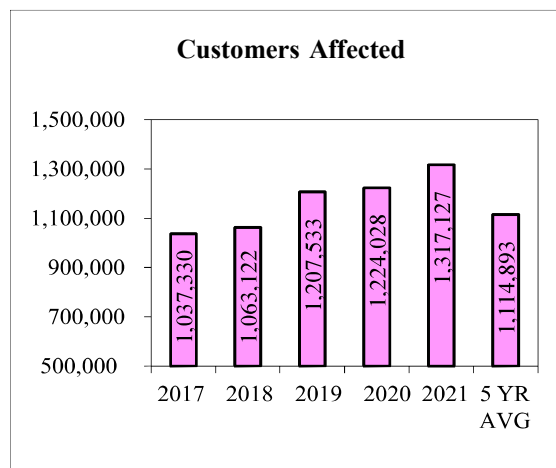
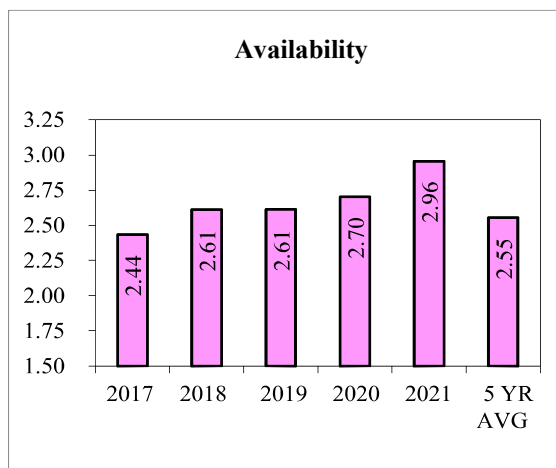
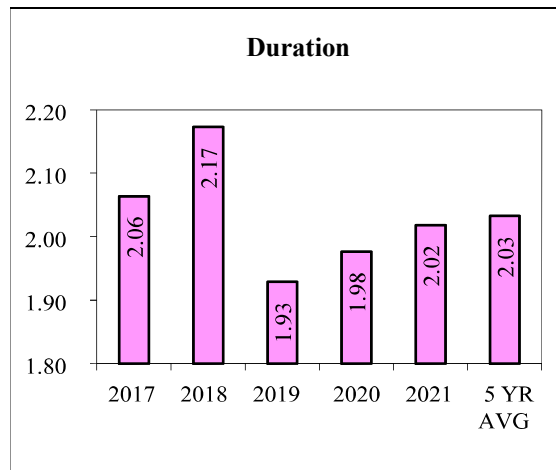
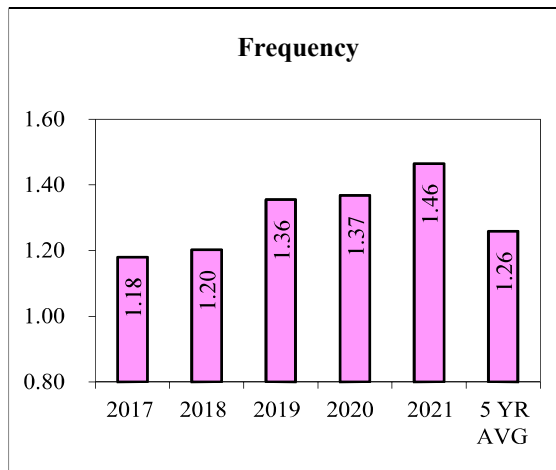
Long Island Power Authority (Excluding Major Storms)



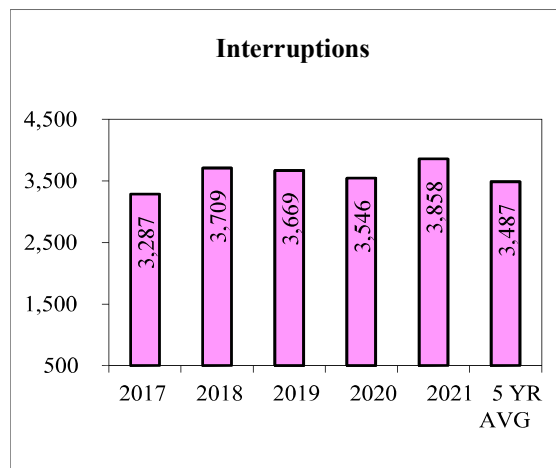
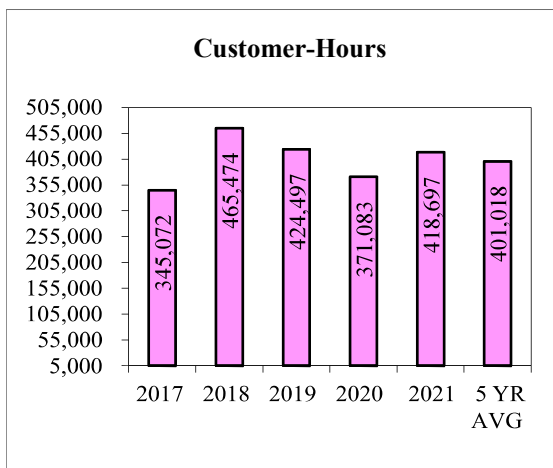
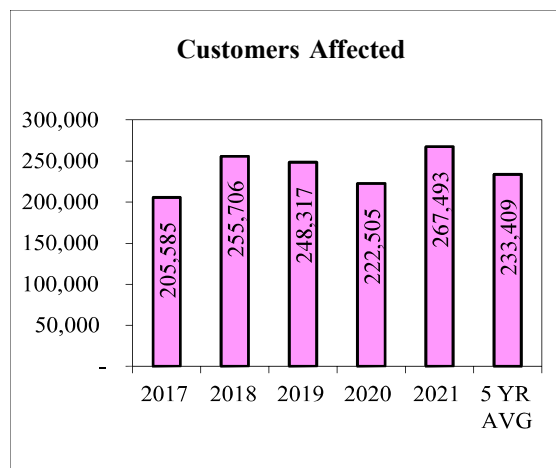
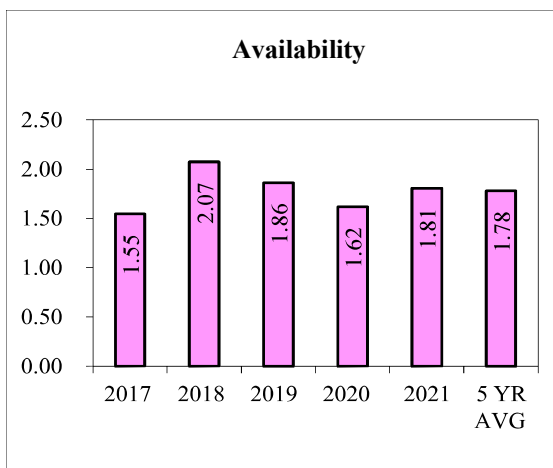
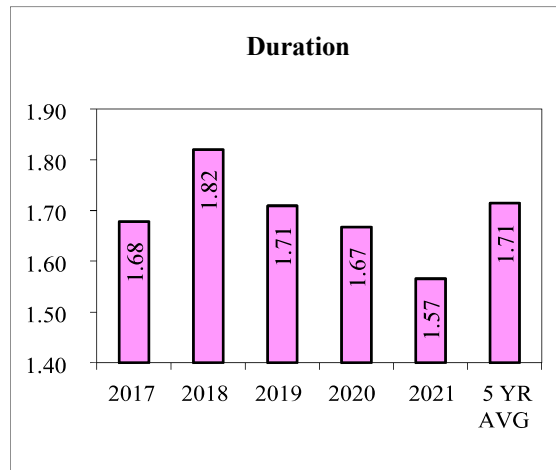
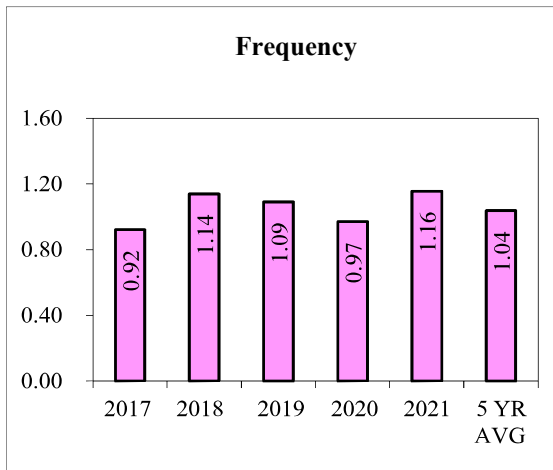
**National Grid
(Excluding Major Storms)**



New York State Electric and Gas (Excluding Major Storms)



Orange and Rockland Utilities (Excluding Major Storms)



Rochester Gas and Electric (Excluding Major Storms)

