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# Climate Change Resilience Plan

## New York State Electric & Gas Corporation

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## Contents

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## List of Figures



## List of Tables

## List of Acronyms

| | |
|---|---|
| CCRP | Climate Change Resilience Plan |
| CCVS | Climate Change Vulnerability Study |
| CMIP6 | Coupled Model Intercomparison Project Phase 6 |
| CRWG | Climate Resilience Working Group |
| DAC | Disadvantaged Communities |
| EOP | Emergency Operations Procedures |
| ETR | Estimated Time of Restoration |
| FEMA | Federal Emergency Management Agency |
| FSF | First Street Foundation |
| GCM | Global Climate Model |
| GHG | Greenhouse Gas |
| GIS | Geographic Information System |
| HILL | High Impact and Low Likelihood |
| IEEE | Institute of Electrical and Electronics Engineers |
| IPCC | [United Nations] Intergovernmental Panel on Climate Change |
| JU | New York State Joint Utilities Group |
| MPH | Miles Per Hour |
| NASA | National Aeronautics and Space Administration |
| NESC | National Electric Safety Code |
| NEX-GDDP | NASA Earth Exchange Global Daily Downscaled Projections |
| NOAA | National Oceanic and Atmospheric Administration |
| NYSEG | New York State Electric & Gas Corporation |
| NYSERDA | New York State Energy Research and Development Authority |
| PSL | Public Service Law |
| SME | Subject Matter Expert |
| SSPs | Shared Socioeconomic Pathways |

# Executive Summary

NYSEG is committed to enhancing resilience to climate change in the face of escalating environmental challenges. As our world confronts increasingly frequent and severe climate events, our electric utility recognizes the importance of safeguarding our infrastructure and ensuring uninterrupted service for our customers. This Climate Change Resilience Plan (CCRP) outlines the efforts that have been and will continue to be undertaken by NYSEG to continue making our electric assets more resilient to climate change, while helping enable New York State's significant electrification goals.

Building on the outcome of the Climate Change Vulnerability Study (CCVS), the CCRP identifies a number of ways that NYSEG is proposing to build resilience to the effects of climate change throughout the 10- and 20-year time horizons covered by this plan.

### Priority Vulnerabilities

Identification of priority vulnerabilities was the focus of the CCVS. An asset's vulnerability is determined by sensitivity and exposure to a particular climate hazard, as well as the consequence of its malfunction or failure. The identified priority vulnerabilities listed in Table 1 are based on the study findings as well as input from stakeholders and subject matter experts. Asset-hazard combinations not included in the table (e.g., transmission + flooding) were not identified as priority vulnerabilities.

*Table 1. Summary of Priority Vulnerabilities by Asset Family Type*

| Hazard | Transmission | Distribution | Substation |
|---|---|---|---|
| High Temperature | | | ✓ |
| Flooding | | | ✓ |
| Wind | ✓ | ✓ | |
| Wind & Ice | ✓ | ✓ | ✓ |

### Resilience Measures

The resilience measure included the CCRP help adapt the system to better withstand the projected changes in the climate between now and 2050 based on the SSP5-8.5 50th[1] percentile planning scenario; while also in certain cases helping to meet the significant projected increase in load growth due to policy goals in New York State. The themes of the resilience measures generally meet two main objectives:

> **Grid Modernization**: Resilience measures that modernize the grid by enhancing the system intelligence through automation or restoration activities to quickly reduce the number of customers interrupted, improve restoration time, and decrease interruption costs from weather events. NYSEG has invested substantially in grid modernization, incorporating advanced technologies such as smart meters, automated devices, and real-time monitoring systems onto its grid. These types of additions improve the system's ability to respond swiftly to outages caused by climate-related disruptions; reducing the scope of outages, the cost to restore customers, and reduce the duration that customers are impacted.
>
> **Resilient Infrastructure**: For the expected impact of extreme weather due to climate change on the distribution system NYSEG utilizes design and construction standards that harden key distribution infrastructure components, such as poles, lines, transformers, and substations from the effects of climate change.

[1] Shared Socioeconomic Pathway 5, "Fossil Fueled Development"

The following resilience measures modernize the grid and provide resilient infrastructure to mitigate the identified priority vulnerabilities as part of the CCRP.

### Distribution and Wind, Wind-and-Ice & Substation Transformers and High Temperature Priority Vulnerabilities

**21st Century Grid:** A newly designed suite of projects in the Cheektowaga area of Lancaster, NY were designed to improve reliability, resiliency, address deteriorating asset condition, and enhance the area's capability to meet future load growth in the area. The 21st Century Gird utilizes both traditional solutions like distribution circuit hardening/rebuilds, and novel solutions like distribution switching stations to build resilience to the effects of climate change.

### Distribution and Wind, Wind-and-Ice

**Distribution Resiliency Program:** Targeting the distribution circuits with poor historical outage performance, NYSEG aims to deploy various solutions that enhance circuit hardening, topology, and automation capability, while also utilizing enhanced vegetation management to further remove vegetation that pose a risk by impacting a distribution circuit and the customers it supplies. This varied approach to resiliency will help directly prevent outages caused by wind, wind-and-ice, and impacted vegetation.

**TripSaver Program:** Advanced technology devices that are small enough to easily replace traditional fused cutouts and allow for temporary faults, often caused by falling branches during severe wind or wind-and-ice events, to be restored automatically without requiring crews to respond.

**Java Microgrid**: A new technology project that installs a battery energy storage system (BESS) to provide backup power to the Java substation in Java, NY. The BESS can activate and automatically supply power to backup customers when upstream events occur with the substation transformer or the transmission line feed into the substation.

**Targeted Undergrounding:** This program aims to enhance the reliability and resiliency of the distribution system by burying sections of overhead lines. The approach will focus on identifying high-impact locations for undergrounding to protect against wind, wind-and-ice, and vegetation-related damage and improving community resilience.

### Substation and Flooding Priority Vulnerability

**Substation Flood Mitigation**: Using a risk-based analysis the CCRP identified four new substations and associated resilience measures that were designed to relocate the substation out of the identified floodplain. These resilience measures are currently scheduled for usage in the 10- and 20-year horizon.

### Substation and High Temperature Priority Vulnerability

**Substation Transformers with Increased Temperature Capability**: Due to the expected increase in maximum temperatures NYSEG will update substation transformer specifications to begin installing substation transformers with higher ambient temperature capability. This update addresses the substation and heat priority vulnerability from the CCVS and will allow newly installed substation transformers to better withstand future extreme temperatures.

### Transmission and Wind, Wind-and-Ice Priority Vulnerabilities

**Transmission Line Upgrades**: No new transmission line rebuild projects were identified in the CCRP; accordingly, any associated costs or rate impacts are not included in the CCRP. However, to build resilience to the expected impact of extreme weather due to climate change on the transmission system NYSEG anticipates that it will continue to rebuild existing lines with the most up-to-date and resilience designs as other needs (e.g., transmission asset-condition or capacity constraints) are identified. Replacing this infrastructure with modern facilities designed to current requirements helps boost its resilience to the challenges posed by extreme climate events and identified in the CCVS in the Transmission and Wind and Transmission and Wind-and-Ice priority vulnerabilities.

### NYSEG 5-Year Plan

The following table identifies the proposed resilience measures identified for the first 5-years of the 20-year CCRP. These resilience measures are designed to build resilience to the identified hazard(s) for the identified asset family, and to reduce storm restoration costs, improve outage frequency, and/or reduce outage durations.

*Table 2. Estimated Costs for First 5-Years*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) |
|---|---|---|---|---|
| 21st Century Grid (Lancaster Area) | All | All | Project | $245.3 M |
| Distribution Resiliency | Wind / Wind-and-Ice | Distribution | Program | $155.6 M |
| SCADA/Automation | Wind / Wind-and-Ice | Distribution | Program | $24.8 M |
| Trip Saver | Wind / Wind-and-Ice | Distribution | Program | $16.9 M |
| Java Microgrid | Wind / Wind-and-Ice | Distribution / Substation | Project | $43.1 M |
| Transformer Specification Update | Heat | Substation | Program | $0.9 M |
| Substation Rebuilds | Flooding | Substation | Program | - |
| Targeted Undergrounding | Wind / Wind-and-Ice | Distribution | Program | $27.9 M |
| | | | **Totals** | **$514.4 M** |

### NYSEG's Commitment to Resilience

NYSEG is committed to building resilience to climate change throughout its electric system as demonstrated by the resilience measures identified in this plan that each have direct ties to enhancing climate resiliency. The results of this CCRP are based on an evaluation against current standards, observations, and projections of future conditions due to climate change. As new data, standards, and projections become available, they will be incorporated into future CCRPs.

# Introduction

# 1. Introduction and Background

The Climate Change Resilience Plan (CCRP) builds upon the ongoing resilience work performed by New York State Electric & Gas Corporation (NYSEG). The recently published Climate Change Vulnerability Study (CCVS)[2] presents the findings of the Company's electrical transmission, distribution, and substation assets across a set of priority hazards: high temperature, flooding, wind, and wind & ice. The CCRP identifies how NYSEG is planning to address the results of the CCVS with the intent of building resiliency to the identified climate change vulnerabilities and enhancing the resiliency of the Company's assets and operations to the impacts from climate change.

To complete this CCRP, NYSEG continued its engagement of internal subject matter experts and ICF[3], a climate resilience consultant. In addition to the Study Team, external stakeholders were invited to participate in Climate Resilience Working Group (CRWG) meetings[4]. In these meetings, the CRWG discussed key elements of the CCRP, including the Multi-pronged Resilience Strategy and Approach and the Business Cost Justification Frameworks.

## 1.1 Background

In response to worsening climate hazards and in support of climate resilience planning, the Governor of New York State signed into law on February 24, 2022, the addition of subdivision 29 to Public Service Law (PSL) §66. Under the law, electric utilities in the state are required to conduct a Climate Change Vulnerability Study (CCVS) and develop a Climate Change Resilience Plan (CCRP) (New York State Public Service Commission, 2022). The CCVS was structured to evaluate the utility's assets, design specifications, and procedures to better understand the electric system's vulnerability to climate-driven risks[5]. The CCRP, due 60 days after the filing of the CCVS, will detail how utilities are, or plan to increase the resilience of their electrical system to the vulnerabilities identified in the CCVS.

## 1.2 Overview of the NYSEG Electrical System

NYSEG (Figure 1) was established in 1852 and operates approximately 35,000 miles of electric distribution lines and 4,000 miles of electric transmission lines. NYSEG serves more than 900,000 electricity customers across more than 40% of upstate New York (NYSEG, 2023).

[2] https://www.nyseg.com/documents/40132/5898083/NYSEG+RG%26E+Climate+Change+Vulnerability+Study_10.03.23.pdf/b9710f65-1427-db97-7730-5b803c2e0c1c?t=1696356358334
[3] https://www.icf.com/company/about
[4] NYSEG's CCRP was performed in conjunction with Rochester Gas & Electric's CCRP. Accordingly, some references in this report may include both companies though the results in this document apply only to NYSEG.
[5] NYS PSC Case 22-E-0222 Order Initiating Procedure: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7bCA027C18-8246-47E7-A1A1-B2C096AC42C0%7d

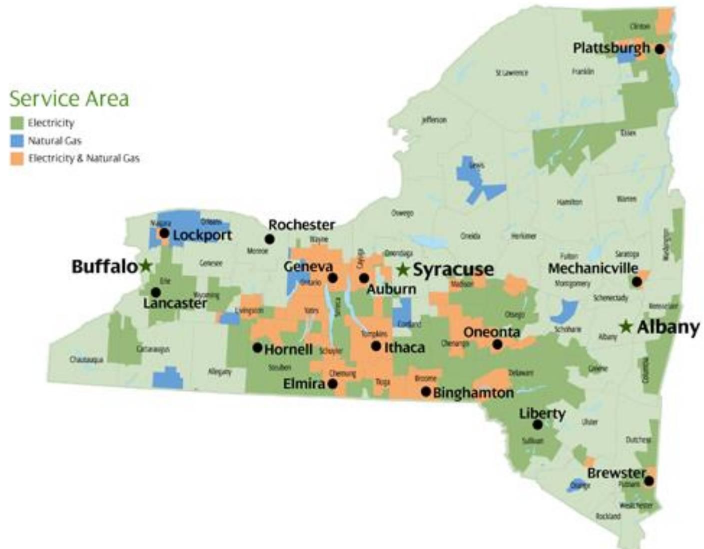


*Figure 1. Map of New York State Electric & Gas Service Area*

## 1.3 Climate Change Vulnerability Study

NYSEG's CCVS assessed the risks climate change poses to the Company's electric system and generated results that guide the CCRP. The CCVS identified the projected impacts of climate change on the Company's service area and contemplated potential resilience measures that have been evaluated for the CCRP. The CCVS used several resources to establish climate and risk projections, including climate projections developed by Columbia University and NYSERDA[6], baseline and projected flooding depths from First Street Foundation[7], baseline historical average wind speeds and wind gusts from the National Oceanic and Atmospheric Administration, and daily average wind speed projections from NASA's NEX-GDDP downscaled global climate models (GCMs).[8]

### Assets

For the CCVS, NYSEG electrical assets were grouped into three asset families: transmission, distribution, and substations.

Transmission assets carry electricity over long distances and at high voltage; these voltages range from 34.5 to 345 kilovolts (kV). These assets allow for power to efficiently flow from interconnected generation facilities to substations where it is transformed to feed the distribution system. Transmission line structures, conductors, and other related components were included in this assessment.

Distribution assets originate at substations and deliver electricity to homes and businesses at voltages that typically range from 4.8 to 12.5 kV. The distribution conductors, structures, transformers, regulators, capacitors, surge arrestors, and other current-carrying components were included in this assessment.

Substations are facilities where one or more generation, transmission, or distribution systems interconnect to supply electricity to other parts of the grid. Substations often include complex pieces of interconnected electrical assets, like transformers and circuit breakers, which are crucial to the operation of the grid.

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[6] Columbia University and NYSERDA are currently updating the 2014 ClimAID report using these same newly produced CMIP6 station data.
[7] First Street Foundation. https://firststreet.org/
[8] NASA. "NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP-CMIP6)." https://www.nccs.nasa.gov/services/data-collections/land-based-products/nex-gddp-cmip6

Transformers, circuit breakers, regulators, reactors, protection and control equipment, and substation structures were included in this assessment.

### Priority Vulnerabilities

An asset's vulnerability was determined by sensitivity and exposure to a particular climate hazard, as well as the consequence of its reduced performance or failure. The identified priority vulnerabilities listed in Table 3 are based on the results of the CCVS. Asset-hazard combinations identified as priority vulnerabilities are indicated with a checkmark in the table below; asset-hazard combinations without a checkmark (e.g., transmission + flooding) are not considered priority vulnerabilities.

*Table 3. Summary of Priority Vulnerabilities by Asset Family Type*

| Hazard | Transmission | Distribution | Substation |
|---|---|---|---|
| High Temperature | | | ✓ |
| Flooding | | | ✓ |
| Wind | ✓ | ✓ | |
| Wind & Ice | ✓ | ✓ | ✓ |

### Key Results from CCVS

To complete its CCVS NYSEG worked with Rochester Gas and Electric (RG&E). The following summary information comes directly from the Companies' shared CCVS.

**Temperature Projections:** Climate projections reveal the potential for significant temperature increases across the NYSEG and RG&E service areas. For example, the number of days with daily maximum temperatures exceeding 95°F in Rochester is projected to increase from the historical average occurrence of approximately 1 day per year to over 11 days per year by 2050.

**Temperature Vulnerabilities:** Transformers, a critical component in substations, are highly sensitive when exposed to maximum ambient temperatures above 104°F or prolonged exposure to average temperatures[9] above 86°F; these temperatures have rarely occurred throughout the Companies' service area. The projected higher ambient temperatures could lead to accelerated transformer degradation, damage, or sudden failure.

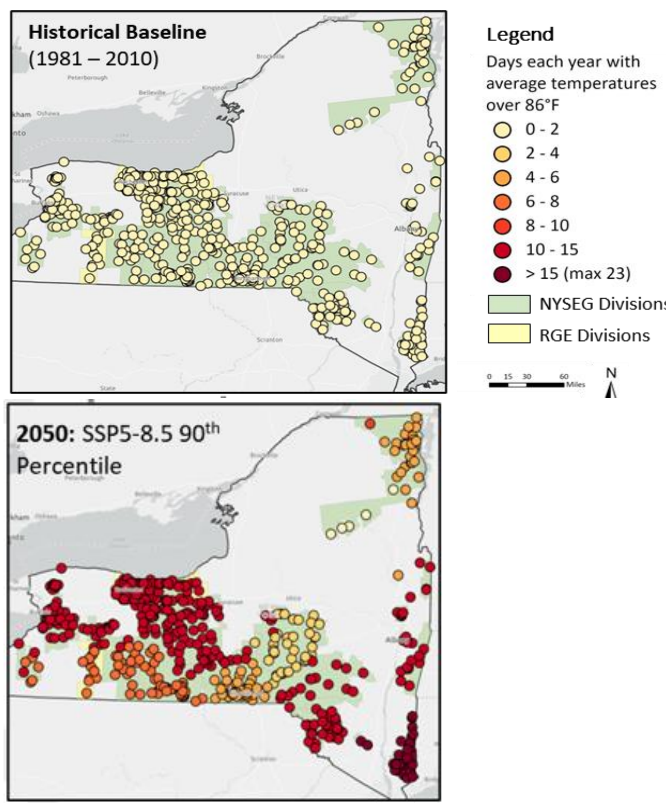



*Figure 2. Historical and Projected Number of Days with Temperatures over 86°F*

[9] Average temperature across a 24-hour period including the nighttime low and daytime high.

Under the study planning scenario (SSP5-8.5 50th percentile 2050[10]), NYSEG is projected to have 67 substations (14%), 489 miles of transmission lines (12%), and 5,541 miles of distribution lines (16%) experience between 5 and 15 days with average temperatures above 86°F.

**Flooding Projections:** NYSEG and RG&E's service areas are not coastal; therefore, the CCVS focused on inland flooding. In general, floods throughout the NYSEG service area are expected to increase in depth and extent for both 100- and 500-year storm scenarios due to increased precipitation. By 2050, substations that already experience some levels of flooding are projected to see, on average, an approximate 2-inch increase in flood depth under the 100-year storm scenario and a nearly 2.4-inch increase under the 500-year storm scenario.

**Flooding Vulnerabilities:** Components in substations are highly vulnerable to flooding due to their sensitivity to water exposure. If flood waters reach critical components (such as control cabinets, fans, pumps, external wiring connections, or other accessories), the damage can range from minor to significant, causing prolonged outage exposure to customers.

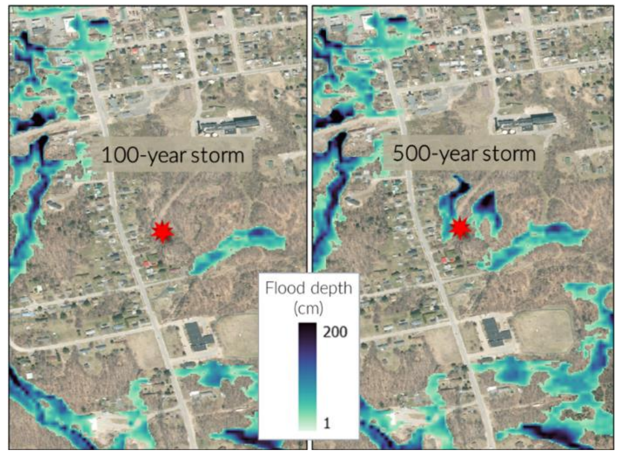


*Figure 3. Sample Flooding*

The takeaways from the exposure analysis are summarized below:

- Under the 100-year flood, 143 substations are projected to be exposed to more than 12 inches of water in all or a portion of the substation yard at present day and in 2050.
- Under the 500-year flood, 192 substations are projected to be exposed to more than 12 inches of water in all or a portion of the substation yard at present day. In 2050, five additional stations are projected to be exposed to more than 12 inches of water.

**Wind Projections:** Qualitative analysis showed that extreme wind speeds and gusts are projected to increase in both frequency and intensity by mid- through late century based on available peer-reviewed research on these infrequent but highly impactful events (Thrasher, 2022). The quantitative analysis performed in the CCVS showed an increase of less than 1 mile per hour in 2050. These findings were localized to regional airports and do not preclude higher wind speeds from occurring elsewhere in New York.

**Wind Vulnerabilities:** Extreme wind speeds that occur in low likelihood events, such as tornadoes and hurricanes, can directly affect utility assets and frequently cause fallen vegetation to impact the transmission or distribution system. While these assets are designed to be resilient, such additional and sudden impacts may cause assets to be damaged or to fail.

**Wind & Ice Projections:** Quantitative projections for the influence of climate change on ice and simultaneous windstorms remain uncertain due to the specific atmospheric conditions required for ice storms to occur (Intergovernmental Panel on Climate Change (IPCC), 2021). However, there has been qualitative analysis that shows that the overall frequency of ice storms is projected to decrease in the service areas as temperatures warm but that the intensity of these events could increase (Zarzycki, 2018).

[10] The SSP5-8.5 50th percentile of results was selected as the climate resilience planning level. This was selected and discussed with the Study Team and external stakeholders with the aim of establishing a conservative planning level for analysis of future conditions. This selection aligns with work performed by industry peers.

**Wind & Ice Vulnerabilities:** Concurrent wind-and-ice events can damage transmission and distribution structures and conductors. Significant accumulation of ice, followed by strong wind gusts, can exceed the design capabilities causing assets to be damaged or fail.

## Special Section: Climate Change to Drought/Wildfire

Drought can affect assets, such as wood poles, by causing accelerated drying and aging. Drought can also affect trees and vegetation in a variety of ways, including exacerbating conditions that increase the probability of wildfires. Droughts have occurred before in New York, with the most recent significant event occurring the 1960's; in addition, wildfire has been a concern throughout New York as demonstrated by historical fire towers that dot the Adirondack National Park. New projections for drought and wildfire were not developed by the Study Team as part of the CCVS or the CCRP; but research by others, including the New York State Climate Impact Assessment, is referenced as part of this discussion.[11]

**Present Day**

According to data from the New York Department of Environmental Conversation (DEC), from 2000-2024 there have been more than 4,000 wildfires in New York state that burned over 40,000 acres.[12] In the Fall of 2024 severe drought conditions occurred throughout New York state contributing to wildfires that burned the most acreage in 35 years, and the most acres burned per wildfire in nearly 100 years. To help maintain public awareness of the likelihood of wildfire the DEC maintains a fire danger rating for all of New York that can be used to assess risk of wildfire.

NYSEG and RG&E have also recently performed a historical assessment of the conditions conducive to wildfire by calculating the Fire Weather Index (FWI) across their service territories. FWI uses temperature, precipitation, relatively humidity and windspeed to classify an area's potential for wildfire intensity; the ratings developed for FWI are (from least to most severe): Low, Moderate, High, Very High, and Extreme[13].

*Table 4. Fire Weather Index Values and Descriptions*

| Fire Weather Index | Description |
|---|---|
| 1 - Low | Fires likely to be self-extinguishing and new ignitions unlikely. Any existing fires limited to smoldering in deep, drier layers. |
| 2 - Moderate | Creeping or gentle surface fires. Fires easily contained by ground crews with pumps and hand tools. |
| 3 - High | Moderate to vigorous surface fire with intermittent crown involvement. Challenging for ground crews to handle; heavy equipment (bulldozers, tanker trucks, aircraft) often required to contain fire. |
| 4 - Very High | High-intensity fire with partial to full crown involvement. Head fire conditions beyond the ability of ground crews; air attack with retardant required to effectively attack fire's head. |
| 5 - Extreme | Fast-spreading, high-intensity crown fire. Very difficult to control. Suppression actions limited to flanks, with only indirect actions possible against the fire's head |

The extensive analysis included tabulating a variety of variables to calculate the experienced maximum FWI and the frequency that each area of the system was identified as having conditions extremely conducive to wildfire. Importantly, nearly all areas of the combined service territories were found to have experienced at

[11] https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.15240, Section 5.2 & 5.3
[12] https://dec.ny.gov/environmental-protection/wildfires/fire-danger-map
[13] Fires are twice as likely to occur on high- risk days compared to moderate risk days, and 10 times more likely compared to low-risk days

least one day at a high or very-high FWI rating; with some experiencing more than 20 from 2013-2023. As a point of comparison a high fire-risk state like California can experience 200 or more days of high, very-high, or extreme fire risk in a single year. While comparatively NY faces hazardous fire weather much less frequently, conditions conducive to wildfire do occur.

**Future Projections**

The NY Climate Assessment notes that through a review of historical data and projections for future conditions it is projected that New York will be wetter in the future; with probability of multi-year droughts not increasing. Since the last major drought experienced in NY that occurred in the 1960s, there has been a significant multidecadal wet period that has persisted since. The assessment notes that there are other factors that could lead to an increased frequency of short-term droughts including implied dry spells, increased evapotranspiration, and reduced snowfall in the future. In addition, if climate change exacerbates interannual variability, more extreme conditions, including drought, could exist between periods of high or moderate precipitation.

For wildfire projections the NY Climate Assessment notes that due to climate change the fire season in New York is expected to last longer due to increases in conditions that contribute to increased FWI. In fact, some studies have shown the potential for a more than 100% increase in fire probability under the high greenhouse gas emission scenarios; though this effect is somewhat muted due to the present-day frequency of wildfire with the NY Climate Assessment noting that given the existing probably of wildfire in the state and the calculated risk level, climate change is "…not likely to greatly expand the risk of wildfires in most of New York."[14]

While projections show an increase in precipitation through the coming decades the development of these projections utilize 30-year averages which can dampen observation of periods that significantly deviate from the average. If climate change increases the interannual variability of temperature and precipitation it can produce short periods of drought that could increase the potential for these high impact events.

**Moving Forward**

Based on historical observations there have been periods of time where areas of New York State have experienced conditions where the risk of drought and wildfire is elevated. In addition, findings from climate change projections indicate that these conditions are unlikely to improve; and may become more severe. Given these observations and findings these hazards warrant additional consideration in future research. As detailed in this special section NYSEG and have RG&E are in the process of investigating this climate hazard and identifying how resilience to drought and wildfire can be enhanced.

## 1.4 Resilience Planning Approach

In the CCRP, NYSEG used a risk-based resilience strategy that considers multiple approaches to advancing resiliency, but it is important to recognize that it is not feasible to harden the electrical system against all future event types and severity. The CCRP utilizes a multi-value framework to review potential resilience measures.

### Summary of the Multi-Pronged Resilience Strategy

The multi-pronged resilience framework, initially discussed in the CCVS, establishes four key ways to enhance resilience for operational processes and assets:

1. **Strengthen** assets and processes to **withstand** the adverse impacts of a climate hazard event.
2. Increase the ability to **anticipate** when a climate hazard event may occur and increase the electric system's ability to **absorb** the effects.

[14] https://www.sciencedirect.com/science/article/pii/S0048969721029430

3. Bolster the ability to quickly **respond and recover** in the aftermath of a climate hazard event.
4. **Advance and adapt** the electric system to address continuous changes from climate change and to perpetually improve resilience.

A risk-based approach was used to identify the most at-risk assets based on the potential magnitude of customer interruption and severity of the climate event the asset could be exposed to. The resulting top scoring assets were identified as key locations to evaluate implementing resilience measures as identified in each section of the CCRP.

## Summary of the Business Cost Justification Framework

Once locations were identified, the Study Team developed a Business Case Justification (BCJ) Framework that captures the benefits of implementing a resilience measure at the identified location. The BCJ established several criteria to arrive at a score by asset. The dimensions included in the criteria are as follows:

1. **Community Resilience:** Provides insight into the extent of the impact on the region due to an electrical outage. It is based on the types of critical facilities and the customers they serve.
2. **System Reliability:** Provides insight on whether a resilience measure being proposed is in an area with historically lower reliability, including during storms, relative to others in the service territory.
3. **Community Safety:** Based on the count of critical facilities that provide health- and safety-related services to the community (e.g., hospitals, police stations, water treatment plants, and shelters) associated to each circuit.

Additionally, the priority locations for resilience measures were mapped to understand if the asset serves disadvantaged communities (DACs), which are discussed further in Section 3.

## Legislative Context

There are multiple requirements listed in PSL §66 (29) that are distributed throughout the CCRP. The following table maps each of these requirements and in what sections they are discussed.

*Table 5. Legislative Requirements*

| Legislative Requirement | CCRP Section |
|---|---|
| Describe how the utility will mitigate the impacts of climate change on utility infrastructure, reduce restoration costs and outage times associated with extreme weather events, and enhance electric system reliability. | **Section 4 & Section 5**: Discussed alongside each proposed resilience measure. |
| Propose storm hardening and resiliency measures for the next ten and twenty years. | **Sections 5.1 – 5.3**: Resilience measures and implementation discussed for each priority vulnerability and resilience measure. |
| Describe how climate change considerations will be incorporated into planning, design, operations, and emergency response. | **Section 4.2**: Includes description of how impacts of climate change are considered in identified processes. |
| Incorporate climate change into existing processes and practices, manage climate change risks, and build resilience. | **Section 4.2**: Includes description of how impacts of climate change are considered in identified processes. |
| Consider the extent to which storm protection and hardening of transmission and distribution infrastructure is feasible, reasonable, or practical. | **Sections 5.1-5.3:** Discuss the identified resilience measures, how they are utilized, and their feasibility. |

| | |
|---|---|
| Propose adjustments to how the corporation plans and designs infrastructure for the increasing impacts from climate change. | **Sections 5.1 – 5.3**: Proposed resilience measures discuss how the system is designed to mitigate effects of climate change. |
| Provide an estimate of the costs and benefits to the corporation and its customers of making the improvements in the plan, with particular attention paid to the costs and benefits in undergrounding transmission and distribution lines. | **Section 5.3:** Discusses approach and benefits achieved through undergrounding.<br>**Section 5.4**: Costs for proposed resilience measures included in summary table. |
| Describe how equity is considered in the plan. | **Section 3:** Discusses how equity was approached in the CCRP. |
| Provide an implementation schedule of proposed measures. | **Section 5.4**: Included summary table in this section. |
| Provide performance benchmarks. | **Section 7:** Includes performance benchmarks for resilience measures. |

# Engagement of the Climate Resilience Working Group

# 2. Climate Resilience Working Group

To gather information from community and public sources, stakeholders were engaged to form a Climate Resilience Working Group (CRWG); involvement in the CRWG was open to the public for anyone to participate. The CRWG met periodically to receive updates on the development progress of the CCVS. In these engagements, stakeholders were given the opportunity to provide feedback via meeting participation or through e-mail. In addition, CRWG members were given an opportunity to review and comment on the CCVS and CCRP before they were filed.

There were five stakeholder meetings held throughout the development of the CCVS and CCRP that occurred regularly between September 2022 and September 2023[15]. Again, participation in these meetings was open to the public, such that anyone could participate and be considered a stakeholder. For each of these meetings, the Study Team prepared presentation materials that were shared with all registered participants regardless of attendance at meetings. These materials were designed to communicate project progress and next steps and to invite stakeholder participation and feedback. These meetings covered the following topics:

- **Stakeholder Meeting (September 22, 2022):** Initial kickoff meeting that included introduction to Study Team, broad overview of the legislation, project scope, and expected timeline for future engagement of the Climate Resilience Working Group.
- **Climate Resilience Working Group Session #1 (December 14, 2022):** In the first meeting of the CRWG, the initial climate projection results were shared, as well as an overview of the next steps that would be used to assess vulnerability.
- **Climate Resilience Working Group Session #2 (April 17, 2023):** The second meeting of the CRWG expanded upon the previous climate projection data by including asset locations to demonstrate the exposure of NYSEG's assets to climate hazards. In addition, asset sensitivity, consequence, and vulnerability ratings for each of the assets and asset families were shared.
- **Climate Resilience Working Group Session #3 (July 12, 2023):** In the third and last meeting before the publication of the CCVS, a summary of the key findings from the study were shared, as well as potential mitigation solutions, prioritization frameworks, and resilience measure benefit scoring.
- **Climate Resilience Working Group Session #4 (September 28, 2023):** This meeting was focused on discussing the next steps for the Climate Change Resilience Plan and discussion of how resilience measures were identified.

Key inputs from Working Group participants included discussion of the most concerning climate hazards in their community and how these hazards may impact their communities. This stakeholder input was used to help tailor the CCVS and future CRWG meetings to focus on concerns raised by the CRWG. Written comments that were received were incorporated enhancing the analysis or explanation of certain vulnerabilities; for example, how extreme heat is likely to impact substation equipment, or how future load forecasts can be considered. Finally, stakeholders noted that reducing societal greenhouse gas emissions, helping to limit warming and worst-case climate change outcomes, is necessary to develop societal resilience to climate change.

## Future CRWG Meetings

NYSEG will continue to meet at least twice annually with the CRWG to discuss the Climate Change Resilience Plan and any updates from the Company or stakeholders.

[15] Additional Stakeholder Meetings were held in 2024 and 2025 in accordance with the legislation. From 2025 and onwards CRWG meetings included representatives from the telecom sector.

# Consideration of Equity

# 3. Consideration of Equity

NYSEG acknowledges its role in contributing to the equitable development of the communities it serves. The Company's investments to aid the transition to clean energy, for example, will generate jobs and access to clean, renewable, and affordable energy. Additionally, NYSEG's Supplier Diversity program has the goal of increasing spending on businesses owned by ethnic minorities, women, people with disabilities, veterans, and members of the LGBTQI+ community (Avangrid, 2022).

NYSEG is looking to continue pursuing equity in the prioritization of climate resilience projects by leveraging the work done by the New York State Climate Justice Working Group (CJWG) and the New York State Department of Environmental Conservation, who identified disadvantaged communities (DAC) across New York State. Pursuant to the Climate Leadership and Community Protection Act (CLCPA) that was signed into law in July of 2019[16], 35% of census tracts in New York State were identified as DACs (New York State Climate Justice Working Group, 2023). A map of the DACs is available to the public and is depicted in Figure 4.

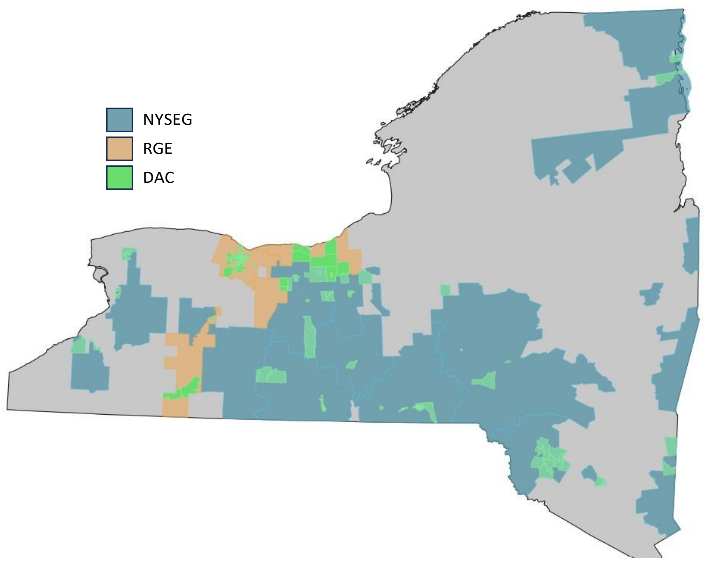



*Figure 4. Map of Disadvantaged Communities in NYSEG and RG&E 's Service Territory*

In the CJWG context, DACs are communities that "have historically been overburdened by environmental pollution"[17] and are now also exposed to climate hazards, like flooding and extreme heat. The CLCPA mandates that no less than 35% (with a goal of 40%) of the State's climate action benefits (e.g., reducing emissions and investing in clean energy) must go toward DACs (New York State, 2023). While this mandate is not specifically applicable to the CCRP, NYSEG is actively identifying which of the resilience measures discussed in Section 5 are in, adjacent to, or directly benefit DACs.

[16] https://www.dec.ny.gov/press/127364.html
[17] https://climate.ny.gov/Our-Impact/Ensuring-Equity-Inclusion

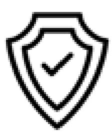
# Multi-pronged Resilience Strategy and Approach

# 4. Multi-pronged Resilience Strategy and Approach

Public Service Law §66 includes consideration that resilience measures could include a multi-pronged approach with a range of solutions used to achieve resilience. In the CCRP, NYSEG implemented a resilience framework that explores alternatives within four key objectives: 1) strengthen assets and operations to withstand the adverse impacts of a climate hazard event; 2) increase capacity to anticipate when a climate hazard event may occur and absorb its effects; 3) bolster the system's ability to quickly respond and recover in the aftermath of a hazard event; and 4) advance and adapt the system such that it may evolve with the continuously changing climate threat landscape and perpetually prioritize resilience.

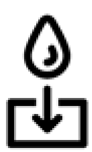
## 4.1 Proposing Resilience-Related Measures

### Strengthen and Withstand



As shown in the results of the CCVS, NYSEG's assets are projected to be exposed to different climate hazards. This resilience objective explores measures that provide physical strength to assets to withstand impacts that may occur during extreme weather events (e.g., extreme wind gusts and extreme temperatures).

### Anticipate and Absorb

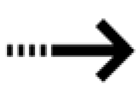


In some cases, reinforcing assets with a resilience measure designed to strengthen and withstand may be insufficient or impractical. The anticipating and absorb resilience measure explores ways to reduce the impacts to electrical service should an asset fail regardless of physical strengthening. These types of measures limit the level or propagation of service disruption that may occur.

### Respond and Recover

The previous two objectives (strengthen and withstand, anticipate and absorb) focus on reducing the level of disruption in the service level through physical measures. This objective is focused on activities and procedures to restore the service to normal levels in the aftermath of a climate hazard event. Respond and recover measures are often incorporated into planning, design, and operation practices but may also include identification of additional spare equipment needs.

### Advance & Adapt



The last objective addresses a continuously changing climate threat landscape and perpetually improve resilience. This is achieved by learning from previous experiences and continued investment in resilience, so that the next time the system is exposed to a similar climate hazard event, the level of disruption is reduced. These learnings are incorporated into planning, design, and operation practices. Relocating assets to avoid the exposure to climate hazards, when feasible, is an example of an adaptive resilience measure.

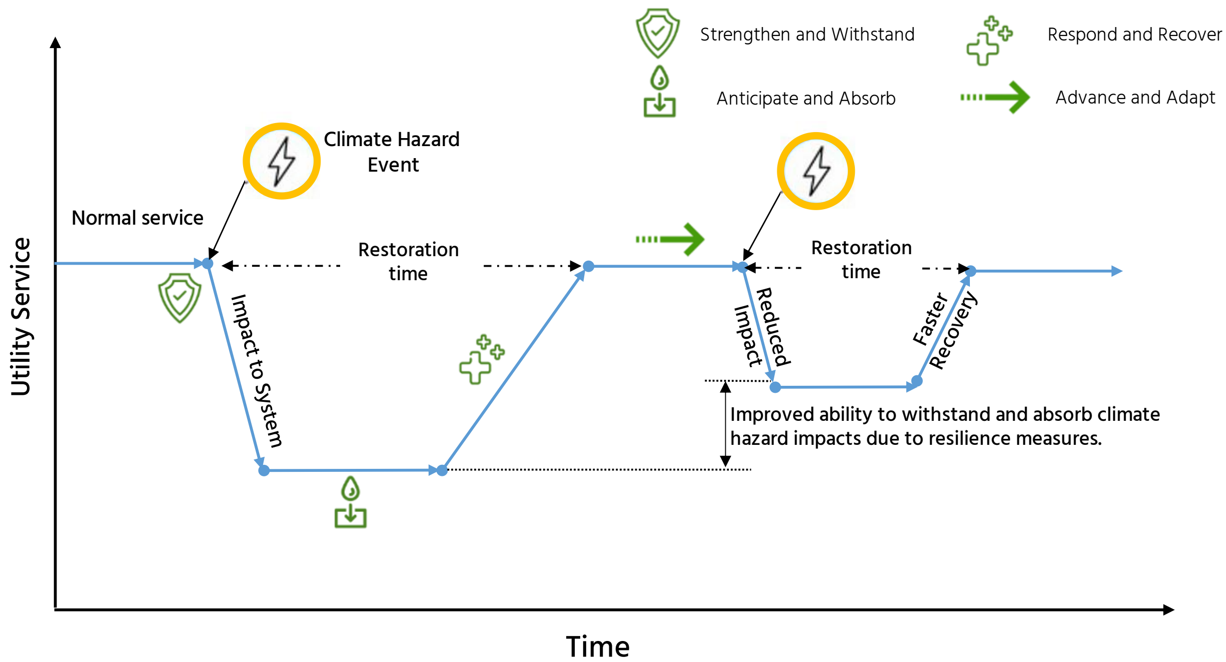



*Figure 5. NYSEG's Multi-Pronged Resilience Strategy*

## 4.2 Incorporating Resilience into Existing Planning, Design, and Operations

NYSEG used the findings of the CCVS's Operational Process Vulnerability Summary to identify ways in which resilience to climate hazards could be built gradually over-time, or through updates to existing processes. These identified measures can also be considered under the multi-pronged resilience framework.

*Table 6. Building Resilience to Operational Processes*

| Operational Process | Strengthen and Withstand | Anticipate and Absorb | Respond and Recover | Advance and Adapt |
|---|---|---|---|---|
| Emergency Response | | ✓ | ✓ | ✓ |
| Reliability Analysis | | | | ✓ |
| Load Forecasting | | | | ✓ |
| Climate Vulnerability & Resilience | | | | ✓ |
| Worker Safety | | ✓ | | ✓ |
| Vegetation Management | | | | ✓ |
| Asset Management – Substations & High Temperature | ✓ | | | |
| Asset Management – Substations and Flooding | | ✓ | | ✓ |
| Asset Management – Facility Ratings | | ✓ | | ✓ |

### 4.2.1 Emergency Response to Severe Weather Events

The NYSEG and RG&E Emergency Response Plan (ERP) is an integral component of how the companies prepare and respond to severe weather events that are expected to intensify due to climate change. The plan utilized by the companies is based on philosophies of the National Incident Management System (NIMS) and the Incident Command System (ICS), and provides a structured framework for roles and responsibilities used during emergency preparation and response. This structure facilitates efficient coordination and communication among various teams and external stakeholders, ensuring a swift and organized response. Included below are examples of the resilience framework described in the CCRP that are incorporated into the ERP and help build resilience to the impacts of severe weather events.

#### Anticipate and Absorb

Prior to an event the companies will communicate and coordinate with customers, public officials, and the media as part of its preparation activities for severe weather events. These strategies for proactive outreach can include press releases, television news updates, emails, website, social media updates, and outbound calls to customers helping alert them to the potential of a power outage; in addition, there may be specific outreach activities to Life Support Equipment, Special Needs and Critical Facility Customers.

#### Respond and Recover

The companies are committed to maintaining a trained workforce to enable personnel involved in the response effort to execute on their emergency response role. This training is accomplished through conducting regular training, as well as planning and conducting exercises or drills. When a severe weather event is identified the companies collaborate with other utilities, including telecommunication providers, to coordinate the response efforts which can include the gathering of mutual aid crews and/or securing external contractors that may be necessary depending on the Event Classification. Finally, the companies have detailed step-by-step processes to assess, repair, and restore customer outages; including details on how the companies can provide road clearing assistance crews, how to address downed wires situations, damage assessment, development of Estimated Times of Restoration, and ultimately damage repair and outage restoration. To support customers during restoration efforts, the companies also have provisions for supplying dry ice and bottled water.

#### Advance & Adapt

Finally, the Advance and Adapt prong of the resilience framework detailed in the CCRP is included by making regular updates and as well as specific updates based on lessons learned previous significant weather events. These on-going updates allow NYSEG and RG&E to continuously adapt to the increasing frequency and intensity of severe weather events that are expected to occur.

### 4.2.2 Reliability Analysis – Advance and Adapt

Through use of advanced data analytics, the company's Operational Performance Team is leveraging data science, engineering, and analytics to help drive reliability and resiliency decision making. This team, formed in 2020, is helping to aid the digital transformation of electric operations. The following are some examples of the projects and initiatives that this team has led.[18]

#### GeoMesh

This project maps NYSEG's service area to identify the strengths and weaknesses of its electric networks to help forecast its performance during both blue-sky and storm scenarios. The goal is to improve understanding about how the electric grid is performing under various weather conditions so that NYSEG can better plan upgrades, storm response, and more.

[18] Additional details can be found at https://www.avangrid.com/documents/d/avangrid-1/the-digital-transformation-of-electric-operations-pdf

To accomplish this, GeoMesh breaks the service area into small sections to allow the Company to focus on one specific region at a time. For the chosen selection, GeoMesh makes predictions by analyzing millions of data points, such as temperature, average wind speed, precipitation type and amount, outage history and reason, population and density of tree limbs and other vegetation. All of this lets the Company make informed, data-based decisions on things like where and what upgrades are most needed or which customers are most likely to be impacted by a storm.

### HealthAI

This project will analyze millions of high-resolution photos of the Company's street-level distribution system—poles, wires, and grid equipment—to identify the assets in the photos and, eventually, catalogue their health. This increases the Company's awareness of the condition of its grid equipment and helps to identify areas of concern. HealthAI is anticipated to save NYSEG time and money by targeting at-risk locations for inspections and maintenance. It is also expected to reduce outage exposure and improve safety for line workers by giving them more information before they arrive on scene.

Currently, NYSEG is training the AI system to correctly identify grid equipment in photos, such as cross arms, transformers, or wire. Next, the AI system will learn to analyze and determine the health of that equipment. For instance, it will identify if the cross arm is broken or if the wire is sagging. Currently NYSEG learns of these equipment damages or failures from customer reports, manual inspections, or customer outages. HealthAI aims to be a proactive process that automatically identifies system needs prior to customer interruptions occurring. In the long term, NYSEG aims to also use HealthAI to identify threats to its distribution network such as hanging tree limbs or dead trees that may fall onto Company electric lines.

### Zone of Protection Evaluation Tool

The new internally developed Zone of Protection tool automatically parses through distribution system topology and recent outage data to identify which circuit portions are leading to the highest number of customer outages. This tool works by automatically identifying all protective devices (e.g., circuit breakers, reclosers, TripSavers, fuses) and determining each device's Zone of Protection (i.e., the portion of the circuit they are designed to protect from faults.) Next, recent outage data is mapped into each Zone of Protection to identify which specific areas are leading to the most outages. This tool can help to quickly identify specific circuit locations where the combination of downstream customers and external factors are the most impactful.

This tool allows for engineers to quickly parse through thousands of protective devices to identify which of them has experienced the most outages, and depending on the specific situation, could provide the most benefit from installation of new devices, undergrounding, or other hardening measures.

### Outage GeoLocator Tool

Similar to the Zone of Protection Tool, the Outage Geolocator tool provides a unique way for engineers to view and interact with historical outages to help inform reliability planning decisions. The Outage Geolocator tool focuses on individual circuits by mapping where each outage has occurred, and what the cause of the outage was. By grouping outages by cause and location, engineers can easily identify what type of solutions may be most appropriate to address the issues that have affected each circuit. For example, if a portion of a circuit has experienced a large number of outages from animal contact the most effective solution would be significantly different than if the primary cause of outages was due to vegetation contact. Once a potential solution has been identified the tool then allows the engineer to select the outages that would have been mitigated (e.g., installation of animal

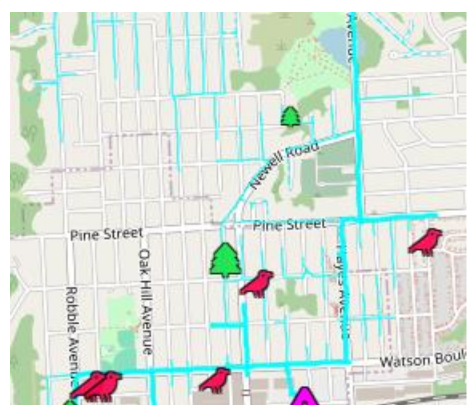



*Figure 6. Outage GeoLocator Tool Example*

guards or installation of tree wire) and automatically calculate the customer count and outage duration that would have been mitigated.

### 4.2.3 Load Forecasting – Advance and Adapt

Load forecasting teams and processes utilize 10-years of historical weather when generating their forecasts which inherently include the effects of climate change on temperature and humidity. It is crucial to note that New York is projected to experience a significant amount of electrical load growth throughout first half of the 21st century, see the figure below from the New York Independent System Operator (NYISO) 2024 Gold Book for details.[19]

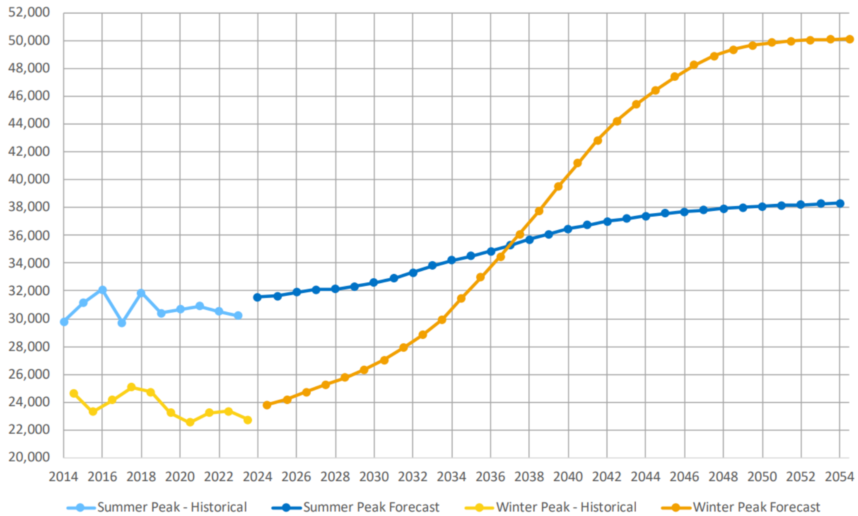



*Figure 7. NYCA Baseline Peak Forecast Comparison - Coincident Peak, MW (2024 NYISO Gold Book)*

Historically, New York state has been a summer peaking region primarily due to the use of air conditioning during the warm summer months, with the coincident peak demand experienced in the region being relatively stable for the past 10-years. Due to the summer peak demand being significantly higher than the peak experienced during winter, many parts of the grid were limited only on their ability to deliver power during the warm summer months. However, this is projected to change drastically throughout the 21st century. The included NYISO forecast shows the effects of widespread electrification of heating and transportation are projected to cause New York state to transition to a winter peaking region; this change to a winter peaking region, with a coincident peak demand that could be 30% higher than the summer peak, will have significant impacts.

The specific impacts and how to best resolve them are not a primary focus of the CCRP and are instead being handled through a variety of other study efforts; however, the effect of this growth in demand are an important consideration when designing a resilient system that meets expected future needs.

### 4.2.4 Climate Vulnerability & Resilience – Advance and Adapt

As required in PSL §66 (29), NYSEG will be submitting an updated resilience plan to the commission at least once every five years. NYSEG anticipates that these updates can provide an opportunity to include the latest and most appropriate data on the effects of climate change that may be developed as the scientific communities' understanding of the complex climatological process continues to improve, new research is completed, and/or computational capabilities unlock the ability to develop even more robust projections for climate hazards affecting NYSEG's service area.

[19] https://www.nyiso.com/documents/20142/2226333/2024-Gold-Book-Public.pdf

### 4.2.5 Worker Safety – Anticipate and Absorb; Advance and Adapt

NYSEG workers understand and take protective steps for a variety of hazards that may impact safe working conditions. These hazards can include heat, high winds, air-quality, and frozen precipitation. Workers are provided periodic training that is updated to account for the best available health-science, including the climate conditions that can be expected during particular times of the year or areas of the system. If hazards exceed pre-determined limits (e.g., elevated heat indices, wind speeds) certain work activities must be modified or stopped. In addition, NYSEG workers can determine on their own using their training supervisor guidance if they believe working conditions are unsafe and should be stopped or suspended until conditions improve.

NYSEG utilizes a variety of PPE to help mitigate the impacts from various hazards to its workforce, lightweight clothing, fire retardant clothing, hard hats, etc. To help mitigate heat impacts to workers trucks are equipped with air conditioning and workers can use lighter weight clothing during hot weather days when working activities permit. In addition, field workers are supplied with water and other liquids and crews are encouraged periodically monitor local conditions to identify if unsafe conditions may occur later in the day, or week.

### 4.2.6 Vegetation Management – Advance and Adapt

Tree and vegetation contact is a leading cause of outages for NYSEG; the current vegetation management plan utilizes a 6-year cycle to trim vegetation in proximity energized distribution circuits. This includes trimming in a specific area around energized conductors as well as removal of other vegetation that poses more immediate threats that is outside of the prescribed trimming area. In addition, on parts of the system that have not had recent trimming there is on-going reclamation being performed to bring the trimming with specification.

As noted in the CCVS, future changes to the climate may cause impacts to vegetation that could include faster vegetation growth, lower tree strength, and changes the species of vegetation or pests that are found in New York. The CCVS and CCRP did not identify any changes necessary to current vegetation management plans as they remain effective in reducing the number of outage incidents and outage frequency.

### 4.2.7 Asset Management - Substations & High Temperature – Strengthen and Withstand

In the CCVS, temperature was identified as a priority vulnerability for the following substation equipment: transformers, regulators, circuit breakers, and reactors. For each of these types of equipment, the 24-hour average ambient temperature and the daily maximum temperature are important design considerations. If these assets are subjected to high loading coincident with ambient temperatures beyond their design parameters, their internal components will degrade at an increased rate leading to a shortened service life and potentially resulting in a higher risk of failure.

Many transformers operating today are expected to remain in service into and beyond 2050. NYSEG SMEs have reviewed the climate projections generated in the CCVS and determined that in order to adapt to the coincident effects of high loading and increased ambient temperatures, future substation transformers should be specified so that they are suitable to operate in an environment where the average temperature of the cooling air for any 24-hour period is 35°C, rather than the current 30°C. This will allow for future equipment to withstand the projected effects of climate change and operate at full rated capacity in future climate conditions, which are discussed further in Section 5.

### 4.2.8 Asset Management - Substations and Flooding – Advance and Adapt, Anticipate and Absorb

As noted in the CCVS, comprehensive FEMA flood depth data is not available across all of New York State. As part of the developing the CCVS and CCRP data was obtained from the First Street Foundation that provides comprehensive flood data including at-risk substation locations throughout the NYSEG service territory.

This comprehensive list was shared with the Emergency Preparedness, Energy Control Center, Asset Management, Planning, and Operations groups to expand the areas that have the potential to experience significant flooding events. Expansion of the at-risk locations can bolster the company's emergency response planning, improve situational awareness, and enhance future planning efforts when siting new or modified facilities.

### 4.2.9 Asset Management - Facility Ratings and Dynamic/Ambient Adjusted Ratings – Advance and Adapt, Anticipate and Absorb

As noted in the CCVS, NYSEG SMEs are currently working with the other New York Transmission Owners to review and revise the 2019 New York Transmission Owner's Tie-Line Ratings Report[20]. One of the topics for discussion is if the normal and emergency ambient temperature assumptions used to calculate the static season transmission line ratings in NY should be revised. In addition, NYSEG is in the process of installing Ambient Adjusted Ratings (AAR) and Dynamic Line Ratings (DLR) systems. These are discussed in additional depth in the Section 5 of the CCRP.

## 4.3 Business Case Justification Framework

The Business Case Justification framework (BCJ) helps NYSEG estimate the benefits of the resilience projects and programs. The BCJ is scored by three main dimensions: System Reliability, Community Safety, and Community Resilience. After System Reliability, Community Safety, and Community Resilience scores are calculated, the three scores are then used to determine the BCJ score out of 100%. A score closer to 100% indicates that an investment may have a larger impact on communities. Figure 8 provides example summaries for each of these dimensions. The BCJ was only performed for substations with regards to flooding, and for circuits with regards to wind and combined wind-and-ice; in both cases, the BCJ score is intended to be used as an estimate of potential project prioritization.

BCJ scores should be understood as a relative comparison among all assets, not only the assets selected for mitigation projects, within the service territory. Therefore, high-scoring assets can be interpreted as having the potential of a greater benefit relative to lower-scoring assets. The BCJ analysis is rooted in two main values: 1) number of customers and 2) number of critical facilities.

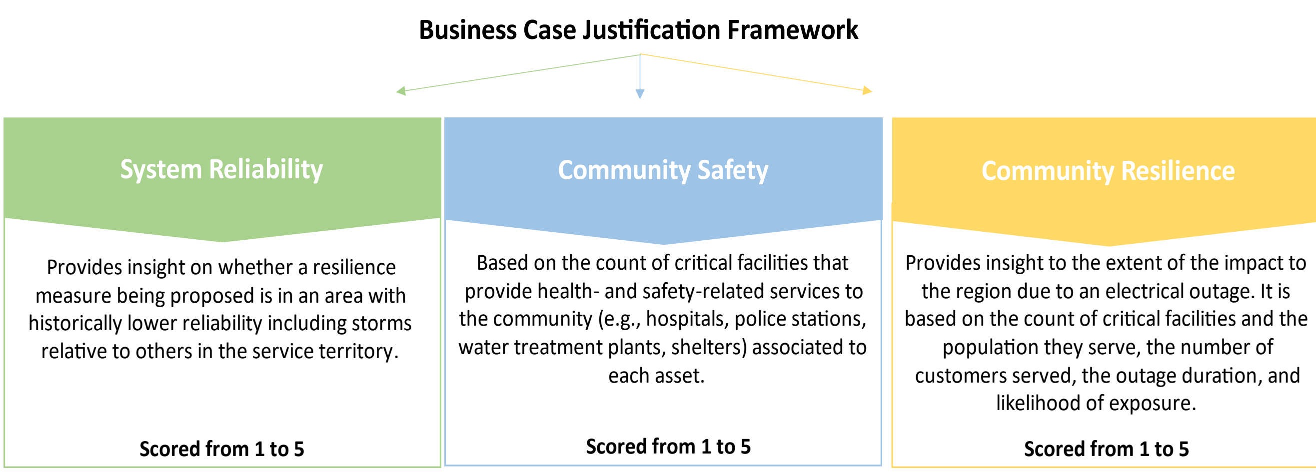



*Figure 8. Business Case Justification Framework Components*

[20] https://www.nyiso.com/documents/20142/1402024/NYTO-2019-Tie-Line-Report-V01-2020-January-9.pdf/7029e9e9-3f76-5355-5646-8b1f18699750

### 4.3.1 System Reliability Score

The reliability score assesses whether a proposed resilience measure is being considered in an area with historically lower reliability, including storms, as compared to other areas in the service territory. This score is composed of the three-year average System Average Interruption Frequency Index (SAIFI) from 2020 to 2022.

The average SAIFI value is used to obtain a quintile score, which becomes the circuit reliability score. The worst performing circuits receive a score of 5, and the best performing circuits receive a score of 1. For substations, the reliability score is assigned from the worst performing circuit associated with it.

### 4.3.2 Community Safety

The Community Safety score characterizes the impact to health and safety services for the community during an outage and is based on the count of Tier 1 and Tier 2 customers associated to each circuit. Tier 1 and 2 customers are facilities deemed critical to the overall health and safety of the community. These facilities include hospitals, emergency responder facilities, water treatment facilities, municipal buildings, buildings designated as evacuation shelters, etc. When calculating the Community Safety score for a substation, the highest quintile of all the associated circuits is rolled up to the substation. A higher quintile indicates that the asset has more influence in community safety, based on the number of critical facilities associated with it.

Community Safety scores for each circuit were ranked from 1 to 5 based on the following criteria:

- 5 = Tier 1 facility count is more than 4 facilities.
- 4 = Tier 1 facility count is between 1 and 4.
- 3 = Tier 2 facility count is more than 3 and Tier 1 facility count is 0.
- 2 = Tier 2 facility count is between 1 and 3 and Tier 1 facility count is 0.
- 1 = Tier 1 and Tier 2 facility count is 0.

### 4.3.3 Community Resilience

The Community Resilience score provides insight into the extent to which daily activities in the community may be impacted due to an electrical outage. It also captures the extent to which a region may be impacted by the loss of power to critical facilities. This score is broken down into two components: Community Activity Loss (CAL) and Avoided Impact to Critical Facilities (AIC). Each component is scored in quintiles, and the average of both is the overall Community Resilience score.

CAL is based on the number of customers associated with an asset and the potential outage duration, specific to the asset sensitivity threshold to a climate hazard exposure. CAL provides a sense of which assets would result in larger disruptions to daily activities for residential and commercial customers. AIC is based on the population in the region served by Tier 1 and 2 critical facilities associated with the asset, as well as its potential outage duration. Each critical facility is assumed to have the potential to serve the population in the region, therefore, AIC informs the asset's level of influence on maintaining health and safety services in the community. For example, even though a hospital represents one customer, it has the potential of serving the entire region in which it is located.

CAL and AIC are multiplied by the likelihood of exposure to a climate hazard before arriving at the quintile scores. Therefore, each represents the duration of impact to customers or population, respectively, and how likely that is to occur. For flooding calculations, the annualized likelihood of recurrence assumed for flooding was 1% (i.e., a 1-in-100-year flood event). For wind and wind-and-ice, historical storm data was analyzed to arrive at the likelihood of impact by region.

In summary, Community Resilience score is based on the following components:

- Community Activity Loss (CAL), which is a product of
    - Estimated outage duration by climate hazard,
    - Number of customers served by the asset, and
    - Likelihood of exposure.
- Avoided Impact to Critical Facilities (AIC), which is a product of
    - Estimated outage duration by climate hazard,
    - Number of critical facilities served by the asset,
    - Regional population potentially served by the critical facility, and
    - Likelihood of exposure.

The final Community Resilience score of an asset is expressed in quintiles. Quintiles were calculated as the average of the CAL and AIC scores, multiplied by projected event likelihood (e.g., 1% annual recurrence probability for a 1-in-100-year flood event). Assets with the highest activity loss and impact to the community (i.e., potential outage of Tier 1 and Tier 2 facilities) receive a quintile score of 5. Assets with the lowest impact receive a quintile score of 1.

# Climate Resilience Measures and Investment Plan

# 5. Climate Resilience Measures and Investment Plan

NYSEG is currently executing several already-approved projects that increase resilience to climate hazards. The analysis in the CCRP focused on utilizing the CCVS's priority vulnerabilities and the associated climate hazard projections to identify areas where incremental resilience measures were appropriate. The following sections discuss each of the priority climate hazards identified in the CCVS and how resilience to each can be increased. The final portion of this section includes a summary of the incremental investment plan composed of new resilience measures identified in the CCRP. Through the following section, NYSEG results may be shown separately in East and West[21] portions of the service area to provide additional granularity due to a diverse array of climate zones; an asset's location in either the East or West grouping was not a factor considered during analysis.

*Table 7. Summary of Priority Vulnerabilities by Asset Family Type*

| Hazard | Transmission | Distribution | Substation |
|---|---|---|---|
| High Temperature | | | ✓ |
| Flooding | | | ✓ |
| Wind | ✓ | ✓ | |
| Wind & Ice | ✓ | ✓ | ✓ |

## 5.1 Extreme Heat

As identified in the CCVS, ambient temperatures are projected to increase throughout New York State in the coming decades. Notably, most assets are projected to experience 2-5 days per year with daily average temperatures above 30°C in 2050, which is a parameter used in NYSEG's existing substation transformer specification. Most assets are not often subjected to temperatures higher than 40°C, which is another important temperature threshold. See the following tables for summary information on temperature projections.

*Table 8. Substations and Days Over 30°C using SSP5-8.5 50th Percentile Projections*

| NYSEG Substations Days over 30°C | 0-2 | 2-5 | 5-10 | 10-15 | 15-30 | 30+ |
|---|---|---|---|---|---|---|
| Baseline (1981–2010) | 471 (100%) | - | - | - | - | - |
| 2030 | 388 (82%) | 83 (18%) | - | - | - | - |
| 2050 | 129 (27%) | 259 (55%) | 50 (11%) | 33 (7%) | - | - |
| 2080 | - | 5 (1%) | 70 (15%) | 55 (12%) | 308 (65%) | 33 (7%) |

[21] The "East" portion of the NYSEG system consisted of the following divisions: Plattsburgh, Ithaca, Brewster, Mechanicville, Liberty, Binghamton, and Oneonta. The "West" portion consisted of Elmira, Lancaster, Lockport, Geneva, Hornell, and Auburn.

*Table 9. Substations and 1-in-10 Year Temperatures using SSP5-8.5 50th Percentile Projections*

| NYSEG Substations 1-in-10 year temps | 35°C-38°C (95°F-100°F) | 38°C-41°C (100°F-105°F) | 41°C-43 °C (105°F-110°F) | 43°C-46° C (110°F-115°F) | > 46°C (> 115°F) |
|---|---|---|---|---|---|
| Baseline (1981–2010) | 369 (78%) | 102 (22%) | - | - | - |
| 2030 | 119 (25%) | 283 (60%) | - | - | - |
| 2050 | - | 319 (68%) | 152 (32%) | - | - |
| 2080 | - | - | 220 (47%) | 251 (53%) | - |

### 5.1.1 Substation Transformers, Regulators, Reactors and Extreme Heat

In the CCVS, extreme temperatures were identified as a priority vulnerability for the following substation equipment: 1) transformers, 2) regulators, 3) reactors, and 4) circuit breakers.

### Transformers, Regulators, and Reactors

Transformers, regulators, and reactors all use similar electrical insulating and thermal design principles: the core and coils are wrapped in mineral-oil impregnated insulating paper with the entire assembly mounted in a sealed tank that is also filled with mineral-oil. The mineral-oil serves two purposes: 1) it is a dielectric and provides electrical insulation between energized and unenergized components and 2) it allows for transfer of heat from the core and coils to the ambient air through the transformer tank and any attached radiators. If the temperature of insulating paper and mineral-oil increases and reaches their design limit, they can begin to break down into various byproducts that over time will reduce their effectiveness; accordingly, the heat generation and dissipation profile of these types of equipment is a fundamental component of their design.

#### Current Designs

NYSEG's substation transformers, regulators, and reactors are currently designed in accordance with IEEE C57.12.00, which specifies that for an air-cooled unit the "…ambient temperature shall not exceed 40°C [104°F], and the average temperature of the cooling air for any 24-hour period shall not exceed 30°C [86°F]." Operating in an environment with ambient temperatures above the design specification will cause the cooling capability of a transformer to be reduced below what was expected during design.

If a transformer, regulator, or reactor is operated in an environment with an ambient temperature above its design specification, its ability to effectively cool will be reduced. During high-load conditions that often occur during times of increased temperature, this decrease in cooling capability will lead to an increased internal temperatures and increased ageing and risk of damage. In addition, there are other factors that are important to consider when evaluating the effects of ambient temperature and high-loading on transformers. For example, a transformer that does not experience its maximum loading capability can periodically be operated above the designed ambient temperatures without significant issue. If a transformer is instead heavily loaded during the period of time where ambient temperatures are greater than the transformer design specification, that transformer could experience increased rate of ageing, but it would be uncommon for those devices to experience an immediate failure.

### 5.1.1.1 Future Considerations for New Transformers, Regulators, and Reactors

**Climate Hazards Addressed:** Extreme Heat
**Resilience Frameworks Utilized:** Strengthen and Withstand, Anticipate and Absorb

Transformers, regulators, and reactors purchased and installed today are expected to remain in service into and beyond 2050. NYSEG SMEs reviewed the climate projections generated in the CCVS and determined that in order to avoid potential damage due to the coincident effects of high loading and increased ambient temperatures, future transformers should be specified so that they are suitable to operate in an environment where the average temperature of the cooling air for any 24-hour period will not exceed 35°C. This resilience measure will allow for equipment designed with this new specification to withstand the projected effects of climate change and operate at full rated capacity under expected future climate conditions.

Substation reactors are specialized equipment that are not widely used. NYSEG does not currently have plans to purchase any reactors in the next five years. Substation regulators are commonly found on the NYSEG system; however, new substations frequently use transformers with load tap changers in lieu of standalone regulators to regulate voltage. Accordingly, the application of a resilience measure to reactors and regulators is not necessary to be included in the CCRP.

### Resilience Measure – New Substation Transformers – Strengthen and Withstand, Advance & Adapt

NYSEG expects that through the first five years of CCRP, it will purchase multiple transformers using the increased ambient temperature specification previously discussed. The specification change to a higher average ambient temperature will make transformers a bit larger and more expensive. Based on feedback from transformer manufacturers, NYSEG estimates that the change in ambient temperature capability will increase the cost of each substation transformer by approximately 3%.

There are currently plans to purchase substation transformers in all years of the CCRP. The CCRP only includes the incremental cost to increase the ambient temperature specification and not the full cost of the new transformer.

### Resilience Benefit of Upgrade Transformer Ambient Temperature Specification

Adoption of this resilience measure is not anticipated to reduce storm restoration costs. It is anticipated that this resilience measure will be effective in reducing the frequency and duration of outages that could potentially occur during the most extreme heat events. As temperatures and air conditioning loads increase there are a variety of strategies that can be used to ensure that the grid and its underlying equipment is operated within its designed parameters. These strategies are not frequently used, but include augmented cooling, demand response, grid reconfiguration, voltage reduction, and as a last resort temporary disconnection of customers. The usage of these strategies is tiered starting with the least disruptive strategy; as conditions improve during an extreme heat event these strategies are rolled back to restore the grid to normal operating conditions.

The proposed increase in the substation transformer ambient temperature specification expands the suitable conditions within which a transformer may operate with its full nameplate capacity without experiencing accelerated aging. Although load shedding during heat events is rare, this increased capability reduces this likelihood of outages related to transformer capacity during extreme heat events even further. This reduction in outage duration during the most extreme heat events is anticipated because the duration for the outage would likely be reduced as the transformer has enhanced capability; and customers could be re-energized sooner compared to transformers with a lower ambient temperature specification. The potential reduction in use of strategies to enhance transformer loadability will depend on a variety of site-specific factors including the degree of overload, success of each subsequent mitigating activities, load-shape, ambient condition, etc. – one scenario analyzed showed that this reduction could be up to 5 hours[22].

### Alternatives Considered

The alternatives that were evaluated in comparison to increasing the transformer ambient temperature specification were use of an ester oil instead of the traditional mineral oil as a dielectric cooling medium or purchasing larger transformers and performing a derating. These alternatives were not expected to be beneficial and were not utilized as they introduced operational complexities where specialized tooling or

[22] Based on 2024 peak day load shape and 5% difference in capability between transformers with and without enhanced temperature specifications.

procedures would be necessary to maintain a transformer fleet utilizing different sets of assumptions (e.g., dissolved gas testing equipment, oil handling/filling, etc.)

### 5-, 10- and 20-year Summary

*Table 10. Transformer Specification Update Summary Table*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (10 Years) | 2036-2045 (20 Years) |
|---|---|---|---|---|---|---|
| Transformer Specification Update | Heat | Substation | Program | $0.9 M | $1.0 M | $3.0 M |

## Existing Transformers, Regulators, and Reactors

For existing transformers, regulators, and reactors that were designed with an expected ambient condition of 30 °C (average) and 40 °C (maximum), the IEEE C57.91 standard has approximate rating reductions that can be utilized to compensate for increased ambient temperatures. Most NYSEG transformers, regulators, or reactors are either self-cooled (i.e., no external fans) or utilize forced-air-cooling (i.e., external fans). If a rating adjustment were made due to increased future temperatures, transformer ratings would be reduced by 1.5% for self-cooled or 1.0% for forced air, respectively, per degree Celsius above the designed ambient condition. Due to the current climate conditions and the relative infrequency with which the NYSEG system is currently subjected to 24-hour average temperatures above 30°C or maximum temperatures above 40°C, these rating correction factors do not currently need to be used. As part of future studies and evaluations, NYSEG will continue to review the factors that can contribute to transformer, regulator, and reactor overheating to determine if changes to planning or operating practices become necessary.

### Existing Substation Transformers – Advance & Adapt

NYSEG's Distribution Load Relief Program conducts system-wide facility analyses on thermally overloaded or nearly overloaded substations to develop mitigation strategies so that transformers do not exceed their ratings as loads change over time.

To complement these load relief analyses, NYSEG performed a risk-based analysis in the CCRP that evaluated the capability of existing substation transformers against an extreme heat event in the year 2050. This evaluation included the magnitude of load served by a transformer, number of customers served, and the impact of extreme temperatures on increasing demand and decreasing transformer capability to determine the potential for customer interruptions. The results are summarized in Table 7 and Table 8.

*Table 11. NYSEG East - Top 5 At-Risk Transformers – 1-in-100 2050 Temperature*

| Substation | Bank | 2050 Projected Peak Temp (°F) | Customers Served | Projected MW Required Above Nameplate | DAC |
|---|---|---|---|---|---|
| Walden | 2 | 110.26 | 4,853 | 6.11 | Yes |
| Neversink | 1 | 110.44 | 999 | 0.69 | Yes |
| Hilldale | 1 | 110.44 | 1,960 | 2.90 | Yes |
| Crafts | 1 | 110.26 | 5,266 | 6.11 | No |
| Sylvan Lake | 1 | 110.26 | 4,986 | 6.00 | Yes |

*Table 12. NYSEG West – Top 5 At-Risk Transformers – 1-in-100 2050 Temperature*

| Substation | Bank | 2050 Projected Peak Temp (°F) | Customers Served | Projected MW Required Above Nameplate | DAC |
|---|---|---|---|---|---|
| Swift St. | 1 | 108.72 | 2,794 | 1.20 | No |

| | | | | | |
|---|---|---|---|---|---|
| Bulkhead | 2 | 111.71 | 4,165 | 3.17 | Yes |
| Whiskey Creek | 1 | 111.71 | 1,634 | 1.27 | No |
| Kane St. | 1 | 111.71 | 1,952 | 1.51 | No |
| Marcellus | 1 | 108.72 | 2,126 | 1.20 | No |

It is expected that the listing of at-risk transformers will change over time due to business-as-usual changes to the electric system including mitigation strategies developed by the load relief program, new customer or generator interconnections, or system reconfigurations, as well as undetermined changes to factors that drive load magnitudes including electrification of transportation and heating. This information is presented in the CCRP for informational purposes only; these assets do not require near-term resilience measures to mitigate the expected climate results in 2050. Accordingly, no Business Case Justifications were developed for these locations. As future CCRPs are completed and the electric system evolves, this type of information will continue to be reviewed and updated.

### Extreme Heat Transformer Sensitivity Analysis

Utilities often utilize a probabilistic approach to forecast customer demand and then accompanying simulations to identify where upgrades to the system may be necessary to meet future needs. NYSEG, among many other utilities, has established that a peak load condition corresponding to a 1-in-10-year probability of occurrence is appropriate for designing much of the electric system[23]. In addition to this routine 1-in-10-year analysis, sensitivity testing, where certain assumptions (e.g., ambient temperatures, customer demand, etc.) are amplified to stress the system, can be an important tool to help understand the strengths and/or weaknesses of the electric system. However, as the conditions used in sensitivity testing are generally above-and-beyond the system design criteria they are not intended to identify deficiencies that require mitigation; instead, sensitivity testing is used to help determine if there some underlying and/or widespread system weaknesses not identified during routine testing.

In the CCVS Substation transformers and extreme heat events were identified as a priority vulnerability. To enhance the current-day analysis of this vulnerability NYSEG performed an extreme heat sensitivity analysis on its existing fleet of distribution substation transformers. This sensitivity analysis explored the potential impacts from an extreme heat event by increasing expected peak load along with reducing transformer ratings due to extremely high ambient temperatures.

A maximum temperature of 103°F and an average temperature of nearly 92°F was selected for this extreme event sensitivity analysis.[24] To represent the effects of ambient temperature on reducing effective transformer cooling, a 3% transformer continuous nameplate rating reduction was used (based on a 1% rating reduction per degree Celsius over daily average temperature.) To represent the potential increase in demand due to additional air-conditioning usage, the peak load utilized was 105% of the summer peak for each NYSEG distribution substation transformer[25]. The combination of a simulated increase in customer demand and derated transformer capability caused by an extreme heat event matching this sensitivity analysis, without application of the potential operational mitigation techniques, could cause six NYSEG transformers to experience more than 2 hours of accelerated aging per event occurrence.[26] This evaluation did not consider potential load reductions from use of demand response, grid reconfiguration, voltage reduction or load shedding.

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[23] A 1-in-10-year event has a 10% chance of occurring per year.
[24] 103°F based on hottest day recorded in Binghamton, NY (July 9, 1936)
[25] Increase derived from load forecast differences from a 1-in-10 year and 1-in-100-year forecast difference of 5%.
[26] IEEE C57.91-2011 Annex I example calculations show that when a transformer experiences a peak of 120% of its nameplate rating it could experience a total loss of life of approximately 1.86 hours per occurrence.

This analysis was intended to explore the magnitude of potential impacts to distribution transformers from an extreme heat event beyond the criteria used to design the electric system and was not intended to be predictive. The results of this sensitivity analysis did not identify an underlying or widespread weakness with NYSEG's distribution transformers during the simulated extreme heat event. Finally, if this type of extreme event were to occur it is reasonable to expect there to be emergent challenges that occur due to conditions not explicitly included in this sensitivity analysis (e.g., unexpected equipment failure.)

### 5.1.2 Circuit Breakers and Extreme Heat

In comparison to transformers, regulators, and reactors, circuit breakers have a relatively straightforward thermal design. NYSEG circuit breakers are designed in accordance with IEEE C37.04, which specifies that normal service conditions for outdoor circuit breakers are where "…ambient air temperature does not exceed 40°C and its average value, measured over a period of 24 hours, does not exceed 35°C." Like transformers, regulators, and reactors, circuit breakers generate heat through resistive losses that are exponentially proportional to loading. Circuit breakers can be designed with low resistive losses and generate less heat during operation so external cooling is not often required.

**Future Considerations for Existing and New Circuit Breakers**

Circuit breakers that are heavily loaded at ambient temperatures exceeding their design parameters have an increased risk of failure or damage to circuit breaker insulation, internal contacts, or other components. Outdoor circuit breakers purchased and installed today are expected to remain in service into and beyond 2050s.

Due to the relative infrequency with which the NYSEG system is and will be subjected to 24-hour average temperatures above 35°C or maximum temperatures above 40°C through the year 2050, NYSEG SMEs have determined that the ambient temperature specifications used for new circuit breakers remain suitable. Circuit breakers that do not frequently carry their maximum rated current can periodically experience ambient temperatures above their design specifications without incurring significant damage or outright failure. NYSEG distribution circuit breakers have a rated maximum current that is greater than the other downstream circuit components. As non-circuit breaker components of a circuit determine the capacity limit it would be unlikely for a distribution circuit breaker to be loaded to its maximum capacity while coincidently experiencing extreme temperatures above the design specifications. As part of future studies and evaluations, NYSEG will continue to review temperature and load projections to determine when specification changes are necessary.

### 5.1.3 Transmission Lines and Extreme Heat

Extreme heat and transmission lines were not identified as a priority vulnerability; however, NYSEG is currently in the process of deploying new technology that will actively account for the impact of ambient temperature during real-time operation of transmission lines. The following information is listed in the CCRP for informational purposes only. The CCRP is not requesting additional funding for this initiative.

### Advanced Technologies - Ambient Adjusted and Dynamic Line Ratings – Advance and Adapt

Historically, transmission line ratings have been calculated for normal and emergency scenarios using environmental assumptions, like ambient temperatures, which are different for the summer and winter seasons. These ratings were static and did not vary based on real-time environmental conditions. For example, the 2019 New York Transmission Owner's Tie-Line Ratings Report[27] specifies that the maximum and average temperatures for transmission facility rating calculations in the summer season should be 35°C (95°F) and 30°C (86°F) respectively.

[27] NYISO: https://www.nyiso.com/documents/20142/1402024/NYTO-2019-Tie-Line-Report-V01-2020-January-9.pdf/7029e9e9-3f76-5355-5646-8b1f18699750

### Ambient Adjusted Ratings

If actual experienced ambient temperatures are different than the assumed values used when calculating facility ratings, transmission lines may have more or less capacity than represented by the static rating. FERC Order 881[28] "Managing Transmission Line Ratings" will require the use of Ambient Adjusted Ratings (AAR) on transmission lines. AARs are continuously updated in pseudo real-time based on the ambient temperature measured at a location that may not be immediately adjacent to the transmission line. This allows for asset design parameters, particularly conductor maximum operating temperature, to be followed regardless of the ambient temperature. As part of implementing FERC Order 881, NYSEG will be implementing AARs on its bulk electric system lines.

### Dynamic Line Ratings

Dynamic line ratings (DLR) are similar to AAR in that they utilize local conditions to determine a transmission line's rating in real-time. However, DLRs go one step further and incorporate location specific equipment and measurements to perform a more detailed rating calculation for the most critical transmission lines. The additional equipment that is utilized may include anemometer, windvane, sun intensity sensor, Light Detection and Ranging (LiDAR), or other pieces of equipment depending upon the particular implementation that is utilized.

### Example Benefits

When conditions are more favorable than expected the usage of these methods and technologies allow for a wider capability of transmission infrastructure to be utilized; when conditions are less favorable they offer enhanced protection against lines sagging into the area underlying the transmission right-of-way.

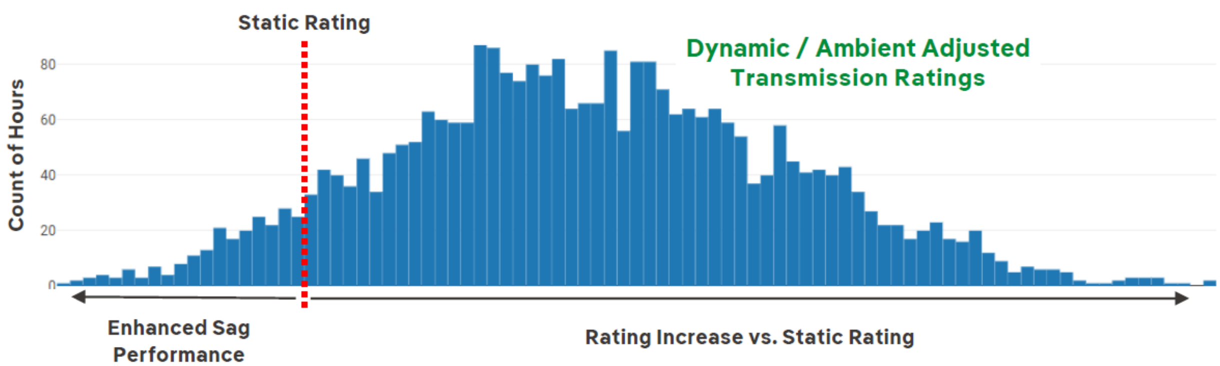


*Figure 9. Example Effects of Ambient/Dynamic Rating Technology*

## 5.2 Flooding

Statewide floodplains, generated by the First Street Foundation (FSF), were leveraged for the flooding analysis in the CCVS and the CCRP. The results show inundation depths for 100- and 500-year storm events in present-day and projected flooding to 30 years in the future (representing the 2050 planning scenario). Return periods of 100-, and 500-years indicate an annual occurrence probability of 1% and 0.2% per year, respectively. Substation evaluations to determine exposure were done against 100-year flood depth.

### 5.2.1 Substations and Flooding

Prior to the initiation of CCVS and CCRP, NYSEG developed substation review criteria that identifies flood exposure critical substation equipment (e.g., breaker control cabinets and control house) that are below the 100-year floodplain as needs that must be addressed. Recent usage of this review requirement has helped identify the required scope for the four projects discussed in the following section. In addition to the review

[28] FERC: https://www.federalregister.gov/documents/2022/05/25/2022-11233/managing-transmission-line-ratings

of these criteria, NYSEG has recently updated its minimum design elevation for critical substation equipment. Previously NYSEG substation design criteria for new equipment defined that the minimum elevation of critical equipment be at the FEMA 100-year flood elevation plus an additional 2 feet; however, this was revised to add an additional 1 foot (final elevation of FEMA 100-year +3 feet) to mitigate future projected flood events.

### Ongoing Substation Flood Mitigation Projects

NYSEG has multiple ongoing projects that directly address vulnerabilities to substation flooding along with other existing needs like asset condition or ability to increase generation capacity. These projects are being described in the CCRP to provide a fuller account of the resilience measures currently being deployed by NYSEG on its system. The CCRP does not include any additional funding requests or corresponding rate impacts for these four ongoing projects.

*Table 13. Ongoing Flood Mitigation Projects*

| Substation | FEMA Data | Vulnerability | DAC |
|---|---|---|---|
| Goudey | FEMA 100-year | Equipment/Access | Yes |
| Hickling | FEMA 100-year | Access | No |
| Lounsberry | FEMA 100-year | Equipment/Access | Yes |
| Montour Falls | FEMA 100-year | Equipment/Access | No |

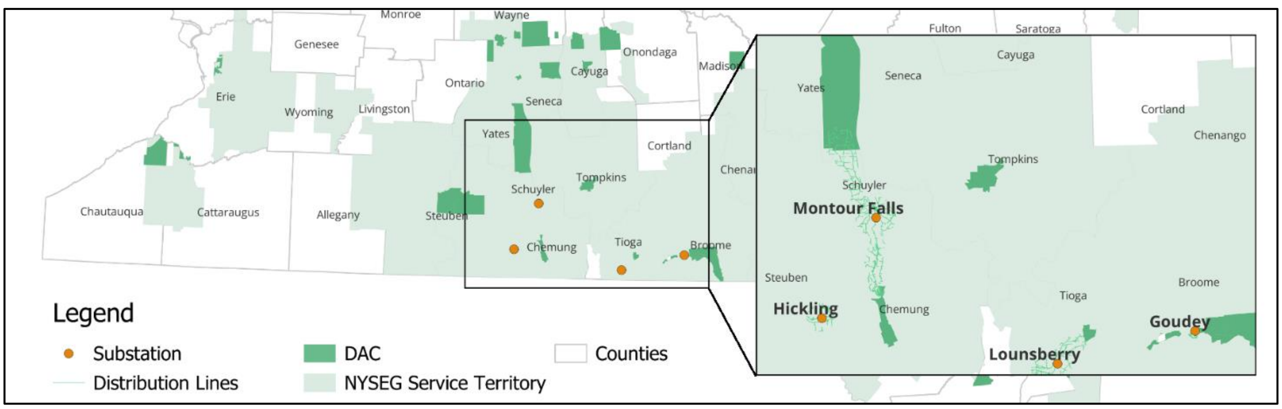


*Figure 10. NYSEG Ongoing Flood Mitigation Projects*

## Goudey Substation Rebuild – Flooding - Advance & Adapt

As part of the Climate Leadership and Community Protection Act (CLCPA) Phase 1, NYSEG identified that there were significant needs in the Binghamton area of its system[29]. Through NYSEG's analysis, it was identified that the existing Goudey Substation had significant flood risk concerns (i.e., the entire yard including all voltage levels (115/34/12.5 kV) reside within the FEMA 100-year flood zone and have a history of severe flooding).

CLCPA Phase 1 determined that rebuilding Goudey outside of the floodplain was the most practical solution. This solution addressed the asset condition and flooding issues present at Goudey within the same project.

## Lounsberry Substation Rebuild – Flooding - Advance & Adapt

Lounsberry' s 115 & 12.5 kV yard is located just outside the FEMA floodway and the entire yard is located within the FEMA 100-year flood zone. Lounsberry experienced a significant flooding event in 2011 where the water level rose to 11 feet which inundated all substation equipment requiring it to be removed from service.

[29] Similar system performance violations were also identified as a BES Project in previous study work performed by NYSEG.

As part of CLCPA Phase 1, it was determined that rebuilding Lounsberry Substation outside of the floodplain and upgrading the other equipment would be most appropriate. The current project at Lounsberry includes a full rebuild of the substation outside of the floodplain which includes installation of new 115 kV and 12.5 kV circuit breakers, a 22.4 MVA transformer, and modern protection and control equipment.

### Montour Falls Substation Rebuild (Elmira) – Flooding - Advance & Adapt

As part of CLCPA Phase 2, NYSEG identified that Montour Falls had asset condition needs, was exposed to severe flooding, and if upgraded, could allow for additional generation to be connected in the area.

A multi-value solution was identified to rebuild the Montour Falls substation outside of the floodplain which resolved each of the identified needs with a single project.

### Hickling Substation Rebuild (Elmira) – Flooding - Advance & Adapt

Similar to Montour Falls, as part of CLCPA Phase 2, NYSEG identified that Hickling Substation had asset condition needs, was isolated in the event of severe flooding, and if upgraded, could allow for additional generation to be connected in the area.

A multi-value solution was identified to rebuild the Hickling substation outside of the floodplain which resolved each of the identified needs with a single project.

#### Identification of Additional At-Risk Locations

Substation evaluations to determine exposure of equipment to floodwaters were done against the 100-year flood depth. As noted in the CCVS, substation 100-year return period flood depths increased by, on average, 2 inches between the current-day baseline 100-year flood depth and 2050 100-year flood depth.

In the analysis the Study Team leveraged the 100-year return period flood depths from the FSF and GIS overlays of substation locations to assess the flooding impact to NYSEG substations.


*Figure 11. Satellite Flood Overlay*

First, a screening was performed to identify which substations were at risk of significant outages due to flooding. The focus was on identifying which facilities, if exposed to damaging floodwaters, would have a larger impact relative to other stations due to the number of customers served, impact to the transmission system, or have the potential for an extended path to restoration. In addition, a visual inspection of flooding data and substation equipment was performed to identify sites that did not have exposure to widespread flooding. If significant flooding was not widespread inside of a substation location, it was removed from further consideration.

There were no additional substations identified in this analysis that would be expected to have a significant impact on the transmission system and affect a wide area like Goudey, Hickling, Lounsberry, and Montour Falls. The stations that were identified are listed in Table 14 and are sub-transmission or distribution substations that are predominantly involved in directly serving customer load. The following table lists sites that have been identified as important locations for future flood mitigation.

*Table 14. CCRP Flooded Substations.*

| Substation | FSF 100-year Floodplain | FEMA Data | Approximate Customers | DAC |
|---|---|---|---|---|
| Deposit | Yes | Not Available | 1,900 | No |
| Fourth St. | Yes | Between 100/500 Floodplain | 3,500 | Yes |
| Hammondsport | Yes | FEMA 100-year Floodplain | 2,200 | Yes |
| Vestal | Yes | FEMA 100-year Floodplain | 2,700 | No |

## Business Case Justification

Using the Business Case Justification framework detailed in previous sections, each of the priority substations were scored based on their impact to System Reliability, Community Safety, and Community Resilience. As a reminder, a higher score indicates a more impactful substation in each category.

*Table 15. Flooding Business Case Justification Scores*

| Substation | System Reliability | Community Safety | Community Resilience | Final BCJ Score | DAC |
|---|---|---|---|---|---|
| Deposit | 4.5 | 4 | 5 | 90% | No |
| Fourth St. | 4 | 5 | 4 | 93% | Yes |
| Hammondsport | 5 | 5 | 5 | 100% | Yes |
| Vestal | 4 | 2 | 5 | 73% | No |

## Resilience Measure Options

There are three common resilience measures to mitigate against flood damage in substations, each of these measures can meet different resilience objectives:

1. Rebuild a substation away from the floodplain (Advance and Adapt)
2. Raise affected equipment out of damaging waters (Anticipate and Absorb)
3. Install floodwalls or flood barriers (Strengthen and Withstand)

Each of these potential resilience measures has trade-offs between categories that can include feasibility, cost, or other ancillary benefits (e.g., mitigation of asset condition issues). For solution evaluation, NYSEG utilized the following qualitative scoring categories:

- **Asset Improvement:** Scored based on the extent to which a resilience measure may result in improving asset condition, capacity, or redundancy.
- **Flexibility:** Scored based on the extent to which the resilience measure can be augmented as needed over time.
- **Hazards Addressed:** Scored based on the number of climate hazards that the resilience measure reduces the risk to.
- **Passive or Active**: Scored based on the level of interaction required to active the resilience measure.
- **Cost**: Scored based on the approximate order of magnitude of costs to construct a measure.

**Deposit Street Substation (46 kV / 4.8 kV)**

*Table 16. Deposit Street Substation Evaluation*

| Measure | Asset Improvement | Flexibility | Hazards Addressed | Passive or Active | Cost | Total Score |
|---|---|---|---|---|---|---|
| Rebuild | 5 | 3 | 5 | 5 | 1 | 76 |
| Floodwall | 1 | 3 | 3 | 3 | 5 | 60 |
| Elevate | - | - | - | - | - | - |

Deposit St. Substation in Deposit, NY, serves approximately 3,000 customers through a total of three distribution circuits. The transformers are in “very good” to “fair” condition, and the circuit breakers are in “fair” or “poor” condition. There are overhead space constraints that prevent the raising of existing equipment above critical elevations, from being feasible. Construction of a floodwall to protect the site is feasible, but it would greatly limit future expansion at the site to accommodate new or additional equipment.

### Fourth Street Substation (34.5 kV / 8.3 kV)

*Table 17. Fourth Street Substation Evaluation*

| Measure | Asset Improvement | Flexibility | Hazards Addressed | Passive or Active | Cost | Total Score |
|---|---|---|---|---|---|---|
| Rebuild | 5 | 3 | 5 | 5 | 1 | 76 |
| Floodwall | 1 | 3 | 3 | 3 | 5 | 60 |
| Elevate | - | - | - | - | - | - |

Fourth St. Substation in Ithaca, NY serves approximately 3,500 customers in DAC(s) through a total of five distribution circuits. The transformers are in "fair" condition, and the circuit breakers there are in "poor" condition. There are overhead space constraints that prevent the raising of existing equipment above critical elevations from being feasible. Due to the age of the substation, its existing asset condition issues, and location in a floodplain, a rebuild of the Fourth St. Substation is the preferred solution. There is an ongoing evaluation of flood risks in Ithaca being performed by the city that may affect this measure. NYSEG will continue to monitor and coordinate with those stakeholders.

### Hammondsport Substation (34.5 kV / 4.8 kV & 12 kV)

*Table 18. Hammondsport Substation Evaluation*

| Measure | Asset Improvement | Flexibility | Hazards Addressed | Passive or Active | Cost | Total Score |
|---|---|---|---|---|---|---|
| Rebuild | 5 | 3 | 5 | 5 | 1 | 76 |
| Floodwall | 1 | 3 | 3 | 3 | 5 | 60 |
| Elevate | - | - | - | - | - | - |

Hammondsport Substation in Elmira, NY was originally built in the early 1970's. There are approximately 2,200 customers fed from this substation through three distribution circuits. The equipment at Hammondsport is in "fair" or "poor" condition. There are overhead space constraints that prevent the raising of existing equipment above critical elevations from being feasible. Due to the age of the substation, its existing asset condition issues, and location in a floodplain, a rebuild of the Hammondsport Substation is the preferred solution.

### Vestal Substation (34.5 kV / 4.8 kV & 12.5 kV)

*Table 19. Vestal Substation Evaluation*

| Measure | Asset Improvement | Flexibility | Hazards Addressed | Passive or Active | Cost | Total Score |
|---|---|---|---|---|---|---|
| Rebuild | 4 | 3 | 5 | 5 | 1 | 72 |
| Floodwall | 1 | 3 | 3 | 3 | 5 | 60 |
| Elevate | - | - | - | - | - | - |

Vestal substation in Vestal, NY, serves approximately 2,700 customers, and has been identified as being at risk of significant flooding. The substation is a 34.5 kV to 4.8 and 12.5 kV distribution substation with limited overhead clearances that limit equipment elevation modifications. Vestal has moderate asset condition issues and limited 34.5 kV fault protection and isolation. Due to the age of the substation, its existing equipment condition, and location in a floodplain, a rebuild of the Vestal Substation outside of the floodplain is the preferred conceptual solution.

## Resilience Benefit of Substation Flood Mitigation

Substation electrical equipment is highly sensitive to flooding. The flood depths and extents, complexity of and level of damage suffered by equipment, as well as the ability for crews to access the substations have a significant impact on the likelihood of outage, duration of outages, and the storm restoration costs incurred. Using a historical example experienced during Tropical Storm Lee[30] in 2011, a significant flood event caused a substation in Vestal, NY to be de-energized for approximately three days. The three-day duration included the time for floodwaters to recede, damage to be assessed, and equipment mobilized to repair and re-energize the substation and its customers. In addition to an estimated three-day outage, flooding would likely require additional repairs to be completed once emergency restoration activities were completed. For more minor flooding events that cause less damage, outage durations would likely be shorter, potentially ranging from a few hours to 1-2 days depending on the level of repairs necessary.

The substation flood mitigation proposals included in this CCRP utilize solutions that would completely protect or remove facilities from being exposed to the expected 1-in-100-year[31] return period flood events. These proposals would prevent flood damage, directly decreasing the cost of storm restoration activities, and reducing the number and duration of customer outages for 1-in-100-year flood events.

### 5.2.1.1 Substation Flood Mitigation

**Climate Hazards Addressed**: Flooding
**Resilience Frameworks Utilized:** Strengthen and Withstand, Anticipate and Absorb

In locations where there may be multiple underlying needs at a substation (asset condition, capacity, modernization, etc.) NYSEG believes that following an approach to flood mitigation that identifies multiple benefit streams at the sites exposed to flooding is the most efficient manner in which to mitigate vulnerability to flooding. A review of asset condition information and site analysis at the identified locations found that at most 30% of their transformers or circuit breakers were classified in "poor" health; however, many were classified as "fair". The implementation order of flood mitigation resilience measures will be determined throughout the CCRP timeframe with a focus on performing efficient, multi-value projects that can address reliability, resiliency, asset condition, modernization, or capacity needs that currently exist, or may arise in the future. It is anticipated that based on other emergent needs across the system, flood mitigation efforts may take place at other locations in addition to the identified sites.

#### 5-, 10- and 20-year Summary

High level representative cost estimates for conceptual solutions at the identified locations in the 10- and 20-year timeframes were developed and estimated at approximately $15 M in 2023 dollars with future costs impacted by an annual escalation of 3%. Each of these prospective solutions will undergo complete solution alternative and engineering analysis prior to being selected and implemented.

*Table 20. Substation Flood Mitigation Summary Table*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (10 Years) | 2036-2045 (20 Years) |
|---|---|---|---|---|---|---|
| Substation Flood Mitigation | Flooding | Substation | Program | - | $38.0 M | $48.0 M |

[30] USGS reports show that the streamgage discharge along the Susquehanna River at Vestal, NY slightly above the expected 1-in-100-year event: https://pubs.usgs.gov/sir/2014/5058/pdf/sir2014-5058.pdf; Figure 55
[31] A 1-in-100-year return period event has a 1% chance of occurring each year; over the course of 40 years a 1-in-100-year event has an approximately 33% chance of occurring. See https://www.weather.gov/epz/wxcalc_floodperiod for the calculation method.

## 5.3 Extreme Wind / Wind-and-Ice

As noted previously, the focus of the CCRP was to develop solutions to asset deficiencies identified through the evaluation of the priority vulnerabilities and the associated climate hazard projections.

#### Wind Gusts

The CCVS generated quantitative projections for future wind-gust speeds and discussed qualitative projections for future wind-speed intensities. Qualitative projections indicated that extreme wind speeds and gusts are projected to increase in both frequency and intensity by mid- through late century based on available peer-reviewed research on these infrequent but highly impactful events (Thrasher, 2022). These qualitative sources were unable to quantify increases to peak wind gusts for evaluation against current design standards. The quantitative projections that NYSEG performed in the CCVS showed minimal changes in peak wind gusts at the measured locations throughout New York State.

#### Wind-and-Ice

Quantitative projections for the influence of climate change on ice and simultaneous windstorms remain uncertain due to the specific atmospheric conditions required for ice storms to occur (Intergovernmental Panel on Climate Change (IPCC), 2021). However, there has been qualitative analysis that shows that the overall frequency of ice storms is projected to decrease in the service areas as temperatures increase, but that the intensity of these events could increase (Zarzycki, 2018).

### 5.3.1 Transmission Assets and Extreme Wind / Wind-and-Ice

NYSEG's transmission lines and substation structures are designed to meet or exceed the applicable structural loading criteria specified in the most recent version of the NESC (include requirements for extreme wind, a combination of wind and ice loading, and heavy-ice conditions).

The CCVS did not quantify any changes to wind or wind-and-ice events in the NYSEG service area that require any changes to its transmission design and construction practices; accordingly, the CCRP is not proposing any additional transmission line rebuilds or upgrade projects. Due to the expected continuation of extreme climate weather events the CCRP does include discussion and examples of the processes, projects, and programs that the Company is currently doing to identify transmission lines deficiencies and deploy solutions via targeted repairs or line rebuilds. The practice of performing transmission line upgrades/rebuilds, typically funded through the traditional rate-making process, will build resilience to the identified effects of climate change. It is crucial to note that the significant forecasted load growth in New York is nearly certain to require rebuilding of some transmission lines to support this growth; however, the exact location and timing of these needs depends on a multitude of factors. These future needs to support load growth, along with the asset-condition, reliability, and resiliency-based needs has made the development of multi-value projects a core practice of efficiently planning the future electric system. Forecasting where and when these needs arise is a core component of the company's planning processes.

The following section discusses on-going projects funded either through normal rate case proceedings or special orders from the Public Service Commission. They are included in this CCRP to showcase the multi-value projects being developed by NYSEG to simultaneously enhance the reliability, resiliency, and capacity of its electric system. In the future as additional needs are identified through studies of the transmission system, these types of projects will be proposed to generate multiple benefit streams.

### Ongoing Transmission Line Projects

NYSEG has multiple ongoing projects that directly address transmission vulnerabilities to wind, and wind-and-ice. As the NESC code is revised from time to time, existing transmission structures designed to previous versions of the NESC are not required to be brought up to the requirements of the latest version. Accordingly, replacing aging transmission infrastructure with modern designs increases their resilience to the priority climate hazards. The following selection of projects are being described in the CCRP to provide a fuller account of the resilience measures currently being used by NYSEG on its system. The CCRP does not include any additional funding requests or rate impacts for these projects.

## Resilience Benefit of Rebuilt Transmission Lines

Generally, new transmission line designs incorporate stronger conductors, steel poles, taller construction, and modern design techniques that significantly enhance resilience to extreme weather conditions. Stronger conductors are less prone to sagging and breaking under heavy loads, such as ice or wind, steel poles offer superior durability compared to traditional wooden poles, reducing the likelihood of structural failure. Taller structures elevate the energized conductors above potential hazards like falling trees and flying debris reducing the risk of damage and outage. These modern designs also include updated engineering and stricter design requirements that require the design of newly built transmission lines to withstand a wider range of severe weather impacts, helping maintain the integrity of the grid. Rebuilt transmission lines also enhance the powerflow capability of the transmission system enhancing its performance during extreme heat events, and its ability to support the additional load and/or generation that is expected to be connected throughout the 21$^{st}$ century.

These improvements enhance the physical resilience of the transmission lines that directly contribute to reducing storm restoration costs, outage frequency, and outage duration. These more robust designs help prevent damage, reducing the need for repairs and/or replacements which results in lower outage frequency and lower storm restoration costs. When damage and outages do occur, modern designs can reduce the scope of repairs facilitating quicker repairs, shortening the duration of power interruptions. For example, during an extreme weather event tree impacts to a transmission line could cause damage that required a structure to be replaced. Modern designs with higher strength requirements reduce the likelihood of a similar tree impact causing a structure to fail which can reduce storm restoration costs and outage duration. Consequently, these modern transmission line designs play a crucial role in maintaining a reliable and resilient power supply, even in the face of extreme weather events.

## CLCPA Phases 1 and 2 – Wind/Wind-and-Ice – Strengthen and Withstand

NYSEG has 22 ongoing +115 kV transmission line rebuild projects being done through the CLCPA Phase 1 and Phase 2. These projects will increase the resilience of the transmission system to climate hazards by utilizing modern designs such as new conductors, steel poles, and will be engineered in accordance with the most current structural design requirements. These measures will help to boost system resilience and better prepare these facilities in the face of the challenges posed by extreme climate events and identified in the CCVS in the Transmission and Wind and Transmission and Wind-and-Ice priority vulnerabilities.

*Table 21. CLCPA Phase 1 and 2 Transmission Line Rebuild Projects*

**CLCPA Phase 1**

| Line Number | Voltage | Miles | DAC |
|---|---|---|---|
| 982 | 115 kV | 21 | |
| 946 | 115 kV | 20 | |
| 949 | 115 kV | 25 | |
| 962 | 115 kV | 35 | |
| 961 | 115 kV | 18 | |

**CLCPA Phase 2**

| Line Number | Voltage | Miles | DAC |
|---|---|---|---|
| 68 | 230 kV | 24 | |
| 69 | 230 kV | 1 | |
| 72 | 230 kV | 27 | |
| 723 | 115 kV | 15 | |
| 953 | 115 kV | 5 | |
| 965 | 115 kV | 22 | |
| 711 | 115 kV | 3 | |
| 712 | 115 kV | 6 | |
| 935 | 115 kV | 9 | |
| 722 | 115 kV | 23 | |
| 724 | 115 kV | 15 | |
| 968 | 115 kV | 5 | |
| 978 | 115 kV | 16 | |
| 963 | 115 kV | 16 | |
| 67 | 230 kV | 11 | |
| 906 | 115 kV | 30 | |
| 934 | 115 kV | 19 | |

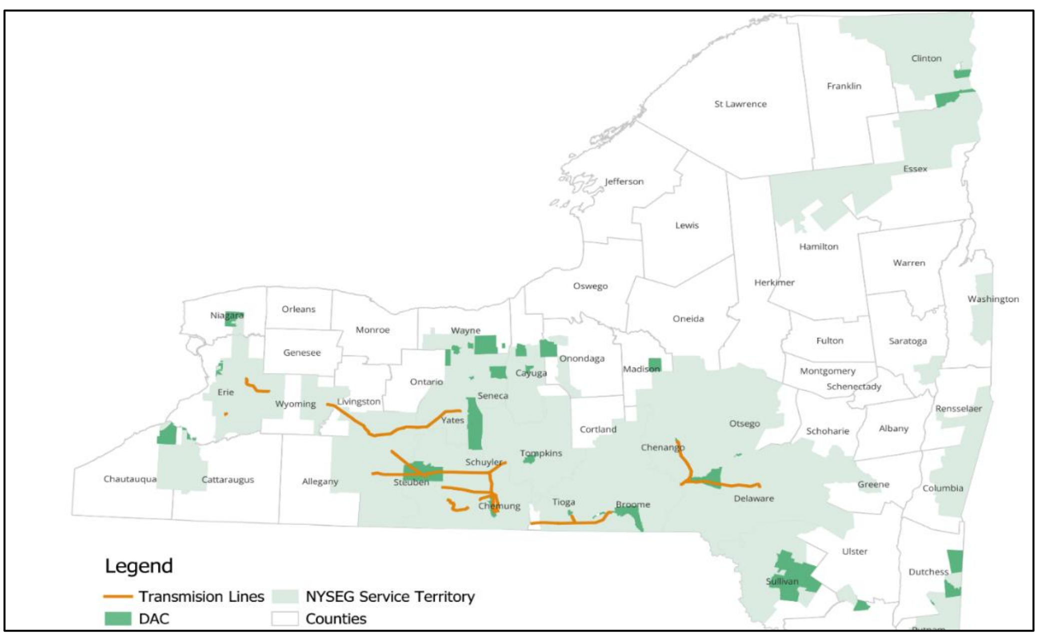


*Figure 12. NYSEG's CLCPA Transmission Line Rebuilds*

## 5.3.2 Distribution Assets and Extreme Wind / Wind-and-Ice

As identified in the CCVS, distribution circuits are vulnerable to extreme wind, and extreme wind-and-ice events as their effects can directly damage these assets or cause secondary impacts due to the hazard's effect on nearby vegetation.

NYSEG distribution construction standards meet or exceed the 2023 updates to the NESC. The CCVS did not quantify significant changes to the severity of wind or wind-and-ice events in the NYSEG service area that could be used to modify distribution construction specifications and designs. However, the expected continuation of extreme weather events, their impact to NYSEG assets, and the effects on customers caused by the wind and wind-and-ice climate hazards underscore the importance of continuing to build resilience to these effects.

### 5.3.2.1 Distribution Resiliency Plan

**Climate Hazards Addressed**: Wind/Wind-and-Ice
**Resilience Frameworks Utilized:** Strengthen and Withstand, Anticipate and Absorb

In response to severe storm events experienced throughout its service area, NYSEG has developed a distribution resiliency guide, for assets up to 35 kV, which specifies changes to construction practices aimed at increasing the reliability and resiliency of its distribution circuits to prepare for impacts caused by future storm events. The resiliency guide includes the following:

- Designing to meet or exceed the 2017 NESC, including Rule 250B Heavy Loading criteria (40 mph wind and 0.5 inches of radial ice).[32]
- Restricting pole classes to Class[33] 1, 2, or 3 and defining when each pole class should be used.
- Defining when tree wire should be used to reduce impacts from momentary contact with nearby vegetation.

This distribution resiliency guide is used to establish design standards that inform annual NYSEG Distribution Resiliency Plans; this plan focuses on increasing the storm-hardening of distribution circuits and reducing restoration costs, and customer outage times.

Three main focuses of the Distribution Resiliency Plan are:

1. **Infrastructure Hardening:** Hardening of the distribution circuits through conductor replacement, replacement of defective poles, and selective undergrounding.
2. **Topology with Automation:** Upgrades made to improve the ability to restore customers quickly for temporary faults, or to reconfigure circuits in case of permanent faults.
3. **Enhanced Vegetation Management**: select application of "ground-to-sky" clearance when performing vegetation management.

**Infrastructure Hardening**

**Stronger, Contact-Resistant Conductor**

The NYSEG overhead distribution systems have been built over decades with multiple sizes and designs of conductors. Most of these overhead conductors are bare (uninsulated). Some are smaller than NYSEG's most current standards or are made of material that is less resistant to physical damage or breakage from tree contact. For new construction, NYSEG's Distribution Resiliency Guide specifies that bare aluminum wire will be used in areas where tree encroachment is not possible. Tree wire will be used in areas where tree encroachment is likely. Tree wire is an aluminum conductor covered with multiple layers of material that

[32] The current version of the resiliency guide identifies the 2017 NESC but internal SMEs confirmed that the designs also meet or exceed the 2023 NESC.
[33] Pole class refers to the horizontal loading capability of a pole with lower numbers indicating stronger poles.

provides electrical insulation and physical protection from incidental tree contact. Tree wire has been shown to reduce electrical faults from tree contact dramatically. When used in spacer cable configurations, overhead distribution lines can withstand impacts from larger branches.

**Replacement of Failure-Prone Poles**

Experience has shown that stronger, higher-class poles are significantly less prone to failure from storm damage. NYSEG's Distribution Resiliency Guide specifies that only Class 1, 2, or 3 poles will be used for new construction. The purpose of this specification is to improve the resiliency of distribution systems during storm and severe weather events. This Resiliency Plan calls for replacing defective poles, as identified by the Distribution Line Inspection Program, on circuits selected for resiliency work to ensure all known asset condition needs are mitigated on an identified circuit.

### Topology Updates with Automation

A distribution system topology describes the configuration of infrastructure that comprises the distribution system. Most of the distribution systems within NYSEG's territory consist of radial circuits. These circuits are characterized by a design in which power is received at a substation from the transmission system and distributed to customers via three-phase or single-phase lines. In NYSEG's service territory, long circuits often serve multiple communities, and therefore, are exposed to many miles of trees along their rights-of-way. An interruption caused by a single tree can affect numerous homes, businesses, and public safety infrastructure, creating a critical resiliency challenge. This circumstance is exacerbated during major storms when there are multiple sites of damage along a circuit path.

**Circuit Ties**

If feasible, Distribution Resiliency Plans look to propose adding circuit ties for most projects. A circuit tie creates an alternate power source by connecting to an adjacent circuit served by a different substation. If the power from the primary source is lost due to an upstream outage, the circuit tie can be closed to re-route power from the alternate source. Adding automated switching makes it possible to quickly transfer customers from the primary source to the alternate source so that the interruption customers experience is momentary in nature.

**Distribution Reclosers and SCADA Switches**

Reclosers and switches are electrical devices that allow utilities to connect and disconnect portions of a distribution circuit to an upstream power source. Strategically placed reclosers and switches can help isolate faulted parts of a distribution circuit and reduce the number of customers that lose power when a fault occurs. NYSEG can automate reclosers and switches to enable remote or coordinated control by sophisticated automatic switching schemes. Fault Location, Isolation, and Service Restoration (FLISR) is an available distribution automation application that uses reclosers and switches to automatically reconfigure one or more distribution circuits to isolate faulted portions of a distribution circuit and keep power flowing to as many customers as possible.

**Distribution Reclosers**

Reclosers have relays that can detect the excessive electric current associated with a short circuit (fault) caused by tree contact, animal contact, or other abnormal condition. Upon detection of a fault, the recloser can open to safely interrupt the fault current and de-energize the downstream portion of the circuit until crews can fix the problem. Some faults, such as a tree branch brushing against a line, can be temporary and may not require repair. Reclosers can be programmed to reconnect ("reclose") the downstream circuit quickly. If the fault is cleared, the recloser remains closed and downstream customers may only lose power for a moment. If the fault is not cleared, the recloser may "reclose" multiple times (typically up to three times) and "lockout." Under this scenario, local operations personnel would be dispatched to fix the underlying damage and reconnect the line safely to restore power to customers.

**SCADA switches**

SCADA switches have telecommunications and intelligence that enable remote and coordinated operation without requiring the presence of an onsite crew. These automated switches are often used with reclosers and help system operators isolate an outage and connect customers to an alternate power source. Unlike reclosers, utilities do not use these switches to interrupt faults. However, fault detection capabilities are built into these switches and can help utility operators identify and locate the source of a fault more quickly.

**Undergrounding**

Undergrounding is the replacement of overhead primary electric wires with underground cables. From a resiliency perspective, undergrounding makes the power lines less susceptible to outages during high winds, thunderstorms, heavy snow, or ice storms. Some communities and municipalities express an interest in undergrounding because of the aesthetic benefits and the resiliency benefits it can provide. Undergrounding of wires and associated infrastructure has higher costs when compared with other hardening measures; with the benefits of undergrounding increasing in densely populated areas, when there are multiple distribution circuits in the same location, or other non-typical circumstances.

During the design of Distribution Resiliency Plan solutions engineers evaluate a variety of techniques to minimize or reduce outages. When reviewing distribution line topology an assessment can be made between moving the lines underground and performing other hardening work like targeted replacement of conductors and poles, enhanced vegetation management, and circuit automation using reclosers and other smart devices. Undergrounding of distribution circuits has clear benefits for removing or minimizing outage causes, but there are also tangible benefits for wires remaining accessible in a traditional overhead configuration. The following table summarizes a subjective analysis of the cost and benefits between strategic undergrounding or overhead hardening.

*Table 22. Overhead vs. Underground Costs vs. Benefits Evaluation*

| | Undergrounding | Overhead Hardening |
|---|---|---|
| Initial Cost | | ✓ |
| Future Replacement Cost | | ✓ |
| Storm Restoration Cost | ✓ | |
| Short-Term Maintenance Cost | ✓ | |
| Long-Term Maintenance Cost | | ✓ |
| Outage Frequency | ✓ | |
| Outage Duration[34] | | ✓ |
| Ease of Modification[35] | | ✓ |

For existing overhead circuits that are well established and supply existing customers, identifying sections to that would have sufficient benefits to warrant the cost is challenging. Generally, the most beneficial locations for undergrounding are determined through a combination of the number of customers that would be affected if a section were to be outaged, the proximity to the substation, and/or locations that are particularly prone to experience outages. Across the distribution system a common location to see portions of circuits located underground is in the area directly adjacent to a substation as there can be limited overhead infrastructure to support the quantity of circuits from a substation, and these portions of the circuits impact all downstream customers if outaged.

[34] While there may be fewer total outages for underground, locating and repairing underground equipment failures typically requires specialized equipment and takes longer to complete compared with overhead equipment.

[35] Modification to overhead facilities to add customers or upgrade capability is a relatively simple process for overhead facilities. For underground construction this can involve significant planning and costs to install the necessary supporting equipment (e.g., splicing chambers, etc.)

**Line Upgrades, Voltage Conversions, and Step-Transformers**

Creating a circuit tie requires sufficient capacity and voltage support on both circuits so that each one can serve additional customers during restoration. Sometimes this requires upgrading portions of each circuit to 3-phase and replacing conductors with a larger size. Adding voltage support with a voltage regulator or capacitor bank might also be needed. In some cases, NYSEG may want to connect two circuits that operate at different voltages, such as one circuit at 12.5 kV and the other at 34.5 kV. In such a case, a step-transformer is needed. Engineers and distribution planners might also consider adding a new circuit.

**Topology Upgrade Example**

The following figure is an example of the topology upgrades that are used as part of the Distribution Resiliency Plan. In the existing circuit configuration, there is a single distribution feeder supplying 1,046 customers protected by a single substation breaker and one downstream recloser. This arrangement also includes one non-automated circuit tie.

As part of the Distribution Resiliency Plan engineers reviewed this topology and determined that there were opportunities for significant improvement to the circuit topology and automatic capabilities. The solution proposal included installation of three new automatic devices: two reclosers and one normally open SCADA switch at the circuit tie point. Installation of the reclosers enables the circuit to be divided into multiple smaller segments so that a smaller number of customers are affected. For example, if a permanent fault occurred on the 4.8 kV section of the existing circuit all 1,046 customers would be automatically de-energized; in the proposed topology this same event would only result in 291 customers being de-energized; a 70% improvement. The normally open SCADA switch allows for a remote-controlled or automatic backup that can be switched in to reenergize the circuit from the alternate source.

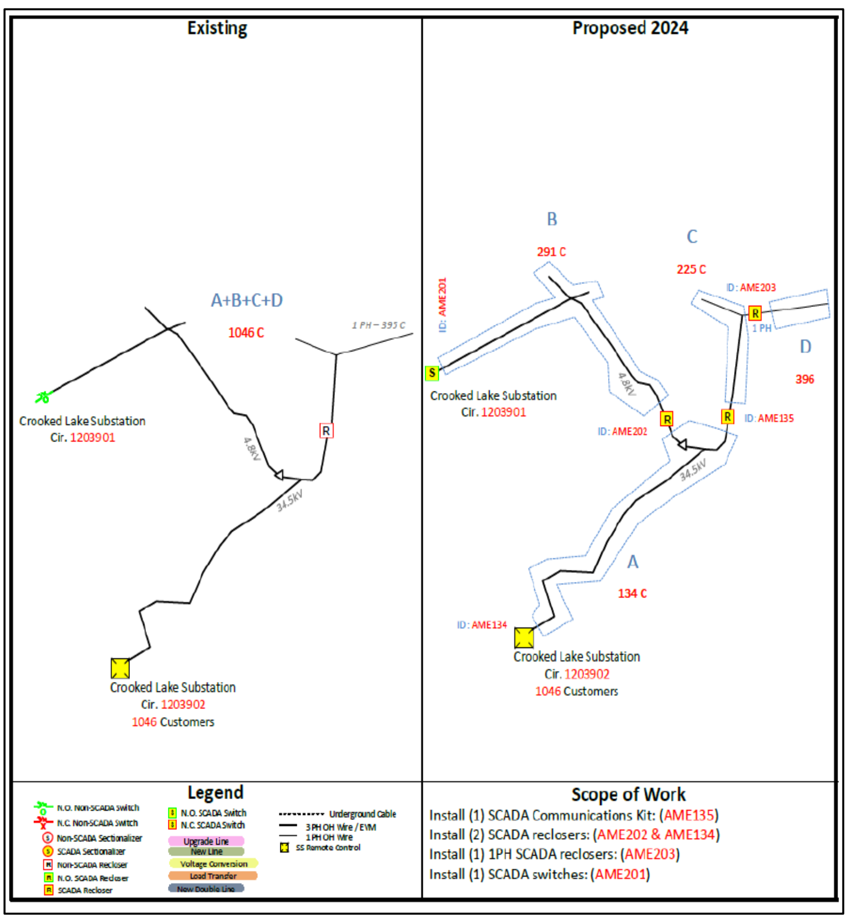


*Figure 13. Example Project with Topology and Automation Benefits*

### Enhanced Vegetation Management

NYSEG's standard vegetation management reliability programs work to maintain clearance between vegetation and distribution system infrastructure on thousands of miles of distribution lines. The programs have two main parts:

1. Inspecting and pruning all forested rights-of-way to standard clearances. This "cycle" trimming program also includes tree removal inside rights-of-way.
2. Supplemental "hot-spot" pruning for faster-growing vegetation species that could encroach upon electric facilities before subsequent cycle trimming occurs (i.e., within the cycle).

For the circuits identified in the distribution resiliency plans, NYSEG may apply enhanced "ground-to-sky" clearance (i.e., "Enhanced Vegetation Management" or EVM) as appropriate in conjunction with the Topology with Automation and Hardening resiliency programs. In developing the circuit plans, engineers and field technicians endeavor to coordinate and optimize multiple improvements to deliver best-value resiliency to customers.

### Distribution Resilience Plan Benefits

The Distribution Resiliency Plan directly impacts storm restoration costs, outage frequency, and outage duration. The following is a summary of how the identified resilience measures can affect each of these focuses:

- **Reducing Storm Restoration Costs:** Storm restoration costs following major events can be driven by the damage that is sustained during an event; if there are less damaged pieces of equipment and/or the degree to which damage has occurred is reduced, then overall storm restoration costs will be reduced. Installation of new poles, stronger conductors, and enhanced vegetation management included in the Distribution Resiliency Plan reduces the extent and amount damage that is sustained for similar events. For example, one of the most time-intensive restoration activities is replacement of a broken pole. When failure-prone poles are replaced during the Distribution Resiliency Plan the new, stronger poles are able to withstand a higher degree of physical stress before failing, directly reducing the likelihood of a broken pole. Similar benefits are incurred when stronger wires are installed and when the likelihood of vegetation impacts is reduced through enhanced vegetation management.
- **Reducing Outage Frequency:** The frequency that outages occur during major weather events is related to when objects, frequently vegetation, contacting energized utility equipment causing a fault, and/or when equipment fails. These impacts require sections of the system to be automatically disconnected to minimize damage. The likelihood of object impact, equipment failure, and the extent and duration to which a distribution circuit must be de-energized following a fault are all directly reduced through the Distribution Resiliency Plan. For example, stronger poles, stronger and contact-resistant wires, smart devices, and improvements to distribution system topology all directly reduce the frequency of outages.

  Furthermore, faults can be classified into two major types: temporary and permanent. A temporary fault is one that occurs when an object touches an energized piece of equipment but does not cause significant damage and the object is not in permanent contact with the line (e.g., a falling branch). The other type is a permanent fault where an object permanently impacts energized equipment (e.g., a tree resting on the line) and/or the object impact causes enough damage that repair is required before reenergization. The techniques employed in the Distribution Resiliency Plans reduce the frequency of outages in the following ways:

  1. Reduce the likelihood of objects impacting energized lines (enhanced vegetation management, tree-wire)
  2. Reduce the number and extent of permanent outages (stronger poles, stronger wires, automation schemes) and,

3. Quickly restore the system following temporary outages through automatic/remote controlled re-energization (automation, reclosers, trip savers)

- **Reducing Outage Duration:** The duration of an outage is affected by the level and type of damage that is sustained, and the ability of the grid to be reconfigured to restore de-energized customers. By performing enhanced vegetation management and installing stronger poles and wires, the level of damage that is sustained will be reduced, allowing for easier repairs and faster outage restoration. In addition, expanding the isolation and automation capabilities of the grid can enable a portion of affected customers to be restored quickly via automatic or remote device operation as opposed to having all devices operated reset by field crews.

The volatility of experienced weather conditions is an important consideration when evaluating performance of resilience measures; there is no currently accepted way to "normalize" weather events to remove outliers which is done in reliability metric calculations (e.g., SAIFI, CAIDI[36]). To mitigate this volatility the evaluation of outage performance of programs aimed at reducing customer outages can utilize a significant sample size of circuits and timeframes to normalize the dataset and remove outliers. As part of the Distribution Resilience Plan there is routine analysis done to evaluate its effectiveness in reducing customer outages. The most recent analysis performed on circuits before and after Distribution Resiliency work described in this plan show that there was a 33% reduction in customers impacted. For the number of outages caused by weather and vegetation the comparison was performed between two timeframes, 2018–2020 and 2021–2023 to determine if circuits under the Distribution Resilience Plan performed better compared to circuits that were not included in the plan. The results, shown below, indicate that Resilience Circuits experienced on average 34% fewer outage incidents than non-Resilience Circuits during the same timeframe.

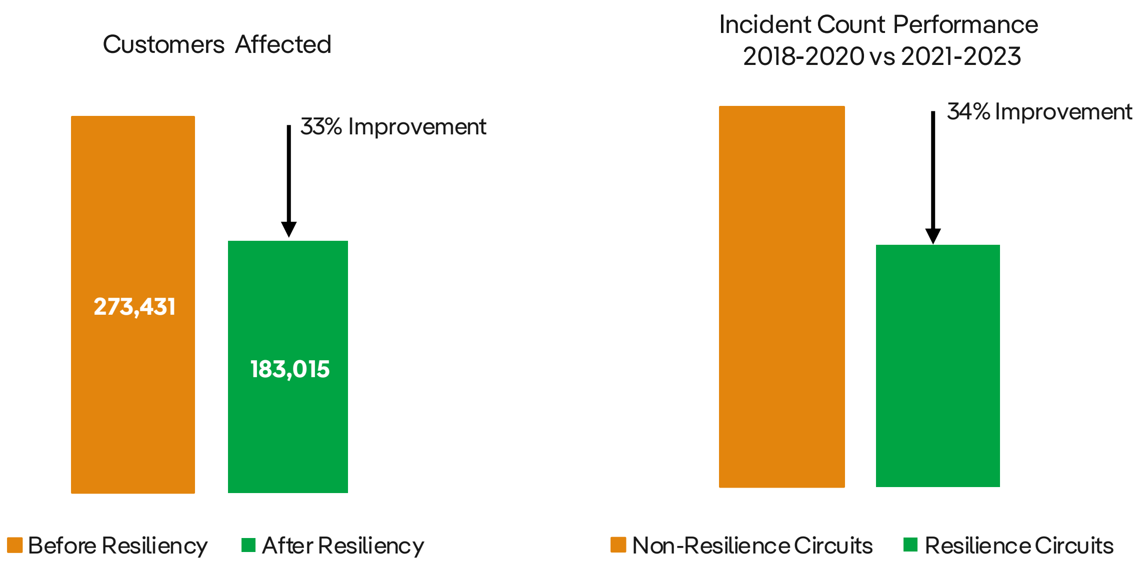


*Figure 14. Distribution Resilience Plan Performance Analysis*

## Alternatives Considered

The selection and application of Distribution Resiliency projects includes analysis of alternatives throughout the project inception and design process. The circuits select to be included in resilience are chosen from the listing of the worst performing circuits, with additional input from subject matter experts. During design, the available alternatives for each portion of a circuit vary and are evaluated based on the location and objective. For example, in an area with significant exposure to tree contact leading to customer outages different

[36] Customer Average Interruption Duration Index

solutions such as tree-wire, undergrounding, and/or enhanced vegetation management could be utilized. The selected alternative is determined based on comparison against the costs, benefits, and feasibility of each.

### 2026 Distribution Resiliency Circuits

Based on historical outage performance and input from internal subject matter experts, NYSEG has identified the following circuits for inclusion in the Distribution Resiliency Plan for 2026. The scope for each of these circuits and what components of hardening, automation, and topology that are utilized is different based on the specific conditions for each circuit.

*Table 23. 2026 Circuits Identified for Distribution Resiliency*

| Division | Circuit | Red Circuit Ranking[37] | Total Customers | BCJ Score | DAC |
|---|---|---|---|---|---|
| Binghamton | Kattelville 422 | 10 | 2,898 | 63% | Adjacent |
| Geneva | Greenidge 596 | 14 | 2,220 | 47% | Yes |
| Mechanicville | Klinekill 630 | 27 | 1,464 | 73% | No |
| Mechanicville | Klinekill 631 | 25 | 1,866 | 73% | No |
| Oneonta | Shandaken 501 | 26 | 1,878 | 67% | No |
| Lancaster | Cemetery Rd. 490 | 16 | 3,339 | 67% | No |
| Lancaster | North Broadway 535 | 22 | 2,220 | 50% | Adjacent |

### 5-, 10- and 20-year Summary

*Table 24. Distribution Resiliency Plan Summary Table*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (10 Years) | 2036-2045 (20 Years) |
|---|---|---|---|---|---|---|
| Distribution Resiliency | Wind / Wind-and-Ice | Distribution | Program | $155.6 M | $158.0 M | $319.0 M |
| SCADA/Automation | Wind / Wind-and-Ice | Distribution | Program | $24.8 M | $41.0 M | $10.0 M |

## 5.3.2.2 TripSaver Program

**Climate Hazards Addressed**: Wind/Wind-and-Ice
**Resilience Frameworks Utilized:** Strengthen and Withstand, Anticipate and Absorb

As noted previously, reducing the number of permanent faults on the grid can improve the cost to restore outages, the frequency of outages, and it can limit the amount of time customers are affected as they may be able to be restored automatically.

Due to the limitations of technology available to detect faults on smaller portions the system it has been challenging to differentiate between permanent and temporary faults on single phase lateral portions of the distribution system that typically feed individual streets or neighborhoods. On many distribution circuits there can be a *significant* number of laterals which have traditionally been protected by fused cutouts. These fused cutouts respond quickly to all fault types but due to their simple nature are unable to determine if a fault was permanent or temporary. When a fused cutout operates it must be reset by utility workers even if the fault was temporary.

[37] Circuit selected based on worst-performing 2021-2023 SAIFI Ranking (Including Storms), with feedback from Operations and exclusion of previous distribution resiliency circuits.

Through technology improvements there are now single-phase reclosers that fit into the same location as traditional fused cutouts but have the benefit of being able to test if the cause of a fault was temporary, and if so, automatically re-energize the line. If the fault was instead permanent, they operate in the similar manner to a fused cutout and a crew must be dispatched to repair the permanent fault and reset the device.

*Figure 15. TripSaver II - sandc.com*

Analysis of the TripSavers that have already been deployed show that these devices can significantly reduce outage frequency and the frequency that crews must be dispatched to restore affected customers. To remove sample volatility due to experienced weather severity analysis was performed on "Blue Sky" days that did not meet Major Storm qualifications before and after TripSavers have were installed. The analysis found that there was a 48% reduction in outage frequency (i.e., reduction in crews dispatched) and a 38% reduction in affected customers.

As demonstrated through the recent analysis performed, further installation of the TripSaver devices will help reduce storm restoration costs, outage frequency, and allow for faster restoration of customers affected by faults by automatically re-energizing portions of the circuit that experience temporary faults without needing to dispatch crews. During major events this can allow these crews to focus on the more elaborate repair efforts and scenarios.

#### Alternatives Considered

Trip Saver devices are installed to automatically restore temporary outages that occur to thereby reduce the frequency of customer outages. Alternatives that accomplish a similar improvement could be the application of a standard three-phase recloser to restore automatically restore outages, or other enhancements like tree-wire, undergrounding, or vegetation management to reduce outage potential. The usage of the Trip Saver device is essentially a one-for-one replacement with a fused cutout that can be installed quickly and at low cost. Usage of a traditional recloser or undergrounding for these single-phase portions of a circuit would be significantly more expensive. Usage of tree-wire can provide a similar benefit; but would not provide all the benefits of a Trip Saver and would also be significantly more expensive based on the complexity of replacing a conductor actively feeding customers.

#### 5-, 10- and 20-year Summary

*Table 25. TripSaver Summary Table*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (Years 6-10) | 2036-2045 (Years 11-20) |
|---|---|---|---|---|---|---|
| Trip Saver | Wind / Wind-and-Ice | Distribution | Program | $16.9 M | $20.0 M | $48.0 M |

### 5.3.2.3 Java Microgrid Non-Wires Alternative

**Climate Hazards Addressed**: Wind/Wind-and-Ice
**Resilience Frameworks Utilized:** Strengthen and Withstand, Anticipate and Absorb

A microgrid is a localized energy system capable of operating independently from the main electric grid. Typically, microgrids include Battery Energy Storage Systems (BESS), solar power, and a control system to manage power supply, balance, and quality. They enhance local system resilience by maintaining power during the loss of incoming transmission feeds or substation transformers, which is particularly beneficial in remote areas served by long transmission lines. This reduces the frequency and duration of outages caused by transmission line or transformer failures.

NYSEG's Java electric substation in Wyoming County, serving approximately 1,700 residential and small commercial customers via two 4.8 kV distribution circuits, has been identified as a potential microgrid location using a BESS. In the event of transmission line or substation transformer failure, the microgrid can utilize stored energy to re-energize customers for at least 8 hours. From 2015 to 2024 there were at least 14 events that affected the Java substation and its customers that would likely have been completely mitigated by the proposed microgrid as many involved faults that occurred on the approximately 16-mile 34.5 kV sub-transmission line that feeds the Java substation. Additionally, using the microgrid during peak hours can lower electricity prices for consumers by charging during off-peak when energy prices are lower and discharging during peak usage when prices are higher.

#### Alternatives Considered

The proposed traditional wires solution alternative was to replace the existing 5 MVA transformer bank with two (2) new 14 MVA LTC 34.5-12.47 kV units, install 12.5 kV Gas Insulated Switchgear, and a new control house. The proposed wires alternative also includes a 12.5 kV conversion of Java circuit #280 and #281 and a new second 34.5 kV transmission line to create an in-and-out configuration to provide a redundant sub-transmission supply.

In addition to the traditional solution evaluations varying sizes of BESS were evaluated along with and without additional voltage support through use of a synchronous condenser.

#### 5-, 10- and 20-year Summary

*Table 26. Java Microgrid Summary Table*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (Years 6-10) | 2036-2045 (Years 11-20) |
|---|---|---|---|---|---|---|
| Java Microgrid | Wind / Wind-and-Ice | Distribution / Substation | Project | $43.1 M | - | - |

### 5.3.2.4 New York 21st Century Grid Plan

**Climate Hazards Addressed**: Heat, Wind/Wind-and-Ice
**Resilience Frameworks Utilized:** Strengthen and Withstand, Anticipate and Absorb

As part of its commitment to designing a resilient and robust grid, NYSEG has performed a comprehensive area study of a significant portion of its Lancaster division located in western New York and created a suite of projects for what it envisions as the grid-of-the-future.

This comprehensive area solution builds resiliency to the power system to extreme weather conditions exacerbated by climate change including wind, wind-and-ice, extreme heat; and it increases the capacity of this area of NYSEG's service territory to accommodate the significant projected load growth due to the electrification of heating and transportation. The solutions utilized in this project build resilience to extreme weather events through unique approaches to automation, circuit reconfiguration, and circuit backup provisions which are coupled with extensive undergrounding, replacement of obsolete equipment, and hardening of poles and wires.

With the growing needs on the electric grid NYSEG envisions utilizing this comprehensive area study approach in many areas of the system to generate these types of comprehensive solutions that include components that enhance reliability and resiliency to future climate events.

#### Lancaster Division

NYSEG's Lancaster Division includes numerous substations supplying electricity to over 177,000 customers. Many of substations, fed through a highly loaded 34.5 kV sub-transmission system, are purely load serving substations that do not utilize advanced technology to enable remote sensing or automatic restoration. From

2020-2022 this area of the NYSEG system experienced nearly 6,000 outage events affecting approximately 750,000 customers[38].

## Cheektowaga Area

**Background**

NYSEG's Cheektowaga area of Lancaster was chosen as the area to evaluate for the New York 21st Century Grid Plan as over the last 3-year period it has been one of NYSEG's worst performing areas contributing to ~5% of overall system SAIFI impacts between 2020 and 2022 in part due to limited redundancy in the area. The initial area of focus for this project was a subset of seven transmission and distribution facilities in Lancaster that have had among the worst outage performance. From there, the area system needs, reliability, voltage/thermal performance, and asset condition were comprehensively evaluated with conventional and novel system upgrades proposed to resolve any identified, enhancing system reliability, resiliency, and capacity.

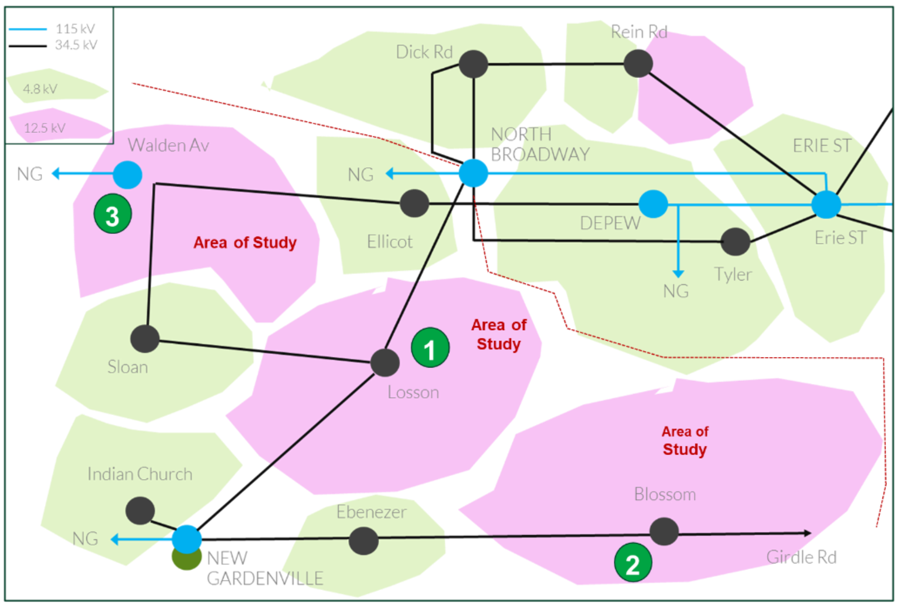


Figure 16. Overview of Cheektowaga Area

*Table 27. Cheektowaga Area Substations*

| Name | DAC |
|---|---|
| Losson Road | Yes |
| Blossom Road | No |
| Sloan | Yes |
| Walden Ave | Yes |
| Ellicott | Yes |
| Ebenezer | No |
| Indian Church | Yes |

**Identified Needs**

NYSEG utilizes a variety of criteria to identify a minimum level of performance or condition for its assets and systems. During detailed transmission, distribution, reliability and asset condition studies there were a significant number of system needs identified at each of the seven facilities included in the area review. If left unresolved these system needs could lead to decreases in customer reliability and the inability to supply customer load growth. To address the identified needs a cross-functional team of NYSEG engineers performed a systematic review to develop a comprehensive and holistic plan mitigate identified needs in an efficient manner, while striving to utilize "no regret" upgrades that would be suitable for multiple decades of expected load growth.

## Proposed Solutions & Climate Resilience Benefits

The suite of solutions included as part of the NY 21st Century Grid address all the identified needs by utilizing traditional solutions (e.g., wires and poles) as well as novel approaches like the introduction of distribution switching stations that enhance the reliability and resiliency of the Cheektowaga area.

[38] This figure includes some of the same customer experiencing multiple outages in the noted timeframe.

**Novel Solutions**

The current approach used by NYSEG to backup circuits is to connect two circuits together through a normally open switching device (e.g., manual switch, SCADA switch, or a recloser). This has the benefit of utilizing existing infrastructure to provide a backup power source during outage events. However, this design requires that the loading on each feeder remain at or below approximately 50% of its capability. As loads across the state are expected to increase in the future NYSEG investigated an alternative backup technique that also allows for each feeder to utilize its complete capability.

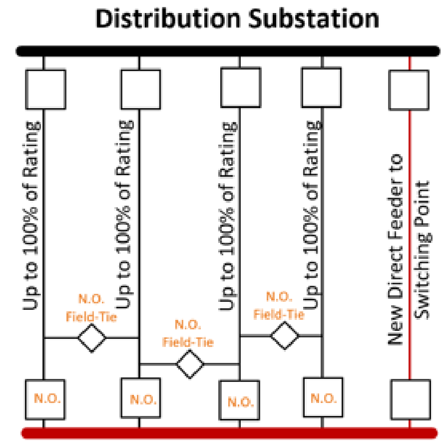

*Figure 17. Switching Station Example*

The new approach includes a distribution switching station, a type of station typically utilized on the transmission system. In the proposed project, the distribution switching stations would be fed from resilient underground direct connections but would also have normally open connections to the end-points of other local distribution circuits to enable the switching station to provide backup power. If one of the local circuits with endpoints terminated at the switching station experienced a problem along its route the distribution switching station would automatically detect this anomaly and reconfigure the local system to re-energize the portion of the circuit sectionalized from the encountered problem.

**Traditional Solutions**

There are a significant number of individual system components that are proposed to be upgraded as part of this project. Proposed upgrades were designed to accommodate a 30% growth in load in this area.

First, the project includes upgrading 63 miles of three-phase circuits to the maximum standard conductor size. This upgrade strengthens the circuits to better withstand wind, wind-and-ice events, and vegetation contact, which is expected to reduce storm restoration costs, outage frequency, and duration experienced by affected customers by limiting the damage sustained by the system. Additionally, this upgrade provides additional load-carrying capacity for future load growth.

Another key component of the project is converting the distribution voltage for approximately 85 miles of overhead circuit out of Ebenezer, Ellicott, Indian Church, and Sloan from 4.8KV to 12.5KV. This conversion allows for connection between circuits, increasing loadability and allowing the system to absorb the effects of severe weather events by reconfiguring the distribution system to utilize backup provided by the distribution switching station; reducing the frequency of outages and the duration experienced by affected customers.

Similar to the Distribution Resilience Plan discussed in a previous section, the 21st Century Grid project is expected to reduce storm restoration costs, reduce outage frequency, and help limit the amount of time customers are affected for. For example, the project will accomplish these improvements by installing new, stronger equipment and adding automated schemes designed to isolate faulted sections of the grid and restore unaffected customers, all while improving the future capacity for this area of the NYSEG system.

**Climate Resiliency Benefits**

The selected suite of solutions addresses all identified system needs, including 30% additional load growth, as well as improvements to reliability, and resiliency.

The solutions proposed for this comprehensive area solution build resilience to the extreme heat vulnerability by increasing the load serving capacity of the region through replacement of transformers with higher capability and updated temperature specifications, as well as upgrading the distribution lines to a higher voltage that significantly increases power delivery capacity of the circuits over longer distances.

For wind and wind-and-ice vulnerabilities resilience is built in a manner similar to the Distribution Resiliency Plan. Rebuilding distribution circuits to more resilient designs and by enabling the system to withstand the effects of severe weather events through hardened infrastructure, allows these systems to absorb the effects of severe weather events by enabling automation reconfiguration of the distribution system to provide an alternate power source if the main source is lost during an event.

The 21st Century Grid project includes some of the components noted in PSL §66 (29) including:

- §66 (29)(d)(i) – Examination of areas with lower reliability performance:
  - This area of the NYSEG system was specifically identified based on its history of poor reliability performance.
- §66 (29)(d)(vii) – A multi-prong approach that includes "...undergrounding of distribution and transmission lines, replacement of obsolete cables, wires and poles, automation and circuit reconfiguration, investing in infrastructure that supports the development of technologies that would improve response to extreme weather events and reduce restoration costs...":
  - The 21st Century Grid project includes many of these components including undergrounding of distribution lines, replacement of obsolete wires, poles and substation equipment, automation and circuit reconfiguration, and development of technologies (switching stations) to improve the system's ability to respond to extreme weather events.

The following tables lists all upgrades and associated reliability and resilience benefits:

*Table 28. Cheektowaga Area Solution Set; Enhancements to Climate Resilience in Bold*

| Substation | Area Upgrades | Upgrade Capacity, Reliability, and Resilience Benefits |
|---|---|---|
| **Losson Road** | • Full substations rebuild.<br>• **Replace existing transformers with two new 50 MVA transformers.**<br>• **Convert ~20 miles of 4.8 kV to 12.5 kV** | • Retire one transformer with Fair health rating.<br>• **Upgrade of overloaded grid assets to accommodate 30% area load growth. (+Resilience to Extreme Heat)**<br>• **Converted distribution circuits rebuilt to latest resilient designs. (+Resilience to Extreme Heat, Wind, Wind-and-Ice)** |
| **Blossom Rd.** | • Full substation rebuild.<br>• **Replace existing transformers with two new 37.3 MVA transformers**<br>• **Convert ~24 miles of 4.8 kV to 12.5 kV** | • Retire two transformers with Fair health rating.<br>• **Upgrade of overloaded grid assets to accommodate 30% area load growth. (+Resilience to Extreme Heat)**<br>• **Converted distribution circuits rebuilt to latest resilient designs. (+Resilience to Extreme Heat, Wind, Wind-and-Ice)**<br>• Limited remote SCADA control and telemetry from equipment. |
| **Walden Avenue** | • Upgraded 115 kV facilities.<br>• Fully rebuilt 34.5 kV facilities.<br>• **Replace existing transformers with two new 50 MVA transformers**<br>• **Convert ~41 miles of 4.8 kV to 12.5 kV** | • **Upgrade of overloaded grid assets to accommodate 30% area load growth. (+Resilience to Extreme Heat)**<br>• **Converted distribution circuits rebuilt to latest resilient designs. (+Resilience to Extreme Heat, Wind, Wind-and-Ice)**<br>• Retire 10 circuit breakers with Very Poor, Poor, or Fair health ratings.<br>• Structures in Moderate to Poor condition.<br>• Limited remote SCADA control and telemetry from equipment. |
| **North Broadway** | • **Add one new 50 MVA transformer**<br>• Multiple 115kV and 34.5 kV circuit breakers. | • **Upgrade of overloaded grid assets to accommodate 30% area load growth. (+Resilience to Extreme Heat).**<br>• Enables 115 kV and 34.5 kV re-routing to retire other area substations with poor asset health. |

| | | |
|---|---|---|
| **Losson Switching Station (New)** | • **Five positions to provide backup for Walden Ave. circuits**<br>• **Two express underground feeds to Walden Ave. and Losson Rd.** | • **Improved N-1 capabilities (additional tie provided) (+Resilience to Extreme Heat, Wind, Wind-and-Ice)**<br>• **Converted distribution circuits rebuilt to latest resilient designs. (+Resilience to Extreme Heat, Wind, Wind-and-Ice)** |
| **Sloan Switching Station (New)** | • **Three positions to backup Walden Ave. circuits.**<br>• **2 x express underground feeds to Blossom Rd. and Losson Rd.** | • **Improved N-1 capabilities (additional tie provided) (+Resilience to Extreme Heat, Wind, Wind-and-Ice)**<br>• **Converted distribution circuits rebuilt to latest resilient designs. (+Resilience to Extreme Heat, Wind, Wind-and-Ice)** |

#### Alternatives Considered

Development of the 21st Century Grid project considered a variety of solutions to improve customer reliability, resolve asset conditions needs, and enhance the ability to meet growing customer load. The alternatives analyzed primarily focused on the final configuration of the 34.5 kV sub-transmission system and whether the expansion of the North Broadway substation or construction of a new sub-transmission line was preferred. The selected solution expands North Broadway and was selected based on the expected construction and operating costs, as well as expected customer outage improvements compared to the alterative that constructed a new 34.5 kV sub-transmission line.

#### 5-, 10- and 20-year Summary

*Table 29. 21st Century Grid Summary Table*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (10 Years) | 2036-2045 (20 Years) |
|---|---|---|---|---|---|---|
| 21st Century Grid (Lancaster Area) | All | All | Project | $245.3 M | - | - |

### 5.3.2.5 Targeted Undergrounding Program

**Climate Hazards Addressed**: Wind/Wind-and-Ice
**Resilience Frameworks Utilized:** Strengthen and Withstand, Anticipate and Absorb

As extreme weather events increase due to climate change the use of Targeted Undergrounding on portions of the electric distribution system is a proactive solution to significantly enhance its reliability and resiliency. This program aims to improve system resilience by identifying and performing undergrounding on specific sections of overhead distribution lines that may be more prone to outages, are in locations that are difficult to repair, or if outaged could have an outsized impact on the community; for example, based on the number or type of customers that they are served. The goal is to underground approximately two miles of per year, with the initial focus on development of a process or framework to identify high-impact locations for undergrounding.

#### Climate Resilience Benefits

The burying of primary electric distribution equipment protects the equipment from damage and outages caused by wind, wind-and-ice, and vegetation contact that often accompany major weather events which climate change is expected to worsen. These improvements can nearly eliminate storm restoration costs and outages caused by weather on a specific portion of a circuit, though the overhead sections before or after the underground portion are still exposed to the weather effects. Due to these avoided hazards underground conductors are more reliable and resilient than overhead conductors. These performance improvements can be particularly beneficial in areas that have significant outage history and/or when they include facilities that support community resilience.

### Identifying Targeted Undergrounding Priorities

Developing projects that efficiently build resiliency should incorporate a variety of factors including historical outage performance, local topology, and supplied customers. The process to identify locations to utilize Targeted Undergrounding will consider some or all of the following characteristics:

- **Outage History**: Analysis of appropriate customer outage metrics potentially including the list of worst performing circuits.
- **Community Resilience**: Analysis of what connected facilities (e.g., hospitals, town centers, community shelters) could benefit from the undergrounding.
- **Disadvantaged Communities:** Does the undergrounding section contribute to serving or backing-up a disadvantaged community?
- **Local topology Considerations**: Including items like difficult to access areas (e.g., steep or offroad terrain), potential for out-of-ROW tree related outages, major road or water crossings, multiple circuit rights-of-way, etc.
- **Other Needs:** If an area is known to have recent projects deployed or expected to have future needs these should be considered to determine how this affects the priority (e.g., asset condition, recent vegetation management/hardening efforts.)

The Targeted Undergrounding Program represents an investment to enhance the resiliency for select portions of the electric distribution system. Initially the program will include identification of locations to deploy Targeted Undergrounding with the goal of undergrounding approximately two miles per year. The initial years of the program will be used to build a foundation that will be utilized to determine the realized benefits and to need to expand the program.

### Alternatives Considered

Alternatives to Targeted Undergrounding include potential use of aerial or space cable, vegetation management, and other distribution resilience activities like installation of tree-wire or circuit automation. Targeted Undergrounding is expected to be particularly beneficial when other alternatives that can improve resilience to portions of distribution circuits, like inclusion tree-wire or vegetation management do not have the same benefit profile. For example, in areas where there are multiple circuits on the same pole-line or when there is vegetation outside of the right-of-way other mitigating measures may not provide the same benefit as undergrounding.

### 5-, 10- and 20-year Summary

*Table 30. Targeted Undergrounding Summary Table*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (Years 6-10) | 2036-2045 (Years 11-20) |
|---|---|---|---|---|---|---|
| Targeted Undergrounding | Wind / Wind-and-Ice | Distribution | Program | $27.9 M | $60.0 M | $119.0 M |

### 5.3.3 Substations Assets and Extreme Wind / Wind-and-Ice

In the CCVS, NYSEG found that substations and wind-and-ice were a priority vulnerability for analysis in the CCRP due to the high consequence of damage to a substation and the medium sensitivity of some equipment to ice accumulation.

There are two primary risks to substation equipment due to wind-and-ice: 1) additional physical stress on components due to the weight of ice accumulation and force from wind and 2) possibility of flashover caused by ice and other contaminants reducing the insulating potential of insulators or equipment bushings.

#### Wind-and-Ice Physical Stresses

Ice accumulation on substation components, including strong winds, increases the physical stresses on these components that can lead to possible damage or failure. However, much of the equipment in a substation is ground-mounted and constructed without long distances between supporting structures. These two features reduce the potential for impact from high wind speeds and for cantilever forces that can cause physical damage.

#### Wind-and-Ice Flashover Risk

In addition to the physical stress placed on equipment, ice accumulation reduces the insulating capability of insulators and bushings, creating an increased risk of flashover between energized components and equipment at ground potential.

Equipment insulators and bushing are designed with transverse ridges, also called sheds, which maximize the surface distance between energized and unenergized components. In the case of an insulator, the unenergized component is likely a support structure, whereas for a bushing, the unenergized component is a piece of equipment, like a transformer. In most cases, the arc or fault that results from flashover is quickly detected protective relaying and the equipment is quickly isolated before permanent damage can occur.

Substation insulators and bushings are designed to continue operation even with significant ice accumulation. As identified in the CCVS, in the warming future climate, ice storms are expected to become less frequent but may become more intense.

#### Future Considerations for Substations

Due to the lower likelihood of ice storms, physical characteristics of substations, and the temporary nature of flashover issues, NYSEG did not identify any necessary resilience measures to mitigate the impacts of climate change on the substation and wind-and-ice priority vulnerability.

## 5.4 Resilience Measure Investment Plan

A focus of the CCRP was to identify resilience measures that address the results and conclusion reached in the CCVS. These conclusions are summarized in the list of priority vulnerabilities, each of which has been discussed at length in the CCRP, along with the resilience measures that NYSEG has proposed to mitigate against these climate hazards. The following table summarizes the resilience measures and timing proposed in the CCRP, including the hazard addressed, and the estimated costs in the denoted timeframe.

*Table 31. 5, 10, and 20-year Implementation Plan*

| Project/Program | Hazards Addressed | Asset Family | Project / Program | 2026-2030 (First 5 Years) | 2031-2035 (10 Years) | 2036-2045 (20 Years) |
|---|---|---|---|---|---|---|
| 21st Century Grid (Lancaster Area) | All | All | Project | $245.3 M | - | - |
| Distribution Resiliency | Wind / Wind-and-Ice | Distribution | Program | $155.6 M | $158.0 M | $319.0 M |
| SCADA/Automation | Wind / Wind-and-Ice | Distribution | Program | $24.8 M | $41.0 M | $10.0 M |
| Trip Saver | Wind / Wind-and-Ice | Distribution | Program | $16.9 M | $20.0 M | $48.0 M |
| Java Microgrid | Wind / Wind-and-Ice | Distribution / Substation | Project | $43.1 M | - | - |
| Substation Flood Mitigation | Flooding | Substation | Project | - | $38.0 M | $48.0 M |
| Transformer Specification Update | Heat | Substation | Program | $.9 M | $1.0 M | $3.0 M |
| Targeted Undergrounding | Wind / Wind-and-Ice | Distribution | Program | $27.9 M | $60.0 M | $119.0 M |
| | | | **Totals** | **$514.4 M** | **$318.0 M** | **$547.0 M** |

## 5.5 Estimated 5-Year Rate Impact

The preceding section identified the asset-based resilience measures and their estimated total costs through the 5-, 10-, and 20-year time periods. The following table includes the incremental revenue requirement for the proposed resilience measures, and the estimated annual rate impact for implementing the first 5 years of the plan.

*Table 32. Incremental Revenue Requirements and Bill Impacts for First Five Years*

| | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|
| Incremental Revenue Requirement ($000) | $1,578 | $5,813 | $25,979 | $48,656 | $59,726 |
| Total % Bill Increase | 0.1% | 0.2% | 1.0% | 1.9% | 2.3% |
| Delivery % Bill Increase | 0.1% | 0.4% | 1.8% | 3.3% | 4.1% |

As part of its CCRP NYSEG reviewed its current resilience efforts, proposed resilience measures, and climate science and determined that it will not be seeking to utilize the surcharge mechanism discussed in PSL §66 (29) at this time. Instead, the company will include CCRP resilience measures as part of its next rate case proceeding.

# Governance

# 6. Governance

The Company's governance of climate risk and resilience will expand upon previous frameworks and policies to maintain accountability and continue to provide consistent, transparent communication regarding its work on climate adaptation.

As of March 22, 2022, New York Public Service Law §66 (29) requires utilities to include certain information and goals in the Climate Change Vulnerability Study and Resilience Plan, as well as to create a Climate Resilience Working Group (CRWG). A CRWG was formed with representatives from the government, environmental advocacy groups, universities, large customers, energy industry associations, utilities, service providers, and low-income advocates. The Working Group will continue to meet at least twice annually as outlined by the Public Service Law. During these meetings, the CRWG will discuss the resilience plan and provide feedback. Continuing discussions with stakeholders following the submission of the CCRP will ensure that NYSEG remains responsive to customer and community priorities while continuing to enhance asset reliability and complying with regulatory requirements.

Additionally, NYSEG will continue to use the most current and appropriate climate science data sets validated by industry standards to re-evaluate and refine its adaptation measures. NYSEG used quantitative climate hazard projections from three main sources for the CCVS and CCRP: Columbia/NYSERDA, First Street Foundation, and NASA Center for Climate Simulation. As the Company will re-evaluate its resilience plans at least once every five years, it will evaluate the use of the most recent data and climate assessment tools to ensure they are acting on the most appropriate information available. To support this, NYSEG is creating a Climate Change Data Governance Working Group with participation from groups across the organizations. This group will help to develop and define roles and responsibilities required to socialize the importance of climate change data and to support studies like the CCVS and CCRP.

NYSEG is dedicated to applying the best practices in governance, and transparency is integral to this endeavor. The Company will maintain consistent and transparent communication with stakeholders. Consistent communication involves regular, public updates on resilience measure implementation, as well as targeted, individual outreach to address specific areas of concern. NYSEG must file an updated plan with the Commission for approval at a minimum of every five years to ensure constant evaluation and improvement. Overall, these governance measures will provide NYSEG with the guidance and oversight necessary to achieve successful implementation, monitoring, and evaluation of resilience measures.

# Performance Measures

# 7. Performance Measures

PSL §66 (29) requires utilities to file a report with the Commission detailing its activities to comply with its current plan after the second full year of plan implementation, and biennially thereafter. As part of this biennial filing, NYSEG will prepare a comparison between the latest approved CCRP cost and timeline, and actual expenditures and resilience measure progress.

In addition, NYSEG will provide performance metrics for incremental proposals included in the CCRP:

Implementation-based Metrics:

- **Transformer Specification:** Total number of transformers owned by NYSEG that meet the latest temperature specification.
- **Substation Flood Damage:** Detailed report on schedule and budget for implementation of substation flood projects in the CCRP. Description of flood damage experienced at locations that have had flood mitigation performed under the CCRP.
- **TripSaver Program:** Detailed report on schedule and budget for implementation of TripSavers, total number of TripSavers installed.
- **Java Microgrid:** Report on schedule and budget for implementation of Java Microgrid.
- **21st Century Grid:** Detailed reports on schedule and budget for implementation of the 21st Century Grid Plan.
- **Targeted Undergrounding:** Detailed report on schedule and budget for implementation of Targeted Undergrounding, total miles of Targeted Undergrounding completed.

Performance-based Metrics:

- **Substation Flood Damage:** Description of flood damage experienced at locations that have had flood mitigation performed under the CCRP.
- **Distribution Circuit Resiliency:** Report on circuit customer outages experienced, including storm and non-storm activity, for the first three full years following the completion of a Distribution Circuit Resiliency project compared to three full years prior, excluding outages related to transmission and substation.
- **TripSaver:** Report on circuit customer outages experienced, including storm and non-storm activity the first three full years for the locations or circuits following the installation of TripSavers, compared to three full years prior, excluding outages related to transmission and substation.
- **Java Microgrid:** Report on number of times that microgrid successfully operated, and total number of customer outage and durations prevented.
- **21st Century Grid (Lancaster Area):** Report on circuit customer outages experienced, including storm and non-storm activity, for the first three full years following the completion of the 21st Century Grid project compared to three full years prior.
- **Targeted Undergrounding:** Report on circuit customer outages experienced, including storm and non-storm activity, for the first three full years following the completion of a Targeted Underground project compared to three full years prior, excluding outages related to transmission and substation.

As of the publication date of this CCRP, there are no industry standard resilience performance metrics. NYSEG is committed to collaborating with other entities, including the New York utility companies, to discuss and potentially develop resilience performance metrics to improve the system performance for our customers.

# Conclusion and Next Steps

# 8. Conclusion and Next Steps

The CCRP aimed to propose resilience measures to address key climate hazards and priority climate vulnerabilities for NYSEG's assets and operations identified in the 2023 Climate Change Vulnerability Study. The Company is dedicated to asset resilience, as seen through its numerous past studies, projects, and programs. Due to the increasing impacts of climate change, the continuation of proactive planning to ensure consistent, equitable, and reliable service for customers is imperative.

The resilience measures and activities discussed in this plan are designed to make assets more resilient to four key climate hazards identified in the CCVS: 1) high temperature, 2) flooding, 3) wind, and 4) wind-and-ice. When designing or reviewing these measures, NYSEG utilized a multi-pronged resilience strategy, focusing on four key objectives: Strengthen & Withstand, Anticipate & Absorb, Respond & Recover, and Advance & Adapt. All resilience activities included in the CCRP, meet one of these key objectives.

In order to characterize the benefits of newly proposed projects and programs, NYSEG used the Business Case Justification (BCJ) Framework. The BCJ was performed to aid in identifying priority assets identified for resilience measure implementation. The framework shows the respective asset's score for each of the following considerations: System Reliability, Community Safety, and Community Resilience.

Implementing resilience measures to protect against flooding, extreme heat, and wind/wind-and-ice events will be necessary for achieving electric system-wide resilience under future climate change projections. This CCRP proposed multiple resilience measures, including their associated costs and timelines, that are expected to build resilience to these effects. In the future, performance measures will be used to measure the success of the proposed resilience measures. These performance measures updates will be filed biennially in accordance with PSL §66 (29) and include an implementation update with respect to the original CCRP cost and timeline.

In addition, NYSEG will file its next updated climate change resilience plan by November 21, 2028. These updated plans will utilize the most up to date standards, data, and climate projections with the results incorporated into future CCRPs.

# Appendix A: Example BCJ Scores

## Sample Prioritization Frameworks: Distribution Circuits and Extreme Wind

Using the BCJ Framework described in Section 4.3, the top 10 BCJ scores for distribution circuits and extreme wind are listed below for NYSEG East and NYSEG West. The resulting BCJ scores are a product of the System Reliability score, Community Safety score, and Community Resilience score. The following listing is presented for informational purposes only; the final order of implementation of Distribution Resiliency Projects will be determined by the Distribution Planning group using the most recent information available.

*NYSEG East - Top 10 Wind BCJ Scores*

| Substation Name | Circuit Number | System Reliability Score | Community Safety Score | Community Resilience Score | BCJ Score | DAC |
|---|---|---|---|---|---|---|
| Amawalk | 451 | 5 | 5 | 5 | 100% | No |
| Bedford Hills | 225 | 5 | 5 | 5 | 100% | No |
| Bedford Hills | 462 | 5 | 5 | 5 | 100% | No |
| Cross River | 469 | 5 | 5 | 5 | 100% | No |
| Cross River | 470 | 5 | 5 | 5 | 100% | No |
| Goldens Bridge | 418 | 5 | 5 | 5 | 100% | No |
| West Patterson | 474 | 5 | 5 | 5 | 100% | No |
| Pawling | 509 | 5 | 5 | 5 | 100% | Yes |
| Pawling | 508 | 5 | 5 | 5 | 100% | Yes |
| Peach Lake | 249 | 5 | 5 | 5 | 100% | No |

*NYSEG West - Wind BCJ Scores*

| Substation Name | Circuit Number | System Reliability Score | Community Safety Score | Community Resilience Score | BCJ Score | DAC |
|---|---|---|---|---|---|---|
| Davis Rd. | 380 | 5 | 4 | 4.5 | 90% | No |
| Davis Rd. | 382 | 5 | 4 | 4.5 | 90% | No |
| Davis Rd. | 383 | 5 | 4 | 4.5 | 90% | No |
| Langer Rd. | 434 | 5 | 4 | 4.5 | 90% | Yes |
| Losson Rd. | 401 | 5 | 4 | 4.5 | 90% | Yes |
| Chestnut Ridge | 190 | 5 | 5 | 4.5 | 90% | Yes |
| Holland | 321 | 5 | 4 | 4 | 87% | No |
| Cobble Hill | 530 | 5 | 4 | 4 | 87% | No |
| Macedon | 602 | 5 | 5 | 3 | 87% | No |
| Van Buren | 606 | 5 | 5 | 3 | 87% | Yes |

## Sample Prioritization Frameworks: Distribution Circuits and Extreme Wind-and-Ice

Using the BCJ Framework described in Section 4.3, the top 10 BCJ scores for distribution circuits and extreme wind-and-ice are listed below for NYSEG East and NYSEG West. The resulting BCJ scores are a product of the System Reliability score, Community Safety score, and Community Resilience score. The following listing is presented for informational purposes only; the final order of implementation of Distribution Resiliency Projects will be determined by the Distribution Planning group using the most recent information available.

*NYSEG East - Top 10 Wind-and-Ice BCJ Scores*

| Substation Name | Circuit Number | System Reliability Score | Community Safety Score | Community Resilience Score | BCJ Score | DAC |
|---|---|---|---|---|---|---|
| Amawalk | 451 | 5 | 5 | 5 | 100% | No |
| Bedford Hills | 462 | 5 | 5 | 5 | 100% | No |
| Bedford Hills | 225 | 5 | 5 | 5 | 100% | No |
| Canaan | 145 | 5 | 5 | 5 | 100% | No |
| Craryville | 400 | 5 | 5 | 5 | 100% | No |
| Craryville | 610 | 5 | 5 | 5 | 100% | No |
| Cross River | 470 | 5 | 5 | 5 | 100% | No |
| Cross River | 469 | 5 | 5 | 5 | 100% | No |
| Goldens Bridge | 418 | 5 | 5 | 5 | 100% | No |
| Grossinger | 211 | 5 | 5 | 5 | 100% | Yes |

*NYSEG West – Top 10 Wind-and-Ice BCJ Scores*

| Substation Name | Circuit Number | System Reliability Score | Community Safety Score | Community Resilience Score | BCJ Score | DAC |
|---|---|---|---|---|---|---|
| Davis Rd. | 382 | 5 | 4 | 4.5 | 90% | No |
| Davis Rd. | 383 | 5 | 4 | 5 | 93% | No |
| Holland | 321 | 5 | 4 | 5 | 93% | No |
| Langner Rd. | 434 | 5 | 4 | 5 | 93% | Yes |
| Losson Rd. | 401 | 5 | 4 | 5 | 93% | Yes |
| Chestnut Ridge | 190 | 4 | 5 | 5 | 93% | Yes |
| Cobble Hill | 530 | 5 | 4 | 4 | 87% | No |
| Davis Rd. | 380 | 5 | 4 | 5 | 93% | No |
| New Gardenville | 536 | 5 | 4 | 4.5 | 90% | Yes |
| W. Varysburg | 355 | 5 | 4 | 4.5 | 90% | No |

# Appendix B: 2026 Distribution Resiliency Circuits

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# CCRP Update – Appendix B:

## 2026 NYSEG Distribution Resiliency Program

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# KLINE KILL 630 & 631

# NYSEG – MECHANICVILLE – KLINEKILL 630 & 631 – $2.26M – 4Q2026

## DISTRIBUTION NEEDS SUMMARY

1. 1477 Customers on Kline Kill 630 and 1904 on 631 (within criteria of 2500-3000)
2. Major Outages
3. Total Customer affected: 2395 (Exc Storm) & 7156 (Inc Storm) on Kline Kill 630 Additionally 5116 (Exc Storm) and 8001 (Inc Storm) on Kline Kill 631
4. Kline Kill 630 has existing ties with 631 & Two (2) Ties with Falls park 641 (One Tie can provide a limited support during N-1 due to step down transformers).Kline Kill 631 has existing tie with 630 & Craryville 610(which can provide very limited support).

5.1. Power Flow analysis has indicated (2) Single Phase step banks are overloaded on Kline Kill 630 at L-150 P-5785 by 146.2% and L-140 P-9993A (116.5%)

5.2. Power Flow analysis has indicated (5) Three Phase Step Banks are overloaded on Kline Kill 631 at L-95 p-67 (122%), L-175 P-4997 (120.4%),L-109 P-5 (110%), L-106 P-4 (101%) and L-98 P-1 (100.6%)

6. Power Flow analysis has indicated there are some thermal and low voltage violations during N-1.

## CIRCUIT KEY CHARACTERISTICS FOR 630

**AUTOMATION:**

- 1 – SCADA N.O. Ckt. Tie
- 3 – SCADA N.C. Device

**TOPOLOGY & HARDENING:**

- 34.5 kV
- 65.59 – PRI Ckt. Miles

**VEGETATION:**

- Last Trimmed – 2021

## CIRCUIT KEY CHARACTERISTICS FOR 631

**AUTOMATION:**

- 1 – SCADA N.O. Ckt. Tie
- 5 – SCADA N.C. Device

**TOPOLOGY & HARDENING:**

- 34.5 kV
- 126.78 – PRI Ckt. Miles

**VEGETATION:**

- Last Trimmed – 2020

| OPCO | DIVISION | Circuit | Description | Circuit Voltage | Total Customers | Incident count | Customer Count | Customer Hours | SAIFI | SAIFI Weight | 22_23 | 21_22 | 20_21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NYSEG | Mechanicville | 1205403 | Kline Kill 631 | 34500 | 1866 | 72 | 2936 | 6000.24 | 0.0032344 | 0.002342 | 2 | 1 | 1.1 |
| NYSEG | Mechanicville | 1205402 | Kline Kill 630 | 34500 | 1464 | 38 | 2807 | 4623.082 | 0.0030938 | 0.00224 | 2 | 3 | 2 |

Figure 9: Kline Kill 630 & 631 Red Circuit List Information

# NYSEG – MECHANICVILLE – KLINEKILL 630 & 631 – $2.26M – 4Q2026

## DISTRIBUTION NEEDS SUMMARY

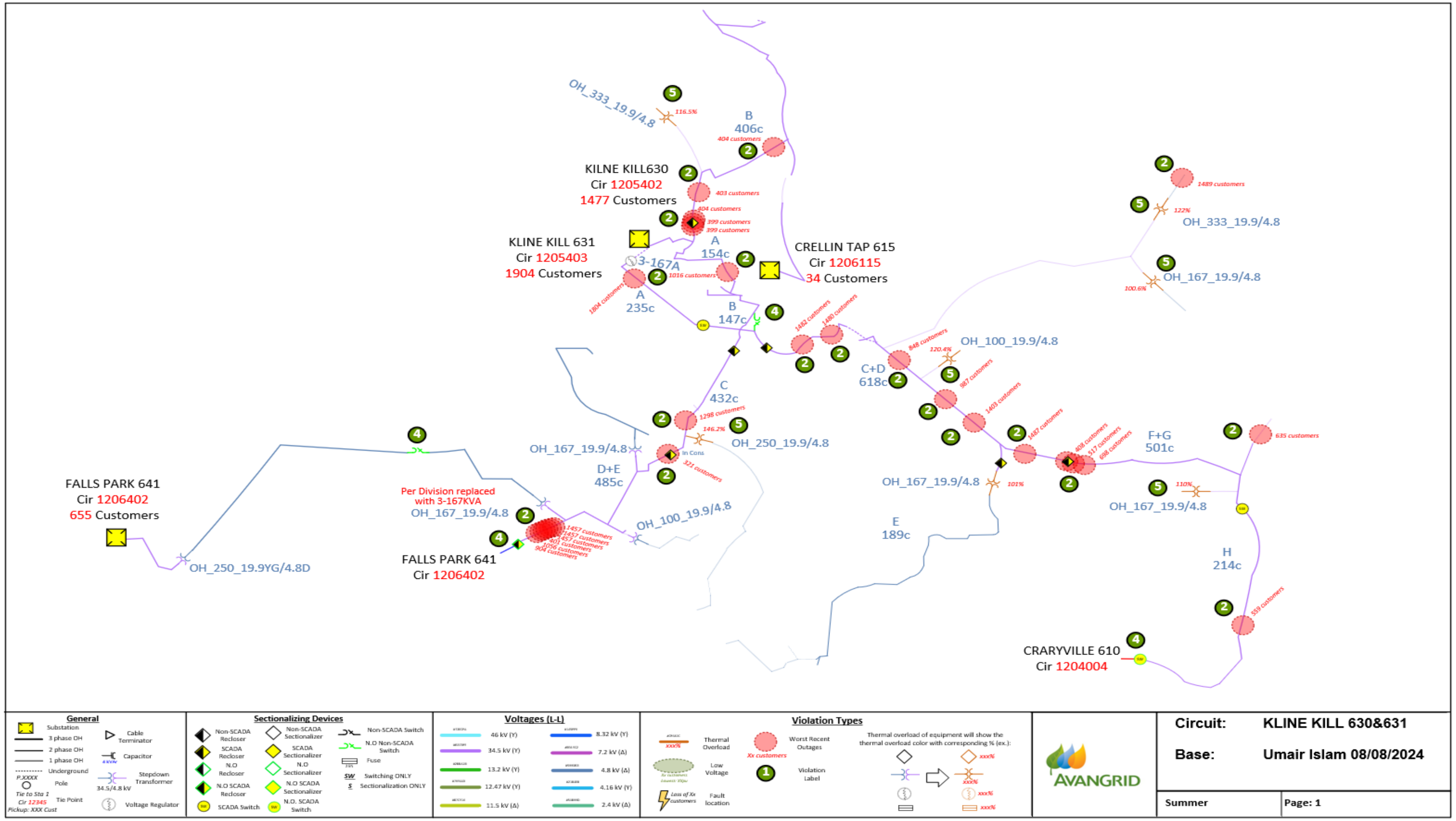


Figure 10: Kline Kill 630 & 631 One Line Diagram, Needs

# NYSEG – MECHANICVILLE – KLINEKILL 630 – $2.26M – 4Q2026

## DISTRIBUTION OUTAGE SUMMARY

| Annual Reliability KPIs Based on 2021-2023 Outage Data | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Contribution to System SAIFI | Contribution to System SAIDI(h) | Contribution to System SAIFI(%) | Customer Hours | Customers Affected | SAIFI | SAIDI |
| Inc. Storm | 0.007888 | 0.028877 | 0.38% | 26,241.16 | 7,156 | 4.924 | 18.03 |
| Exc. Storm | 0.002642 | 0.004668 | 0.19% | 4,230.22 | 2,395 | 1.649 | 2.914 |

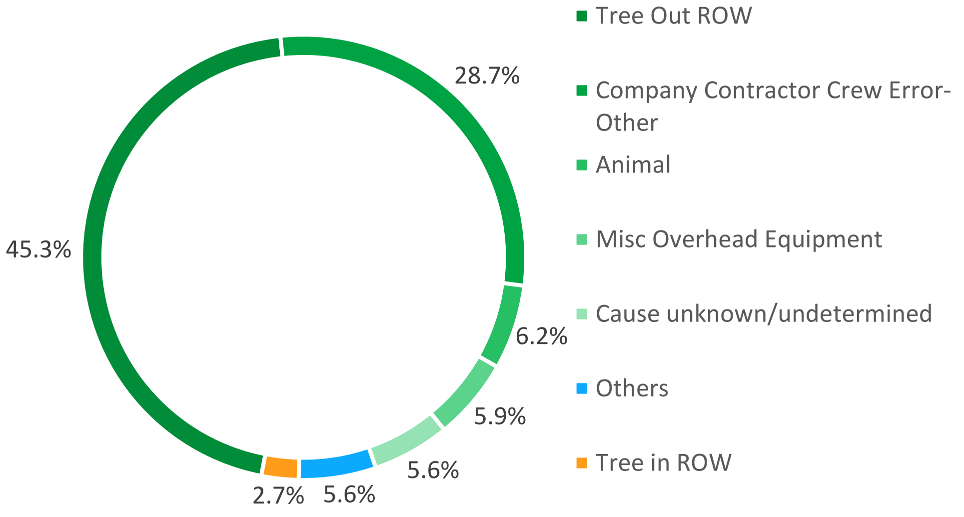


Figure 11: Main Outage Causes for Kline Kill 630 From 2021-2023 Without Storm Data

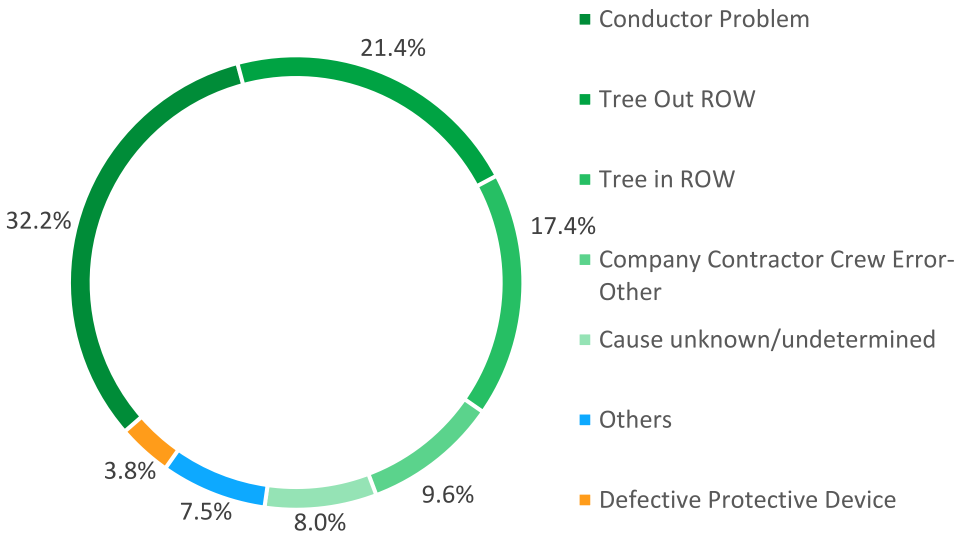


Figure 12: Main Outage Causes for Kline Kill 630 From 2021-2023 With Storm Data

# NYSEG – MECHANICVILLE – KLINEKILL 631 – $2.26M – 4Q2026

## DISTRIBUTION OUTAGE SUMMARY

| Annual Reliability KPIs Based on 2021-2023 Outage Data | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Contribution to System SAIFI | Contribution to System SAIDI(h) | Contribution to System SAIFI(%) | Customer Hours | Customers Affected | SAIFI | SAIDI |
| Inc. Storm | 0.008816 | 0.038134 | 0.42% | 34,674.84 | 8,001 | 4.29 | 18.54 |
| Exc. Storm | 0.00564 | 0.008556 | 0.41% | 7,768.50 | 5,116 | 2.74 | 4.161 |

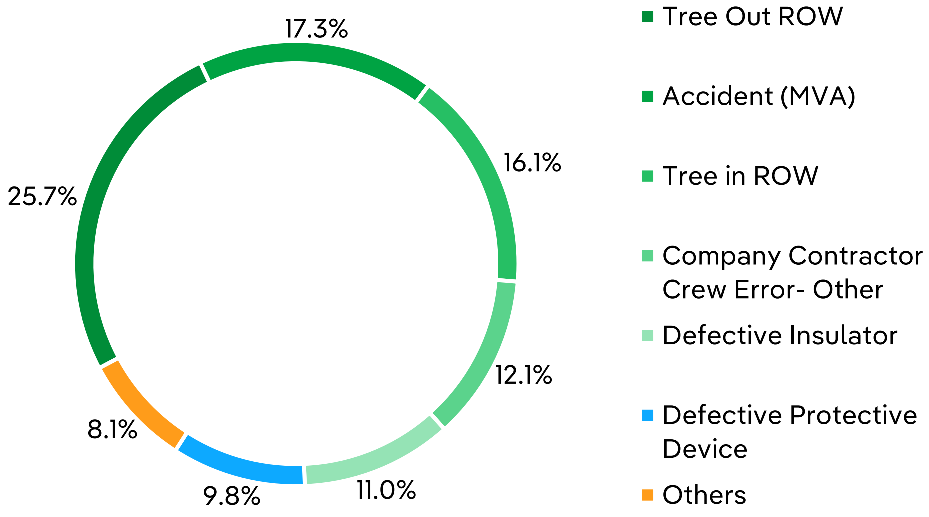


Figure 13: Main Outage Causes for Kline Kill 631 From 2021-2023 Without Storm Data

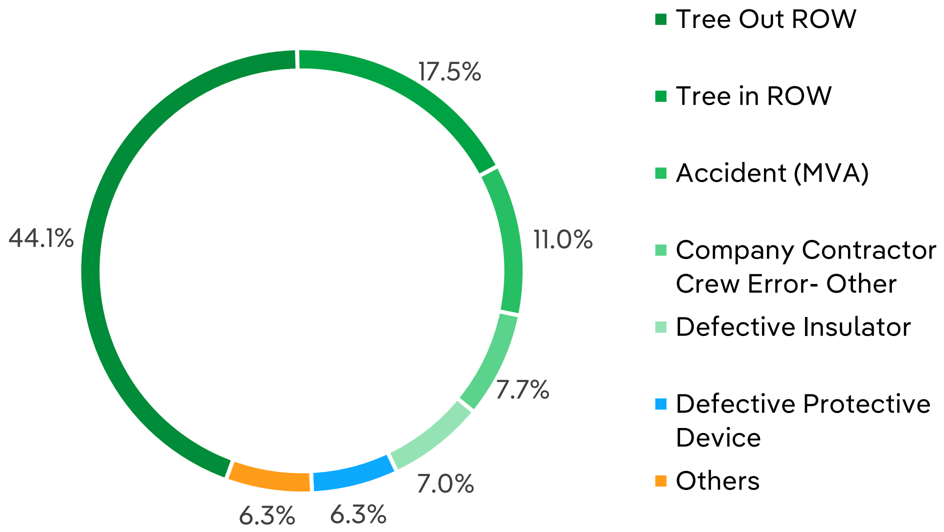


Figure 14: Main Outage Causes for Kline Kill 631 From 2021-2023 With Storm Data

# NYSEG – MECHANICVILLE – KLINEKILL 630 & 631 – $2.26M – 4Q2026

## PROJECT SCOPING SUMMARY

1.1. Improve the Existing Tie between Kline Kill 631 and Craryville 610 to support N-1

1.2. Reconductor ~0.05 miles Exit Conductor 3P_2ALURD_2AL(N) to 500CU

1.3. Reconductor ~0.29 miles 3P_2ALURD_2AL(N) to 3P 500CU with Neutral Wire from L175 P4941 to L175 P4950

1.4. Replace existing 3-167A Feeder Regulator bank with 3- 335A Regulator Bank

1.5. Install 3-200A Regulator at L269 P195

2.1. Replace Exiting Overloaded transformers on Kline Kill 630 at:

- L150 P5785 from 1-250KVA to 500_19.9YG/4.8D
- L140 P9993 from 1-333KVA to 500_19.9YG/4.8D.

2.2. Replace Exiting Overloaded transformers on Kline Kill 631 at:

- L95 P48 from 167KVA to 1-333_19.9YG/4.8D,
- L95 P66 from 1-333KVA to 500_19.9YG/4.8D
- L175 P4997 from 1-100KVA to 250KVA_19.9YG/4.8D
- L106 P4 from 3-167KVA to 3-333_19.9YG/4.8D
- L109 P5 from 1-167KVA to 333_19.9YG/4.8D.

3.1. Install N/O SCADA switch at L150 P5701

3.2. Install N/C SCADA recloser at L-175 P5025

3.3. Install N/C SCADA recloser at L109 P1367

3.4. Install N/C SCADA recloser at L189 P6186

4. Relocate 0.23miles 4/0AC on Kline Kill 630 off road to roadway from L1113 P55 to L1113 P62.

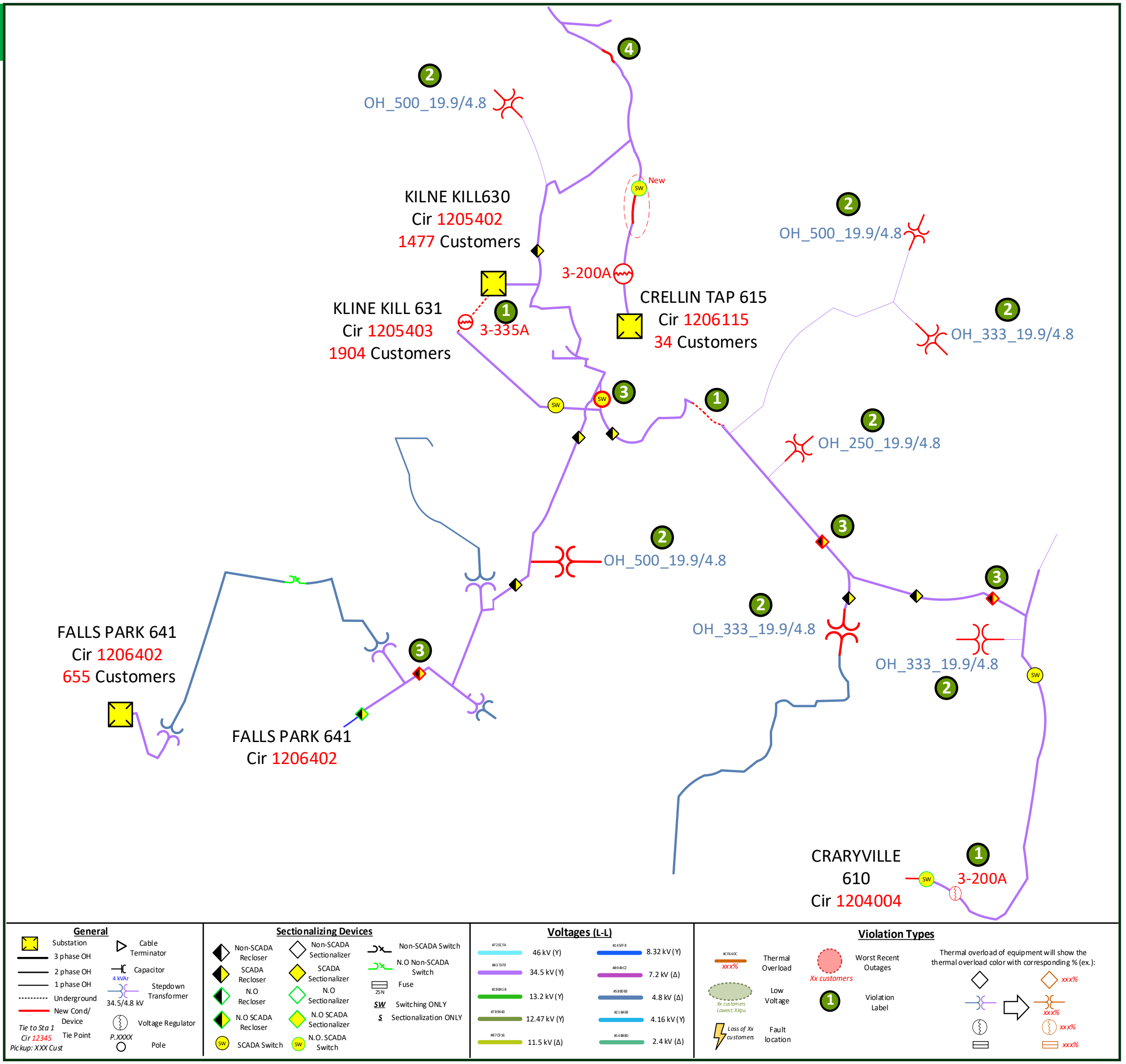


Figure 15: Kline Kill 630 & 631 Oneline Diagram, Solutions

# NYSEG – MECHANICVILLE – KLINEKILL 630 & 631 – $2.26M – 4Q2026

## COST ANALYSIS

**Automation**

SCADA Devices Installed: 4

Cost: $600,000

**Hardening &Topology:**

Upgrade (1) Regulator Bank – 3-167A to 3-335A

Install (1) Regulator Bank – 200A

Reconductor 0.34 miles - to 3P_500CUURD

Replace 7-step transformers - 3-500KVA, 3-333KVA and 1-250KVA

Relocate Conductor - 0.23miles 4/0 AC off road to roadway

Cost: $1,663,000

**Total Cost:**
**$2,263,000**



Figure 17: Kline Kill 630 & 631 Customer Impact

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# SHANDAKEN 501

# NYSEG – ONEONTA – SHANDAKEN 501– $3.51M – 4Q2026

## DISTRIBUTION NEEDS SUMMARY

1. 1916 Customers on Shandaken 501 (within criteria of 2500-3000)
2. There are no circuit ties and it has been deemed infeasible to create a tie with Shandaken 12
3. Major outages occur along the mainline
4. Isolated areas are not readily accessible and cross waterways through backlot
5. Step bank overloaded to 132%

## CIRCUIT KEY CHARACTERISTICS FOR 630

**AUTOMATION:**

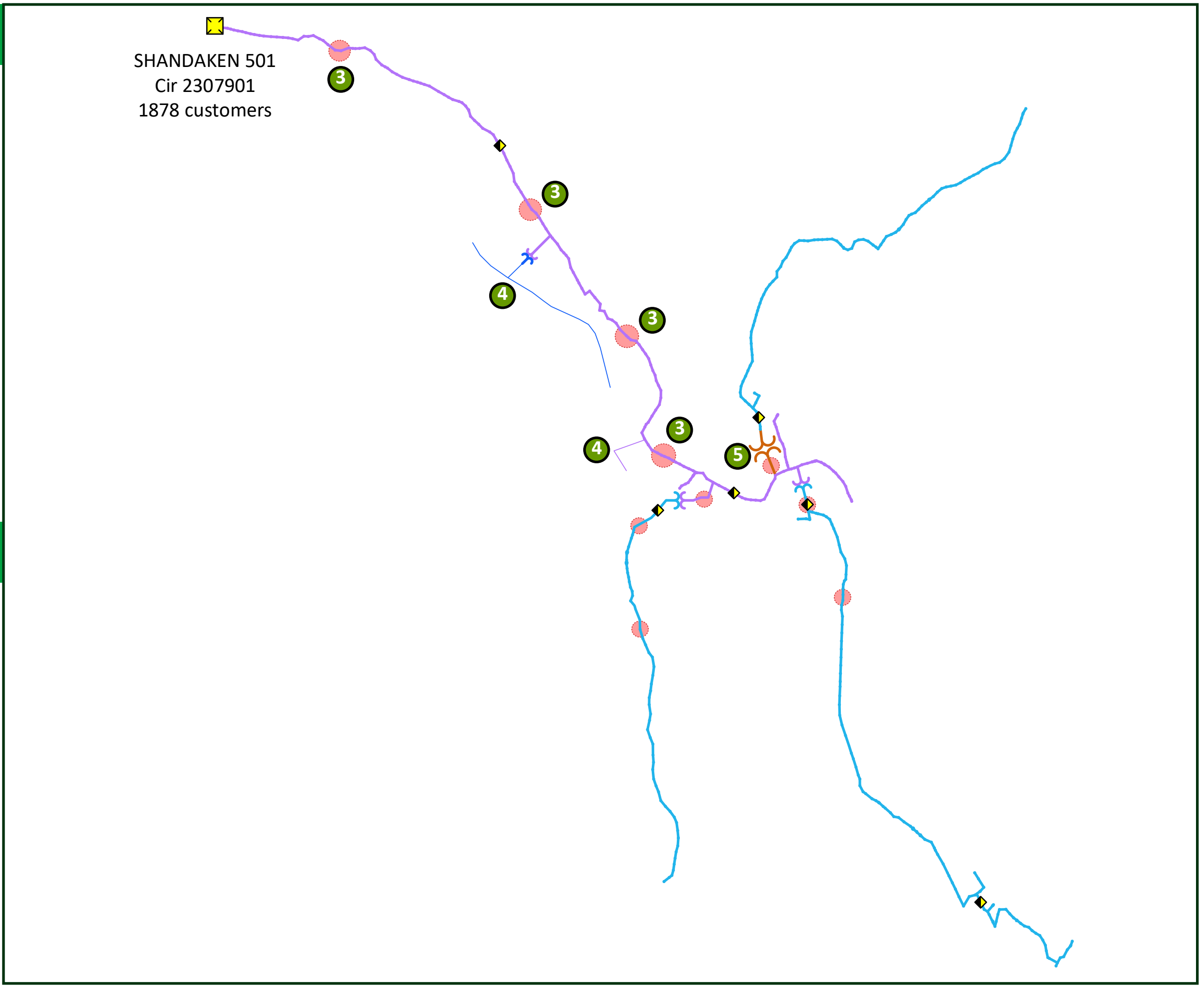
- 6 – SCADA N.C. Device

**TOPOLOGY & HARDENING:**

- 34.5 kV
- 61.13 – PRI Ckt. Miles

**VEGETATION:**

- Last Trimmed – 2020




| OPCO | DIVISION | Circuit | Description | Circuit Voltage | Total Customers | Incident count | Customer Count | Customer Hours | SAIFI | SAIFI Weight | 22_23 | 21_22 | 20_21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NYSEG | Oneonta | 2307901 | SHANDAKEN 501 | 34500 | 1878 | 44 | 6331 | 24939.6 | 0.00697249 | 0.005049 | 1 | 2 | 1.1 |

Figure 18: Shandaken 501 Red Circuit List

# NYSEG – ONEONTA – SHANDAKEN 501– $3.51M – 4Q2026

## DISTRIBUTION OUTAGE SUMMARY

| Annual Reliability KPIs Based on 2021-2023 Outage Data | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Contribution to System SAIFI | Contribution to System SAIDI(h) | Contribution to System SAIFI(%) | Customer Hours | Customers Affected | SAIFI | SAIDI |
| Inc. Storm | 0.010659 | 0.048069 | 0.51% | 43,565.52 | 9,664 | 5.214 | 23.514 |
| Exc. Storm | 0.007113 | 0.025464 | 0.51% | 23,092.12 | 6,451 | 3.479 | 12.456 |

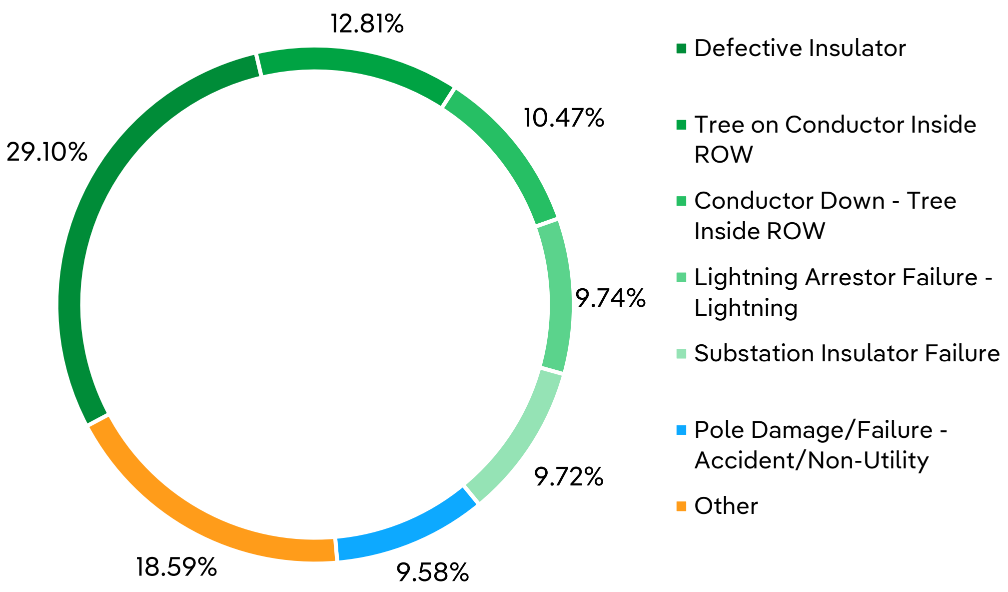



Figure 19: Shandaken 501 Red Circuit List Main Outage Causes for Shandaken 501 From 2021-2023 Without Storm Data

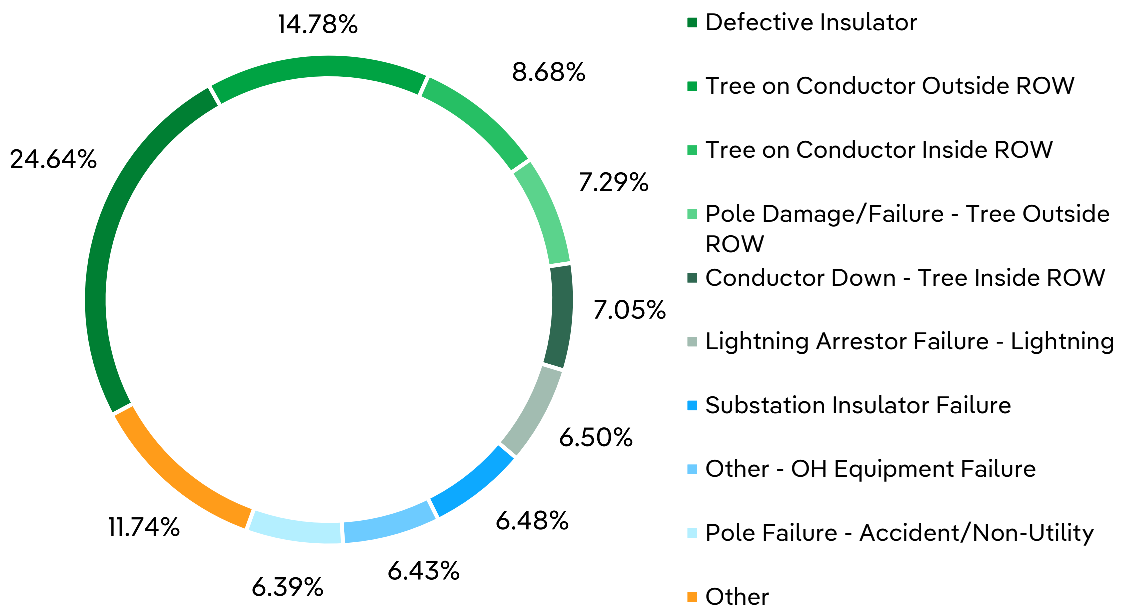



Figure 20: Shandaken 501 Red Circuit List Main Outage Causes for Shandaken 501 From 2021-2023 With Storm Data

# NYSEG – ONEONTA – SHANDAKEN 501– $3.51M – 4Q2026

## PROJECT SCOPING SUMMARY

1.1. Relocate 0.34 miles of line with 3 Phase 477ALTW with neutral wire to road from L321 P25 to L321 P34

1.2. Reconductor 0.12 miles of line with 3 Phase 477ALTW with neutral wire from L321 P41 to L321 P45

1.3. Relocate 0.19 miles of line with 3 Phase 477ALTW with neutral wire to road from L321 P51 to L321 P55

1.4. Relocate 0.33 miles of line with 3 Phase 477ALTW with neutral wire to road from L321 P79 to L321 P89

1.5. Relocate 1.26 miles of line with 3 Phase 477ALTW with neutral wire to road from L321 P104 to L321 P141

1.6. Reconductor 0.2 miles of line with 3 Phase 477ALTW with neutral wire from L321 P166 to L321 P175

2.1. Relocate 3-500kVA Overhead Step Bank downstream and convert section from 8.32kV to 34.5kV and relocate Recloser to be after the step bank from L330 P1 to L330 P32

3.7. Remove over-water step banks and create a 2 phase 4.16kV line to absorb the stranded single-phase sections

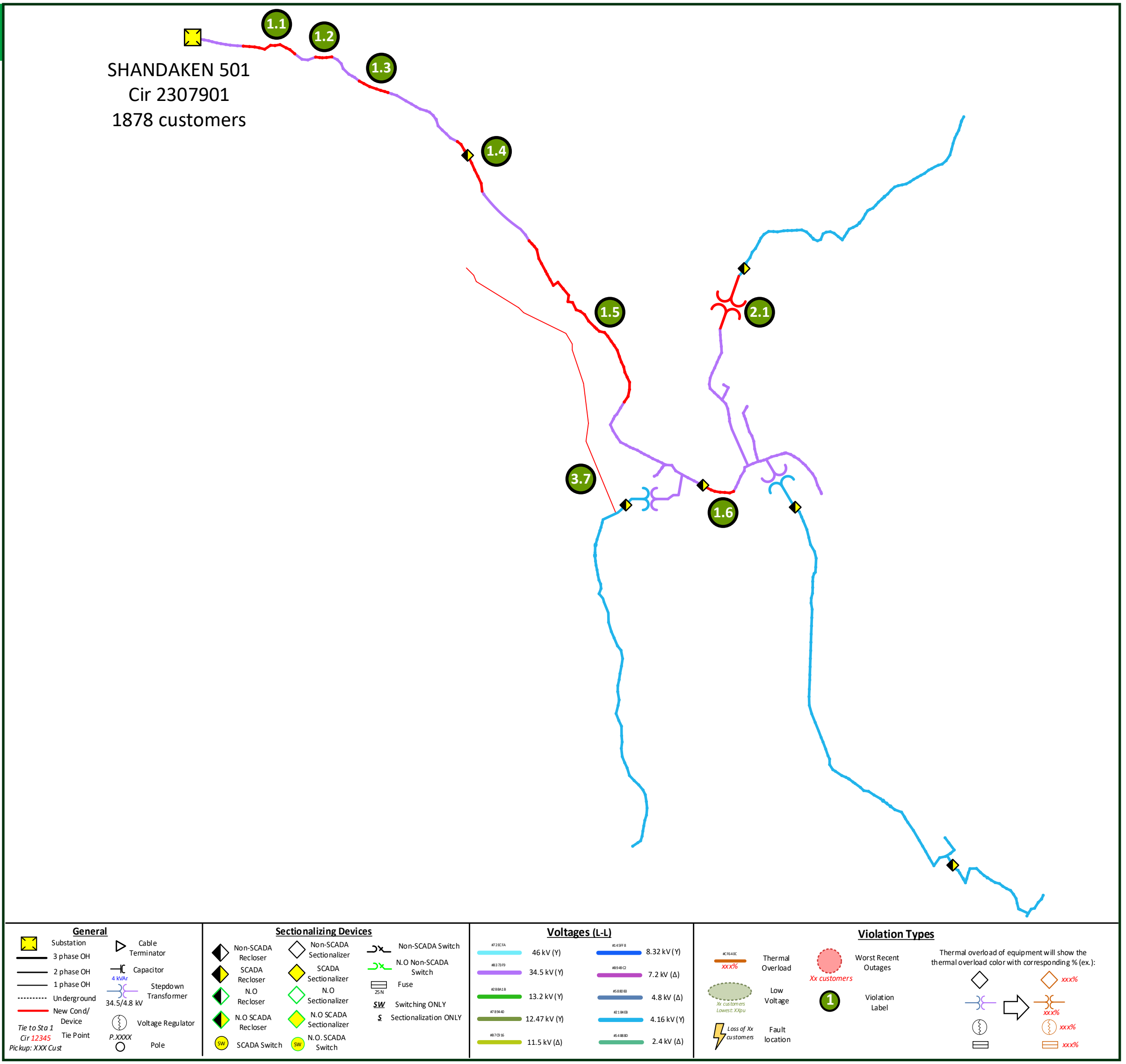



Figure 21: Shandaken 501 Oneline Diagram, Solutions

# NYSEG – ONEONTA – SHANDAKEN 501– $3.51M – 4Q2026

## COST ANALYSIS

**Automation**

SCADA Devices Installed: 1

Cost: $100,000

**Vegetation Management**

Miles of EVM: 2.44

Cost: $48,800

**Hardening &Topology:**

Miles of Mainline Relocation with 477ALTW : 2.12

Miles of Mainline Reconductoring to 477ALTW – 0.32

Miles of New Line – 0.54

Install 2 Step transformers - 3-500KVA and 3-167KVA

Miles of Voltage Conversion – 1.12

Cost: $3,359,500

**Total Cost:**
**$3,508,300**

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# CEMETERY RD 490 & NO. BROADWAY 535

# NYSEG – LANCASTER – CEMETERY RD 490 & NO. BROADWAY 535 – $2.62M – 4Q2026

## DISTRIBUTION NEEDS SUMMARY

1. 2255 Customers on Cemetery Rd 490 (within criteria of < 2500) and 2229 Customers on No. Broadway 535 (within criteria of 2500 - 3000)
2. Major Outages
3. Total Customer affected: 5580 (Exc Storm) & 6482 (Inc Storm) on Cemetery Rd 490 Additionally 2515 (Exc Storm) and 3397 (Inc Storm) on No. Broadway 535
4. Cemetery Rd 490 has existing ties with Erie St. 207, Blossom 313, No. Broadway 535 & Two (2) Ties with Cemetery Rd 492 (which can provide very limited support).
5. No. Broadway 535 has existing ties with Cemetery Rd 490, Blossom 313, Blossom 517 & No. Broadway 544 (which can provide very limited support).

## CIRCUIT KEY CHARACTERISTICS FOR 490

**AUTOMATION:**

- 4 – SCADA N.O. Ckt. Tie
- 6 – SCADA N.C. Device

**TOPOLOGY & HARDENING:**

- 12.47 kV
- 32.38 – PRI Ckt. Miles

**VEGETATION:**

- Last Trimmed – 2023

## CIRCUIT KEY CHARACTERISTICS FOR 535

**AUTOMATION:**

- 4 – SCADA N.O. Ckt. Tie
- 4 – SCADA N.C. Device

**TOPOLOGY & HARDENING:**

- 34.5 kV
- 33.28 – PRI Ckt. Miles

**VEGETATION:**

- Last Trimmed – 2024

| OPCO | Division | Circuit | Description | Circuit Voltage | Circuit Total Customers | Incident Count | Customer Count | Customer Hours | SAIFI | SAIFI Weight | 22_23 RCL | 21_22 RCL | 20_21 RCL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NYSEG | Lancaster | 3103702 | CEMETERY RD 490 | 4800 | 2502 | 12 | 3339 | 6274.677 | 0.0037 | 0.002658 | 2 | 1.1 | 2 |
| NYSEG | Lancaster | 3104801 | NORTH BROADWAY 535 | 4800 | 2220 | 41 | 2574 | 1612.866 | 0.0028 | 0.002058 | 2 | 2 | 1.1 |

Figure 24: Cemetery Rd 490 & No. Broadway 535 Red Circuit List

# NYSEG – LANCASTER – CEMETERY RD 490 – $2.62M – 4Q2026

## DISTRIBUTION NEEDS SUMMARY

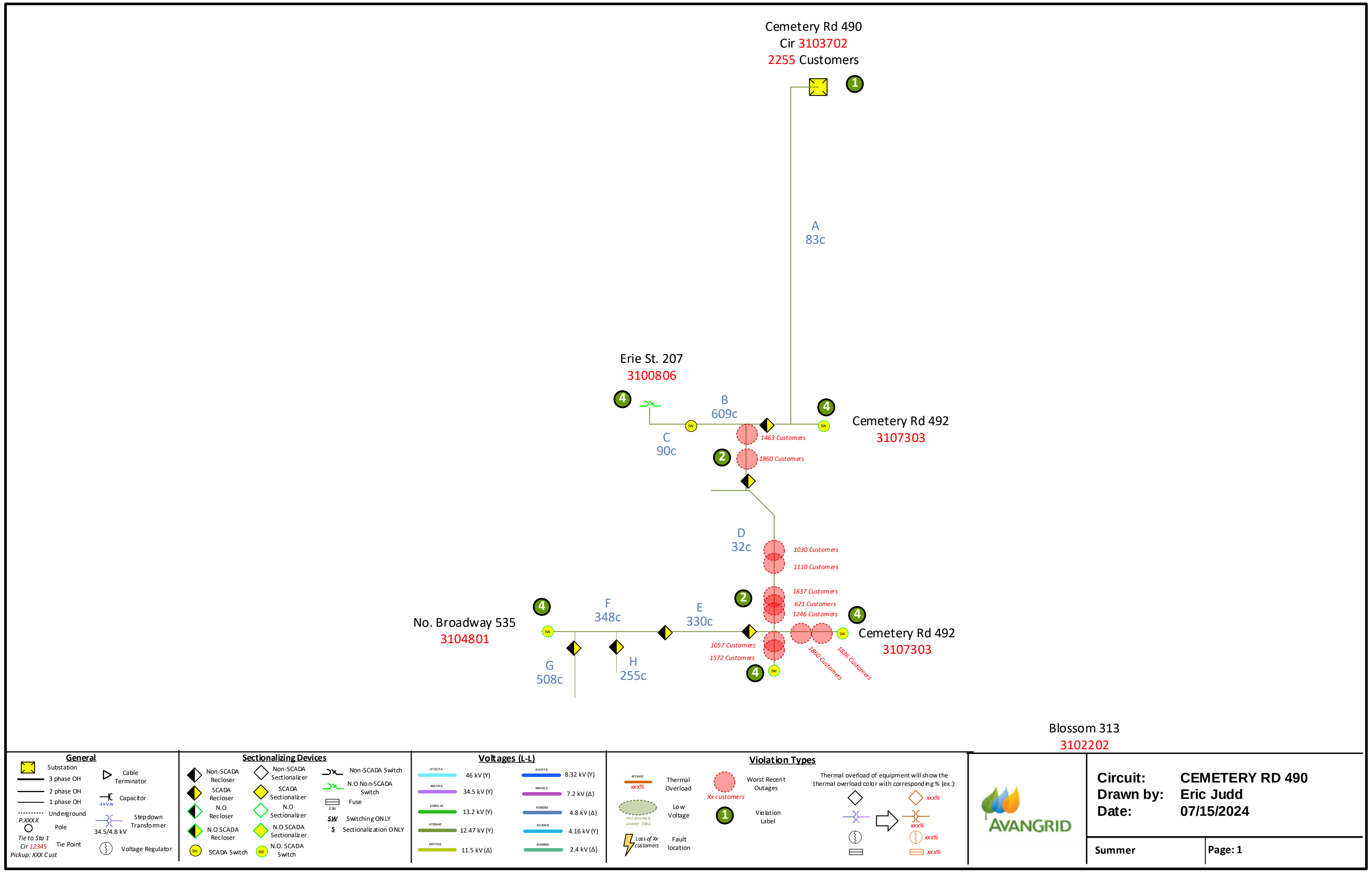


Figure 25: Cemetery Rd 490 Oneline Diagram, Needs

# NYSEG – LANCASTER – NO. BROADWAY 535– $2.62M – 4Q2026

## DISTRIBUTION NEEDS SUMMARY

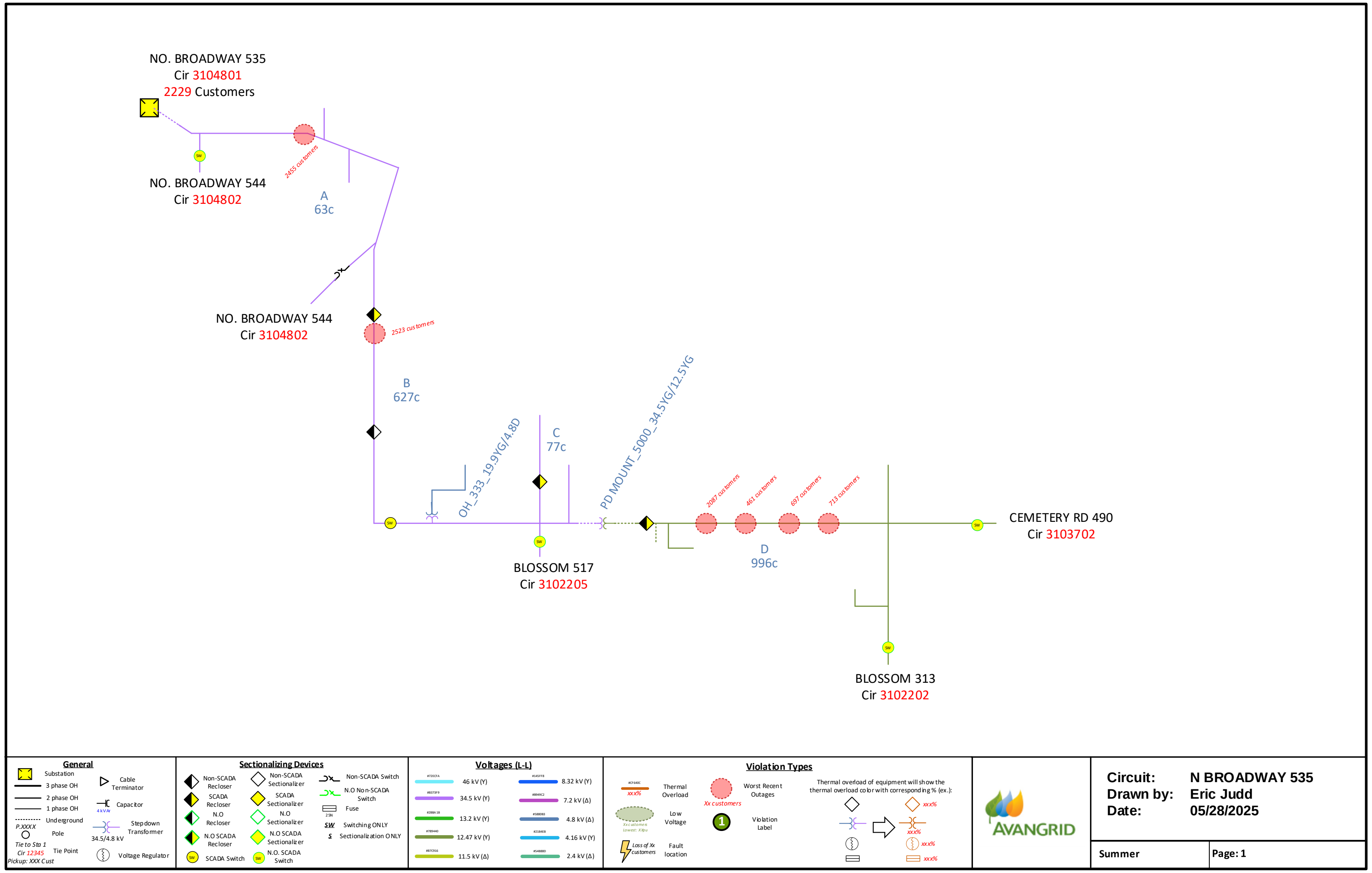


Figure 26: No. Broadway 535 Oneline Diagram., Needs

# NYSEG – LANCASTER– CEMETERY RD 490 – $2.62M – 4Q2026

## DISTRIBUTION OUTAGE SUMMARY

| Annual Reliability KPIs Based on 2021-2023 Outage Data | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Contribution to System SAIFI | Contribution to System SAIDI(h) | Contribution to System SAIFI(%) | Customer Hours | Customers Affected | SAIFI | SAIDI |
| Inc. Storm | 0.007146 | 0.01286 | 0.34% | 11,661.47 | 6,482 | 2.898 | 5.216 |
| Exc. Storm | 0.006157 | 0.011402 | 0.44% | 10,334.35 | 5,580 | 2.497 | 4.624 |

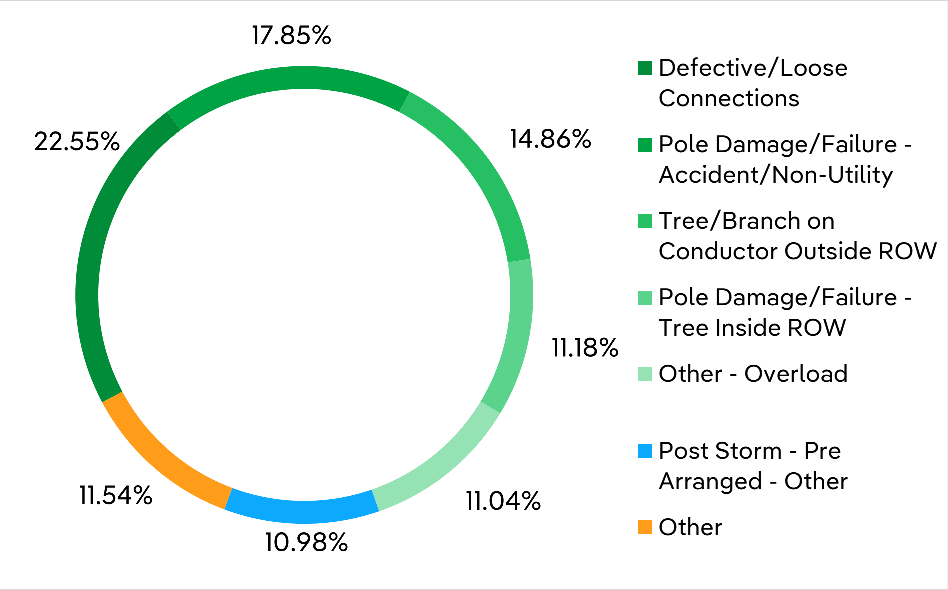


Figure 27: Main Outage Causes for Cemetery Rd 490 From 2021-2023 Without Storm Data

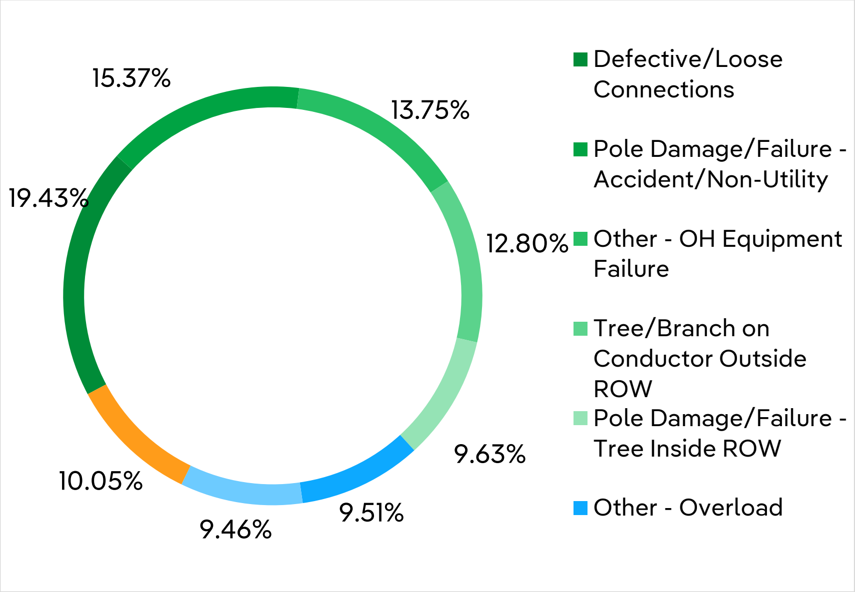


Figure 28: Main Outage Causes for Cemetery Rd 490 From 2021-2023 With Storm Data

# NYSEG – LANCASTER– NO. BROADWAY 535– $2.62M – 4Q2026

## DISTRIBUTION OUTAGE SUMMARY

| Annual Reliability KPIs Based on 2021-2023 Outage Data | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Contribution to System SAIFI | Contribution to System SAIDI(h) | Contribution to System SAIFI(%) | Customer Hours | Customers Affected | SAIFI | SAIDI |
| Inc. Storm | 0.003747 | 0.00701 | 0.18% | 6,367.29 | 3,397 | 1.537 | 2.875 |
| Exc. Storm | 0.002773 | 0.00448 | 0.10% | 4,076.35 | 21,515 | 1.137 | 1.837 |

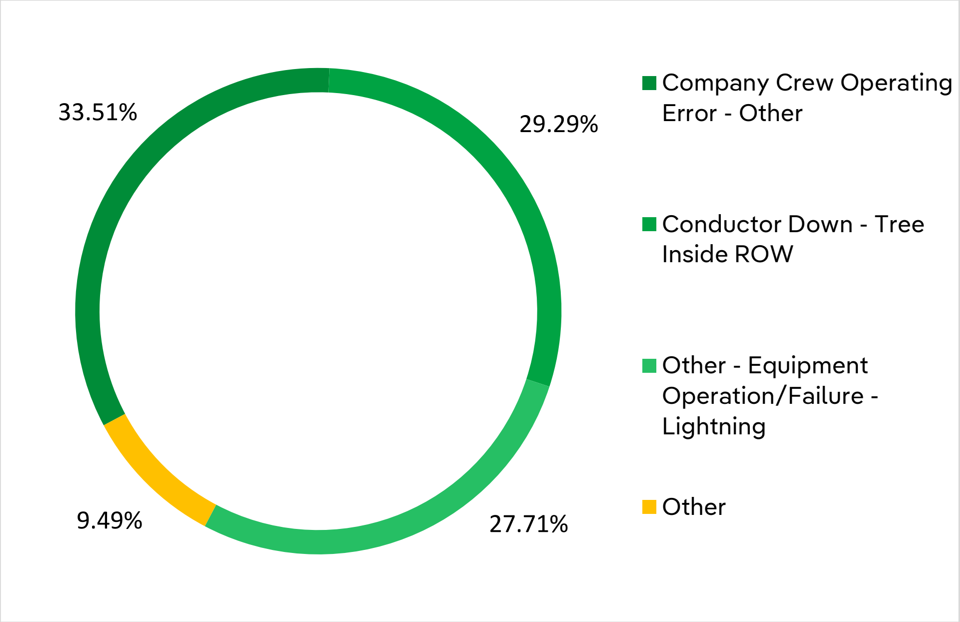


Figure 29: Main Outage Causes for No. Broadway 535 From 2021-2023 Without Storm Data

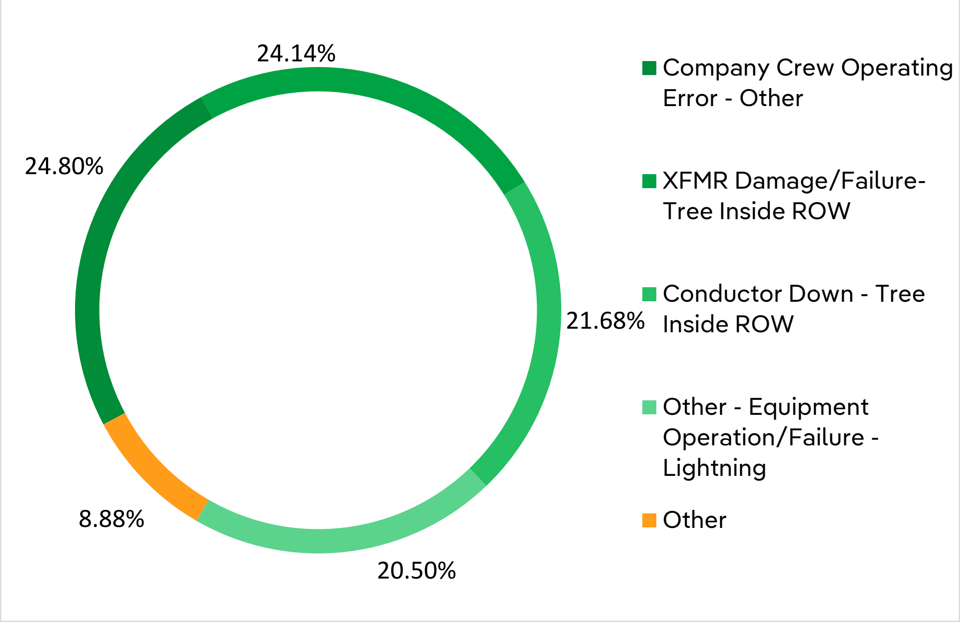


Figure 30: Main Outage Causes for No. Broadway 535 From 2021-2023 With Storm Data

# NYSEG – LANCASTER – CEMETERY RD 490 & NO. BROADWAY 535 – $2.62M – 4Q2026

## PROJECT SCOPING SUMMARY

1.1 - Install 3P 477AL Tree Wire with neutral wire (1.9 total miles) from L517 P192 to L289 P12 for increased capacity benefits and reduction of major outages

1.2 – Install 3P 477AL Tree Wire with neutral wire (1.2 total miles) from L289 P138 to L289 P173 for increased capacity benefits and reduction of major outages

2.1 – Upgrade 4.8D/12.47Y 3-333kVA Step bank on Erie St. 207 to a 3-500kVA

2.2 – Load Transfer 259kVA (90 Customers) from Cemetery Rd 490 to Erie St 207

3.1 - Install SCADA Recloser at L256 P2

3.2 - Install SCADA Recloser at L243 P60

3.3 - Install communications for existing non-scada enabled recloser at L220 P39

4.1 - Install 328A Regulator at L289 P138

4.2 - Install 656A Regulator at L511 P21

4.3 - Upgrade existing 3P 219A Regulator to a 3P 336A at L289 P15

5.1 - Upgrade 2ALURD Cable to 3P 750ALURD with neutral wire (0.1 mile) at LU1622 PU1 to L289 P137A

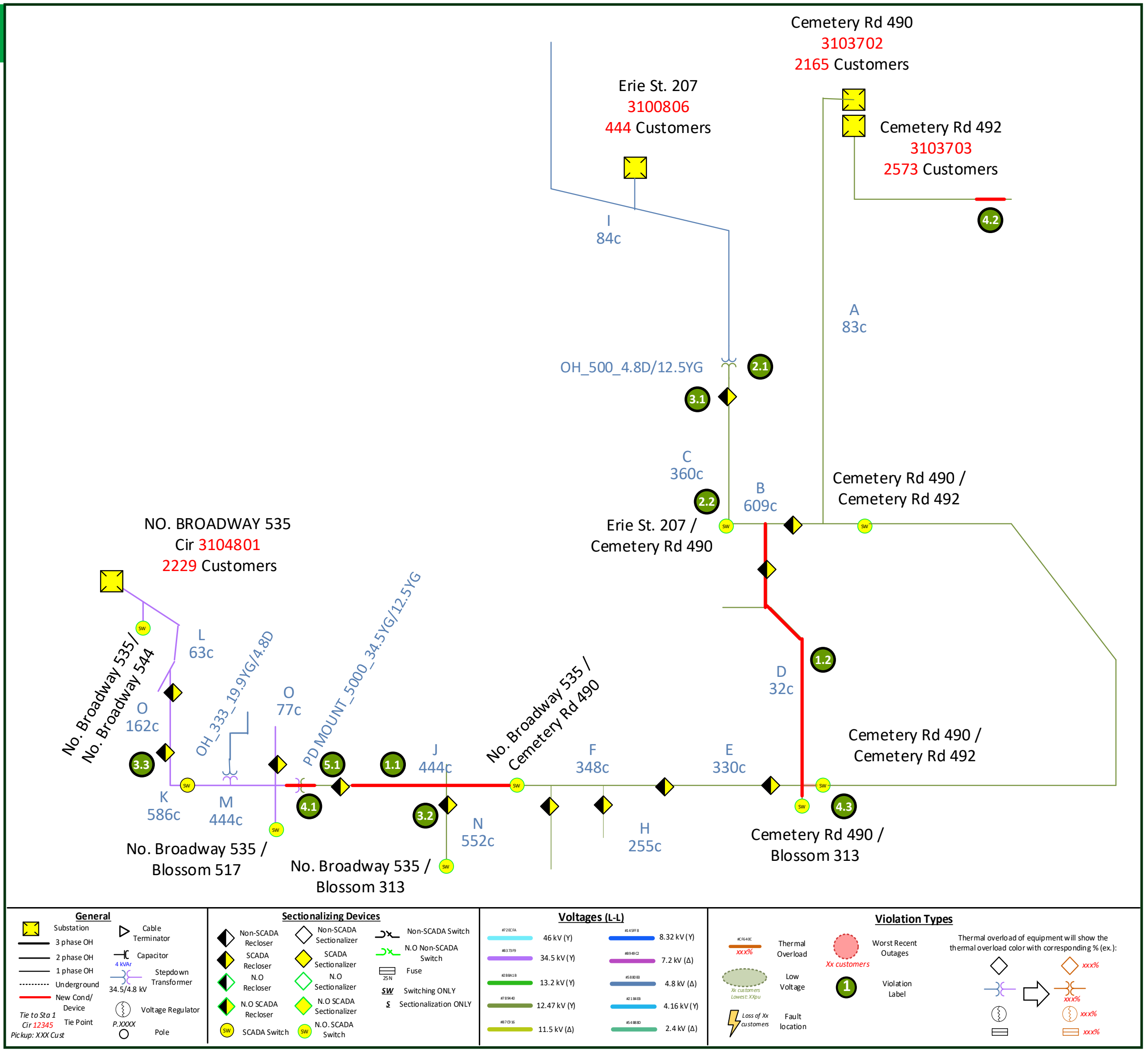


Figure 31: No Broadway 535 & Cemetery Rd 490 Oneline Diagram, Solutions

# NYSEG – LANCASTER – CEMETERY RD 490 & NO. BROADWAY 535– $2.62M – 4Q2026

## COST ANALYSIS

**Automation**

SCADA Devices Installed: 2

Add Communications: 1

Cost: $209,000

**Hardening &Topology:**

Upgrade (1) Regulator Bank – 3-219A to 3-336A

Install (2) Regulator Bank – 328A and 656A

Reconductor 3.1 miles - to 3P_477ALTW

Reconductor 0.1 miles – to 3P_750ALURD

Upgrade (1) step transformer – 3-333kVA to 3-500kVA

Load Transfer – 90 customers from Cemetery Rd 490 to Erie St. 207

Cost: $2,415,000

**Total Cost:**
**$2,624,000**

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# KATTLEVILLE 422

# NYSEG – BINGHAMTON – KATTLEVILLE 422 – $10.58 – 4Q2026

## DISTRIBUTION NEEDS SUMMARY

1. The Kattleville 422 customer count is 2,889 (within planning criteria)
   - Kattleville 422 has been on the red circuit list for the last 4 years
2. There is an existing tie with Sanitaria Springs 212 with capacity constraints during N-1 and cannot support all the load
3. Power flow analysis has indicated 4 step transformers are overloaded by 106%, 178%, 141%, and 106% during system normal (N-0)
   - There are some thermal and low voltage issues during N-1

## CIRCUIT KEY CHARACTERISTICS

**AUTOMATION:**

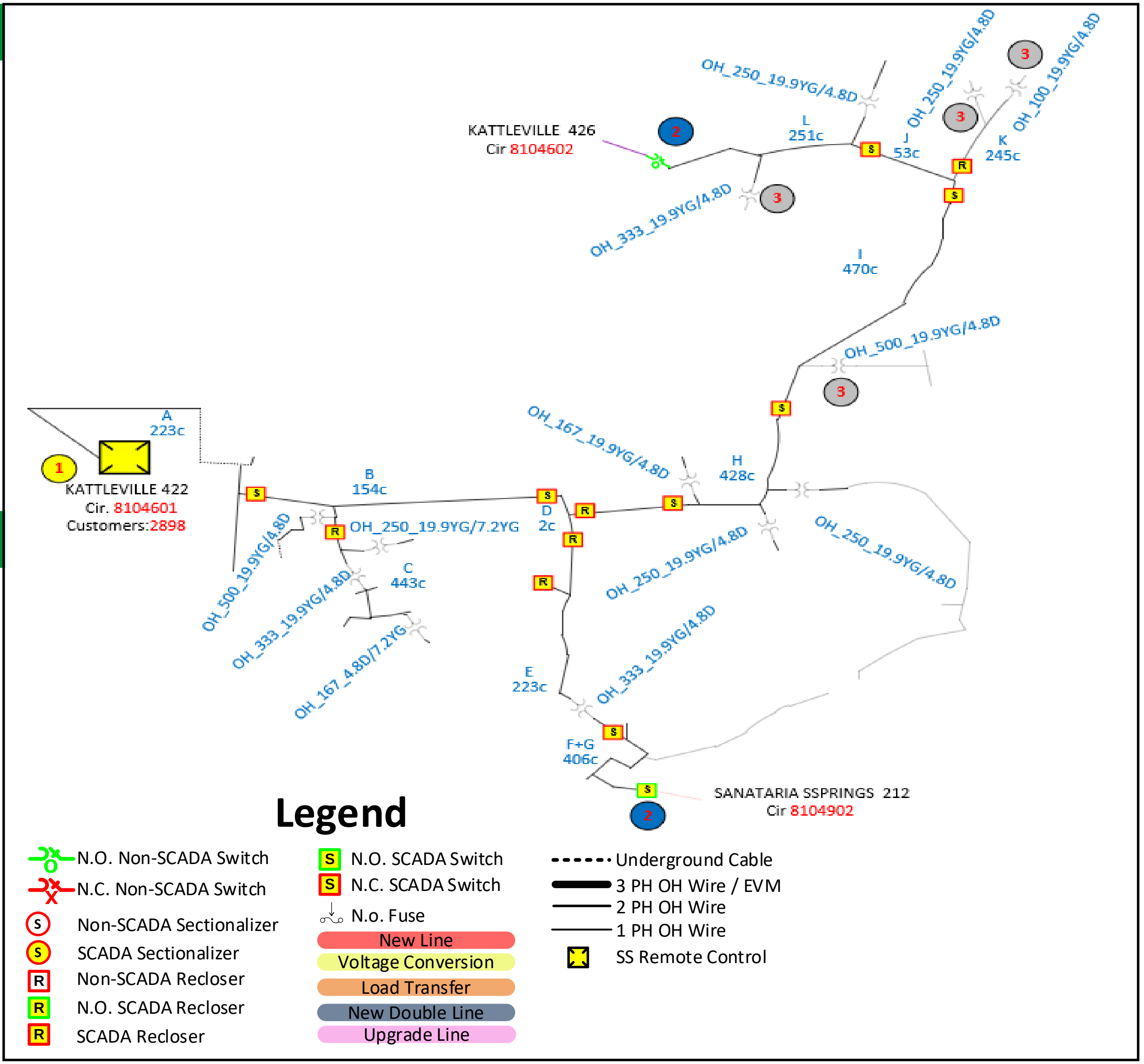
- 1 – SCADA N.O. Ckt. Tie
- 13 – SCADA N.C. Device

**VEGETATION:**

- Last Trimmed – 2021

**TOPOLOGY & HARDENING:**

- 34.5 kV
- 82.44 – PRI Ckt. Miles

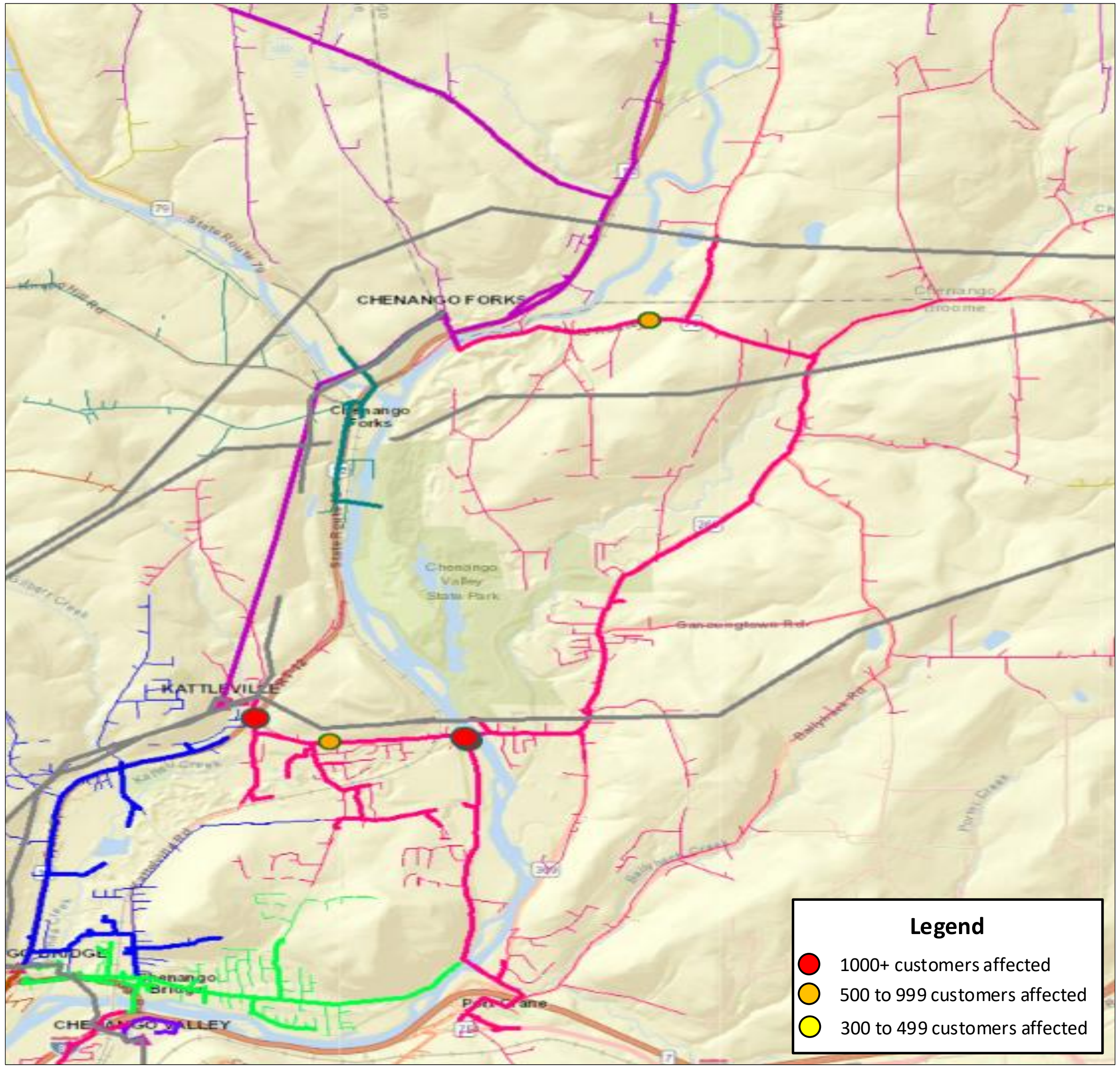


# NYSEG – BINGHAMTON – KATTLEVILLE 422 – $10.58 – 4Q2026

## DISTRIBUTION OUTAGE SUMMARY

| Annual Reliability KPIs Based on 2020-2022 Outage Data | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Contribution to System SAIFI | Contribution to System SAIDI(h) | Contribution to System SAIFI(%) | Customer Hours | Customers Affected | SAIFI | SAIDI |
| Inc. Storm | 0.00936 | 0.094243 | 0.43% | 85,260.73 | 8,465 | 2.976 | 30 |
| Exc. Storm | 0.006526 | 0.021847 | 0.46% | 19,714.63 | 5,899 | 2.075 | 6.95 |

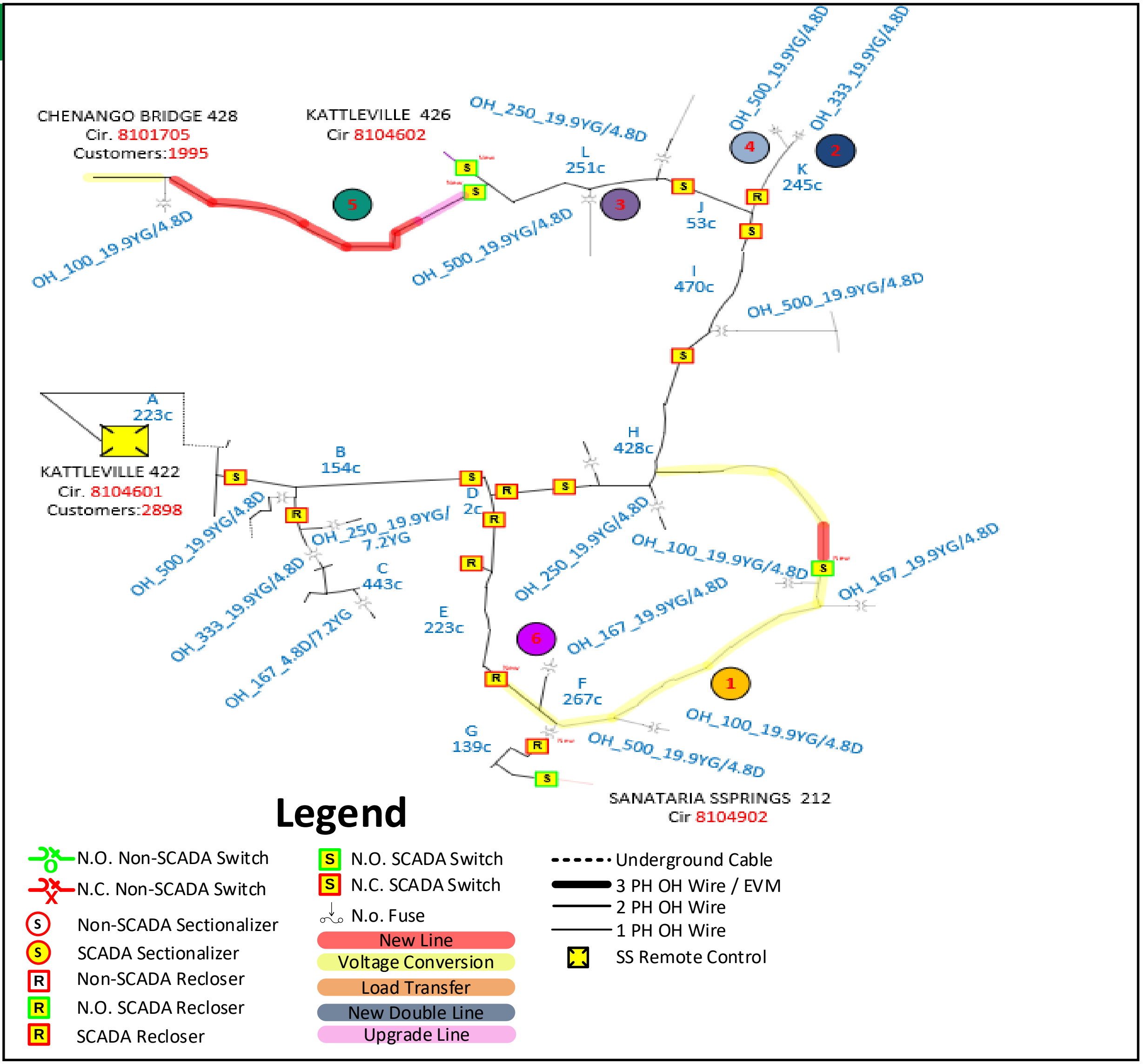
| Main Outage Causes for Selected Circuit From 2020-2022 Without Storm Data (Kattleville 422 & Chenango Bridge 428) | | | |
|---|---|---|---|
| Main Outages Causes | Outages No | % Contribution To SAIFI | % Contribution To SAIDI |
| Tree in ROW | 35 | 21.08% | 33.85% |
| Tree Out ROW | 32 | 19.38% | 16.00% |
| OH Transformer & Parts | 18 | 1.32% | 1.07% |
| Defective Protective Device | 19 | 14.13% | 8.22% |
| Cause unknown/undetermined | 6 | 8.23% | 8.52% |
| Underground Equip & Pad Mount Xfmr | 6 | 0.23% | 0.16% |
| Defective Insulator | 12 | 16.22% | 12.60% |
| Animal | 10 | 3.88% | 1.99% |
| Accident (MVA) | 8 | 3.66% | 4.62% |
| Pole Equipment Damage/Failure - Lightning | 2 | 4.01% | 4.05% |
| Equipment Change - Pre Arranged | 4 | 0.58% | 0.15% |
| Transformer CLF Blown - Lightning | 3 | 0.38% | 0.13% |
| Public Authority - Other | 3 | 0.18% | 0.07% |
| Tree Contact - Customer or Cust Contractor Felled | 2 | 0.02% | 0.02% |
| Reset Fuse/Breaker Weather Related - Overload | 3 | 0.01% | 0.01% |
| Fuse Blown - Lightning | 1 | 0.33% | 0.13% |
| Transformer Damage/Failure Lightning | 3 | 0.09% | 0.06% |
| New/Added Customer Load - New Transformer | 1 | 0.02% | 0.00% |
| Replace Transformer Weather Related - Overload | 2 | 0.02% | 0.02% |
| Other - Overload | 1 | 0.01% | 0.01% |
| Company Contractor Crew Error- Other | 1 | 0.01% | 0.00% |
| Defective Connection | 4 | 0.22% | 0.19% |
| Conductor Down - Lightning | 2 | 3.33% | 6.65% |
| Misc Overhead Equipment | 1 | 2.27% | 1.00% |
| Conductor Problem | 9 | 0.31% | 0.37% |
| Wood Product Decay/Failure | 1 | 0.10% | 0.13% |
| Cause unknown/undetermined | 3 | 0.05% | 0.04% |
| Total | 192 | 100.00% | 100.01% |



# NYSEG – BINGHAMTON – KATTLEVILLE 422 – $10.58 – 4Q2026

## PROJECT SCOPING SUMMARY

1. Remove 1P 4.8KV step, then reconductor approximately 3.4 miles 1P line to 3P line 34.5KV
   - Install 3 SCADA devices and 3 step transformers to utilize the internal loop.
2. Upgrade step transformer from 100KVA to 333KVA
3. Upgrade step transformer from 333KVA to 500KVA
4. Upgrade step transformer from 250KVA to 500KVA
5. Create a 34.5KV tie between Kattleville 422 and Chenango Bridge 428
   - Install 2 SCADA devices to utilize this tie
   - Install a step transformer
   - Rebuild and reconductor ~0.35 miles of 34.5KV from 1P to 3P
   - Install a new line (aerial cable) ~3.43 miles including an open gap on Knapp Hill Road
   - Remove 4.8KV step, then convert ~1.01 miles of 4.8KV 1P to 3P
   - Install 34.5 to 4.8kv step transformer.



# NYSEG – BINGHAMTON – KATTLEVILLE 422 – $10.58 – 4Q2026

## COST ANALYSIS

**Automation**

SCADA Devices Installed: 5

Cost: $568,750

**Vegetation Management:**

Miles of EVM: ~ 5

Cost: $250,000

**Hardening &Topology:**

Replace (2 locations) – 300A bladed cutouts with 600A disconnect switches

Upgrade (2) Regulators – 100A, 200A to 200A and 334A

Reconfigure 3.7 miles to 3P_477AL and 3p_477AL tree wire where needed

Reconfigure 0.05 miles to 3P_4/0AL

Install 3.43 miles of aerial cable

Replace 3-step transformers 2-500KVA and 1-333KVA

Install 4 new step transformers 3-100KVA and 1-167KVA

Cost: $9,758,687.5

**Total Cost:**

**$10,577,437**

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# GREENDIGE 596

# NYSEG – GENEVA – GREENIDGE 596 – $4.37 – 3Q2026

## DISTRIBUTION NEEDS SUMMARY

1. 2,169 customer (within criteria of 2,500-3,000)
2. Existing automatic tie using the 594-transmission line is limited in the number of customers that can be restored
3. Four major outages from L35 P113 to P121 due to tree contact in the last three years

## CIRCUIT KEY CHARACTERISTICS

### AUTOMATION:

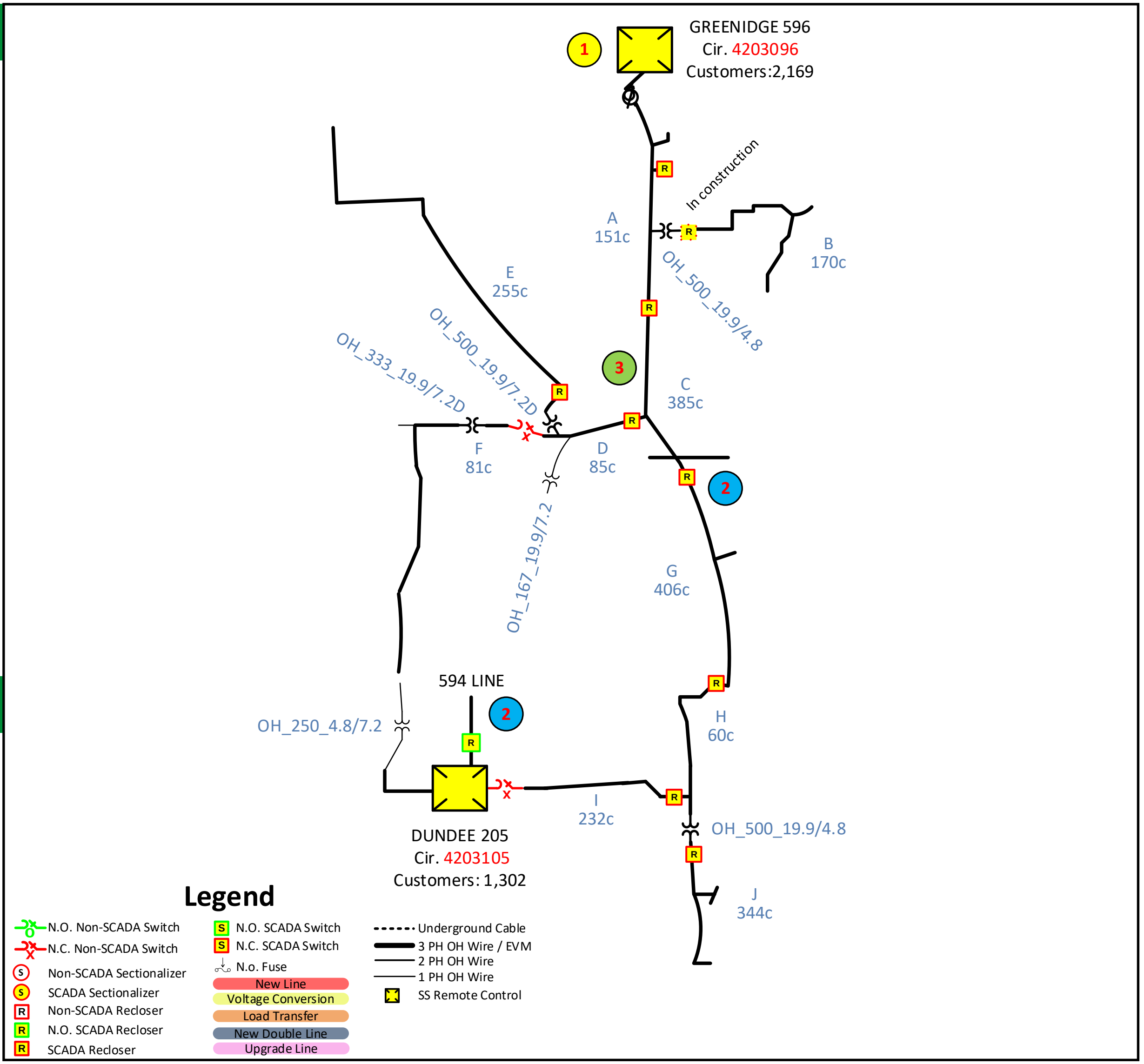
- 1 – SCADA N.O. Ckt. Tie
- 8 – SCADA N.C. Device

### VEGETATION:

- Last Trimmed – 2019

### TOPOLOGY & HARDENING:

- 34.5KV
- 130.23 – PRI Ckt. Miles



# NYSEG – GENEVA – GREENIDGE 596 – $4.37 – 3Q2026

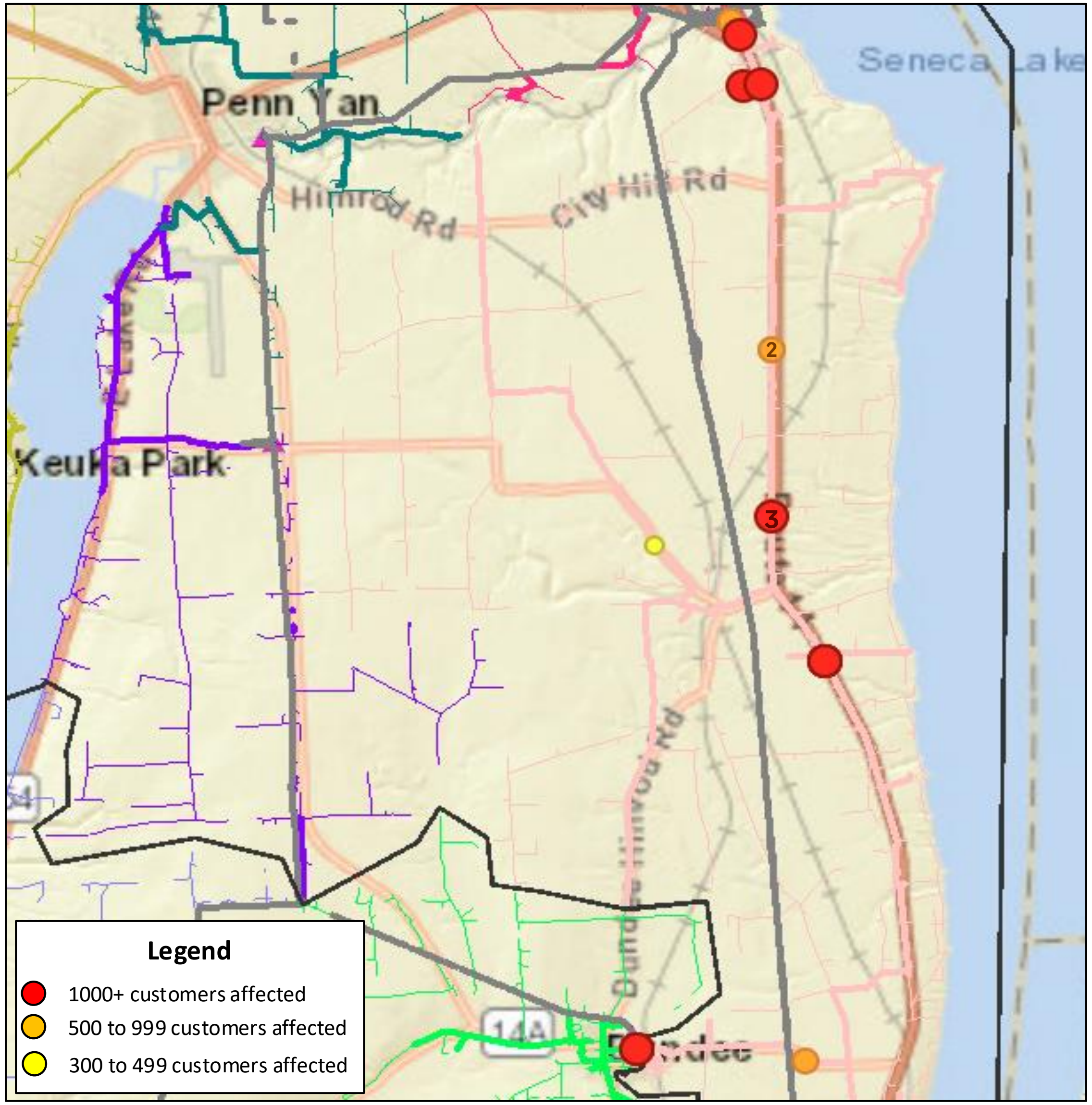
## DISTRIBUTION OUTAGE SUMMARY

**Annual Reliability KPIs Based on 2020-2022 Outage Data**

| | Contribution to System SAIFI | Contribution to System SAIDI(h) | Contribution to System SAIFI(%) | Customer Hours | Customers Affected | SAIFI | SAIDI |
|---|---|---|---|---|---|---|---|
| Inc. Storm | 0.009549 | 0.031244 | 0.44% | 28,256.62 | 8,632 | 4.149 | 13.58 |
| Exc. Storm | 0.007659 | 0.017732 | 0.54% | 16,034.93 | 6,922 | 3.328 | 7.704 |

**Main Outage Causes for Selected Circuit From 2020-2022 Without Storm Data**

| Main Outages Causes | Outages No | % Contribution To SAIFI | % Contribution To SAIDI |
|---|---|---|---|
| Tree Out ROW | 43 | 44.57% | 51.91% |
| Tree in ROW | 15 | 8.43% | 8.89% |
| Animal | 13 | 21.49% | 14.81% |
| Fuse Blown - Lightning | 8 | 1.13% | 1.10% |
| Cause unknown/undetermined | 6 | 0.97% | 1.03% |
| OH Transformer & Parts | 6 | 0.27% | 0.28% |
| Conductor Down - Lightning | 4 | 10.20% | 16.08% |
| Defective Connection | 4 | 0.35% | 0.16% |
| Defective Protective Device | 4 | 0.29% | 0.17% |
| Accident (MVA) | 4 | 0.21% | 0.43% |
| Transformer Damage/Failure Lightning | 4 | 0.02% | 0.05% |
| Misc Overhead Equipment | 3 | 4.86% | 2.18% |
| Equipment Change - Pre Arranged | 3 | 1.02% | 0.60% |
| Foreign Object | 2 | 0.42% | 0.54% |
| Transformer CLF Blown - Lightning | 2 | 0.25% | 0.43% |
| Public Authority - Other | 2 | 0.21% | 0.15% |
| Conductor Problem | 2 | 0.08% | 0.15% |
| Other - Overload | 2 | 0.01% | 0.01% |
| Substation Equipment | 1 | 4.87% | 0.60% |
| Reset Fuse/Breaker Weather Related - Overload | 1 | 0.19% | 0.17% |
| Wood Product Decay/Failure | 1 | 0.09% | 0.19% |
| Defective Insulator | 1 | 0.05% | 0.04% |
| Replace Transformer Weather Related - Overload | 1 | 0.02% | 0.03% |
| Total | 132 | 100% | 100% |



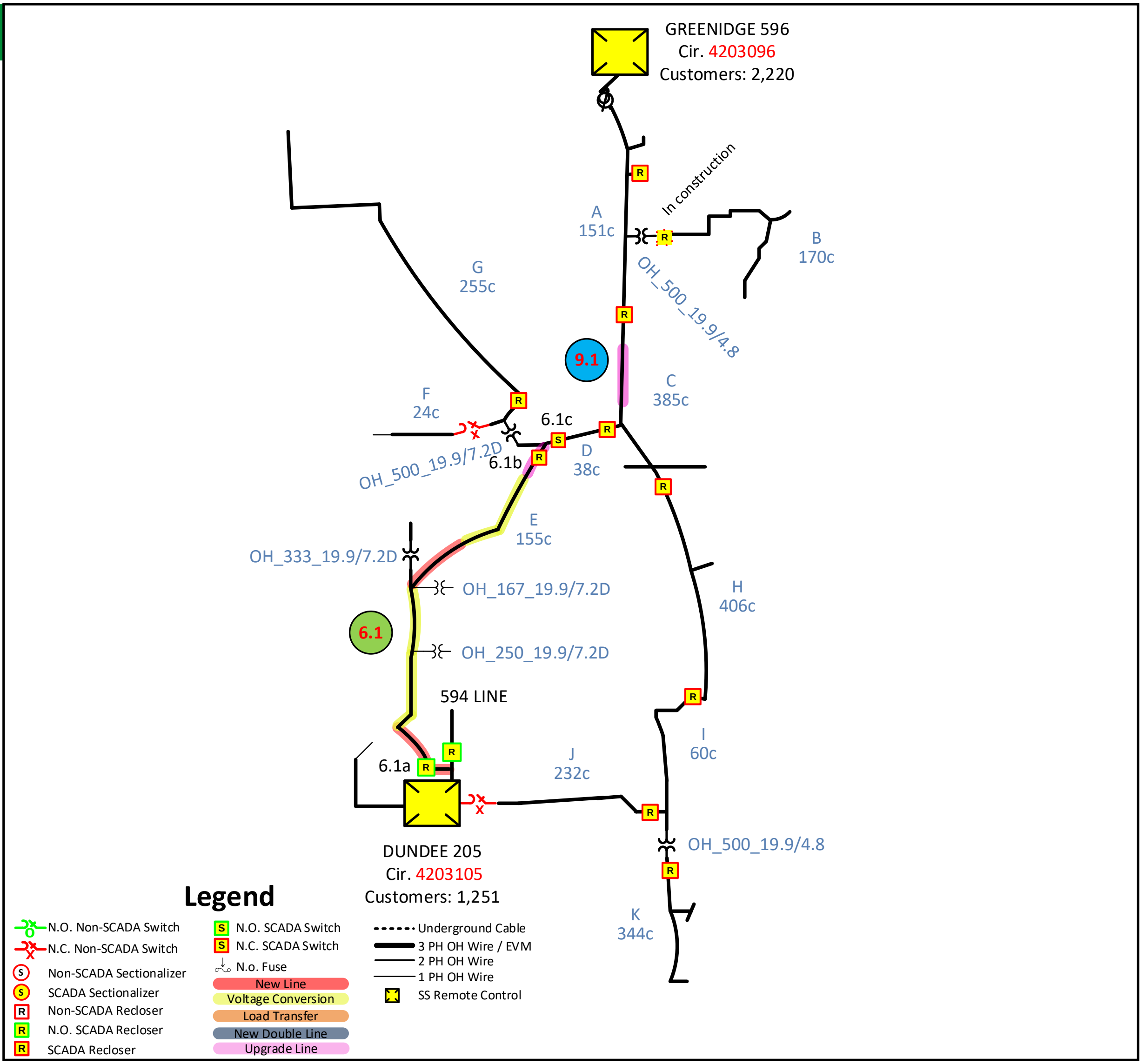
# NYSEG – GENEVA – GREENIDGE 596 – $4.37 – 3Q2026

## PROJECT SCOPING SUMMARY

6.1 Create 34.5KV internal loop

- Add 3 SCADA devices
- Convert 3.7 miles of 1P 4.8kV/7.2kV Delta to 3P 34.5KV 477AL
  - Relocating 1.5miles of backlot line to road side
  - Eliminate 250KVA step bank (70% capacity)
  - Creating new Greenidge Loop to back feed up to 1,127 customers
  - Relocate 2 step transformers
- Install 1 step transformer
- Install 1.0 mile of new 34.5KV line 477AL
- Reconfigure 0.1 miles of 1P 34.5KV to 3P 477AL
- Transfer 51 customers from Dundee 205 to Greenidge 596

9.1 Relocate 0.4 miles of 3P 477AL (off-road section)



# NYSEG – GENEVA – GREENIDGE 596 – $4.37 – 3Q2026

## COST ANALYSIS

### Automation
SCADA Devices Installed: 3

Cost: $393,750

### Vegetation Management
Miles of EVM: ~ 6

Cost: $300,000

### Hardening &Topology
Convert 3.7 miles of 1P 7.2 kV to 3P 34.5 kV 477AL

Install 1.0 mile of 35KV 477AL

Install/replace 1 step transformer

Reconfigure 0.1 miles of 1P 34.5 kV to 3P 477AL

Relocate 0.4 miles of 35KV 3P 477AL to roadside

Cost: $3,671,500

**Total Cost:**
**$4,365,250**