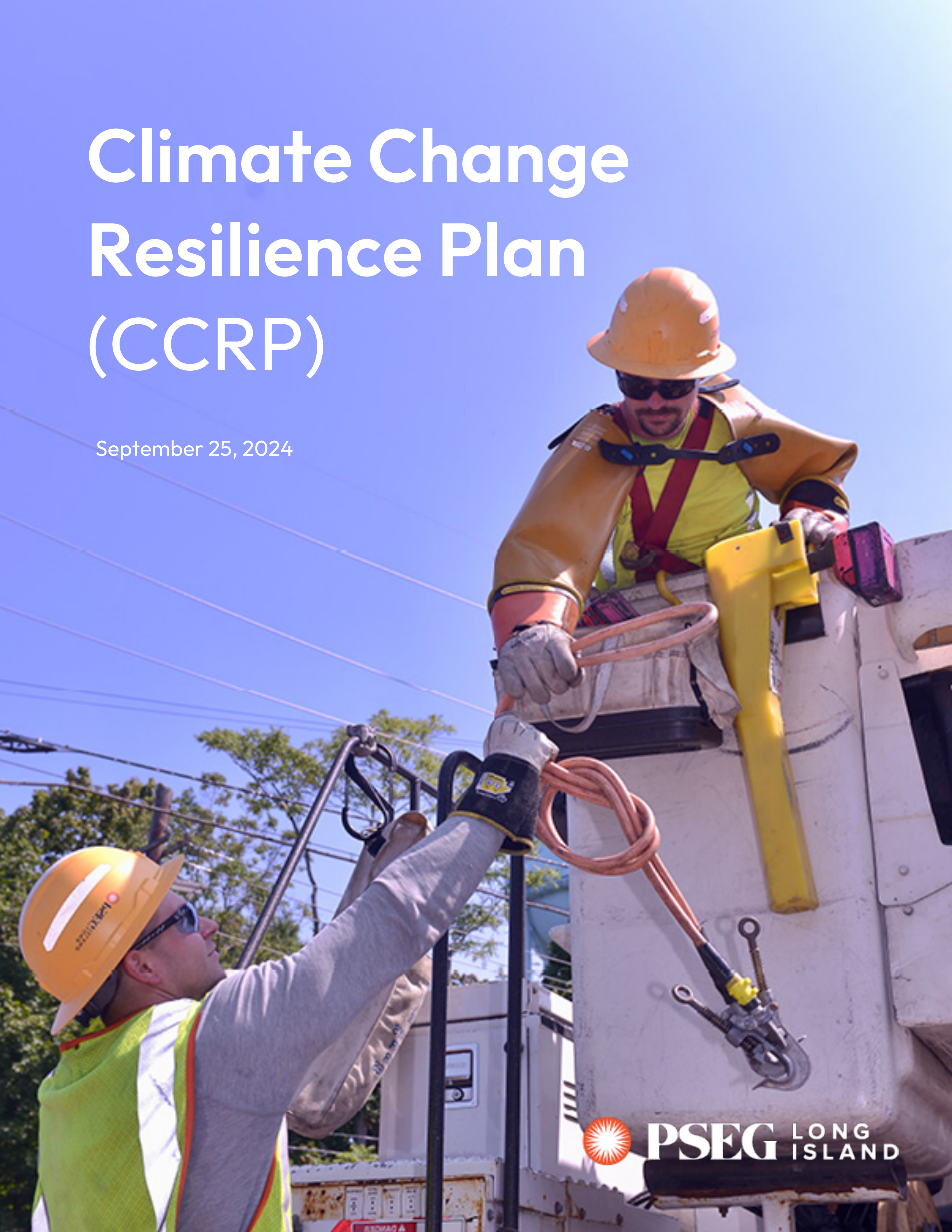
Climate Change Resilience Plan (CCRP)

September 25, 2024



PSEG LONG ISLAND

Table of Contents

Executive Summary ... 1
Introduction and Background ... 3
  Advancing Resilience ... 3
    Case Study: Power On and FEMA Storm Hardening Action ... 5
  Benefits of Storm Hardening ... 6
    Undergrounding Projects ... 12
    Programs Designed to Reduce Equipment Failure ... 13
  Policy and Regulatory Context ... 14
  Summary of the Climate Change Vulnerability Study Results ... 15
    Priority Asset Vulnerabilities ... 15
    Key CCVS Exposure and Vulnerability Results ... 16
    Operational and Planning Vulnerabilities ... 20
Stakeholder Engagement ... 22
Consideration of Equity ... 23
  Adding DACs into Capital Project Prioritization for Resiliency Initiatives ... 25
Multi-pronged Resilience Strategy and Approach ... 25
  Proposed Adaptation-Related Measures ... 27
  Incorporating Resilience into Existing Planning, Design, and Operations Practices ... 28
  Applying New Technologies ... 29
Investment Plan: Project Justification Documents (PJDs) ... 30
  Capital PJDs: Infrastructure ... 31
  Capital PJDs: Technology ... 51
  O&M PJDs ... 54
Governance ... 60
Conclusion and Next Steps ... 61

Executive Summary

The Long Island Power Authority ("LIPA") and its service provider, PSEG Long Island ("the Company" or "PSEGLI"), have long been committed to delivering safe, reliable, and affordable energy to customers across the Long Island service area. This becomes more challenging as climate change makes extreme weather events such as heat waves, intense precipitation, flooding, and high wind events more frequent and severe. PSEG Long Island strives to build and maintain an energy system capable of withstanding and recovering from these events to provide reliable service to customers. In service of this goal, PSEG Long Island is working to anticipate and respond to climate change in a way that mitigates impacts on assets, operations, and services.

Prior to this Climate Change Resilience Plan ("CCRP" or this "Plan"), we have taken deliberate steps to prepare for and adapt to an increase in the frequency and severity of extreme weather events. These steps have included installing new transmission lines and distribution feeders, elevating and protecting substation equipment, and replacing and upgrading transmission and distribution structures to meet updated standards.[1] PSEG Long Island has also storm hardened over 1,400 miles of mainline distribution to withstand higher sustained winds including those which occur during extreme system events. In addition, PSEG Long Island has expanded its vegetation management program to include more robust trimming and has adopted targeted overhang limb removal and hot-spotting practices[2] to reduce the risk of debris interference during high-wind events. These efforts have been instrumental in building resiliency. PSEG Long Island and LIPA continue to anticipate and prepare the electric system for future impacts associated with climate change.

This Plan builds on PSEG Long Island's 2024 Climate Change Vulnerability Study ("CCVS") to identify actionable and cost-effective investment options that address the impacts of climate change on LIPA's electric system. The investments described in this Plan are based on the latest, most relevant climate science reviewed for the CCVS.

The CCVS identified extreme heat, coastal and inland flooding, high wind events, and ice as the electric system's most pressing climate hazards. To increase resilience across the system in the face of these hazards, PSEG Long Island is building a Resilience Strategy Framework to guide the implementation of adaptation measures. This framework includes adaptation measures that will help the Company **strengthen** and **resist, anticipate** and **absorb, respond** and **recover,** and **advance** and **adapt to the hazards identified by the CCVS.** This multi-pronged resilience

---

[1] Reliability Projects - PSEG Long Island (psegliny.com)
[2] Hot spotting is the practice of identifying critical areas where vegetation poses a risk to assets which then informs vegetation management decisions.

strategy allows for effective planning and implementation across the Company and the electric system. We are also integrating resilience into operational and planning processes to withstand gradually evolving climate risks, as well as acute weather events and are committed to improving these practices to best serve customers in the face of a changing climate.

PSEG Long Island has developed adaptation measures to address vulnerabilities to different climate hazards. This CCRP presents project justification documents ("PJDs") for proposed capital and operational projects to bolster climate resilience. The PJDs address capital and operational vulnerabilities in response to specific climate hazards and describe a project or program. Examples of these measures range from implementing a substation flood mitigation program, to bolstering the current storm hardening program to meet the challenge of increased frequency and severity of extreme events, to transmission load pocket hardening. Details about each project, including timelines, are included in this CCRP.

Recognizing that the impacts of climate change are not experienced equally across all communities, we are committed to viewing climate risk planning and resilience initiatives through an equity lens and are making equity a prioritization factor when choosing investments in adaptation measures.

PSEG Long Island has instituted a three-pronged governance strategy to guide transparency and consistency in the resilience process: 1) ensuring adequate power supply, 2) activating mainline/backbone restoration, and 3) expediting tail-end restoration. This CCRP explores the roles and responsibilities of each prong of the governance strategy in depth to articulate how they will support PSEG Long Island's ongoing resilience work.

PSEG Long Island will focus on implementing the adaptation measures identified in this CCRP to advance resilience in the coming years. In addition, the Company will continue to engage with stakeholders and industry leaders to learn about and incorporate new methodologies, tools, data, and evolving climate projections to ensure that adaptation measures are based on best practices.

Introduction and Background

Electric utilities own and operate extensive infrastructure networks that can be susceptible to extreme weather and climate change impacts. LIPA and its service provider, PSEG Long Island,[3] recognize the necessity of maintaining an energy supply system capable of withstanding and recovering from these extreme events to continue serving the 1.2 million customers in the Long Island service area.

In 2024, PSEG Long Island published a CCVS that assessed the vulnerability of the utility's electric infrastructure, design specifications, and operational procedures to relevant climate hazards. This Plan builds on a foundation of previous resilience efforts and the findings from the CCVS, and also aims to identify actionable and cost-effective investment options that will help ensure that customers will continue to receive safe and reliable service. The investments identified within this Plan are based on the latest climate change science and analysis by internal and external experts. This Plan also describes how equity considerations are included in the project prioritization and implementation process.

Advancing Resilience

We have been addressing climate change threats for more than a decade. This Plan grounds the continuation of this resilience journey in current climate science to build on the foundation of lessons learned and improvements made over the past ten plus years.

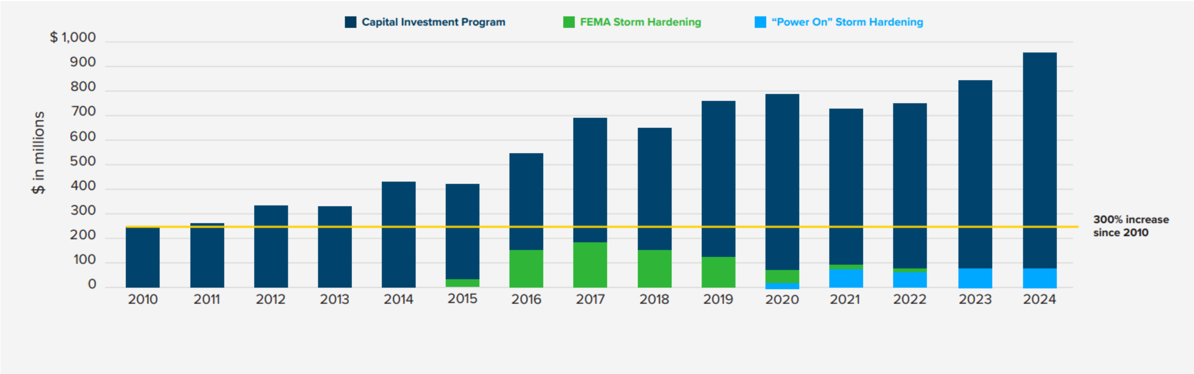
The unprecedented destruction from Tropical Storm Irene in 2011 and Superstorm Sandy in 2012 informed PSEG Long Island's approach to resilience resulting in a new understanding and need for investment focused on strengthening electric infrastructure from storms and extreme weather.

Since 2014, PSEG Long Island has taken proactive steps to update and harden the electric transmission and distribution systems to make them more resilient to extreme weather events, which are projected to increase in frequency and severity over the next several decades. Through intentional upgrades and improvements to physical infrastructure and operations, PSEG Long Island has and will continue to improve system reliability, with the goal of minimizing customer outages.

[3] As LIPA's service provider, PSEG Long Island operates and maintains the LIPA-owned transmission and distribution assets that constitute Long Island's electric grid or "the system".

Since 2010, LIPA has increased its *annual* capital investment in the electric grid by 300%, focusing on improving system reliability (Figure 1).

Figure 1. Increase in capital investment in Long Island's electrical grid since 2010.



Programs developed with funding from the Federal Emergency Management Agency ("FEMA") supported post-Sandy investments. From 2014 through 2020, we have invested approximately $730 million in federal funding to complete storm hardening and reliability work on 1,050 miles of mainline distribution circuits, including the installation of nearly 894 new smart switches and replacement of over 26,000 poles. Existing poles were replaced with stronger class poles installed deeper into the ground to mitigate against the impacts of severe winds. Cross-arms, pole hardware, and primary wires were also upgraded to a new storm hardening standard. We have also invested in technology and emergency response process improvements. As the FEMA-funded work ended in 2020, PSEG Long Island continued its storm-hardening efforts under a new program, Power On (described in further detail below).

Figure 2. A storm-hardened distribution circuit.

CASE STUDY: Power On and FEMA Storm Hardening Action

PSEG Long Island is committed to hardening the transmission and distribution system to better withstand extreme weather and continue to deliver best-in-class system reliability to its customers. Power On is PSEG Long Island's **current storm hardening program focused on strengthening vulnerable electric distribution circuits across Long Island and the Rockaways regions.** Power On builds upon initiatives started as part of the Company's previously federally-funded FEMA mitigation program. Power On employs a storm hardening approach similar to PSEG Long Island's previous FEMA work, organizing each circuit's mitigation based on a toolbox of strategies. Since its initiation, Power On has helped storm harden over 330 miles of distribution mainline and branch line circuits, following reliability standards developed for the FEMA-funded storm hardening program. Roughly two-thirds of distribution circuits across Long Island and the Rockaways are overhead. Robust distribution circuits are essential to climate resilience because they transport electricity to customers. While mainline distribution circuits connect directly to substations, secondary circuits connect customers to mainlines. Customers along secondary circuits are thus dependent on a functioning mainline circuit. Targeted circuit upgrades were conducted under Power On, and a brief explanation of why and how they are essential to resilience is included below.

- **Stronger and more durable poles.** PSEG Long Island is replacing existing utility poles with more robust, durable poles capable of withstanding winds up to 135 mph. New poles will typically be treated with a wood preservative. Whereas an untreated pole has a life expectancy of about 4.5 years, a treated pole can be expected to last about 40 years.
- **Narrow profiles and vertical construction.** To help wires deflect falling limbs instead of catching them, PSEG Long Island is installing shorter cross arms atop some poles.
- **Stronger wires and crossarms.** The existing wire is being replaced with more resilient and durable wire.
- **Additional guying[4] and surge arresters.**
- **Utilization of dual pass insulated conductor.** The two-layer tree cover and additional lightning protection in these conductors help prevent damage throughout the year so that the wire is not damaged or compromised during a hurricane. These damage-resistant conductors enhance potential storm outcomes.
- **More robust bracing.[5]**

Figure 3. A tree trimming crew maintaining

Figure 4. Improved circuit included in the Power On program prior to removal of original poles.

[4] Guying refers to fastening braces or cables on poles to strengthen and secure them in position.
[5] Bracings are used to connect the legs of transmission lines to enhance stability and resist wind and snow loads.

Benefits of Storm Hardening

In the summer of 2020, severe winds from Tropical Storm Isaias – comparable to 2012's Superstorm Sandy – threatened the electric system. However, our investments in resiliency led to a decrease in incidents on hardened portions of the electric system compared to non-hardened portions. The storm hardening effectiveness analysis reflects a decrease in the frequency of outages ("SAIFI") and duration of outages ("SAIDI"). The performance statistics related to these resilience measures are provided in Figure 5.

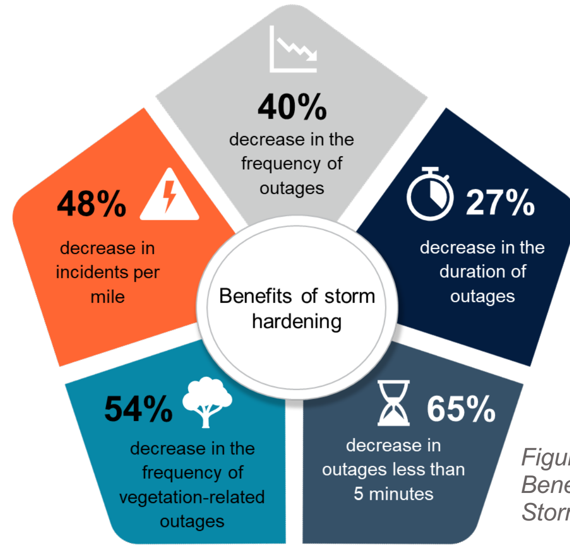


Figure 5. Benefits of Storm Hardening

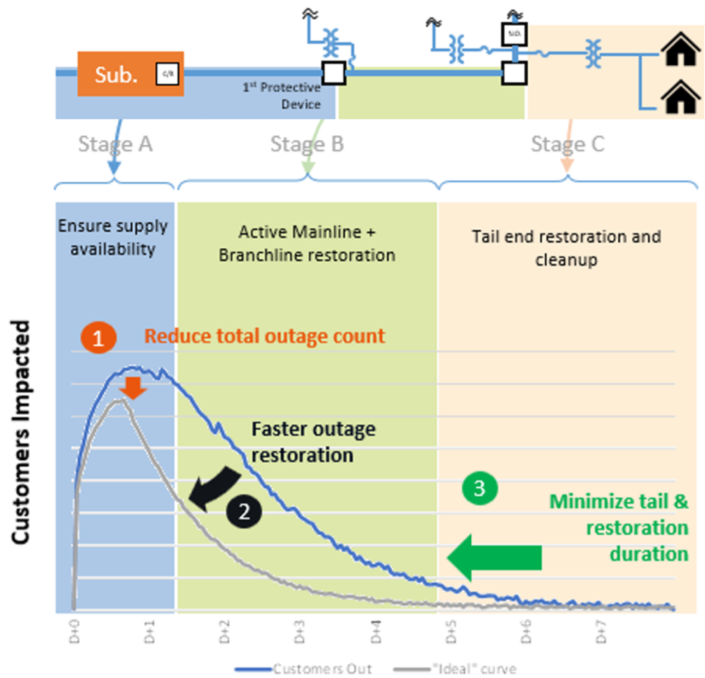
Highlights of Post-Sandy Hardening Efforts (FEMA)

- Seven substations' switchgear were replaced and foundations were elevated from 4 ft to 9 ft.
- 319 distribution circuits were partially hardened (entire circuit was not hardened).
- 877 miles of overhead mainline were hardened.
- 26,364 distribution poles were replaced.
- 2,720 miles of covered "tree" wire were installed.

  44,956 poles were hardened.

Figure 6. Far Rockaway (left) and Arvene (right) substations after implementation of storm hardening projects.

In 2021, PSEG Long Island began executing a five-year resiliency plan to include recommendations from LIPA's 2020 Tropical Storm Isaias Task Force. The resiliency plan focused on a three-prong strategy, ensuring adequate power supply, activating mainline/backbone restoration, and expediting tail-end restoration, as shown in Figure 7 below:



Illustrative Restoration Curve

Restoration Stage	Primary Activities	Aspirational Objectives
A	Ensure adequate supply power	No source / supply (e.g. area substation) loss No feeder lockouts
B	Active Mainline / backbone restoration	Automation and Fast restorations, no more than 500 customers behind protective device
C	Tail end restoration + Cleanup	No prolonged tail

All three restoration stages contribute to the overall successful major event restoration effort and duration.
Solutions to address these stages should work cohesively to shorten the overall restoration duration

Figure 7. Recommendations for grid resiliency improvements..

Specific components of the 2021 five-year resiliency plan included the following measures:

- Hardening the worst-performing distribution circuits.
- Increasing hazard tree removal.
- Limiting the number of customers affected behind each smart switch to less than 500.
- Hardening transmission supply to load pockets.
- Implementing tree overhang limb removal and hotspot vegetation management practices.

Figure 8. Installing an elevated switchgear at the Arverne Substation.

At the completion of the five-year plan, these programs are projected to result in an 18% decrease in customer minutes interrupted ("CMI") in the event of another Tropical Storm Isaias-level major storm.

As temperatures, precipitation, flooding, and weather events increase in intensity, we are working to make Long Island's electric system more resilient to climate change. Some examples of ongoing adaptation measures and capital expenditures that we are undertaking to improve the resiliency of their systems are identified in Table 1 below:

Table 1. Ongoing Resiliency Investments by Climate Hazard.

Climate Hazards	Existing Adaptation and Investment Strategies for Resiliency	Resiliency Benefit
Extreme Heat	• Increase the standard overhead transformer size from 37.5 kVA to 50 kVA to increase system capacity.	• Be ready for higher system load during extreme heat events.
	• Implement HVAC systems in newly constructed control enclosures.	• Reduce detrimental exposure of control equipment to extreme temperature.
	• Add more cooling to new units and revise designs for substation transformers.	• Substation transformers can operate at higher ambient temperatures.
	• Increase the capacity of substation transformers from 28 MVA to 33 MVA.	• Accommodate increased demand, including during heat waves and peak conditions.
	• Use AMI to proactively identify overloaded fuses and transformers for replacement	• Helps reduce customer impacts during heat waves.
	Example: Using projected Temperature Humidity Index (THI) values in future decades, PSEG Long Island aligned projected THI with historically experienced peak producing weather. This analysis enabled PSEG Long Island to project the increase in mid-century peak demand solely due to climate change. The findings from this analysis have been incorporated into the PSEG Long Island load forecasting process.	
Precipitation & Flooding	• Seal control cabinets, wiring conduits, and connections.	• Protect assets against flooding.
	• Elevate control cabinets, radiators, fans, pumps, wiring conduits, and wiring connections for new transformers.	• Protect assets against flooding.
	• Routinely Inspect & Treat distribution poles to extend asset life and deeply embed them into subsurface.	• Protect poles from decay in wet and windy conditions.
	Example: The Navy Road Substation project (2021) was a community-involved project that supported relocation of the Montauk Substation. The former Montauk Substation was located in a flood prone area and some equipment within the substation was nearly 100 years old and designed to obsolete standards. The newly constructed Navy Road Substation is located in an area less prone to flooding and contains elevated equipment to increase climate resilience.	

Climate Hazards	Existing Adaptation and Investment Strategies for Resiliency	Resiliency Benefit
Sea Level Rise & Coastal Flooding	• Improve prediction modeling and design basis.	• Better anticipate sea level rise and adjust design standards accordingly.
	• Elevate critical substation equipment above flood level.	• Protect assets against flooding.
	• Install floodwalls at selected substations.	• Protect assets against flooding.
	• Install monitoring devices at flood prone substations to assess flood levels during severe events.	• Increased insight into flood levels allows faster and more coordinated responses to protect infrastucture.
	Example: Using storm surge prediction models, substation equipment has been elevated or protected at all 12 substations impacted by storm surge during Superstorm Sandy.	
Extreme Weather	• Develop improved storm outage projections using machine learning.	• Better predict and prepare for extreme weather events to decrease outage duration and frequency.
	• Replace old radio network with a new 900 MHz Land Mobile Radio system.	• Provides public safety grade communications infrastructure/equipment and redundant head-cores for disaster resiliency.
	• Replace aging infrastructure.	• Reduce infrastructure vulnerabilities to extreme events.
	• Use AMI to proactively detect customer outages	• Improve restoration time after an outage
	• Install polymer bushings on transformers and circuit breakers.	• Resist ice accumulation on transformers and circuit breakers, reducing the risk of flashover.
	• Ensure all transformers are capable of outdoor operation under a temperature range of between -25 °C (-13 °F) and +40 °C (104 °F).	• Operate more reliably under a range of temperature extremes.
	• Improved design standards for overhead transmission equipment to withstand 130 MPH winds, exceeding sustained wind speeds associated with a Category 3 hurricane.	• Withstand impacts of extreme weather events on transmission infrastructure.
	• Harden transmission crossing at major critical transportation highway crossings/intersections with stronger electrical wire and new poles designed to withstand 130 MPH winds.	• Withstand impacts of extreme weather events on transmission infrastructure.

	• Implement an Enhanced Vegetation Management program to significantly expand the clearance distances for trimming.	• Reduce likelihood of damage/outage due to contact with vegetation.
	Example: Since Superstorm Sandy, 35,668 poles were replaced with stronger poles capable of withstanding winds up to 135 mph and storm hardened more than 1,000 miles of mainline distribution circuits. *Example: Installed new overhead transmission infrastructure with the capacity to withstand a Category 3 storm. Critical service paths where this degree of storm hardening has been implemented include Far Rockaway to Arverne to Rockaway Beach, reaching critical load pockets and disadvantaged communities (DAC). (See Figure 8.)*	

Undergrounding Projects

We have invested nearly $450 million in local transmission upgrades since 2014, increasing the system's capacity, improving system reliability, and creating several redundant storm-hardened paths to substations. While many undergrounding projects were completed with the primary goal of increasing capacity, these projects also offer important climate resilience co-benefits. Some examples of underground projects are included in Table 2 below.

Table 2. Examples of PSEG Long Island's Undergrounding Projects since 2014.

Project	Year	Miles	Description
Reconductoring 69 kV circuit from East Garden City to Meadowbrook	2017	0.6	Reconductored an aging underground transmission supply that serves the Nassau University Medical Center, a major public hospital located centrally in Nassau County
Hempstead Transmission Lines Project	2019	0.6	Reconductored an existing 23 kV transmission line and added a new 69 kV underground transmission segment, creating a storm hardened supply to a community later classified as a Disadvantaged Community (DAC) by New York State's Climate Justice Working Group
Western Nassau Transmission Project	2020	7.36	Created a new 138 kV underground feed to the East Garden City Substation, improving the reliability and resiliency of the electric system in Western Nassau County
New Riverhead to Canal 138kV	2021	15.8	Created a new underground transmission path to Long Island's South Fork, adding resiliency and redundancy to a load pocket
New Flowerfield to Terryville 69kV	2023	4.6 underground	New underground transmission facility added an additional source of supply to the Smithtown load pocket, an area which had experienced service disruptions in the aftermath of Tropical Storm Isaias

Programs Designed to Reduce Equipment Failure

PSEG Long Island implemented several programs designed specifically to **reduce the negative impact of equipment failure on customers.** Some of these actions include:

- Investing in spare equipment and mobile banks/substations to increase the robustness of the Company's storm readiness strategy.
- Increasing the rollout of ACRV, automatic overhead switches, with the goal of limiting the amount of customers affected due to faults to less than 500 customers between switches.
- Adding branch line reclosers to upgrade the existing fused cutouts with the goal of limiting the amount of customers interrupted due to transient faults. The device restores power automatically after a transient fault as opposed to a field technician visiting the site to perform a manual restoration.

The Company also implemented several strategies specifically designed to **improve inventory management** and **speed of customer restoration** to "Isaias-level storms". This effort involved **developing new vendor relationships, improving supply chain risk mitigation strategies, and enhancing business and operational functions**.

Since 2014, the **Vegetation Management** program has completely mapped the overhead network to identify vegetation management encroachments. Vegetation Management also increased the frequency of tree trimming cycles and clearance levels. Since 2014, the Vegetation Management program has accomplished the following:

- Trimmed over 22,000 miles of Distribution Circuits.
- Trimmed over 1,500 miles of Transmission Circuits.
- Removed over 80,000 whole trees and large limbs.
- Removed over 15,000 vines.
- Removed all overhead limbs from the substation to the first automated switch (Overhang Limb Removal Program) on close to 400 circuits.

Figure 9. Completion of pruning to create a buffer between the power lines and nearby trees, reducing outage threats.

Since Superstorm Sandy over a decade ago and Tropical Storm Isaias in 2020, PSEG Long Island has increased its commitment to understanding and adapting to the changing frequency and severity of extreme weather events. The adaptation measures included in this CCRP will build upon work we have undertaken and will continue to advance the resilience maturity of the system, which is informed by climate change vulnerabilities identified based on updated climate projections.

Policy and Regulatory Context

LIPA Board policy direction and other State regulatory actions have recently sought to improve utility resilience to the impacts of climate change. In November 2021, the LIPA Board of Trustees formalized LIPA's commitment to increasing resiliency by revising its Board Policy on Transmission and Distribution Operations. The revised policy requires LIPA to mitigate the effects of climate change through multi-year programs that reduce the number and duration of outages after significant system disruptions. In addition, PSEG Long Island began work on a preliminary assessment of vulnerability to climate change. The preliminary assessment considered potential areas of vulnerability to future climate change, including extreme temperatures, precipitation and inland flooding, sea level rise and coastal flooding, and other extreme events.

In February 2022, New York Governor Kathy Hochul signed into law an updated Public Service Law ("PSL") §66, which requires major investor-owned electric utilities to conduct a Climate Change Vulnerability Study ("CCVS") and develop a Climate Change Resilience Plan ("CCRP") to better prepare for the anticipated increase in severe weather events due to climate change. The Climate Action Council ("CAC") Scoping Plan, released in December 2022, recommended that LIPA, NYPA, and New York State's municipal utilities undertake studies to identify vulnerability to climate change and establish resiliency plans.

PSEG Long Island is committed to staying aligned with and integrating rapidly emerging sustainability and climate resilience standards into its practices. PSEG Long Island implemented the CAC recommendations, conduct a CCVS, and develop a CCRP for the System that is largely in line with PSL §66 and the efforts being undertaken by the State's investor-owned electric utilities.

The 2024 CCVS expanded upon PSEG Long Island's earlier 2022 climate vulnerability assessment by considering more recent climate modeling and identifying specific assets and operations that are highly vulnerable to hazards associated with climate change. Informed by the CCVS findings, this CCRP intends to address vulnerabilities and strengthen the resilience of the electrical grid infrastructure to mitigate the impacts of climate change.

Summary of the Climate Change Vulnerability Study Results

PSEG Long Island produced the CCVS to analyze asset and operational vulnerabilities of the the system in relation to critical climate hazards. The results of the CCVS form the foundation for this CCRP. This CCRP selects a set of optimal adaptation measures to address the system's most pressing climate risks. The CCVS analyzed vulnerabilities of transmission, distribution, and substation assets to **six distinct climate hazards**: *extreme heat, cold temperatures, extreme precipitation, coastal and inland flooding, high wind,* and *ice*. These hazards were selected as the most salient for the Long Island service area based on historical impacts, future climate projections, and consultations with subject matter experts ("SMEs").

Using the most up-to-date climate data, the CCVS evaluated the exposure and potential impacts of climate change on the service territory. The CCVS used the following climate data:

- **Temperature and precipitation data** from climate projections developed by Columbia University and New York State Energy Research and Development Agency ("NYSERDA"). These datasets use an ensemble of 16 Coupled Model Intercomparison Project Phase 6 ("CMIP6") Global Climate Models ("GCMs") and two future greenhouse gas emissions trajectories based on Shared Socioeconomic Pathways ("SSPs"). The SSPs represent a range of future climate change scenarios and development pathways encompassing various global greenhouse gas emissions trajectories. SSP2-4.5 and SSP5-8.5 scenarios were used in the CCVS, where SSP2-4.5 represents aggressive global emissions reductions and middle-of-the-road assumptions on earth system sensitivity, and SSP5-8.5 represents low global emissions reduction efforts and high-end climate sensitivity.
- **Coastal flooding data** was produced by WaterRIDE, a proprietary software that models sea level rise using the United Nations Intergovernmental Panel on Climate Change ("IPCC") intermediate climate future scenario (RCP4.5) and the associated NOAA intermediate regional sea level rise scenario.
- **Present-day inland flooding maps** from FEMA.
- **Tropical cyclone and wind exposure data** were obtained through a combination of historical data, a scientific literature review, and an empirical model for wind decay after landfall.

Priority Asset Vulnerabilities

An asset type's vulnerability was determined based on three factors: exposure to a climate hazard, sensitivity to it, and the consequence of its reduced performance. **Exposure** represents the degree to which assets could experience changes in climate hazards based on their physical location and the magnitude of projected future changes in climate hazards. **Sensitivity** represents the degree to which assets could be negatively affected by exposure to a climate hazard. **Consequence** represents the magnitude of negative outcomes for the system and customers in the event of asset failure or damage.

Table 3 shows priority vulnerability results from the CCVS. Of the six assessed climate hazards, four were identified as significant based on climate projections and hazard exposure analysis results. A check mark indicates the asset-hazard combination is considered a priority vulnerability; asset-hazard combinations without a check mark are not considered priority vulnerabilities.

Table 3. Priority vulnerability results from PSEG Long Island's CCVS for each asset-hazard combination.

Asset Family	Sub-Asset	Extreme Heat	Coastal and Inland Flooding	High Wind	Ice
Transmission	Line Structures			✓	✓
	Overhead Conductors			✓	✓
Distribution	Overhead Structures (including poles)			✓	✓
	Overhead Conductors			✓	✓
	Overhead Transformers	✓			
	Pole Mounted Regulators	✓			
	Pad Mounted Switchgear		✓		
Substations	Transformers and regulators	✓	✓		✓
	Circuit Breakers		✓		
	Switchgear (distribution, including breakers, PTs, and relay)	✓	✓		
	Instrument Transformers (CT's and PT's[6])		✓		
	Control Room/Control House/Protection and Control Devices		✓		

Key CCVS Exposure and Vulnerability Results

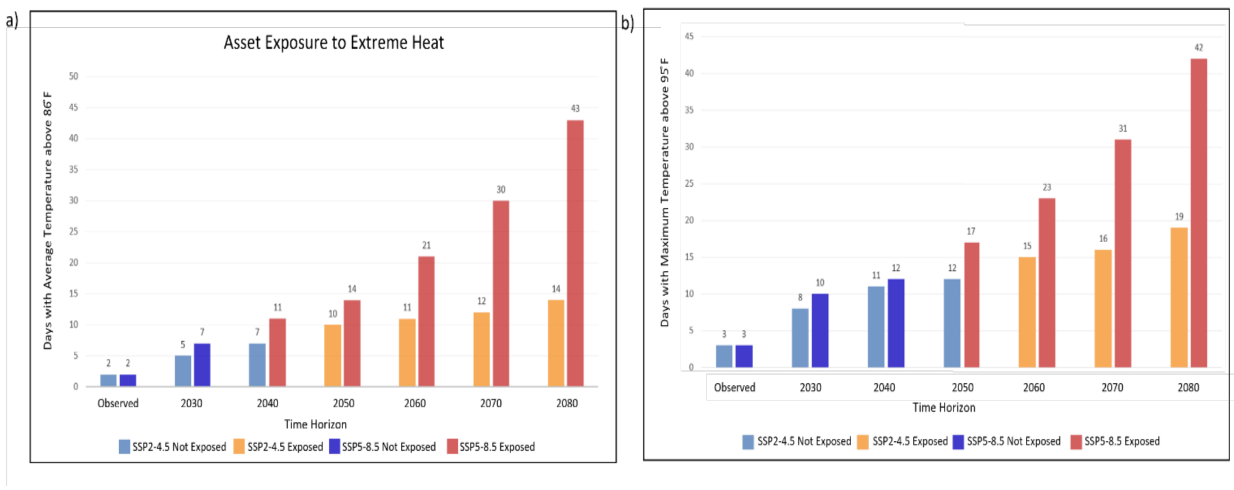
The following summarizes the CCVS results for assets' exposures and vulnerabilities to climate hazards.

Extreme Heat: The capacity of the grid to transmit power decreases as temperature increases to extremes. Due to climate change, both average ambient temperatures and the frequency of extreme heat events, such as heat waves, are expected to increase. At the same time, system

[6] CT's refer to current transformers and PT's refer to potential transformers.

load increases during high heat event due to increased demand from air conditioning. Operating the system at sustained peak load in high temperatures can affect grid components and cause premature aging and/or sudden failure of critically important assets. By 2050, Long Island could experience an average of up to two weeks per year with average temperatures above 86ºF and maximum temperatures above 95ºF, about a five-fold increase over what is currently experienced (Figure).

Figure 10. Asset exposure to extreme heat for days with daily average temperature above 86°F (a) and days with daily maximum temperature above 95°F (b). Bars and numbers indicate the number of days with extreme heat for each time horizon. Colors represent the emissions scenarios, SSP2-4.5 50th percentile (light blue and orange) and SSP5-8.5 50th percentile (dark blue and red). A bar shaded light or dark blue describes a time horizon in which assets are not exposed. A bar shaded orange or red describes a decade in which assets are exposed.



The following assets are vulnerable to extreme heat:

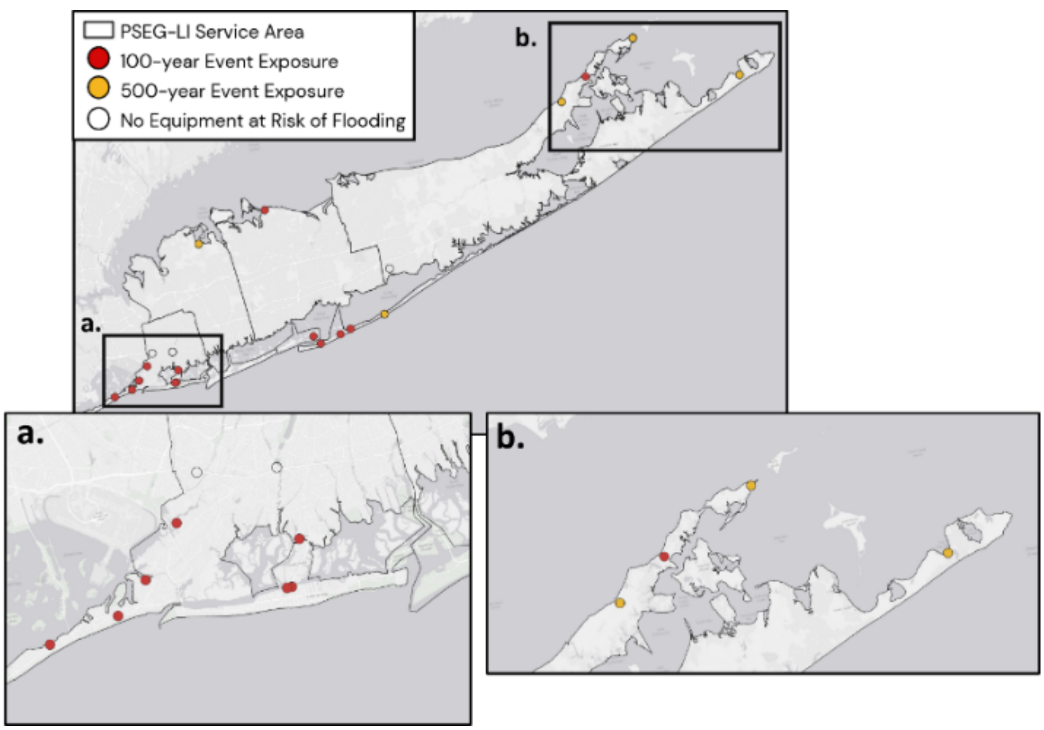
- **Distribution**
  - **Overhead transformers:** Extreme heat can reduce transformer capacity and, when coupled with high demand, can accelerate aging and increase the risk of failure. Failure of overhead transformers may result in customer outages.
  - **Pole-mounted regulators:** Extreme heat can reduce regulator capacity and, when coupled with high demand, can accelerate aging and increase the risk of failure. Failure of pole-mounted regulators may result in customer outages.
- **Substations**
  - **Transformers and regulators:** The increasing frequency, intensity, and duration of heat waves may marginally increase transformer failure rates. Transformer failures may result in customer outages. Extreme heat events can also cause

high peak demand while reducing transformer capacity, which may, in rare circumstances, require load shedding to protect transformers.[7]

- **Switchgear:** Higher temperatures can accelerate aging or increase the risk of asset failures, leading to customer outages.

Coastal and Inland Flooding: As early as mid-century, climate change is expected to increase sea levels on Long Island, subjecting a greater number of low-lying assets to coastal flooding. There are already assets in historical 100-year and 500-year FEMA flood zones where inland flooding is projected to increase throughout the century, though asset exposure to inland flooding will likely be low relative to coastal flooding across the service area. The service territory's coastal proximity and low elevation along the south shore puts the service area at risk of flooding (coastal and inland), which causes equipment damage and customer outages. By mid-century, up to 15% of assets could be exposed to a 500-year coastal flooding event (Figure 11).

Figure 11. A map of substations exposed to a 100-year (red) and 500-year (orange) coastal flooding event in 2045. Substations within the 100- or 500-year floodplain that have no equipment that would be impacted by coastal flooding are depicted as clear circles.



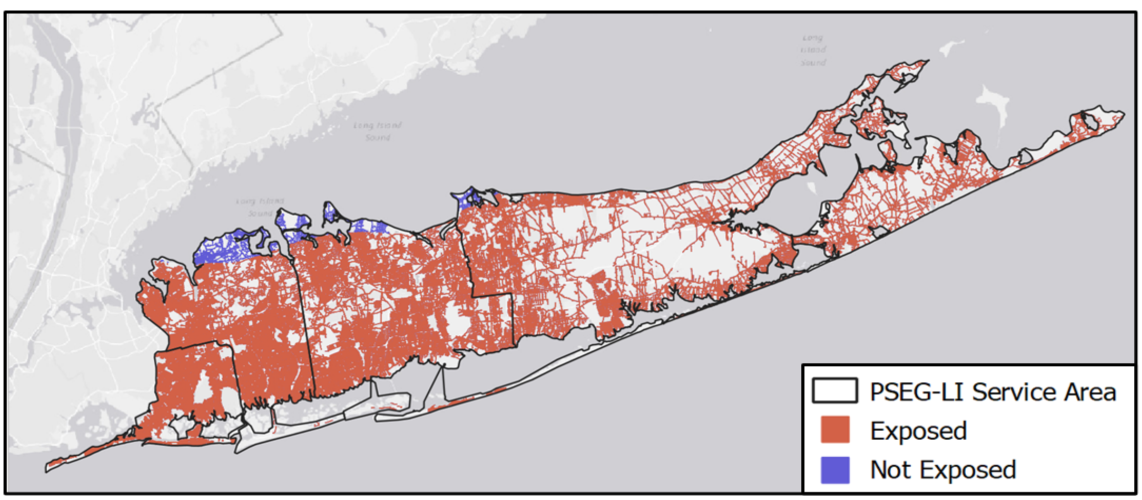
[7] During the Spokane, Washington, 2021 heat wave, in order to protect transformers from damage, Avista Utilities initiated rotating blackouts which interrupted service to approximately 20,000 customers.

The following assets are vulnerable to coastal and inland flooding:

- **Distribution**
  - **Pad-mounted switchgear:** Once exposed to water, pad-mounted switchgear cannot be reenergized until inspected and maintained. Switchgear can even be displaced by extreme flooding. Failure of this asset can result in customer outages.
- **Substations**:
  - **All:** Substation transformers, regulators, and circuit breakers have a low tolerance for inundation. Water from flooding events can also enter and impact switchgear and control devices. Flooding from saltwater can be particularly damaging to equipment. Failure of substation assets through inundation can result in large numbers of customer outages. Furthermore, the replacement of these assets can be complex and time-consuming.

High Wind: Projections for 1-in-10-year hurricane wind speeds are expected to increase due to climate change, exceeding 110 mph across a large portion of Long Island. By the late century, over 90% of assets are projected to be exposed to 1-in-10-year hurricane maximum sustained wind speeds exceeding 110 mph (Figure 12).

Figure 12. A map of overhead distribution lines. Lines are colored red if exposed and blue if not exposed to 1-in-10-year hurricane wind speeds exceeding 110 mph. Hurricane wind speeds are modeled for 2080-2100.



The following assets are vulnerable to high winds:

- **Transmission:**
  - **Line structures:** Extreme winds can topple transmission line structures, and wind-blown debris can impact lines, resulting in circuit outages with the potential to impact significant numbers of customers.

    - **Overhead conductors:** Conductors are susceptible to damage from falling trees during strong winds, damage from phase to phase arcing due to blowout, or mechanical damage from galloping (where the line experiences oscillations, leading to line damage and weakening), all of which can cause circuit outages.
- **Distribution:**
    - **Overhead structures:** Vegetation can fall or break, damaging infrastructure and poles. Failure of overhead structures can lead to outages.
    - **Overhead conductors:** Electrical contact during strong winds (blowout) and downed vegetation can damage overhead conductors. Failure of overhead conductors can lead to outages.

Ice: Overall, models project a decrease in the frequency of ice storms in the service area but potentially more intense radial ice accumulation when they do occur. Despite the high degree of uncertainty in the magnitude of these trends, ice poses a high risk to assets as it can lead to significant damage; it is therefore necessary to consider this hazard when selecting adaptation measures.

The following assets are vulnerable to ice:

- **Transmission:**
    - **Line structures:** Ice storms can result in loading that causes failure of transmission line structures, which can result in circuit outages with the potential to impact significant numbers of customers. A combination of freezing rain and wind can also cause galloping of transmission lines.
    - **Overhead conductors:** Ice accumulation can cause faults (short circuits) between conductors, resulting in a sustained outage of the transmission line that could interrupt significant numbers of customers.
- **Distribution:**
    - **Overhead structures:** Icing above defined tolerance levels can result in failures. Ice accumulation on structures can put pressure on conductors, leading to downed poles. Icing can also bring down trees, in turn damaging poles. Failure of overhead structures can lead to customer outages.
    - **Overhead conductors:** Icing beyond the design threshold can cause conductors and attachment failure. Icing can also bring down trees, in turn damaging conductors. The failure of overhead conductors can lead to customer outages.
- **Substations:**
    - **Transformers/regulators:** Icing can increase the risk of flashover on bushings and insulators, causing a transformer outage that may result in customer outages.

Operational and Planning Vulnerabilities

Based on consultations with other utility subject matter experts, PSEG Long Island identified several operational and planning vulnerabilities, including workforce safety, emergency response, vegetation management, asset management, reliability planning, capacity planning, and load forecasting. These functional areas are expected to be impacted by future increases in the severity and frequency of extreme climate events (Table 4).

Table 4. Priority operational and planning vulnerabilities from PSEG Long Island's CCVS.

Operations and Planning Function	Extreme Heat	Extreme Cold	Flooding	High Wind	Ice
Safety	✓		✓	✓	✓
Emergency Response	✓	✓	✓	✓	✓
Reliability Planning	✓			✓	✓
Asset Management	✓		✓	✓	✓
Vegetation Management				✓	✓
Capacity Planning	✓	✓			
Load Forecasting	✓				

Safety operations may need to adapt to account for projected vulnerabilities due to climate change. As the frequency of extreme weather events increases, workers will be increasingly exposed to increasingly adverse conditions. Working in extreme heat, extreme cold, extreme precipitation, high winds, and smoky conditions from wildfires can potentially increase safety risks.

Emergency response will also be more effective in the future if climate change and its impacts are incorporated into planning. The Emergency Restoration Plan guides these operations. Key climate hazards that are expected to impact emergency response operations include extreme heat, extreme cold, flooding, high winds, and ice. The increased frequency and severity of such climate events may lead to resource constraints, supply chain disruptions (which may impact the ability to make repairs effectively), higher repair and/or restoration costs, and the need for additional education and communications with emergency workers and customers.

The projected increase in the frequency and severity of heat waves and extreme wind events and their impact on reliability and resiliency will likely require changes to the PSEG Long Island **reliability planning process**. The increasing frequency and severity of extreme heat and wind events will require PSEG Long Island to improve its understanding of the impact of such events on service levels and the reliability and benefits of adaptation measures employed to address such events.

Heat waves and intense storms may also impact **asset management**, the process of specifying, inspecting, maintaining, repairing, and replacing assets. Increased frequency of heat waves can potentially increase the aging rate of transformers, which may require more frequent upgrades and replacements. Extreme temperatures also can marginally increase the risk of transformer failure; however, PSEG Long Island has not yet seen such a trend. Flooding from intense storms will likely impact substations, including erosion from flooding, which increases the risk of collapse. Substations may need to be stabilized and/or relocated to address this risk. Flooding may also impact pad-mounted distribution equipment by increasing corrosion and aging rates.

Vegetation management is critically important in the service territory, as tree-related outages are the second leading cause of interruptions for PSEG Long Island. PSEG Long Island has a robust vegetation management program that considers historical performance and field observations. Storms, which can lead to downed trees damaging assets, are expected to increase in frequency and severity because of climate change. In addition, increases in Growing Degree Days[8] and more optimal conditions for invasive species will further stress vegetation management. PSEG Long Island will need to continue to advance its vegetation management capabilities to meet the increasing impact of climate change on service levels.

Extreme heat and cold may introduce more uncertainty into the current **capacity planning** process. Extreme heat, which causes reduced equipment capacity and high customer demand, may result in equipment overloads, which can accelerate aging and increase the risk of failures and outages. PSEG Long Island will need to evaluate the assumed ambient temperatures used when determining equipment ratings and the process for forecasting peak demand. Due to increased electrification, PSEG Long Island will need to consider the potential impact of this significantly higher demand on assets as the system transitions from summer peaking to winter peaking.

Lastly, extreme heat will affect the **load forecasting** process. The potential climate vulnerabilities of the load forecasting process include the use of historical weather, which may not accurately reflect changes in weather due to climate change. PSEG Long Island has already begun addressing these vulnerabilities, as described in “Multi-Pronged Resilience Strategy and Approach.”

Stakeholder Engagement

PSEG Long Island is committed to collaborating with stakeholders and considering their input to inform Company policies and projects. The Company recognizes that engaging with customers,

[8] Growing Degree Days are a measure of accumulated heat. They are used to determine how much heat vegetation is exposed to over a period of time.

communities, and relevant advocates is necessary to enhance community-wide resiliency. For the development of both the CCVS and the CCRP, PSEG Long Island held three rounds of external stakeholder engagement consisting of meetings with five stakeholder groups:

- PSEG Long Island's Environmental Advisory Committee
- Consumer Advocacy and Human Service Organizations, including the Public Utility Law Project ("PULP"), the Health and Welfare Council of Long Island ("HWCLI"), and the EAC Network[9]
- Suffolk County administration
- Nassau County administration
- NYC administration

The first round of engagements, which took place in June of 2023, covered climate science. These initial meetings covered legislative context and climate findings from analyses using NYSERDA and Columbia University datasets and supplementary climate change analyses. The next round of engagements occurred at the end of February 2024 and focused on the results of the CCVS. These meetings delved into the process behind the vulnerability assessment, including the scoring methodology, and then discussed the highest-scoring climate vulnerabilities. The third round of meetings were held in August 2024 and discussed the plans outlined in this CCRP.

PSEG Long Island intends to involve customers, communities, and advocates in decision-making. This requires consistent, transparent communication with stakeholders throughout the CCVS and CCRP creation process. Following the development of the CCRP, PSEG Long Island will continue to engage with stakeholders to assess the impact of the adaptation measures on communities.

Consideration of Equity

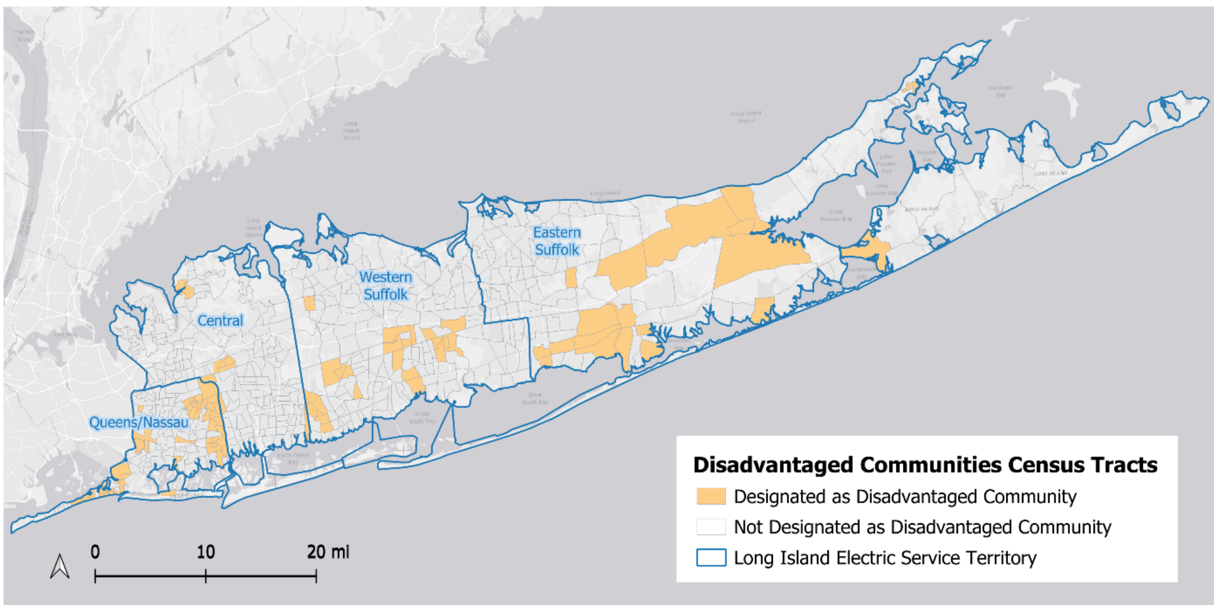
The effects of climate change are not felt equally by all New York State residents. Climate risks pose greater challenges for disadvantaged communities ("DACs") due to sociodemographic characteristics and environmental and health burdens. Recognizing this, the NYS Climate Leadership and Community Protection Act ("Climate Act") of 2019 directs the state agencies to consider equity in climate risk planning and analysis, such as PSEG Long Island's CCRP.

---

[9] The Health and Welfare Council of Long Island ("HWCLI") participated in the first round of stakeholder engagement held in June 2023. In February 2024, HWCLI member organization EAC Network replaced HWCLI on the Consumer stakeholder panel.

The Climate Act also established the Climate Justice Working Group ("CJWG"). This working group, composed of representatives from environmental justice communities, rural and urban communities, the State Departments of Environmental Conservation, Health, and Labor, and the New York State Energy Research and Development Authority ("NYSERDA"), developed criteria to identify New York DACs based on socioeconomic metrics. On March 27, 2023, after an extensive revision process incorporating feedback from collaborators, the CJWG approved a set of 45 criteria for defining DACs. Based on these metrics (which can be found in *Technical Documentation on Draft Disadvantaged Communities Criteria*[10]), the CJWG identified 35% (1,736 census tracts) of New York State as DACs. In our service territory, approximately 14% of customers live in census tracts identified as DACs (*see* Figure 13).

Figure 13. Map of Disadvantaged Communities (DACs) in Long Island.



The CJWG considered multiple criteria to identify DACs. Factors include:

- Environmental burdens include proximity to a range of industrial or energy facilities.
- Climate change risks include exposure to extreme heat and/or flooding and distance to emergency health services.
- Potential exposure to environmental pollutants.

[10] The Technical Documentation on the Draft Disadvantaged Communities Criteria can be found on the New York's Climate Leadership & Community Protection Act website: https://climate.ny.gov/resources/disadvantaged-communities-criteria/

- Population characteristics include area median income, unemployment, race and ethnicity, high incidence of adverse health outcomes, and indicators of housing stress.

Adding DACs into Capital Project Prioritization for Resiliency Initiatives

Diversity, equity, and inclusion principles have long been centered in PSEG Long Island's internal operations. This plan helps to center equity in the Company's power delivery by operationalizing it as a factor in investment prioritization for adaptation measures and other capital spending.

PSEG Long Island employs an investment prioritization software platform to help optimize project-related spending and expenditures. The platform allows the Company to easily see trade-offs, determine ideal investment decisions, and align investments with PSEG Long Island's four main objectives: financially attractive, helpful to many customers, supportive of sustainability initiatives, and safe/reliable.

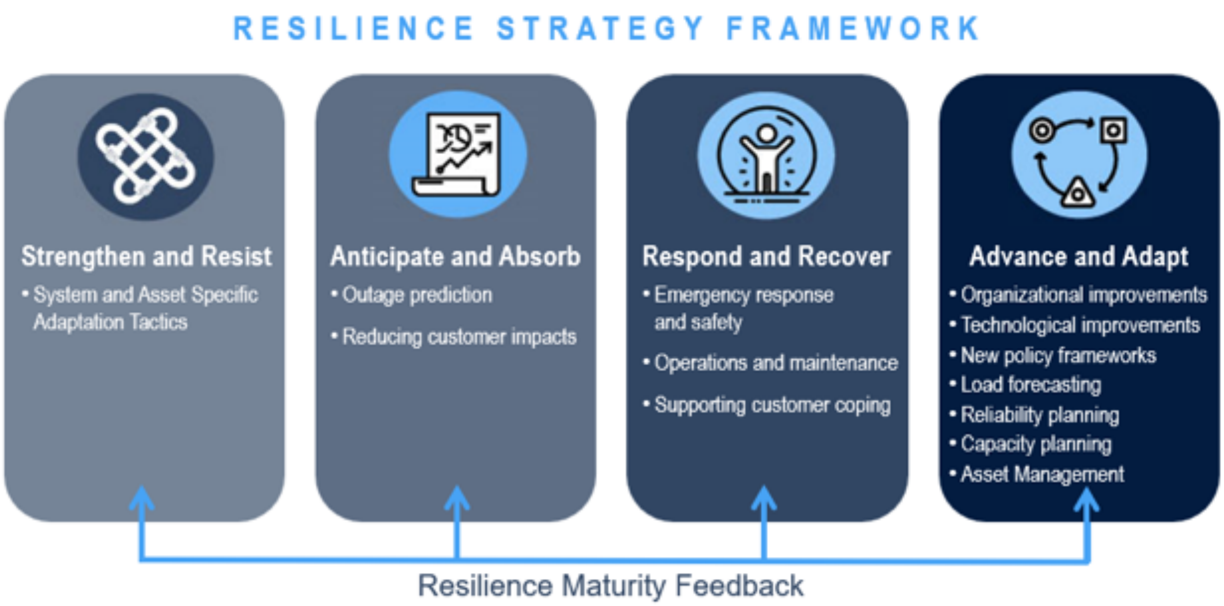
DACs have been included as a new evaluation criterion in the prioritization tool, meaning the impact of potential investments on DACs are being factored into a proposed project's costs and benefits. Beginning in the 2025 budget cycle with the implementation of this CCRP, this additional DAC criteria is now being included as a consideration for prioritizing investments.

Multi-pronged Resilience Strategy and Approach

PSEG Long Island is committed to continuing to build resilience at both the system and asset levels to ensure consistent service delivery to Long Island customers. To achieve this, PSEG Long Island employed a guiding framework for increasing the system's resilience and controlling adaptation costs in the face of climate hazards. This framework incorporated asset vulnerability scores from the CCVS along with feedback from SMEs. As discussed below, adaptation measures were selected, outlined, and justified in PJDs.

PSEG Long Island created a Resilience Strategy Framework (Figure 14) as part of its Climate Change Vulnerability Study. This multi-pronged framework focuses on four different but equally important criteria for systems to adjust to the impacts of climate change.

Figure 14. Resilience Strategy Framework.



The core components – which help the overall system cope, respond, and transform – are listed below:

- **Strengthen and resist:** Adaptation measures that help the system withstand adverse impacts of climate hazards through hardening measures and infrastructural improvements to strengthen assets to mitigate damage from extreme conditions.
- **Anticipate and absorb:** Adaptation measures that help the system anticipate and absorb climate hazard impacts, predict potential hazards and their impacts, and give an advance warning for gray sky adjustments to be made to limit the number and extent of adverse effects and allow the system to continue to operate during hazard events.
- **Respond and recover:** Adaptation measures that bolster the utility's ability to restore service and normal operations in the wake of a climate hazard event. These measures are mostly, but not exclusively, operations based.
- **Advance and adapt:** Adaptation measures that assist the system in advancing and adapting help make the system more mature, support cyclical processes to routinely

revisit, assess, and update the system to be most resilient to climate risks based on the latest data, climate science, technology, and best practices.

Effective adaptation measures outlined in the PJDs will align with at least one of these four criteria in the Resilience Strategy Framework. This framework was used to develop adaptation measures for both physical assets and operational processes to bolster the entire system and all PSEG Long Island operations.

This CCRP represents an additional step in PSEG Long Island's lengthy journey of enhancing asset-wide and system-wide resilience.

Proposed Adaptation-Related Measures

To identify and select the adaptation measures in this plan, PSEG Long Island first consulted the results from the CCVS to understand the highest priority asset/hazard combinations and the most at-risk asset classes. For flooding specifically, PSEG Long Island conducted a GIS analysis to examine how many and which assets were exposed to coastal flooding. The asset classes most at risk for each climate hazard were selected for resilience projects and programs.

The Company then consulted existing asset management programs and projects to develop its new set of measures. Guided by the Resilience Strategy Framework, it identified existing adaptation measures it could expand upon and any gaps it would address with new measures. Throughout this process, it collaborated closely with SMEs to identify the most appropriate and impactful measures.

Once PSEG Long Island identified adaptation measures, the measures were assembled into PJDs, outlining the broad array of considerations from cost to resilience impact to justify their investment. The following adaptation measures were selected for inclusion in this plan and are summarized in PJDs in the Investment Plan section of this document:

- Storm Hardening (Power On)
- FEMA-Funded Defective Pole Replacement Queens/Nassau and Suffolk Counties
- FEMA-Funded Distribution Storm Hardening
- FEMA-Funded Transmission Crossings Upgrade
- System Spares
- Distribution Multiple Customer Outages (MCO)
- Distribution Circuit Improvement Program (CIP)
- Distribution Breaker Replacements
- Distribution Switchgear Replacements
- Climate-Driven Distribution Pad Mount Switchgear Program
- Substation Battery Replacements

- Substation Transformer Replacements
- Substation Control Power Transformer Replacements
- Substation Flood Mitigation Program
- Transformer Major Component Replacements
- Transmission Load Pocket Storm Hardening
- Transmission Breaker Replacements
- Transformer Load Tap Changer Replacements
- Storm Hardening Feeds to Critical Fuel Depots

As PSEG Long Island incorporates adaption measures into the transmission and distribution electric system, resiliency solutions or sets of solutions will be considered based upon site conditions and historical performance at each location.

Incorporating Resilience into Existing Planning, Design, and Operations Practices

PSEG Long Island developed adaptation measures for existing planning, design, operations practices, and physical assets to holistically enhance the entire system. The Study team conducted interviews with SMEs and reviewed design specifications and operational documents (such as emergency response procedures, environmental health guidelines, safety standards, etc.) to determine areas in need of enhanced resilience. Adaptation measures for planning, design, and operations practices are also included in this plan and further detailed in the PJDs.

As identified in the CCVS, the following operations and planning categories are vulnerable to at least one climate hazard:

- Safety
- Emergency Response
- Reliability Planning
- Asset Management
- Vegetation Management
- Capacity Planning
- Load Forecasting

Adaptation measures for these operations were also developed through the resilience strategy framework; each proposed project helps the operational area strengthen and resist, anticipate and absorb, respond and recover, or advance and adapt. The following is a list of proposed projects:

- Technology Road Map to Allow Flexibility Across Systems (Emergency Response)
- Strategic Supervisory Control of Branch Line Reclosers in Flood-Zones Study (Emergency Response)
- Vegetation Intelligence Data (Vegetation Management)

- Mid-Cycle Hot Spotting (Vegetation Management)
- Overhang Limb Removal Program (Vegetation Management)
- Wildfire Assessment (Worker Safety, Emergency Response, Asset Protection)

PJDs for each of the proposed operational projects include the climate vulnerability being addressed, the operational vulnerability being addressed, and a brief description of the project or program. By carefully outlining each proposed measure in this manner, PSEG Long Island can ensure the efficient implementation of said programs, as well as clear, transparent communication with stakeholders.

Applying New Technologies

In its resilience investment strategy, PSEG Long Island will also continue to incorporate the most up-to-date technology into its projects.

For example:

- **Installing online monitoring systems:** Substation transformers will have online monitoring systems, enabling asset managers to monitor the transformers' health condition and make informed maintenance decisions.

- **Utilizing Advanced Metering Infrastructure (AMI):** AMI systems will provide PSEG Long Island with comprehensive, accurate data regarding the number of customers experiencing low voltage during peak load days; this project will evaluate and design solutions for those customers.

Investment Plan: Project Justification Documents (PJDs)

PJDs were created for each proposed capital and operational project. These documents include the climate vulnerabilities being addressed, the operational vulnerabilities being addressed, and a brief description of the project or program. The PJDs will be assessed on an ongoing basis given actual climate change that occurs and evolving priorities.

The PJDs are divided into Capital Projects and O&M Projects. Capital Projects target physical assets, while O&M Projects address gaps in system processes. Capital PJDs are further divided into Infrastructure (including physical asset upgrades, replacements, purchasing, etc.) and Technology (automation, monitoring, AMI).

Capital PJDs: Infrastructure

Storm Hardening Program (Power On)

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Storm Hardening Program (Power On)	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: High Wind, Ice	
Operational Vulnerability: The key climate vulnerability for emergency response processes is the potential for an increase in the frequency and intensity of storms and extreme weather. The increasing intensity and frequency of severe weather events could result in more frequent activations of emergency response procedures. While PSEG Long Island's existing emergency response procedures are flexible and designed to scale to reflect anticipated event impacts, a large increase in the number of activations has the potential to strain PSEG Long Island's resource capabilities. Due to the unpredictable and intense nature of these events, emergency response procedures may require new skills and protocols that extend beyond the current capabilities of both PSEG Long Island and municipalities. Furthermore, the increasing frequency of certain types of events increases the probability that events follow each other in quick succession, which can result in additional cumulative impacts.	
Project/Program Description: Upgrade mainline primary circuit miles to align with current distribution storm hardening standards developed after Superstorm Sandy. These standards were approved by FEMA for distribution hardening funded through a multi-year FEMA grant. Mainline circuit miles are prioritized based on historical outages with an annual review to confirm priorities for future engineering and construction efforts. Branch line circuit miles will follow similarly. PSEG Long Island intends to carry on the storm hardening effort begun in 2020 to effectively continue the hardening scope of the FEMA program but also potentially expand it in later years to branch upgrades in an effort to most effectively mitigate storm damage and associated repair efforts. This will help mitigate risks from major storms to electric operations by improving reliability and upgrading/mitigating/storm hardening distribution circuits, both mainline and branch line, making them more storm resilient.	

FEMA-Funded Defective Pole Replacement
Queens/Nassau & Suffolk Counties

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: FEMA-Funded - Defective Pole Replacement Queens/Nassau & Suffolk Counties	
Status: ☒First year investment proposed for funding ☐Construction/Program already started	
Climate Vulnerability: High Wind, Ice	
Operational Vulnerability: The key climate vulnerability for emergency response processes is the potential for an increase in the frequency and intensity of storms and extreme weather. The increasing intensity and frequency of severe weather events could result in more frequent activations of emergency response procedures. While PSEG Long Island's existing emergency response procedures are flexible and designed to scale to reflect anticipated event impacts, a large increase in the number of activations has the potential to strain PSEG Long Island's resource capabilities. Due to the unpredictable and intense nature of these events, emergency response procedures may require new skills and protocols that extend beyond the current capabilities of both PSEG Long Island and municipalities. Furthermore, the increasing frequency of certain types of events increases the probability that events follow each other in quick succession, which can result in additional cumulative impacts.	
Project/Program Description: The FEMA sub-standard pole replacements are two separate projects (one for Queens/Nassau Counties the other Suffolk County) to replace individual mainline and branch line poles that are 55 years or older and are Class 4 or less strength. The newly installed poles will be Class 2 poles, which are stronger and thicker and are designed to the current LIPA storm hardening standards to withstand up to 130 mph winds. These hardening projects are designed to mitigate the impact of storms on PSEG Long Island customers by reducing the number of customer interruptions during a storm event. Up to 385 poles for each project are planned to be replaced for a total of 770 poles within 50 circuits in Queens/Nassau County and 27 circuits in Suffolk.	

FEMA-Funded Distribution Storm Hardening

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: FEMA-Funded Distribution Storm Hardening	
Status: ☒First year investment proposed for funding ☐Construction/Program already started	
Climate Vulnerability: High Wind, Ice	
Operational Vulnerability: The key climate vulnerability for emergency response processes is the potential for an increase in the frequency and intensity of storms and extreme weather. The increasing intensity and frequency of severe weather events could result in more frequent activations of emergency response procedures. While PSEG Long Island's existing emergency response procedures are flexible and designed to scale to reflect anticipated event impacts, a large increase in the number of activations has the potential to strain PSEG Long Island's resource capabilities. Due to the unpredictable and intense nature of these events, emergency response procedures may require new skills and protocols that extend beyond the current capabilities of both PSEG Long Island and municipalities. Furthermore, the increasing frequency of certain types of events increases the probability that events follow each other in quick succession, which can result in additional cumulative impacts.	
Project/Program Description: The FEMA-Funded Distribution Storm Hardening Program is a continuation of overhead mainline hardening of 166 distribution circuits that were damaged during the Tropical Storm Isaias. Thirteen of the 166 circuits are planned for partial undergrounding based on consideration of site-specific conditions and historic reliability. These circuits will be updated to the current LIPA storm hardening standards to withstand up to 130 mph winds. The program is expected to storm-harden 417 overhead miles and approximately 9 underground miles. The mainline line distribution hardening program is designed to mitigate the impact of storms on PSEG Long Island customers by reducing the number of customer interruptions during a storm event. This will help mitigate risks from major storms to electric operations by improving reliability and upgrading/mitigating/storm hardening distribution circuits, making them more storm resilient. The program is being funded through FEMA's Hazard Mitigation Grant Program, which provides funding to state, local, tribal and territorial governments so they can develop hazard mitigation plans and rebuild in a way that reduces, or mitigates, future disaster losses in their communities. This grant funding is available after a presidentially declared disaster.	

FEMA-Funded Transmission Crossings Upgrade

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: FEMA-Funded Transmission Crossings Upgrade	
Status: ☒First year investment proposed for funding ☐Construction/Program already started	
Climate Vulnerability: High Wind, Ice	
Operational Vulnerability: The key climate vulnerability for emergency response processes is the potential for an increase in the frequency and intensity of storms and extreme weather. The increasing intensity and frequency of severe weather events could result in more frequent activations of emergency response procedures. While PSEG Long Island's existing emergency response procedures are flexible and designed to scale to reflect anticipated event impacts, a large increase in the number of activations has the potential to strain PSEG Long Island's resource capabilities. Due to the unpredictable and intense nature of these events, emergency response procedures may require new skills and protocols that extend beyond the current capabilities of both PSEG Long Island and municipalities. Furthermore, the increasing frequency of certain types of events increases the probability that events follow each other in quick succession, which can result in additional cumulative impacts.	
Project/Program Description: The FEMA-Funded Transmission Crossing Upgrade project is intended to harden/upgrade 19 transmission power line crossings to withstand 130-mph sustained wind standard. These crossing are located on critical high traffic volume north-south and east-west roadways (e.g. Northern State Parkway, Southern State Parkway, Sunrise Highway, Wantagh Parkway, Seaford Oyster Bay Expressway, Sunken Meadow Parkway, Sagtikos Parkway and Meadowbrook Parkway) used by first responders and emergency services. These crossings were not damaged because of Tropical Storm Isaias, but did suffer damage during Superstorm Sandy and are a critical reliability link to the T&D electric system. The result of performing this hazard mitigation on nineteen (19) critical parkways and primary roadways transmission line crossings is to prevent or reduce damage to the transmission line during severe and major storms to allow the electrical system to function without interruption. Should the power lines fall on critical roadways (e.g. State Parkways, primary roadways, or the Long Island Rail Road), these routes of egress are effectively closed until service crews are able to clear the dangers caused by downed power lines. These closures could last for many hours and delay the rescue efforts of first responders, such as police and fire departments, there by placing life and property at a higher risk of loss. In addition, by preventing damage to transmission line crossings, which go over parkways or main roadways, we enable community lifelines (shelters, health and medical facilities, critical government and business functions) to be stabilized and able to respond to the recovery efforts required to ensure the safety and health of the communities affected.	

System Spares

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: System Spares	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat, flooding, wind and ice	
Operational Vulnerability: With more frequent and intense extreme events and extreme heat, PSEG Long Island is likely to see more stress on assets and a higher asset replacement rate. Expanding the system spares program will allow PSEG Long Island to address issues of failed equipment more quickly thereby improving system reliability.	
Project/Program Description: The Spare Equipment program supports the on-hand requirements for major T&D equipment. Required equipment purchases are reviewed annually and are based upon minimum required equipment quantities which are impacted by equipment failures. **Purchased equipment may include switchgear, underground transmission equipment, breakers, and transformers.**	

Distribution Circuit Improvement Program (CIP)

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Distribution circuit improvement program (CIP)	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: High wind, ice, extreme events	
Operational Vulnerability: Under high wind and ice conditions there is an increase in potential outages due to effect of these adverse weather condition on both the distribution mainline and branch line due primarily to mechanical failure of assets.	
Project/Program Description: The Circuit Improvement Program involves an analysis of the causes of interruptions on those overhead circuits experiencing the lowest reliability levels. Circuits are selected based on their reliability performance and are ranked based on recent distribution customer interruptions. Once selected for inclusion in the program, a detailed, pole-by-pole field inspection of the circuits is conducted to visually identify substandard conditions such as: pole replacements, decayed crossarms, broken insulators, damaged transformers, broken down-grounds, blown lightning arresters, etc. The program also includes the installation of Automatic Sectionalizing Unit ("ASUVs"), at strategic locations with a goal of limiting the number of customers affected behind each smart switch to less than 500, as well as other locations identified through reliability analyses. This project will help to partially mitigate the risk from major storms to electric operations by addressing substandard conditions, the first and most likely causes for outages in storms. This program will also help partially mitigate the Electric Operations Risk – "Circuit Configurations" by addressing mainline faults that cause excessive numbers of customer outages.	

Distribution Breaker Replacements

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Distribution Breaker Replacements	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat	
Operational Vulnerability: Under extreme heat conditions, the aging and declining health of substation equipment can be expedited, making outages more likely and degrading the resiliency of the transmission and distribution systems.	
Project/Program Description: This program replaces distribution breakers at various substations that have been reviewed as non-repairable (e.g., obsolete parts) or mis-operating with repeat reliability issues (e.g., failing to trip, failing or slow to reclose). The project will help to mitigate the operational risk of aging and declining health of substation equipment by replacing aging and at-risk substation equipment.	

Substation Battery Replacement Program

PROJECT/PROGRAM SUMMARY

<table>
<tr><td>Type: ☐Specific ☒ Program/Blanket</td><td>Category: ☒Capital ☐O&M</td></tr>
<tr><td colspan="2">Project/Program Title: Substation Battery Replacement Program</td></tr>
<tr><td colspan="2">Status: ☐First year investment proposed for funding ☒Construction/Program already started</td></tr>
<tr><td colspan="2">Climate Vulnerability: Extreme heat, inland flooding</td></tr>
<tr><td colspan="2">Operational Vulnerability: Extreme heat conditions can accelerate the aging of substation equipment, increasing the likelihood of outages and degrading transmission and distribution system resiliency. Engineers evaluate flood risk for identified substations to ensure design adequately accounts for these risks.</td></tr>
<tr><td colspan="2">Project/Program Description: This blanket program replaces the substation DC battery set and charger at various substations.

The Substation Battery Replacement Program will help to mitigate the operational risk of aging and declining health of substation equipment by replacing aging and at-risk substation equipment.</td></tr>
</table>

Substation Control Power Transformer Replacements

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Substation Control Power Transformer Replacements	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat, inland flooding	
Operational Vulnerability: Given that extreme heat accelerates the aging of substation equipment, increases in extreme heat can make outages more likely and impact the resiliency of the transmission and distribution systems. Furthermore, flooding poses a risk to substation equipment and necessitates design that accounts for flood risk.	
Project/Program Description: Replace dry type control power transformers ("CPT") with pole mounted single phase oil-filled transformers. Work may or may not require the setting of a station or pole to support the three single phase pole top transformers. Additionally, new cable must be run to the switchgear compartment and ATO to complete the improvements. This project will help to mitigate the operational risk of aging and declining health of substation equipment by replacing the specified aging substation equipment with health concerns across the system.	

Substation Transformer Major Component Replacements

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Substation Transformer Major Component Replacements	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat	
Operational Vulnerability: Extreme heat accelerates the aging of substation equipment, making outages more likely and decreasing the resiliency of the Transmission and Distribution system.	
Project/Program Description: This program targets major transformer components (bushings, pumps, coolers, etc.) that have demonstrated reliability issues. Under this program, we plan on providing targeted component replacements to provide a life extension for two to three transformers a year. The Transformer Major Components Replacements Program will help to mitigate the risk from aging and declining health of substation equipment by implementing actions to extend the life of aging substation transformers across the system.	

Transmission Breaker Replacement Program

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Transmission Breaker Replacement Program	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat, inland flooding	
Operational Vulnerability: Under extreme heat conditions, the aging and declining health of substation equipment can be expedited, making outages more likely and degrading the resiliency of the transmission and distribution systems. Furthermore, inland flooding can pose a risk to substation equipment and require design features that account for this risk.	
Project/Program Description: This blanket replaces transmission breakers at various substations that have either experienced high levels of required corrective maintenance or have reached their operational end of life. The Transmission Breaker Replacement Program will help to mitigate the risk from aging and declining health of substation equipment by replacing the specified aging substation equipment with health concerns across the system. Once approved by the LIPA Board, this project will be updated to include climate hazards.	

PSEG LONG ISLAND

Transformer Load Tap Changer Replacement Program

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Transformer Load Tap Changer Replacement Program	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat	
Operational Vulnerability: Under extreme heat conditions, the aging and declining health of substation equipment can be accelerated, making outages more likely and degrading the resiliency of the transmission and distribution systems.	
Project/Program Description: The Transformer Load Tap Changer Replacement ("LTC") program will address LTC's which have been shown to have reliability issues. A primary cause of transformer LTC board failures is that over the years, the sealing components where the low voltage leads from the main tank of the transformer pass through to the LTC mechanism, start to fail. These seals have deteriorated over the life of the transformer during the various loading, heating, and cooling of the transformer periods. This project will help to mitigate the risk from aging and declining health of substation equipment by implementing actions to extend the life of aging substation transformer LTC's across the system.	

Distribution Switchgear Replacements

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Distribution Switchgear Replacements	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat, inland flooding	
Operational Vulnerability: Under extreme heat conditions, the aging and declining health of substation equipment may accelerate, making outages more likely and degrading the resiliency of the transmission and distribution systems. Engineering evaluates flooding risk for identified substations and factors that into their designs.	
Project/Program Description: The intent of this program is to start replacing the vintage style switchgears that are between the ages of 49 and 89 years old. These switchgear replacements are based on the physical condition, vintage manufacturer operating history, upcoming potential planning jobs, and maintenance history. Proactive replacement of the vintage switchgear within our fleet that falls into the categories mentioned above will help to avoid the significantly more costly options of replacing gear after failure events. Typically, replacing a switchgear in response to a failure can cost 2-2.5x more than replacing the same gear under a proactively scheduled replacement program. This program will help to mitigate the risk from aging and declining health of substation equipment by replacing the specified aging substation equipment with health concerns across the system.	

Substation Transformers Replacements

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Substation Transformers Replacements	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat	
Operational Vulnerability: Extreme heat can accelerate the aging of substation transformers, requiring more frequent replacement to prevent increased outages and bolster resilience.	
Project/Program Description: A replacement program for substation transformers is important to mitigating the increased risk posed by extreme heat. There are transformers in the system with gassing concentrations of level 4 (which is the highest level of gassing according to IEEE standards). These transformers are monitored and will be prioritized for replacement in this program. Additionally, this program will target transformers that have issues with their major components (cooling, LTC, etc.) that cannot be repaired due to availability of vintage spare components. Finally, the program will also consider transformers that have a poor physical condition, which would cost as much to repair as the cost of a new unit. This replacement program will help to mitigate the risk from aging and declining health of substation equipment by replacing the specified aging substation equipment with health concerns across the system.	

Transmission Load Pocket Storm Hardening

PROJECT/PROGRAM SUMMARY

Type: ☒Specific ☐ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Transmission load pocket storm hardening	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: High wind, ice, extreme events	
Operational Vulnerability: During extreme events such as Superstorm Sandy, customers located in transmission load pockets are more likely to experience outages due to loss of supply. Replacing vulnerable transmission poles and increasing redundancy will help reduce outages and restoration time.	
Project/Program Description: As a part of the transmission load pocket study, this project will improve the storm resiliency and blue-sky performance of various load pockets.	

Substation Flood Mitigation Program

(non-DOE GRIP Program)

PROJECT/PROGRAM SUMMARY

Type: ☒Specific ☐ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Substation Flood Mitigation Program (non-DOE GRIP Program, Fire Island Substation Relocation)	
Status: ☒ To be evaluated	
Climate Vulnerability: Coastal flooding	
Operational Vulnerability: Coastal flooding threatens operations of certain substations within our service territory. Flooding causes erosion, which puts substations at risk. This project would relocate substations to new locations with shoreline protection, elevated equipment, and relocated transmission and distribution feeders.	
Project/Program Description: General Scope will vary by location, but may include; replacement of substation transformer banks, replacement and raising of standalone breakers and switchgear, replacement/raising of control enclosures, general flood mitigation, and relocation of equipment to protected or elevated locations. The potential substations to possibly be included in this program are: Fire Island Pines, Ocean Beach, Oyster Bay, Peconic, Prospect, Northport, Far Rockaway, Long Beach, Woodmere, Green Acres, Southold, and Patchogue.	

Substation Flood Mitigation Program

(DOE GRIP Program - Prioritizing DAC Areas)

PROJECT/PROGRAM SUMMARY

Type: ☒Specific ☐ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Substation Flood Mitigation Program (DOE GRIP Program - Prioritizing DAC Areas)	
Status: ☒To be evaluated	
Climate Vulnerability: Coastal flooding	
Operational Vulnerability: Coastal flooding threatens the operations of certain substations within our service territory. For example, increased erosion due to flooding can threaten the integrity and operation of substations.	
Project/Program Description: Addressing this vulnerability will vary by location, but may include replacement of substation transformer banks, replacement and raising of standalone breakers and switchgear, replacement/raising of control enclosures, and general flood mitigation. We are seeking federal funding to support this initiative. The potential substations included in this program are: Far Rockaway, Woodmere, Green Acres, Southold, and Patchogue.	

Storm-Hardening Feeds to Critical Fuel Depots

PROJECT/PROGRAM SUMMARY

<table>
<tr><td>Type: ☐Specific ☒ Program/Blanket</td><td>Category: ☒Capital ☐O&M</td></tr>
<tr><td colspan="2">Project/Program Title: Storm-hardening feeds to critical fuel depots</td></tr>
<tr><td colspan="2">Status: ☒To be evaluated</td></tr>
<tr><td colspan="2">Climate Vulnerability: Severe storm</td></tr>
<tr><td colspan="2">Operational Vulnerability: As the frequency of extreme storms such as hurricanes increases, maintaining power to fuel depots is crucial to supporting customers and operations when fuel supply chains are strained.</td></tr>
<tr><td colspan="2">Project/Program Description: This program will harden distribution circuits to improve reliability of circuits feeding critical fuel depots during major events.</td></tr>
</table>

PSEG LONG ISLAND

Distribution Multiple Customer Outages (MCO)

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Distribution multiple customer outages (MCO)	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: High wind, ice, extreme events	
Operational Vulnerability: Under high wind and ice conditions there is an increase in potential outages due to these adverse weather conditions on both the distribution mainlines and branch lines primarily because of mechanical failure of assets.	
Project/Program Description: The focus of this program is targeted mitigation of small sections of the overhead and underground distribution system, which contribute to customers experiencing multiple sustained and/or momentary outages. This program will help to partially mitigate operational risk by creating work scopes to address potential outages caused by renewable energy resources such as miscoordinations, overloads, and other conditions causing distribution branch tap outages. This program will also help partially mitigate the operational risk to circuit configurations by addressing mainline faults that cause excessive number of customers to lose power.	

Climate-Driven Distribution Pad Mount Switchgear Program

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Climate Driven Distribution pad mount switchgear Program	
Status: ☒To be evaluated	
Climate Vulnerability: Inland and coastal flooding	
Operational Vulnerability: Increased inland and coastal flood risk threatens the operations of certain distribution assets within our service territory.	
Project/Program Description: This program targets remediation of pad-mounted switchgear, which could include relocation of the gear, elevation of the gear, or replacement of the gear with submersible switches. The specific remediation could vary by location based on projected location specific flood levels. Out of the PMH pad mounted switchgear assets, approximately 400 are located in the potential storm surge zone. Remediation efforts will attempt to target these assets to decrease the impacts of flooding.	

Capital PJDs: Technology

End-to-End Mutual Aid Acquisition Project

PROJECT/PROGRAM SUMMARY

Type: ☒Specific ☐ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: End to End Mutual Aid Acquisition Project	
Status: ☒To be evaluated	
Climate Vulnerability: Severe storms, flood, extreme heat, ice	
Operational Vulnerability: During storm events or similar event responses, it is critical to track the availability of PSEG Long Island employees, On-Island Contractors, and Mutual Aid Crews for different storm restoration roles, such as line repair work, vegetation management, surveying/damage assessment, etc. to ensure a quick response to storm impacts.	
Project/Program Description: This project will attempt to develop solutions to automate the resource check-in and checkout processes, to introduce new mobile technology solutions that will better capture field updates, to integrate key applications used to capture resource availability, and to present consolidated views of all resources available for storm restoration. Resource acquisition and enablement is one of the foundational elements for future implementations of electronic scheduling.	

Transformer Monitoring

PROJECT/PROGRAM SUMMARY

Type: ☒Specific ☐ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Transformer Monitoring	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat	
Operational Vulnerability: Extreme heat accelerates substation equipment aging, increasing the likelihood of outages and degrading the resilience of the transmission and distribution system as a whole.	
Project/Program Description: The scope of work of the Transformers Monitoring program is the installation of an online monitoring system(s) on substation transformer(s). The data collected from these systems will enable the asset managers to monitor the transformer's health condition, prioritize maintenance, and help make repair or replacement decisions to maximize the system's reliability. Different monitoring systems can be installed on transformers and their major components. These include DGA, partial discharge, bushings monitors, etc. The data collected from these systems are automated to a health condition assessment platform to be used with algorithms to analyze the health condition of individual transformers and the whole transformer fleet health. This program will help mitigate the operational risk of aging and declining health of substation equipment by implementing actions to monitor aging substation transformers across the system.	

PSEG LONG ISLAND

Distribution Voltage Remediation Program

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☒Capital ☐O&M
Project/Program Title: Distribution Voltage Remediation Program	
Status: ☐First year investment proposed for funding ☒Construction/Program already started	
Climate Vulnerability: Extreme heat	
Operational Vulnerability: Under extreme heat conditions, there is a higher chance of repeat reliability issues during peak load days and more customers experiencing low voltage issues.	
Project/Program Description: With the arrival of AMI and utilizing data for the summer 2021, it provides the utility with the opportunity to more closely monitor the voltage level at a customers' meters. This project will work to evaluate, engineer, and construct solutions for customers that may receiving less than the established minimum voltage.	

O&M PJDs

Technology Road Map to Allow Flexibility Across Systems

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☐Capital ☒O&M
Project/Program Title: Technology roadmap to allow flexibility across systems	
Status: ☒To be evaluated	
Climate Vulnerability: Severe storms, flooding, extreme heat, ice	
Operational Vulnerability: In the event of outages, OMS is the main system used by PSEG Long Island to identify outages and dispatch jobs for restoration. As part of PSEG Long Island's product life-cycle management, the recommendation is to identify and implement the latest technology solutions for outage management systems.	
Project/Program Description: An Advanced Distribution Management System ("ADMS") is the software platform that supports the full suite of distribution management and optimization. An ADMS system is essential for more automated operation and optimization of the electric distribution system. This project would fund the product vendor Design and Discovery work leading to a detailed implementation roadmap for more advanced ADMS modules. This first phase of ADMS implementation will also include the OSII Monarch DSCADA system upgrade needed for full feature availability of the ADMS, and the development of the Distribution Power Flow ("DPF") network model for the entire PSEG Long Island service territory.	

PSEG LONG ISLAND

Strategic Supervisory Control of Branch Line Reclosers in Flood Zones – Study

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☐Capital ☒O&M
Project/Program Title: Strategic supervisory control of branch line reclosers in flood-zones – study	
Status: ☒To be evaluated	
Climate Vulnerability: Floods	
Operational Vulnerability: During coastal flooding events, PSEG Long Island needs to de-energize radial branch fuses that feed into flood zone-areas, typically on the north and south shore.	
Project/Program Description: This project would identify fuses to convert to branch-line reclosers, which could be remotely de-energized in the event of coastal flooding. The branch line reclosers would be located near the 100-year flood storm marks so that the branch taps that feed into the flood zones can be opened safely without putting linemen in harm's way of the flooded area.	

Vegetation Intelligence Data

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☐Capital ☒O&M
Project/Program Title: Vegetation Intelligence Data	
Status: ☒To be evaluated	
Climate Vulnerability: Severe storms, ice	
Operational Vulnerability: Tree related outages are the second leading cause of interruptions for PSEG Long Island. PSEG Long Island currently operates a "time-based" trimming approach, where approximately 25% of the system is inspected and trimmed each year. A key vulnerability to the PSEG Long Island vegetation management program is the potential for the increasing frequency and intensity of storms to cause more damage and tree-driven outages. Climate change may also decrease the strength of trees, increase the growth rate of trees requiring more frequent trimming, and allow invasive species to proliferate, which can also impact the strength of trees.	
Project/Program Description: This program would employ a variety of technology-based solutions for Vegetation Management Programs. Satellite, fixed wing, and drone technologies could survey the territory to determine next steps and direct resources to certain programs while saving on the use of "boots-on-the-ground" resources that currently perform this work.	

Mid-Cycle Hot Spotting

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☐Capital ☒O&M
Project/Program Title: Mid-cycle hot spotting	
Status: ☒First year investment proposed for funding ☐Construction/Program already started	
Climate Vulnerability: Severe storms, ice	
Operational Vulnerability: Tree related outages are the second leading cause of interruptions for PSEG Long Island. PSEG Long Island currently operates a "time-based" trimming approach, where approximately 25% of the system is inspected and trimmed each year. A key vulnerability to the PSEG Long Island vegetation management program is the potential for the increasing frequency and intensity of storms to cause more damage and tree-driven outages. Climate change may also decrease the strength of trees, increase the growth rate of trees requiring more frequent trimming, and allow invasive species to proliferate which can also impact the strength of trees.	
Project/Program Description: This program would support Vegetation Management and Reliability Management collaborating to develop a list of poor-performing sections of circuits that require a more frequent trim than the current 4-year cycle. All mainline and branch line will be covered in the program.	

Overhang Limb Removal Program

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☐Capital ☒O&M
Project/Program Title: Overhang Limb Removal Program	
Status: ☐First year investment proposed for funding ☒Construction/Program already started (with possible expansion)	
Climate Vulnerability: Severe storms, ice	
Operational Vulnerability: Tree related outages are the second leading cause of interruptions for PSEG Long Island. PSEG Long Island currently operates a "time-based" trimming approach, where approximately 25% of the system is inspected and trimmed each year. A key vulnerability to the PSEG Long Island vegetation management program is the potential for the increasing frequency and intensity of storms to cause more damage and tree-driven outages. Climate change may also decrease the strength of trees, increase the growth rate of trees requiring more frequent trimming, and allow invasive species to proliferate which can also impact the strength of trees.	
Project/Program Description: Expand the existing Trim-to-Sky Program to include the entire primary distribution circuit (pilot for 10% of the circuit for a four-year trim cycle and evaluate results to determine whether to expand).	

PSEG LONG ISLAND

Wildfire Assessment

PROJECT/PROGRAM SUMMARY

Type: ☐Specific ☒ Program/Blanket	**Category:** ☐Capital ☒O&M
Project/Program Title: Wildfire Assessment	
Status: ☒To be evaluated	
Climate Vulnerability: Wildfires	
Operational Vulnerability: Parts of the PSEG Long Island service territory are prone to wildfires and have been identified to be among the highest risk in New York State for wildfire. Climate change has the potential to exacerbate this risk. Precipitation is projected to experience greater interannual variability, so tree-covered areas may be subject to greater drought risk in some years. Wildfires can cause service disruptions, as well as risk to worker and customer safety. This study would identify areas of risk to the system and from the system and will propose solutions to mitigate identified risks.	
Project/Program Description: This program would involve procuring expert outside services to assess system risk from wildfires and develop a wildfire plan, which would include both mitigation and response actions. This project plan would leverage existing expertise and planning efforts, including planning documents developed by the Long Island Central Pine Barrens Wildfire Task Force.	

Governance

PSEG Long Island is deeply committed to the success of its resiliency agenda, as laid out in this Plan. Transparency and consistency in implementing the selected resiliency measures will be key to ensuring the success and longevity of advancing the system's overall resilience to climate hazards.

To maximize the impact of resilience investments, PSEG Long Island has established a three-pronged governance strategy articulated as follows:

- First, the Company has **convened a team of dedicated staff to oversee climate change matters and resiliency planning**. In addition to coordinating the implementation of adopted resilience initiatives over time, this group of experts will be involved in securing grants designed to support resiliency initiatives. This will ensure that climate resilience efforts benefit from regular and dedicated oversight, funding, and advocacy within the Company.
- Second, based on the urgency of the resiliency needs highlighted by the CCVS, the Company has **created a Climate Leadership Council ("CLC")**. The Council comprises PSEG Long Island's executive leadership members from across the organization, including the Chief Operating Officer ("COO") and Vice Presidents of T&D, Construction and Operations Services, Power Systems Management, and External Affairs. It is set to receive biennial updates on key Company activities related to climate change planning and will be tasked with reviewing major deliverables.
- Third, PSEG Long Island will **hold oversight committee meetings on an ongoing basis with representation from LIPA leadership to address climate change resiliency planning**. For PSEG Long Island, the meetings will involve representatives from Asset Management, Engineering, Planning, External Affairs, and Policy & Regulatory. For LIPA, it will include representatives from the T&D, Finance, Legal, External Affairs, and Regulatory divisions. PSEG Long Island will propose deliverables to LIPA for review, and potential adoption, as requested, or as new information about climate change is received.

PSEG Long Island will also continue to exchange and interact with the Joint Utilities of New York and industry organizations. The Company intends to continue learning from stakeholders about the best practices in resiliency planning and to share any crucial insight gathered in the process of advancing the system's resilience. Given our commitment to the public and our customers, we intend to share regular public updates on the advancement of the CCRP's implementation and monitoring.

Conclusion and Next Steps

As recent extreme weather events have illustrated, the effects of climate change threaten the assets and operations and thus impact the safety and reliability of service. This CCRP builds on our ongoing climate resilience efforts to address these challenges with the goal of allowing PSEG Long Island to continue to provide safe and reliable delivery of energy to customers. The CCVS and this CCRP have provided PSEG Long Island with a greater understanding of climate hazards and the specific options available for addressing these hazards within the Long Island service area.

The adaptation measures presented in this CCRP are intended to improve customer experience by enabling the system to better withstand and respond to extreme climate events. PSEG Long Island is intentionally factoring equity into these decisions to ensure that all individual customers and disadvantaged communities are included in its resilience journey.

Implementation of the adaptation measures identified in this CCRP is the primary focus of resilience work for PSEG Long Island moving forward. However, the Company will continue to engage with stakeholders and industry leaders to ensure that they are implementing the best available resilience practices. Furthermore, PSEG Long Island will continue to learn about and incorporate new methodologies, tools, data, and evolving climate projections to ensure that adaptation measures are based on the current best practices. Consistent with guidance for other New York State electric utilities, PSEG Long Island will review and make any appropriate updates to our CCRP based on progress to date as well as evolving climate projections.

PSEG Long Island and LIPA have worked together for over a decade to enhance the system's resiliency. This CCRP represents another step in their collaborative effort to continue providing reliable energy to their 1.2 million customers.