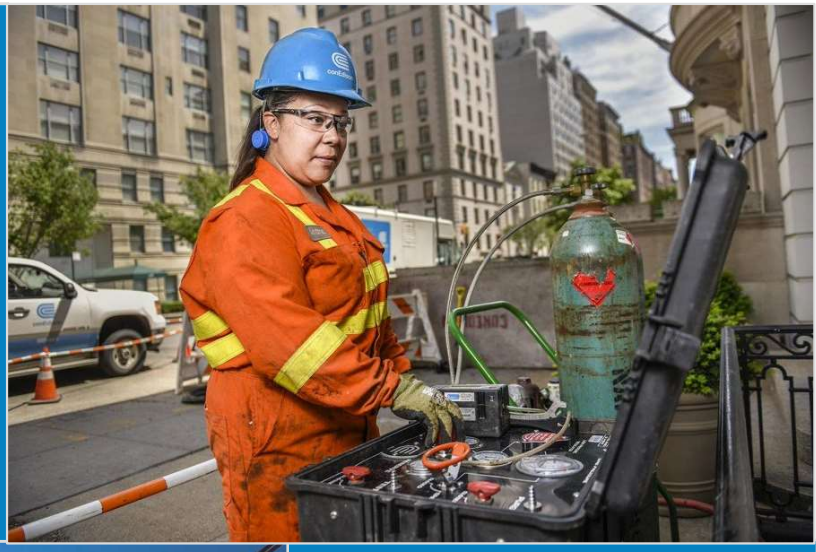
conEdison

Con Edison Climate Change Resilience Plan

Case 22-E-0222

February 18, 2025



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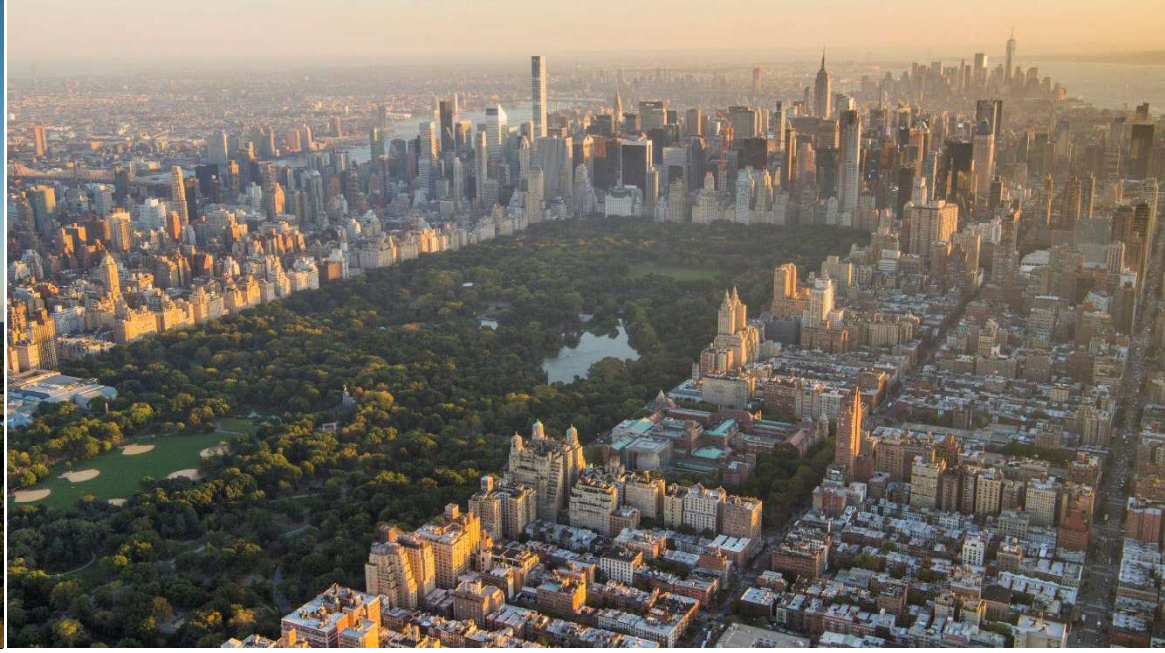
Abbreviations

AMI	Advanced Metering Infrastructure
ATS	Automatic Transfer Switch
CCRP	Climate Change Resilience Plan
CCVS	Climate Change Vulnerability Study
CJWG	Climate Justice Working Group
Con Edison or the Company	Consolidated Edison Company of New York, Inc.
CRRG	Climate Change Risk and Resilience Group
CRWG	Climate Resilience Working Group
DAC	Disadvantaged Communities
DPS	Department of Public Service
EAP	Energy Affordability Program
ERM	Enterprise Risk Management
FEMA	Federal Emergency Management Agency
HVAC	Heating, Ventilation, and Air Conditioning
LMI	Low to Moderate Income
MIT	Massachusetts Institute of Technology
NRI	Network Resiliency Index
NYSERDA	New York State Energy Research and Development Authority
OHPOT	Overhead Program Optimization Tool
OMS	Outage Management System
PPE	Personal Protective Equipment
PSL	Public Service Law
R&D	Research and Development

RCP	Representative Concentration Pathway
SSO	Substation Operations
SSP	Shared Socio-economic Pathway
TV	Temperature Variable
UHI	Urban Heat Island
USACE	United States Army Corps of Engineers
USS	Unit Substation



Executive Summary

New York State is leading the nation in addressing climate change, both through efforts that will mitigate future climate change by reducing carbon emissions and also by taking bold actions to help adapt the state to prepare for impacts of climate change that cannot be mitigated. Leadership in this space is essential and Consolidated Edison Company of New York, Inc. (Con Edison or the Company) agrees with the state's leaders and our customers: addressing climate change and advancing the clean energy transition is critical for New York's future.

One way New York State is leading is by demonstrating the need for a bold reimagining of energy systems, moving away from processes that address only immediate needs and towards processes that look farther into the future – this is true not only for resilience investments related to climate change, but in other areas like system planning for transportation and building electrification.

In November 2023, Con Edison submitted its Climate Change Resilience Plan (the Plan or CCRP) to the New York State Public Service Commission (the Commission or PSC) as required by Public Service Law (PSL) §66.[1] Con Edison's Plan is an example of this proactive approach applied to adaptation to climate change, preparing our infrastructure for conditions we may not experience for decades but which, when those conditions occur, may have devastating impacts if we do not plan for them now.

In December 2024, the Commission approved [2] nine of the seventeen proposals Con Edison included in its Plan and directed that the cost, timing, and priority of these investments be addressed in rate cases. Accordingly, Con Edison included the nine approved proposals in its current rate case filed January 31, 2025. Finally, the Commission directed Con Edison to file a revised resilience plan within 60 days of the issuance of the Resilience Plan Order (*i.e.*, by February 18, 2025). In compliance with the Commission's directive, the Company submits this revised Plan.

For over 200 years Con Edison has provided safe, reliable, resilient energy to its customers. But climate change presents new threats to the grid at a time when customers and our economy rely on electricity more than ever. The unprecedented destruction that Superstorm Sandy (Sandy) inflicted in 2012

transformed the trajectory and pace of the Company's resilience journey. Evolving climate science has provided a pathway forward.

The Company has already taken bold action to keep its energy system reliable and resilient for its 3.6 million customers. Con Edison has invested more than $1 billion in resilience initiatives since Sandy. These upgrades have prevented more than 1.2 million customer outages, avoiding inconvenience for residential and commercial customers, and improving safety for all.

In 2020, the Company developed a Climate Change Implementation Plan as a guide for incorporating climate change in its planning, design, operations, emergency response, and investment practices. This has made resilience a larger part of our company's culture. That same year, Con Edison established a climate change governance structure to oversee the incorporation of climate change into the Company's processes and practices.

The Company's continued efforts to fortify its equipment reflect the reality that severe weather events are becoming more common and devastating. The six worst storms in the Company's long history have all occurred since 2010.[i]

The Company also recognizes there is more to be done on behalf of our customers. This CCRP builds on our efforts and addresses new information on emerging and growing climate change risks that Con Edison identified in our September 2023 Climate Change Vulnerability Study (CCVS) and is consistent with the requirements of PSL §66.[ii] [3] The investments this Plan proposes are based on the latest climate change science and the analysis of internal and external experts. The investments will support Con Edison's customers as they live, work, and play in the nation's largest economic and cultural center.

The Company recognizes that the cost of our service to customers is an important consideration and the projects included in this CCRP will provide significant benefits to customers. Moreover, the Company strongly supports providing assistance to our most vulnerable customers and residents. We provide bill discounts to our most vulnerable customers enrolled in the statewide Energy Affordability Program (EAP); we have expanded our outreach to customers to increase awareness of the availability of this program and have begun allowing customers to self-certify that they qualify to be enrolled. We also offer a variety of other payment assistance tools and programs, like flexible payment plans, as well as programs focusing on customers living in disadvantaged communities and energy efficiency programs for low- and moderate-income multi-family housing.

Con Edison is committed to continuous improvement and will update this Plan at least once every five years as science evolves and enables us to better understand the risks and take the right steps to protect our equipment and customers.

[i] Measured by the number of customer outages.

[ii] On December 19, 2024, the PSC issued an Order approving CECONY's CCRP with modifications and designated the listed investments in this revised document as climate resiliency. Per the Order, the funding for each program will be approved via regular rate case proceedings.

Stakeholder Engagement

Con Edison has been engaging stakeholders and collaborating with peer utilities and other infrastructure owners throughout the resilience planning process. This report represents broad stakeholder understanding that additional resilience investments are necessary for the Company to provide safe, reliable, and resilient service to its customers in a changing climate. The robust stakeholder engagement effort was designed to identify stakeholders' concerns, challenges, and goals; collect and consider best/effective practices and expertise; integrate feedback as appropriate; and provide transparency and insight on the climate study process and outcomes.

Con Edison convened stakeholders to serve on the Climate Resilience Working Group (CRWG), which provided input and feedback for both the CCVS and the CCRP throughout the project. Much of the feedback from the CRWG informed the development of the CCRP, and Con Edison considered that feedback in its approach and investment plan.

Multi-Pronged Resilience Strategy

This Plan builds on Con Edison's existing resilience management framework. This innovative framework employs a multi-pronged strategy that emphasizes the use of adaptable, resilient infrastructure and operational practices that anticipate and adjust for a changing climate. This approach extends beyond individual assets and isolated events to consider the full spectrum of potential climate impacts across Company operations. Consistent with the new statutory requirements for Resilience Plans,[iii] Con Edison's investments will increase resilience to extreme events, decrease customer outages, and reduce restoration costs.

This strategy allows the Company to address various climate factors that threaten grid integrity by leveraging the tools that drive system resilience. This approach also allows the Company to capitalize on synergies between resilience measures, improve efficiency by streamlining operations, and maximize the impact of their investments. The main strategies of Con Edison's resilience management framework are to **prevent**, **mitigate**, and **respond** to the climate change vulnerabilities the Company identified in the CCVS. Con Edison classifies its resilience investments into three strategic areas: **resilience-driven investments; incorporating resilience into planning, design, and operations;** and **application of new technologies**.

Con Edison's approach is adaptable, so that the Company can adjust as climate science and other external conditions evolve. Future iterations of this Plan will reflect the latest climate data and lessons learned from previous efforts just as this Plan builds on our previous study and adaptation efforts. Con Edison's commitment to learning and adaptation places the Company at the forefront of resilience planning and positions the Company to meet the challenges of a changing climate.

In addition to targeted investments in resilience projects and programs, Con Edison is taking action to make climate-informed investment decisions. Recognizing the need for a comprehensive approach to

[iii] Public Service Law §66(29).

resilience, the Company embeds resilience considerations into its planning, design, and operational activities, including adopting internal design guidelines that reflect the most recent climate change projections. For example, the design guidelines provide projected changes in median and peak summer average temperatures in the service area to inform equipment ratings.

Con Edison considers the co-benefits its resilience measures may have. These include reduced costs, sustained environmental excellence, and improved service for customers. This increases the value of the investments for our customers.

Consideration of Equity

Con Edison recognizes that the impacts of climate change and extreme weather events can disproportionately fall upon disadvantaged communities. These communities are the least able to prepare for severe weather events and recover from them. These populations are less likely to have access to alternative heating or cooling services. They are more likely to experience food spoilage and shortages and delayed or disrupted access to healthcare.

The Company believes equity is a crucial consideration in its resilience investments and therefore, includes equity in the planning process. The Company also tracks the number of outages in disadvantaged communities relative to other communities. Our Plan includes investments to support selected critical facilities and we would also support New York City's development of resilience centers by helping these locations maintain essential energy services during extreme events.

Con Edison has also formed an Environmental Justice Working Group and released an Environmental Justice Policy Statement.[4] The Company will use that statement as a guide for considering equity in all of the Company's operations and investments. With disadvantaged communities comprising 45% of the Con Edison service territory, it is important that the Company considers equity where possible.

Investment Plan

The projects and programs in the investment plan address some of the most pressing climate change risks the Company identified in the CCVS. The thought process included consideration of:

- Previous and ongoing resilience work
- Factors like technical feasibility and co-benefits
- How the solutions will complement each other to protect the electric system
- The ability to prevent, mitigate, and respond to extreme weather

To make the appropriate upgrades to our electric system, Con Edison expects to invest approximately $645.4 million during the first five years (2025-2029) of our Resilience Plan. Based on the expected in-service dates for the projects, we estimate those investments will result in a rate impact to our customers of $139.7 million during the first five-years of the Plan. This would have varying delivery and total bill impacts from 0.0% to 0.7% and 0.0% to 0.5%, respectively, over the five years (2025-2029). As a result, the five-year cumulative electric delivery and total bill impacts would be 1.7% and 1.2%, respectively. Over the

next 10 years (2025 through 2034), the Company will continue implementing resilience programs and projects at an order of magnitude cost of approximately $2.2 billion, and the total capital expenditures for all resilience investments for the next 20 years (2025 through 2044) are approximately $5.3 billion. These programs will minimize outages from heat waves, snowstorms, sea level rise, and other extreme weather events and help restore service faster when outages do occur.

Governance

In 2020, Con Edison established a corporate governance structure for managing climate risk and resilience and incorporating climate change considerations into the Company's core functions. This structure enables the Company to maintain progress by incorporating climate change into the Company's design, operations, and planning. Con Edison has made considerable progress in incorporating this governance structure into its operations and will continue its momentum on this effort.

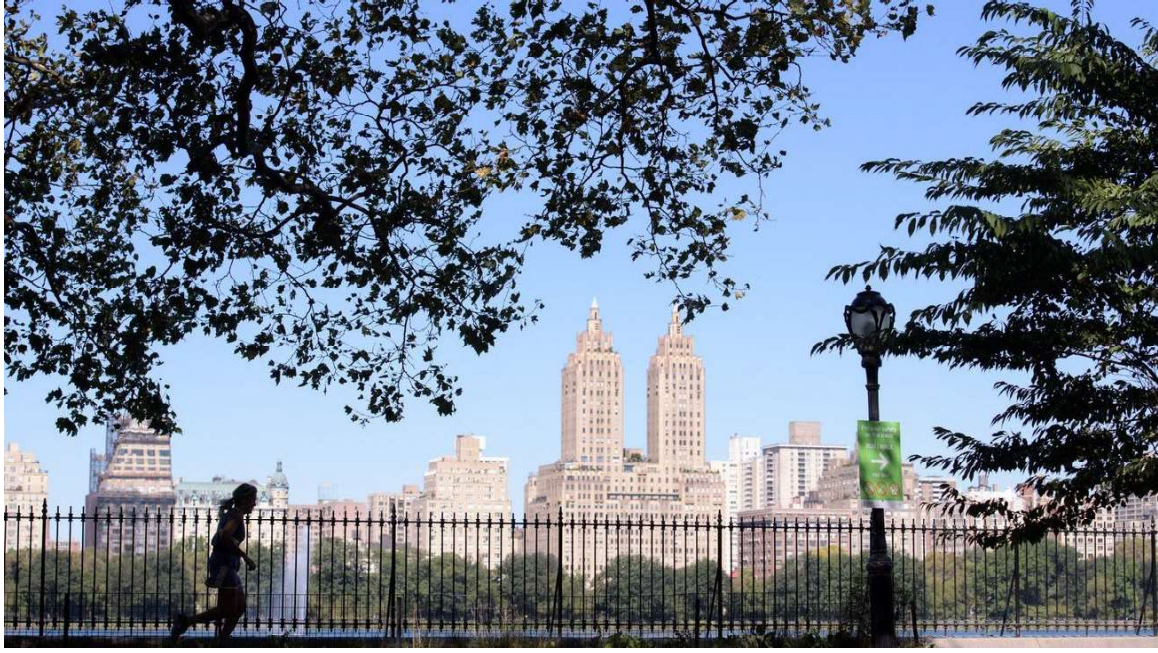
The governance structure includes a corporate instruction, internal design guidelines, executive oversight, a Climate Risk and Resilience Executive Committee, and a Climate Risk and Resilience Group. It also includes public reporting on the Company's risk management activities and financial risks related to climate change impacts. These governance components work together to help Con Edison sustain climate change adaptation efforts while providing guidance, support, and oversight.

Performance Measures

Con Edison uses resilience performance measures to track the implementation and effectiveness of resilience investments (i.e., outcome-based measures). Resilience performance measures are an area of research and there is no industry standard; however, Con Edison has developed potential measures to evaluate each resilience program. Details are in the Performance Measures section.

Conclusions and Next Steps

The Company's approach and investments in this Plan will help the Company continue to provide safe, reliable, resilient energy to its customers. This Plan identifies short, intermediate, and long-term investments that will address climate change. The Company relies on the latest climate projections and literature relevant to its service territory, as well as input from stakeholders and considerations of equity in planning its investments. Con Edison will meet with stakeholders at least twice per year and report every other year on the performance measures and status of investments. This monitoring and reporting will yield lessons learned about the effectiveness of resilience investments. Con Edison will use those lessons in developing future plans.



Introduction

Con Edison has long prioritized providing safe, reliable, and resilient energy to its customers, and given the impacts of climate change, new and different investments are also required. The Company recognizes the necessity of maintaining a resilient energy system that is capable of withstanding extreme weather events, especially given our customers' increasing reliance on the electric system. Con Edison's resilience journey, including a forward-looking approach to system resilience, can be traced back to the 19th century, when Con Edison built the world's first underground network. The Company continues to enhance the resilience of its electric grid, in service of its customers, as depicted in Figure 1.

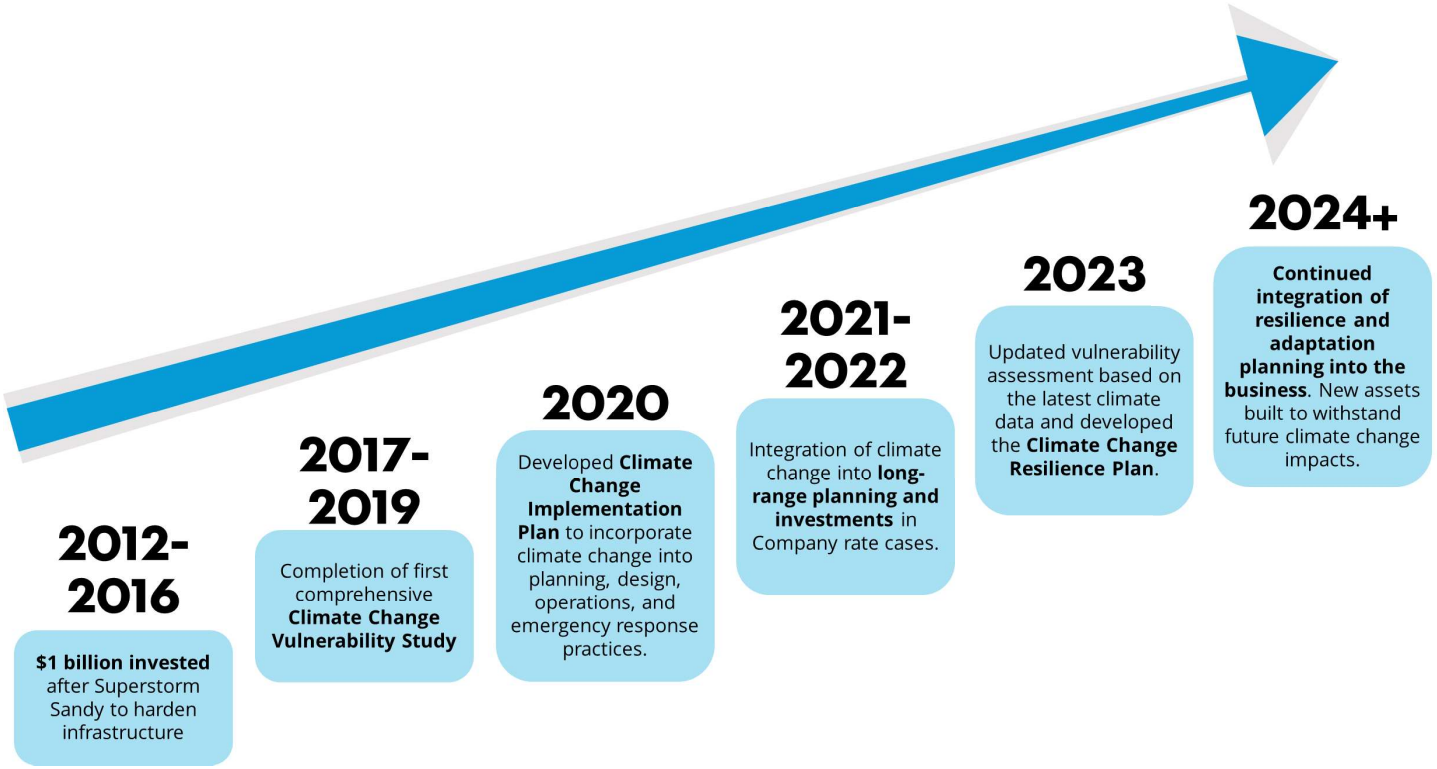


Figure 1. Con Edison's Resilience Journey.

In 2012, the unprecedented destruction of Superstorm Sandy (Sandy) transformed the trajectory and pace of the Company's resilience journey and left a clear impact on NYS utilities' approach to climate resilience. In the last decade, Con Edison has invested more than $1 billion in resilience initiatives to strengthen its energy systems. Some examples include installing flood barriers and submersible equipment, raising or relocating critical equipment, and expanding the use of smart grid technologies.[5]

Over 1.2 million weather-related customer outages have been avoided as a result of the resilience investments Con Edison continues to make post-Sandy.

In 2019, the Company published a Climate Change Vulnerability Study (2019 CCVS), a comprehensive summary review of the risks climate change posed to the electric, gas, and steam systems. This 2019 CCVS established a foundational understanding of the climate risks facing Con Edison's systems.

In 2020, the Company developed a Climate Change Implementation Plan to incorporate climate change into its planning, design, operations, emergency response, and investment planning. The same year, Con Edison established a climate change governance structure to support the incorporation of climate change into processes and practices.

Con Edison's service territory has already experienced impacts from climate-driven events, such as storms and intense precipitation. For more detail on recent events, see Appendix 1: Climate Change Challenges.

Con Edison continues to:

- Study local climate change projections and science
- Identify potential system vulnerabilities
- Act to prepare its infrastructure for a changing climate and extreme weather events

This Climate Change Resilience Plan (CCRP or Plan) builds upon and addresses findings in the Company's recently published Climate Change Vulnerability Study (CCVS) in September 2023, which updated the 2019 study with the latest climate science projections. Based on the CCVS findings, the Company continues to take action to address climate change risks while maintaining safe, reliable service. Above all, this Plan identifies actionable adaptation strategies that address identified vulnerabilities and will sustain service to Con Edison's customers as they live, work, and play in one of the world's largest economic and cultural centers.

The CCRP considers Con Edison's overarching **resilience framework** which was first developed as part of the Company's 2019 CCVS. The framework promotes comprehensive thinking about the types of measures that may help build a more resilient system and aims to support investments that:

• **Prevents** climate change impacts through infrastructure hardening,

• **Mitigates** the impacts from outage-inducing events by minimizing disruptions, and

• **Responds** rapidly to disruptions to reduce recovery times for customers.

Building resilience into complex energy systems as climate science evolves is a dynamic process. Our understanding of climate change will continue to grow. It is essential to learn from our investments and identify opportunities for improvement. Con Edison is committed to continuous improvement and will update this Plan every five years.

Legislative Context

In March 2022, NYS enacted a new section to the Public Service Law (PSL) §66(29)[6] which requires major electric utilities to conduct a Climate Change Vulnerability Study and develop a Climate Change Resilience Plan. The goals of the CCVS and CCRP are to better prepare utilities for climate change and severe weather events. The new law required Con Edison, along with the other NYS electric utility companies to submit a CCVS within 18 months (Con Edison's submittal was on September 22, 2023), and a CCRP within 60 days after the CCVS filing.[iv]

Con Edison's CCRP provides a comprehensive long-term roadmap and investment strategy to address climate risks identified in the CCVS for the next 5, 10, and 20 years. Informed by findings from the CCVS, the CCRP establishes Con Edison's plan to address priority vulnerabilities and aims to achieve the following as required by PSL §66:

- Mitigate the impacts of climate change to Con Edison's infrastructure, reducing restoration costs and outage times associated with extreme weather events, and enhancing reliability,
- Incorporate climate change into Con Edison's planning, design, operations, and emergency response,
- Incorporate climate change into processes and practices, manage climate change risks and build resilience; and
- Propose adjustments, as necessary, to how the Company plans and designs infrastructure for the increasing impacts of climate change.[7]

Con Edison's CCRP is comprehensive and also meets the law's requirements to establish a systematic approach and multi-pronged strategy to address the impacts of climate change, reduce restoration and outage times, and enhance electric infrastructure resilience. Because the Plan is a complete package of needed resilience investments, it includes funding for both new and expanded programs and is detailed in the Investment Plan section.

Con Edison has expanded or developed new programs that are feasible, reasonable, practical, and designed to meet the needs of our customers and the service territory. In preparation for this filing and based on the climate change data, the Company evaluated its electrical system for almost two years. The Company reviewed design parameters of equipment and procedures, and then developed or expanded these programs to address the impacts of the climate change variables detailed in the CCVS.

[iv] On December 19, 2024, the PSC issued an Order approving CECONY's CCRP with modifications and designated the listed investments in this revised document as climate resiliency. Per the Order, the funding for each program will be approved via regular rate case proceedings.

In the CCRP, the Company is required to provide the Commission with the estimated costs and benefits to the Company and its customers. For each program or project included in the Plan, the Company provides the detailed cost estimates for the first five years (2025-2029) as well as projections through 2044. In addition, the Company provides a description of the customer benefits in terms of overall resilience, outage prevention, or quicker outage restoration times as applicable. The Company also provides the five-year estimated annual rate impact for its Plan.

As the Joint Utilities explained in their comments filed on August 22, 2022 in this proceeding, "there currently is no widely recognized and accepted methodology for comparing resilience investments to customer and regional avoided costs."[8] The same is true today. The Company will work with the Commission and Staff to consider and discuss appropriate methodologies for evaluating resilience investments in the future. See the Performance Measures section for more detail.

In addition to the cost information, each program description contains a schedule of planned expenditures and implementation for the first five years of the plan and projected expenditures with increases based on similar scope and inflation through 2044. Because the new law requires the Company to file a new CCRP every five years, the Company will provide similar detail in its next Resilience Plan filing.

This strategic planning was done with the input of the Company's climate resilience working group which provided advice and feedback for the development of the CCRP. See the Engagement with the Climate Resilience Working Group and Stakeholder Input sections for more detail.

Con Edison's CCRP is a comprehensive and cohesive long-term plan for mitigating climate change impacts, reducing restoration times and related costs, and enhancing reliability as required by the law. Any reductions or changes to individual components of the CCRP can impact the overall effectiveness of the Company's resilience efforts.

Climate Change Vulnerability Study Summary

The purpose of the Climate Change Vulnerability Study (CCVS) was to update our understanding of climate change risks to Con Edison's electric system to inform the development of this Plan. In the CCVS, Con Edison built upon its 2019 CCVS and understanding of physical and operational vulnerability by:

- Understanding the basis of the latest science and the changes in projections from the 2019 CCVS.
- Applying these insights and revisiting previously identified impacts to determine if and how they may differ (in timing or magnitude) based on the latest climate change projections.
- Advancing prior work by completing a comprehensive rating of risks to the various components of the Company's electric system between now and 2050. This development is useful as it helps to highlight the near-term risks.

Advanced Climate Science

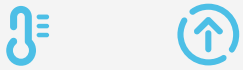
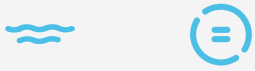
Con Edison is committed to basing its planning decisions on the latest climate science and has therefore:

1) Invested in comprehensive modeling with highly customized climate data specific for use within our service territory.

2) Maintained a partnership with Columbia University for over 6 years.

3) Contributed to and invested in the Mesonet system (e.g., New York City Micronet). The NYC Micronet is a network of 22 (17 owned by Con Edison) weather stations designed to report both real-time and long-term data for measuring high-impact events and monitoring climate change.

The CCVS used the latest climate projections to understand how climate change may manifest in the coming years. Updated climate projections were provided by the New York State Energy Research and Development Authority (NYSERDA) in partnership with Columbia University and supplemented with literature reviews and an additional data set developed by the Massachusetts Institute of Technology (MIT). Primary findings from the climate change projections developed for this Study are summarized in Table 1.

	**Temperatures** will increase faster. The 2023 CCVS found that **by 2030**, there could be **17 days per year** when the temperature in Central Park **exceeds 95°F**, compared to a previous projection of 11 days per year. This will also lead to increasingly frequent, **intense heatwaves**.
	**Precipitation** projections show an increase relative to historical norms. This could **increase deluge precipitation events** – short-duration, high-intensity rainfall—that may impact municipal stormwater systems, resulting in localized flooding.
	**Sea level rise** projections have not changed since the 2019 CCVS. Con Edison's service area is still expected to experience **16 inches of sea level rise by 2050**. While the Company's efforts and process updates have begun to address the risk, continued investments are needed.

 	**Wind and ice** projections remain the most uncertain. A review of external scientific studies indicates that the Con Edison service area is likely to experience **stronger wind gusts** in the future due to **intensifying storms**, particularly during tropical cyclones. In addition, there remains the potential for **more higher-intensity radial icing events** (ice forming on overhead distribution and transmission lines) in the winter.
 	Directional changes in **extreme events** have not changed since the 2019 CCVS, but new scientific research has strengthened and refined current understanding of these risks. • **Hurricanes** are expected to increase in intensity with a higher probability of northeast tracks due to a projected northward migration of strong hurricanes. • **Extreme heat waves** will increase in both frequency and intensity. • **Nor'easters and cold snaps** may increase in intensity but are expected to decrease in frequency. • **Deluge precipitation** is expected to increase in both frequency and intensity. • **Concurrent and consecutive** extreme events are expected to increase in frequency and intensity.

Table 1. Summary of climate updates and changes since Con Edison's 2019 CCVS.

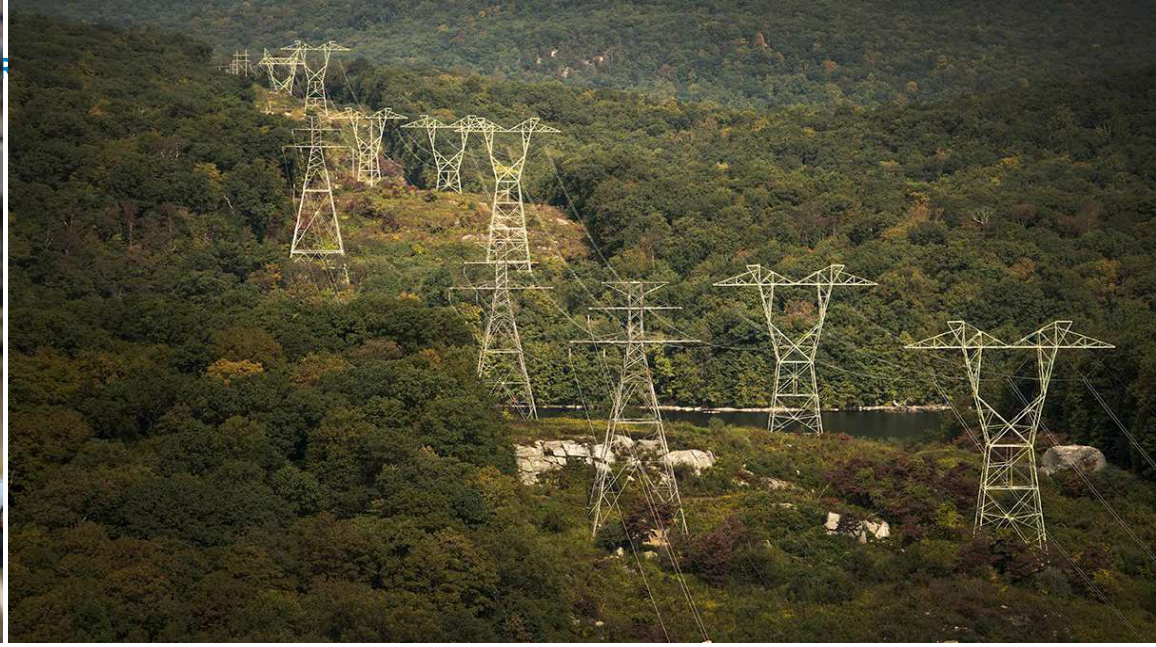
Vulnerability is defined as the potential for assets or operations (and, by extension, customers) to be affected by climate change. Vulnerability incorporates the degree to which assets may be exposed to climate hazards, as well as the potential impacts of exposure, defined by infrastructure sensitivity. Exposure and asset sensitivity were considered together to generate vulnerability rankings of primary (dark blue), secondary (medium blue), and low (pale blue); the results of this analysis, along with summaries of the impacts of each hazard, and detailed summaries of the physical and operational impacts of each hazard are summarized in Appendix 2: Physical and Operational Hazard Impact Summaries.

The highest vulnerability asset-hazard combinations from the CCVS included substations, overhead transmission, overhead distribution, and underground distribution. These, along with selected secondary vulnerability combinations, were prioritized for adaptation measures in this Plan.

	Trans.	Subs.	Dist.	2050 Projected Change and Impact to Con Edison's Electric System
Temperature and Temperature Variable (TV)[v]	OH		OH	Con Edison's electric system will see impacts due to rising temperatures, and those impacts will increase during intense heat waves. Increasing temperature variable (TV) indicates load will increase and high load levels will continue for longer periods, potentially straining the capacity of the system. Overhead transmission and distribution, substation, and underground distribution assets are particularly vulnerable to the impacts of heat and subject to accelerated deterioration, decreased reliability, and decreased capacity.
	UG		UG	
Flooding	OH		OH	Con Edison has already experienced flooding that has impacted its assets. That risk is likely to increase. Substations are especially vulnerable to flooding since they contain a large quantity of equipment that is sensitive to water. The exposure assessment found that a 16-inch rise in sea level by 2050 (relative to 1995-2014 sea levels) would impact 23 substations in 2050 during a 1% annual chance flood. Seven of these locations do not currently have flood protection, while 16 have flood protection that would need to be modified to provide adequate protection against future flood levels
	UG		UG	
Wind and Ice	OH		OH	Wind and ice present a threat to the overhead distribution system, which is susceptible to tree contact during intense wind and icing events.
	UG		UG	
	OH = Overhead assets UG = Underground assets Primary (dark blue); Secondary (pale blue); Low (light blue)			

Table 2. Summary of vulnerability ratings for all hazards and asset groups (transmission, substations, distribution) under the 75th percentile of the SSP5-8.5 emissions scenario for 2050.

[v] TV is an index that Con Edison uses to evaluate system load. It is similar to a heat index but considers the persistence of heat and humidity over three days. Electric summer TV is calculated using a weighted calculation of the rolling three-hour average of wet and dry bulb temperature for the current day (70%; D), prior day (20%; D-1), and next prior day (10%; D-2).



Engagement with the Climate Resilience Working Group

For climate resilience planning to be effective, it must include a broad range of stakeholders, and leverage external expertise. Con Edison collaborates and coordinates with other utilities in New York State and around the country regarding climate resilience efforts. Con Edison also benefits from being located in an area with leadership on climate resilience – the Company can share resources (e.g., climate science data) and best practices with a variety of stakeholders including New York State Department of Public Service staff, the NYC Mayor's Office of Climate and Environmental Justice and other municipality representatives, labor groups, and advocacy groups for consumers, the environment, and equity.

Con Edison has engaged stakeholders throughout the resilience planning process. This report represents a shared stakeholder understanding of the identified resilience investments for Con Edison to serve its customers safely and reliably in a changing climate.

This effort was designed to build upon previous engagement efforts, with many members participating consistently since 2012. The intent is to capture feedback, input, and experience and fulfill the Company's goal of serving communities' and customers' energy needs. The robust stakeholder engagement effort was designed to:

- Identify stakeholders' key concerns, challenges, and priorities
- Collect and consider best practices and expertise
- Integrate stakeholder feedback in Con Edison's resilience planning
- Provide transparency and insight on the climate study process, investments, and outcomes

Con Edison convened a group of external stakeholders to serve on the Climate Resilience Working Group (CRWG). The purpose of CRWG was to provide input and feedback to the CCVS and the CCRP throughout the project. A list of the organizations represented on the CRWG is provided in Table 3.

Organization Type	CRWG Member Organization
Federal Agencies	U.S. General Services Administration
State Agencies	Department of Public Service (DPS)
	New York State Energy Research and Development Authority (NYSERDA)
	Office of the New York State Attorney General
	New York State Office of General Services
Universities	Columbia Sabin Center for Climate Change Law
Local Government	NYC Mayor's Office of Climate and Environmental Justice
	Westchester County Government
Unions	Utility Workers Union of America, AFL-CIO, Local 1-2
Customer Advocate Groups	AARP New York Brooklyn Navy Yard Cogeneration Partners Centsiblehouse NRG Energy, Inc. Individual/Consultant New York Energy Consumers Council, Inc. The Ad Hoc Group, Inc. WE ACT for Environmental Justice
Other Infrastructure Owners	MTA
	Port Authority of New York and New Jersey
	PSEG-LI/LIPA

Table 3. Climate Resilience Working Group Member Organizations.

Con Edison engaged CRWG members through numerous meetings, which focused on the following:

	CRWG Meeting Date	Meeting Focus
1	**August 9, 2022**	Introduction to the climate legislation and the role of the working group.
2	**December 14, 2022**	Climate science updates and objectives and timelines for the project.
3	**March 28, 2023**	Climate change pathways and associated risk tolerance; understanding how risk tolerance impacts planning and design.
4	**June 23, 2023**	CCVS updates and the approach to the CCRP.
5	**August 28, 2023**	CCVS updates and the projects/programs in the Investment Plan section of the CCRP.
6	**September 25, 2023**	CCRP project and program overview part 1.
7	**September 26, 2023**	CCRP project and program overview part 2.
8	**October 30, 2023**	Stakeholder feedback on draft CCRP and proposed investments.

Figure 2. Climate Resilience Working Group Meeting Dates and Focus.

Stakeholder Input

Con Edison actively reviewed its approach and investment plan in response to CRWG feedback. Table 4 summarizes the CRWG feedback and how it was incorporated into the CCVS and CCRP.

CRWG Feedback	Actions Taken
Engagement Process CRWG members want to be engaged early and often with the opportunity to review and provide feedback at key stages.	Con Edison added additional CRWG meetings to the schedule. Con Edison provided proposed schedules of milestones and dates for feedback opportunities.
Updated Pathway Selection CRWG members were actively engaged in discussions surrounding the updated climate change pathways used projections.	Using the updated climate data from SSP5-8.5 this pathway aligns with the risk tolerances of the previous pathways in the 2019 CCVS, which used the corresponding RCP 8.5 data.

CRWG members recommended feedback and alignment on the chosen pathways and their associated risk tolerances, especially to align with New York City's pathway selection.	Con Edison performed external benchmarking to align with regional resilience guidelines, including New York City.
Updates and Changes from the previous published reports CRWG members were also concerned about steam and gas system vulnerabilities, in addition to the electric system.	Per the legislation, only the electric system was required to be assessed and incorporated into this Plan. The Company also reviews climate change risks associated with the gas and steam systems.
Scope of Vulnerability Assessment CRWG members recommended additional climate hazards for consideration, including wildfire, wind, and icing. CRWG members also raised concerns about the use of Federal Emergency Management Agency (FEMA) maps for locations outside the FEMA floodplain that were inundated during Hurricane Sandy.	Difficult-to-model climate hazards were qualitatively analyzed based on literature, including wildfires, hurricanes, wind, extreme heat, nor'easters, and cold snaps. Wind and radial icing projections were included in the CCVS, along with information on the limitations of the dataset. Con Edison benchmarks with New York City's Climate Resilience Design Guidelines which uses FEMA floodplain maps as the basis for construction and engineering/design purposes. The Company supplements designs with other resources, such as NYC Stormwater Maps and Flood Hazard Mapping tools. Con Edison adheres to the latest building codes and undertakes a complete environmental review when it comes to building and planning new infrastructure. For areas inundated by Sandy's storm surge, Con Edison fortified its system to FEMA +3' and is now moving to FEMA +5' based on sea level rise projections.
Exploring new resilience strategies and coordinating with others CRWG members recommended exploring new projects and programs throughout the study. CRWG members also inquired about the recent US Army Corp of Engineers	Con Edison has included a series of resilience solutions in this Plan, including additional underground interrupters, erosion protection and drainage upgrades, and other projects and programs.

(USACE) plan[vi] and how that affects Con Edison's planning process.	Con Edison engaged its research and development group in the development of the Plan and will continue to work with them on new ideas. The US Army Corps of Engineers coastal resilience proposal has not been integrated into this Plan since it is not yet fully developed. However, when more details are provided and approved, it may be used in future iterations of this Plan.
Equity CRWG members are concerned about environmental justice. They recommend that the CCRP should consider prioritizing circuits beyond critical facilities and consider equity.	The Company has formed an Environmental Justice Working Group and established corporate Environmental Justice principles that will inform its planning processes, including the CCRP. The Consideration of Equity section in this Plan includes the state's disadvantaged communities (DAC) maps which will be used for tracking the Company's investments within these areas.
Climate Justification CRWG members and DPS Staff requested additional detail from Con Edison on the climate science justifications for increasing the size of existing resilience programs.	The Company has revised program descriptions to connect the climate science with the need and value for stakeholders.

Table 4. Summary of CRWG feedback and actions taken

[vi] The USACE Climate Action Plan can be found on the USACE website (https://www.usace.army.mil/corpsclimate/).

Multi-Pronged Resilience Strategy

Con Edison developed a holistic resilience management framework to think strategically and innovatively about the portfolio of investments to reduce both near and long-term climate change risks. This framework emphasizes the importance of adaptable, resilient infrastructure and operational practices that anticipate changing climate conditions. This approach extends beyond individual assets and isolated events to comprehensively address the spectrum of climate impacts across operations. The objectives of Con Edison's investments are to increase resilience from extreme events, decrease customer outages and disruptions, and reduce restoration costs.

More information on the multi-pronged resilience strategy is provided in the following subsections.

Past Investments

Con Edison's prior investments demonstrate the Company's firm commitment to resilience across infrastructure and operations. These investments were informed by past events, such as Hurricane Andrew, Hurricane Irene, and Superstorm Sandy, as well as changes to Company policies that incorporated resilience into design guidelines.

Past initiatives to improve the Company's resilience have included:

Strategy	Hazard Addressed
Installed higher and stronger flood barriers	Flooding
Installed submersible equipment	Flooding
Raised flood prone infrastructure	Flooding
Pilot project that selectively undergrounded overhead power lines	Wind and Ice, Extreme Events

Strengthened flood design standards to exceed city code, by requiring an additional foot of elevation for 100-year flood protection measures	Flooding
Updated planning and operations processes to account for future changes in climate	Multiple
Installed advanced smart-grid technologies	Multiple
Made improvements to storm readiness and restoration processes	Extreme Events
Established a dedicated Climate Risk and Resilience Group to work on resilience efforts	Multiple

Table 5. Summary of Past Resilience Investments.

As the Company navigates the evolving landscape of climate risks, it continues to refine its strategies, adapt its practices, and draw insights from past climate events. Con Edison's commitment to continual learning and adaptation underpins the Company's place at the forefront of resilient infrastructure and operations and makes the Company well-prepared to meet the challenges of a rapidly evolving climate. Figure 3 illustrates the Con Edison's approach to increasing system resilience, via asset replacements, new construction, resilience projects, and operational measures.

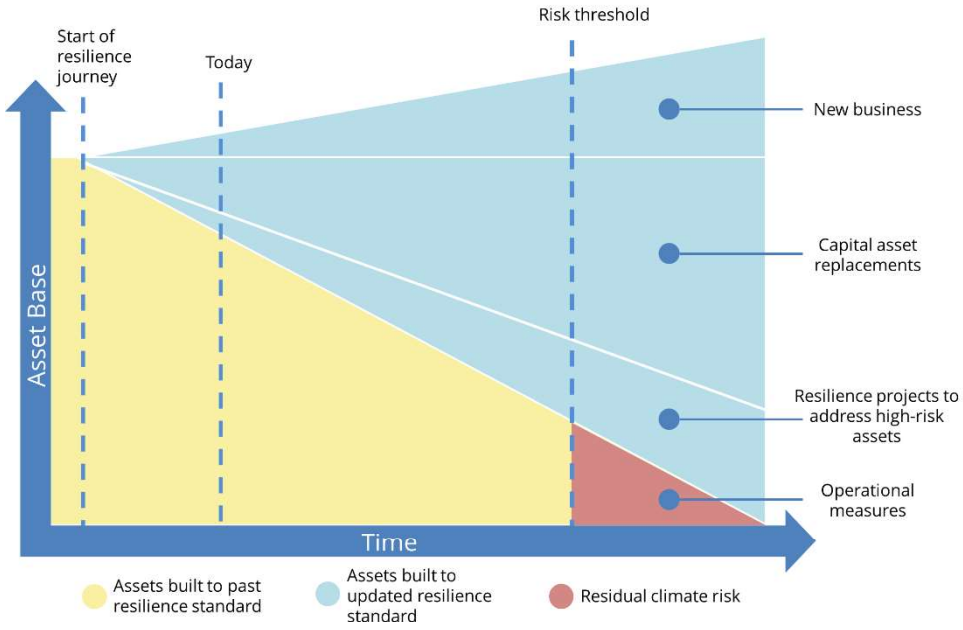


Figure 3. Con Edison's climate resilience approach

Adapting to Coastal Flooding and Sea Level Rise

In the aftermath of Hurricane Sandy in 2012, Con Edison recognized the mounting challenges posed by climate change induced coastal flooding and sea level rise. Con Edison is consistently evaluating how to adapt to the evolving threats of sea level rise and coastal flooding. The Company adopted an internal climate change design guideline that requires all infrastructure in coastal areas to incorporate the risk of sea level rise. For example, the guideline requires substations within the area of the 1% annual chance floodplain plus 5 feet of simulated sea level rise to be evaluated and hardened, as appropriate. Such long-range planning may result in design changes such as requiring the use of floodwalls, waterproof cabinets, or other flood risk mitigation measures. By utilizing forward-looking climate science, Con Edison demonstrates its commitment to being proactive and adaptable.

Resilience Management Framework

Con Edison's resilience framework addresses various climate factors that threaten grid integrity by leveraging tools such as system hardening, data analytics, and load management. Given the multifaceted nature of climate-related risks, no individual measure or solution can provide comprehensive resilience. This holistic approach allows the Company to capitalize on synergies between resilience measures, improves efficiency by streamlining operations and maximizes the impact of investments. Overall, the framework emphasizes:

- Reducing the impact of climate-driven hazards.
- Considering solutions across planning, operations, engineering, and emerging technologies.
- Maintaining adaptability.

The following sections describe how Con Edison will use this framework to develop and implement resilience work.

Reducing the impact of climate-driven hazards

This principle focuses on reducing impacts by hardening the electric system, mitigating impacts of events by modifying system design to reduce customer impacts of damages, and increasing the Company's ability to respond to events and restore service expeditiously.

The main strategies of Con Edison's resilience framework are to **prevent**, **mitigate**, **and respond** to the climate change vulnerabilities identified in the CCVS. Each of these strategies consistently play a role in the Company's approach, fortifying infrastructure and services against climate events and maintaining dependable service. This Resilience Plan focuses on the **prevention** and **mitigation** areas of investment the Commission approved as climate resiliency to address the specific climate hazards facing our customers. The Company continues to advance its response area of investments through other filings with the Commission.

Figure 4. Con Edison's three strategies to address climate risks

"**Prevent**" encompasses proactive measures to both reduce climate change risks and enhance the reliability and resilience of Con Edison's electric system. "Prevention" investments are not necessarily a one-time event. Rather, the ability to prevent climate change impacts must be integrated and revisited throughout the life cycle of Con Edison's assets. Doing so requires changes in the planning, design, and construction of new infrastructure, ongoing data collection and monitoring, and investment in the upgrade of existing infrastructure using forward-looking climate information.

Example **Prevent** strategy: Elevation of sensitive equipment to avoid flood damage.

"**Mitigate**" includes strategies to reduce the impacts of climate events, since Con Edison cannot feasibly harden its energy systems to tolerate every possible low-probability, high-impact extreme weather event. These actions serve to reduce damage and protect exposed systems from further damage. Examples include auto-loop sectionalization, bifurcating feeders, and increasing feeder diversity.

Example **Mitigate** strategy: Grid automation using devices such as switches, auto-loop circuits, and reclosers.

"**Respond**" refers to improvements to reduce restoration times. Activities in this category involve the continuous improvement of Con Edison's emergency response efforts and outage management system to support swift response to power outages.

Example **Respond** strategy: Utilization of AMI to allow for faster restoration times using data and machine learning.

Resilience investments which encompass the prevention and mitigation strategies will lessen the impact of climate hazards and allow Con Edison to recover more quickly. Figure 5 visualizes the possible impact of a climate change-driven extreme weather event on Con Edison's service without resilience investment (left) and with resilience investment (right).

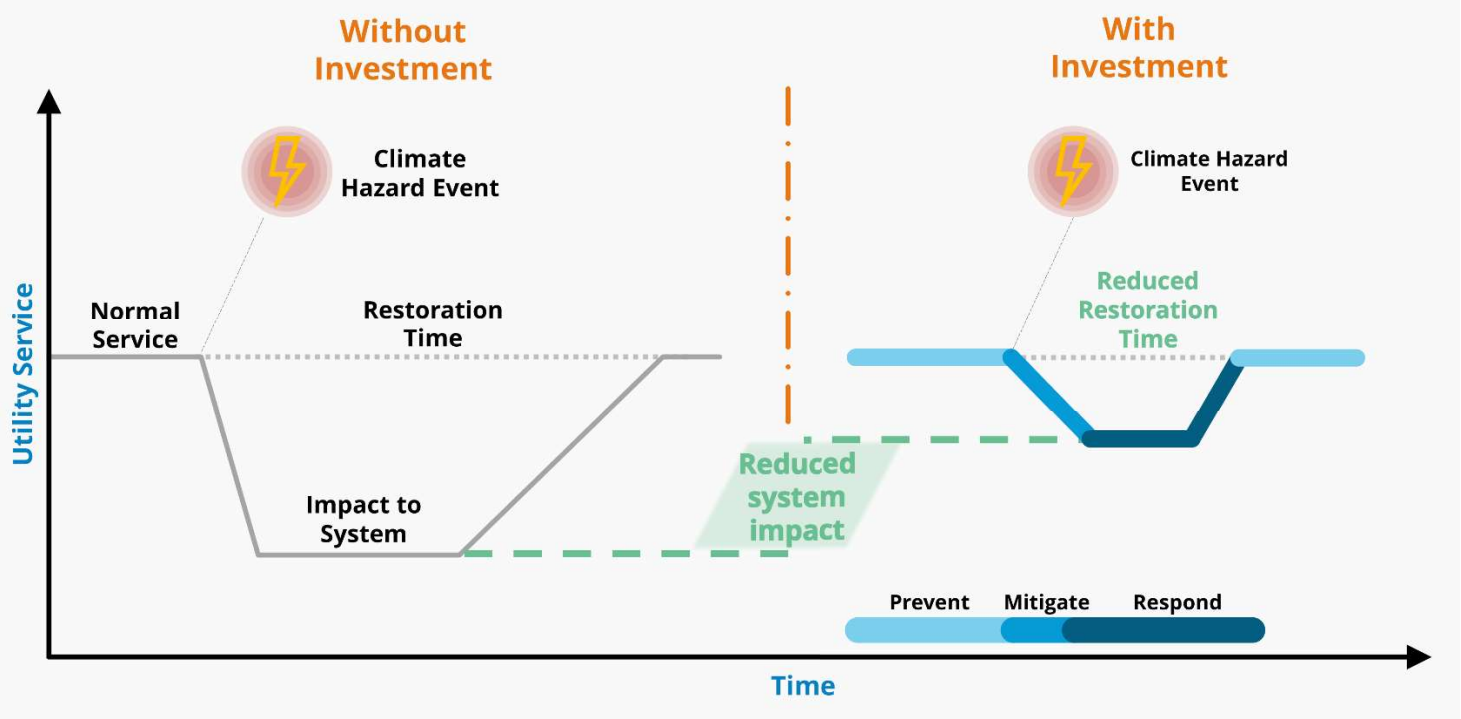


Figure 5. Visualization of how resilience measures can reduce the impact of a climate hazard event on service

The Investment Plan section of this CCRP provides more information on the full portfolio of proposed investments across these two strategies.

Considering solutions across planning, operations, and emerging technologies

Updating planning and design approaches will help all Company strategies and investments to be more resilient. This is paired with strategic investments in existing infrastructure to enhance its resilience, and consideration of new or emerging approaches to resilience that could be piloted.

Investments are categorized in three areas: resilience-driven asset investments, incorporation of resilience into planning, design and operations, and application of new technologies. Con Edison plans to use this framework to help define future projects to enhance resilience and reliability. These investments may also provide co-benefits (advantages or positive effects that are secondary to the primary goal of increasing resilience) that improve system performance in other areas. Outcomes include increased system reliability, long-term value and cost savings, and enhanced preparedness for the integration of new technologies and grid capabilities for the future.

Maintaining adaptability

The Company's resilience framework is flexible and supports continued adaptability over time. This approach allows Con Edison to develop near term strategies, while formulating future projects and programs based on projected climate conditions over 10- and 20-year planning horizons. This long-term

outlook reduces the cost of managing uncertainty as resilience measures can be sequenced to respond to changing conditions. It also allows future iterations of this Plan to consider new climate science and lessons learned from previous efforts. For example, Con Edison may identify solutions to implement now that protect against near-term climate changes that are lower cost and foundational, while leaving options open to protect against plausible changes emerging later in the century.

Figure 6 depicts how flexible adaptation pathways are used to maintain tolerable levels of risk. As seen by the blue line, the key to flexible adaptation is to continually monitor and adjust to keep the total risk level below a tolerable threshold.

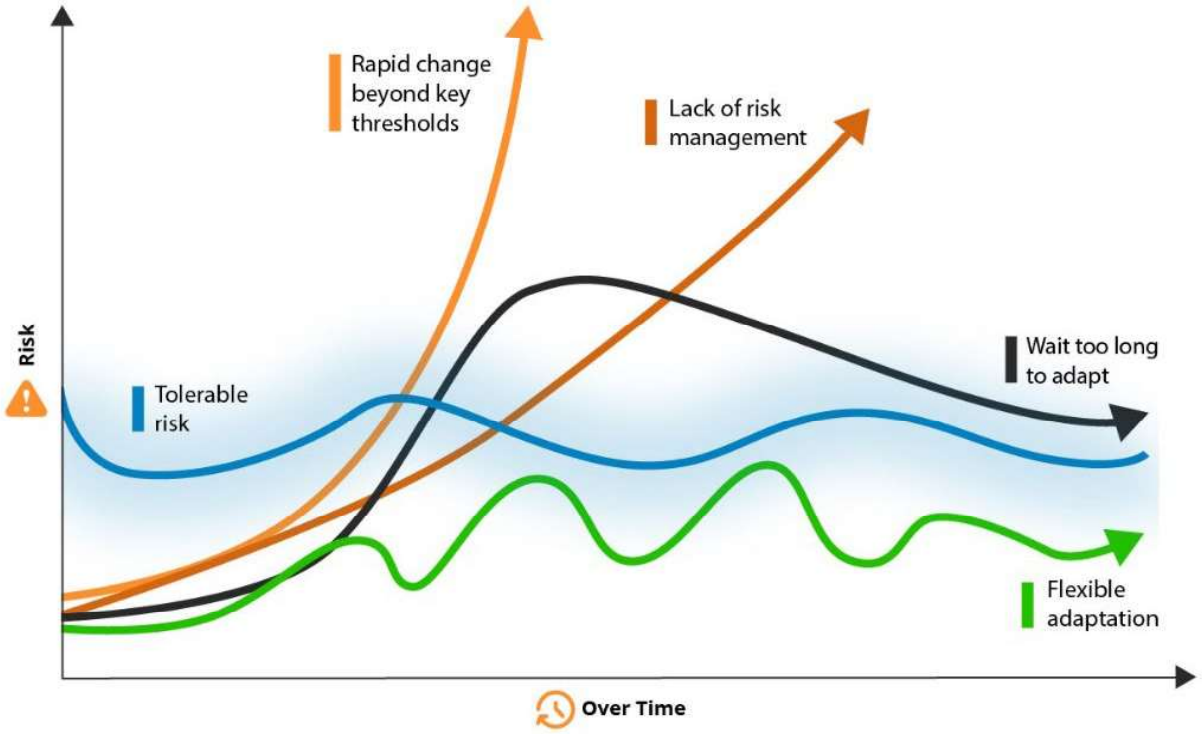


Figure 6. Flexible adaptation pathways in the context of tolerable risk and risk management challenges to non-flexible adaptation. Adapted from Rosenzweig & Solecki, 2014.

Furthermore, Con Edison considers impacts beyond the immediate scope of its resilience investments with co-benefits such as reduced costs to customers, sustained environmental excellence, and improved customer service. This perspective amplifies the overall value and effectiveness of Con Edison's resilience efforts.

Investment Categories

Con Edison recognizes that its past investments have reduced outages, but additional investments will be needed to address future climate change impacts. The forward-looking resilience projects and programs included in this CCRP were developed using the resilience management framework and encompass work that will address changing climate hazards as their primary objective.

Resilience-Driven Investments

Con Edison recognizes that its past investments addressed the known risks at that time; however, more is required to prepare the grid for the impacts of climate change. The resilience projects and programs included in this Plan are specifically designed to cope with changing climate hazards. Some investments may provide co-benefits, though the primary driver of the investments is increasing resilience.

Building, reinforcing, and adapting infrastructure to enhance resilience is an ongoing necessity. The lessons learned from previous efforts will inform the planning and implementation of these projects.

The prevention and mitigation resilience investments proposed in this Plan are shown in Figure 7 below, categorized by which strategy they primarily support. More detail on each item is given in the Investment Plan section of this CCRP.

Prevent

- Selective Undergrounding
- Non-Network Resiliency
- Substation Operations Storm Hardening
- Submersible Equipment
- Critical Facilities
- Substation Enclosure Upgrade

Mitigate

- Primary Feeder Resiliency
- Erosion Protection and Drainage Upgrade
- Non-Network Resiliency Cutout Upgrade

Figure 7. Resilience-driven investments that support the Prevention and Mitigation strategies

Incorporating Resilience into Planning, Design, and Operations

Recognizing the need for a comprehensive approach to resilience, the Company embeds resilience considerations into its planning and operational activities, including adopting internal design guidelines that reflect the most recent climate change data. For example, when planning capacity projects for substations to address increasing customer demand, projected increases in temperatures (which can also drive increased demand) are incorporated into the design process. This includes higher temperature and temperature variable (TV) projections used in power equipment ratings and load relief planning, sea level rise projections used in updated flood risk standards, and heavy rainfall and wind considerations.[vii] These considerations can lead to design modifications, such as situating a new substation farther from a floodplain or elevating it, thereby reducing the risk of future flood impacts.

Tools are provided to engineers and planners to assist with these updates and modifications, including information on how to apply the FEMA Preliminary Flood Insurance Rate Maps[viii] to account for sea level rise, and forward-looking rainfall intensity-duration-frequency curves.[ix] Con Edison incorporates resilience to bolster its entire system to withstand the challenges presented by climate change and is committed to refining these practices for better outcomes.

In its 2020 Climate Change Implementation Plan, Con Edison identified strategies to update operational processes to better address the multifaceted risks posed by climate change. These updates span across several key areas of the Company's operations, each playing a role in enhancing the overall resilience of the system. Table 6 provides an overview of these updates and their implications for Con Edison's climate resilience strategy.

Procedure or Practice	Climate Dependencies and Planned Adaptations
Load Forecasting	Con Edison recognizes that climate change will increase customer demand for electricity and has (since 2020) refined its load forecasting process to incorporate future temperature projections. Con Edison has integrated an increase in peak TV of 1 degree in 2030 (87 TV) and 2 degrees in 2040 (88 TV) into its electric system peak load forecast.[9] This integration enhances the Company's ability to anticipate and prepare for future electricity demand under hotter conditions.
Load Relief Planning	Since 2021, the load relief planning process has been updated to account for hotter conditions that will lead to increased loads (driven by increased air conditioning use and electrification) and reduced electrical equipment

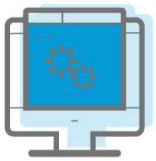
[vii] Note that temperature projections show a 1% decrease in transformer ratings by 2035 and a 2% decrease by 2045. These minimal impacts will be incorporated into load relief planning.
[viii] The most up-to-date FEMA FIRM map is the 2015 National Flood Hazard Layer (NFHL) for the State of New York, which reflects the FIRMs done by each county. https://www.fema.gov/flood-maps/national-flood-hazard-layer
[ix] This information is publicly available through Cornell University. http://ny-idf-projections.nrcc.cornell.edu/index.html

	capacity. This update helps identify areas where growth in electricity peak demand could exceed system capacity, which allows Con Edison to implement load relief measures as required. By adapting to forward-looking temperature projections, Con Edison is able to maintain reliable service and keep equipment ratings within design parameters.
Reliability Planning for the Sub-Transmission and Distribution Systems	Con Edison's reliability planning process for the electric sub-transmission and distribution systems considers how weather conditions, including heat, rain, wind, snow and ice, affect equipment failures and customer outages. To maintain reliability standards, the Company has integrated climate change-adjusted load forecasts and projected increases in heat into its modeling processes.
Asset Management	The Company is making key asset management updates to cope with projected sea level rise, increases in temperature, and changes in intense rain events. The Company has also updated its flood design standard for new sites, adding the sea level rise projections and freeboard to FEMA's 1% annual chance base flood elevation. As climate science evolves, Con Edison will review existing assets and make changes as needed.
Facility Energy System Planning	Con Edison has incorporated climate change projections into its process for periodic replacement and installation of heating, ventilation, and air conditioning (HVAC) systems in its buildings. The Company is also using more efficient lighting and other green design elements to reduce building thermal loads, allowing Con Edison to be better prepare for increased demand on HVAC systems.
Emergency Response Activations	Con Edison is considering projected climate data in its emergency response planning. For example, the Company conducts emergency response drills and exercises based on projected future climate conditions. By including climate data related to heat, precipitation, and flooding in periodic emergency response plan reviews, the Company can adjust to account for new conditions.
Worker Safety Protocols	Con Edison plans to include new climate projections for heat in future reviews of worker safety protocols. Con Edison continues to leverage the latest research and plans to invest in several heat stress pilot projects that will be the foundation for future worker safety protocols.

Enterprise Risk Management (ERM)	Con Edison has integrated climate change into its ERM risk identification process. This incorporates climate change in the overall risk management strategy, allowing the Company to better understand and manage climate risks.

Table 6. Incorporating climate change into planning, design and operations.

Application of New Technologies



Con Edison actively explores and implements new technologies, striving to set higher standards for resilience projects. By employing modern technological solutions and maintaining the flexibility to adopt future advancements, Con Edison is enhancing its preparedness for the increasing intensity and frequency of climate-driven events.

Moving forward, Con Edison will pursue three avenues of engagement to continue to understand and evaluate the latest developments in resilience technologies:

- **Identifying system needs and existing capabilities**: Evaluating areas of system performance that need new resilience solutions will help Con Edison focus its search for technologies that will have the greatest impact. An integral part of this assessment involves optimizing the value of recent advancements, such as advanced metering infrastructure so that the Company fully leverages its existing capabilities while identifying areas for further enhancement.
- **Partnering to develop new technologies**: Working with government and industry to collaborate on new energy technologies, which may involve sharing system data, providing opportunities for testing equipment, or access to the Company's subject matter experts.
- **Monitoring industry developments**: Tracking new technologies and approaches coming out of national laboratories and the private sector, while also engaging other electric utilities to understand how they are deploying new technologies.

Con Edison's research and development (R&D) teams play a crucial role in allowing the Company to stay at the forefront of new technology. Through its proactive research and piloting of new technologies, Con Edison is contributing to an industry-wide approach of resilience strategies and solidifying its reputation as a forward-thinking leader in the field.

Consideration of Equity

Con Edison recognizes that the impacts of climate change are disproportionately falling upon overburdened communities who are the least able to prepare for and recover from them.[10] These communities tend to be the most exposed to and the most sensitive to climate hazards, like inland flooding or extreme heat, both of which are projected to increase across Con Edison's service territory.[11]

Analyses by the U.S. EPA show that minorities are more likely to live in areas with the highest projected levels of climate change impacts.[12] In addition, vulnerable populations are more likely to lack access to heating or cooling services, more likely to experience food spoilage and shortages, and can experience delayed or disrupted healthcare services during a power outage.[13] Elderly and health-compromised groups also have a lower tolerance for extreme temperatures. These communities have also been shown to correlate with increased health risks, lower levels of power outage preparedness, and willingness and means to evacuate if necessary.[14]

Con Edison's Role

Con Edison recognizes the importance of equity and its crucial role in energy resilience planning. The Company has been deliberate about reviewing how it incorporates equity into the planning process and tracking the implementation of clean energy and climate resilience-driven programs. In the Company's most recent rate case, the Company reaffirmed its continued focus on investments and programs that provide disadvantaged communities with safe and reliable service. For details on how Con Edison defines "disadvantaged communities," see Appendix 3: Defining Disadvantaged Communities.

Con Edison has formed an Environmental Justice Working Group (EJWG) and released a corporate policy statement to apply an equity lens to its operations and programs.[4] Con Edison will consider these principles going forward as the Company learns from the effects investments may have on DACs through reporting. Key components of the policy statement include:

- Con Edison will work to actively reduce or address any disproportionate burdens of operations on DACs;

- Con Edison will work to understand DAC concerns;
- Clean energy and resilience investments will benefit DACs;
- Con Edison will provide opportunities for employment in their clean energy future.[x] [15]

The EJWG's principles are embodied within subcommittees that are responsible for setting and achieving these objectives. One objective is to focus on working with operational groups to develop review processes to advance work that will benefit DACs. Another objective is to educate Company employees on environmental justice, which will allow for more consideration of DACs across the corporation. In addition, the Company will work to expand efforts to recruit and train residents of DACs as well as seek federal funding for projects within these areas. Lastly, the EJWG will be responsible for supporting and advising the development of the Company's reporting efforts as the Company makes investments in these communities.

Con Edison has committed to two ways to report on investments in DACs to learn how they affect these communities. The first is to report the value (dollar amount) of strategic electric capital investments in DACs (and determining the baseline), through biennial retroactive reporting using the New York State DAC map (see Figure 8). The second is to track the number of outages in DACs relative to non-DACs to understand the level of impact on these communities. Furthermore, for the selective undergrounding program, Con Edison will align with its latest rate case and follow screening criteria that consider DACs in the site selection process. See the Project Prioritization Selection Criteria section for more detail.

These actions help to balance broader infrastructure needs with focused DAC resilience enhancements and to align with the NYS Climate Leadership and Community Protection Act. The Company also plans to work with external stakeholders to assist in project site selection and prioritization for investments that specifically benefits DAC communities, such as the Critical Facilities program.

[x] Con Edison has issued a Request for Proposal (RFP) to community-based organizations and educational institutions to train the next generation of professionals. These proposals may be related to jobs in clean energy, technology, climate change adaptation, and environmental restoration.

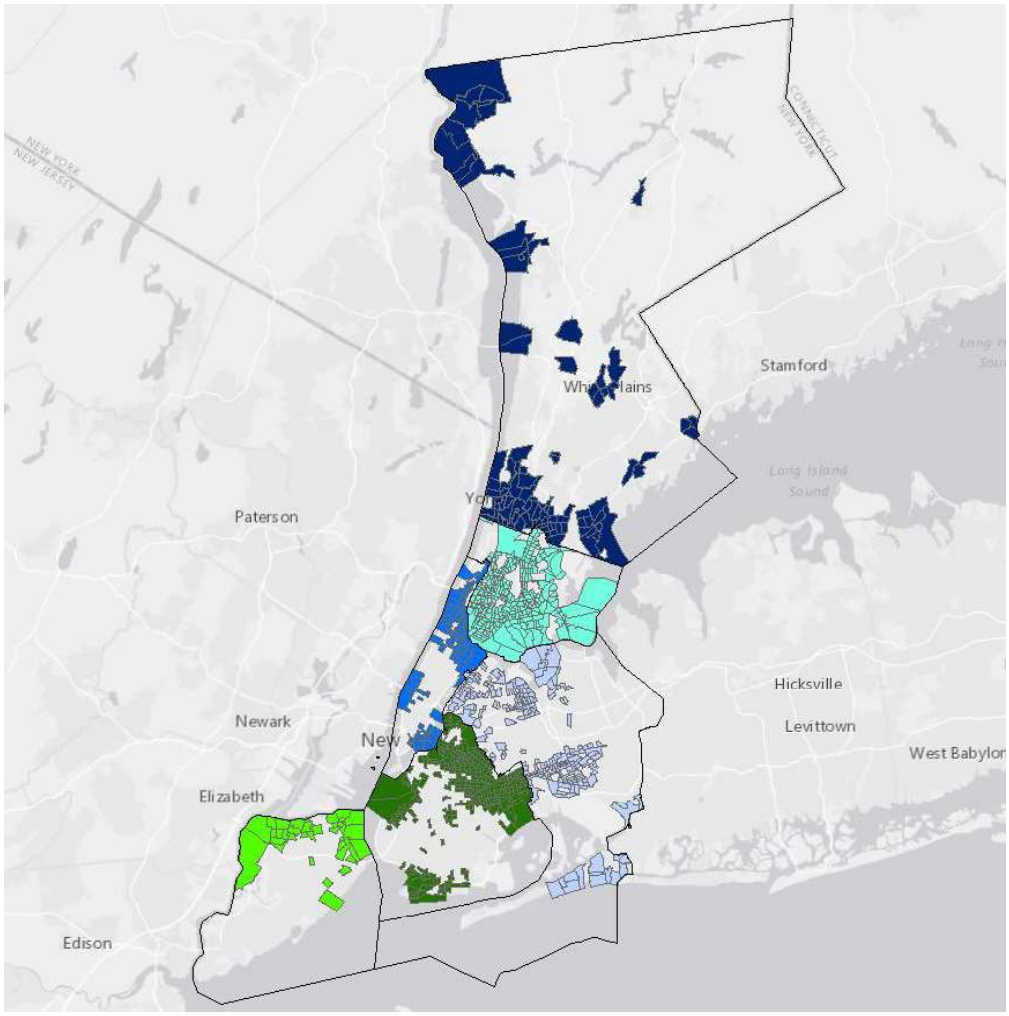


Figure 8. Disadvantaged communities in Con Edison's service territory, colored by county.

Project Prioritization Selection Criteria

Many of the investments in this plan are of a programmatic nature and therefore the phasing of implementation based on location has yet to be defined. To consider equity in the implementation of the Plan, Con Edison has developed general project prioritization selection criteria that may be used to develop the phasing of specific infrastructure investments and guide investments that benefit disadvantaged communities. The criteria draw inspiration from the Undergrounding Pilot Program Screening Criteria included in the Company's 2022 Rate Case, which has received stakeholder support. The Company recognizes the criteria is general at this point and that it should be modified as needed for different programs, as specific programs may have different or additional screening criteria.

This screening criteria could be used in a step-by-step manner, starting with the first objective.

1. Identify where investments will avoid the largest number of outages. Con Edison will prioritize assets that have been identified by our engineers and planners as being vulnerable by 2050, as well as assets that have a history of recurring outage events. Investing in these vulnerable assets first will reduce the overall number of outages for the system by replacing older or damaged equipment and those projected to be exposed in the near term with more resilient equipment. This is an important first step of system planning to increase system resilience.

2. Identify where investments would have the greatest impact for critical customers (hospitals, fire stations, emergency facilities, etc.). Prioritizing these investments will enable customers to keep receiving service during an extreme weather event, either at home or at a community facility.

3. Identify disadvantaged communities using the NYS DAC Map. Once criteria 1 and 2 have been considered and specific assets have been identified that also serve disadvantaged communities, as identified in the NYS DAC Map, the assets may then be prioritized for investment.

Potential Use of the Screening Criteria

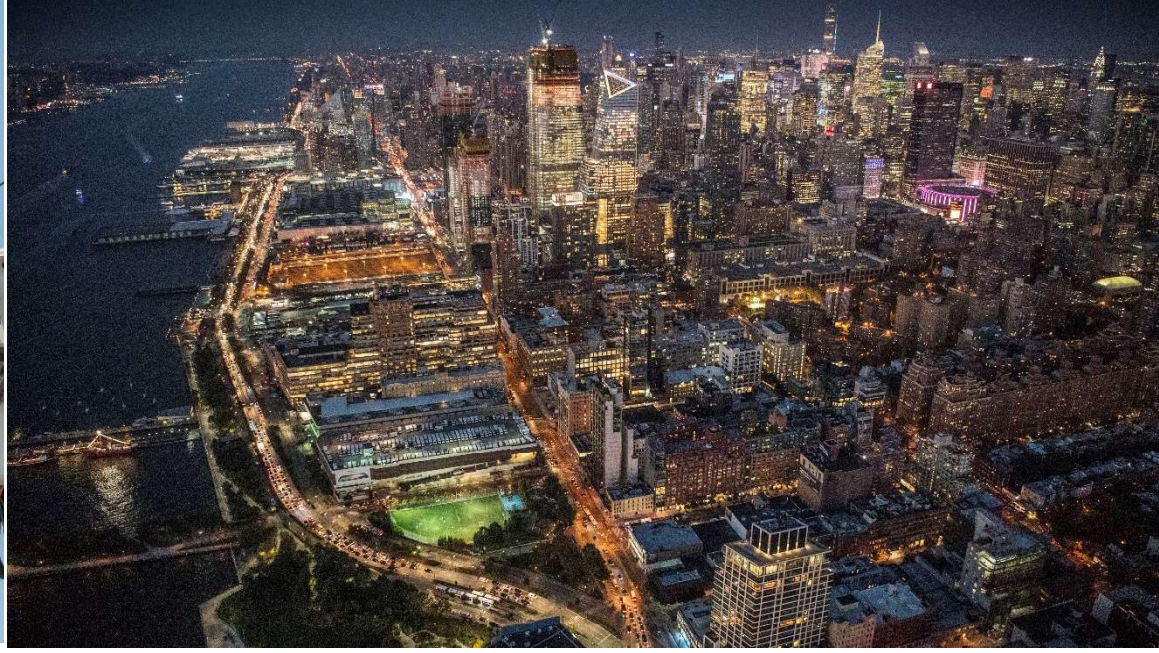
The following provides an example of how the screening criteria may be used to select which electrical devices to replace in a program due to increased temperature risks.

1. 25 devices are identified as having a history of failure and are located in areas that are projected to have high risk of extreme heat by 2050.

2. Of those 25 devices, 10 serve critical customers, which would be prioritized first.

3. Of the remaining 15 devices, 7 of them are within disadvantaged communities, which would be prioritized next.

The remaining 8 devices would then be prioritized as part of regularly phased work.



Investment Plan

This section summarizes the resilience investments that Con Edison plans to make to prevent and mitigate the risks of projected climate changes. They are meant to lessen the severity of climate impacts which in turn assist with lowering restoration costs and outage times. The investments follow the resilience management framework and were developed through a comprehensive process, as described below.

First, Company subject matter experts reviewed and agreed upon the primary and secondary climate risks identified in the CCVS to address in the next 5-20 years. This included considering how those risks might be mitigated through investments already committed and through the commitments to integrate changing future climate conditions. The resulting set of high priority risks (based on potential impacts to the electric system and to customers) includes:

- Temperature impacts on electric substations and across the transmission and distribution systems.
- Sea level rise, flooding, and erosion impacts across the transmission and distribution systems, and on other Company facilities.
- Wind and ice impacts on the Company's overhead transmission and distribution systems.

These areas encompass many of the primary risks identified in the CCVS. The specific justifications for inclusion of each investment are included in the subsections below.

The Company developed the set of preferred adaptation strategies for each hazard by:

- Working through the resilience management framework to consider solutions that prevent and mitigate climate change impacts through a mix of traditional solutions and innovative strategies.
- Mapping the toolbox of potential adaptation measures included in the CCVS to the priority risks and hosting additional discussions in order to think holistically about the set of potential solutions.

- Narrowing the set of potential solutions by considering factors such as technical feasibility and co-benefits.

The resulting package of proposed investments was reviewed by company leadership and the CRWG. To implement these programs, Con Edison expects to invest approximately $645.4 million in capital expenditures over the first five years (2025–2029) of the resilience plan. Based on estimated in-service dates for the projects, the Company estimates those investments would result in a revenue requirement of $139.7 million over that same period. This would have varying delivery and total bill impacts from 0.0% to 0.7% and 0.0% to 0.5%, respectively, over the five years (2025-2029). As a result, the five-year cumulative electric delivery impact would be 1.7% and total bill impact would be 1.2%.

Year	Capital Requested ($ Millions)	Rate Base ($ Millions)	Revenue Requirement[xi] ($ Millions)	Associated O&M ($ Millions)	Delivery (% Change)	Total Bill (% Change)
2025	$0	$0	$0	$0	0.0%	0.0%
2026	$124	$37	$8	$0	0.1%	0.1%
2027	$141	$137	$25	$0	0.3%	0.2%
2028	$183	$278	$49	$0	0.6%	0.4%
2029	$197	$350	$57	$0	0.7%	0.5%

Table 7. Estimated revenue requirement and total bill impact by year.

Over the first 10 years (2025 through 2034), the Company will continue implementing resilience programs and projects at a cumulative order of magnitude cost of $2.2 billion, and the total capital expenditures for all resilience investments for 20 years (2025 through 2044) will be approximately $5.3 billion.

The Company recognizes that the investments needed to prepare and protect customers from climate change have an impact on customer rates. The Company is committed to providing assistance to vulnerable customers who can be the most impacted by extreme weather, due to their location or lack of resources to mitigate the impacts of an extreme weather event. In addition to the equity considerations focused on disadvantaged communities, Con Edison has current programs that prioritize affordability for low- to moderate- income (LMI) customers. The Company provides discounts to those who are eligible as part of the Energy Affordability Program (EAP). EAP discounts are reset each year to account for changes in the Company's rates as part of base rate cases, so participating customers are, in effect, mitigated against some of the impacts of increased rates. In the Company's most recent base rate cases, the Company more than doubled the target level for its low-income Energy Affordability Programs to over

[xi] The Revenue Requirement is the sum of all costs incurred to the customers during a period of time; for the purposes of bill impacts – this is on an annual basis. This expenditure is for the resilience investments introduced in this CCRP.

$202 million per rate year and continued its reconnection fee waiver program, which provides low-income customers with a waiver of the normal charge to reconnect service after termination for non-payment.

In addition to these cost savings, the Company continues its efforts with customers and stakeholders to assist LMI customers. The Company has implemented outreach and education regarding bill assistance and payment plan opportunities for all customers and coordinates with social service agencies to apply public assistance funding directly to customer accounts. The Company also participates in an EAP Working Group led by DPS Staff to discuss statewide efforts to improve and expand the EAP program. Finally, the Company is a partner to NYSERDA in providing information related to the most vulnerable customers for participation in NYSERDA's Empower Program and offers energy efficiency and building electrification programs to LMI customers in multi-family homes. The Company will continue to work with stakeholders on these and other customer affordability programs.

A year-by-year schedule of expenditures is shown in Figure 9. The proposed resilience investments, along with timing and implementation, are shown below.

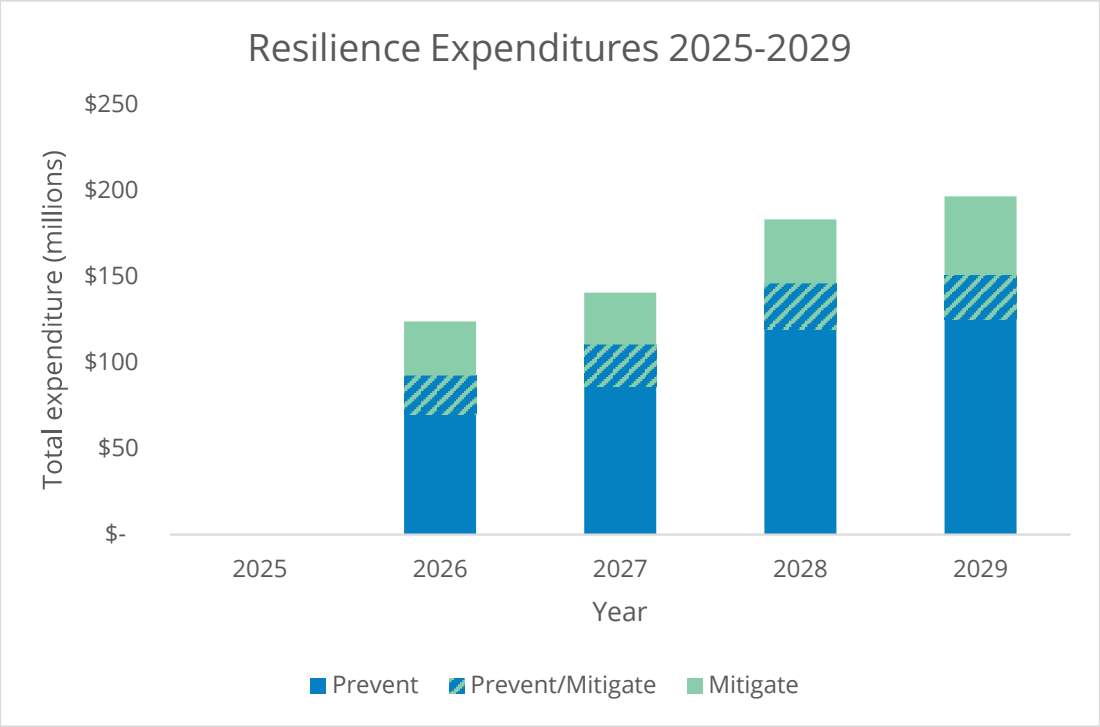


Figure 9. Resilience Expenditures by Strategy and Year.

The proposed investments are shown below in Table 8. Investments are listed with the climate hazard(s) they address and resilience management framework strategy(s) they support. Please note that while many programs will reduce risk from multiple hazards, in this report they are organized by the **primary** climate hazard addressed (in bold below).

Investment	Climate Hazards	Strategy
Primary Feeder Resiliency	**Heat**, Extreme Events	Mitigate
Substation Operations Storm Hardening	**Flooding**	Prevent
Submersible Equipment	**Flooding**	Prevent
Erosion Protection and Drainage Upgrade	**Flooding**, Extreme Events	Mitigate
Selective Undergrounding	**Wind and Ice**, Extreme Events	Prevent
Non-Network Resiliency	**Wind and Ice**, Heat, Extreme Events	Prevent, Mitigate
Non-Network Resiliency Cutout Upgrade	**Wind and Ice**, Extreme Events	Mitigate
Critical Facilities	**Extreme Events**, Wind and Ice	Prevent, Mitigate
Substation Enclosure Upgrade	**Extreme Events**	Prevent

Table 8. Summary of Planned Resilience Investments.

The investments are proposed to mitigate the effects of heat, flooding, wind and ice, and extreme events, with the specific connection to the most recent climate data summarized below.[xii] For individual program details, see Appendix 4: Project and Program Details.

Heat

Increasing temperature and humidity are a risk to Con Edison's electric system and hotter conditions will lead to a harsher operating environment for the entire electric system. As noted in the CCVS, updated climate projections indicate that electric assets will be exposed to higher temperatures sooner than previously projected, making this an urgent risk to begin addressing over the next 5 years and beyond.

[xii] The Company has provided both financial and non-financial benefits for the investments in the CCRP. Because there currently is no widely recognized and accepted methodology for comparing resilience investments to customer and regional avoided costs, the specific cost savings to customers cannot currently be provided. As a result, financial and non-financial benefits can overlap. As noted earlier, the Company will continue to work with the Commission and DPS Staff to further review an appropriate customer benefit methodology.

For example, 17 days with maximum temperatures exceeding 95°F are projected to occur in 2030 which were previously projected to occur in 2040 (up to a decade earlier). The potential impacts of heat include:

- Accelerated asset degradation: Increasing temperatures can result in premature asset failure that, if unexpected, could result in customer outages.
- Physical impacts: Line sagging due to heat can reduce the clearance between overhead assets and surrounding vegetation, which can increase the potential for contact with vegetation, leading to asset failure and safety risks.
- Decreased asset capacity: Increasing temperatures can increase system load, which could exceed system capacity and force the Company to implement load shedding to avoid further damage to equipment.

To address these risks, Con Edison has developed the following key programs:

- **Primary Feeder Resiliency**: Installs switches and bifurcates existing feeders that are prone to failure during high heat events to prevent failures and reduce the number of customers who would be affected during an outage.

Primary Feeder Resiliency

Investment Description

Mitigate

Climate Hazard(s)
Heat (Temperature Variable, Heat Waves)

Scope
The Primary Feeder Resiliency program enhances the core resiliency work performed under the Primary Feeder Reliability program and further mitigates potential network system vulnerabilities resulting from future climate-driven increases in heat, temperature variable (TV, heat plus humidity), and extreme heat events (heat waves and heat domes).

The Primary Feeder Resiliency program enhances feeders by installing modern interrupter switches and by bifurcating primary feeders adding capacity and sectionalizing capability to fortify against the impacts of climate change. Sectionalizing overhead feeders has been a primary strategy for mitigating the risks of extensive feeder outages across the industry for many years. Newly developed technology has made this design feasible on the Company's underground network system. These new interrupters are next-generation, vacuum-based sectionalizing switches that allow for partial circuit isolation rather than a full feeder outage resulting from a fault. Now, it's possible to implement this best practice for underground feeders, providing both resiliency benefits that will strengthen network operations and protect customers under a wide variety of extreme circumstances and blue-sky benefits, including support for the Company's clean energy and electrification goals.

Justification
The CCVS found that temperature increases are expected to occur a decade earlier than previously understood. Current projections estimate that by 2050, there will be 32 days per year in which the daily average temperatures exceed 86°F, compared to 3 days in the historical baseline and 26 days estimated in the 2019 CCVS (a 23% increase). The CCVS also found that heatwaves are likely to increase in frequency and duration, with approximately nine heatwaves per year by 2050 compared to a baseline of two heatwaves per year. Currently, system peak loads are driven by customer cooling needs. When feeders operate at loads above their assumed design threshold, they can experience accelerated degradation, which could lead to premature failure and customer outages. Operating at loads above the design threshold can also force Con Edison to reduce the output of power to customers, as a protective measure.

Program Benefits	Upgrading to the latest technology and extending interrupter technology throughout the network distribution system helps the Con Edison system absorb failures on primary feeders by limiting the number of feeders and associated network transformers out of service through automatic actions – i.e., dropping the faulted sections automatically to keep un-faulted sections in service. The program also increases the resiliency of the network system by bifurcating and, in some cases, extending key primary feeders. These feeders are reconfigured into double legged feeders with an interrupter installed on each leg. Bifurcating a feeder not only provides the benefit of being able to isolate half of the feeder if faults occur rather than having the entire feeder out but it also protects available feeder capacity on the remainder of the feeder. Previous feeder bifurcations have resulted in increased normal and emergency feeder ratings by 40-50%.

Funding Request	**2025 - 2029**	**2030 - 2034**	**2035 - 2044**
	$113,000,000	$262,100,000	$786,400,000

Long-term Roadmap	This is an on-going program with no currently planned ending date. The specific plan for work under this program will be evaluated each year, but, currently, the annual scope of work for the program in future years is expected to be similar to the scope of work included for 2025-2029 (*i.e.*, to include similar volumes of the same types of work). The annual per unit cost is assumed to escalate by inflation, with an assumed inflation rate of 3%.

Flooding

Rising sea levels, coastal storms, and increasingly intense precipitation presents flooding risks to Con Edison's electric system. Updated heavy rain projections have increased with the latest climate data, as noted in the CCVS. Specifically, projections show that annual days with precipitation exceeding two inches, relative to a baseline of three days, could reach five days in 2050. This increase in heavy precipitation events, along with rising sea levels and more frequent coastal storms, necessitates action. The potential impacts of flooding and water intrusion include:

- Equipment damage: Floodwaters, saltwater spray, and water intrusion damage electric components, leading to increased repair costs and longer outages.
- Equipment corrosion: Saltwater from rising sea levels and coastal storms corrode electronic components, introducing longer-term risks for asset failures and outages.
- Soil weakening: Water exposure weakens equipment foundations, increasing risk due to erosion near riverbanks and coasts.
- Limited accessibility: Flooding and high tides make it difficult for maintenance and repair crews to access key assets, delaying timely service restoration during or after storms.

To address these risks, Con Edison has developed several programs:

- **Substation Operations Storm Hardening**: Mitigates flood risks at 23 substations through infrastructure improvements such as raising assets, installing flood barriers, and relocating control rooms, aiming to enhance reliability and minimize service interruptions from flooding and storms.
- **Submersible Equipment**: Aims to protect underground distribution assets vulnerable to flooding so that equipment can continue functioning if exposed to flood waters. Customers

will benefit from a more reliable and continuous supply of energy, and restoration costs for the Company will be reduced.

- **Erosion Protection and Drainage Upgrade**: Upgrades weather enclosures for switchgear cubicles and relay cabinets across selected substations, enhancing the system's resilience to inclement weather and reducing the potential risk of equipment failure from flood events.

Substation Operations Storm Hardening

Prevent

Investment Description

Climate Hazard(s)
Flooding, Extreme Events

Scope
The scope of the Substation Operations Storm Hardening program includes work needed to mitigate increased risks of flooding identified by Con Edison's CCVS at 23 area and transmission substations. Storm hardening physically improves infrastructure to make it less susceptible to damage from flooding and other extreme weather events. The loss of a single area substation could result in an interruption of electric service to a large number of Con Edison's customers, which makes protection from storm events important to prevent customer outages and avoid costly repairs.

- The types of flood protections that are likely to be considered as protective measures include:
- Installation of moats and walls around critical station equipment
- Sealing of troughs, conduits, panels and cabinets, as well as any other critical station penetrations
- Installation of removable flood doors and barriers
- Installation of sump pumps in protected areas
- Migration of a substation control room to a higher elevation
- Elevation of critical relays and control panels
- Installation of nitrogen-powered pumps for pressurization plants
- Installation of fiber optic communication lines
- Raising and sealing of moat walls, curbs, louvers, and flood barriers

Justification
Adoption of the FEMA+5' standard results in 23 area and transmission substations that are projected to be vulnerable to flooding with projected rise in sea levels.

The CCVS concluded that Con Edison's electric system is vulnerable to risk of damage from extreme flooding and weather events like those that have been experienced in recent history. The Study also confirmed through a growing body of scientific evidence that projected climate change estimates extreme storm events will likely increase in frequency and intensity in the future. In fact, by some estimates, severe weather events (thunderstorms, strong winds, etc.) are projected to increase in frequency by 5%-20% per 1˚C warming (under the SSP5-8.5 scenario).

Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode the ability of communities and their residents to cope with and recover from the impacts of extreme events, with members of disadvantaged communities the least able to recover.

Program Benefits

Severe flooding can result in customer outages, present issues of inaccessibility, and lead to equipment damage. The proposed resiliency investments included in the Substation Storm Hardening program will improve Con Edison's ability to withstand the impacts of climate changes without experiencing substation equipment failures from projected future flood levels accompanying rising sea levels, heavy precipitation, and storm surge from severe storms.

Funding Request	2025 - 2029	2030 - 2034	2035 - 2044
	$25,300,000	$470,600,000	$570,200,000

Long-term Roadmap

The first five years of this program are currently projected to focus on engineering, planning, design, and procurement for the flood protection enhancements needed at each of the substations identified as at-risk under the higher standard (FEMA+5'). Costs are projected to escalate with the beginning of construction in 2030, and all flooding protections are projected to be completed by the end of 2040.

Submersible Equipment

Prevent

Investment Description

Climate Hazard(s)
Flooding (Sea Level Rise)

Scope
After Superstorm Sandy, Con Edison undertook an extensive storm hardening program to install flood protections, including submersible equipment, for all existing facilities that were in the floodplain for 100-year storms to make the underground system more resilient to such storm events. Con Edison also changed design standards to require the installation of submersible equipment for all new underground distribution equipment installed in a flood zone.

Design standards in Con Edison's Climate Change Planning and Design Guideline Document establish the sea-level rise adjusted Design Flood Elevation (DFE) criteria of a 100-year storm with 3 feet of sea level rise and 2 feet of freeboard (FEMA + 5'). The Company evaluated all vault locations when plotted on a survey map and identified all locations within the FEMA +5' floodplain. At the FEMA + 5' level, non-submersible underground distribution equipment (120V/208V transformers and 460V transformers with network protectors) located in the projected floodplains – at nearly 400 locations – will be replaced with submersible equipment under this program.

Justification
The CCVS indicated that sea level rise may exceed Con Edison's current design standards for coastal flood protection (e.g., a 100-year storm with 1 foot of sea level rise and 2 feet of freeboard; FEMA +3') between 2030 and 2080. Underground distribution assets that are located within the current 1% annual chance floodplain are projected to face more frequent and severe flooding, and assets that are not currently in the 1% annual chance floodplain could still face future flooding risks as sea level rise expands the extent of the 1% annual chance floodplain. In addition, underground equipment that is in the expanded future floodplain is not submersible and could be damaged if deluge rainfall events overwhelm the stormwater systems and result in flooding outside of the FEMA floodplains. If exposed to flooding, underground distribution assets could experience severe damage, corrosion, and accessibility issues during necessary repairs and restoration. Damage to these assets would result in frequent customer outage events and reduced reliability across the system.

Program Benefits

This program will benefit Con Edison's customers in providing a more reliable and continuous supply of electricity. In addition, the program will reduce restoration costs for Con Edison by avoiding premature equipment replacement or failure and ultimately reduce repair and replacement costs.

Funding Request	2025 - 2029	2030 - 2034	2035 - 2044
	$37,009,000	$34,703,000	$0

Long-term Roadmap

The current plan for this program is for all equipment identified as vulnerable to flooding at the new standard to be replaced by the end of 2033. The current timeline anticipates over 60% of the 120V/208V transformers and all of the 460V transformers and network protectors being replaced in the initial five years, with the remaining 127 120V/208V transformers replaced over the next four years.

Erosion Protection and Drainage Upgrade

Investment Description

Mitigate

Climate Hazard(s)
Flooding, Extreme Events

Scope
This program will install reinforcements and upgrade drainage systems in select substations to protect from erosion that may occur from extreme, deluge rain events or large storms (e.g., hurricanes and nor'easters). Similar to the Substation Enclosure Upgrade program (above), the Erosion Protection and Drainage Upgrade program is designed to mitigate the risk of potential substation equipment damage and failures at area and transmission substations caused by climate-driven increases in heavy precipitation during extreme storm events.

The program began in 2024 with six substations initially identified as in-scope for upgrades: Dunwoodie, Sprain Brook, Rainey, Ramapo, Gowanus, and Granite Hill. Erosion and drainage issues were discovered at these stations from hurricane Ida in late 2021. Erosion and drainage issues have also been noted at four additional stations – East 63rd Street, Ossining, West 65th Street, and Pleasantville – and upgrades at these stations will be included in this program. Erosion protection and drainage upgrades will begin with Dunwoodie and Sprain Brook and will target concurrent work on two substations per year. Typical upgrades at each station include replacement of below grade cable trays and installation of new retaining basins; however detailed engineering and evaluations will be performed at each station to determine the appropriate upgrades at each facility.

Justification
The CCVS projects an average annual increase in precipitation up to 15% by 2050, with the heaviest 5-day precipitation amount at Central Park of 11.8 inches. The number of days per year with more than 2 inches of precipitation is also projected to increase 33% by 2030 and 88% by 2080 from the historical baseline.

Prolonged and intense rain events which lead to flooding can cause erosion and undermine substation equipment. In extreme events, the impacts of flooding and erosion could cause critical substation equipment to lose control power, resulting in customer outages and costly restoration costs depending on the extent of sub-asset damage. Erosion caused by extreme rain events could also create unsafe conditions and safety hazards for substation personnel. Proactive investment in erosion protection and drainage upgrades helps to mitigate these risks.

Program Benefits

Proactive investment in erosion protection and drainage upgrades helps to mitigate the risk of damage to substation equipment caused when equipment shifts and becomes unstable after periods of heavy precipitation causes the ground to erode. Shifts in equipment position are likely not only to damage the equipment but also, possibly, to result in loss of service for large numbers of customers served from the substation. Erosion conditions also represent safety hazards to crews working in the substation.

Funding Request

2025 - 2029	2030 - 2034	2035 - 2044
$21,800,000	$31,000,000	$77,600,000

Long-term Roadmap

This program is an on-going program with no currently planned ending date. The specific plan for work under this program will be evaluated each year, but, currently, the annual scope of work for the program in future years is expected to be similar to the scope of work included for 2025-2029 (i.e., to include similar volumes of the same types of work). The annual per unit cost is assumed to escalate with an assumed inflation rate of 3%.

Wind and Ice

Con Edison's service area is expected to experience higher wind gusts in the future, and there remains the potential for severe icing events. As noted in the CCVS, maximum wind gusts in New York City could increase from 80 mph to 110 mph by midcentury and hurricane winds speeds are projected to increase as well. Additionally, there is potential for increased freezing rain frequency and ice accumulation. The potential impacts of wind and ice include:

- Line impacts: Con Edison's electric system is built to withstand defined design tolerances for combined ice and wind loading, consistent with the National Electric Safety Code (NESC) Rule 250B. Wind or ice loading that exceeds these standards can result in asset failure, resulting in outages.
- Vegetation impacts**:** Strong winds and ice accumulation can cause trees and tree limbs to fall on overhead lines and other equipment, causing customers to lose service.

To address these risks, Con Edison has developed the following programs:

- **Selective Undergrounding**: Converts high-risk overhead electrical lines to underground systems to enhance resilience against extreme weather events like storms, wind, and ice, based on a data-driven approach. Aims to reduce customer outages and long-term repair costs by focusing on the most at-risk circuits.
- **Non-network Resiliency**: Uses advanced analytics tools to inform the installation of aerial cables and upgrades to overhead feeders thereby strengthening the distribution system against wind and ice hazards.
- **Non-network Resiliency Cutout Upgrade**: This program will continue to install automatic and fuse-less reclosers throughout the non-network system, shortening the length of time that a circuit is out of service, which is especially beneficial during storms with high winds.

Selective Undergrounding

Prevent

Investment Description

Climate Hazard(s)
Wind Gusts and Ice, Extreme Events

Scope
The goal of the Selective Undergrounding program is to prevent outages during heat waves, high winds, and storm events by placing the most vulnerable segments of the non-network system underground.

The program prioritizes segments of the overhead system that are most vulnerable to damage in these weather conditions, such as main runs in heavily wooded areas and radial spur installations where damage is more likely to result in customer outages. Con Edison uses the Overhead Program Optimization Tool (OHPOT) model to review data at the 4, 13 or 27kV primary "segment" or "protective device" level (e.g., Spur, Sub-Spur or main Run segment). The statistics provided by OHPOT are primarily based on the Outage History (PSC Outage Database) and consist of the number of outage events for that segment, and customers impacted. This, and other information, such as available fault current and the length of the segment, helps determine the appropriate mitigating measures. In late 2021, Environmental Justice (EJ) metrics were added as another input. These inputs can then be used by the system to prioritize jobs.

OHPOT selects overhead circuits to be considered for undergrounding based on the best available data and current circuit configuration. For example, the tool may be configured to mark circuits as warranting "U – underground review" based on meeting **any** of these four criteria:

1. An EJ area containing 10% of population in the LMI category AND a line segment experiencing four (4) or more outage events in last 6 years.
2. The segment experienced four (4) or more outage events in last 6 years AND the segment outages resulted in a total of 1,500 or more customer outages in last 6 years.
3. The segment experienced eight (8) or more outage events in last 6 years.
4. The segment experienced three (3) or more outage events in last 3 years.

Circuits meeting the selected criteria are then forwarded for engineering review and analysis. This review includes detailed engineering and constructability analyses to determine the solution that best mitigates the circuit vulnerabilities, including:

- Selectively undergrounding a problematic portion of the circuit
- Selectively undergrounding a portion of the circuit and creating a tie to a neighboring circuit
- Selectively undergrounding the entire circuit
- Pursue other appropriate design enhancements under other programs

Justification

Over the past two decades, New York has experienced multiple major storm events – both hurricanes and nor'easters – bringing high winds that downed trees and overhead facilities, resulting in widespread power outages. The CCVS found that Con Edison's service territory is projected to experience an increase in the frequency and intensity of storms, including wind and ice. Hurricanes are projected to cause wind speeds increases far beyond typical average speeds, and wind speeds of the most intense hurricanes are projected to increase. Freezing rain frequency and radial icing are also projected to increase, although the magnitude of the trend remains highly uncertain.

Exposure to these climate hazards can present an increased risk to the distribution system. Increased temperatures can lead to line sag, presenting safety concerns in areas with vegetation clearance limitations. High winds can cause downed trees or wind-blown debris to make contact with overhead lines, especially if there is limited vegetation clearance. Contact with vegetation can cause asset failure, result in system outages and require restoration. If overhead distribution lines make contact with vegetation, fallen poles can lead to system outages and require restoration. In the event of an extreme storm, difficulty accessing the damaged asset may prolong the restoration time and cause customers to remain without power.

Program Benefits

By continuing the Selective Undergrounding program, Con Edison will increase the resiliency of the system but eliminating exposure to extreme events such as heat waves and extreme wind and ice storms. Underground assets will be protected and allow reliable service to customers. This initiative is also expected to result in fewer instances of high fault current, reduced stress on cable connections and splice joints, and less operational wear on breakers, switches, and reclosers—potentially extending the lifespan of these equipment. Public safety is another key focus of the undergrounding program, as it minimizes the risk of downed conductors and associated hazards. This, in turn, reduces the need for wire-guards, thereby cutting down on storm restoration costs and freeing up Con Edison personnel for other critical restoration tasks.

Funding Request

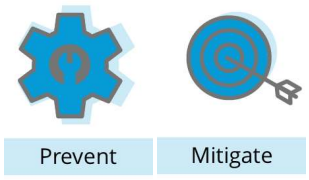
2025 - 2029	2030 - 2034	2035 - 2044
$333,000,000	$563,500,000	$1,410,200,000

Long-term Roadmap

This program is an on-going program with no currently planned ending date. The specific plan for work under this program will be evaluated each year, but, currently, the annual scope of work for the program in future years is expected to be similar to the scope of work included for 2025-2029 (i.e., to

include similar volumes of the same types of work). The annual per unit cost is assumed to escalate by inflation, with an assumed inflation rate of 3%.

Non-Network Resiliency



Investment Description

Climate Hazard(s)
Wind Gusts and Ice, Heat, Extreme Events, Heavy Rainfall

Scope
The Non-Network Resiliency Program is the second of four programs, like the Selective Undergrounding program (above), included in Con Edison's Resilience Plan to address potential climate change impacts on the overhead non-network distribution system, including the risk of system failures resulting from increases in wind, extreme storms, and heat.

The Non-Network Resiliency Program will both prevent potential outages on the overhead distribution system and mitigate the extent of system outages that do occur.

Justification
Outages are prevented by replacing vulnerable open wire conductor with aerial cable, which has been shown through prior pre- and post-storm evaluations to be as much as 20 times more reliable per foot than open wire conductors. The extent of actual outages is mitigated by installing Automatic Transfer Switches (ATSs) and diversifying primary sources to the 4kV system, limiting the number of customers experiencing outages from a single fault.

The non-network overhead distribution system is primarily at risk from increases in the frequency and intensity of storms and the accompanying high winds and ice accumulation. Current scientific literature indicates that winds are projected to become more intense and have faster wind speeds in the future largely due to more intense storms. There is also the potential for higher-intensity radial icing events in the winter months. Furthermore, there is high confidence that the probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future. Strong winds and ice accumulation from intense storms can cause trees and tree limbs to fall and make contact with the non-network system, potentially resulting in widespread outages. Furthermore, Con Edison's electric system is vulnerable to increasing temperatures and sea level rise. Projections indicate that the number of days per year with maximum temperatures exceeding 95°F will be 32 days per year in 2050, compared to a historical baseline of 4 days per year. Projections also show that sea level rise could reach 16 inches by the 2050s and 36 inches by 2100 within the service area.

Program Benefits

This program will reduce the number of customers outages and the time to restore power, when outages occur, as well as mitigate risks for non-network equipment that are vulnerable to extreme events through the system hardening approaches. Limiting the extent of customer outages on this system during an event has the supplemental benefit of reducing the overall duration of system outages by focusing available restoration crews on other issues.

Funding Request

2025 - 2029	2030 - 2034	2035 - 2044
$60,600,000	$78,300,000	$128,200,000

Long-term Roadmap

The current high-level plan for this program projects completion of the known scope of work (based on current conditions) to be completed by the end of the twenty-year period (2025-2044). The volumes of work performed annually are projected to ramp up over the first few years of this period, remain approximately level for the next ten years, and then ramp down over the last seven years. The per unit costs are projected to escalate annually by an estimated 3% inflation rate.

Non-Network Resiliency Cutout Upgrade

Mitigate

Investment Description

Climate Hazard(s)
Wind Gusts and Ice, Extreme Events, Heavy Rainfall

Scope
The Non-Network Resiliency Cutout Upgrade program integrating devices with reclosing capabilities into the non-network system, increasing Con Edison's capacity to mitigate outages and limiting the impact of climate change on customers by reducing outages caused by temporary faults, such as tree contact and live phase conductor interactions. This program installs automatic, Trip Saver reclosures at locations with less than 6 kA of available fault current and Single Triple Single (STS) reclosers (also automatic and fuse-less) at locations with between 6 kA and 15 kA of available fault current.

Justification
Typically, if there is a fault on a non-network feeder, reclosers re-configure the circuit so that the closest reclosing device to the fault opens while all others are closed, protecting the majority of a non-network circuit (circuits that can run for several miles) from outages caused by a single fault. Without reclosers that can automatically re-configure the system to isolate a fault, all customers fed through the circuit would lose service from a single event, such as a downed tree during a storm.

This project mitigates risks for the overhead distribution system that is highly vulnerable to wind and ice and other extreme events such as heat waves and flooding. Wind and ice events that exceed the design tolerances for combined ice and wind loading can cause asset failure, along with downed trees and falling vegetation. Projections indicate that the service area is likely to experience higher wind speeds and gusts due to intensifying hurricanes, nor'easters, and thunderstorms in the future. North Atlantic hurricanes are projected to become more intense (~5% increase) and have higher rainfall amounts (~10%-15% increase) in the future relative to historical hurricanes. There is also the potential for higher intensity radial icing events in the winter months in the future, though the magnitude is uncertain.

High temperatures can also cause overhead distribution lines to sag and lose material strength, increasing the potential for contact with vegetation and resulting asset failure and safety risks. Projections indicate higher than average temperatures and periods of extreme high heat through the end of the century. In particular, projections indicate that the number of three-day heat waves with temperatures averaging above 90°F for each day could increase to 4 heat waves per year by the 2080s, compared to 0 heat waves in the historical baseline. Decreased capacity and higher than usual demand from higher temperatures could necessitate load shedding to prevent severe damage to substation equipment.

To address these risks, the upgrades and installations from this program will automate shut offs and restore power automatically when the equipment is damaged, therefore making outages shorter than previous designs.

Program Benefits

Initial assessments of non-network circuits, primarily using OHPOT, based on current system conditions, identified over 250 priority circuits where installation of reclosing devices would mitigate the risk of outages to customers, and high-level planning efforts suggest that this initial scope of work can be completed in less than ten years.

Installing reclosers on spurs on the non-network system increases the resiliency and reliability of this system by providing capabilities that enable Con Edison to avoid some outages, and restoring the system to normal operations more quickly than would be possible without these investments.

Funding Request

2025 - 2029	2030 - 2034	2035 - 2044
$10,000,000	$4,900,000	$0

Long-term Roadmap

The Non-Network Resiliency Cutout Upgrade Program targets the installation of approximately 267 cutout devices on the non-network system. The current high-level plan projects that over 70% of these devices will be installed in the initial five-year timeframe, and the remaining devices will be installed by the end of 2033. The annual volumes and types of work for 2030-2033 are anticipated to be ramping down slowly from 2029 levels with per unit costs escalating annually by an estimated 3% inflation rate.

Extreme Events

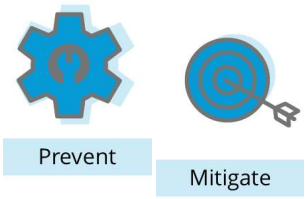
Extreme weather events, including concurrent or consecutive extreme events, present additional challenges to operations, planning, and infrastructure across the electric system. These events may take the form of intense storms, hurricanes, extreme heat waves, Nor'easters and cold snaps, deluge rainfall, or multiple extreme weather events (e.g., ice storm followed by a cold snap). There is high confidence that the probability of coincident extreme events will continue to increase in both frequency and intensity in the future.[16] Due to the wide variety of hazard types that may take the form of extreme events, impacts to Con Edison's infrastructure and operations could be widespread, including infrastructure damage and failure, operational disruptions, and increased risk of prolonged customer outages.

To address these risks, Con Edison has developed several programs:

- **Critical Facilities**: Focuses on fortifying over 2,000 critical facilities on Con Edison's non-network distribution system against extreme weather like wind and ice. Strategies include upgrading to stronger aerial cables, implementing advanced Supervisory Control and Data Acquisition (SCADA) switching schemes, and streamlining emergency backup generation.
- **Substation Enclosure Upgrade**: This existing program will install weatherproof enclosures for switchgear cubicles and relay cabinets to reduce the impacts of flooding and extreme precipitation on substations.

Critical Facilities

Investment Description



Climate Hazard(s)
Extreme Events, Wind Gusts and Ice

Scope
Critical Facilities (as defined in Con Edison's Customer Service Procedure, CPS 4-5-4) include facilities important to our communities' emergency response (e.g., hospitals, police, fire, EMS operations, etc.), facilities housing critical infrastructure (e.g., transportation facilities, water pollution control plants, etc.), facilities providing critical public services (e.g., prisons and correction facilities, shelters/care facilities, etc.), and residential facilities considered more vulnerable (e.g., developments with large elderly populations, nursing homes, high-rises, etc.). Over 2,000 locations currently designated as Critical Facilities are served by the non-network distribution system.

The Critical Facilities program enhances service to the locations on or fed via non-network distribution circuits to withstand climate impacts by implementing one or more of the following strategies:

- Undergrounding of overhead cables and equipment
- Replacement of open-wire conductors with Aerial
- Redundancy of supply through the use of SCADA, loop and bypass design
- Configuration for rapid deployment of emergency backup generation

Justification

Heavy precipitation and wind-related stress and debris from extreme storms were determined to be primary vulnerabilities for Con Edison's overhead distribution system in the 2023 Climate Change Vulnerability Study. Recent studies and science project a 20% to 40% increase in nor'easter strengthening (i.e., producing the types of storms with destructive winds) immediately inland of the Atlantic coast by late-century, suggesting stronger storms may more frequently impact the New York Metropolitan Region with heavy precipitation, wind, and storm surge, giving clear importance to the scope of work under this program. Con Edison's Climate Change Vulnerability study also confirmed through a growing body of scientific evidence and climate projections that these extreme storm events to be likely to increase in frequency and intensity in the future as a result of climate change.

This project will mitigate risk for critical facilities and the feeders that serve them by upgrading ones that are vulnerable to extreme events, like wind storms and deluge rain events. To address this risk, the Critical Facilities Program will prioritize and upgrade non-networks feeders. Addressing at risk feeders that serve critical facilities will help reduce the number of outages experienced during storm events, including wind and rain events. Mitigating outages for critical facilities, including hospitals, emergency centers, and disadvantaged communities will ultimately support efforts to improve community resilience. By prioritizing critical facilities, this project will provide reliable service and improve public safety.

Program Benefits

Given the projected climate changes with the potential to impact not only the Company's electric delivery systems but many other critical infrastructures supporting the communities in the service territory, the Company realizes that availability of the infrastructure and public services provided by the facilities identified as critical will be more important than ever and would look to support strengthening the circuits serving Critical Facilities. The Company proposes to leverage existing Emergency Preparedness coordination processes to prioritize circuits serving Critical Facilities.

These investments strengthen the distribution system serving community facilities which are vital for residents to prepare for and recover from the impact of increasingly frequent and more severe weather events. These "hardened" facilities have higher probabilities of maintaining electric service and of being restored more quickly than they would have without these investments.

Funding Request

2025 - 2029	2030 - 2034	2035 - 2044
$39,000,000	$57,000,000	$146,800,000

Long-term Roadmap

This is an on-going program with no currently planned ending date. The specific plan for work under this program will be evaluated each year, but, currently, the annual scope of work for the program in future years is expected to be similar to the scope of work included for 2025-2029 (i.e., to include similar volumes of similar types of work). The annual per unit cost is assumed to escalate by inflation, with an assumed inflation rate of 3%.

Substation Enclosure Upgrades

Prevent

Investment Description

Climate Hazard(s)

Extreme Events

Scope

The Substation Enclosure Upgrades program addresses risks of potential equipment damage and failure at area and transmission substations from water intrusion resulting from extreme precipitation during extreme storm events.

Under this program, robust, weatherproof outdoor enclosures will be installed to protect switchgear and relay cabinets from potential water intrusion during more frequent and intense extreme storms, preventing water-related equipment damage and potential equipment failures. These equipment

failures do not typically result in outages to customers because of the overall robust designs of the transmission system, but they do decrease the system's resiliency by limiting the ability for the system to withstand additional challenges during extreme weather events.

Plans for installation of substation enclosure upgrades are developed for each region annually, with work prioritized based on the current conditions of switchgear cubicles and relay cabinets and risks of exposure to weather conditions, with work planned to optimize availability during planned transmission system outages.

Justification

As the atmosphere warms due to climate change, precipitation events (including rainfall, downpours, snowfall, and ice) are expected to become more intense due to how a warmer atmosphere holds more water vapor and thus provides increased energy for strong storms. This program aims to address risks associated with substations from flooding and extreme precipitation.

Climate projections indicate that the Con Edison service territory could experience more frequent and intense rain events in future decades, increasing the likelihood of a substation being exposed to flooding from rain. Average annual precipitation is projected to increase from 0% to 15% relative to the historical baseline in Central Park through 2050. The heaviest 5-day precipitation amount could be 11.8 inches at Central Park by 2050, which represents a 17% increase over the historical reference period. The number of days per year with more than 2 inches of precipitation is projected to increase 33% by 2030 and 88% by 2080 from the historical baseline.

Program Benefits

The main benefit of installing upgraded enclosures is the potential avoided cost of having to replace damaged switchgear or relay panels.

Accelerating the work included under the Substation Enclosure Upgrades program increases the overall resiliency of the transmission system to withstand the impacts of future climate-driven weather events by maintaining the robust, three-contingency design of the system – i.e., by reducing the risk of failure of switchgear and relays due to water intrusion as one of the three "contingencies" that the system is designed for. These equipment failures do not typically result in customer outages, but the probability of outages is increased with each system failure experienced.

Funding Request

2025 - 2029	2030 - 2034	2035 - 2044
$5,700,000	$8,100,000	$18,700,000

Long-term Roadmap

This program is an on-going program with no currently planned ending date. The specific plan for work under this program will be evaluated each year, but, currently, the annual scope of work for the program in future years is expected to be similar to the scope of work included for 2025-2029 (i.e., to include similar volumes of the same types of work). The annual per unit cost is assumed to escalate by inflation, with an assumed inflation rate of 3%.

Long-Term Funding Plan

Figure 10 below represents our best estimate of what is necessary to support Con Edison's comprehensive resilience goals, continue delivering our core services, and adapt our system to a changing climate. Where known, the long-term roadmap for each investment is described in the sections above.

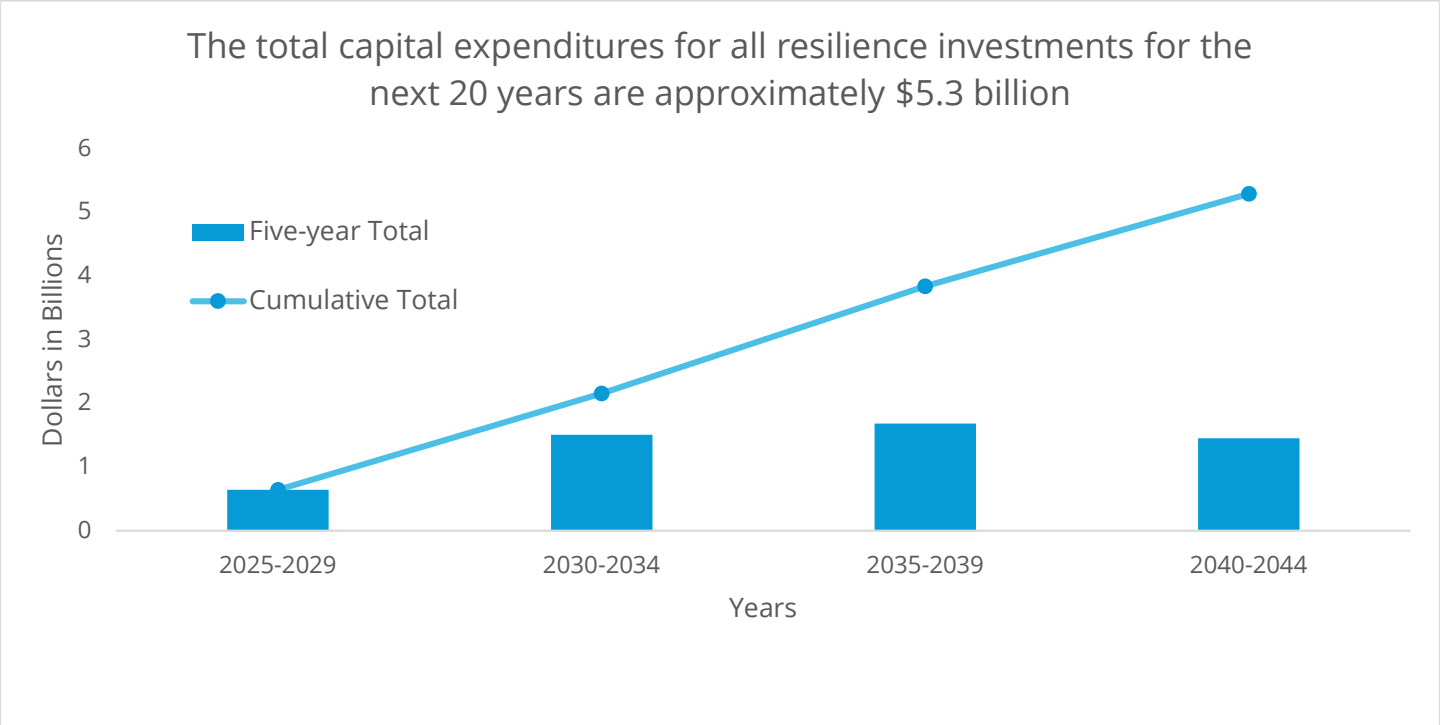


Figure 10. Long-Term Expenditure Projection

Governance

As part of the development of its 2020 Climate Change Implementation Plan, Con Edison established a corporate governance structure for managing climate risk and resilience efforts. This structure enables the Company to track and maintain progress for incorporating climate change into the Company's assets, operations, and planning. The governance approach includes:

- A **Corporate Instruction** that governs how the Company integrates climate change information into its processes for designing, building, and investing in resilient infrastructure, as well as planning for emergency weather events.
- **Internal design guidelines** that provide climate change projections and guidance on its use in planning, design, operations, and other Company processes.
- The **Climate Risk and Resilience Executive Committee**, which is responsible for providing oversight and organizational support for the development, coordination, communication, and implementation of strategies to prepare and adapt to climate change and incorporate climate change projections into Company organizations, policies, and practices.
- A **Climate Risk and Resilience Group** that assists operating and planning groups with their adaptation and resilience efforts, continues to monitor climate change science, and continues the Company's engagement with stakeholders. It reports to the executive committee.
- A procedure to provide **public reporting** on its progress, continued risk management activities, and financial risks related to climate change through the Company's annual Sustainability Report and other industry-standard risk reporting frameworks.[xiii]

[xiii] CEI reports using the ESG/Sustainability disclosure guidelines and templates developed by the Task Force on Climate-related Financial Disclosures (TCFD), the Sustainability Accounting Standards Board (SASB), and the Edison Electric Institute (EEI) and the American Gas Association (AGA). These disclosures are accessible at https://lite.conedison.com/ehs/2023-sustainability-report/.

This governance structure continues to provide a comprehensive and coordinated climate change adaptation effort. It also provides the appropriate responsibility, oversight, and guidance. Figure 11 shows the governance structure as incorporated at Con Edison.

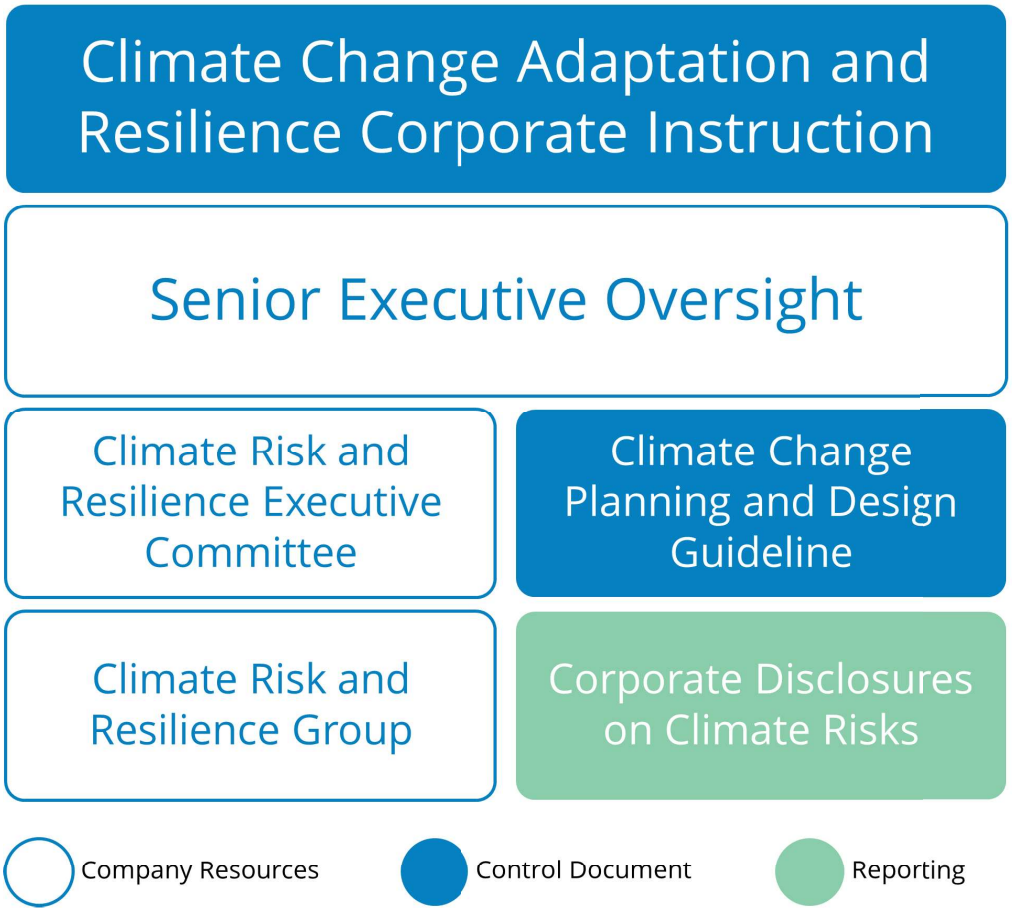


Figure 11. Climate Adaptation Governance Structure.

Performance Measures

Performance measures will be used to track the effectiveness of resilience investments (i.e., outcome-based measures) and the implementation of programs and projects. There is no standardized set of performance measures for the resilience of electric distribution systems.[17] Performance measures to track the resilience of the electric system are difficult to define and formalize because they are centralized around "individual, low-frequency events [so] it is often not possible to base measurements on historical data".[18] However, Con Edison recognizes the importance of performance measures to track progress, incorporate lessons learned, and improve future iterations of this CCRP. More information on available performance measures literature is available in Appendix 5: State of the Literature on Resilience Performance Measures.

Con Edison will track both outcome-based and implementation-based resilience measures on a biennial basis. Outcome-based measures will attempt to assess the overall effectiveness of the Company's Resilience Plan, and implementation-based measures will assess the progress over time using a more traditional project management approach. Measures are subject to change over time as more peer reviewed and benchmarked measures become widely accepted in the utility industry. Additional details relating to the specifics may be found in the expanded program descriptions in Appendix 4: Project and Program Details.

Con Edison's proposed approach to performance measures is summarized below.

Outcome-Based Resilience Measures

Impact of Major Storms: Following a major storm or extreme weather event that results in outages, Con Edison will continue to track the number of outages and restoration times (broken down into lower-level measures, as appropriate). Con Edison will also review the type of weather event that occurred as compared to system performance. This review will be used to understand the effectiveness of the various investments Con Edison made, to obtain an understanding of the overall resilience of the electric system, and to identify opportunities to improve the effectiveness of the Resilience Plan.

Network Distribution System Resiliency: Con Edison will measure the overall resilience of the network distribution system using the Network Resiliency Index (NRI). NRI identifies portions of the network more likely to experience area-level outages than others and can be used to evaluate the potential resiliency impacts of network changes under projected future conditions. Changes in the NRI will be evaluated to assess the effectiveness of network resiliency programs and to evaluate potential changes to the Resilience Plan.

Non-Network Distribution System Resiliency: Con Edison will measure customer outage frequency for the circuits on the non-network distribution system enhanced under resilience programs. The Company will take the three-year average customer outage frequencies pre- and post-enhancements and track this measurement over time for incorporation into its biennial reporting.

Implementation-Based Resilience Measures

Resilience Program	Implementation-Based Resilience Measure
Primary Feeder Resiliency	Number of planned network feeder bifurcations completed Number of planned interrupters installed in new network locations
Selective Undergrounding	Number of planned miles of overhead non-network distribution system converted to underground
Non-Network Resiliency	Miles of planned aerial cable installations completed Number of planned automatic transfer switch installations completed
Non-Network Resiliency Cutout Upgrades	Number of planned sectionalizing switches installed
Critical Facilities	Number of Critical Facilities identified and prioritized for enhancement where enhancements have been completed
Submersible Equipment	Number of network system equipment identified and planned for replacement that have been replaced with submersible equipment
Erosion Protection and Drainage Upgrade	Number of substations with identified issues enhanced as planned
Substation Operations (SSO) Storm Hardening	Number of substations identified for hardening completed as planned

Substation Enclosure Upgrades	Number of substations identified and prioritized for enclosure upgrades completed as planned

Table 9. Proposed performance measures for Con Edison's Investment Programs and Projects.

Conclusion and Next Steps

As evidenced by recent examples of extreme weather, the effects of climate change threaten the operational capacity and resilience of Con Edison's electric system, and therefore, potentially impacts safety, reliability, and resilient service to our customers. This Plan identifies short-, intermediate-, and long-term resilience investments and operational changes to address the projected risks of climate change. Con Edison will continue to gather input from stakeholders and consider equity in our resilience investments. The Company's climate resilience governance structure will guide the strategy and oversight for the implementation of this Plan.

While implementing this Plan will be the primary focus for resilience work moving forward, these will not be the only actions the Company undertakes. Con Edison understands that the Company can continue to advance its resilience capabilities and lead the conversation about what's next for future resilience work. The Company is currently pursuing the following as next steps:

- This Plan outlines an initial set of performance measures, but there are currently no industry-accepted performance measures for electric system resilience. Going forward, the Company would like to participate in **future collaborative efforts with peer utilities**, other infrastructure owners, and regulators on this topic.
- Continue to partner and collaborate with the **Electric Power Research Institute** for benchmarking and knowledge sharing on the latest climate change insights.
- Engage and invite stakeholders outside of our climate resilience working group to participate, benchmark and potentially align on resilience efforts, such as with telecommunications service providers.
- Conduct further studies and vulnerability assessments from the **impacts of high wind** and **radial icing events**, as well as on emerging topics such as **machine learning** and advanced modeling.
- Review the potential development of a **risk visualization tool** to support decision-making, such as a geospatial tool to visualize both climate exposure and key attributes of assets that may make them more sensitive to the changes in climate (e.g., flagging non-submersible

equipment). Developing such a tool can help internally improve alignment around understanding of climate risks.

- Examine methods for capturing the **community benefits and effectiveness** of Con Edison's resilience investments, with a focus on vulnerable populations. While this Plan's main goal is to reduce customer outages and restoration costs, it is difficult to estimate the magnitude of those benefits for customers. This is particularly challenging but working with stakeholders such as the NYC Mayor's Office of Climate and Environmental Justice could help frame future planning efforts.
- Continue to **align resilience and decarbonization** in long-range planning efforts by reviewing strategies to understand gaps and opportunities. Integration of the Company's electrification efforts with its resilience efforts will enhance the Company's ability to holistically manage climate change impacts. One potential approach is to partner with stakeholders, such as the NYC Housing Authority, to combine electrification efforts of buildings with climate resilience efforts so that vulnerable populations will have continued service during extreme weather events.
- Conduct further research and modeling of the **Urban Heat Island (UHI) effect** and integrate these considerations into load forecasting and asset management/ratings. The collection of additional Micronet data will help the Company's understanding of this topic. The Company may also look to partner with New York City on reducing the UHI effect by assisting with the expansion and implementation of the upcoming Urban Forest Master Plan to increase tree canopy and reduce UHI impacts to disadvantaged communities.[19]
- Continue to explore alternative funding sources for resilience projects such as federal programs like the Infrastructure Investment and Jobs Act. By exploring **alternative funding** resources, it will allow for the implementation of additional resilience programs.

While this Plan's focus is on the electric system based on the requirements of the law, Con Edison will continue to utilize the latest climate science and address potential vulnerabilities for the gas and steam systems that serve our customers.

Con Edison's CRRG will continue leading implementation of the resilience programs and will meet at least twice a year with the Working Group to share relevant updates. The Company will work with Community Boards, neighborhood groups, and nonprofits within DACs to review the effects of these investments. Con Edison's monitoring and reporting on performance measures will lead to lessons learned about the effectiveness of resilience investments. Combined with the latest climate science, these lessons learned will inform future updates of this Resilience Plan (on a 5-year cycle). Con Edison's proactive commitment to action will help minimize customer outages, reduce restoration costs, enhance reliability, and improve resilience.

Appendix 1: Climate Change Challenges

Investing in climate resilience has become a priority for Con Edison. Minimizing the impacts of climate change on the Company's equipment requires immediate action.[20] Given the geography of the Company's service territory, Con Edison faces an array of weather trends and climate conditions, including heat, sea level rise, ice and windstorms, and inland flooding, among other extreme events. We have already experienced damage from these types of events today.

One key finding from the CCVS is that temperatures will increase faster than previously thought, meaning that extreme heat events will become more frequent and intense. In New York City, the Urban Heat Island (UHI) effect exacerbates the impacts of higher temperatures. UHI causes urban areas to run warmer than surrounding areas due to urban land surface characteristics.[21] According to an independent group of scientists, 78% of New York experiences at least 8°F higher temperatures due to the UHI effect.[22] To better understand these challenges, Con Edison has invested in the New York City Micronet, a network of 17 weather monitoring stations that helps the Company make informed decisions regarding climate resilience. Micronet data from 2021-2022 illustrate this effect across the City, showing the coolest daily minimum summer temperatures at the Staten Island site (68°F), and the highest daily minimum summer temperatures at the Murray Hill site in Midtown Manhattan (72°F). Micronet data also highlights the importance of monitoring weather at each site. Average temperatures at Central Park tend to be lower due to the cooling effects of tree cover and vegetation and may not apply to the other weather stations.[xiv] An expansion of weather monitoring is critical to tracking temperature differentials and potential asset impacts across our service territory.

Examples of how changes in heavy precipitation events and increasing temperatures are already impacting and projected to impact Con Edison's service area include:

Precipitation:

- In September 2023, Tropical Storm Ophelia brought 7.88 inches of rain in 15 hours, recorded at John F. Kennedy International Airport in NYC.[23]
- In September 2021, the remnants of Hurricane Ida brought more than 7 inches of rainfall to Central Park, with more than 3 inches falling in just one hour, putting the city under its first flash flood emergency.[24]
- The Climate Change Vulnerability Study projects an average annual increase in precipitation of as much as 15% by 2050, with the heaviest five-day precipitation at Central Park of 11.8 inches.
- In August 2011, Hurricane Irene brought upwards of 6 inches of rainfall to Central Park, causing major inland flooding.
- North Atlantic hurricanes are projected to become more intense (~5% increase) and have higher rainfall amounts (~10%-15% increase) relative to historical hurricanes.
- In September 1999, Hurricane Floyd brought upwards of 5 inches of rainfall to Central Park, causing major inland flooding in areas to the west of the service territory.

[xiv] The average daily minimum summer temperature between 1991-2020 at Central Park is 67°F.

Extreme Heat Events:

- In July 2022, there were six days with a maximum daily temperature at or above 90°F, followed by flash flood warnings.[25]
- July 2023 saw the hottest three-week period of global mean surface air temperatures ever recorded, along with several temperature records broken across the globe.[26]
- While heat waves with daily average temperatures above 90°F provide sustained heat during the daytime and nighttime, heat waves with daily maximum temperatures above 95°F are periods of prolonged daytime heat. The number of consecutive days with peak temperatures above 95°F at Central Park was up to two days on average between 1981 and 2010. By 2050, this could be seven consecutive days.

Other types of extreme weather have impacted our customers in recent years. For example, from April 18 to 20, 2022, a Nor'easter brought 50 mph wind gusts and up to 18 inches of snow to parts of New York.[27] In addition, compound extreme events, such as two Nor'easters in five days in March 2018 that resulted in numerous repair jobs and customer outages struck our region.[28]

For information on how climate change is exacerbating these challenges and posing risks to the Company's infrastructure, see Appendix 2: Physical and Operational Hazard Impact Summaries.

Appendix 2: Physical and Operational Hazard Impact Summaries

Temperature and Humidity

The latest climate projections show that increasing temperature and humidity remain high priority hazards for Con Edison. Data from Columbia suggests that temperature will increase faster than previously expected, possibly causing system impacts much sooner. Coincident high heat and humidity is also expected to intensify rapidly over the coming decades. Con Edison combines temperature and humidity together over a three-day period as a measure of heat wave intensity in a custom climate variable called Temperature Variable (TV).

Temperature and TV represent a high priority concern for most of Con Edison's physical assets. Higher temperatures can cause reductions in capacity for certain equipment, accelerated degradation (potentially leading to failures and decreased system reliability), as well as physical impacts, such as line sag. When high temperatures coincide with high humidity, Con Edison typically experiences a spike in demand due to customer air conditioning use. In extreme situations, reduced capacity and increased demand could lead to capacity shortfalls. All these risks have the potential to result in increased frequency of customer outages and repair costs.

Temperature and TV also represent a threat to Con Edison's operational processes:

- Load forecasting and load relief planning calculations are influenced by temperature (since high temperature increases demand).
- Higher average temperatures can accelerate vegetation growth, increasing the risk of vegetation contact with lines.
- Higher temperatures can also present a risk to the health and safety of Con Edison personnel who work outside.

Many of these vulnerabilities were addressed as part of the Company's 2020 Climate Change Implementation Program; however, the accelerated rate of change in temperature will likely mean that additional investments are required to maintain capacity, reliability, and safety standards.

Flooding

Flooding remains a high priority hazard for Con Edison, especially for area and transmission substations. The Company has undertaken significant work to harden the electric system in the years since Superstorm Sandy, but the risk of flooding has not been eliminated entirely. It is anticipated that Con Edison's service area will be increasingly exposed to flooding due to sea level rise on the coast. The risk of inland flooding due to precipitation also remains high. Extreme storms such as hurricanes are likely to increase in intensity, bringing with them the possibility of storm surge.

The latest climate science is aligned with the 2019 CCVS projections. As stated in the table above, it finds that a 16-inch rise in sea level by 2050 (relative to 1995-2014 sea levels) would result in 23 substations exposed to flooding during a 1% annual chance flood. This would result in equipment damage, ongoing corrosion issues, and reduced access if surrounding roads are flooded. These impacts could result in more frequent outages with longer repair times and higher costs of recovery.

An increase in flooding due to sea level rise, precipitation, or storm surge will also likely result in more frequent activations of Con Edison's emergency response procedures. The Company has developed a robust emergency management framework, but an increase in extreme events could still impact the Company's resources and delay recovery.

Wind and Ice

Wind and ice have historically been difficult to model due to their highly localized nature. To inform this Study, Con Edison sought out the best available information by acquiring an additional data set from MIT that provides some insight into future wind speeds and radial icing potential. This data set and other studies demonstrate that wind speeds will likely increase, and the risk of radial icing will remain. Extreme storms such as hurricanes can cause wind speeds to increase far beyond typical average speeds. Wind speeds of the most intense hurricanes are projected to increase. Freezing rain frequency and radial icing are also projected to increase, although the magnitude of the trend remains highly uncertain due to the specific atmospheric conditions required for ice storms to occur.

These potential changes in wind and ice present an especially large risk to overhead distribution equipment. Overhead distribution assets, including conductors, attachments, and cross-arms, are built to withstand defined design tolerances for combined ice and wind loading, but they are frequently adjacent to neighboring vegetation that may be downed during these events. Contact with trees can cause lines to disconnect and fall, and can even lead to pole collapse, especially older poles, or those with existing damage. This can result in asset failure, leading to outages and restoration costs.

Extreme and Coincident Events

Climate models have difficulty resolving extreme weather events, including coincident or consecutive extreme events, due to the small space and time scales at which these events occur and the rarity of the events themselves. This necessitates an evaluation of extreme events using historical analogs and projections from scientific literature. Updating the 2019 CCVS, the current study incorporated findings from the most up-to-date scientific literature and included additional context for hurricanes, winds, nor'easters, cold snaps, and wildfire. Each extreme event illustrates differing projected future change in terms of frequency and intensity across the service territory:

- Hurricanes are projected to increase in maximum sustained wind speed intensity but will likely experience no change in overall frequency. However, formed hurricanes may travel further northeast

- Extreme heat waves are projected to increase in both frequency and intensity. Higher temperatures could also increase the likelihood of severe drought, which create favorable conditions for wildfire. Furthermore, increased winds can increase the risk of wildfire and exacerbate their damage by spreading their area of impact. The overall risk from wildfire remains relatively low; however, the projected increases in temperatures combined with the potential for lightning strikes and human error could lead to a higher likelihood of wildfires.
- Nor'easters and cold snaps are projected to decrease in frequency as temperatures warm, but the strongest storms and cold snaps could increase in intensity. Deluge precipitation (high intensity and short duration precipitation events) are projected to increase in both frequency and intensity. The occurrence of multiple extreme weather events either simultaneously (compounding) or sequentially (cascading) is projected to increase in both frequency and intensity.

Importantly, extreme and coincident events can amplify the damage to energy infrastructure and can hamper emergency response activities. These events potentially put Con Edison workers at risk and are the most likely to result in prolonged outages for customers. They also strain other infrastructure systems that Con Edison relies on such as municipal stormwater drainage systems, and the transportation network – these interdependencies can exacerbate the impacts to the Company's system.

Appendix 3: Defining Disadvantaged Communities

To help better understand how Con Edison's investment prioritization serves disadvantaged communities (DACs) Con Edison will utilize the DAC map developed by New York State. If measurements show that the prioritization process fails to benefit DACs fairly, Con Edison will adjust it to do so. In 2019, New York State signed into law the Climate Leadership and Community Protection Act (Climate Act), requiring the State to consider disadvantaged communities in regulatory actions, amongst other requirements. As defined in Climate Act Environmental Conservation Law §75-0111, DACs are identified "based on geographic, public health, environmental hazard, and socioeconomic criteria, which shall include but are not limited to:

1. Areas burdened by cumulative environmental pollution and other hazards that can lead to negative public health effects;
2. Areas with concentrations of people that are of low income, high unemployment, high rent burden, low levels of home ownership, low levels of educational attainment, or members of groups that have historically experienced discrimination on the basis of race or ethnicity; and
3. Areas vulnerable to the impacts of climate change such as flooding, storm surges, and urban heat island effects."[29]

The Climate Act charged the Climate Justice Working Group (CJWG) to lead the development of criteria to identify disadvantaged communities and confirm that underserved communities benefit from climate change investments. The CJWG identified 35%, or 1,736 census tracts in New York State as DACs.[30] The tracts are identified based off 45 indicators, some including potential pollution exposures, potential climate change risks, income, and race and ethnicity.[xv] Con Edison relies on the best publicly available resources to define the indicators for identifying populations that are disproportionately burdened by energy outages, to serve as a useful planning tool.

The CJWG released an accompanying interactive map that geographically plots census tracts in New York State and indicates those identified as disadvantaged communities in purple. This valuable tool is being adopted by Con Edison to help identify where investments are to be prioritized throughout the service territory based on engineering and system needs. Based on the criteria described above, disadvantaged communities comprise 45% of Con Edison's service territory by population.

[xv] For a full list of indicators, see Technical Documentation on Disadvantaged Communities Criteria (https://climate.ny.gov/-/media/Project/Climate/Files/Disadvantaged-Communities-Criteria/Technical-Documentation-on-the-Disadvantaged-Communities-Criteria---Final-Version.pdf).

Appendix 4: Project and Program Details

Primary Feeder Resiliency

Electric Operations / Electric Distribution
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Primary Feeder Resiliency	
Project/Program Manager: Stephen Pupek	**Project/Program Number (Level 1):** 27207951, 27207952, 27207953, 27207954, 27207955, 27207959
Status: ☐ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☒ **On-going (Programs Only)**	
Estimated Start Date: Ongoing	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $113,000 **O&M:** $0	

Work Description:

The Primary Feeder Resiliency program enhances the core resiliency work performed under the Primary Feeder Reliability program and further mitigates potential network system vulnerabilities resulting from future climate-driven increases in heat, temperature variable (TV, heat plus humidity), heat waves and heat domes by installing additional network interrupters and bifurcating/reconfiguring existing network feeders. Sectionalizing overhead feeders has been a primary strategy for mitigating the risks of extensive feeder outages across the industry for many years. Now, it's possible to implement this best practice for underground feeders, providing both blue sky benefits – including support for the Company's clean energy and electrification goals – and significant resiliency benefits that will strengthen network operations and protect customers under a wide variety of extreme circumstances.

Con Edison's Climate Change Vulnerability Study (the Study or the CCVS) projects an increase in TV in Con Edison's service territory of 1□F as early as 2030. The Company assessed the potential impact of this increase in temperature on the underground network distribution system using the Network Resiliency Index (NRI) where the lower the NRI, the more reliable the network has historically been. NRI is the measure used to gauge the reliability of all 65 second contingency networks on the Con Edison distribution system. The lower the index, the less likely for that network to experience cascading feeder outages during extreme weather events. Factors that impact the NRI include the number (and age) of components in the network, component failure rates, longer and elevated predicted periods of heat stress, and feeder/network loading, and the load shifts during contingencies. The Company's network reliability goals target NRI results where all networks have an NRI of less than 1.0 and the average NRI for the top 25 networks (i.e., the 25 networks with the worst NRI) less than 0.5. The current plan is for forecasted network performance issues to be a focus of the Primary Feeder Reliability program – as projected TV values are incorporated into future NRI analyses as part of the Company's standard practice – with an emphasis on installation of interrupters in existing underground structures (replacing existing manual switches) and the replacement of known problem transition joints (e.g., PILC removal). The scope of the Primary Feeder Resiliency program goes beyond that of the Primary Feeder Reliability program to mitigate the potential, but unquantifiable, risks associated with projections of increases in extreme heat events. For the resiliency program, NRI can be used to point to the circuits where program enhancements will provide the most benefit.

The CCVS projected increases in the frequency, duration, and intensity of low frequency but potentially high impact climate-driven periods of extended, extreme heat – heat waves and heat domes in the service territory. In fact, according to research for the Study, July 2023 saw the hottest three-week period of global mean surface air temperatures ever recorded, along with multiple broken temperature records around the globe. If not prepared for these extreme weather events, the impact to customers could be significant, at a time when customers are coping with a broad range of impacts from the weather event.

To mitigate the risks of these potentially high-impact events, this program emphasizes additional network sectionalizing and bifurcation of priority feeders achieved through installation of interrupters in new underground structure locations and feeder extensions when required. These new interrupters are next-generation, vacuum-based sectionalizing switches that allow for partial circuit isolation rather than a full feeder outage resulting from a fault. Upgrading to the latest technology and extending interrupter technology throughout the network distribution system helps the Con Edison system absorb failures on primary feeders by limiting the number of feeders and associated network transformers out of service through automatic actions – i.e., dropping the faulted sections automatically to keep unfaulted sections in service.

Limiting the impact of a fault on the network both reduces the number of customers impacted and supports faster restoration of the primary network. Isolating faults, in turn, can also prevent the need to implement emergency actions necessary to prevent cascading failures in network system – such as voluntary load reduction, emergency voltage reduction and proactive load shedding – that would impact many more customers. Installation of interrupters also reduces the need for new mains and improves the reliability of individual primary sections and the associated network transformers. Improving the reliability of the transformers in a localized area reduces the probability that secondary mains will be required to carry not only their normal load but also contingency load. The same is true for Network Transformers. The Company projects the installation of eighteen (18) new interrupters in 2025 and ramping up to thirty (30) new switches in 2029.

The Primary Feeder Resiliency program also increases the resiliency of the network system by bifurcating and, in some cases, extending key primary feeders. These feeders are reconfigured into double legged feeders with an interrupter installed on each leg. Network feeders with an NRI greater than 0.2 would be in-scope for potential bifurcation/reconfiguration, approximately 40 feeders currently, and the program will target bifurcation of one network feeder per year. Bifurcating a feeder not only provides the benefit of being able to isolate half of the feeder if faults occur rather than having the entire feeder out but it also protects available feeder capacity on the remainder of the feeder. Previous feeder bifurcations have resulted in increased normal and emergency feeder ratings from 40-50%. During extreme heat waves, loads are generally higher and system capacity can become limited. Reconfigured feeders help reduce the risk of feeder capacity shortfalls.

The program will prioritize program investments based on current projections of network and feeder reliability, increased resilience from limiting customer exposure to outages, support of clean energy, and support for the Company's clean energy and electrification goals.

Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.

	Con Edison's service territory is projected to be impacted by rising temperatures. Those impacts are expected to be amplified during intense heat waves. Increasing TV will cause load to increase, potentially challenging the capacity of the system.
	Con Edison has previously experienced flooding events that have impacted its assets from major storms. Due to future climate projections, that risk is expected to expand in Con Edison's service area, and facilities like substations will be more exposed to flooding.
	Con Edison's overhead distribution system has historically been the most sensitive to wind and ice, due to its susceptibility to tree contact during high wind and icing events.
	Extreme events are low-likelihood, high-impact scenarios that can amplify and compound the types of impacts anticipated from changes in temperature, sea level rise, and other variables. These events pose risks to all aspects of the system and are especially impactful for emergency response planning.

Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The Con Edison Climate Change Vulnerability Studies project increases in average and maximum air temperatures throughout the century relative to historical conditions, with the 2023 Study projecting that temperatures will increase faster than projected in the 2019 Study. By all measures evaluated in the Studies – maximum daily temperature, number of days per year in which maximum temperature exceeds 95°F, and number of days per year the daily average temperature exceeds 86°F – climate-related increases in heat are projected to occur roughly a decade faster than projected in the first Study.

Variable	Study	Baseline	2030	2040	2050	2080
Highest annual maximum daily temperature	Current Study	97°F	103°F	104°F	106°F	112°F
	2019 CCVS	97°F	101°F	103°F	104°F	108°F
The number of days per year in which maximum temperatures exceed 95°F	Current Study	4 days	17 days	27 days	32 days	69 days
	2019 CCVS	4 days	11 days	18 days	23 days	47 days
The number of days per year in which daily average temperatures exceed 86°F	Current Study	3 days	16 days	22 days	31 days	68 days
	2019 CCVS	3 days	11 days	16 days	21 days	45 days

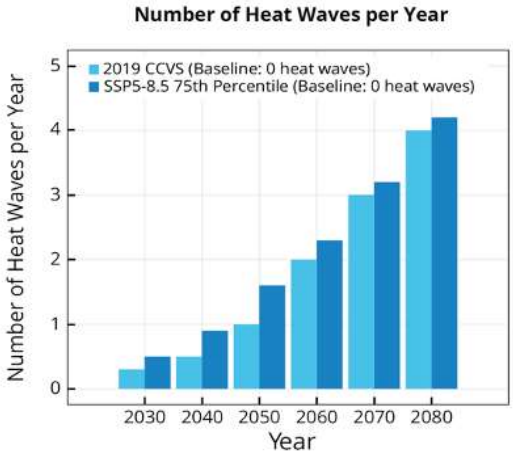
In addition, projections of Temperature Variable (TV) – an index that is similar to a heat index but which considers the persistence of heat and humidity over several days – that historically occur only

once a year (e.g., 86°F) are forecast to become common occurrences within a generation, occurring as many as 16 times per year by 2050 and as many as 49 times per year by 2080.

Variable	Study	Baseline	2030	2040	2050	2080
Days per year with maximum summer TV exceeding 86°F	Current Study	1 day	6 days	10 days	16 days	49 days
	2019 CCVS	1 day	6 days	10 days	15 days	35 days

Multiday heat events, known as heat waves, are also impactful because they drive demand for air conditioning and can strain infrastructure. Heat waves of three or more consecutive days with maximum daily temperatures above 90°F occurred approximately twice per year in New York City between 1981 and 2010. Recent heat waves in New York City include events in July 2022, July 2019, July 1999, and July 1993, which featured 6, 4, 10, and 1 consecutive days, respectively, with maximum daily temperatures at or above 90°F, respectively.

Projections show that the number of three-day heat waves with temperatures averaging above 90°F for each day will increase. While heat waves with daily average temperatures above 90°F provide a measure of sustained heat during the daytime and nighttime hours, heat waves with daily maximum temperatures above 95°F represent periods of prolonged daytime heat. The number of consecutive days with peak temperatures above 95°F at Central Park was up to two days on average between 1981 and 2010. By 2050, this could be seven consecutive days.



Extreme heat can manifest as heat waves or other tail-end heat events, such as heat domes, that increase demand for air conditioning and, in turn, limit the capability of efficiency reductions. Unlike hurricanes or other extreme storms, heat wave intensity and frequency are tightly linked to long-term changes in atmospheric temperature and are thus comparatively well-simulated in climate model projections. Additionally, higher temperatures associated with urbanization, a phenomenon referred to as the Urban Heat Island (UHI), such as from lower surface reflectivity of built surfaces and waste heat from buildings, can exacerbate the impacts of extreme heat events. Heat waves are intensified by events such as heat domes, which are areas of high pressure in the atmosphere that trap hot air. The Climate Change Vulnerability Study projections increases in the frequency, duration, and intensity of extreme heat days in the service territory by the late 21st century. Across Con Edison's service area, approximately 9 heat waves are projected to occur in 2050 compared to a baseline of 2 heat waves per year.

The key sensitivities of electric assets to the projected changes in temperature and TV are:

- Decreased asset capacity: An asset's internal temperature is the result of (1) the amount of power flowing through it and (2) the temperature of the environment in which it operates. Operating at ambient temperatures above a design reference can decrease the operational rating of an asset. In turn, derating the system (reducing the output of power as a protective measure) due to increasing temperatures decreases the resilience capability of the system by decreasing capacity.
- Accelerated asset degradation: Assets are designed to operate within a particular environment. When temperatures exceed design assumptions, components (e.g., insulation) age at an accelerated rate.
- Increased system load: During periods of coincident high temperature and humidity (as represented by high TV values), customer cooling demand increases. Con Edison's system has historically experienced a spike in load during such conditions, primarily due to air conditioner use. These projected high-load situations could exceed system capacity.

The Climate Change Vulnerability Study identified projected increases in temperature and humidity as a primary vulnerability to the underground distribution network system – i.e., finding that the assets in the network system are at high risk of failure from this hazard. This vulnerability is confirmed by the Company's internal Network Reliability Index (NRI) models., Monte Carlo simulations used to predict the performance of a network. The program uses the historical failure rates of the various components/equipment that are in the network, and, through probability analysis, determines which networks are more likely to experience a shutdown. Con Edison's targets all networks having an NRI of less than 1.0 and maintaining the average NRI for the top 25 networks at less than 0.5.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

The enhanced Primary Feeder Resiliency program does not prevent the potential climate change impacts from increasing temperatures and heat waves discussed above, but it does increase the network system's resiliency by mitigating the impacts of outage events, limiting the number of network transformers out of service and the impact of a single failure on primary network feeders. The interrupter device operates instantaneously, automatically opening to isolate primary faults detected downstream from the device. The interrupter device is coordinated to operate before the corresponding Area Station feeder breaker thereby preventing the entire feeder from going out of service. Un-faulted sections remain in service. The faulted and isolated cable sections can be processed from the interrupter device to reduce restoration time. Similarly, faults on bifurcated primary network feeders can be isolated to half of the feeder rather than the entire feeder, limiting the impact of a single fault.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible

(i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The company has committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits of its investments to customers in DACs and revise its investment approach if needed.

The Company has also formed an Environmental Justice Working Group under an executive committee and plans to release a finalized Environmental Justice Policy Statement in 2023 to apply an equity lens to resilience-driven investments. Key components of the upcoming policy statement include:

- Operations will not disproportionately burden DACs.
- Con Edison will work to understand DAC concerns.
- Clean energy investments will benefit DACs.
- Con Edison will provide opportunities for employment in the clean energy future.

These equity considerations will help inform resilience plan investments moving forward.

Impact on Greenhouse Gas (GHG) Emissions

The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Primary Feeder Resiliency program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Primary Feeder Resiliency program reduces the need for field visits by converting manual switching operations to automatic operations and by reducing feeder outages requiring field restoration. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment

The Primary Feeder Resiliency program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)

This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)"

The Primary Feeder Resiliency program provides resilient energy delivery by increasing the ability of the electric distribution system to withstand the impacts of climate-driven increases in heat and humidity (as measured by TV) with fewer equipment derates and failures and increased network reliability.

Impact on Company Risk Mitigation Activity

Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Primary Feeder Resiliency program mitigates the risk of increased network outages from climate change, while also mitigating risks to network customers by providing additional means of limiting the number of customers impacted by network failures and enabling faster network restoration.

2. Supplemental Information

Alternatives

Alternative 1

Voltage reduction during heat events has proven to be effective in avoiding system failures. If network performance (NRIs) is not maintained to the 2021 levels, the specification (EOP-5022) governing voltage reduction could be updated to reduce voltage more preemptively on circuits to avoid failures.

Alternative 2

During high load events, we have load shedding programs that provide guidance on dropping customers from the grid to preserve the system's operational integrity. An alternative could be to institute aggressive load shedding / rolling blackout programs to preserve the system integrity and avoid equipment failure. This alternative is not desirable because it will result in poor customer experience.

Risk of No Action

Based on the Climate Change Vulnerability Study, the risk of not performing the work included in the Primary Feeder Resiliency program is significant declines in the reliability of the network system beginning in 2030. The NRI analysis performed projects that by 2030 eight networks will not meet NRI targets and the average NRI for the top 25 networks would increase to 0.87.

Non-Financial Benefits

The program began in the mid 1980's due to concerns over the reliability and potential environmental impact of PILC cable. PILC cable contains a dielectric fluid (usually a mineral oil) and a lead sheath that are potential environmental contaminants.

The first generation of underground sectionalizing switches deployed on the distribution system were motor-operated three-phase SF6 (sulfur hexafluoride) gas insulated switches. Over time these switches have become problematic to operate due to motor failure, or loss of

SF6 gas. These switches are being selectively targeted for replacement with the newest variant, which is a vacuum-based switch.

Summary of Financial Benefits and Costs

1. Cost-benefit analysis

A comparative analysis between periods of extreme heat and normal conditions indicates that the underground distribution system is highly susceptible to extreme heat events. This issue is anticipated to become more pronounced with the expected increase in the frequency of heat events like heat domes in the coming decades, leading to a substantial rise in faults and component failures, particularly during the summer months.

Although predicting the recurrence of extreme weather events is a complex task, based on climate science, there is growing evidence suggesting an increased likelihood of heat events such as heat domes. Given the potentially devastating consequences of a network shutdown during these less frequent but highly impactful events, it is crucial to enhance our preparedness.

To address these challenges, NRI indicators will be utilized to identify networks that are most susceptible. Implementing strategies such as feeder sectionalization and bifurcation in these vulnerable networks will significantly enhance their resilience against extreme heat events.

2. Major Financial Benefits

N/A

3. Basis for estimate

The estimated annual cost of the enhanced Primary Feeder Resiliency program was calculated by applying average historical costs associated with interrupter installations and feeder bifurcations to the forecasted number of interrupters to be installed and feeders to be bifurcated each year. Per unit costs are escalated annually for inflationary increases of 3%.

	2025 Annual Units	2026 Annual Units	2027 Annual Units	2028 Annual Units	2029 Annual Units	2023 Unit Cost ($000)	2025 Unit Cost (000) (assuming 3% inflation annually)	2025 Cost ($000)	2026 Cost ($000)	2027 Cost ($000)	2028 Cost ($000)	2029 Cost ($000)
Primary Section		72	60	88	120	$ 41.00	$ 43.50	-	3,226	2,769	4,183	5,875
Interrupter Switch		18	15	22	30	$ 200.00	$ 212.18	-	3,934	3,377	5,101	7,164
Conduit Cost 250' Section		36	30	44	60	$ 175.00	$ 185.66	-	6,884	5,909	8,926	12,538
Manhole Installation		18	15	22	30	$ 68.00	$ 72.14	-	1,337	1,148	1,734	2,436
						Total Cost-Interrupters		$ -	$15,381	$13,202	$19,944	$28,012

	2025 Annual Units	2026 Annual Units	2027 Annual Units	2028 Annual Units	2029 Annual Units	2023 Unit Cost ($000)	2025 Unit Cost (000) (assuming 3% inflation annually)	2025 Cost ($000)	2026 Cost ($000)	2027 Cost ($000)	2028 Cost ($000)	2029 Cost ($000)
Feeder Extensions included	Feeder 1	Feeder 2	Feeder 3	Feeder 4	Feeder 5	2023	2025	2025	2026	2027	2028	2029
INSTALL REPLACE UG CONDUIT		24	24	24	24	$ 43.75	$ 46.41	$ -	$ 1,147	$ 1,182	$ 1,217	$ 1,254
INSTALL REPLACE UG MANHOLE VAULT		10	10	10	10	$ 68.00	$ 73.57	$ -	$ 758	$ 781	$ 804	$ 828
INSTALL REPLACE UG PRI COND CONV SECTION LEG		116	116	116	116	$ 41.00	$ 48.34	$ -	$ 5,776	$ 5,949	$ 6,127	$ 6,311
INSTALL REPLACE UG SEC COND CONV SECTION LEG		4	4	4	4	$ 41.00	$ 50.94	$ -	$ 210	$ 216	$ 223	$ 229
INSTALL REPLACE UG SVC CABLE CONV		4	4	4	4	$ 3.10	$ 4.16	$ -	$ 17	$ 18	$ 18	$ 19
INSTALL VISO Switch		4	4	4	4	$ 230.00	$ 237.31	$ -	$ 978	$ 1,007	$ 1,037	$ 1,068
						Total Cost-Feeder Bifurcation		$ -	$ 8,886	$ 9,152	$ 9,427	$ 9,710
						Total Program Cost - Interrupters + Feeders		$ -	$24,267	$22,354	$29,371	$37,722

Project Risks and Mitigation Plan

Risk 1:
Skilled Labor Availability

Mitigation Plan 1:
Work with Work and Resource Management group to schedule resources around known busy periods in order to maximize productivity. In addition, projects are prioritized to have resources focus on higher impacted jobs first. Barring significant system emergencies, the Company should be able to progress this work as planned.

Risk 2:
Material Availability

Mitigation Plan 2:
Engineering to work with Work and Resource Management and supply chain to establish a cohesive plan to align with vendor lead times and stay engaged with vendors so that lead times are maintained and if shortages are encountered, plan is adjusted as needed.

Technical Evaluation / Analysis

Primary feeder reliability is effectively managed through the Network Reliability Index (NRI) ranking that leverages current system conditions and historical data to provide a proven method for targeting problem issues throughout the electric system. The introduction of new interrupter switches will expand the utilization of interrupter technology in the distribution system. The incorporation of these switches into circuits allows for partial circuit isolation rather than a full feeder outage resulting from a fault, reducing the system impact and improving the restoration time for the faulted section. Similarly, faults on bifurcated primary network feeders can be isolated to half of the feeder rather than the entire feeder, limiting the impact of a single fault.

Project Relationships (if applicable)

N/A

3. Funding Detail ($000)

Historic Spend

	Actual 2020	Actual 2021	Actual 2022	Actual 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$0	$0	$0	$0	N/A	$0

2025-2029 Request:

Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$24,000	$22,200	$29,200	$37,600
Labor	$0	$6,213	$5,879	$7,551	$10,501
M&S	$0	$4,934	$4,539	$5,953	$7,537
Contract Svcs.	$0	$5,751	$5,315	$6,985	$8,966
Other	$0	$944	$841	$1,067	$1,230
Overheads	$0	$6,158	$5,625	$7,644	$9,365

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$262,100	$345,200	$441,200
Basis for funding direction:	Assumes similar scope plus annual inflationary cost escalation (3%).	Assumes similar scope plus annual inflationary cost escalation (3%).	Assumes similar scope plus annual inflationary cost escalation (3%).

Substation Operations Storm Hardening Program

Central Operations / Substation Operations
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Substation Operations (SSO) Storm Hardening Program	
Project/Program Manager: John Mazzani	**Project/Program Number (Level 1):** 27204331
Status: ☒ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☐ **On-going (Programs Only)**	
Estimated Start Date: 2026	**Estimated Date In Service:** 2041
2025-2029 Funding Request ($000) **Capital:** $25,300 **O&M:** $0	

Work Description:
The scope of the SSO Storm Hardening program includes all work needed to mitigate increased risks of flooding identified by Con Edison's Climate Change Vulnerability Study at 23 Area and Transmission substations. This program is not a new program at Con Edison but, rather, a revival of similar programs that were implemented twice previously to address similar risks. The first SSO Storm Hardening program was undertaken immediately after Superstorm Sandy to install immediate flooding protection measures at substations impacted during Sandy, and the second SSO Storm Hardening program hardened all substations located in a floodplain for a 1% annual chance Baseline Flood Elevation (BFE) of FEMA + 3'. (See "Justification" section, below, for additional discussion.)

The SSO Storm Hardening program is part of the comprehensive set of investment strategies included in Con Edison's Climate Vulnerability and Resiliency Plan to address the vulnerabilities of the electric system to the impacts of climate change – from heat/temperature variable, flooding (caused by sea-level rise, storm surges or heavy precipitation), or extreme events (such as hurricanes, nor'easters, or heat waves) – identified in the 2019 and 2023 Climate Change Vulnerabilities Studies (CCVS, the Study, or the Studies). These strategies were developed by following Con Edison's Resilience Framework to identify investments that enable Con Edison to better prevent negative impacts from changes in climate (avoiding equipment damage or failures and outages), mitigate the impacts from outage-inducing events (limiting the number of customers impacted or improving the customers' ability to cope with the outage), and recover quickly (restoring service more quickly and at a lower cost).

The Area and Transmission substations vulnerable to flooding when sea level rise projections are updated to include the latest climate data – i.e., to a Baseline Flood Elevation of FEMA + 5' – include fourteen locations in Manhattan, five in Brooklyn/Queens, two in Bronx/Westchester, and two in Staten Island. Seven of these substations need new flood protections, and the remaining sixteen need to either have existing flood protections rebuilt and enhanced or to have existing flood protections extended.

Substations In-Scope	Flood Protection Enhancements Required
Academy	New flood protections needed
Bruckner	Rebuilt/extended flood protections needed

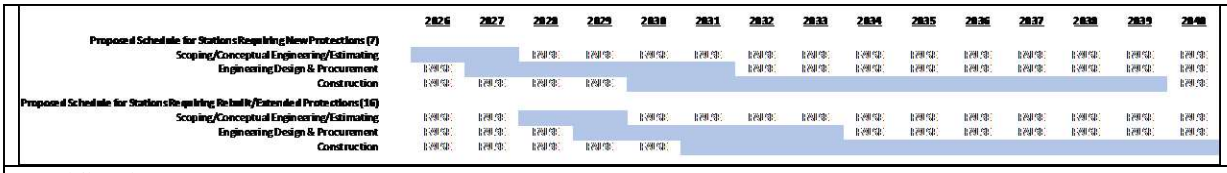
Cherry Street	New flood protections needed
East 13th Street	Rebuilt/extended flood protections needed
East 15th (East 16th) Street PURS	Rebuilt/extended flood protections needed
East 36th Street	Rebuilt/extended flood protections needed
East 75th Street	New flood protections needed
East River 69kV Yard	Rebuilt/extended flood protections needed
Farragut	Rebuilt/extended flood protections needed
Fresh Kills	Rebuilt/extended flood protections needed
Goethals	Rebuilt/extended flood protections needed
Gowanus	Rebuilt/extended flood protections needed
Hell Gate	Rebuilt/extended flood protections needed
Leonard Street	Rebuilt/extended flood protections needed
Parkview	New flood protections needed
Queensbridge	New flood protections needed
Rainey	Rebuilt/extended flood protections needed
Seaport	Rebuilt/extended flood protections needed
Sherman Creek	Rebuilt/extended flood protections needed
Trade Center	Rebuilt/extended flood protections needed
Vernon	Rebuilt/extended flood protections needed
West 42nd Street	New flood protections needed
West 49th Street	New flood protections needed

The specific changes to be made to revise each substation's design to the Design Flood Elevation (DFE) associated with the increase in Baseline Flood Elevation to the new FEMA + 5' requirement will be based on engineering analysis of each substation's design. The types of flood protections that are likely to be considered as protective measures include:

- Installation of moats and walls around critical station equipment
- Sealing of troughs, conduits, panels, and cabinets, as well as any other critical station penetrations
- Installation of removable flood doors and barriers
- Installation of sump pumps in protected areas
- Migration of a substation control room to a higher elevation
- Elevation of critical relays and control panels
- Installation of nitrogen powered pumps for pressurization plants
- Installation of fiber optic communication lines
- Raising and sealing of moat walls, curbs, louvers, and flood barriers

Specific work plans for program work at in-scope substations will be developed annually. Work is planned to optimize the time available in planned substation outages and to coordinate with other work planned at the same substation. The actual work performed each year; however, is subject to system conditions that can result in shortening planned outages; in these cases, remaining work may be delayed until a second outage can be planned. SSO Storm Hardening work will be prioritized based on a combination of the relative vulnerability to flooding (based on the substation's location and the robustness of the current substation design), the amount of work needed to upgrade substation equipment and infrastructure to the higher FEMA + 5' BFE, and, therefore, the amount of time needed to complete this work and the substation to be protected from increased risk of flooding.

An initial schedule for completing the new and enhanced flood protections at these substations has been developed that proposes completion of work on the initial 23 substations by the end of 2040. This schedule will be adjusted as needed once detailed design engineering is completed.



Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

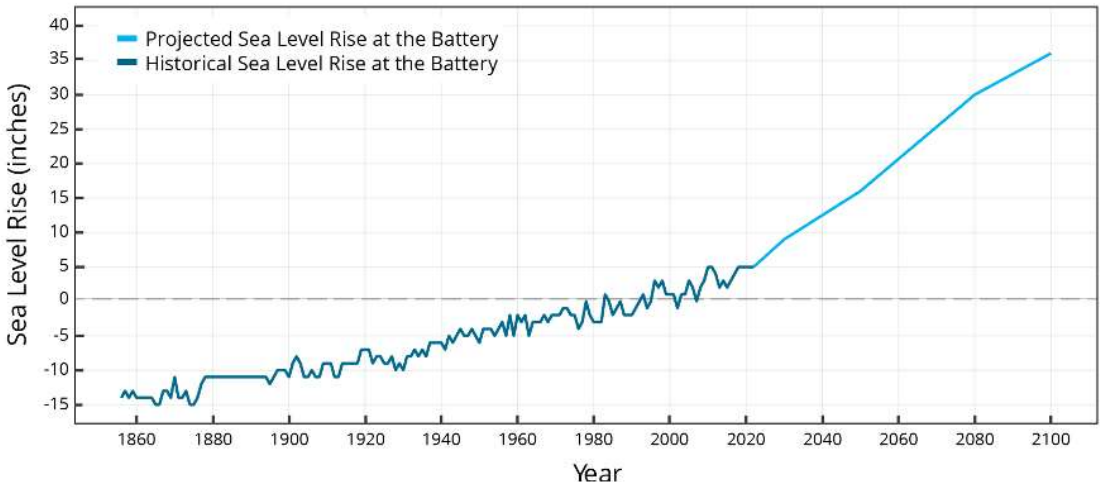
The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.

	Con Edison's service territory is projected to be impacted by rising temperatures. Those impacts are expected to be amplified during intense heat waves. Increasing TV will cause load to increase, potentially challenging the capacity of the system.
	Con Edison has previously experienced flooding events that have impacted its assets from major storms. Due to future climate projections, that risk is expected to expand in Con Edison's service area, and facilities like substations will be more exposed to flooding.
	Con Edison's overhead distribution system has historically been the most sensitive to wind and ice, due to its susceptibility to tree contact during high wind and icing events.
	Extreme events are low-likelihood, high-impact scenarios that can amplify and compound the types of impacts anticipated from changes in temperature, sea level rise, and other variables. These events pose risks to all aspects of the system and are especially impactful for emergency response planning.

Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The primary vulnerabilities that the Study identified to Area and Transmission substations are Flooding and Heat. The SSO Storm Hardening Program is designed to address the risk of climate-driven flooding from projected increases in sea level rise. Flooding due to sea level rise and coastal storm surge is a high priority vulnerability for Con Edison's electric system, and flooding from changes in precipitation is a secondary priority.

Following Superstorm Sandy in 2012, the Company implemented a minimum protection design standard of "FEMA plus three feet," allowing for one foot of sea level rise. At that time, Con Edison protected all infrastructure in the floodplain against future 100-year storms and one foot of sea level rise (e.g., submersible infrastructure, flood walls, pumps, elevation). CCVS projections show that sea level rise within the territory could reach 16 inches by the 2050s and 36 inches by 2100.

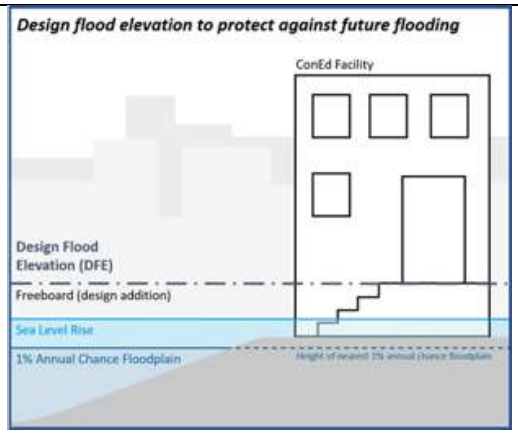


Historical and projected sea level rise at the Battery Tide Gauge in New York City under the combined SSP2-4.5 and SSP5-8.5 50th percentile. The dark blue line shows historical mean sea level at the Battery tide gauge (NOAA Tides & Currents). The light blue line shows the 50th percentile of projected sea level rise relative to the Battery tide gauge, with a historical baseline time period of 1995-2014. Since 1992, the Battery tide gauge has experienced approximately 5 inches of sea level rise.

Sea level rise will also have profound effects on coastal flooding and storm surge, increasing the severity of coastal flooding during extreme events such as hurricanes and deluge rain.

Based on sea level rise projections and findings from the 2019 CCVS, Con Edison updated its design standards to account for the projected amounts of sea level rise over an asset's useful life. More specifically, assets designed to be in place past 2050 will be designed to the elevation of the FEMA 1% annual chance flood (also known as the base flood elevation, or BFE) plus 5 feet (to account for projected 3 feet of sea level rise and 2 feet of freeboard). This requires redesign of assets currently designed with FEMA BFE plus 3 feet protections and new assets with a lifespan past 2050.

For below-grade assets, any asset determined to be within a future floodplain should be designed to include protection to mitigate flooding risks, such as upgrading to submersible equipment. For above-grade assets determined to be within a future floodplain the appropriate Design Flood Elevation (DFE) is determined, based on the asset's useful life, and used to determine the appropriate design interventions. The DFE includes the 1% annual chance BFE, a sea level rise adjustment, and additional freeboard representing a safety factor required by the NYC Building Code, as illustrated below.



The storm hardening measures implemented under the SSO Storm Hardening program at the 23 substations identified as at-risk will be designed to withstand flooding impacts from sea level rises at a FEMA 1% + 60" Design Flood Elevation.

Con Edison's Climate Change Vulnerability Study also concluded that Con Edison substations are also vulnerable to flooding caused by increases in periods of heavy precipitation and by storm surge from more frequent and severe storms, particularly in light of projected increases in sea levels. The latest climate data projects that there has been a small increase in projected heavy precipitation events. Specifically, projections show that annual days with precipitation exceeding 2 inches, relative to a baseline of three days, could reach five days in 2050 (the 2019 CCVS projection was four days). Days with more than 2 inches of rain per 24-hour period could cause flash flooding that could overwhelm drainage systems, which in turn could cause localized flooding onto Company property.

Variable	Study	Baseline	2030	2040	2050	2080
Annual days with precipitation exceeding 2 inches	Current Study	3 days	4 days	4 days	5 days	6 days
	2019 CCVS	3 days	4 days	4 days	4 days	5 days

The primary sensitivities of electric assets to projected changes in flooding are:

- Equipment damage: Floodwaters damage electric equipment and decrease the life expectancy of assets. Equipment damage costs Con Edison both capital (needed for repairs) and time (which results in longer outages and can be exacerbated if spare parts are limited). Saltwater spray can also cause arcing and failure of components. In addition, continued exposure to water can rot wooden assets such as poles.
- Equipment corrosion: Sea level rise and coastal storms pose a particular threat to coastal assets due to the corrosive properties of salt water, which can damage electronic components. These impacts may not be immediately evident but can present issues over time that may result in asset failures and outages.
- Soil weakening: Exposure to water can weaken or undermine the foundation of equipment in instances of prolonged inundation or erosion, increasing the overall risk of equipment damage. Increases in the projected flow and magnitude of floodwaters near riverbanks and the coast have the potential to alter and intensify how erosion occurs and may require intervention to avoid assets becoming destabilized or failing.
- Limited accessibility: Flooding presents issues of access. If assets are flooded or surrounded by water at high tide or during storms, it becomes more difficult to access the locations for maintenance and repair.

Substations contain equipment that is highly sensitive to flooding. The exposure assessment found that a 16-inch rise in sea level (2050 projection) would cause 23 substations to be inundated during a 1%

annual chance flood. All of these locations could experience equipment damage, corrosion, soil weakening, and accessibility issues. Seven of these locations do not currently have flood protection in place, while 16 have existing flood protection that would need to be modified or replaced to provide sufficient protection against future flood levels.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

The investments proposed under the SSO Storm Hardening program are focused on preventing potential substation damage and equipment failures from flooding, significantly increasing the ability of the transmission system to withstand climate change-driven weather events.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The Company has committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits of its investments to customers in DACs and revise its investment approach if needed.

Impact on Greenhouse Gas (GHG) Emissions

The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the SSO Storm Hardening program, are to prevent, mitigate or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The SSO Storm Hardening program reduces the need for field visits required to repair substation damage and equipment failures

due to flooding. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment
The SSO Storm Hardening program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)
This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)"

The SSO Storm Hardening program provides resilient energy delivery by increasing the ability of area and transmission substations to withstand the impacts of climate changes without experiencing substation equipment failures from projected future flood levels accompanying rising sea levels, heavy precipitation, and storm surge from severe storms.

Impact on Company Risk Mitigation Activity
Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The SSO Storm Hardening program mitigates the risk of increased substation damage or equipment failures from projected climate-driven increases in future flood levels accompanying rising sea levels, heavy precipitation, and storm surge from severe storms.

2. Supplemental Information

Alternatives
There are no alternatives that will provide protection from forecasted flooding levels.

Risk of No Action
The Climate Change Vulnerability Study concluded that Con Edison's electric system is vulnerable to risk of damages from extreme weather events like those that have been experienced in recent history. The Study also confirmed that a growing body of scientific evidence supports the conclusions that projected climate changes project these extreme storm events to be likely to increase in frequency and intensity in the future. Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode the ability of communities and their residents to cope with and recover from the impacts of extreme events, with members of disadvantaged communities the least able to recover.

Without the proposed resiliency investments included in the SSO Storm Hardening program, Con Edison's transmission system will be less able to withstand the impacts of climate changes without experiencing substation equipment failures from projected future flood levels accompanying rising sea levels, heavy precipitation, and storm surge from severe storms.

Non-Financial Benefits

Performing the work proposed under the SSO Storm Hardening program, increases the overall resiliency of the transmission system to withstand the impacts of future climate-driven weather events by significantly reducing the risk of failure of substation equipment from flooding. These equipment failures do not typically result in customer outages, but the probability of outages is increased with each system failure experienced.

Summary of Financial Benefits and Costs

1. Cost-benefit analysis

N/A

2. Major Financial Benefits

N/A

3. Basis for estimate

We anticipate the following project timeline will be necessary to complete the flood protection installations at these initial 23 substations, based on previous experiences with storm hardening measures performed by Con Edison following superstorm Sandy.

Previous storm hardening efforts expended $360M at 16 substations, an average of $22.5M per station. We assume that existing storm hardening measures will need to be removed and reinstalled to meet the new higher flood standards and increased forces that will be exerted on perimeter barriers during flooding conditions. We also believe that designing and installing flood barriers strong enough to withstand the potential flooding depths being projected will be more complex and likely to cost more than previous efforts. A "defense in depth" approach will be taken in the design of these flood protections, using multiple layers of barriers and solutions to strengthen the substation from multiple potential damage points. Given the expected scope and complexities, we believe that the cost of installing new flood protections will cost approximately $50M per station (in present day dollars) and that the cost of rebuilding and/or extending flood protections will cost approximately $45M per station (in present day dollars). Costs are subject and likely to change as specific scope is developed and detailed design is performed.

Project Risks and Mitigation Plan

Risk 1:

Outage scheduling conflicts with other initiatives.

Mitigation Plan 1:

Outages to be coordinated with the Sequencing Group at System Operations to potentially incorporate other project/programs to avoid conflict with other program/ projects resulting in a more predictable budget and manageable outage scheduling.

Risk 2:

Delays due to resources support coordination.

Mitigation Plan 2:

Anticipate, schedule and pre-plan with resource requirements such as engineering, labor, and construction and outages to avoid performance delays alignment conflicts.

Risk 3:

Lack of alignment between resources support and outages.

Mitigation Plan 3: Anticipate, schedule and pre-plan with resource requirements such as engineering, labor and construction to avoid alignment conflicts with outages.
Technical Evaluation / Analysis The initial 23 substations included in the scope of this program were identified by plotting the locations of existing Area and Transmission substations on the Con Edison FEMA + 5′ flooding map. This map reflects the geographic areas vulnerable to flooding assuming a FEMA 100-yr flood plus three feet of sea level rise plus two feet of freeboard. This comparison identified 28 locations in Manhattan, Brooklyn, Queens, Staten Island and the Bronx that were inside the flood zone under these conditions. Assessment of each of these locations was conducted and 23 of the 28 locations were determined to need either new or enhanced flood protections.
Project Relationships (if applicable) Given the dependence of completing this work on scheduled outages, the work in-scope for substations under this program should be carefully coordinated with work proposed at the substation for all other projects and programs, including other resiliency programs. This coordination may require that planned work be broken into smaller scopes of work that can optimize available outage time across projects and programs but may introduce sub-optimization of individual projects.

3. Funding Detail ($000)

2020-2024 Actual/Forecast Spend

	Actual 2020	Actual 2021	Actual 2022	Actual 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$0	$0	$0	$0	N/A	$0

2025-2029 Request:

Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$1,400	$4,900	$8,300	$10,700
Labor	$0	$121	$144	$166	$260
M&S	$0	$900	$3,500	$6,000	$6,500
Contract Svcs.	$0	$0	$0	$30	$1,300
Other	$0	$0	$0	$0	$0
Overheads	$0	$379	$1,256	$2,104	$2,640

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$470,600	$502,500	$67,700
Basis for funding direction:	Forecasted scope of work plus annual inflation-related increases estimated (3%)	Forecasted scope of work plus annual inflation-related increases estimated (3%)	Forecasted scope of work plus annual inflation-related increases estimated (3%)

Submersible Equipment Program

Electric Operations / Electric Distribution
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Submersible Equipment Program	
Project/Program Manager: Dan Chen	**Project/Program Number (Level 1):** 27207958
Status: ☒ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☐ **On-going (Programs Only)**	
Estimated Start Date: 2026	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $37,009 **O&M:** $0	

Work Description:

The Company has identified 391 locations where 120V/208V transformers, 460V transformers, and network protector units (NWPs) on the underground electric distribution system need to be replaced with new, submersible equipment capable of withstanding the potential impacts of climate-driven flooding from sea-level rise, storms, and deluge rainfall.

After Superstorm Sandy, Con Edison undertook an extensive storm hardening program to install flood protections, including submersible equipment, for all existing facilities that were in the floodplain for 100-year storms to make the underground system more resilient to such storm events. Con Edison also changed design standards to require the installation of submersible equipment for all new underground distribution equipment installed in a flood zone. Once the work in-scope for that storm hardening program was completed, the program was closed.

The Submersible Equipment program revives some of the scope of the previous storm hardening program in response to findings in Con Edison's Climate Change Vulnerability Study (CCVS or the Study) [1] that underground distribution equipment would be highly vulnerable to risk of damage during severe inland flooding events projected to result from future climate changes. CCVS projections indicated that sea level rise may exceed Con Edison's current design standard for coastal flood protection (i.e., a 100-year storm with 1 foot of sea level rise and 2 feet of freeboard, FEMA + 3') between 2030 and 2080. To address these future climate-driven flooding risks, design standards in Con Edison's Climate Change Planning and Design Guideline Document establishes the sea-level rise adjusted Design Flood Elevation (DFE) criteria of a 100-year storm with 3 feet of sea level rise and 2 feet of freeboard (FEMA + 5').

The Company evaluated all vault locations when plotted on a survey map and identified all locations within the FEMA +5' floodplain. At the FEMA + 5' level, additional non-submersible underground distribution equipment is located in the projected floodplains and will be replaced with submersible equipment under this program. Equipment to be replaced includes 391 locations.

	Number of 120V/ 208V Transformers	Number of 460V Network Protectors
Brooklyn/Queens	130	33
Bronx/Westchester	39	8
Manhattan	178	3
Total	**347**	**44**

Note: All similar equipment on Staten Island has already been replaced with submersible equipment.

Each region has performed a preliminary evaluation of the equipment to be replaced at each of the locations and created initial replacement schedules for the 2026-2029 timeframe:

	2026		**2027**		**2028**		**2029**		**2030**	
	120V/ 208V Trans-formers	460V NWPs	120V/ 208V Trans-formers	460V NWPs	120V/ 208V Trans-formers	460V NWPs	120V/ 208V Trans-formers	460V NWPs	120V/ 208V Trans-formers	460V NWPs
Brooklyn/ Queens	14	16	14	10	17	6	20	1	13	0
Bronx/ Westchester	0	8	2	0	5	0	4	0	1	0
Manhattan	12	0	30	0	26	0	25	3	37	0
Total	**26**	**24**	**46**	**10**	**48**	**6**	**49**	**4**	**51**	**0**

This projected timeline for replacing these transformers and NWPs is dependent on system conditions and may be adjusted after further evaluations are completed. The schedule above results in 220 of the 347 transformer replacements and all of the 44 NWP installations completed by the end of 2030, leaving 127 transformers to be installed.

Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

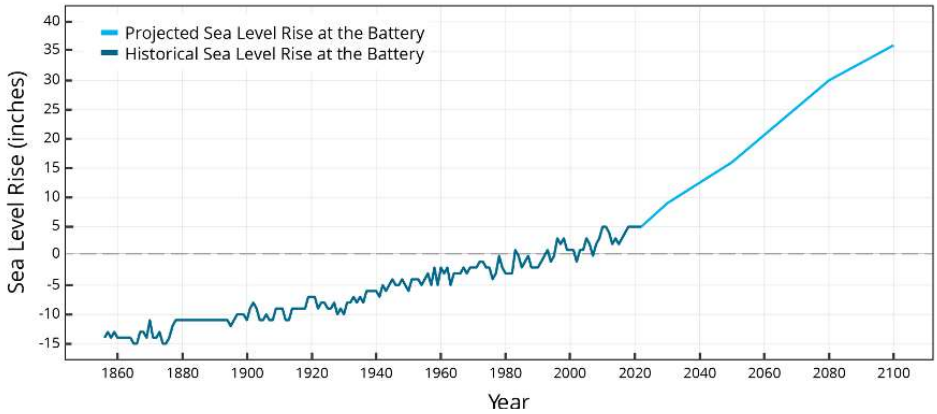
The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.

	Con Edison's service territory is projected to be impacted by rising temperatures. Those impacts are expected to be amplified during intense heat waves. Increasing TV will cause load to increase, potentially challenging the capacity of the system.
	Con Edison has previously experienced flooding events that have impacted its assets from major storms. Due to future climate projections, that risk is expected to expand in Con Edison's service area, and facilities like substations will be more exposed to flooding.
	Con Edison's overhead distribution system has historically been the most sensitive to wind and ice, due to its susceptibility to tree contact during high wind and icing events.
	Extreme events are low-likelihood, high-impact scenarios that can amplify and compound the types of impacts anticipated from changes in temperature, sea level rise, and other variables. These events pose risks to all aspects of the system and are especially impactful for emergency response planning.

Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

One vulnerability that the Study identified to underground distribution is the risk of flooding with climate-driven changes in sea levels. Transformers and network protectors at risk from the projected increases in sea levels will be replaced with submersible versions that protect against damage from flooding under this program.

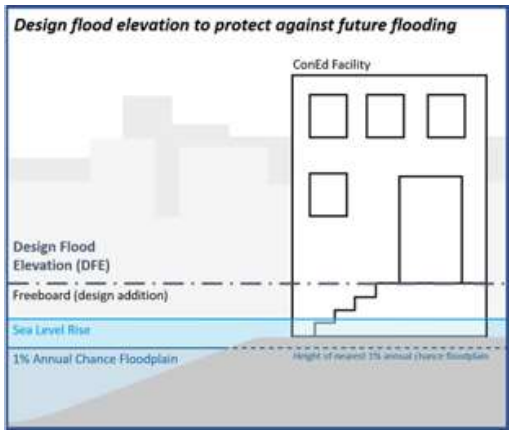
Following Superstorm Sandy in 2012, the company implemented a minimum protection design standard of "FEMA plus three feet," allowing for 1 foot of sea level rise. At that time, Con Edison protected all infrastructure in the floodplain against future 100-year storms and 1 foot of sea level rise (e.g., submersible infrastructure, flood walls, pumps, elevation). CCVS projections show that sea level rise within the territory could reach 16 inches by the 2050s and 36 inches by 2100.



Historical and projected sea level rise at the Battery Tide Gauge in New York City under the combined SSP2-4.5 and SSP5-8.5 50th percentile. The dark blue line shows historical mean sea level at the Battery tide gauge (NOAA Tides & Currents). The light blue line shows the 50th percentile of projected sea level rise relative to the Battery tide gauge, with a historical baseline time period of 1995-2014. Since 1992, the Battery tide gauge has experienced approximately 5 inches of sea level rise.

Sea level rise will also have profound effects on coastal flooding and storm surge, increasing the severity of coastal flooding during extreme events such as hurricanes and deluge rain.

For below-grade assets, any asset determined to be within a future floodplain should be designed to include protection to mitigate flooding risks, such as upgrading to submersible equipment. For above-grade assets determined to be within a future floodplain the appropriate Design Flood Elevation (DFE) is determined, again based on the asset's useful life, and used to determine the appropriate design interventions. The DFE includes the 1% annual chance BFE, a sea level rise adjustment, and additional freeboard representing a safety factor required by the NYC Building Code, as illustrated below.



Con Edison's 2023 Climate Change Planning and Design Guideline includes the DFE planning levels below.

Planning horizon	BFE in NAVD 88[12]	+ Freeboard	+ Sea Level Rise Adjustment[13]	= Design Flood Elevation (DFE) in NAVD 88
through 2039	FEMA 1% (PFIRM)	24"	12"	FEMA 1% + 36"
2040-2069	**FEMA 1% (PFIRM)**	**24"**	**16"**	**FEMA 1% + 40"**
2070-2099	FEMA 1% (PFIRM)	24"	28"	FEMA 1% + 52"
2100+	**FEMA 1% (PFIRM)**	**24"**	**36"**	**FEMA 1% + 60"**

The submersible 120V/208V transformers and 460V Network Protectors will be installed in all underground electric distribution vaults evaluated to be vulnerable to flooding at the new, elevated DFE.

The primary sensitivities of electric assets to projected changes in flooding are:

- Equipment damage: Floodwaters damage electric equipment and decrease the life expectancy of assets. Equipment damage costs Con Edison both capital (needed for repairs) and time (which results in longer outages and can be exacerbated if spare parts are limited). Saltwater spray can also cause arcing and failure of components. In addition, continued exposure to water can rot wooden assets such as poles.
- Equipment corrosion: Sea level rise and coastal storms pose a particular threat to coastal assets due to the corrosive properties of salt water, which can damage electronic components. These impacts may not be immediately evident but can present issues over time that may result in asset failures and outages.
- Soil weakening: Exposure to water can weaken or undermine the foundation of equipment in instances of prolonged inundation or erosion, increasing the overall risk of equipment damage. Increases in the projected flow and magnitude of floodwaters near riverbanks and the coast

have the potential to alter and intensify how erosion occurs and may require intervention to avoid assets becoming destabilized or failing.
- Limited accessibility: Flooding presents issues of access. If assets are flooded or surrounded by water at high tide or during storms, it becomes more difficult to access the locations for maintenance and repair.

Installing submersible distribution equipment for underground locations in the sea level adjusted Design Flood Elevation of FEMA 1% + 5', will enable the Con Edison distribution system to withstand the projected impacts of climate change without damage to this equipment from flooding, increasing the overall system resiliency.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

Investments in the Submersible Equipment program provide all of these resiliency benefits.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The company is committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits of its investments to customers in DACs and revise its investment approach if needed.

The Company has also formed an Environmental Justice Working Group under an executive committee and plans to release a finalized Environmental Justice Policy Statement in 2023 to apply an equity lens to resilience-driven investments. Key components of the upcoming policy statement include:

- Operations will not disproportionately burden DACs.
- Con Edison will work to understand DAC concerns.
- Clean energy investments will benefit DACs.
- Con Edison will provide opportunities for employment in the clean energy future.

These equity considerations will help inform resilience plan investments moving forward.

Impact on Greenhouse Gas (GHG) Emissions
The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Submersible Equipment program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Submersible Equipment program reduces the need for field visits by reducing the need for field assessment and restoration of the system from water damage to underground distribution equipment.
Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment
The Submersible Equipment program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)
This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)"

The Submersible Equipment program provides resilient energy by enabling underground electric distribution equipment to withstand projected climate-driven flooding impacts from sea level rise, storms, and deluge rain without equipment damage or failure from water intrusion.

Impact on Company Risk Mitigation Activity
Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Submersible Equipment Program mitigates the

risks of equipment failures or damage from potential vulnerability to climate change-driven increases in flooding from sea-level rise, storm surge, and heavy precipitation.

2. Supplemental Information

Alternatives

Alternative 1 description and reason for rejection

Remove individual feeders from service that are at risk of flooding (i.e., in the FEMA 1% + 5' floodplain) during major storms. When a network cannot sustain the loss of these feeders, the entire network must be shut down to protect non-submersible equipment from catastrophic failure. This alternative; however, can result in forced outages for customers in the flooded areas and outside of the flooded areas, potentially during extended or severe storm conditions.

Risk of No Action

The Climate Change Vulnerability Study concluded that Con Edison's underground distribution system is vulnerable to risk of damage from extreme weather events like those that have been experienced in recent history. Modeling performed by climate science experts with input from Con Edison subject matter experts determined that the electric system is most vulnerable to climate-induced changes in temperature/humidity and sea level rise. The Study also confirmed that a growing body of scientific evidence supports the conclusions that projected climate changes project these extreme storm events to be likely to increase in frequency and intensity in the future. Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode people's ability to cope with and recover from the impacts and that disadvantaged communities are the least able to recover.

Without the proposed resiliency investments in the electric distribution system, Con Edison's customers remain more vulnerable to both the short-term risks (of electrical outages) and long-term risks of not recovering from the effects of climate change.

Non-Financial Benefits

The replacement of non-submersible equipment in flood prone areas and the isolation of flood-prone areas, as described in the work description, will benefit public safety, network restoration, network integrity, and mitigate the cost of extensive damages caused by flood water. It will mitigate damage caused by fresh and saltwater infiltrating our electrical facilities. Overall, this program will reduce the number of component failures, thereby reducing our exposure to system failures and improving the resiliency of the electric distribution system.

Summary of Financial Benefits and Costs

1. Cost-benefit analysis

N/A

2. Major Financial Benefits

N/A

3. Basis for estimate

The estimated costs of replacing the existing underground transformers and NWPs were based on actual storm hardening projects to replace similar equipment. The average cost per project was calculated for 9 replacements of 120V/208V transformers (2016) and for 8 replacements of 460V Network Protectors (2014-2015). Then the average actual capital cost per replacement of $140,239 per transformer and $63,858 per NWP were escalated to 2026 dollars by applying inflation factors (from the Bureau of Labor Statistics and Deloitte) to arrive at per replacement estimates of $194,961 for replacing the transformers and for $92,298 for replacing NWPs.

Project Risks and Mitigation Plan

Risk 1: Equipment Availability

Issues with transformer and NWP availability have occurred in the past and could impact future installation plans.

Mitigation plan 1:
The Company's Supply Chain professionals continue to explore additional vendors, but the number of transformer manufacturers remains limited.

Risk 2: Outage Windows
Outage windows are limited to non-summer months, and this program must compete with new business, system emergencies/reliability, and other capital programs.

Mitigation plan 2:
Careful planning and coordination with other system work requiring outage windows is needed to replace the at-risk equipment with submersible equipment.

Technical Evaluation / Analysis
All currently installed 120V/208V underground distribution transformers and 460V Network Protectors that are not designed to withstand water submersion were evaluated for potential flood risk at the FEMA+5' Base Flood Elevation to identify all installed equipment needing replacing.

Project Relationships (if applicable)
N/A

3. Funding Detail ($000)

Historic Spend

	Actual 2020	Actual 2021	Actual 2022	Actual 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$0	$0	$0	$0	N/A	$0

2025-2029 Request:
Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$7,284	$9,891	$9,912	$9,922
Labor	$0	$0	$0	$0	$0
M&S	$0	$0	$0	$0	$0
Contract Svcs.	$0	$7,053	$9,578	$9,598	$9,608
Other	$0	$0	$0	$0	$0
Overheads	$0	$231	$313	$314	$314

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$34,703	$0	$0
Basis for funding direction:	Projected work scopes with inflationary increases in cost (3%)		

Erosion Protection and Drainage Upgrade Program

Central Operations / Substation Operations
2025-2029

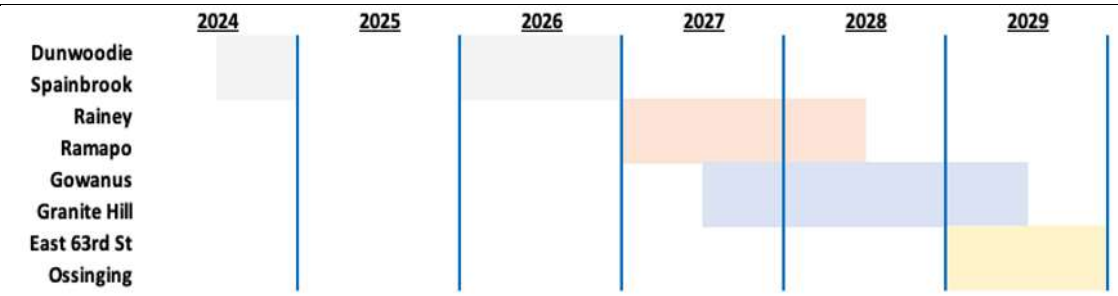
1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Erosion Protection and Drainage Upgrade Program	
Project/Program Manager: Holly Reilly	**Project/Program Number (Level 1):** 27204334
Status: ☐ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☒ **On-going (Programs Only)**	
Estimated Start Date: 2024	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $21,800 **O&M:** $0	

Work Description:

This program will install reinforcements and upgrade drainage systems in select substations to protect from erosion that may occur from extreme, deluge rain events or large storms (e.g., hurricanes and nor'easters). Extreme rain events, such as Tropical Storm Ida, have produced rainfall of 4 to 8 inches in just a few hours. The Climate Change Vulnerability Study projected average annual increases in precipitation of as much as 15% by 2050, with the heaviest 5-day precipitation amount at Central Park of 11.8 inches. This type of deluge can cause pooling and in some cases erosion that could undermine substation equipment. If extreme enough, these impacts could cause critical substation equipment to lose control power or inadvertently trip out, resulting in outages. Erosion caused by extreme rain events could also create unsafe conditions for substation personnel.

The program began in 2024 with six substations initially identified as in-scope for upgrades: Dunwoodie, Sprain Brook, Rainey, Ramapo, Gowanus, and Granite Hill. Erosion and drainage issues were discovered at these stations from hurricane Ida in late 2021. Erosion and drainage issues have also been noted at four additional stations – East 63rd Street, Ossining, West 65th Street, and Pleasantville – and upgrades at these stations will be included in this program. Erosion protection and drainage upgrades will begin with Dunwoodie and Sprain Brook and will target concurrent work on two substations per year. Typical upgrades at each station include replacement of below grade cable trays and installation of new retaining basins; however detailed engineering and evaluations will be performed at each station to determine the appropriate upgrades at each facility. Work for each station is expected to take 18-24 months to complete on average, including engineering, planning, and procurement, at an estimated cost of approximately $3 million per substation. The initial, high-level schedule for completing upgrades at the stations currently known to have erosion and drainage issues projects that issues at eight of these stations will be addressed by the end of 2029.



Although the stations initially included in the scope of this program have existing erosion and/or drainage issues, the Company believes that to increase the system's resiliency, given projections for more frequent and intense climate-driven storms and deluge rain events, a proactive approach to avoiding future issues of this type is needed. Accordingly, Con Edison will be evaluating current substation designs to identify design elements that may allow erosion poor drainage when experiencing heavy precipitation from hurricanes or deluge rain events and will assess the substations built with these design elements for the potential need for upgrades.

The Erosion and Drainage Upgrade program is part of the comprehensive set of strategies included in Con Edison's Climate Vulnerability and Resiliency Plan (the Plan) to address the vulnerabilities of the electric system to the impacts of climate change – from heat/temperature variable, flooding (caused by sea-level rise, storm surges or heavy precipitation), or extreme events (such as hurricanes, nor'easters, or heat waves) – identified in the 2019 and 2023 Climate Change Vulnerabilities Studies (CCVS, the Study, or the Studies). These strategies were developed by following Con Edison's Resilience Management Framework to identify investments that enable Con Edison to (1) better withstand changes in climate (avoiding outages), (2) absorb impacts from outage-inducing events (limiting the number of customers impacted or improving the customers' ability to cope with the outage), (3) recover quickly (restoring service more quickly and at a lower cost), and (4) advance to a better state (by incorporating additional data and feedback from events into future plans, standards, and processes). This program increases the ability of the transmission system to withstand the impacts of increasingly intense and frequent storms and heavy precipitation driven by projected climate changes.

Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.

	Con Edison's service territory is projected to be impacted by rising temperatures. Those impacts are expected to be amplified during intense heat waves. Increasing TV will cause load to increase, potentially challenging the capacity of the system.
	Con Edison has previously experienced flooding events that have impacted its assets from major storms. Due to future climate projections, that risk is expected to expand in Con Edison's service area, and facilities like substations will be more exposed to flooding.
	Con Edison's overhead distribution system has historically been the most sensitive to wind and ice, due to its susceptibility to tree contact during high wind and icing events.
	Extreme events are low-likelihood, high-impact scenarios that can amplify and compound the types of impacts anticipated from changes in temperature, sea level rise, and other variables. These events pose risks to all aspects of the system and are especially impactful for emergency response planning.

Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The Study identified that Area and Transmission substations were at risk from damage caused by heavy rainfall, often associated with extreme storms. Con Edison's service area experiences a range of precipitation types, including rainfall and frozen precipitation (i.e., snow, sleet, and freezing rain). The region has experienced several tropical cyclones producing heavy precipitation over the last century. For example, in 2011, Hurricane Irene produced up to 12 inches of rain in the service area, with nearly 7 inches in Central Park. More recently, remnants of Hurricane Ida in 2021 brought over 7 inches of rain to Central Park. Alternatively, nor'easters have brought some of the heaviest snowfall on record to New York City, along with freezing rain; the January 2021 nor'easter accumulated up to 2 feet of snow in New York City.

Climate change is projected to drive heavier precipitation events because a warmer atmosphere holds more water vapor and provides more energy for storms, among other factors. Looking forward, projections show climate change could drive stronger and more frequent storms in the region, bringing heavy precipitation, wind, and storm surge. Tropical cyclone rainfall totals are projected to increase by approximately 10%-15% in the North Atlantic basin by the late 21st century. In addition, extratropical cyclones could become 5%-25% more wet in the future relative to present day. In contrast, climate change could reduce the frequency of snowfall and other frozen precipitation in future decades. Projections in the Study show that heavy precipitation in the service area could increase throughout the century relative to the baseline.

Variable	Study	Baseline	2030	2040	2050	2080
Annual days with precipitation exceeding 2 inches	Current Study	3 days	4 days	4 days	5 days	6 days
	2019 CCVS	3 days	4 days	4 days	4 days	5 days

The primary sensitivities of electric assets to projected changes in flooding are:

- Equipment damage: Floodwaters damage electric equipment and decrease the life expectancy of assets. Equipment damage costs Con Edison both capital (needed for repairs) and time (which results in longer outages and can be exacerbated if spare parts are limited). Saltwater

spray can also cause arcing and failure of components. In addition, continued exposure to water can rot wooden assets such as poles.

- Equipment corrosion: Sea level rise and coastal storms pose a particular threat to coastal assets due to the corrosive properties of salt water, which can damage electronic components. These impacts may not be immediately evident but can present issues over time that may result in asset failures and outages.
- Soil weakening: Exposure to water can weaken or undermine the foundation of equipment in instances of prolonged inundation or erosion, increasing the overall risk of equipment damage. Increases in the projected flow and magnitude of floodwaters near riverbanks and the coast have the potential to alter and intensify how erosion occurs and may require intervention to avoid assets becoming destabilized or failing.
- Limited accessibility: Flooding presents issues of access. If assets are flooded or surrounded by water at high tide or during storms, it becomes more difficult to access the locations for maintenance and repair.

The Substation Erosion Protection and Drainage Upgrade program is focused on mitigating risks to substation equipment associated with all of these sensitivities during periods of heavy precipitation.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The company has committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits its investments to customers in DACs and revise its investment approach if needed.

The Company has also formed an Environmental Justice Working Group under an executive committee and plans to release a finalized Environmental Justice Policy Statement in 2023 to apply an equity lens to resilience-driven investments. Key components of the upcoming policy statement include:

- Operations will not disproportionately burden DACs.
- Con Edison will work to understand DAC concerns.
- Clean energy investments will benefit DACs.
- Con Edison will provide opportunities for employment in the clean energy future.

These equity considerations will help inform resilience plan investments moving forward.

Impact on Greenhouse Gas (GHG) Emissions
The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Erosion Protection and Drainage Upgrade program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Erosion and Drainage Upgrade program reduces the need for field visits by eliminating customer outages from damaged equipment caused by erosion from heavy precipitation. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment
The Erosion and Drainage Upgrade program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)
This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)"

The Erosion Protection and Drainage Upgrade program provides resilient energy delivery by mitigating the potential risk of equipment failures and outages at vulnerable substations from flooding and water intrusion associated with climate-driven storms and heavy precipitation.

Impact on Company Risk Mitigation Activity
Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Erosion and Drainage Upgrade program mitigates the risk of increased substation equipment outages from climate change, while also mitigating risks to customers served by each of the substations customers by hardening the substation to withstand the impacts of increasing periods of heavy precipitation.

2. Supplemental Information

Alternatives

Alternative 1

One alternative is to reconfigure outdoor facilities as indoor facilities that are better protected against extreme weather. This alternative would require extensive outages to complete and is cost prohibitive.

Alternative 2

The only alternative to making the proposed investments is to do nothing and accept the risks of substation equipment damage and customer outages from erosion resulting from projected climate-driven increases in heavy precipitation. This alternative does not meet the requirements of the Act to develop "… dedicated storm hardening programs … to reduce damage and costs from future weather events, as well as facilitate prompt restoration times."

Risk of No Action

Doing nothing means that Con Edison is willing to accept the risks of substation equipment damage and customer outages from erosion resulting from projected climate-driven increases in heavy precipitation.

Non-Financial Benefits

Upgrades under this program mitigate the risk of damage to substation equipment caused when equipment shifts and becomes unstable when periods of heavy precipitation cause the ground to erode. Shifts in equipment position are likely not only to damage the equipment but also, possibly, to result in loss of service for large numbers of customers served from the substation. Erosion conditions also represent safety hazards to crews working in the substation. Proactive investments in erosion protections and drainage upgrades mitigate these risks.

Summary of Financial Benefits and Costs

1. Cost-benefit analysis

N/A

2. Major Financial Benefits

N/A

3. Basis for estimate

Each substation upgraded under this program is estimated to cost approximately $3 million, based on previous projects. Upgrades to each substation are expected to take an average of 18-24 months to complete, including engineering, planning, and procurement (expected to average 6 months).

The estimated annual cost of substation upgrades under this program for the stations with identified issues and based on the initial high-level schedule are below. However, as discussed above, increasing system resiliency and mitigating erosion and drainage vulnerabilities associated with climate change requires that the Company proactively assess future risks, and it is expected that upgrades will need to be made other substations.

Currently In-scope Substations					
	2025*	2026	2027	2028	2029
Dunwoodie	$ -	$ 2,502	$ -	$ -	$ -
Spainbrook	$ -	$ 2,502	$ -	$ -	$ -
Rainey	$ -	$ -	$ 1,933	$ 1,327	$ -
Ramapo	$ -	$ -	$ 1,933	$ 1,327	$ -
Gowanus	$ -	$ -	$ 644	$ 1,327	$ 1,367
Granite Hill	$ -	$ -	$ 644	$ 1,327	$ 1,367
East 63rd St	$ -	$ -	$ -	$ -	$ 2,050
Ossinging	$ -	$ -	$ -	$ -	$ 2,050
Total estimated cost ($000)	**$ -**	**$ 5,004**	**$ 5,154**	**$ 5,308**	**$ 6,834**

* No program work performed in 2025 due to budget cuts

Project Risks and Mitigation Plan

Risk 1:

Delays due resource/support coordination

Mitigation Plan 1:

Anticipate, schedule and pre-plan with resource requirements such as engineering, labor, and construction and outages to avoid performance delays alignment conflicts.

Technical Evaluation / Analysis

N/A

Project Relationships (if applicable)

N/A

3. Funding Detail ($000)

2020-2024 Actual/Forecast Spend

	Actual 2020	Actual 2021	Actual 2022	Forecast 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$0	$0	$0	$0	$0	$300

2025-2029 Request:

Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$5,200	$5,400	$5,500	$5,700
Labor	$0	$712	$729	$753	$799
M&S	$0	$2,163	$2,249	$2,295	$2,295
Contract Svcs.	$0	$618	$643	$667	$767
Other	$0	$290	$310	$285	$285
Overheads	$0	$1,417	$1,468	$1,500	$1,554

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$31,000	$36,000	$41,600
Basis for funding direction:	Annual inflation-related increases estimated (3%)	Annual inflation-related increases estimated (3%)	Annual inflation-related increases estimated (3%)

Selective Undergrounding

Electric Operations / Electric Distribution
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Selective Undergrounding - Resiliency	
Project/Program Manager: Jeffrey Mah	**Project/Program Number (Level 1):** 27207956, 27207957, 27207975
Status: ☐ **Initiation/Planning** ☒ **In-Progress (Projects Only)** ☐ **On-going (Programs Only)**	
Estimated Start Date: Ongoing	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $333,000 **O&M:**	

Work Description

The overhead distribution system is comprised of non-network circuits, including 4kV primary grids and 4kV, 13kV, and 27kV auto loops, and 33 kV circuits. The primary vulnerability of the overhead non-network system identified by the Climate Change Vulnerability Study is risk to system failures resulting from increases in wind and ice, with additional vulnerability from extreme storms, and heat. Increased temperatures can lead to line sag, presenting safety concerns in areas with vegetation clearance limitations, and the overhead system is at risk of damage from high winds, wind-blown debris, downed trees, and ice during storms. Over the past two decades, New York has experienced multiple significant storm events – both hurricanes and nor'easters – bringing high winds that downed trees and overhead facilities, resulting in widespread power outages. Climate science projects that such storms will become more frequent and more intense. The goal of the Selective Undergrounding program is to mitigate the risks of outage during these heat waves and high-winds, and storm events by placing the most vulnerable segments of the non-network system underground. The program prioritizes segments of the overhead system that are most vulnerable to wind damage, such as lines in heavily wooded areas.

This program will convert approximately 70 miles of the non-network system from overhead to underground. Con Edison is planning to ramp up our capacity to perform undergrounding from an average of approximately 11 miles per year in 2026 to approximately 20 miles per year in 2028 by increasing our efficiency through the implementation of standard designs, increasing internal resources, and putting contracts in place with other vendors.

Con Edison uses the Overhead Program Optimization Tool (OHPOT) model to review data at the 4, 13 or 27kV primary "segment" or "protective device" level (e.g., Spur, Sub-Spur or main Run segment). The OHPOT provides Con Edison with statistics and information for that segment of the system. The statistics provided by OHPOT are primarily based on the Outage History (PSC Outage Database) and consist of the number of outage events for that segment, and customers impacted. This, and other information, such as available fault current and the length of the segment, helps determine the appropriate mitigating measures. In late 2021, Environmental Justice (EJ) metrics were added as another input. These inputs are then used by the system to automatically prioritize jobs.

OHPOT selects overhead circuits segments to be considered for undergrounding based on the best available data and current circuit configuration. Criteria for project selection were developed with feedback from key stakeholders these criteria are as follows:

i. An EJ area containing 10% of population in the Low and Medium Income (Low to Moderate Income) category AND a line segment experiencing four (4) or more outage events in last six (6) years.
ii. The segment experienced four (4) or more outage events in last six (6) years AND the segment outages resulted in a total of 1,500 or more customer outages in last six (6) years
iii. The segment experienced eight (8) or more outage events in last six (6) years
iv. The segment experienced three (3) or more outage events in last three (3) years

OHPOT has been configured to use these criteria to identify potential hardening projects. Circuits meeting the selected criteria are then sorted by the UG/Aerial index and forwarded for engineering review and analysis. The UG/Aerial index value is calculated with the following formula:

(Customer Outages + 100*Events) / (Segment Length)
This index gives insight into the density and frequency of outages. The higher the index the greater the opportunity to reduce outages through hardening measures.

The engineering review includes detailed engineering and constructability analyses to determine the solution that best mitigates the circuit vulnerabilities, including:

- Selectively undergrounding a problematic portion of the segment (This may involve removing the OH portion or bypassing the OH portion leaving it to serve a much smaller number of customers)
- Selectively undergrounding a portion of the circuit and creating a tie to a neighboring circuit
- Selectively undergrounding the entire circuit
- Pursue other appropriate design enhancements under other programs

Coincident with engineering analysis of the best solution for mitigating risks to an individual circuit segment, the expected benefits of undergrounding the locations meeting the selection criteria are compared and used to create an initial prioritization ranking. Recommended solutions from the engineering analyses are then incorporated and the relative cost-effectiveness of undergrounding alternative circuits are used to adjust the prioritization.

Potential locations to be considered for undergrounding in the 2026 – 2029 timeframe were identified using the prioritization process described above, based on current system conditions. The top priorities for potential undergrounding were identified using OHPOT, based on current system conditions and circuit performance data from Jan 2017 through July 2023. The top circuits identified as undergrounding priorities will be reevaluated annually to reflect current system conditions and the most recent circuit data.

	Number of Locations	Number of Feet
Brooklyn/ Queens	28	75,000
Bronx/ Westchester	103	276,000
Staten Island	7	8,000
Total	**138**	**359,000**

Justification Summary:

Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.

	Con Edison's service territory is projected to be impacted by rising temperatures. Those impacts are expected to be amplified during intense heat waves. Increasing TV will cause load to increase, potentially challenging the capacity of the system.
	Con Edison has previously experienced flooding events that have impacted its assets from major storms. Due to future climate projections, that risk is expected to expand in Con Edison's service area, and facilities like substations will be more exposed to flooding.
	Con Edison's overhead distribution system has historically been the most sensitive to wind and ice, due to its susceptibility to tree contact during high wind and icing events.
	Extreme events are low-likelihood, high-impact scenarios that can amplify and compound the types of impacts anticipated from changes in temperature, sea level rise, and other variables. These events pose risks to all aspects of the system and are especially impactful for emergency response planning.

Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The primary vulnerability of the overhead non-network system identified by the Study is risk to system failures resulting from increases in wind and ice, with additional vulnerability from extreme storms, and heat also identified. For all of these climate-driven hazards, the common failure mode is contact – conductors, poles, or other overhead equipment – with vegetation, wind-blown debris, nearby structures, or the ground.

The Con Edison Climate Change Vulnerability Studies project increases in average and maximum air temperatures throughout the century relative to historical conditions, with the 2023 Study projecting that temperatures will increase faster than projected in the 2019 Study. By all measures evaluated in the Studies – maximum daily temperature, number of days per year in which maximum temperature

exceeds 95°F, and number of days per year the daily average temperature exceeds 86°F – climate-related increases in heat are projected to occur roughly a decade faster than projected in the first Study.

Variable	Study	Baseline	2030	2040	2050	2080
Highest annual maximum daily temperature	Current Study	97°F	103°F	104°F	106°F	112°F
	2019 CCVS	97°F	101°F	103°F	104°F	108°F
The number of days per year in which maximum temperatures exceed 95°F	Current Study	4 days	17 days	27 days	32 days	69 days
	2019 CCVS	4 days	11 days	18 days	23 days	47 days
The number of days per year in which daily average temperatures exceed 86°F	Current Study	3 days	16 days	22 days	31 days	68 days
	2019 CCVS	3 days	11 days	16 days	21 days	45 days

High temperatures can cause overhead distribution lines to experience sagging and loss of material strength. Line sagging reduces the clearance between overhead assets and surrounding vegetation, which can increase the potential for contact with vegetation, leading to asset failure and safety risks. Derating lines helps mitigate the risk of line sag but could necessitate adding capacity to meet demand.

Wind and ice have historically been difficult to model due to their highly localized nature. To inform this Study, Con Edison sought the best available information by acquiring an additional dataset from MIT, which covers the Northeast, and provides insight into future wind speeds and radial icing potential. This data and other studies demonstrate that wind speeds will likely increase, and the risk of ice accumulation on wires (radial icing) will remain. The dataset developed by MIT covers the Northeast and shows the 2025-2041 projected and baseline observed annual maximum and average wind speeds at Central Park, JFK, and LaGuardia.

	Central Park		JFK		LaGuardia	
Wind Speed	1-min Baseline	MIT Projection	1-min Baseline	MIT Projection	1-min Baseline	MIT Projection
Annual maximum (mph)	51.0	60.2	46.1	57.5	55.0	62.4
Annual mean (mph)	14.0	17.6	18.1	19.2	20.1	18.5

Extreme storms such as hurricanes can cause wind speeds to increase far beyond typical average speeds. Wind speeds of the most intense hurricanes are projected to increase. Freezing rain frequency and radial icing are also projected to increase, although the magnitude of the trend remains highly uncertain due to the specific atmospheric conditions required for ice storms to occur.

Con Edison's service area experiences a range of precipitation types, including rainfall and frozen precipitation (i.e., snow, sleet, and freezing rain). The region has experienced several tropical cyclones producing heavy precipitation over the last century. For example, in 2011, Hurricane Irene produced up to 12 inches of rain in the service area, with nearly 7 inches in Central Park. More recently, remnants of Hurricane Ida in 2021 brought over 7 inches of rain to Central Park. Alternatively, nor'easters have brought some of the heaviest snowfall on record to New York City, along with freezing rain; the January 2021 nor'easter accumulated up to 2 feet of snow in New York City.

Climate change is projected to drive heavier precipitation events because a warmer atmosphere holds more water vapor and provides more energy for storms, among other factors. Looking forward, projections show climate change could drive stronger and more frequent storms in the region, bringing heavy precipitation, wind, and storm surge. Tropical cyclone rainfall totals are projected to increase by approximately 10%-15% in the North Atlantic basin by the late 21st century. In addition, extratropical cyclones could become 5%-25% more wet in the future relative to present day. In contrast, climate change could reduce the frequency of snowfall and other frozen precipitation in future decades.

Projections in the Study show that heavy precipitation in the service area could increase throughout the century relative to the baseline.

Variable	Study	Baseline	2030	2040	2050	2080
Annual days with precipitation exceeding 2 inches	Current Study	3 days	4 days	4 days	5 days	6 days
	2019 CCVS	3 days	4 days	4 days	4 days	5 days

These potential changes in wind, precipitation, and ice present an especially large risk to overhead distribution equipment. Overhead distribution assets, including conductors, attachments, and cross-arms, are built to withstand defined design tolerances for combined ice and wind loading, but they are frequently adjacent to neighboring vegetation that may be downed during these events. Fallen vegetation and wind-blown debris can come into contact with lines and cause them to disconnect, fall, or even lead to pole collapse. This can result in asset failure, leading to outages and incurring restoration costs.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

The investments made in the overhead distribution system under this program proactively increase Con Edison's resiliency by preventing likely outages from climate-induced extreme weather events by eliminating the circuits exposure to the extreme weather.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for these communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The Company is committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits of its investments to customers in DACs and revise its investment approach if needed.

Impact on Greenhouse Gas (GHG) Emissions

The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Selective Undergrounding program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Selective Undergrounding program reduces the need for field visits by reducing outages on the overhead non-network system by placing vulnerable circuits underground. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment

The Selective Undergrounding program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)

This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)"

The Selective Undergrounding program provides resilient energy delivery by increasing the ability of the electric distribution system to withstand the impacts of climate changes without experiencing failures from wind and wind-blown debris during more frequent and intense climate-driven storms.

Impact on Company Risk Mitigation Activity

Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs, including the Selective Undergrounding program, are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Selective Undergrounding program mitigates the risk of increased network outages from climate change, while also mitigating risks to customers on the non-network system by mitigating risks of damage to overhead circuits vulnerable to impacts of wind, wind-blown debris, downed trees, and ice under climate change projections that include forecasts of more frequent and more intense storms.

2. Supplemental Information

Alternatives

Alternative 1

Aggressive vegetation management has historically been and will continue to be the first line of defense against storm related outages in areas served by overhead distribution. However, since the intensity of storms is increasing due to climate change, further enhanced vegetation management would require removal of more hazardous trees and further expansions of the clearance zones (beyond the current right-of-way). It is also unlikely to be sufficient to address other causes for outage.

Alternative 2

A second alternative is to continue hardening the overhead system. Installation of stronger poles and aerial cables to higher construction standards can help the system withstand higher wind speeds and potentially some number of tree limb caused outages. However, the risk of outage from weather exposure is not eliminated, only reduced. As this program is "selective" in nature, it is intended to identify specific spurs or spur segments which are optimal recipients of undergrounding. This program will rank spurs by performance and by customer attributes. Spurs with lower ranking targets may be hardened in the intermediate years prior to eventually being undergrounded.

Alternative 3

Underground main runs as well as spurs. Currently, this is not considered an option due to operational and safety concerns around fault clearing time. The Company is evaluating various design and operational options to determine if there is a viable safe solution.

Risk of No Action

The Climate Change Vulnerability Study concluded that Con Edison's overhead distribution system is vulnerable to risk of damages from extreme weather events like those that have been experienced in recent history. The Study also confirmed that a growing body of scientific evidence supports the conclusions that projected climate changes project these extreme storm events to be likely to increase in frequency and intensity in the future. Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode the ability of communities and their residents to cope with and recover from the impacts of extreme events, with members of disadvantaged communities the least able to recover.

Without the proposed resiliency investments in the non-network system, Con Edison's customers remain more vulnerable to both the short-term risks (of electrical outages) and long-term risks of not recovering from the effects of climate change.

Non-Financial Benefits

One benefit Con Edison expects from undergrounding spur lines is a reduction in the number of outages that occur on overhead lines due to weather exposure, trees, wind, and ice. An additional benefit is that this reduction in outages allows for the restoration crews who normally would be tasked with restoring these spur lines to work to restore other parts of the system.

As a result of undergrounding, Con Edison's customers will see fewer outages. For every outage that is eliminated by undergrounding, the system will experience a reduction in instances of high fault current going through it, reduce the stresses put on the cable connections and splice joints, and fewer operations on breakers, switches, and reclosers, all potentially leading to longer equipment life.

Lower avoided economic losses - The overall restoration post major event will be shorter – the exact duration reduction of the restoration will depend on the path and damage of the storm. However, undergrounding spurs will prevent outages from happening on the undergrounded portions of the system. There is a benefit in returning the system back to normal operating conditions and power restoration to the Con Edison service territory faster. Public safety will be enhanced by the Con Edison

undergrounding program. Burying wires reduces the chances of downed conductors and the public safety issues they cause. Further, by reducing the number of potentially downed wires, the need for wire-guards would decrease as well, which could potentially further reduce storm restoration costs associated with contract wire-guards, and free up Con Edison wire guard personnel to take on other restoration duties that can better serve the community or directly affect the restoration process.

Customer resiliency to the impacts of climate change should increase as a result of the undergrounding program. There will be fewer outage incidents, and overall shorter outage durations, which should help customers cope with extreme weather events both during the event and while recovering afterward.

Summary of Financial Benefits and Costs

1. Cost-benefit analysis

N/A.

2. Major Financial Benefits

N/A

3. Basis for estimate

The estimated cost of placing overhead distribution circuits underground is $4 million per mile, beginning in 2026, and is based on undergrounding pilots conducted in 2022. This estimated cost per mile is based on the actual cost of the two undergrounding pilots conducted in 2022 and the estimated cost of six in-flight projects. This average cost per circuit mile is assumed to escalate with annual inflation (3%).

Based on this estimated cost per mile and the Company's annual targeted undergrounding miles, the cost of funding these resiliency improvements for 2026-2029 are:

	2025*	2026	2027	2028	2029
Estimated cost/mile ($000)	$4,393	$4,524	$4,660	$4,800	$4,944
Targeted miles/year	N/A	13.3	15.0	20.8	20.8
Total estimated costs ($000)	$1,000	$60,000	$70,000	$100,000	$103,000

* Due to budgetary constraints in 2025, no new program work is started. Costs in 2025 are for completion of in-flight pilots in Brooklyn, Queens, Staten Island and Westchester.

The average cost per mile in the estimate above is based on recent/planned undergrounding projects (in 2023 $s):

Status	Project Name	Trench Foot total	Cost($Mil)	$/trenchfoot	$/mile
COMPLETED	Westchester-Yorktown14U2	3700	2.1	$ 568	$ 2,999,040
	Queens-JuniperValley	3400	2.73	$ 803	$ 4,239,840
IN-FLIGHT	StatenIsland-HighviewAve	3400	3	$ 882	$ 4,656,960
	Westchester-Cortlandt73U1	23596	14.9	$ 631	$ 3,331,680
	Westchester-Greenburgh106U2	16013	10.4	$ 649	$ 3,426,720
	Brooklyn-Feeder3028	7399	6.9	$ 933	$ 4,926,240
	Queens-JuniperValleyPhase2	5620	7.9	$ 1,406	$ 7,423,680
	StatenIsland-33R27/30	5900	6.2	$ 1,051	$ 5,549,280
IN-FLIGHT	StatenIsland-VictoryBlvd/TravisAve	N/A(inexistingconduit)	2.2	N/A	n/a

Total costs (for jobs with Trench Foot amounts)	$	54.13	Million
Total Trench Feet		69,028	feet
Cost / Trench Foot	$	784.17	$/trenchfoot
Blended Cost / Mile	$	4,140,442	$/mile

Project Risks and Mitigation Plan

Risk 1:

Inability to achieve scale and standardization. The second substantial risk to the program is not being able to execute the engineering and/ or construction at the planned scale, relying on existing resources as currently organized. This could have additional consequences in terms of standardization of design and equipment used, or in the construction methods and techniques used. Without engineering and construction resources scaled to scope, there will be risks to current construction costs, future repair, and maintenance costs (due to potential lack of standardization in engineering, design, and construction). This could significantly alter the project costs.

Mitigation plan 1:

This risk can be mitigated by deploying a dedicated team. This dedicated team would be scaled to scope and bring about a specific set of knowledge drawn from peer utility undergrounding programs and previous projects completed at Con Edison.

Technical Evaluation / Analysis

Con Edison developed a quantitative model (OHPOT) and the qualitative justification for this program. This analysis reflects a combination of environmental, demographic, and system performance data to determine segment rankings for undergrounding. The investigation calculates the implied improvement of total system restoration from previous storms (such as Isaias). This analysis is flexible such that it can be updated over time with tree density / hazard tree data, socio-economic data, and major storm restoration performance. The focus of this analysis and justification was on improving system resilience which is quantitatively reflected by customer minutes of interruption (CMI) following major events and the customer experience.

This OHPOT application has been updated to identify projects and prioritize them for engineering review as described in the Work Description section of this White Paper.

Project Relationships (if applicable)

To maximize benefit, this program should be incorporated with existing hardening and resiliency capital programs and customer engagement initiatives. The undergrounding program will entail involvement and leadership from a broad cross section of the Company, from engineering to customer outreach to regulatory and legal. Establishing a dedicated team within Con Edison to spearhead this program may be desired.

3. Funding Detail ($000)

2020-2024 Actual/Forecast Spend

	Actual 2020	Actual 2021	Actual 2022	Actual 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$14	$3,743	$1,486	$11,969	N/A	$25,000

2025-2029 Request:

Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$60,000	$70,000	$100,000	$103,000
Labor	$0	$8,126	$9,480	$13,543	$13,949
M&S	$0	$11,077	$12,842	$18,346	$18,896
Contract Svcs.	$0	$24,726	$28,847	$41,210	$42,446
Other	$0	$0	$0	$0	$0
Overheads	$0	$16,141	$18,831	$26,902	$27,709

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$563,500	$653,100	$757,100
Basis for funding direction:	Annual inflation-related increases estimated (3%)	Annual inflation-related increases estimated (3%)	Annual inflation-related increases estimated (3%)

Non-Network Resiliency Program

Electric Operations / Electric Distribution
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Non-Network Resiliency Program	
Project/Program Manager: Frantz Phar	**Project/Program Number (Level 1):** 27207976, 27207998, 27207999, 27208000, 27208001
Status: ☐ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☒ **On-going (Programs Only)**	
Estimated Start Date: Ongoing	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $60,600 **O&M:** $0	

Work Description:
The overhead distribution system is comprised of non-network circuits, including primarily 4kV primary grids and 4kV, 13kV, and 27kV auto loops, and 33 kV circuits. The Climate Change Vulnerability Study concluded that Con Edison's overhead distribution system is primarily vulnerable to wind and ice, with additional vulnerabilities from increased frequency and intensity of storms and from heat. Increased temperatures can lead to line sag, presenting safety concerns in areas with vegetation clearance limitations. The overhead distribution system is also at risk of damage from high winds, wind-blown debris, downed trees, and ice during storms. Over the past two decades, New York has experienced multiple significant storm events – both hurricanes and nor'easters – that brought high winds which downed trees and overhead facilities, resulting in widespread power outages. Climate science projects that such storms will become both more frequent and more intense.

The Company follows two primary approaches to strengthening the non-network system: (1) addressing primary reliability, which involves replacing overhead and underground feeder cables which connect the distribution system to the substations, (2) replacing portions of the open wire system and failure prone aerial cable. The specific investment options included under the Non-Network Resiliency program to accomplish these goals include:

- **Improving Source Reliability** – The non-network system is supplied by a combination of underground and aerial feeder cable systems. In areas where poor performing vintages of aerial and underground cable (PILC, Okonite etc.) leave our customers vulnerable to outages, we will proactively replace the cable with more reliable alternatives. We will also introduce a second primary source to 4kV Unit Substations and install Automatic Transfer Switches (ATSs).
- **Replacing Open Wire Conductors –** Replace portions of the open wire system, particularly long spans (greater than 1000') with no load and single-phase with aerial and/or spacer cable. Replace sections of failure prone cables on Staten Island's 33kV system.

The Non-Network Resiliency program is part of the comprehensive set of strategies included in Con Edison's Climate Vulnerability and Resiliency Plan (the Plan) to address the vulnerabilities of the

electric system to the impacts of climate change – from heat/temperature variable, flooding (caused by sea-level rise, storm surges or heavy precipitation), or extreme events (such as hurricanes, nor'easters, or heat waves) – identified in the Climate Change Vulnerabilities Study (CCVS or the Study). These strategies were developed by following Con Edison's Resilience Management Framework to identify investments that enable Con Edison to (1) better withstand changes in climate (by avoiding outages), (2) absorb impacts from outage-inducing events (by limiting the number of customers impacted or improving the customers' ability to cope with the outage), and (3) recover quickly (by restoring service more quickly).

The investments in the overhead distribution system under the Non-Network Resiliency Program are focused on hardening this system to increase the system's ability to withstand the impacts of storms, including projections of more frequent and more intense storms driven by climate change. Work under this program is prioritized within each operating area, with priorities based on a combination of the use of the Overhead Program Optimization Tool (OHPOT) and in-depth engineering analysis of individual circuits to identify and ranking potential circuits for hardening by ranking the feeders based on statistics and historical information about the feeder. The statistics provided by OHPOT are primarily based on the Outage History (PSC Outage Database) and consist of the number of outage events for the feeder, and customers impacted. Additional information that is provided which can help determine the appropriate solution includes the available fault current, the length of the segment and links to feeder prints. In late 2021, Environmental Justice (EJ) metrics were added as an input. OHPOT ranks feeders for investment based on these statistics, then these rankings are evaluated and adjusted by additional engineering analysis, as needed.

The number of circuits initially identified for resiliency enhancements under this program and by region, are summarized below. Each region evaluates capital work priorities annually and creates specific work plans accordingly.

Region	Number of Loops or Circuits In Scope for Aerial Cable Installation	Length of Open Wire Cable to be Replaced with Aerial Cable	Number of ATS Installations In Scope
Brooklyn/Queens	18 (27 kV autoloops)	32.2 miles	0
Bronx/Westchester	66 (13 kV autoloops)	57.8 miles	30 - 40
Staten Island	11 (33kV circuits)	13.3 miles	0
Totals	90 circuits	103.3 miles	30 - 40

On average, the resiliency-related program work targeted for completion annually, by region, varies from year-to-year. The average number of miles targeted annually is below. These annual plans will be re-evaluated each year and may be adjusted due to system conditions; however, all work in scope is projected to be completed within 20 years. Bronx/Westchester plans to install three Automatic Transfer Switches during this rate period.

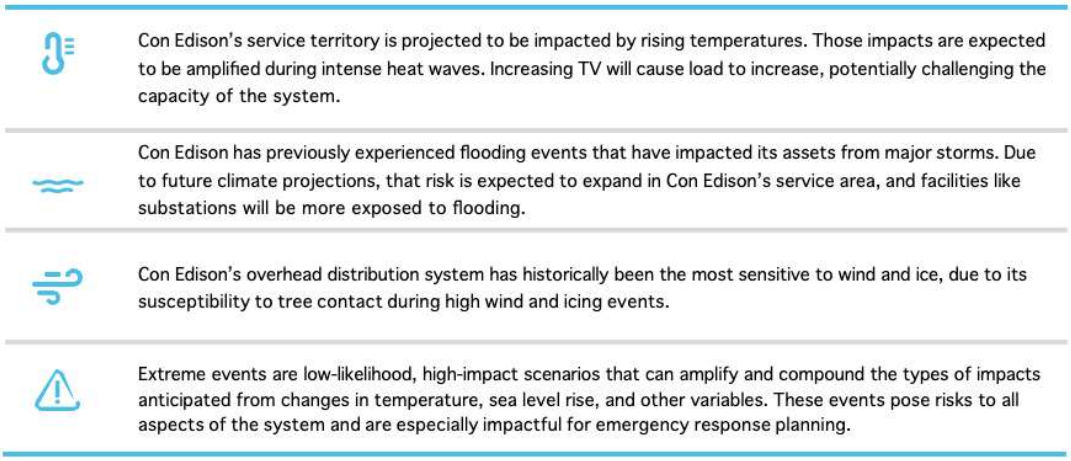
Region	*Average* Length of Aerial Cable to be Installed Annually (Miles)	*Average* Number of Automatic Transfer Switches to be Installed Annually
Brooklyn/Queens	2.0 miles	–
Bronx/Westchester	3.5 miles	3
Staten Island	1.1 miles	–

Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback

from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.



Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The primary vulnerability of the overhead non-network system identified by the Study is risk to system failures resulting from increases in wind and ice, with additional vulnerability from extreme storms, and heat also identified. For all of these climate-driven hazards, the common failure mode is contact – conductors, poles, or other overhead equipment – with vegetation, wind-blown debris, nearby structures, or the ground.

The Con Edison Climate Change Vulnerability Studies project increases in average and maximum air temperatures throughout the century relative to historical conditions, with the 2023 Study projecting that temperatures will increase faster than projected in the 2019 Study. By all measures evaluated in the Studies – maximum daily temperature, number of days per year in which maximum temperature exceeds 95°F, and number of days per year the daily average temperature exceeds 86°F – climate-related increases in heat are projected to occur roughly a decade faster than projected in the first Study.

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Annual mean (mph)	14.0	17.6	18.1	19.2	20.1	18.5

Extreme storms such as hurricanes can cause wind speeds to increase far beyond typical average speeds. Wind speeds of the most intense hurricanes are projected to increase. Freezing rain frequency and radial icing are also projected to increase, although the magnitude of the trend remains highly uncertain due to the specific atmospheric conditions required for ice storms to occur.

Con Edison's service area experiences a range of precipitation types, including rainfall and frozen precipitation (i.e., snow, sleet, and freezing rain). The region has experienced several tropical cyclones producing heavy precipitation over the last century. For example, in 2011, Hurricane Irene produced up to 12 inches of rain in the service area, with nearly 7 inches in Central Park. More recently, remnants of Hurricane Ida in 2021 brought over 7 inches of rain to Central Park. Alternatively, nor'easters have brought some of the heaviest snowfall on record to New York City, along with freezing rain; the January 2021 nor'easter accumulated up to 2 feet of snow in New York City.

Climate change is projected to drive heavier precipitation events because a warmer atmosphere holds more water vapor and provides more energy for storms, among other factors. Looking forward, projections show climate change could drive stronger and more frequent storms in the region, bringing heavy precipitation, wind, and storm surge. Tropical cyclone rainfall totals are projected to increase by approximately 10%-15% in the North Atlantic basin by the late 21st century. In addition, extratropical cyclones could become 5%-25% more wet in the future relative to present day. In contrast, climate change could reduce the frequency of snowfall and other frozen precipitation in future decades. Projections in the Study show that heavy precipitation in the service area could increase throughout the century relative to the baseline.

Variable	Study	Baseline	2030	2040	2050	2080
Annual days with precipitation exceeding 2 inches	Current Study	3 days	4 days	4 days	5 days	6 days
	2019 CCVS	3 days	4 days	4 days	4 days	5 days

These potential changes in wind, precipitation, and ice present an especially large risk to overhead distribution equipment. Overhead distribution assets, including conductors, attachments, and cross-arms, are built to withstand defined design tolerances for combined ice and wind loading, but they are frequently adjacent to neighboring vegetation that may be downed during these events. Fallen vegetation and wind-blown debris can come into contact with lines and cause them to disconnect, fall, or even lead to pole collapse, especially older poles or those with existing damage. This can result in asset failure, leading to outages and incurring restoration costs.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

The investments made in the overhead distribution system under this program proactively increase Con Edison's resiliency. Replacing open wire cables with Aerial cable "hardens" the overhead system by eliminating current vulnerabilities to failures due to heat, wind, ice, and storms, reducing the risk of outages. Previous post-storm reviews of the overhead distribution system have shown that Aerial cable is significantly more reliable than open wire conductors. The investments made in the overhead distribution system under this program proactively increase Con Edison's resiliency in three of these areas.

Adding a second primary source in 4kV grids by installing Automatic Transfer Switches (ATS) limits the number of customers that are impacted by outage events that do occur, mitigating the impacts of outage-inducing events.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The company is committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This

tracking process will provide data and allow the Company to evaluate the benefits of its investments to customers in DACs and revise its investment approach if needed.

The Company has also formed an Environmental Justice Working Group under an executive committee and plans to release a finalized Environmental Justice Policy Statement in 2023 to apply an equity lens to resilience-driven investments. Key components of the upcoming policy statement include:

- Operations will not disproportionately burden DACs.
- Con Edison will work to understand DAC concerns.
- Clean energy investments will benefit DACs.
- Con Edison will provide opportunities for employment in the clean energy future.

These equity considerations will help inform resilience plan investments moving forward.

Impact on Greenhouse Gas (GHG) Emissions
The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Non-Network Resiliency program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Non-Network Resiliency Program reduces the need for field visits by eliminating outages through system hardening and by eliminating the extent of outages, i.e., the number of circuits forced out and the number of customers impacted by individual failures. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment
The (program name) program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)
This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)"

The Non-Network Resiliency Program provides resilient energy delivery by accelerating investments in reliability to increase the ability of the overhead distribution system to withstand increases in climate-driven changes in weather events.

Impact on Company Risk Mitigation Activity
Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con

Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Non-Network Resiliency Program mitigates the risk of increased outages on the overhead, non-network system from climate change, customers by hardening the overhead distribution system and by limiting the number of customers impacted by network failures and enabling faster network restoration.

2. Supplemental Information

Alternatives
The alternative to making the investments in the overhead distribution system proposed in the Non-Network Resiliency Program, is to choose not to proactively harden Con Edison's overhead distribution system for projected climate changes. This alternative does not meet the requirements of the Act to develop "… dedicated storm hardening programs … to reduce damage and costs from future weather events, as well as facilitate prompt restoration times."

Risk of No Action
The Climate Change Vulnerability Study concluded that Con Edison's overhead distribution system is vulnerable to risk of damages from extreme weather events like those that have been experienced in recent history. Modeling performed by climate science experts with input from Con Edison subject matter experts determined that the electric system is most vulnerable to climate-induced changes in temperature/humidity and sea level rise. The Study also confirmed that a growing body of scientific evidence supports the conclusions that projected climate changes project these extreme storm events to be likely to increase in frequency and intensity in the future. Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode people's ability to cope with and recover from the impacts and that disadvantaged communities are the least able to recover.

Without the proposed resiliency investments in the non-network system, Con Edison's customers remain more vulnerable to both the short-term risks (of electrical outages) and long-term risks of not recovering from the effects of climate change.

Non-Financial Benefits
The improvements made in the overhead distribution system under this program proactively increase Con Edison's resiliency by reducing outages, limiting the number of customers impacted by customers, and facilitating faster system recovery.

Replacing feeder cables and open wire cables "hardens" the overhead system by eliminating current vulnerabilities to failures due to both heat and storms, reducing the risk of outages. Other program investments – e.g., reconfiguration of autoloops, spurs, and 4kV feeders, the addition of supply feeders to URD developments with Automatic Transfer Switches (ATS) – limit the number of customers that are impacted by outage events, and still other investments facilitate quicker system recovery – including, installation of breakaway service connectors, reconfiguration of 13kV autoloops, and relocation of 33kV feeders installed in Staten Island Railroad right-of-ways.

Summary of Financial Benefits and Costs
1. Cost-benefit analysis
A projected increase in severe storm frequency (5–20% per 1°C warming) and intensity (2-5%) due to climate change is expected to magnify, and considerably impact the resilience of Con Edison's

overhead distribution system. The system faces multiple threats due to shifting weather patterns. strong winds heighten the risk of conductors contacting vegetation or debris. Moreover, extended periods of extreme heat can lead to sagging in overhead distribution conductors, impacting older cable vintages' performance. Additionally, heavy rains can loosen soil, resulting in uprooted trees that interfere with conductors.

Con Edison is expecting a significant rise in storm-related conditions that would result in damage to the thousands of miles of overhead cable annually, resulting in significant customer outages. To combat this, the replacement of 103.5 miles of overhead conductors with robust high-strength aerial cables is projected to prevent around 10,000 customer outages each year based on historical performance of targeted circuits. The investment in the aerial cable upgrades, as part of the non-network resiliency program, is estimated to cost on average about $4,800 per affected customer, based on preliminary estimates for the proposed scope of work. Furthermore, approximately 58% of non-network customers connect to the 4kV system, which is similarly susceptible to storm-related climate impacts. To enhance this system's resiliency, particularly in the Bronx and Westchester areas, the installation of 30-40 Automatic Transfer Switches (ATS), including a new 4-Way ATS switch, is planned. These upgrades will improve resiliency for half of the overhead customers, significantly mitigating the risk of outages or blackouts in 4kV grids.

2. Major Financial Benefits
N/A

3. Basis for estimate
The estimated annual cost of upgrading the candidate non-network circuits to install Aerial cable and Automatic Transfer Switches, by region, is below. Annual inflationary cost increases of 3% are assumed.

Cost of installing Aerial Cable	Cost/mile (2023 $000)	Miles Installed 2025-2029	2025 Miles	2026 Miles	2027 Miles	2028 Miles	2029 Miles	2025-2029	2025	2026	2027	2028	2029
Brooklyn/Queens	$ 2,600	9.5	0.0	2.0	2.3	2.2	1.5		$ -	$ 5,682	$ 6,731	$ 6,631	$ 4,657
Bronx/Westchester	$ 986	16.5	0.0	2.5	3.0	4.0	4.5		$ -	$ 2,694	$ 3,330	$ 4,574	$ 5,300
Staten Island	$ 2,335	5.7	0.0	1.0	1.0	1.2	1.2		$ -	$ 2,551	$ 2,628	$ 3,248	$ 3,345
		31.7	0.0	5.5	6.3	7.4	7.2	$ 51,370	$ -	$ 10,928	$ 12,688	$ 14,452	$ 13,302
Cost of installing ATS	Cost/ATS (2023 $000)	ATS Installations 2025-2029	2025 ATSs	2026 ATSs	2027 ATSs	2028 ATSs	2029 ATSs						
Bronx/Westchester	$ 687	17	0	3	3	3	3	$ 9,427	$ -	$ 2,253	$ 2,321	$ 2,391	$ 2,462
	TOTAL ESTIMATED COST							$ 60,797	$ -	$ 13,181	$ 15,009	$ 16,843	$ 15,764

Project Risks and Mitigation Plan
Risk 1: Equipment Availability
In past years, equipment availability has been challenged. The work proposed under this program would be impacted by equipment manufacturing shortages or delivery issues.

Mitigation Plan 1:
We continue to work with manufacturers, stores, and supply chain to maintain inventory and anticipate requirements prior to project commencement.

Risk 2: Storms and ICS Deployments
Storms present a risk as contractors used to supplement the field forces for construction may be called to assist in storm impacted regions.

Mitigation Plan 2:
We maintain timely release of layouts and work requests and active management of our projects and resources to allow us to maintain contractors on site.

Technical Evaluation / Analysis
N/A

Project Relationships (if applicable)
N/A

3. Funding Detail ($000)

Historic Spend

	Actual 2020	Actual 2021	Actual 2022	Actual 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$0	$0	$0	$0	N/A	$0

2025-2029 Request:

Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$13,172	$14,954	$16,774	$15,700
Labor	$0	$4,120	$4,834	$5,500	$5,281
M&S	$0	$4,235	$4,764	$5,316	$4,903
Contract Svcs.	$0	$2,892	$3,271	$3,663	$3,385
Other	$0	$942	$955	$1,039	$970
Overheads	$0	$982	$1,129	$1,256	$1,161

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$78,300	$73,400	$54,800
Basis for funding direction:	Similar work scopes with inflationary increases in cost (3%)	Similar work scopes with inflationary increases in cost (3%)	Work scopes ramping down with inflationary increases in cost (3%)

Non-Network Resiliency Cutout Upgrades

Electric Operations / Electric Distribution
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Non-Network Resiliency Cutout Upgrades	
Project/Program Manager: Kevin Oehlmann	**Project/Program Number (Level 1):** 27207997, 27208006, 27208007
Status: ☐ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☒ **On-going (Programs Only)**	
Estimated Start Date: Ongoing	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $10,000 **O&M:** $0	

Work Description:
The Climate Change Vulnerability Study concluded that Con Edison's overhead distribution system is vulnerable to future increases in heat waves and increased frequency and intensity of storms from climate change. The overhead distribution system is also at risk of damage from high winds, wind-blown debris, downed trees, and ice during storms.

Most of Con Edison's non-network system is comprised of 4 kV primary grids and 4/13/27 kV autoloops. The 4 kV primary grids consist of multiple 4 kV feeders fed from multiple stations connected in parallel to feed customer loads. Autoloops consist of two feeders with multiple reclosers connected via a normally open tie recloser. Typically, if there is a fault on either feeder, the reclosers re-configure such that the two devices closest to the fault open while all others are closed. A typical non-network circuit runs for several miles. Without reclosers that can automatically re-configure the system to isolate a fault, all customers fed through the circuit would lose service from a single event, such as a downed tree during a storm.

The Non-Network Resiliency Cutout Upgrade program increases the resiliency of the distribution system by expanding the deployment of reclosers on the non-network system to limit the extent of the impacts from outage-inducing events on spurs. This program installs automatic, Trip Saver reclosures at locations with less than 6 kA of available fault current and Single Triple Single (STS) reclosers (also automatic and fuse-less) at locations with between 6 kA and 15 kA of available fault current. Traditional cutouts with fuses are more likely to lead to extended outages on a spur during a high wind event than cutouts with Trip Saver reclosers and poles with STS reclosers. After a traditional cutout operates, the fuse needs to be replaced before service can be restored. Reclosers, on the other hand, can be programmed to close and reconnect the circuit for a pre-determined number of operations, automatically shortening the length of time that the circuit is out of service. This capability is most beneficial during storms with high winds that often cause temporary faults due to tree contact and contact between live phase conductors. Expanded deployment of reclosers on spurs will reduce the number of outages caused by these temporary faults and shorten many of the outages that cannot be avoided, as resources are able to focus on those. Additionally, installation of reclosures on non-network circuits facilitate the addition of branch protection technology that enables greater

coordination of the devices and reduces the number of customers affected by faults at the end of a radial spur line.

The Non-Network Resiliency Cutout Upgrade program is part of the comprehensive set of strategies included in Con Edison's Climate Vulnerability and Resiliency Plan (the Plan) to address the vulnerabilities of the electric system to the impacts of climate change identified in the 2019 and 2023 Climate Change Vulnerabilities Studies (CCVS, the Study, or the Studies). The Non-Network Resiliency Cutout Upgrade program substantially increases the resiliency of the system to mitigate the impacts of climate-driven outage events and limit the impact to customers, by reducing the number of customers experiencing outages.

Given the potential impacts of projected climate changes on this system, the Company plans to extend recloser capabilities throughout the non-network system. Seventy-seven (77) automatic reclosers have been installed on the non-network system under this program since 2021, and the Company is targeting similar levels of recloser installations annually going forward. The specific work required to install these switches varies by location. In some cases, replacement of cutouts with an STS recloser requires pole replacement. In locations in which Trip Savers are installed, crossarms may need to be replaced and new cutouts installed. Each device needs to be programmed and tested by Con Edison technicians before it can be placed in service.

There are over 650 locations where cutouts with fuses are currently installed that have experienced three or more outages since January 1, 2017. Cutout upgrades will be prioritized using Con Edison's Overhead Program Optimization Tool (OHPOT) based on high outage event counts and high customer outage counts. OHPOT is used to support prioritization of the cutout locations that the Company is targeting to upgrade. Trip Savers will be installed on circuits with fault currents less than or equal to 6 kA, and reclosers will be installed on circuits with fault currents greater than 6 kA and less than or equal to 15 kA.

Region	Cutouts to be Upgraded*	Estimated Number of TripSavers to be Installed	Estimated Number of Reclosers to be Installed
Brooklyn/Queens	24	4	20
Bronx/Westchester	224	126	98
Staten Island	19	11	8
All Regions	**267**	**141**	**126**

Given the number of devices to be installed, Brooklyn/Queens is projected to have all devices installed at the identified locations by the end of 2027 and Staten Island will have all devices installed at the identified locations by the end of 2026. Bronx/Westchester is projected to complete all cutout upgrades at the 224 locations identified by the end of 2031.

Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.

	Con Edison's service territory is projected to be impacted by rising temperatures. Those impacts are expected to be amplified during intense heat waves. Increasing TV will cause load to increase, potentially challenging the capacity of the system.
	Con Edison has previously experienced flooding events that have impacted its assets from major storms. Due to future climate projections, that risk is expected to expand in Con Edison's service area, and facilities like substations will be more exposed to flooding.
	Con Edison's overhead distribution system has historically been the most sensitive to wind and ice, due to its susceptibility to tree contact during high wind and icing events.
	Extreme events are low-likelihood, high-impact scenarios that can amplify and compound the types of impacts anticipated from changes in temperature, sea level rise, and other variables. These events pose risks to all aspects of the system and are especially impactful for emergency response planning.

Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The primary vulnerability of the overhead non-network system identified by the Study is risk to system failures resulting from increases in wind and ice, with additional vulnerability from extreme storms, and heat also identified. For all of these climate-driven hazards, the common failure mode is contact – conductors, poles, or other overhead equipment – with vegetation, wind-blown debris, nearby structures, or the ground.

The Con Edison Climate Change Vulnerability Studies project increases in average and maximum air temperatures throughout the century relative to historical conditions, with the 2023 Study projecting that temperatures will increase faster than projected in the 2019 Study. By all measures evaluated in the Studies – maximum daily temperature, number of days per year in which maximum temperature exceeds 95°F, and number of days per year the daily average temperature exceeds 86°F – climate-related increases in heat are projected to occur roughly a decade faster than projected in the first Study.

Variable	Study	Baseline	2030	2040	2050	2080
Highest annual maximum daily temperature	Current Study	97°F	103°F	104°F	106°F	112°F
	2019 CCVS	97°F	101°F	103°F	104°F	108°F
The number of days per year in which maximum temperatures exceed 95°F	Current Study	4 days	17 days	27 days	32 days	69 days
	2019 CCVS	4 days	11 days	18 days	23 days	47 days
The number of days per year in which daily average temperatures exceed 86°F	Current Study	3 days	16 days	22 days	31 days	68 days
	2019 CCVS	3 days	11 days	16 days	21 days	45 days

High temperatures can cause overhead distribution lines to experience sagging and loss of material strength. Line sagging reduces the clearance between overhead assets and surrounding vegetation, which can increase the potential for contact with vegetation, leading to asset failure and safety risks. Derating lines helps mitigate the risk of line sag but could necessitate adding capacity to meet demand.

Wind and ice have historically been difficult to model due to their highly localized nature. To inform this Study, Con Edison sought the best available information by acquiring an additional dataset from MIT, which covers the Northeast, and provides insight into future wind speeds and radial icing potential. This data and other studies demonstrate that wind speeds will likely increase, and the risk of ice accumulation on wires (radial icing) will remain. The dataset developed by MIT covers the Northeast and shows the 2025-2041 projected and baseline observed annual maximum and average wind speeds at Central Park, JFK, and LaGuardia.

	Central Park		JFK		LaGuardia	
Wind Speed	1-min Baseline	MIT Projection	1-min Baseline	MIT Projection	1-min Baseline	MIT Projection
Annual maximum (mph)	51.0	60.2	46.1	57.5	55.0	62.4
Annual mean (mph)	14.0	17.6	18.1	19.2	20.1	18.5

Extreme storms such as hurricanes can cause wind speeds to increase far beyond typical average speeds. Wind speeds of the most intense hurricanes are projected to increase. Freezing rain frequency and radial icing are also projected to increase, although the magnitude of the trend remains highly uncertain due to the specific atmospheric conditions required for ice storms to occur.

Con Edison's service area experiences a range of precipitation types, including rainfall and frozen precipitation (i.e., snow, sleet, and freezing rain). The region has experienced several tropical cyclones producing heavy precipitation over the last century. For example, in 2011, Hurricane Irene produced up to 12 inches of rain in the service area, with nearly 7 inches in Central Park. More recently, remnants of Hurricane Ida in 2021 brought over 7 inches of rain to Central Park. Alternatively, nor'easters have brought some of the heaviest snowfall on record to New York City, along with freezing rain; the January 2021 nor'easter accumulated up to 2 feet of snow in New York City.

Climate change is projected to drive heavier precipitation events because a warmer atmosphere holds more water vapor and provides more energy for storms, among other factors. Looking forward, projections show climate change could drive stronger and more frequent storms in the region, bringing heavy precipitation, wind, and storm surge. Tropical cyclone rainfall totals are projected to increase by approximately 10%-15% in the North Atlantic basin by the late 21st century. In addition, extratropical cyclones could increase by 5%-25% in water content in the future relative to present day. In contrast, climate change could reduce the frequency of snowfall and other frozen precipitation in future decades. Projections in the Study show that heavy precipitation in the service area could increase throughout the century relative to the baseline.

Variable	Study	Baseline	2030	2040	2050	2080
Annual days with precipitation exceeding 2 inches	Current Study	3 days	4 days	4 days	5 days	6 days
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These potential changes in wind, precipitation, and ice present an especially large risk to overhead distribution equipment. Overhead distribution assets, including conductors, attachments, and cross-arms, are built to withstand defined design tolerances for combined ice and wind loading, but they are frequently adjacent to neighboring vegetation that may be downed during these events. Fallen vegetation and wind-blown debris can come into contact with lines and cause them to disconnect, fall,

or even lead to pole collapse, especially older poles or those with existing damage. This can result in asset failure, leading to outages and incurring restoration costs.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

The investments made in the Non-Network Resiliency Cutout Upgrade program mitigate the impacts of outage-causing events on the non-network system and limit the number of customers impacted by climate change by automatically segmenting circuits and isolating faults to reduce the number of customers impacted from a single point of damage on the system. The installation of additional switches with SCADA communications will facilitate quicker system restoration from outages by more quickly identifying the fault in the Outage Management System (OMS) and updating the operator on the state of the system. In addition to the benefit of automatic operation, having additional devices that can be controlled remotely provides greater flexibility for restoring the system when a failure occurs.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The company is committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits of its investments to customers in DACs and revise its investment approach if needed.

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Impact on Greenhouse Gas (GHG) Emissions

The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Non-Network Resiliency Cutout Upgrade program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Non-Network Resiliency Cutout Upgrade program reduces the need for field visits by limiting the impacts of temporary faults on spurs and, therefore, eliminating field visits related to system restoration. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment

The Non-Network Resiliency cutout upgrade program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)

This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)" (emphasis added)

The Non-network Resiliency with Cutout Upgrade program provides capabilities that enable Con Edison to mitigate the impacts of temporary faults through installation of reclosers and reducing the number of customers impacted.

Impact on Company Risk Mitigation Activity

Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Non-Network Resiliency cutout upgrade program mitigates the risk of increased non-network outages from climate change, while also mitigating risks to customers fed by the overhead distribution system by reducing outages.

2. Supplemental Information

Alternatives
The only alternative to making the proposed investments in Non-Network Resiliency is to rely on existing fuses that operate due to temporary faults. This alternative does not meet the requirements of the Act to develop "… dedicated storm hardening programs … to reduce damage and costs from future weather events, as well as facilitate prompt restoration times."

Risk of No Action
The Climate Change Vulnerability Study concluded that Con Edison's overhead distribution system is vulnerable to risk of damages from extreme weather events like those that have been experienced in recent history. The Study also confirmed that a growing body of scientific evidence supports the conclusions that projected climate changes project these extreme storm events to be likely to increase in frequency and intensity in the future. Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode people's ability to cope with and recover from the impacts and that disadvantaged communities are the least able to recover.

Without the proposed resiliency investments in the non-network system, Con Edison's customers remain more vulnerable to both the short-term risks (of electrical outages) and long-term risks of not recovering from the effects of climate change.

Non-Financial Benefits
Installing reclosers on spurs on the non-network system increases the resiliency and reliability of this system by providing capabilities that enable Con Edison to avoid some outages and restoring the system to normal operations more quickly than would be possible without these investments.

Summary of Financial Benefits and Costs
1. Cost-benefit analysis
Anticipated changes in storm patterns — with increases in frequency by 5–20% per 1°C warming and intensity by 2-5% — pose a significant threat to Con Edison's overhead electric distribution system. This program will invest $10M toward the installation of 141 TripSavers and 126 reclosers across 169 distinct feeders. The projected outcome is a 17% reduction in outage based on historic weather impacts for customers served by these overhead lines, improving the resilience of approximately 328 miles of overhead circuit. This upgrade strategy, focusing on feeders with large customer bases, is expected to avert around 6,000 outages annually, equating to a one-time cost of $1,725 per affected customer based on preliminary estimates for the proposed scope of work, marking it as a cost-effective approach to increase service resiliency for future climate conditions.

2. Major Financial Benefits
N/A

3. Basis for estimate
The estimated cost of upgrading fused cutouts to modern automatic, fuse-less cutouts was based on the actual cost of the 77 similar upgrades made under this program to date. The average cost per cutout upgrade, $46,274, was used to estimate the annual program cost at the target level of cutoff upgrades per year.

The average cost per installation to date are below:

Device Type Installed	Number of Devices Installed to Date	Avg Cost by Device Type	Total Costs by Device Type
Recloser	33	$ 82,757	$ 2,730,990
Tripsaver Recloser	44	$ 9,791	$ 430,784

Based on the number of cutoff upgrades targeted for completion each year in each region, results in the projected program costs below for the rate period.

Total All Regions	2025	2026	2027	2028	2029
TripSavers	0	14	18	22	20
Estimated TripSaver Costs	$ -	$ 449,332	$ 595,044	$ 749,094	$ 701,425
STS Reclosers	0	22	20	18	18
Estimated STS Recloser Costs	$ -	$ 1,989,484	$ 1,862,881	$ 1,726,891	$ 1,778,697
Total Devices Installed	0	36	38	40	38
Total Estimated Costs	$ -	$ 2,438,816	$ 2,457,925	$ 2,475,985	$ 2,480,122

Project Risks and Mitigation Plan

Risk 1:

Material unavailable due to supply chain issues.

Mitigation Plan 1:

Approve multiple suppliers. Order material well in advance of expected installation.

Risk 2:

Delays due resource/support coordination. There are a large number of projects to expand the electric distribution system that may strain existing resources.

Mitigation Plan 2:

Anticipate, schedule and pre-plan with resource requirements such as engineering, labor, and construction and outages to avoid performance delays alignment conflicts. Expand hiring and increase the number of employees over the next few years to be able to handle the increased flow of work.

Technical Evaluation / Analysis

N/A

Project Relationships (if applicable)

N/A

3. Funding Detail ($000)

Historic Spend

	Actual 2020	Actual 2021	Actual 2022	Actual 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$0	$0	$0	$0	N/A	$0

2025-2029 Request:

Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$2,400	$2,500	$2,500	$2,600
Labor	$0	$792	$848	$865	$919
M&S	$0	$760	$786	$778	$797
Contract Svcs.	$0	$498	$516	$509	$523
Other	$0	$234	$228	$227	$237
Overheads	$0	$115	$122	$121	$124

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$4,900	$0	$0
Basis for funding direction:	Projected annual scope plus inflation-related cost increases estimated (3%)		

Critical Facilities Program

Electric Operations / Electric Distribution
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Critical Facilities - Resiliency Program	
Project/Program Manager: Frantz St. Phar	**Project/Program Number (Level 1):** 27208050, 27208051, 27208052
Status: ☐ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☒ **On-going (Programs Only)**	
Estimated Start Date: Ongoing	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $39,000 **O&M:** $0	

Work Description:
Critical Facilities (as defined in Con Edison procedure, CPS 4-5-4) include facilities important to our communities' emergency response (e.g., hospitals, police, fire, EMS operations), facilities housing critical infrastructure (e.g., transportation facilities, water pollution control plants), facilities providing critical public services (e.g., prisons and correction facilities, shelters/care facilities), and residential facilities considered more vulnerable (e.g., developments with large elderly populations, nursing homes, high-rises). The Critical Facilities program enhances the facilities located on or fed via non-network distribution circuits to withstand storms by implementing one or more of the following strategies:

- **Undergrounding of overhead cables and equipment** – While other circuit hardening measures (including those below) can mitigate risks to overhead distribution facilities during storms, undergrounding is the only way to eliminate potential damage from downed trees or large, wind-blown debris.
- **Replacement of open-wire conductors with Aerial Cable** – The non-current carrying steel cable used to suspend the Aerial cable is far stronger and better able to withstand increased impacts from vegetation and wind-blown debris during storms. Additionally, during grey sky conditions after a weather event, insulated Aerial cables may still operate if downed and provide greater levels of public safety when downed compared to open-wire conductors. Aerial cable that are downed will be guarded by site safety personnel.
- **Redundancy of supply through the use of SCADA, loop and bypass design** – Installation of additional source feeders to Critical Facilities to allow the facility to be served by SCADA switching schemes and/or automatic switching devices.
- **Configuration for rapid deployment of emergency backup generation** – For Critical Facilities that do not have permanently installed emergency backup generation, pre-configuring distribution circuits for the deployment of auxiliary generation can significantly reduce the time to provide backup generation to emergency loads within the facility.

There are over 2,000 Critical Facilities served by the non-network distribution system currently. These facilities are tracked through the Company's Emergency Operating System (EMOPSYS so that the status of service to these facilities during emergency events is visible, tracked, and prioritized.

Critical Facilities on the Non-Network System		
A	66	Residential with large elderly or vulnerable
D	28	Dialysis centers
E	173	Elevator (residential, 6-11 stories)
H	36	Hospitals
M	201	Major customers
N	98	Nursing homes
O	268	Office of Emergency Management (OEM) - Police Dept., Fire & EMS, Cooling Centers, Emergency Shelters, Military Bases, Government Agencies, Critical Control Structures)
P	0	Prisons and correctional facilities
R	76	Residential buildings (12 stories or greater)
S	654	Schools and colleges
T	73	Transportation Facilities (Tunnels, bridges, airports, ferry terminals, train facilities, fuel transfer/loading, ports)
U	97	Major utility facilities (electric, gas, water, communications,
W	342	Water pollution control plants, pumping stations
	2,112	
Level 1	816	Critical to Public Health and Safety
Level 2	126	Provide significant public services
Level 3	1,170	Provide public services considered somewhat less critical by government agencies
	2,112	

This program began in Bronx/Westchester in 2020 and expanded to Brooklyn/Queens and Staten Island in 2021. To-date, 14 projects have been completed (or are in progress) under this program to strengthen non-network circuits serving 38 Critical Facilities including:

Brooklyn/Queens	Bronx/Westchester	Staten Island
1 school (shelter)	3 Department of Environmental Protection facilities	2 hospitals
22 Life-saving equipment (LSE)/medical hardship	2 NYC Housing Authority (NYCHA) complexes	1 high school (evacuation center)
1 DOE facility	1 dialysis center	1 NYCHA complex
	2 senior centers/nursing homes	1 Staten Island Rapid Transit Traction Supply Substation
	1 home care center	

Most of the projects have been multi-year with most projects taking 2 to 3 years to complete and half of the projects involving more than one Critical Facility. Total program work to-date and average costs are below: (See attached work paper for additional detail)

Region	Total Number of Projects	Average Cost per Project	Average Cost per Critical Facility	Average Program Spend per Year
Brooklyn/Queens	4	$1,330,557	$221,759	$1,774,075
Bronx/Westchester	7	$924,782	$719,275	$1,618,369
Staten Island	3	$1,464,330	$878,598	$1,464,330
All Regions	14	$1,156,335	$426,018	$4,047,172

Given the projected climate changes with the potential to impact not only the Company's electric delivery systems but many other critical infrastructure supporting the communities in the service territory, the Company realizes that ensuring that availability of the infrastructure and public services provided by the facilities identified as Critical Facilities will be more important than ever, and plans to be proactive in strengthening the electric distribution circuits serving Critical Facilities where beneficial. As noted in the discussion of previous program work, the scope of work needed to strengthen service to each Critical Facility is unique to that facility and the circuits serving it, it is not possible to estimate what a "typical" project would involve, what it might cost, or how long the project may take. The Company proposes to leverage existing Emergency Preparedness coordination

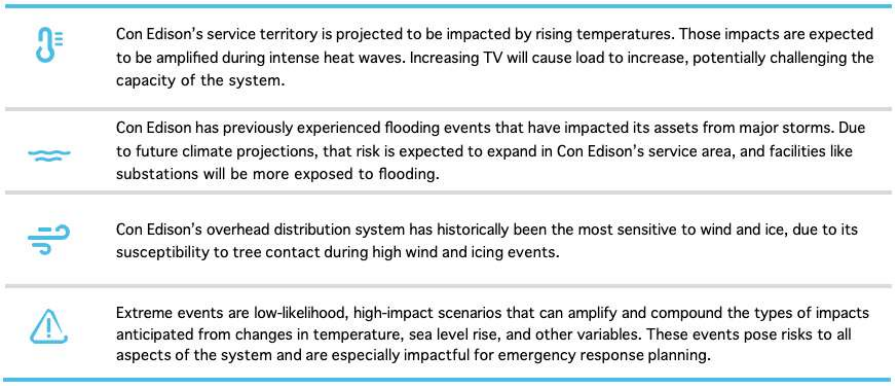
processes to prioritize the resiliency enhancements to be made to circuits serving Critical Facilities, given the program funding.

The Critical Facilities program is part of the comprehensive set of strategies included in Con Edison's Climate Vulnerability and Resiliency Plan (the Plan) to address the vulnerabilities of the electric system to the impacts of climate change – from heat/temperature variable, flooding (caused by sea-level rise, storm surges or heavy precipitation), or extreme events (such as hurricanes, nor'easters, or heat waves) – identified in the 2019 and 2023 Climate Change Vulnerabilities Studies (CCVS, the Study, or the Studies). These strategies were developed by following Con Edison's Resilience Framework and to significantly decrease the risk of losing electrical services during climate-driven storms, while also decreasing the time required to restore service to the facility. The Critical Facilities program increases the resiliency of the upgraded facilities by increasing their ability to withstand climate change impacts without outages and ensuring that they are able to continue providing important community support and services during extreme events.

Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.



Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The Critical Facilities program is focused on strengthening non-network circuits serving Critical Facilities and preventing potential impacts from climate-driven extreme weather events. The primary vulnerability of the overhead non-network system identified by the Study is risk to system failures resulting from increases in wind and ice, with additional vulnerability from extreme storms and heat. For all of these climate-driven hazards, the common failure mode is contact – conductors, poles, or other overhead equipment – with vegetation, wind-blown debris, nearby structures, or the ground.

The Con Edison Climate Change Vulnerability Studies project increases average air temperatures throughout the century relative to historical conditions, with the 2023 Study projecting that temperatures will increase faster than projected in the 2019 Study. By all measures evaluated in the Studies – maximum daily temperature, number of days per year in which maximum temperature exceeds 95°F, and number of days per year the daily average temperature exceeds 86°F – climate-related increases in heat are projected to occur roughly a decade faster than projected in the first Study.

Variable	Study	Baseline	2030	2040	2050	2080
Highest annual maximum daily temperature	Current Study	97°F	103°F	104°F	106°F	112°F
	2019 CCVS	97°F	101°F	103°F	104°F	108°F
The number of days per year in which maximum temperatures exceed 95°F	Current Study	4 days	17 days	27 days	32 days	69 days
	2019 CCVS	4 days	11 days	18 days	23 days	47 days
The number of days per year in which daily average temperatures exceed 86°F	Current Study	3 days	16 days	22 days	31 days	68 days
	2019 CCVS	3 days	11 days	16 days	21 days	45 days

High temperatures can cause overhead distribution lines to experience sagging and loss of material strength. Line sagging reduces the clearance between overhead assets and surrounding vegetation, which can increase the potential for contact with vegetation, leading to asset failure and safety risks. Derating lines helps mitigate the risk of line sag but could necessitate adding capacity to meet demand.

Wind and ice have historically been difficult to model due to their highly localized nature. To inform this Study, Con Edison sought the best available information by acquiring an additional dataset from MIT, which covers the Northeast, and provides insight into future wind speeds and radial icing potential. This data and other studies demonstrate that wind speeds will likely increase, and the risk of ice accumulation on wires (radial icing) will remain. The dataset developed by MIT covers the Northeast and shows the 2025-2041 projected and baseline observed annual maximum and average wind speeds at Central Park, JFK, and LaGuardia.

	Central Park		JFK		LaGuardia	
Wind Speed	1-min Baseline	MIT Projection	1-min Baseline	MIT Projection	1-min Baseline	MIT Projection
Annual maximum (mph)	51.0	60.2	46.1	57.5	55.0	62.4
Annual mean (mph)	14.0	17.6	18.1	19.2	20.1	18.5

Extreme storms such as hurricanes can cause wind speeds to increase far beyond typical average speeds. Wind speeds of the most intense hurricanes are projected to increase. Freezing rain frequency and radial icing are also projected to increase, although the magnitude of the trend remains highly uncertain due to the specific atmospheric conditions required for ice storms to occur.

Con Edison's service area experiences a range of precipitation types, including rainfall and frozen precipitation (i.e., snow, sleet, and freezing rain). The region has experienced several tropical cyclones producing heavy precipitation over the last century. For example, in 2011, Hurricane Irene produced up to 12 inches of rain in the service area, with nearly 7 inches in Central Park. More recently, remnants

of Hurricane Ida in 2021 brought over 7 inches of rain to Central Park. Alternatively, nor'easters have brought some of the heaviest snowfall on record to New York City, along with freezing rain; the January 2021 nor'easter accumulated up to 2 feet of snow in New York City.

Climate change is projected to drive heavier precipitation events because a warmer atmosphere holds more water vapor and provides more energy for storms, among other factors. Looking forward, projections show climate change could drive stronger and more frequent storms in the region, bringing heavy precipitation, wind, and storm surge. Tropical cyclone rainfall totals are projected to increase by approximately 10%-15% in the North Atlantic basin by the late 21st century. In addition, extratropical cyclones could increase by 5%-25% in water content in the future relative to present day. In contrast, climate change could reduce the frequency of snowfall and other frozen precipitation in future decades. Projections in the Study show that heavy precipitation in the service area could increase throughout the century relative to the baseline.

Variable	Study	Baseline	2030	2040	2050	2080
Annual days with precipitation exceeding 2 inches	Current Study	3 days	4 days	4 days	5 days	6 days
	2019 CCVS	3 days	4 days	4 days	4 days	5 days

These potential changes in wind, precipitation, and ice present an especially large risk to overhead distribution equipment. Overhead distribution assets, including conductors, attachments, and cross-arms, are built to withstand defined design tolerances for combined ice and wind loading, but they are frequently adjacent to neighboring vegetation that may be downed during these events. Fallen vegetation and wind-blown debris can come into contact with lines and cause them to disconnect, fall, or even lead to pole collapse, especially older poles. This can result in asset failure, leading to outages and incurring restoration costs.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

The strategies developed using this framework and included in the Critical Facilities program implement measures that decrease the risk of outages to non-network overhead circuits serving Critical Facilities and that facilitate a more rapid restoration of service to the system. Hardening these circuits significantly reduces the risk of outages at the facility, freeing Company response resources to restore other portions of the system and providing confidence that these facilities will continue to function and support the community during extreme events.

Extreme events can present outsized risks compared to chronic events—risks that, in some cases, also extend to larger geographic areas. For example, impacts from hurricanes can overwhelm multiple facets of Con Edison's system and surrounding communities. The combination of governmental, technological, and financial systems based in the Con Edison service territory increases the potential impacts of risks associated with extreme events related to climate change beyond the typical outage risks. While the City of New York has primary responsibility for coordinating resident emergency response efforts, Con Edison can play a role in decreasing customer impacts and increasing customer resilience. This includes helping customers cope with reduced energy service if an extreme event leads to prolonged outages (e.g., supporting on-site energy storage, access to locations in the community with power).

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigating the impacts from outage-inducing events by minimizing disruptions to customers, and responding rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The company is committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits of its investments to customers in DACs and revise its investment approach if needed.

The Company has also formed an Environmental Justice Working Group under an executive committee and plans to release a finalized Environmental Justice Policy Statement in 2023 to apply an equity lens to resilience-driven investments. Key components of the upcoming policy statement include:

- Operations will not disproportionately burden DACs.
- Con Edison will work to understand DAC concerns.
- Clean energy investments will benefit DACs.
- Con Edison will provide opportunities for employment in the clean energy future.

These equity considerations will help inform resilience plan investments moving forward.

Impact on Greenhouse Gas (GHG) Emissions

The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Critical Facilities program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small, but positive impact on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Critical Facilities program may reduce the need for field visits by investing in circuit hardening that prevents outages at Critical Facilities or through installation of technology that will automatically or remotely restore service. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment

The Critical Facilities program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)
This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and *resilient* (able to prevent, mitigate, and recover from events.)"

The Critical Facility program provides resilient energy by:

- Preventing the risk of outage events at Critical Facilities through investments in additional storm hardening measures.
- Mitigating the impacts of potential outages by enabling quick-connect backup generation.
- Enabling communities to respond to climate-driven weather events and provide essential services to community residents.

Impact on Company Risk Mitigation Activity
Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Critical Facilities program mitigates the risk of increased outages at Critical Facilities by hardening the overhead distribution circuits serving the facility.

2. Supplemental Information

Alternatives
The entire focus of the Critical Facilities program is to significantly decrease the impacts of future weather events on all of the communities that Con Edison serves by enhancing the distribution system serving facilities critical to the community's ability to respond to emergencies and resident's abilities to cope during the event. Investments under this program extend beyond what is typical to meet reliability goals and prioritize the most vulnerable facilities. Alternative solutions for enhancing service to each critical facility are considered (see Work Description above) and engineering evaluations performed to determine the best set of solutions for each situation.

The only alternative that Con Edison has to making investments under this program is to continue making investment decisions for these facilities based solely on established reliability standards. This alternative does not meet the requirements of the Act to develop "… dedicated storm hardening

programs … to reduce damage and costs from future weather events, as well as facilitate prompt restoration times."

Risk of No Action

The Climate Change Vulnerability Study concluded that Con Edison's overhead distribution system is vulnerable to risk of damages from extreme weather events like those that have been experienced in recent history. The Study also confirmed that a growing body of scientific evidence supports the conclusions that projected climate changes project these extreme storm events to be likely to increase in frequency and intensity in the future. Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode the ability of communities and their residents to cope with and recover from the impacts of extreme events, with members of disadvantaged communities the least able to recover.

When there is a weather event that causes power outages, the damage is not limited to the electric system. In these emergency conditions it is important for civic leaders and first responder organizations to be at full capability. Loss of power to first responder facilities can cause a delay in response to emergencies. Designated shelter facilities are an important community resource in such times, and loss of power to these facilities can be a safety concern. Blocked streets, lost power and expensive repairs take their toll on the NYC and Westchester County areas. Loss of power to critical customers such as first responders and designated shelter facilities could increase the impact of these events, hampering the ability to execute a coordinated and timely response and recovery effort.

Without the proposed resiliency investments proposed in the Critical Facilities program, Con Edison's communities and most vulnerable customers who use or are served by the facilities identified as critical are at higher risk of outages from the increasing likelihood and severity of storms driven by climate changes.

Non-Financial Benefits

Investments made under the Critical Facilities program strengthen the distribution system serving community facilities vital to the ability of the community and its residents to cope with and recover from the impact of increasingly frequent and more severe weather events. These enhanced facilities have higher probabilities of maintaining electric service and of being restored more quickly than they would have without these investments. The ability of these Critical Facilities to operate during extreme weather events can, in turn, enhance public health and safety, support the provision of emergency response and vital medical care, and support overall community resiliency.

Summary of Financial Benefits and Costs

1. Cost-benefit analysis

The Critical Facilities program targets investments that bolster the electric distribution system serving essential community facilities. These enhancements are crucial to ensure communities can effectively manage and recover from the more frequent and intense extreme weather events. Facilities upgraded through this program will be more capable of maintaining their electric service or to recover faster post-disaster than those not receiving such investments. These Critical Facilities play a pivotal role during such crises by ensuring public health and safety, facilitating emergency responses, providing vital medical services, and enhancing overall community resilience. While it's challenging for the Company to precisely quantify the benefits these facilities provide to the community, the very act of classifying them as 'Critical' by stakeholders and prioritizing them as such underscores their significant value to the community.

2. Major Financial Benefits

N/A

3. Basis for estimate

Given the projected climate changes with the potential to impact not only the Company's electric delivery systems but many other critical infrastructure supporting the communities in the service territory, the Company realizes that ensuring that availability of the infrastructure and public services provided by the facilities identified as Critical Facilities will be more important than ever and plans to

be more aggressive in strengthening the electric distribution circuits serving Critical Facilities where beneficial. All regions are planning to perform more work during rate years compared to actuals. The forecasted costs for the program during rate years is based on the average annual program costs from 2023-2024, with an ~4% escalation per year for increases in material and labor costs to strengthen the electric system for critical facilities. The Company proposes to work with community leaders and providers of critical infrastructure and services to identify and prioritize the resiliency enhancements to be made to the electric distribution system given the program funding.
Project Risks and Mitigation Plan Risk 1: Resource availability from contractors Mitigation Plan 1: The Company has committed to secure adequate contractor resources to complete the required work. If unable to honor that commitment, Company crews will be diverted to complete the associated projects.
Technical Evaluation / Analysis N/A
Project Relationships (if applicable) Where undergrounding of overhead distribution circuits is selected as the best way to harden service to a Critical Facility against climate-driven storms, the funding for undergrounding the identified circuits will be provided through the Selective Undergrounding program.

3. Funding Detail ($000)

Historic Spend

	Actual 2020	Actual 2021	Actual 2022	Actual 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$1,556	$6,139	$6,189	$9,000	N/A	$9,000

2025-2029 Request:

Total Request by Year:

	2025	2026 (RY1)	2027 (RY2)	2028 (RY3)	2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$9,300	$9,600	$9,900	$10,200
Labor	$0	5,260	5,533	5,786	6,057
M&S	$0	1,591	1,617	1,636	1,643
Contract Svcs.	$0	1,176	1,205	1,228	1,243
Other	$0	732	678	670	667
Overheads	$0	541	568	581	590

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$57,000	$67,300	$79,500
Basis for funding direction:	Annual inflation-related increases estimated (3%)	Annual inflation-related increases estimated (3%)	Annual inflation-related increases estimated (3%)

Substation Enclosure Upgrade Program

Central Operations / Substation Operations
2025-2029

1. Project / Program Summary

Type: ☐ **Project** ☒ **Program**	**Category:** ☒ **Capital** ☐ **O&M**
Work Plan Category: ☐ **Regulatory Mandated** ☒ **Operationally Required** ☐ **Strategic**	
Project/Program Title: Substation Enclosure Upgrade Program - Resiliency	
Project/Program Manager: Shakiera Taylor	**Project/Program Number (Level 1):** 27204330
Status: ☐ **Initiation/Planning** ☐ **In-Progress (Projects Only)** ☒ **On-going (Programs Only)**	
Estimated Start Date: Ongoing	**Estimated Date In Service:** Ongoing
2025-2029 Funding Request ($000) **Capital:** $5,700 **O&M:** $0	

Work Description:
The Substation Enclosure Upgrades program will upgrade selected substation outdoor enclosures throughout the system by providing weatherproof enclosures for switchgear cubicles & relay cabinets. This is typically supplemented with sealing existing metal enclosures with a sealing material (typically Kemper Seal) or providing the installation enclosures as long-term solutions. In some cases, cubicle doors are replaced or refurbished, the enclosure structural supports are reinforced, or other steel/sheet metal work is performed to preclude deterioration of equipment while providing for safe inspection, maintenance, and repairs under most weather conditions.

The installation of the enclosures is a long-term solution to protect relay cabinets & switchgear cubicles from inclement weather and enhance the reliability of the electric system, with installed enclosures projected to last 30 years. The enclosures will consist of a structural frame with a roof and siding to protect the top and upper sides of the cabinets. In some cases, the canopy frames can be mounted onto the existing relay cabinet foundations.

The Substation Enclosure Upgrades program is part of the comprehensive set of strategies included in Con Edison's Climate Vulnerability and Resiliency Plan (the Plan) to address the vulnerabilities of the electric system to the impacts of climate change – from heat/temperature variable, flooding (caused by sea-level rise, storm surges or heavy precipitation), or extreme events (such as hurricanes, nor'easters, or heat waves) – identified in the 2019 and 2023 Climate Change Vulnerabilities Studies (CCVS, the Study, or the Studies). These strategies were developed by following Con Edison's Resilience Management Framework to identify investments that enable Con Edison to better withstand changes in climate (avoiding failures), absorb impacts from outage-inducing events (limiting the number of customers impacted or improving the customers' ability to cope with the outage), and recover quickly (restoring service more quickly and at a lower cost.

The switchgear and relay enclosures to be constructed under this program will decrease the risk of equipment damage and failures from water intrusion during the increased and more severe storms and periods of heavy rainfall projected to result from future climate changes. These equipment failures do not typically result in outages to customers because of the overall robust designs of the transmission

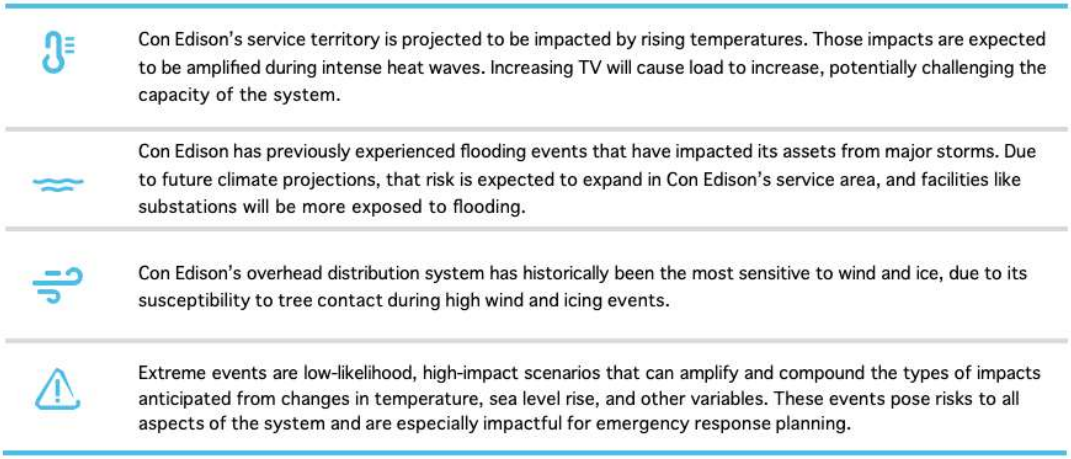
system, but they do decrease the system's resiliency by limiting the ability for the system to withstand additional challenges during extreme weather events.

Specific work plans for work at in-scope substations under this program are developed for each region annually, with work prioritized based on the current conditions of switchgear cubicles and relay cabinets (assessed by visual inspection) and risks of exposure to weather conditions. Work is planned to optimize the time available in planned substation outages and to coordinate with other work planned at the same substation. The actual work performed each year; however, is subject to system conditions that can result in shortening planned outages; in these cases, remaining work may be delayed until a second outage can be planned. The Company is targeting installation of two enclosures each year. This schedule is an appropriate target based on available resources and system outage constraints.

Justification Summary:
Following Superstorm Sandy, Con Edison worked with a Storm Hardening and Resiliency Collaborative to recommend storm hardening investments and one of the recommendations was to conduct a Climate Change Vulnerability Study (CCVS or the Study). The initial Climate Change Vulnerability Study was conducted in 2019 and was updated in 2023. The approach followed a multi-step process that cycled through the steps for each potential climate hazard, incorporating feedback from stakeholders throughout the evaluations. The Study used the best available science to evaluate the sensitivity of Con Edison's electric system to projections of potential climate hazards including:

- **Temperature and humidity** – from heat and coincident high heat and humidity (known as temperature variable or "TV")
- **Flooding** – coastal flooding from sea level rise and/or inland flooding from precipitation
- **Extreme and coincident weather events (Wind and ice)** – hurricanes/wind, extreme heat waves, nor'easters/cold snaps, and multiple concurrent or consecutive extreme events

The hazards that the Study found to pose an elevated risk to Con Edison's assets and operations include heat and humidity, major storms, wind and ice, and extreme events.



Specific projections of future climate conditions, referred to as pathways (Pathways) were incorporated into the Company's forecasting and planning processes – including load forecasting, load relief planning, reliability planning for the sub-transmission and distribution systems, asset management planning, facility energy system planning, planning for emergency preparation and response, and worker safety – through the development of a new Climate Change Planning and Design Guideline document (Guidelines). This document specifies the methodologies to be used to evaluate the vulnerability of electric facilities to projected climate changes and establishes specific design standards to be met for each climate hazard over the useful life of the asset.

The Study identified that Area and Transmission substations were at risk from damage caused by heavy rainfall, often associated with extreme storms. Con Edison's service area experiences a range of precipitation types, including rainfall and frozen precipitation (i.e., snow, sleet, and freezing rain). The region has experienced several tropical cyclones producing heavy precipitation over the last century. For example, in 2011, Hurricane Irene produced up to 12 inches of rain in the service area, with nearly 7 inches in Central Park. More recently, remnants of Hurricane Ida in 2021 brought over 7 inches of rain to Central Park. Alternatively, nor'easters have brought some of the heaviest snowfall on record to New York City, along with freezing rain; the January 2021 nor'easter accumulated up to 2 feet of snow in New York City.

Climate change is projected to drive heavier precipitation events because a warmer atmosphere holds more water vapor and provides more energy for storms, among other factors. Looking forward, projections show climate change could drive stronger and more frequent storms in the region, bringing heavy precipitation, wind, and storm surge. Tropical cyclone rainfall totals are projected to increase by approximately 10%-15% in the North Atlantic basin by the late 21st century. In addition, extratropical cyclones could become 5%-25% more wet in the future relative to present day. In contrast, climate change could reduce the frequency of snowfall and other frozen precipitation in future decades. Projections in the Study show that heavy precipitation in the service area could increase throughout the century relative to the baseline.

Variable	Study	Baseline	2030	2040	2050	2080
Annual days with precipitation exceeding 2 inches	Current Study	3 days	4 days	4 days	5 days	6 days
	2019 CCVS	3 days	4 days	4 days	4 days	5 days

The primary sensitivities of electric assets to projected changes in flooding are:

- Equipment damage: Floodwaters damage electric equipment and decrease the life expectancy of assets. Equipment damage costs Con Edison both capital (needed for repairs) and time (which results in longer outages and can be exacerbated if spare parts are limited). Saltwater spray can also cause arcing and failure of components. In addition, continued exposure to water can rot wooden assets such as poles.
- Equipment corrosion: Sea level rise and coastal storms pose a particular threat to coastal assets due to the corrosive properties of salt water, which can damage electronic components. These impacts may not be immediately evident but can present issues over time that may result in asset failures and outages.
- Soil weakening: Exposure to water can weaken or undermine the foundation of equipment in instances of prolonged inundation or erosion, increasing the overall risk of equipment damage. Increases in the projected flow and magnitude of floodwaters near riverbanks and the coast have the potential to alter and intensify how erosion occurs and may require intervention to avoid assets becoming destabilized or failing.
- Limited accessibility: Flooding presents issues of access. If assets are flooded or surrounded by water at high tide or during storms, it becomes more difficult to access the locations for maintenance and repair.

When choosing resilience strategies to address identified climate vulnerabilities, Con Edison follows a resilience framework that encompasses investments that:

- Prevent climate change impacts by hardening infrastructure
- Mitigate the impacts from outage-inducing events by minimizing disruptions
- Respond rapidly to disruptions by reducing recovery times and costs

The investments planned for the Substation Enclosure Upgrades program are focused on preventing potential water damage to switchgear and relays during storms or periods of heavy precipitation,

increasing the ability of the transmission system to withstand these climate change-driven weather events.

Relationship to Broader Company Plans, Initiatives and the NYS Climate Leadership and Community Protection Act

Impact on Disadvantaged Communities

The resilience strategies included in Con Edison's Resiliency Plan have been chosen in alignment with our Resiliency Framework that provides guidance for developing a comprehensive set of adaptation strategies to mitigate future climate change risks. This comprehensive set of strategies incudes investments that enable Con Edison's electric system to prevent climate change impacts by hardening infrastructure, mitigate the impacts from outage-inducing events by minimizing disruptions to customers, and respond rapidly to disruptions by reducing recovery times and costs.

While the programs included in the Plan are largely focused on withstanding climate changes and avoiding outages, most programs also enable Con Edison to limit outage impacts on customers (i.e., absorb outage impacts), and restore service more quickly than would otherwise have been possible (i.e., recover quickly). Many of the investments proposed to strengthen Con Edison's ability to withstand extreme climate conditions will also, naturally, significantly reduce the risk of outages during "blue sky" conditions.

Disadvantaged communities (DACs) have fewer alternatives during energy system outages and will be more at risk from climate change. Because of this lack of alternatives, resilient and reliable energy service is an important priority for the communities and for Con Edison. Due to the size of Con Edison's electric system and the population density in the City, almost half of Con Edison's system serves at least one DAC. The company has committed to tracking investments that benefit DACs specifically and to measuring and monitoring system performance in DACs and non-DACs. This tracking process will provide data and allow the Company to evaluate the benefits its investments to customers in DACs and revise its investment approach if needed.

The Company has also formed an Environmental Justice Working Group under an executive committee and plans to release a finalized Environmental Justice Policy Statement in 2023 to apply an equity lens to resilience-driven investments. Key components of the upcoming policy statement include:

- Operations will not disproportionately burden DACs.
- Con Edison will work to understand DAC concerns.
- Clean energy investments will benefit DACs.
- Con Edison will provide opportunities for employment in the clean energy future.

These equity considerations will help inform resilience plan investments moving forward.

Impact on Greenhouse Gas (GHG) Emissions

The primary goals of the programs and projects included in the Climate Vulnerability and Resiliency Plan, including the Substation Enclosure Upgrade program, are to withstand, absorb, or recover from the impacts of future climate changes on Con Edison's electric system. While none of the programs are focused on reducing GHG emissions, some of the programs could have small but positive impacts on Con Edison's overall GHG emissions, and none of the programs should negatively impact Con Edison's overall GHG emissions.

All of the programs that prevent or reduce the number of "truck rolls" required to assess, operate, or restore the electric system (i.e., the number of physical trips made by operators, technicians, and other field personnel to physical field locations) will reduce Con Edison's overall GHG emissions by reducing vehicle emissions associated with each field trip prevented. The Substation Enclosure Upgrades program reduces the need for field visits by required to repair switchgear and relay equipment damaged by water intrusion by protecting the equipment from exposure to rain and snow

or ice. Actual program reductions in GHG emissions from reductions in physical trips to the field depend on the number of trips avoided, the miles driven per trip, the type of vehicle, the type of fuel burned, and the condition of the vehicle.

Impact on Clean Energy Commitment
The Substation Enclosure Upgrades program supports Initiative 2 under Pillar 1 of the Clean Energy Commitment, Build the Grid of the Future.

Impact on 5-year and long-range plans (10-year)
This resilience program aligns with and supports Con Edison's integrated strategy, included in the January 2022 Long-Range Plan, focused on four strategic objectives related to Clean Energy, Climate Resilience, Core Service, and Customer Engagement. Con Edison's Climate Resilience strategic objective aims to increase the resilience of the energy infrastructure to adapt to climate change. Furthermore, Con Edison sees the role of utilities as changing from providing, "Universal access to energy that is safe and reliable" to providing, "Universal access to energy that is safe, reliable, and resilient (able to prevent, mitigate, and recover from events.)"

The Substation Enclosure Upgrades program provides resilient energy delivery by preventing equipment failure from water intrusion due to climate-driven extreme storms and heavy precipitation.

Impact on Company Risk Mitigation Activity
Resiliency, in simple terms, can be defined as having the capacity to withstand or to recover quickly from difficulties. While a bit more complex, Con Edison's Resilience Management Framework definition of resilience is very similar – i.e., the Framework identifies resilience strategies as investments that enable Con Edison to withstand changes in climate and avoid outages, absorb impacts from outage-inducing events by limiting the number of customers impacted or improving the customers' ability to cope with outages, recover quickly, and advance to a better state. Both equate resilience with the avoidance or limitation of difficulties or negative consequences – i.e., with the mitigation of risk.

The 2022 Electric Operations Risk Assessment and Mitigation plans include mitigation activities associated with increasing risks of major storms that could damage the Con Edison system and impact customers. Con Edison's comprehensive set of resiliency programs are designed to increase the ability of the electric system to withstand the impacts of climate change, including the increasing risk of storms, and limit potential impacts to customers. The Substation Enclosure Upgrades program mitigates the risk of increased switchgear or relay failures from the impacts of climate change by preventing equipment failure from water intrusion due to climate-driven extreme storms and heavy precipitation.

2. Supplemental Information

Alternatives
Alternative 1: Fully enclose substations.
Reason for rejection: This is not a practical alternative to mitigate potential risks of damage to switchgear and relays from water intrusion during climate-driven increases in storm frequency and severity and more frequent heavy precipitation. Fully enclosing substations would be cost prohibitive and would require the same or greater outages than the current plan, extending the total amount of time required to protect all in-scope switchgear and relays and making Con Edison's transmission system less resilient.

Risk of No Action
Risk 1: Con Edison's transmission system will be less able to withstand the impacts of more frequent and severe weather events driven by climate changes without experiencing switchgear and relay failures resulting from water intrusion. The Climate Change Vulnerability Study concluded that Con

Edison's overhead distribution system is vulnerable to risk of damages from extreme weather events like those that have been experienced in recent history. The Study also confirmed that a growing body of scientific evidence supports the conclusions that projected climate changes project these extreme storm events to be likely to increase in frequency and intensity in the future. Numerous evaluations following actual events have also revealed that the increased frequency of these types of events tends to erode the ability of communities and their residents to cope with and recover from the impacts of extreme events, with members of disadvantaged communities the least able to recover.

Non-Financial Benefits

- Increases the overall resiliency of the transmission system to withstand the impacts of future climate-driven weather events by maintaining the robust, three-contingency design of the system – i.e., by significantly reducing the risk of failure of switchgear and relays due to water intrusion as one of the three "contingencies" that the system is designed for.
- Decreases the probability of outages through a reduction in system failures.

Summary of Financial Benefits and Costs

1. Cost-benefit analysis

N/A

2. Major Financial Benefits

The primary financial benefits of this program are savings associated with not having to replace degraded switchgear and relays that become damaged or degraded from water intrusion. Additional savings stemming from this program include reduced costs associated with equipment trips caused by water intrusion.

3. Basis for estimate

Basis for Estimate for Switchgear Enclosures: This funding request is based on the cost of actual work done in prior years under this program. The average cost per unit is $600K and is budgeted for one unit per year.

Basis for Estimate for Relay Enclosures: This funding request is based on the cost of actual work done in prior years under these programs. The average cost per unit is $600-800k with one enclosure budgeted per year.

Project Risks and Mitigation Plan

Risk 1:

Outage scheduling conflicts with other initiatives.

Mitigation Plan 1:

Outages to be coordinated with the Sequencing Group at System Operations to potentially incorporate other project/programs to avoid conflict with other program/ projects resulting in a more predictable budget and manageable outage scheduling.

Risk 2:

Delays due resources support coordination.

Mitigation Plan 2:

Anticipate, schedule and pre-plan with resource requirements such as engineering, labor, and construction and outages to avoid performance delays alignment conflicts.

Risk 3:

Lack of alignment between resources support and outages.

Mitigation Plan 3:

Anticipate, schedule and pre-plan with resource requirements such as engineering, labor and construction to avoid alignment conflicts with outages.

Technical Evaluation / Analysis N/A
Project Relationships (if applicable) N/A

3. Funding Detail ($000)

2020-2024 Actual/Forecast Spend

	Actual 2020	Actual 2021	Actual 2022	Forecast 2023	Test Year* (O&M Only)	Forecast 2024
O&M	$0	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	N/A	$0
Capital	$0	$0	$0	$0	N/A	$203

2025-2029 Request:

Total Request by Year:

	Request 2025	Request 2026	Request 2027	Request 2028	Request 2029
O&M	$0	$0	$0	$0	$0
Regulatory Asset	$0	$0	$0	$0	$0
Capital (Total)	$0	$1,400	$1,400	$1,400	$1,500
Labor	$0	$80	$80	$80	$84
M&S	$0	$508	$508	$508	$578
Contract Svcs.	$0	$475	$475	$475	$475
Other	$0	$0	$0	$0	$0
Overheads	$0	$337	$337	$337	$363

*The test year runs from 10/1/2023 to 9/30/2024

Long Range Funding Projections

	2030-2034	2035-2039	2040-2044
O&M	–	–	–
Capital	$8,100	$8,900	$9,800
Basis for funding direction:	Similar scopes of work with annual inflationary cost escalation (3%)	Similar scopes of work with annual inflationary cost escalation (3%)	Similar scopes of work with annual inflationary cost escalation (3%)

Appendix 5: State of the Literature on Resilience Performance Measures

Across the utility industry, there has been no universally accepted methodology to measure resilience. Development of resilience measures on the electric grid is an active area of research and current industry discussion. There is ongoing work in the National Labs to develop and implement metrics for appropriately quantifying resilience, including a multi-year project under the DOE's Grid Modernization Laboratory Consortium (GMLC)[31]. The GMLC work focused on outcome-based performance measures, which seek to provide a quantitative answer to the question, "How resilient is my system?" For example, the GMLC work proposed measures such as cumulative customer-hours of outages.

There are several other approaches for quantifying various elements of resilience that have emerged in industry literature and practice. For example, Sandia National Laboratories[32] has made progress toward developing an implementation approach for outcome-based metrics. As shown in Figure 12 below, this approach features the Resilience Analysis Process (RAP). This work notes that, "grid resilience metrics should quantify the consequences that occur as a result of strain on or disruption to the power grid." These consequences may be measured in terms of *direct* consequences, such as unserved energy, or *indirect* consequences, such as or population without power.

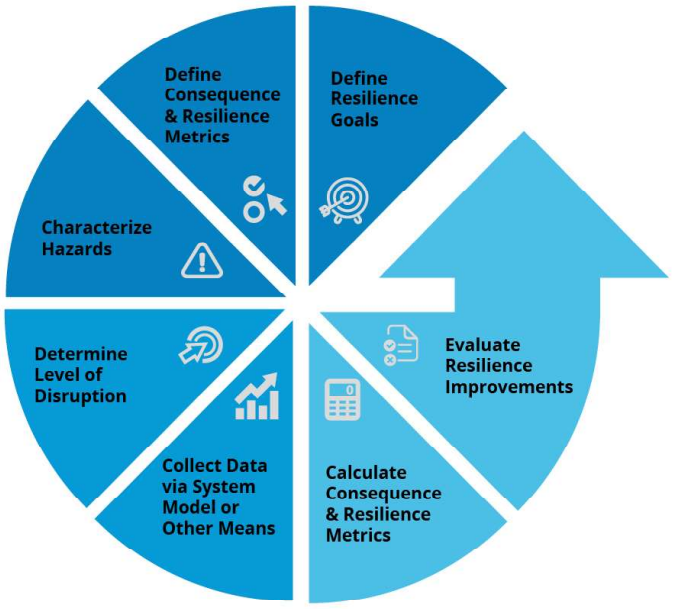


Figure 12. Resilience Analysis Process for Performance-Based Resilience Metrics (from Watson et al. 2014).

The RAP offers a framework for developing customized resilience metrics. These emerge from high-level resilience goals identified in the first step of the process, which includes consideration of key stakeholder needs. In this sense, the RAP does not necessarily guide users toward a standardized set of resilience metrics that can be applied uniformly.

Endnotes

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