

Con Edison Climate Change Resilience Plan

Case 22-E-0222

November 2023



Contents

Figures	ii
Tables	iii
Abbreviations	iv
Executive Summary	1
Introduction	6
Legislative Context	8
Climate Change Vulnerability Study Summary	10
Engagement of the Climate Resilience Working Group and Other Stakeholders	13
Stakeholder Input.....	15
Multi-Pronged Resilience Strategy	18
Past Investments	18
Resilience Management Framework	20
Investment Categories	24
Consideration of Equity	28
Con Edison’s Role	28
Project Prioritization Selection Criteria	31
Investment Plan	32
Heat 36	
Flooding.....	40
Wind and Ice	46
Extreme Events.....	50
Long-Term Funding Plan.....	59
Governance	60
Performance Measures	62
Outcome-Based Resilience Measures	62
Implementation-Based Resilience Measures.....	63
Conclusion and Next Steps	65
Endnotes	67

Figures

Figure 1. Con Edison’s Resilience Journey.....	6
Figure 2. Climate Resilience Working Group Meeting Dates and Focus.....	15
Figure 3. Con Edison's climate resilience approach.....	19
Figure 4. Con Edison’s three strategies to address climate risks.....	21
Figure 5. Visualization of how resilience measures can reduce the impact of a climate hazard event on service	22
Figure 6. Flexible adaptation pathways in the context of tolerable risk and risk management challenges to non-flexible adaptation. Adapted from Rosenzweig & Solecki, 2014.....	23
Figure 7. Resilience-driven investments.....	24
Figure 8. Disadvantaged communities in Con Edison’s service territory, colored by county.	30
Figure 9. Expenditures by Resilience Strategy and Year.....	34
Figure 10. Long-Term Expenditure Projection.....	59
Figure 11. Climate Adaptation Governance Structure.....	61

Tables

Table 1. Summary of climate updates and changes since Con Edison’s 2019 CCVS.... 11

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. 12

Table 3. Climate Resilience Working Group Member Organizations..... 14

Table 4. Summary of CRWG feedback and actions taken 17

Table 5. Summary of Past Resilience Investments..... 19

Table 6. Incorporating climate change into planning, design and operations. 27

Table 7. Estimated revenue requirement and total bill impact by year 33

Table 8. Summary of Planned Resilience Investments. 36

Table 9. Proposed performance measures for Con Edison’s Investment Programs and Projects. 64

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
UAV	Unmanned Aerial Vehicle
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.

Con Edison’s resilience 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.

Indeed, for 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 inflicted in 2012 transformed the trajectory and pace of the Company’s resilience journey. Developing 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 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 aggressive 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 Climate Change Resilience Plan (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 Public Service Law (PSL) §66.¹ 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 CRRP will provide significant benefit 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, 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.

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 CCRP Climate Resilience Working Group (CRWG), which provided input and feedback for both the CCVS and the CCRP throughout the project. Much of the

ⁱMeasured by the number of customer outages

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,ⁱⁱ 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.

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 our investments deliver for our customers.

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 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 has a long tradition of innovating and using state-of-the-art technologies to enhance the resilience of its systems and operations. Con Edison is exploring and implementing new technologies and striving to promote new resilience projects within the state. For example, through the Storm Response

ⁱⁱ Public Service Law §66(29).

Technology Advancements program, the Company plans to use unmanned aerial devices, to assess storm damage and improve response times. By integrating modern technological solutions and keeping the flexibility to adopt future advancements, Con Edison is enhancing its preparedness for the increasing intensity and frequency of severe weather events.

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 must be 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 like to support New York City's development of resilience centers by allowing these locations to maintain essential services during extreme events.

Con Edison has also formed an Environmental Justice Working Group and plans to release a finalized Environmental Justice Policy Statement later in 2023. The Company will use that document 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 C CVS. 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 \$903 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 \$173 million during the first five-years of the Plan. This level of expenditures over the five years (2025-2029) would have varying delivery and total bill impacts from 0.1% to 0.8% and 0.0% to 0.6%, respectively. As a result, the five-year cumulative electric delivery and total bill impacts would be 2.1% and 1.4%, 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 \$2.4 billion, and the total capital expenditures for all resilience investments for the next 20 years (2025 through 2044) are

approximately \$5.6 billion. These programs will minimize outages from heat waves, snowstorms, sea level rise, and other extreme weather events and 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. The Company requests that the Commission fully authorize the funding levels and the programs in the CCRP.



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](#).

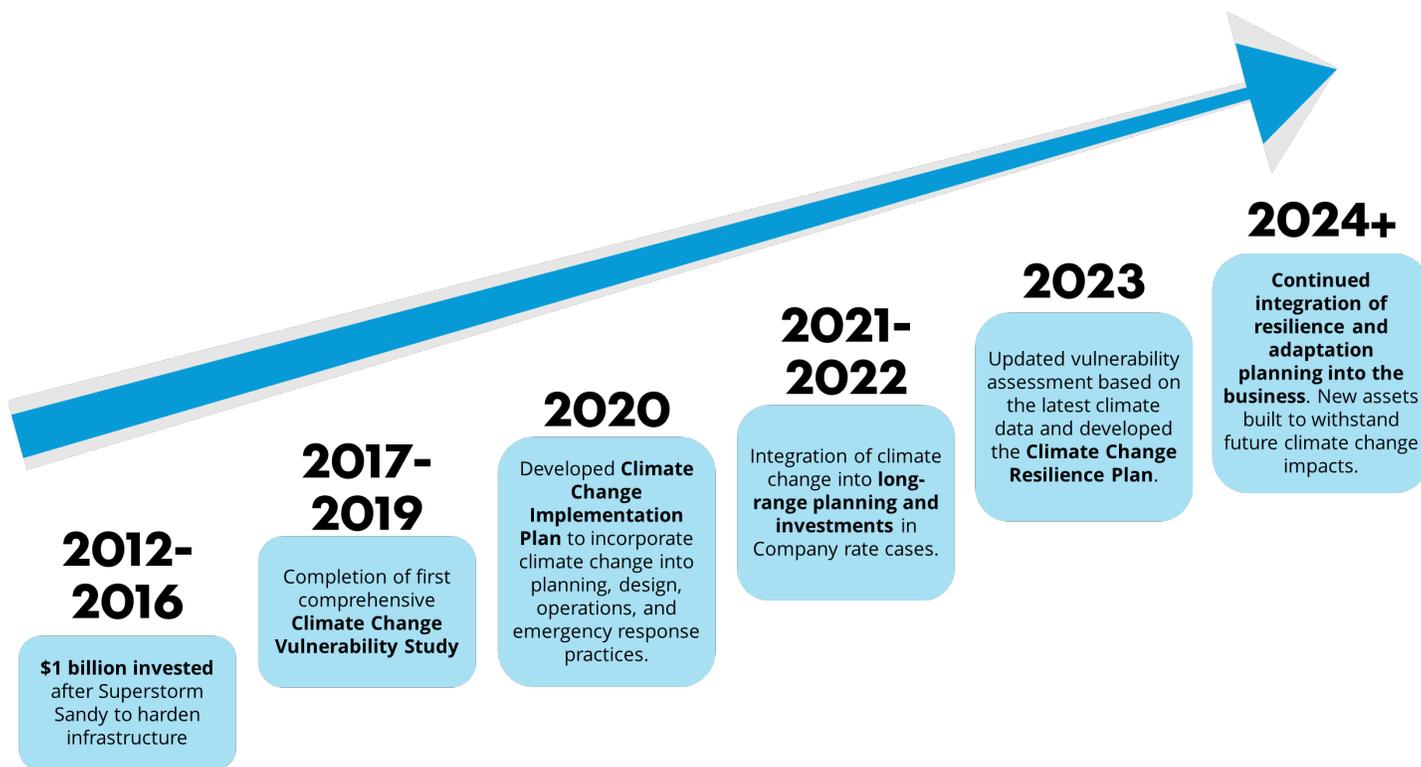


Figure 1. Con Edison's Resilience Journey.

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 New York State 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.²

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, New York State enacted a new section to the Public Service Law (PSL) §66(29)³ 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 requires Con Edison, along with the other electric utility companies to submit a CCVS within 18 months (Con Edison's submittal was on September 22, 2023), and this CCRP within 60 days after the CCVS filing.

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 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.⁴

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, as detailed in the Investment Plan section, the Company is seeking authorization for all new resilience spendingⁱⁱⁱ during the first five years of the Plan.^{iv}

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

ⁱⁱⁱ Con Edison's current electric Rate Plan runs through 2025 (Rate Year 3). The Company's request for resilience spending of approximately \$92.5 million in 2025 is in addition to amounts already authorized in the current electric Rate Plan. Because 2025 is the last year of the approved Rate Plan, the Company has included the full amount for needed resilience investments in 2026 through 2029.

^{iv} The Company is not bifurcating needed resilience investments between resilience plans and rate cases because such a process would not meet the requirement to present a "systematic approach" and a "multi-pronged strategy." Bifurcation does not consider the requirement that the Commission incorporate approved resilience funding directly into base rates without further review as well as the requirement that the review of the resilience plan be separate from a corporation's rate proceeding.

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.

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.”⁵ 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.

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.

The Company has also included opportunities to coordinate with municipalities through its proposed Storm Resilience Center and improve communications with customers through its Emergency Outage Communications Program and included processes to evaluate the effectiveness of each investment in the CCRP through performance measures. See the [Performance Measures](#) section for more detail. All of this work was done with the input of the Company’s climate resilience working group which provided advice and feedback to the Company in the development of the CCRP. See the [Engagement of the Climate Resilience Working Group & Other Stakeholders](#) section 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. Because the CCRP is the Company’s full plan, reductions or changes to individual components of the CCRP can impact the overall effectiveness of the Company’s resilience efforts. Therefore, the Company requests that the Commission fully authorize the funding levels and the projects/programs in the CCRP.

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.

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](#).

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.



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.

		<p>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.</p>
		<p>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.</p>
		<p>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.</p>
		<ul style="list-style-type: none"> • Hurricanes are expected to increase in intensity with a higher probability of northeast tracks due to a projected northward migration of strong hurricanes.
		<ul style="list-style-type: none"> • Extreme heat waves will increase in both frequency and intensity.
		<ul style="list-style-type: none"> • Nor’easters and cold snaps may increase in intensity but are expected to decrease in frequency.
		<ul style="list-style-type: none"> • Deluge precipitation is expected to increase in both frequency and intensity.
		<ul style="list-style-type: none"> • 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

	Trans.	Subs.	Dist.	
Temperature and Temperature Variable (TV)	OH	Primary	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”) ^v 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	Primary	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	Secondary	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 of the Climate Resilience Working Group and Other Stakeholders

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 C CVS 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
	Department of Public Service (DPS)
State Agencies	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.
Other Infrastructure Owners	The Ad Hoc Group, Inc.
	WE ACT for Environmental Justice
	MTA
Other Infrastructure Owners	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
<p><u>Engagement Process</u></p> <p>CRWG members want to be engaged early and often with the opportunity to review and provide feedback at key stages.</p>	<p>Con Edison added additional CRWG meetings to the schedule. Con Edison provided proposed schedules of milestones and dates for feedback opportunities.</p>
<p><u>Updated Pathway Selection</u></p> <p>CRWG members were actively engaged in discussions surrounding the updated climate change pathways used projections.</p>	<p>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.</p>

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 a green infrastructure pilot, 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 draft 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.

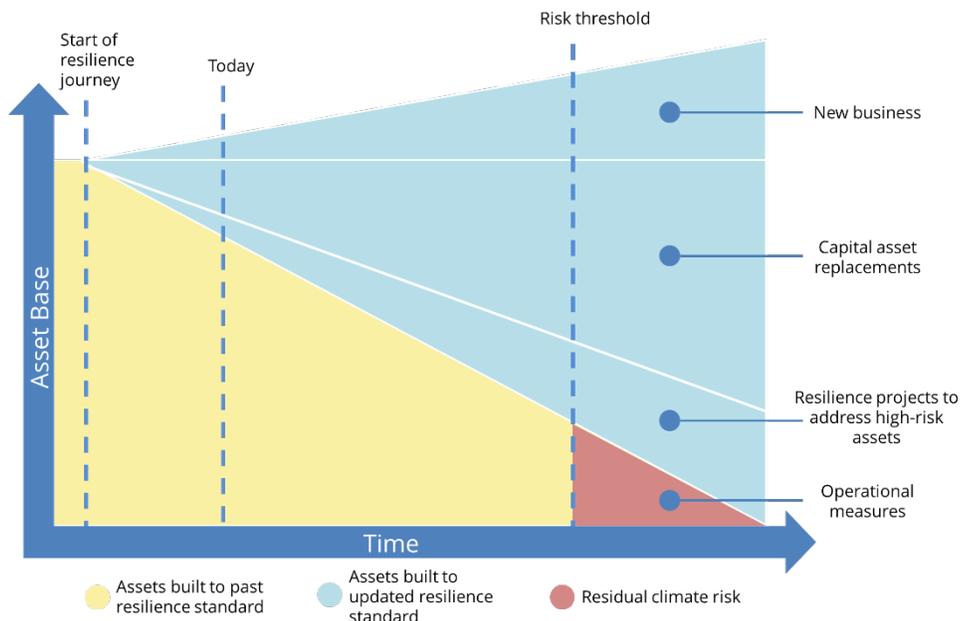


Figure 3. Con Edison's climate resilience approach

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 C CVS. Each of these strategies consistently play a role in the Company's approach, fortifying infrastructure and services against climate events and maintaining dependable service.



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 recovery 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 and new storm response technologies to allow for faster restoration times using data and machine learning.

Investing in prevention, mitigation, and response 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).

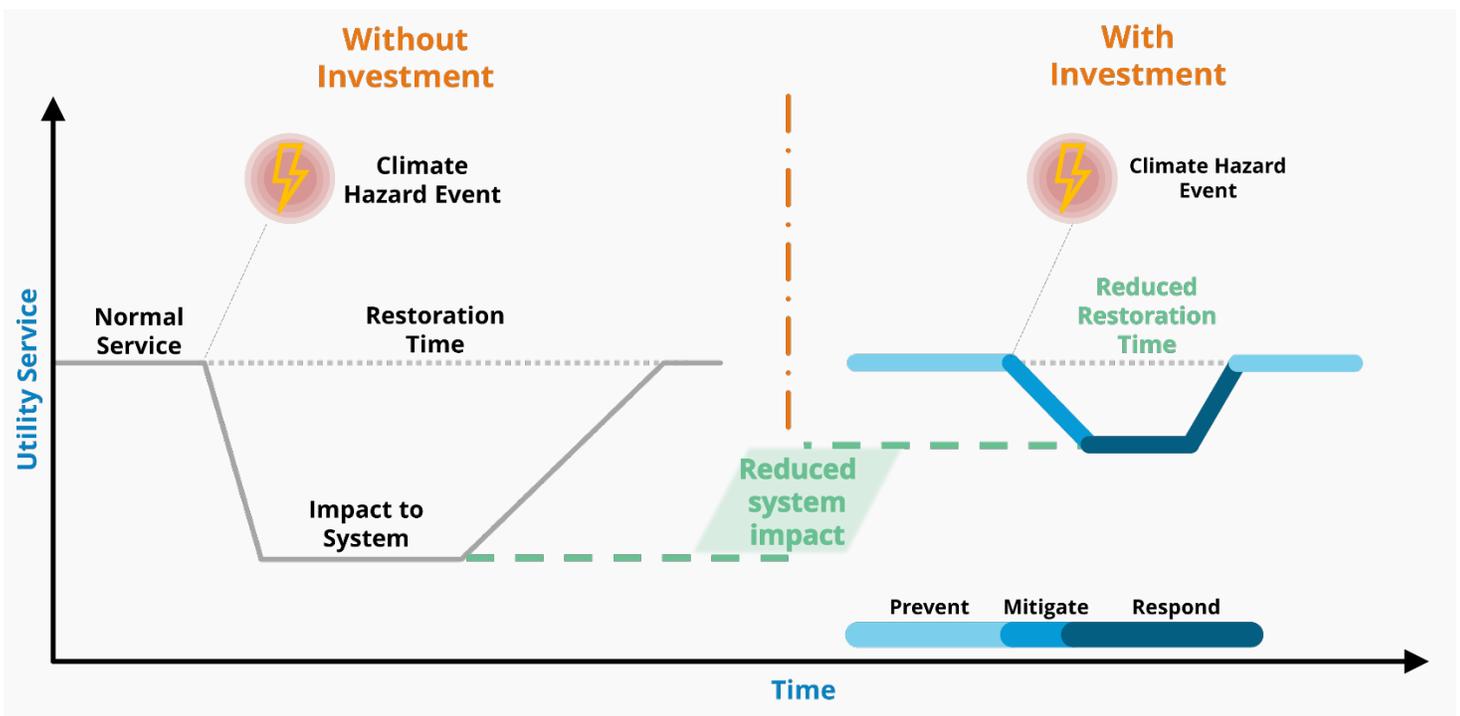


Figure 5. Visualization of how resilience measures can reduce the impact of a climate hazard event on service

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

Resilience 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. 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.

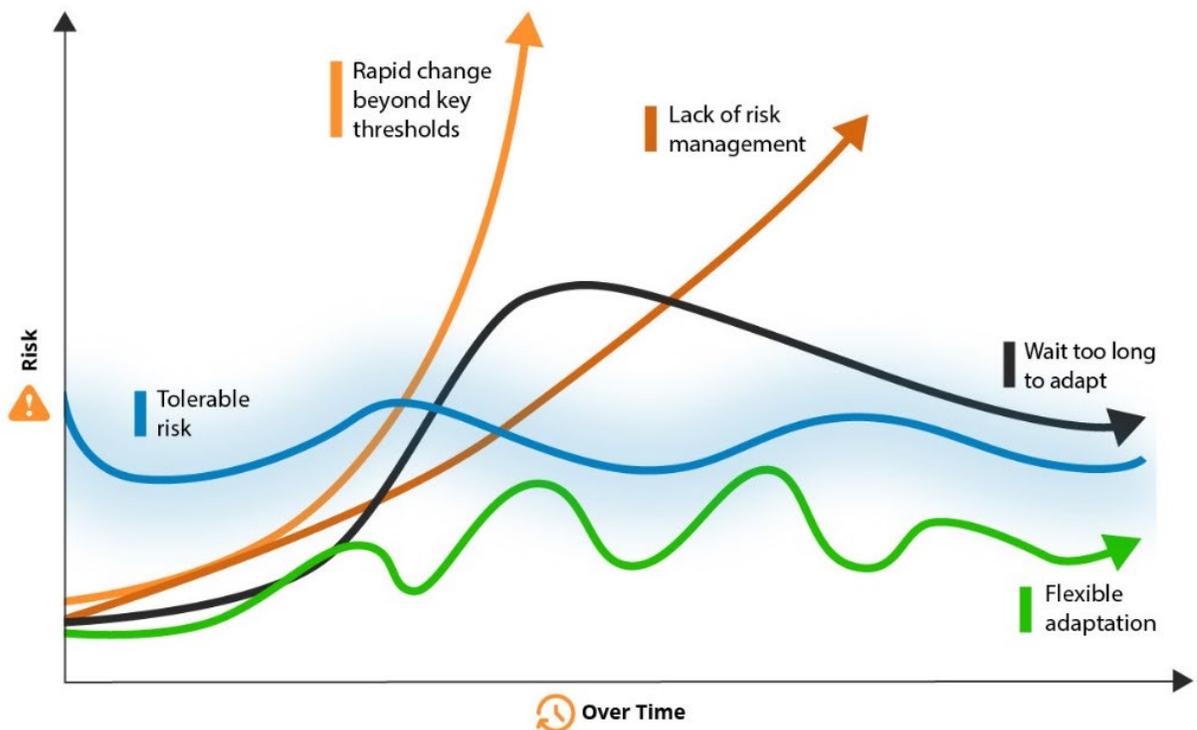


Figure 6. Flexible adaptation pathways in the context of tolerable risk and risk management challenges to non-flexible adaptation. Adapted from Rosenzweig & Solecki, 2014.

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 investments proposed in this Plan are shown in [Figure 7](#) below, categorized by which strategy they primarily support. Programs with an asterisk (*) are shared between Con Edison and O&R. More detail on each item is given in the [Investment Plan](#) section of this CCRP.

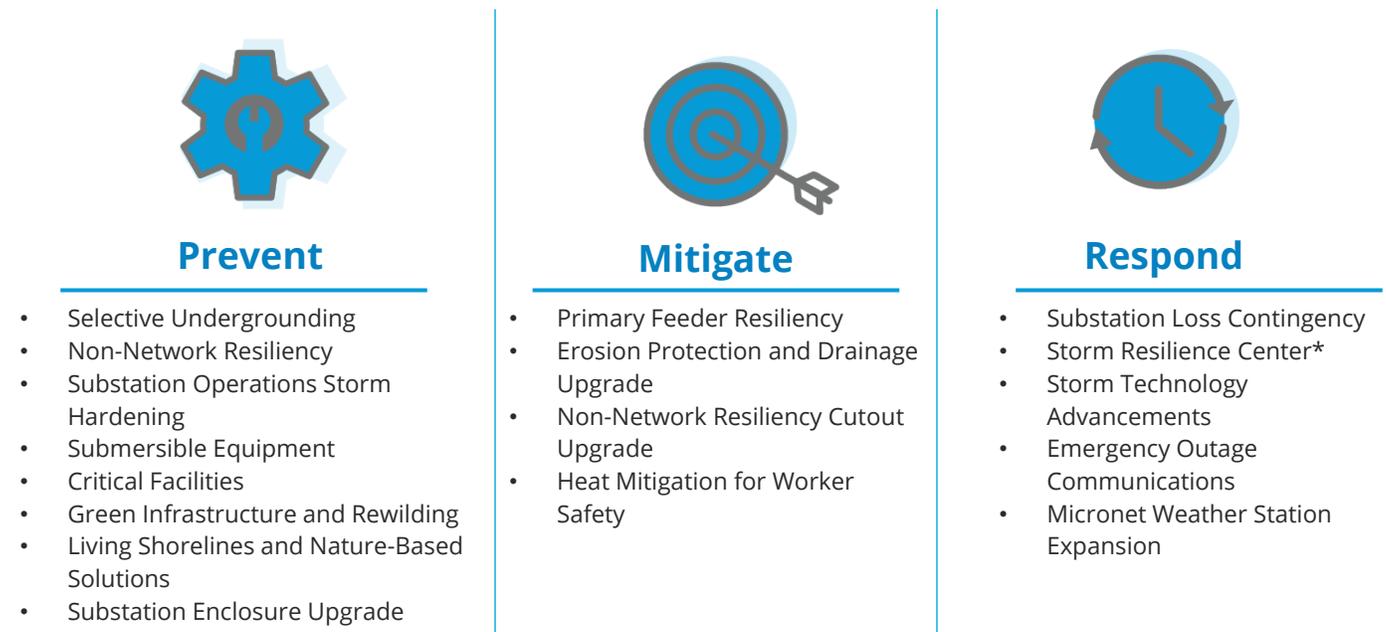


Figure 7. Resilience-driven investments

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.⁶ 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 prepared 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. Con Edison is proposing to invest in a new worker safety program for cooling personal protective equipment (PPE) and to explore other new technologies.

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.

Areas of innovative investment that Con Edison is including in this Plan include use of automation equipment to mitigate disruptions due to outages, construction of a new Storm Resilience Center, investment in advanced storm response technologies (such as unmanned aerial vehicles for rapid response), and new worker safety technology, which include investigating the use of reflective hard hats and mobile cooling centers. More detail on the proposed resilience measures is shown in the Investment Plan section.



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.⁷ 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.⁸

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.⁹ 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.¹⁰ 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.¹¹

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 and plans to release a corporate policy statement to apply an equity lens to its operations and programs. 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, 12}

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 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 New York State (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.

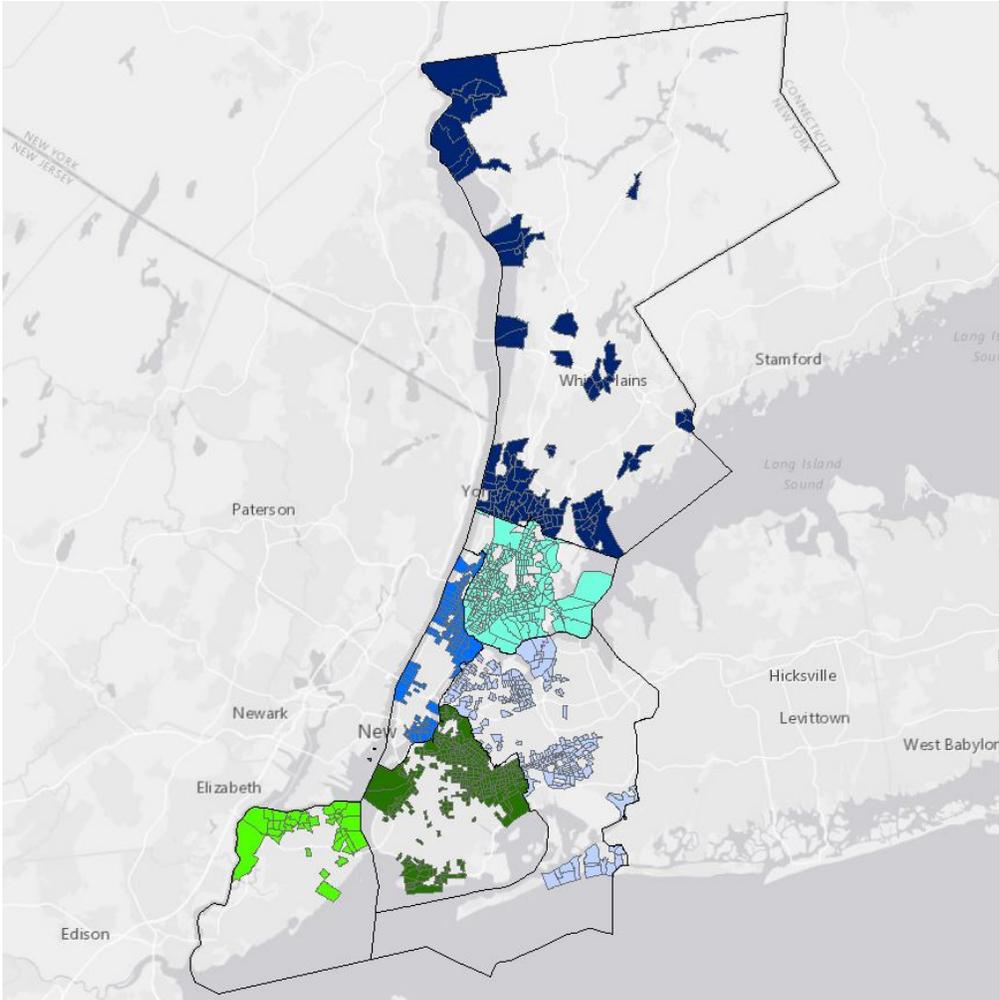


Figure 8. Disadvantaged communities in Con Edison's service territory, colored by county.

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 draws 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.

Using the Screening Criteria

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

1. 25 transformers 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 transformers, 10 serve critical customers.
3. Of the remaining 15 customers, seven of them serve areas identified as disadvantaged communities.

The seven identified transformers could be prioritized for investments first. The remaining transformers would then eventually be upgraded as part of regularly phased work.



Investment Plan

This section summarizes the resilience investments that Con Edison plans to make to prevent, mitigate, and respond to the risks of projected climate changes. 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.
- Temperature impacts on the Company's workforce.
- 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.
- Emergency response and preparedness for extreme weather events.

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, mitigate, and respond to 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 \$903 million over the first five years (2025–2029) of the resilience plan. This amount includes approximately \$884 million in capital expenditures and \$19 million for operations and maintenance. Based on estimated in-service dates for the projects, the Company estimates those investments would result in a revenue requirement of \$173 million over that same period. This level of capital expenditure over the five years (2025-2029) would have a varying delivery and total bill impact from 0.1% to 0.8%, and 0.0% to 0.6% for customers, respectively. As a result, the five-year cumulative electric delivery impact would be 2.1% and total bill impact would be 1.4%.

Year	Capital Requested (\$ Millions)	Rate Base (\$ Millions)	Revenue Requirement ^{xi} (\$ Millions)	Associated O&M (\$ Millions)	Delivery (% Change)	Total Bill (% Change)
2025	\$91	\$16	\$6	\$2	0.1%	0.0%
2026	\$139	\$66	\$16	\$3	0.2%	0.1%
2027	\$193	\$153	\$31	\$4	0.4%	0.3%
2028	\$222	\$261	\$50	\$4	0.6%	0.4%
2029	\$239	\$371	\$70	\$6	0.8%	0.6%

Table 7. Estimated revenue requirement and total bill impact by year^{xii}.

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 \$2.4 billion, and the total capital expenditures for all resilience investments for 20 years (2025 through 2044) will be approximately \$5.6 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

^{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.

^{xii} Con Edison will recover the amounts requested in 2025 through a surcharge. 2025 is the final year of the Company's current electric rate plan.

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 \$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.

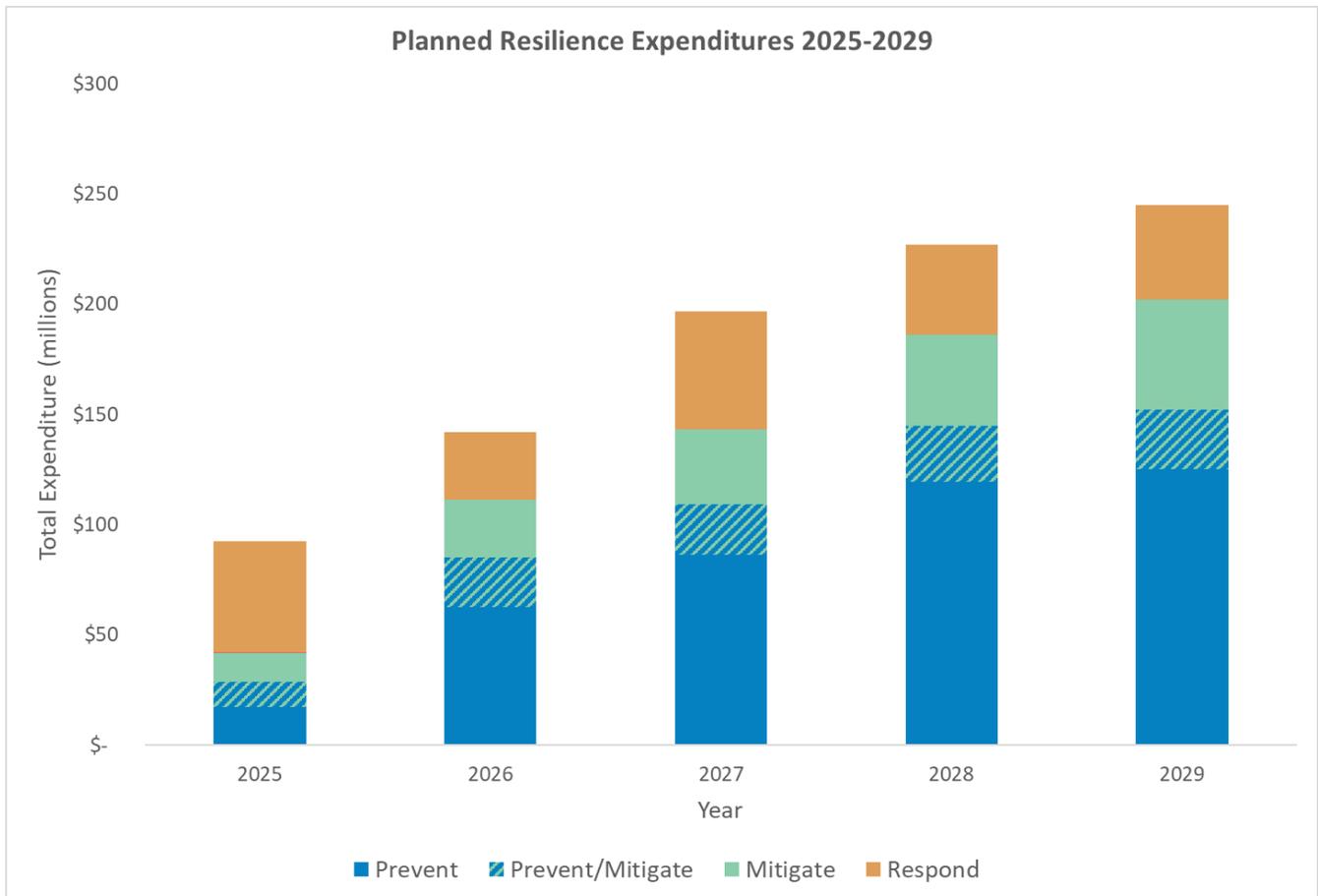


Figure 9. Expenditures by Resilience Strategy and Year.

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
Heat Mitigation for Worker Safety	Heat	Mitigate
Micronet Weather Station Expansion	Heat , Extreme Events	Mitigate, Respond
Substation Operations Storm Hardening	Flooding	Prevent
Submersible Equipment	Flooding	Prevent
Erosion Protection and Drainage Upgrade	Flooding , Extreme Events	Mitigate
Green Infrastructure and Rewilding	Flooding	Prevent, Mitigate
Living Shorelines and Nature-Based Solutions	Flooding	Prevent, 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 Loss Contingency	Extreme Events , Heat, Flooding, Wind and Ice	Respond
Substation Enclosure Upgrade	Extreme Events	Prevent
Storm Resilience Center	Extreme Events	Respond

Storm Response Technology Advancements	Extreme Events	Respond
Emergency Outage Communications	Extreme Events	Respond

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.^{xiii} 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 C CVS, 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. 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.
- **Worker high heat stress:** Increasing temperatures can increase worker high heat stress and potential health impacts.

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.
- **Heat Mitigation for Worker Safety:** Pilot tests cooling/reflective hardhat alternatives, heat wicking base-layer garment, and emerging portable cooling equipment to reduce employee heat stress.
- **Micronet Weather Station Expansion:** Collected weather data will be used to validate climate models, help predict outages, and inform system planning such as identifying heat islands.

^{xiii} 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.

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 to withstand 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. 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. 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
\$113,000,000

2030 – 2034
\$262,100,000

2035 – 2044
\$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%.

Heat Mitigation for Worker Safety

Investment Description

Climate Hazard(s)

Heat



Mitigate

Scope

The primary objective of this program is to bolster and maintain safe working conditions for employees through piloting and field testing various emerging technologies to mitigate heat illnesses associated with sustained higher temperatures. The focus would include garnering feedback of the use and effectiveness of innovative equipment and emerging technology in the next few years, including but not limited to:

- Cooling/Reflective hardhat alternatives
- Heat wicking base layer garments
- Emerging portable cooling equipment

To execute this work, Con Edison will procure the above equipment and deploy it in select departments initially. Based on feedback from the program, as well as analysis of temperature data, Con Edison may decide to roll out the protective equipment to a larger swath of the Companies' workforce.

Justification

Over the coming decades, the Con Edison service territory is expected to experience higher average temperatures, as well as more frequent and extreme heat waves. By 2030, the number of days per year with a 2PM Heat Index^{xiv} over 90°F are projected to increase from a baseline of 13 days to 39 days per, approximately a 300% increase. Average summer temperatures are projected to increase to 80°F compared to baseline of 75°F by 2030. These projections are importantly intensified by the urban heat island effect (UHI), which causes urbanized areas to experience higher temperatures than outlying areas due to high concentrations of infrastructure that absorb and re-emit the sun's heat more than natural, un-urbanized landscapes. It is estimated that 78% of New York experiences at least 8°F more heat due to the UHI effect.¹³

Increased exposure to extreme heat has the potential to threaten the safety of staff who work outdoors and are exposed to the weather conditions on a regular basis. As both average and extreme temperatures increase, the risk of workers being exposed to potentially dangerous heat conditions will increase proportionately. Protecting workers will require changes to pace of work, which could make outage duration and restoration times longer. If an outage event should occur at the same time as an extreme heat event, it becomes essential to provide workers with safe conditions to allow them to perform restoration work needs and minimize the outage duration for customers.

Program Benefits

This program will assist in the comprehensive approach to mitigate heat illness and heat stress of employees due to the exposure of forecasted prolonged heat waves and overall higher temperatures in our area. This program will also increase the overall health and wellness of employees as well as support response times for restoration and maintenance of system.

Funding Request

2025 – 2029

\$1,000,000

2030 – 2034

\$1,000,000

2035 – 2044

\$2,000,000

Long-term Roadmap

Since this program is to pilot and purchase new technologies as they are developed and accepted, the future funding is only an approximate and subject to change.

^{xiv} The Heat Index quantifies the combined effect of air temperature and relative humidity and reflects the human-perceived, rather than the actual, temperature. It's used to assess health risks for employees working in the heat.

Micronet Weather Station Expansion

Investment Description

Climate Hazard(s)

Heat, all climate hazards and extreme events



Mitigate

Respond

Scope

Two weather stations are proposed in Westchester County within CECONY service territory. They will help fill weather observation and existing data gaps in Westchester County while providing crucial information on weather and climate. The two proposed weather stations are expected to be sited on company property in Elmsford, NY and Rye, NY.

Justification

Data gaps in local weather observations in Westchester County can affect the ability to 1) understand Urban Heat Island (UHI) effects, 2) respond to and accurately stage crews during extreme weather events (e.g., heatwaves). The proposed weather stations will be used to better understand the impacts of climate change across the service territory, primarily for tracking temperatures and temperature differentials and potential impacts due to factors such as the Urban Heat Island (UHI) effect. The UHI effect causes urban areas to run warmer than surrounding areas because urban land surface characteristics retain more heat, and it limits overnight cooling. Recent studies have shown New York City to have the highest average UHI index per capita, with people feeling at least 9.5°F more heat in the city due to the local built environment. Having more weather stations throughout the service territory, rather than only using the Central Park station, will better represent the temperatures experienced across different parts of New York City and the surrounding areas. The service territory has also already been impacted by several extreme events, such as Tropical Storm Isaias in August 2020 and the deluge rainfall that hit the Hudson Valley in July of 2023. Projections indicate that extreme events like hurricanes, extreme heat waves, nor'easters, and deluge rainfall, will increase in intensity in the future. It is crucial for Con Edison to make science-based decisions on investments and resilience initiatives, and having more granular data on weather experience across the service territory is critical to this process. The Company must work to develop the tools and data that will allow that to happen smoothly and consistently. Without this program, there will be a less illustrative understanding of potential weather impacts across different areas of the service territory and existing processes will have to rely on weather data from non-representative weather stations in New York City and southern Westchester. These stations do not adequately correlate to observed or forecasted weather across the Lower Hudson Valley.

Program Benefits

This project will provide the benefits of improved relationships with external stakeholders, providing regulatory compliance, and improved data for future climate change adaptation decisions.

The project also continues a strategic partnership with the State University of New York (SUNY) at Albany. The Company will be supporting a state university through this partnership, as well as contributing to the NYS Mesonet by integrating the new weather monitoring stations under this project into the state-wide network that currently lacks a strong presence in the CECONY service territory. In return, the Company will benefit from their already-established expertise in this field and vast array of resources in future research and analytics to properly digest the data that will be gathered.

Funding Request

2025 - 2029

\$224,000

2030 - 2034

\$0

2035 - 2044

\$0

Long-term Roadmap

This project will expand upon Con Edison's existing Micronet weather stations and, in conjunction with Orange and Rockland's installation of an additional 7 stations, will continue to provide important weather-related data. At this time, there is no expected plan for future expansion of additional Micronet weather stations.

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 newest 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.
- **Green Infrastructure and Rewilding**: Con Edison plans to install more green infrastructure and rewild with native vegetation on various types of company property. Rewilding is a conservation approach that allows the land and its ecosystems to return to a more natural state. This will reduce operational costs of vegetation management and improve contributions to natural habitats, allowing for more ground infiltration.
- **Living Shorelines and Nature-Based Solutions**: Pilot project to enhance the resilience of shoreline properties to rising sea levels and storm surge, while at the same time providing surrounding communities with an aesthetically pleasing shoreline composed of native species. Living shorelines are more cost effective than hardened structures and are better at dissipating wave energy during major storms.

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
\$25,300,000

2030 – 2034
\$470,600,000

2035 – 2044
\$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

Investment Description

Climate Hazard(s)
Flooding (Sea Level Rise)



Prevent

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
\$45,900,000	\$24,400,000	\$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

Climate Hazard(s)

Flooding, Extreme Events

Mitigate

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 will begin 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
\$21,800,000

2030 – 2034
\$31,000,000

2035 – 2044
\$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%.

Green Infrastructure and Rewilding

Investment Description

Climate Hazard(s)

Flooding

Scope

Green infrastructure will be constructed to mitigate the impacts of increased precipitation from deluge rain events using rain gardens, bioswales, permeable pavement, and natural retention ponds that can absorb rainwater and reduce stormwater runoff.

Rewilding efforts can help reduce runoff and erosion by restoring native vegetation, which naturally absorbs and retains water and contribute to temperature regulation.

Installing green roofs can help mitigate the extended growing season and warmer temperatures by providing insulation against heat absorption and loss, reducing energy use, and creating a more biodiverse environment.

Justification

Increased precipitation and risks of flooding can negatively impact company equipment, especially in substations and service centers.

Flooding can damage electrical equipment, transformers and other critical infrastructure.

Extended growing seasons can affect vegetation growth, potentially obstructing access to equipment for maintenance and repair. Increased growth may also interfere with crucial transmission lines and can decrease reliability of services to customers.

Protection against extreme weather events such as hurricanes and severe storms will potentially cause damage to equipment and disrupt power distribution with strong winds and/or heavy rain.

Less biodiverse habitats do not channel rain and storm water back to the earth as effectively as more biodiverse natural areas. The need to improve the approach to stormwater management and flood mitigation is only expected to grow in importance. 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.

Furthermore, continuing with standard vegetation management practices for overhead structure corridors would fail to achieve the same benefits as investing in native, growth-limited vegetation. Standard practices include mechanical cutting of existing brushes, tree trimming, and approved use of pesticides and herbicides. While this process effectively safeguards the overhead structures, it incurs maintenance costs and limited contribution to natural habitats.



Prevent

Mitigate

Program Benefits

This process will enhance biological diversity, or biodiversity, which refers to all life on earth, and recognizes the value of maintaining a variety of living species. Biodiversity not only emphasizes mutually beneficial plantings, but also includes insects and animals that taken together contribute to the ecosystem, reduced operational maintenance and increased resiliency. Biodiverse habitats, even with greater vegetation growth seasons in New York, due to climate change, can naturally limit their height – thus maintaining better equipment clearances while requiring minimal upkeep after establishment. In terms of climate change, rain inundation from extreme weather events may result in storm water runoff and flooding that affects nearby water bodies and combined sewer systems. With rewilding and strategically planted vegetation at Company facilities, transmission line right of ways, and substations, these facilities will increase their storm water retention and become more resilient to climate change.

Funding Request

2025 – 2029

\$6,000,000

2030 – 2034

\$6,000,000

2035 – 2044

\$12,000,000

Long-term Roadmap

This program will be reevaluated every five years during each Resilience Plan update and based on the latest science. The goal of this program is to prioritize and invest in various types of green infrastructure and rewilding projects at different facilities across Con Edison’s service territory. The operational needs and locations will vary over time and be coordinated in conjunction with the Company’s experts to maintain operational resiliency.

Living Shorelines and Nature-Based Solutions

Investment Description

Climate Hazard(s)

Flooding (Coastal Storm Surge, Sea Level Rise, Heavy Rainfall)

Scope

Create a pilot program to construct a 1,000’ of living shoreline that utilizes natural materials such as vegetation, rocks, and shells to stabilize shorelines, reduce erosion, and protect against rising sea levels.

Justification

The increased frequency and severity of climate events, including severe coastal storm surge and rising sea levels, has elevated the importance of protecting shoreline properties. Currently, assets are typically protected by conventional bulkheads or a riprap wall. These structures are not expected to exist in perpetuity due to chemical and physical degradation. This type of degradation combined with sea level rise and storm surge could compromise shoreline-adjacent facilities and equipment, potentially resulting in financial burdens and outages for the communities served. Salt water, either from storm surge or sea level rise, can also lead to corrosion and infrastructure damage over time.

By 2030, sea level rise at the Battery is projected to be 16 inches. It is anticipated that Con Edison’s service area will be increasingly exposed to flooding due to projected sea level rise and increased intensity of extreme storms, such as hurricanes and tropical cyclones, which are likely to bring with them the possibility of higher storm surge. North Atlantic hurricanes are projected to become more intense and have higher rainfall amounts (~10-15% increase) relative to historical hurricanes.



Prevent

Mitigate

Program Benefits

Living shorelines are a type of nature-based solution that uses natural materials such as plants, rocks, and shells to stabilize a shoreline, reduce erosion, and protect against rising sea levels, while providing habitat to increase biodiversity. Tidal salt marshes, a type of living shoreline, are known to be among the most productive ecosystem types on Earth, sequestering tens of thousands of tons of carbon annually. They can help purify water, reduce erosion, and store carbon. During major storms, living shorelines have been shown to perform better than hardened shorelines by dissipating wave energy and therefore reducing wave action, rather than just deflecting it downstream like hardened shorelines. Living shorelines can also be cost-effective compared to hardened structures, in aspects of both installation and maintenance costs.

A living shoreline would benefit the communities we serve by greening the landscape and capturing harmful greenhouse gases, while also increasing the resiliency for Company and community facilities. Active shorelines can enhance ecological biodiversity attracting aquatic life, plants, and birds/bats. An active shoreline creates an ecotone between the land and aquatic habitat which leads to species diversity and growth of unique ecosystems.

Funding Request

2025 – 2029

\$3,300,000

2030 – 2034

\$6,300,000

2035 – 2044 (O&M only)

\$600,000

Long-term Roadmap

The first phase of this pilot project is to construct 1,000 linear feet of living shoreline after conducting an internal feasibility study to determine the best approximate location. Upon review of successful implementation and construction, the next phase would be to install an additional 1,000 linear feet of living shorelines at either the same or different location, depending on the site location. The O&M

costs are based on USACE estimates but are expected to decline over time as the shoreline fully develops and grows.

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

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



Prevent

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
\$333,000,000

2030 – 2034
\$563,500,000

2035 – 2044
\$1,410,200

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



Prevent

Mitigate

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

\$60,600,000

2030 - 2034

\$78,300,000

2035 - 2044

\$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 reclosers 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
\$10,000,000

2030 – 2034
\$4,900,000

2035 – 2044
\$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

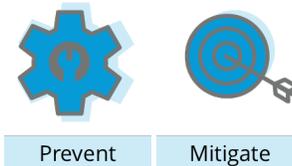
Extreme weather events, including concurrent or consecutive extreme events, present additional challenges to operations, planning, and infrastructure across the electric system. These events may take the form of intense storms, hurricanes, extreme heat waves, Nor'easters and cold snaps, deluge rainfall, 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.¹⁴ 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 Loss Contingency:** This existing program will be enhanced and will allow Con Edison to continue acquiring mobile substation equipment that can be utilized in the event of substation failure or partial power loss as a result of extreme weather and climate events.
- **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.
- **Storm Resilience Center:** This state-of-the-art facility aims to reduce outage and recovery times during extreme weather events. The Center will serve as a central hub for crews, equipment, and emergency response coordination. It is specially designed to host up to 500 mutual aid crew members and space for storm vehicles and equipment. Key areas of focus include rapid deployment of remote mutual aid resources and centralized training for all stakeholders.
- **Storm Response Technology Advancements:** Leveraging cutting-edge technology, this program aims to enhance storm response and reduce outage times. The first focus area employs technologies like unmanned aerial vehicles and GPS vehicle tracking to speed up damage assessment and resource allocation. The second area uses advanced weather modeling and data analytics to anticipate storm impacts, allowing for smarter, more efficient responses.
- **Emergency Outage Communications:** Enhances the Company's emergency communications program to be prepared to message its entire customer base faster than current technology allows. This will make communication more efficient and reduce traffic to call centers.

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 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 Loss Contingency

Investment Description

Climate Hazard(s)
Extreme events, all climate hazards



Respond

Scope

The Substation Loss Contingency program invests in the purchase of additional equipment that can be deployed to facilitate recovery from either the loss of an area substation or to partially recover from the loss of a bulk power substation. The purchase of this equipment was begun in 2021 and is forecast to be completed in 2026. Only a portion of the required equipment has been received. The remainder is pending procurement, design, construction, and delivery, with associated milestones and milestone payments scheduled throughout 2023 to 2026.

The Company is also proposing the inclusion of a mobile control center in this program. The proposed mobile control center is a Mobile Control Center (MCC) designed with core operational systems such as an Energy Management System (EMS), Feeder Management System (FMS), Pi-Historian, Local Area Networks and Communications systems. In cases of emergencies, the MCC will be capable of performing the functions of Con Edison’s Energy Control Center or the Alternate Energy Control Center (the ECC and AECC) to support both the system in case of a loss of either an Area Substation or a Transmission Substation.

Together, the three components of the Substation Loss Contingency program – the Rapid Deployment Area Substation, the Transmission Resiliency Transformers, and the Mobile Control Center – will provide multi-pronged solutions that will enable the Company to recover from near-catastrophic failures on the transmission system and extensive, prolonged outages to customers.

Justification

Con Edison’s transmission system is designed to be robust: in all areas of its service territory, no single failure should result in the loss of load; and in much of its service territory (that system serving network distribution system load), no two failures should suffice to cause a loss of load. Consequently, while it is unlikely, though by no means impossible, that random failures of equipment will force load to be dropped, this may not hold true of a system confronted by the anticipated increases in load or undercut by vulnerabilities that allow the common cause failure of equipment. The rare loss of load events – involuntary load shedding – resulting from transmission system failures – have major impacts. The Substation Loss Contingency program is designed to mitigate the risk of customer impacts in the event of the loss of area or transmission substations.

Acute heat events and flooding hazards present risks to substations’ ability to function properly and are expected to increase in frequency and intensity over the coming decades. For flooding, 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. As for heat, the highest maximum annual temperature by 2030 is projected to be 103 °F compared to baseline of 97 °F.

While other resilience measures become implemented, it is important to have solutions available to address hazards today. Having deployable transformers and mobile switchgears available can help minimize customer outages by having the resources available to restore power and the substation’s

ability to operate at an increased rate. With the equipment purchased under this program, Con Edison will have the capability to quickly deploy the necessary equipment to failed substation and restore service to large numbers of customers much more quickly than without this capability.

Program Benefits

With the equipment to be purchased under this program, Con Edison will have the capability to construct a Rapid Deployment Area Substation near the location of a failed substation within approximately seven days and restore service to large numbers of customers much more quickly than without this capability. Rapid Deployment Area Substations can also be used to provide load relief to area substations when the capacity at a substation must be reduced, such as in instances when equipment may be vulnerable to damage or failure from excessive, sustained heat or when forecast load is predicted to exceed substation capacity. Additionally, in the rare case of loss of service to a bulk power station, the bulk power transformers (Transmission Resiliency Transformers) and mobile relay panels purchased under this program, will allow the Company to restore partial functionality to the bulk power station. Coordination and integration of these supplemental resources with the transmission system will be enabled by a mobile control center, and all equipment is currently planned to be implemented in less than five years.

The construction of a rapid deployment area station reduces the likelihood of loss of electric service to customers and the availability of Transmission Resiliency Transformers reduces the likelihood of the loss of a transmission substation and promotes controllability to mitigate the loss of a substation increasing reliability, resilience (including climate adaptation) improving our response to changing climate and enhancing customers’ coping abilities.

The resiliency transformers are for use at any of the 33 transmission substations. The loss of any of these transmission substations would result in severe issues with system power flows and stability and/or a loss of supply to several area substations that serve critical load in our service territory potentially impacting many customers.

The project addresses the current inability to quickly restore power to customers following the loss of an area substation for 24 hours or longer in instances where it is either impractical or not viable to restore electric service via typical distribution solutions (generators, shunts, switching). In such cases, a new rapid deployment area substation will be installed adjacent to the failed substation to restore power to those customers not able to be restored via other means. This also assists in addressing the current inability to quickly restore reliable power flows through one or more area substations during certain catastrophic events. In such cases, these new transformers would be dispatched to the transmission stations to restore reliable power flows, or to feed area substations to restore power to those substations, hence to the customers supplied by those area substations.

Funding Request	2025 – 2029	2030 – 2034 (O&M only)	2035 – 2044 (O&M only)
	\$25,743,000	\$166,000	\$415,000

Long-term Roadmap

The scope of this program is currently projected to be completed by the end of 2027.

Substation Enclosure Upgrades

Investment Description

Climate Hazard(s)

Extreme Events



Prevent

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

\$5,700,000

2030 – 2034

\$8,100,000

2035 – 2044

\$20,200,000

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%.

Storm Resilience Center

Investment Description



Respond

Climate Hazard(s)

Extreme Events – Increasing Storms

Scope

Con Edison and O&R will enhance our storm readiness and response programs through the development of a state-of-the-art storm response facility, the Con Edison and O&R Storm Resilience Center (the Center). The Storm Resilience Center will serve as a centralized staging area for crews, including mutual aid, during recovery from extreme weather events. It will also serve as a bed-down location for mutual aid crews. Finally, the Center will serve as the year-round home for what will eventually be 250+ bucket trucks that the Companies will maintain for use by up to 500 mutual aid crews that, without the need to supply their own vehicles, can be flown in to support system restoration. The Center will replace the existing Pomona facility with a new facility that has expanded storm response capabilities. This new central facility will be used as a mutual aid operations management center, stage and maintain storm response vehicles and materials as well as providing sleeping space and support for mutual aid resources. The current location is a lease with uncertainty in renewal and cost; in addition, it will be inadequate for the additional trucks we will have by 2025.

Justification

From an operational perspective, the increasing frequency and intensity of extreme weather events could exceed and challenge Con Edison’s current emergency preparedness capabilities. For example, frequent activations of emergency response teams could impact the Company’s available personnel and spare equipment resources, if not addressed. Thus, the implementation of the Storm Resilience Center is critical to keeping a larger contingent of support trained and prepared with resources in place to accelerate deployment for response to events.

The CCVS concluded that Con Edison’s distribution system is vulnerable to extreme weather events like those that have been experienced in recent history, including hurricanes and tropical cyclones. Projections indicate that hurricanes in the service territory will likely become more intense in the future, with higher rainfall amounts relative to historical hurricanes, stronger winds, and coastal storm surge. 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. 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. When extreme events occur concurrently or sequentially to other events, efforts to respond become more difficult, and the impacts can become intensified or cascading.

Program Benefits

The primary benefits of the Center are reductions in customer outage times and costs for any storm event that requires the support of mutual aid crews outside of the Company’s local area. The proposed Storm Resilience Center will provide advanced support capabilities for Con Edison’s communities and customers that are not currently available (see the initiatives in the project description above). Furthermore, with the increase in extreme weather events it may become more difficult to rely on local mutual aid during storm events in the future. Thus, this investment is important for more efficient and faster recovery times after storms.

Funding Request

2025 – 2029

\$169,868,000

2030 – 2034 (O&M only)

\$14,478,000

2035 – 2044 (O&M only)

\$36,242,000

Long-term Roadmap

The Storm Resilience Center is projected to be in service in 2030, with no long-term capital funding projected at this time.

Storm Response Technology Advancements

Investment Description

Climate Hazard(s)

Extreme Events – Increasing Storms



Respond

Scope

Similar to the Storm Resilience Center (above), the scope of the Storm Response Technology Advancements program is focused on addressing vulnerabilities of the electric distribution system to extreme weather events like those that have been experienced in recent history, including hurricanes and tropical cyclones. As part of a multi-pronged strategy to reduce outage duration times and costs for customers following storm events, Con Edison will improve responses to extreme weather events through the development and use of various technologies to increase the safety, effectiveness, and efficiency of system restoration. Initial storm response technologies have been identified for development and implementation under this program, and the Company will continue to evaluate other opportunities to enable improvements in system restoration capabilities.

Initial storm response technologies proposed for development and implementation under this program include:

- Use of unmanned aerial vehicles (UAVs), such as satellites, drones, and high-altitude robot technology, to conduct storm damage assessments
- Use of distribution transformer monitoring technology and pole-top sensors to digitally communicate system status information including transformer voltages, loading, and temperature and information indicating potential system damage to other system components, such as leaning poles and downed conductors
- Development of a dynamic distribution system event simulator designed to increase distribution system operator proficiency and effectiveness in their response roles
- Use of self-service kiosks to onboard and support storm response resources, including employees and mutual aid resources
- Installation and use of global positioning system (GPS) devices in mutual aid storm response vehicles to integrate crew locations with the Outage Management System
- Development of an innovative electronic mobile material application that can be used to direct crew requests for materials to the nearest “material truck” (already in the field)

Justification

Extreme weather events cause extensive OH infrastructure damage resulting in customer outages and additional resource requirements to rebuild/repair the system.

The CCVS concluded that Con Edison’s distribution system is vulnerable to extreme weather events like those that have been experienced in recent history, including hurricanes and tropical cyclones. Projections indicate that hurricanes in the service territory will likely become more intense in the future, with higher rainfall amounts relative to historical hurricanes, stronger winds, and coastal storm surge. 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. 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. When extreme events occur concurrently or sequentially to other events, efforts to respond become more difficult, and the impacts can become intensified or cascading.

The technology improvements as part of this program will provide advanced support capabilities for Con Edison’s communities and customers that are not currently available (see the initiatives in the project description above). Furthermore, with the increase in extreme weather events occurring throughout the country, it is essential to be able to quickly understand the full breadth of impacts to adequately supply support crews throughout the service area in the case of a storm or other extreme event. Without the adoption of technology, Con Edison and the communities they support could

experience extended outage periods in cases of severe storms with extensive damage. Thus, this investment is important for more efficient and faster recovery times after storms.

Program Benefits	Development and implementation of these and other storm response technologies will result in improvements in storm response safety, effectiveness, and efficiency for all storm restoration activities, not just extreme storm events.		
Funding Request	2025 – 2029 \$21,904,000	2030 – 2034 \$8,203,000	2035 – 2044 \$20,533,000
Long-term Roadmap	The current scope of the Storm Response Technology Advancements Program is projected to be completed by 2028 and incorporated with the Storm Resilience Center in 2030.		

Emergency Outage Communications

Investment Description

Climate Hazard(s)
Extreme Events



Respond

Scope

To support the Company’s resiliency measures and the reinforced Emergency Response Plan, the Company’s goal is to enhance its emergency communications program to be prepared to message its entire customer base (3.5 million account holders) in a faster manner than the current technology allows. For that, the Company proposes capital and expense initiatives for 2025 – 2029 that will enable the acquisition of the telecom bandwidth necessary to reach large numbers of customers quickly and reduce latency.

The Company will work with its messaging provider to build a new infrastructure that will include, among other items:

- The acquisition and maintenance of Dedicated Ports for contracted throughput/bandwidth through Tier 1 telecom providers. This will allow high message deliverability. (To clarify, Tier 1 telecom providers own or control their own portion of data transmission networks, while Tier 2 and 3 providers lease bandwidth from them.)
- The use of load balancers to evenly distribute incoming and outgoing data traffic across hundreds of servers.
- Auto-Scaling, allowing the infrastructure to scale up automatically when the traffic surges and scales down when it recedes.
- High Throughput APIs, which are designed to handle large batches of messages.
- Real-time Monitoring & Alerts for any anomalies such as failures, delays, or bottlenecks on messaging traffic.
- AI-Powered Text to Speech (TTS) Technology: For voice messages that are pre-recorded, the new TTS technology will allow the AI generation of raw audio waveforms, resulting in more natural-sounding voices than traditional TTS systems, and eliminating the time-consuming voice recording process for emergency messages.

Justification

The increased frequency and severity of climate events and related outages can affect the speed and efficiency of communicating with large groups of customers to relay vital information before and during large impact emergencies. The end result of this program will be a highly efficient outage and emergency communications program that will allow the Company to reach out to its customers in massive scale with urgent and import messages via text, voice calls and e-mails at the fastest speed modern available technology allows.

The increased frequency and severity of extreme weather events and related outages has elevated the importance of improving the speed and efficiency of communicating with very large groups of customers to relay vital information before and during large impact emergencies. The current state of the science suggests that extreme and coincident events, including hurricanes, extreme heat waves, nor'easters and cold snaps, and deluge rainfall, could increase in intensity in the service territory in the future, necessitating effective communication methods to improve customer resiliency during these events. According to the CCVS, the number of days per year with Heat Index over 90° F is projected to be 39 in 2030, a staggering 300% jump compared to a baseline of 13 days. The Study also forecasts an increase in the number of heatwaves lasting 3 or more days and projects that Con Edison's territory will experience high heat of 103°F by 2030. The rising temperatures will cause load to increase, potentially challenging the capacity of the system, and customers could face an increased risk of potential rolling outages.

Investment in communications platform upgrades and dedicated telecom services will improve the delivery of messages during weather-related events, while also reducing costs to the Company. More efficient communications may also help the Company prevent potential rolling outages and blackouts. When energy loads are reaching their peaks, an efficient massive messaging campaign requesting customers to reduce usage could help balance the load and prevent scenarios that would require emergency power shutoffs or cause blackouts.

Program Benefits

- Quick and reliable updates during extreme weather events enhance customer preparedness, safety and response.
- Increase in more timely communication.
- Improved message delivery rates and reduction of message latency.
- Increase in equity of services, with all regions of the Company receiving the same messaging in a short window of time (today, messages are staggered by region, going from the region with the smallest customer count to the largest, in a process that could take several hours to complete.)
- Expanded ability to comply with regulatory mandates for customer communications during emergencies.
- Improved customer engagement by reaching more customers through data-driven campaign optimization
- Position the Company as an innovative communications leader, increasing brand reputation

Funding Request

2025 – 2029
\$20,610,000

2030 – 2034
\$27,000,000

2035 – 2044
\$72,000,000

Long-term Roadmap

This program is expected to continue into the future and will be reevaluated based on the latest operational needs and the latest technology. If new technology becomes available that no longer warrants this program, Con Edison will weigh the costs and benefits of any new or better technology.

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.

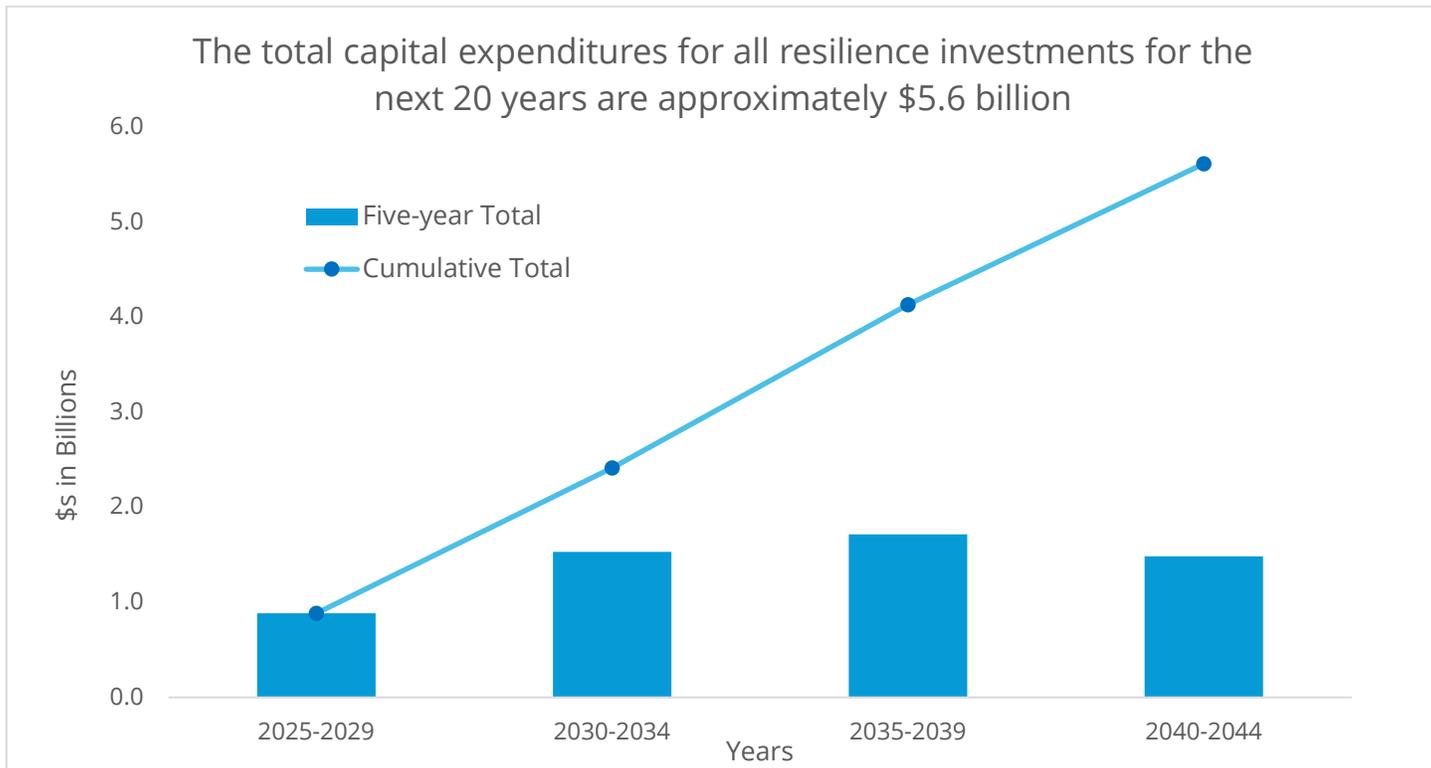


Figure 10. Long-Term Expenditure Projection



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.^{xv}

^{xv} 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/2022-sustainability-report/sustainability-reports/>.

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.

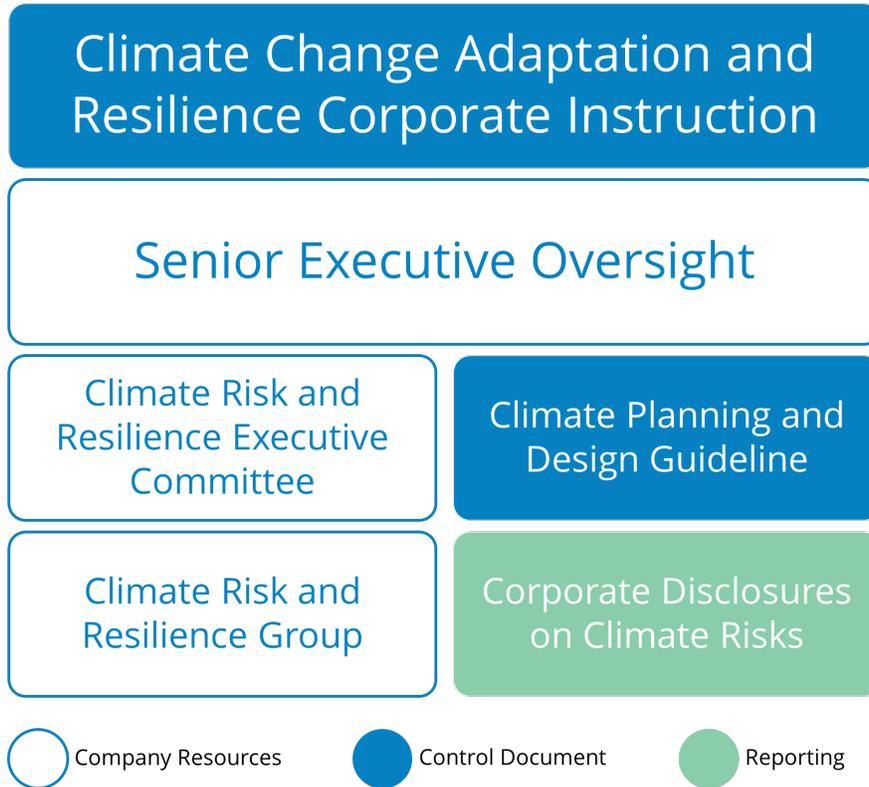


Figure 11. Climate Adaptation Governance Structure.



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.¹⁵ 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”.¹⁶ 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.

Outage Communications: The goal of this program is to rapidly increase the pace of emergency communications to Con Edison’s millions of customers. To gauge the effectiveness of this program, Con Edison will measure the number of customers reached and the time it takes to reach them during major emergency events.^{xvi}

Emergency Preparedness: The goal of this program is to expand the existing Micronet weather monitoring program by installing two additional weather stations. Con Edison will continue to track the number of storms or extreme events by comparing with the measured rain totals, wind speeds, and temperatures experienced.

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

^{xvi} Life Support Equipment (LSE) customers that have registered with the Company will also receive these notices. However, this does not change or modify the Company’s existing LSE notification process where Customer Service Representatives reach out via telephone calls to check on the status of these customers.

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
Storm Response Center	Percentage of implementation plan milestones met
Storm Response Technology Advancements	Percentage of technology implementation plan milestones met
Erosion Protection and Drainage Upgrade	Number of substations with identified issues enhanced as planned
Substation Loss Contingency	Percentage of implementation plan milestones met
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
Heat Mitigation Program for Worker Safety	This program is composed of pilot technologies to be implemented over the course of the five years. Specific performance measures can be determined at a later date
Living Shoreline and Nature Based Solutions	Percentage of implementation plan milestones met.
Rewilding and Green Infrastructure	Acres rewilded with established native habitat and/or amount of danger trees/invasive habitat removed Gallons of water projected to be captured during a major rain event from the installed measures

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 considering 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.
- 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.¹⁷
- 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 legislation, 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 new 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.

Endnotes

- ¹ The New York State Senate, 2023. Section 66. <https://www.nysenate.gov/legislation/laws/PBS/66>
- ² U.S. Climate Resilience Toolkit, 2018. Climate stressors and impacts. <https://toolkit.climate.gov/case-studies/working-together-keep-lights-new-york-city>
- ³ The New York State Senate, 2023. Section 66. <https://www.nysenate.gov/legislation/laws/PBS/66>
- ⁴ Ibid.
- ⁵ Case 22-E-0222, Proceeding on Motion of the Commission Concerning Electric Utility Climate Vulnerability Studies and Plans, *Joint Utilities Comments on Commission Inquiries Regarding Climate Vulnerability Studies and Plans*, August 15, 2022, pp. 18-19.
- ⁶ Climate Change Implementation Plan. 29 Dec 2020. Case Nos. 19-E-0065 and 19-G-0066. Con Edison.
- ⁷ EPA, 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. <http://www.epa.gov/cira/social-vulnerability-report>
- ⁸ Ibid.
- ⁹ Ibid.
- ¹⁰ Dugan, Jesse, et al., 2023. Social vulnerability to long-duration power outages. Science Direct. <https://www.sciencedirect.com/science/article/pii/S2212420922007208#bib8>
- ¹¹ Ibid.
- ¹² Clean Energy & Technology Careers Request for Proposals. Con Edison. <https://www.coned.com/en/business-partners/business-opportunities/clean-energy-tech-careers-rfp>
- ¹³ Climate Central, 2023. Urban Heat Hot Spots. <https://www.climatecentral.org/climate-matters/urban-heat-islands-2023>
- ¹⁴ IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896. <https://www.ipcc.ch/report/ar6/wg1/>
- ¹⁵ National Academies of Science. Enhancing the Resilience of the Nation's Electricity System, 2017. <https://nap.nationalacademies.org/catalog/24836/enhancing-the-resilience-of-the-nations-electricity-system>
- ¹⁶ Beasley, Blair and Judith Greenwald. Power System Resilience: A Primer. February, 2018. <https://bipartisanpolicy.org/download/?file=/wp-content/uploads/2019/03/BPC-Energy-Power-System-Resilience-Primer.pdf>
- ¹⁷ The New York City Council, 2023. An Urban Forest Plan. File 1065-2023. <https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=6229337&GUID=D9415665-C1D2-42C2-93D5-402340A7B90E#:~:text=The%20plan%20would%20be%20required,and%20facilitate%20gain%20in%20the>