

CLIMATE CHANGE IMPLEMENTATION PLAN

Case Nos. 19-E-0065 and 19-G-0066

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1 EXECUTIVE SUMMARY

This Climate Change Implementation Plan (Implementation Plan) is the next step in Con Edison's long-standing commitment to maintaining the reliability and resiliency of its utility infrastructure in the face of climate change. The Plan explains how the Company will incorporate climate change projections for heat, precipitation, and sea level rise from the 2019 Climate Change Vulnerability Study (Vulnerability Study)¹ into its operations to mitigate climate change risks to its assets and operations and establishes an ongoing process to reflect the latest science in the Company's planning.

Con Edison developed the Implementation Plan pursuant to the 2019 Joint Proposal (Joint Proposal).² In the Joint Proposal, the Company agreed to select projected climate change pathways to provide benchmark values of future climate conditions, indicate how the Company will integrate climate risk management into its governance structure, and review seven operational areas for opportunities to incorporate climate change information. This year-long process involved more than 40 subject matter experts from across the Company and included consultation with stakeholders.³

For temperature, precipitation, and related variables, Con Edison will use the 75th percentile of Representative Concentration Pathway (RCP) 8.5 projections as its selected pathway. For sea level rise, Con Edison will use the middle of the 25th to 75th percentile range of merged RCP 4.5 and 8.5 sea level rise projections developed by the New York City Panel on Climate Change.⁴ The Company has agreed to update the selected climate projections with new climate science at least every five years. In addition, Con Edison will review the pathways on an annual basis to determine if updates are necessary to reflect advances in climate science, policy changes, or other factors.

With respect to governance, the Company is adopting a Corporate Instruction⁵ on Climate Adaptation and a Climate Change Planning and Design Guideline, creating an executive committee to oversee implementation of this Plan, and establishing a climate risk and resilience team to execute the day-to-day activities required by this Plan.

¹ The Vulnerability Study identified potential climate changes in the Company's service territory and the range of potential impacts to the Company's electric, gas, and steam systems. Based on these findings, the Vulnerability Study provided a set of potential climate change adaptation strategies that could help the Company withstand future changes in climate, reduce the impact of extreme events, and facilitate a rapid recovery.

² Case 19-E-0065 and Case 19-G-0066 Proceeding on Motion of the Commission as to the Rates, Charges, Rules, and Regulations of Consolidated Edison Company of New York, Inc. for Electric and Gas Service (October 16, 2019).

³ Stakeholders included New York State Department of Public Service Staff, the City of New York, consumer and environmental groups, universities, real estate representatives, and other interested parties. Pursuant to the Joint Proposal, Con Edison will hold two meetings in 2021 and two meetings in 2022 to update stakeholders on its execution of the Implementation Plan.

⁴ The NPCC 2015 Report is available at: <u>https://nyaspubs.onlinelibrary.wiley.com/toc/17496632/2015/1336/1</u>

⁵ Con Edison uses Corporate Instructions to describe a major course of action in conducting Company business, involves major activities or functions of more than one organization, or affects all or a major segment of Company personnel.

The seven operational areas identified for review in the Joint Proposal are:

- Load forecasting
- Load relief planning
- Reliability planning for the sub-transmission and distribution systems
- Asset management
- Facility energy system planning
- Emergency response activations
- Examination of worker safety protocols

Con Edison's anticipated actions in each area are summarized in the chart below.

Focal Area	Implementation Plan
Load Forecasting	 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.
Load Relief Planning	 Beginning in 2021, Con Edison will incorporate climate change-driven increases in load and deratings due to increased temperatures and TV in the 10- and 20-year load relief plans.
Reliability Planning	 Con Edison will use climate change-adjusted load forecasts, any projected changes in asset ratings, and projected increases in TV and heatwaves (frequency and duration) in its Network Reliability Index modeling, non- network reliability analysis, and Transmission Probabilistic Reliability Assessment. In 2021, Con Edison will review the best available literature to evaluate projected changes in wind characteristics in the northeastern United States.
Asset Management	 Con Edison will incorporate the selected climate change pathways into its asset management program to consider the potential impact on asset life and performance. Con Edison has updated its flood design standard for new sites to add two feet of freeboard plus a sea level rise increment based on the sea level rise pathway and the useful life of the site to FEMA's 1% annual chance base flood elevation.

Facility Energy Systems Planning	• Con Edison will pursue flexible design strategies that allow for the installation of future additional HVAC cooling capability.
	 Con Edison will continue its energy efficiency investments in facilities to reduce thermal loads.
	 Con Edison will work with the City of New York to determine if the permitting process allows for pre-emptive upsizing of new HVAC equipment to account for future increases in temperature.
Emergency Response	 Con Edison will continue discussions about how to incorporate heat, flooding, and precipitation projections into weather and impact forecast models.
	 The Company will plan and conduct drills and exercises based on projected pathway criteria.
Worker Safety	 Con Edison has determined that its existing worker safety protocols are appropriate and effective for the near-term projections of climate change.

2 CLIMATE CHANGE PATHWAYS

The Vulnerability Study identified a range of potential climate futures for the Con Edison service territory. In the Joint Proposal, Con Edison agreed to select climate change pathways to narrow that range and establish a baseline for its planning assumptions.⁶

After reviewing the relevant climate science, consulting with stakeholders, and considering other relevant factors (e.g., external benchmarking, high-level system sensitivity),⁷ Con Edison will use the 75th percentile of Representative Concentration Pathway (RCP) 8.5 projections for temperature, precipitation, and related variables. For sea level rise, Con Edison will use the middle of the 25th to 75th percentile range of merged RCP 4.5 and 8.5 sea level rise projections

⁶ Before selecting pathways, Con Edison reviewed the climate projections in the Vulnerability Study and determined that no updates were required. The Vulnerability Study used downscaled climate projections based on an ensemble of Global Climate Models developed as part of the Coupled Model Intercomparison Project Phase 5. Global Climate Models simulate the climate system and future climate change. The Coupled Model Intercomparison Project was initiated in 1995 to organize a standard set of Global Climate Model simulations and forward-looking modeling objectives in support of the United Nations Intergovernmental Panel on Climate Change (IPCC) assessment process. Each IPCC assessment incorporates the latest generation of CMIP models in order to establish the state-of-the- science regarding climate change and evaluate potential consequences.

⁷ These and other considerations are further detailed in the annexed Con Edison memorandum to the Climate Change Implementation Plan Working Group from May 11, 2020.

developed by the New York City Panel on Climate Change.⁸ These pathways broadly align with other regional benchmarks, including New York City's Climate Resiliency Design Guidelines,⁹ and the Port Authority of New York and New Jersey Climate Resilience Design Guidelines.¹⁰

The pathways are reflected in the Company's new Climate Change Planning and Design Guideline. This Guideline serves as a reference for organizational specifications to aid in the design, construction, operations, and maintenance of Company assets, and to inform emergency planning in response to a changing climate. The Guideline provides explanations of pathways, their purpose and supporting science, and climate projections relevant to Con Edison processes.

The Company has agreed to update the selected climate projections with new climate science at least every five years. In addition, Con Edison will review the pathways on an annual basis to determine if updates are necessary. Those reviews may reflect advances in climate science and improved climate change projections applicable to the Company's service territory and may be triggered by material changes in climate science, policy changes, or other factors.

3 CLIMATE RISK GOVERNANCE

The Joint Proposal required Con Edison to indicate how the management of climate risk will be integrated into the Company's organizational governance structure, including the roles and responsibilities of management.

First, Con Edison is adopting a Corporate Instruction on Climate Adaptation that reinforces the Company's commitment to climate change adaptation and resilience and requires Company organizations such as planning, engineering, operations, and emergency response to consider the Climate Change Planning and Design Guideline in their operations.

Second, as mentioned above, the Company has developed a Climate Change Planning and Design Guideline that outlines responsibilities and guiding principles for incorporating climate projections into Company practices. The Guideline addresses ambient temperatures, heat and cold extremes, heavy precipitation, coastal flooding, and variables specific to load forecasting.

⁸ Some processes will continue to use higher risk factors or consider projections different than the selected pathways. For example, RCP 8.5 75th projections do not represent a risk-averse design basis for processes impacted by cold weather extremes since the projected warming in that pathway does not capture the continued chance of cold snaps in the service territory. See Kretschmer, M., Coumou, D., Agel, L., Barlow, M., Tziperman, E., & Cohen, J. (2018) More-persistent weak stratospheric polar vortex states linked to cold extremes. Bulletin of the American Meteorological Society, 99(1), 49-60; Kim, B., Son S., Min, S., Jeong J., Kim, S., Zhang, X., Shim, T., & Yoon, J. (2014). Weakening of the stratospheric polar vortex by Arctic sea-ice loss. Nature Communications, 5(4646). In addition, organizations such as Emergency Preparedness and Risk Management do not have design thresholds that require the use of single pathways. These organizations benefit from analyzing multiple future scenarios (including tail-end risks) rather than a single design basis.

⁹ New York City Mayor's Office of Resiliency. Climate Resiliency Design Guidelines. Version 4. September 2020. <u>https://www1.nyc.gov/assets/orr/pdf/NYC_Climate_Resiliency_Design_Guidelines_v4-0.pdf</u>

¹⁰ The Port Authority of New York & New Jersey. Climate Resilience Design Guidelines. Version 1.2. June 2018. <u>https://www.panynj.gov/port-authority/en/about/Environmental-Initiatives/sustainable-resilient-development.html</u>

The Guideline also explains the Company's climate change pathways and provides direction for monitoring climate science. Con Edison intends that the Guideline will be a "living document" that will provide the flexibility to respond to updates in climate change, projected impacts as they are learned, and findings or recommendations from Working Group members or other climate change professionals.

Third, the Corporate Instruction establishes a new Climate Risk and Resilience Executive Committee. This committee, composed of engineering, emergency preparedness, operations, strategic planning, and other vice president-level executives from across the Company, will meet at least four times a year and provide oversight of the Company's ongoing climate change adaptation activities. The Committee's work includes reviewing the Company's climate change adaptation and resilience strategy, overseeing the activities of a new climate risk and resilience team, promoting coordination across the Company, reviewing and updating the Company's Climate Change Adaptation Corporate Instruction as needed, providing advice on revisions to the Climate Change Planning and Design Guideline, overseeing the Company's efforts to continue the integration of climate adaptation into internal processes, and reporting to senior leadership¹¹ on these matters.

Fourth, as discussed above, the Company is establishing a climate risk and resilience team to execute the day-to-day activities in this Plan. This team will provide direct support to the Climate Risk and Resilience Executive Committee. Among other things, the team will assist in incorporating the Company's selected pathways into the areas identified in this Plan, review new climate information and developments, manage research projects, provide guidance on aligning Company investment and planning efforts with this Plan, and continue the Company's work and engagement with stakeholders.

Finally, the Company's senior leadership will provide monitoring and oversight of climate risk and resilience.

4 LOAD FORECASTING

Each year, Con Edison develops 10-year peak forecasts to project changes in customer demand and identify potential system needs. The Company also develops 20-year peak forecasts as part of its long-term planning activities.¹² Consistent with long-standing industry practice, Con Edison uses historical climate conditions as an input in its forecasts. Starting with its 2020 electric system peak demand forecast, Con Edison is incorporating future climate conditions from its pathways into its 10- and 20-year forecasts.¹³

¹¹ The Climate Risk and Resilience Executive Committee will report to a senior-level executive committee, consisting of the CEO, President, and all senior vice presidents.

¹² The Company also develops daily forecasts looking out over the next 10 days, which are used for emergency response, daily dispatch, scheduling, planning, and operations.

¹³ Based on preliminary findings, Con Edison will continue to forecast and plan to its current design temperature variables for its gas and steam systems, as climate change projections do not preclude the chance of cold snaps in the service territory.

Con Edison uses temperature and humidity for its electric peak demand forecasts. Con Edison has developed its own customized temperature indicator for forecasting purposes, temperature variable (TV), which accounts for temperature and humidity. Incorporating the Company's current selected pathways into this forecast cycle results in an increase in TV by 1 degree in 2030 (87 TV) and by 2 degrees in 2040 (88 TV). Based on current information, the Company expects that its projected increases in TV will in turn increase peak demand growth on its system.¹⁴

5 LOAD RELIEF PLANNING

Each year, Con Edison evaluates peak demand to identify areas of its system where load growth exceeds system capacity. The Company then identifies potential projects to address projected overloads, such as non-wires solutions, load transfers, expanding substation capability (adding cooling or new equipment), or constructing new substations. This process is referred to as load relief planning. The Company develops an annual 10-year load relief plan and a 20-year plan for long range planning purposes.

Con Edison's selected temperature pathway projects increases in temperature and TV. The Company expects that increases in these variables will result in both higher customer demand (e.g., due to increased air conditioning use) and reduced asset ratings (i.e., equipment capacity).¹⁵

As part of this Implementation Plan, Con Edison will modify its load relief planning process to account for these projections. Beginning in 2021, Con Edison will project increases in customer demand and decreases in asset ratings resulting from its pathways for each substation and network and incorporate them in the load relief planning process.

6 RELIABILITY PLANNING FOR THE SUB-TRANSMISSION AND DISTRIBUTION SYSTEMS

Each year, Con Edison develops a sub-transmission reliability plan and a distribution system reliability plan that identifies capital investments needed to meet system reliability standards. The plans rely in part on two reliability metrics: the Network Reliability Index (NRI) (network distribution system) and the Transmission Probabilistic Reliability Assessment (TPRA) (sub-transmission system). The Company also conducts a reliability

¹⁴ Other factors, such as energy and environmental policy, may result in more significant changes in Con Edison's demand growth. For example, New York State policy goals have the potential to increase electric demand and use for the purposes of heating electrification.

¹⁵ Equipment "ratings" indicate the capacity of electrical equipment, such as substation transformers, primary distribution lines, and other assets. Every electrical device on the Con Edison system has a specified rating based on a reference ambient temperature. Increases in ambient temperature could affect equipment ratings and cycling capabilities. Equipment ratings are set by equipment manufacturers and are applied by engineers to design networks at a safe and reliable system capacity. A reduction in equipment ratings, absent measures to compensate, will result in a reduction in electric capacity in the electrical system.

analysis for its non-network distribution system.¹⁶

Con Edison develops the NRI and TPRA through software modeling that simulates different equipment failure and outage scenarios based on multiple variables, including weather. The models prioritize system components by their estimated contribution to future outages. Con Edison then addresses priority components in its reliability plans.¹⁷

As part of this Implementation Plan, Con Edison will incorporate the selected climate change pathways, as applicable, into its annual reliability planning processes to identify and prioritize future infrastructure investments needed to maintain reliability and resiliency. Con Edison will use climate change-adjusted load forecasts, projected changes in any asset ratings, projected increases in TV, and increased frequency and duration of heat waves in its NRI and TPRA modeling and non-network reliability analysis.¹⁸

In addition to heat, storms (high winds in particular) tend to drive equipment failures on Con Edison's overhead distribution system. The scientific community does not yet have localized projections of changes in wind speeds and direction due to climate change, but studies suggest that extreme events will increase in frequency and intensity because of a warming climate. Con Edison will continue to evaluate wind as a climate change risk variable and, in 2021, will undertake a review of best available literature to evaluate projected future changes in wind characteristics in the northeastern United States.

7 ASSET MANAGEMENT

Con Edison's asset management program consists of procedures, specifications, and protocols for the operation, maintenance, and replacement of equipment in its electric, gas, and steam systems.

As part of this Implementation Plan, Con Edison will incorporate the selected climate change pathways into its asset management program to consider the potential impact on asset life and performance. The Company is establishing an internal Climate Change Planning and Design Guideline that, among other things, will support this process.

Con Edison's selected climate change pathways indicate future increases in temperature, TV,

¹⁶ The terms "network" and "non-network" refer to distribution system designs, and Con Edison's electric system contains both designs. Most of Con Edison's electric customers, approximately 86 percent, are served by one of 64 predominantly underground network systems. The remaining electric customers are predominantly served by overhead lines in 19 non-network load areas.

¹⁷ Con Edison uses a target value of 1 per unit (p.u) as the threshold for keeping NRI below. TPRA does not include a similar singular threshold for triggering reliability investments, as TPRA modelling is used to prioritize activities. These activities include purchasing spare inventory for key long-lead time equipment and undertaking new projects and system upgrades.

¹⁸ Currently, Con Edison's selected pathways do not indicate significant heat-related reliability concerns with the nonnetwork distribution system or the sub-transmission system.

and sea level.¹⁹ Increases in temperature and sea level will directly affect the Company's asset management program.

Electric equipment ratings are sensitive to increases in temperature. For example, asset ratings for transformers, cable, busbar, and connections on the sub- transmission and distribution systems are all sensitive to temperature. As ambient temperatures increase, an asset's ability to dissipate heat decreases. To maintain the asset's useful life, Con Edison may need to lower (i.e., "derate") the normal and emergency ratings. The Company continues to assess each asset's reference ambient average temperature to determine whether future derating is required.

Sea level rise presents risks for the electric, gas, and steam systems. Coastal flooding is expected to increase across the Company's service territory. Assets that are located within the 100-year floodplain are projected to experience more frequent and severe flooding. Assets that are not currently in the 100-year floodplain could still face future flooding risks as sea level rise expands the extent of the 100-year floodplain.

As part of this Implementation Plan, Con Edison is updating its flood design standard²⁰ for new sites to add two feet of freeboard plus a sea level rise increment based on the sea level rise pathway and the useful life of the site to FEMA's 1% annual chance base flood elevation. As the flood design standard is updated, Con Edison will review impacted existing assets and identify any changes necessary due to changes in design flood elevation. Those changes may be implemented over time, using a flexible adaptation approach.

8 FACILITY ENERGY SYSTEM PLANNING

Across its service territory, Con Edison operates facilities that use heating, ventilation, and air conditioning (HVAC) systems for indoor temperature/climate control. These systems require periodic evaluation of operating performance and replacement as they reach the end of their useful lives. Con Edison also installs HVAC systems in newly constructed facilities as necessary.

As part of this Implementation Plan, Con Edison is incorporating the selected climate change pathways and an asset's expected useful life into its process for the periodic replacement and new installation of HVAC systems.²¹ Design life of HVAC systems is relatively short compared

¹⁹ The Company has reviewed the selected pathway projections for precipitation. While the projections show an increase in annual precipitation, the science is inconclusive in how that translates to deluge type events that have more relevance to Con Edison's system. This is something the Company will continue to monitor going forward.

²⁰ Con Edison currently designs assets to protect against the 100-year floodplain based on FEMA flood insurance rate map elevations plus two feet of freeboard and one foot of sea level rise (i.e., FEMA +3'). Con Edison's selected climate pathway indicates that the current design criterion of one foot of sea level rise is projected to be exceeded by 2040.

²¹ Con Edison has evaluated its HVAC design practices against the selected climate change temperature pathway, which suggests that facility cooling requirements will increase in coming years. For example, all else being equal, the size of cooling equipment in Con Edison's facilities in New York City may require an increase of up to 40% by 2040. Increasing design temperature is directly proportional to the sizing of cooling equipment in accordance with the formula *Heat Transfer = mCp* * *delta T*, with an indoor target air temperature of 76 degrees. Using the Baseline and 2040

with that of other Con Edison assets and climate may not change significantly enough within the lifetime of existing HVAC systems to merit retrofitting measures. New HVAC systems, however, will require additional consideration and action.

Anticipating that future increases in cooling capacity may become necessary, Con Edison will allow for flexibility in project designs to enable future expansion in the new HVAC systems it installs. For example, this could include evaluating the physical space for additional future HVAC equipment, and allowing for additional space as needed. It could also include measures such as adding additional electrical conduits, adding switchgear, or upsizing ventilation ducts, as appropriate. Con Edison will continue monitoring the hottest hours of each year as well as the hottest hours in the years at the end of the equipment's useful life and will install additional HVAC equipment as it becomes necessary.

In certain cases, it may be necessary to install additional HVAC cooling capacity before it is needed.²² Con Edison is evaluating whether municipal building and energy codes, and ASHRAE guidelines, will impact HVAC designs. This review includes meeting New York City energy efficiency requirements that seek to optimize the sizing of equipment for current needs. If Con Edison's designs and/or the permitting process is impacted by local rule or regulation, the Company will seek additional clarification from the municipality or appropriate agency.

Additionally, Con Edison will continue to reduce building thermal loads (e.g., improve building envelope, use more efficient lighting, and employ green design elements). Con Edison is already implementing and adhering to local laws (i.e., LL84, LL87, LL97, and LL88) to monitor and reduce thermal loads. These include lighting retrofits to improve lighting and energy efficiency, Level 2 energy audits, retro-commissioning to identify energy conservation measures, collecting energy use data, and meeting LL97 carbon emission goals for 2025, 2030 and 2050. These measures will help mitigate the increased demand placed on HVAC systems from the changing climate.

9 EMERGENCY RESPONSE ACTIVATIONS

Con Edison maintains emergency response plans tailored to specific events and circumstances. The Company has staffing plans that are based on the weather forecasts for all of its commodities. As part of this Implementation Plan, Con Edison will incorporate the selected climate change pathways for heat, flooding, and precipitation into its emergency preparation and response activities, as applicable. In addition, if local wind data specific to the Northeast becomes available, Con Edison will incorporate this data.

The Company conducts periodic reviews of emergency response plans. For example, the Company's Emergency Preparedness organization reviews the Electric Emergency Response Plans in coordination with DPS Staff annually. The Company will include climate change data

LaGuardia values in Table 11 indicates a *delta* T of (88.7 – 76) currently versus a *delta* T of (93.7 – 76) in 2040, or an approximate 40-percent increase in the sizing of cooling equipment.

²² Such as when new HVAC equipment is installed that requires a marginal increase in cooling capability to meet a projected climate need that is only a few years out in the future.

from the selected pathways to adapt the emergency response plans to the new conditions as applicable. This review will allow the Company to adjust responses to storms, heat waves, and other climate change-related events.

Along with increased heat, rain, and flooding, the Company's preliminary review forecasts an increase in the frequency of heat waves, extreme heat days, and days with heavy rain. The Company will include increased heat, rain, and flooding in future emergency response drills, including the increased frequency of these events. For example, back-to-back heat or rain events can be used to exercise the Company's ability to respond to rapidly occurring, distinct events.

10 EXAMINATION OF WORKER SAFETY PROTOCOLS

Con Edison employees work to provide reliable energy delivery to customers 24 hours a day in virtually all types of weather conditions. The Company's health and safety protocols include a process to evaluate the appropriate procedures and equipment to safely conduct operations and currently include considerations such as heat, precipitation, and flooding conditions.

As part of this Implementation Plan, the Company has evaluated its worker safety protocols and has determined that existing worker safety protocols and procedures are appropriate and effective for the near-term projections of climate change for the selected pathways. By including new climate projections for heat, precipitation, and sea level rise in the examination of worker safety protocols, the Company will, together with union safety leadership, continue to develop procedures and provide equipment to employees to conduct operations safely. As data becomes available on other climate change impacts (e.g., wind impacts, extreme events), the Company will include those new factors in its ongoing examination of worker safety protocols.

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Consolidated Edison Company of New York, Inc.