conEdison, inc.

Long-Range Plan

Our Electric System

A Comprehensive View of Our Electric System through 2050

January 2022

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About this Long-Range Plan

This document and the statements and analysis contained within are based on information available as of April 2021.

Executive Summary

The Consolidated Edison Company of New York, Inc. (CECONY) operates an electric system that delivers electricity to more than 3.4 million customers in New York City and Westchester County. We have served our electric customers for over 125 years, connecting electric generation and delivering the power needed to light customers' homes, run their appliances, and operate critical facilities such as hospitals and schools. Our electric system is vital for the livelihood and economic prosperity of our communities. It is also essential to the ongoing energy transition and state and local decarbonization and climate adaptation efforts.

As we continue to invest in, build, and operate our electric system to deliver power with world-class reliability, safety, and security, the world around us is also evolving. Causes of the evolution include changes in customer and stakeholder expectations, a changing climate, clean energy legislation, technological advancement, and a focus on equity and environmental justice.

Today, our customers expect greater value in the energy solutions we provide. Customers and stakeholders expect greater comfort, convenience, choice, and control in all aspects of their lives, including energy solutions. They are more environmentally conscious and focused on sustainability. Climate change is leading to severe weather and increasing the potential for extreme weather such as devastating Nor'easters and extended heat waves. We are committed to understanding climate change risks and improving our system resilience. By gaining a better understanding of projected climate changes across our service area—including increasing temperatures, heavier precipitation, sea-level rise, and extreme weather—we can identify system vulnerabilities, prioritize investments, and adapt and strengthen our infrastructure.

To address the current and future impacts of climate change, we are committed to being a next-generation, clean energy company, transitioning to the clean energy future that our customers deserve and expect. We play a critical role in achieving the ambitious climate and clean energy goals set by New York State and New York City, including reaching net-zero greenhouse gas (GHG) emissions by 2050. We are engaged in many initiatives to use innovation and technological improvements to help create rapid decarbonization in electric generation and enable building heating and transportation electrification. We are also building on our understanding of equity and environmental justice issues that are at the forefront of the clean energy transition conversation. As we advance these initiatives, the need for safe, reliable, and secure energy infrastructure remains paramount.

Con Edison, Inc., our parent company, has expanded and deepened its **Clean Energy Commitment** to reflect its intent to lead New York to net-zero GHG emissions by 2050. This commitment builds on our past activities as a climate leader, outlined in our **Sustainability Report,** and boldly expands on that work.

A significant shift for customers from use of fossil fuels to clean electricity is required to achieve net-zero GHG emissions by 2050. Electric sales[1] is expected to grow dramatically—between 42% to 85% by 2050—according to our internal studies. The increase in electric sales can be attributed to widespread electrification of building space heating, building water heating, and transportation, as well as increased heat waves causing air conditioning sales to spike. The

[1] Sales are defined as the volume of energy delivered

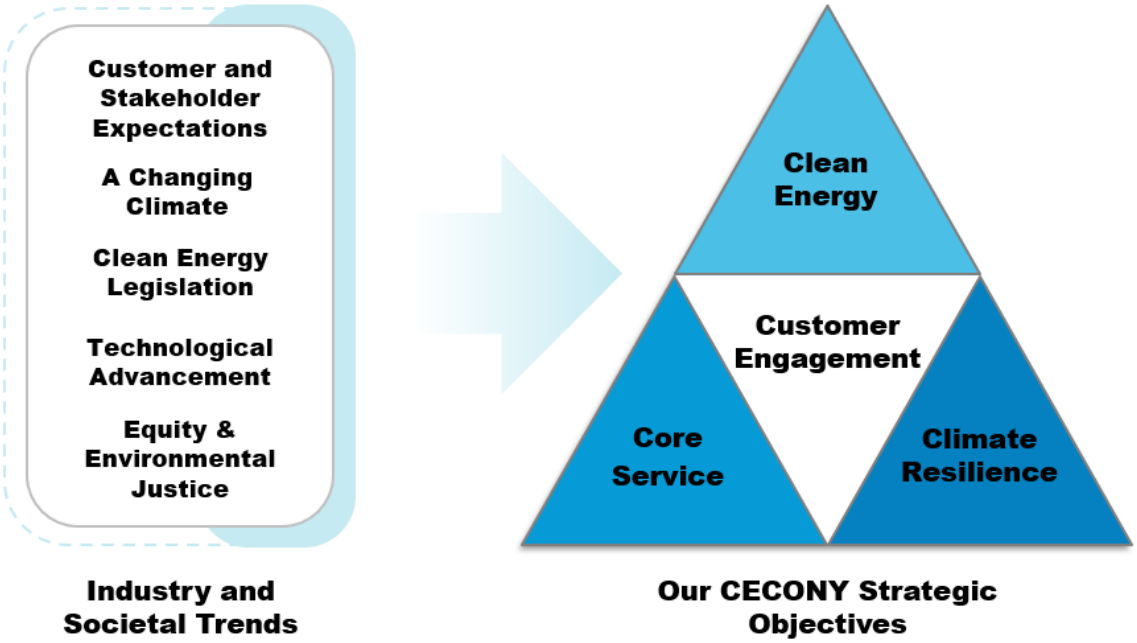
electric system will need to have the infrastructure in place to support that growth. With this electrification, we are expecting high electric demand periods in both the summer and winter.

In addition to accommodating the shift to electrification, we will need to enable the change of electric supply to renewable generation. This includes expanding our transmission and distribution infrastructure to accommodate the interconnection of new and existing clean generation resources to provide supply within our service territory.

This Long-Range Plan articulates the strategies, actions, and investments that we need to deliver our comprehensive strategic objectives in four key areas:

- **Clean Energy:** Economy-wide net-zero GHG emissions in our service territories by 2050
- **Climate Resilience:** Increased resilience of our energy infrastructure to adapt to climate change
- **Core Service:** World-class safety, reliability, and security, while managing the rate impacts and equity challenges of the energy transition
- **Customer Engagement:** Industry-leading customer experience and facilitation through the energy transition

Figure 1. CECONY Strategic Objectives



To deliver on these objectives, we anticipate investing over $53 billion over the next 10 years. Beyond 10 years, we will need to continue to invest in our electric system to ultimately achieve net-zero GHG emissions economy-wide in our service territories by 2050. Given the uncertainty in the trajectory of technology, policy, and customer adoption, we will build flexibility into our planning and in future long-range plans.

Considering this uncertainty, we studied several scenarios to reach net-zero GHG emissions by 2050. We then selected three pathways that inform our decarbonization strategy and that represent a range of possible solutions. These representative pathways depict energy futures ranging from full electrification (including transportation and building heating) to a mix of electrification and low-to-zero carbon gaseous fuels, such as renewable natural gas (RNG) and hydrogen. Each pathway relies on significant increases in clean power generation, adoption of energy efficiency, and a transition away from fossil fuel use to clean electricity or low-to-zero carbon gaseous fuels in buildings and transportation. Our strategy and plans maintain optionality and flexibility based on signposts (indicators to ramp up or down specific programs or actions based on technological and policy developments) to achieve the future value our communities and customers expect. Each of these pathways is detailed in Table 1.

Table 1. Representative Pathways

	Full Electrification	Targeted Electrification	Hybrid Consumption
Energy Efficiency	Buildings achieve 120 TBtu of incremental energy efficiency through improved appliance efficiency and building envelope upgrades; an additional 60 TBtu of energy efficiency achieved through deeper building envelope upgrades	Buildings achieve 120 TBtu of incremental energy efficiency through improved appliance efficiency and building envelope upgrades	Buildings achieve 120 TBtu of incremental energy efficiency through improved appliance efficiency and building envelope upgrades
Building Heating	Renewable electricity and decarbonized steam serve 100% of the building stock in our service territory, and the gas distribution system is decommissioned	Renewable electricity and decarbonized steam serve between 70% and 80% of the New York City building stock with targeted full electrification zones and use of low-to-zero carbon gaseous fuels for remaining heating needs	Renewable electricity and decarbonized steam serve between 50% and 60% of the New York City building stock; the gas system uses low-to-zero carbon gaseous fuels to support difficult-to-electrify[2] buildings
Electric Generation	100% carbon-free generation; 33 GW of capacity in our service territory	100% carbon-free generation; 30 GW of capacity in our service territory	100% carbon-free generation; 25 GW of capacity in our service territory
Transportation	85%-90% of light duty vehicles (LDVs) and 75% of medium and heavy duty (MHDVs) will be electric, with the remaining being a mix of fuel cell and internal combustion vehicles	85%-90% of light duty vehicles (LDVs) and 75% of medium and heavy duty (MHDVs) will be electric, with the remaining being a mix of fuel cell and internal combustion vehicles	85%-90% of light duty vehicles (LDVs) and 75% of medium and heavy duty (MHDVs) will be electric, with the remaining being a mix of fuel cell and internal combustion vehicles
Gaseous Fuel Usage	170 TBtu of gaseous fuels are used for electric and steam generation (100% low-to-zero carbon); no gaseous fuels are used for buildings as the gas distribution system is decommissioned	250 TBtu of gaseous fuels are used across all sectors (100% low-to-zero carbon)	296 TBtu of gaseous fuels are used across all sectors (70% low-to-zero carbon)

[2] Our definition of difficult-to-electrify buildings include those buildings that are either prohibitively expensive to retrofit with electric heating technologies, inclusive of available subsidies, or are technically impractical to retrofit with electric heating technologies due to the engineering or design characteristics of the building.

We remain open to considering all decarbonization solutions that may advance societal goals of combatting climate change and increasing value to our customers as industry and societal trends evolve. Though the ultimate pathway is uncertain, we can use these three representations to prepare our energy systems for projects and programs we will need to meet our customers' needs, to determine the investments we should make at scale in the near-term, and to identify the technologies we should research and pilot.

Our long-range plan and analysis are based on clean energy policies as of April 2021. However, New York State, New York City, and local municipalities continue to enact nation-leading clean energy policies and may develop future legislation. We continue to closely monitor and help shape this rapidly evolving landscape to create beneficial outcomes for our customers and stakeholders. We will review and appropriately modify our plans and supporting strategies as necessary, as new policies are created.

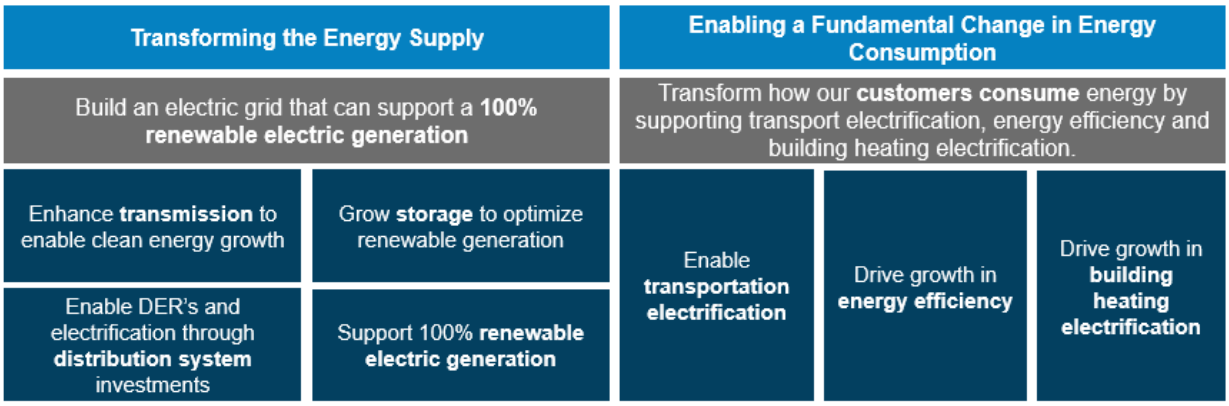
We will also intend to make investments that achieve the goals of this transition as cost-effectively as possible. We are both experienced and well-positioned to provide value and support our customers in the clean energy transition, but we cannot do it alone. We will continue to collaborate with customers, regulators, policymakers, capital providers, suppliers, market operators, and other stakeholders to jointly achieve this future with the principles of cost-effectiveness, equity, and environmental justice in mind.

Clean Energy

New York State and New York City have passed nation-leading legislation—the **Climate Leadership and Community Protection Act** (CLCPA) and the **Climate Mobilization Act** (CMA)—that target economy-wide reductions in GHG emissions to get to net-zero by 2050. Additionally, New York State passed the **Accelerated Renewable Energy and Community Benefit Act,** which seeks to improve and streamline the process for environmentally responsible and cost-effective siting of large-scale renewable energy projects across the state, and New York City passed Local Law 94, which requires buildings undergoing major roof renovations to consist of either solar PV or a green roof.

We have considered the objectives of this legislation and they align with our own views, informed by industry trends and customer expectations, towards a clean energy future. We have developed a strategy to help achieve economy-wide net-zero GHG emissions in our service territories by 2050. The Clean Energy strategy for our electric system is exemplified by a series of initiatives for achieving our ultimate decarbonization goals, as shown in Figure 2:

Figure 2. Electric Clean Energy Strategies



Transforming the energy supply means shifting from fossil-fueled electricity generation to 100% renewable generation. It requires making transformational investments that connect our transmission and distribution system to renewable generation. It also includes supporting large-scale storage solutions that enable the adoption of more intermittent power sources. We continue to advocate for policy changes that will allow for more utility-owned renewables and increase generation capacity fueled by low-to-zero carbon gaseous fuels. This will contribute to meeting the state's ambitious goals to eliminate GHG from electric generation by 2040 at a lower long-term cost compared to renewables owned by third-party generators.

Enabling a fundamental change in energy consumption means electrification of current fossil fuel energy uses such as in transportation and building heating. The availability of skilled third parties that can advance electrification work such as EV charger and heat-pump installations, advocate for appropriate incentives, and enable the market, will further facilitate customer adoption of clean energy solutions.

We recognize that the success of the clean energy transition will depend on the availability of adequate electric infrastructure to meet the needs created by drastically increased electrification. Transmission and distribution infrastructure requires significant lead time to approve, and build. To meet demand growth, we will take a demand-leading strategy, highlighting our commitment to build capacity in a timely manner to meet customer needs in a rapidly shifting environment. During the next 5-10 years, there will be increased need for electric service connections to allow for electrification of transportation, heating, and appliances. In addition, we plan to invest in new electric services and substations in capacity constrained areas. We will also use peak demand optimization tools, such as energy efficiency and demand response, to reduce the need for new capacity where possible. We are monitoring demand projections and the evolving needs of bulk power clean energy proposals and will plan our infrastructure upgrades and build-out accordingly.

Climate Resilience

We partnered with Columbia University to develop an industry-leading **Climate Change Vulnerability Study** to understand current climate risks and projected future risks on our electric system. We identified several specific climate-driven risks:

- **Heat waves:** Heat waves cause greater electric demand as our customers regulate temperature in living spaces through air conditioning. Heat waves and the resulting strain on electric assets also degrades equipment.
- **Heavy precipitation:** Heavy precipitation is a risk to electric grid assets including substations, transmission equipment, overhead distribution lines, and distribution equipment, increasing the risk of disruptions in service.
- **Sea level rise and storm surge:** Sea level rise and storm surge can cause water intrusion into our electric assets, increasing the risk of disruptions in service.
- **Cold spells:** Dramatic cold spells can interfere with electricity production from renewable generation assets, such as wind turbines and solar panels, which will generate an increasing share of electric supply.
- **Extreme weather events:** Events such as hurricanes, tornadoes, and Nor'easters may disrupt service lines.

As a result of the study, we are implementing our **Climate Change Implementation Plan** through a variety of initiatives, including the following examples from our Prevent, Mitigate and Respond framework:

Prevent: Harden Infrastructure

- Placing overhead electric distribution lines underground to avoid wind and tree impacts, which will reduce customer outages
- Enhance our engineering design standards to account for projected climate change in our service territories. All newly built infrastructure is being constructed to these new standards
- Evaluate and continue to retrofit existing infrastructure to enhanced design standards

Mitigate: Minimize Disruptions

- Modify energy system designs to reduce the number of customer disruptions caused by extreme weather, such as by installing sectionalizing switches in our electric distribution networks

Respond: Reduce Recovery Time

- Update our outage management system (OMS) and network of advanced metering infrastructure (AMI) to improve our visibility and ability to respond to events quickly and comprehensively
- Improve our ability to deploy larger recovery crews more quickly to restore damaged electric infrastructure

Fortifying our energy systems will be a major, multi-decade effort, and we continue to enhance the response of our utilities to extreme weather. This includes improving our modeling of the impact more severe weather may have on our energy systems and investing in key storm response capabilities (e.g., acquiring spare utility vehicles for emergency response crews who are flown in to assist with electric service restoration).

Core Service

Energizing the New York City and Westchester County economies is our core responsibility. We are committed to providing safe, secure, and reliable electric service while managing rate impacts and supporting low- and moderate-income communities. The key components of our Core Service strategic objective are shown in Figure 3.

Figure 3. Key Components of Core Service

Our **managed risk portfolio** within electric system planning embodies the elements of our core services, with a concentrated focus on addressing operational risks and asset management.

- Electric **safety** for the public and our employees continues to be our top priority. We monitor our electric assets and upgrade equipment where it poses a safety risk. We also have extensive training and safety programs to protect our employees when out in the field.
- **Security** is critical as we transition to a more digitally enabled electric system. We have a dedicated cybersecurity team that identifies, prevents, and mitigates cybersecurity threats from internal and external sources. We also have measures in place across our enterprise to manage physical threats.
- **Reliability** is the result of our leading-edge designs, operating expertise, and investment in our electric delivery systems. Our reliability program includes proactive maintenance of existing infrastructure, including substations, transmission lines, and distribution assets. This effort provides our customers with award-winning reliability, quantified by a System Average Interruption Frequency Index (SAIFI) value that is 8 times better than the state and national averages.

Our **managed transition** activities include those activities that manage rate impacts from future investments while supporting an equitable transition and encouraging clean energy participation for historically disadvantaged communities.

- **Managing rate impacts** is imperative to making the clean energy transition cost-effective. Growth in electric demand due to electrification of transportation and building heating amplifies the need for cost-based rates. Such rates should provide customers with price signals that promote the efficient use of the electric delivery system and curb rising system costs.
- **Enabling an equitable transition** means that historically disadvantaged communities are not disproportionately burdened by the energy transition and that they receive the benefits of clean energy. We are actively pursuing programs to reduce cost barriers for

building heating electrification and electric energy efficiency for buildings that house low-income tenants.

Finally, investing in our diverse, inclusive, and talented workforce is central to our success. Investing makes the company stronger and helps us lead the industry on every level, from maintaining our best-in-class reliability to achieving a sustainable future for our company and making sure every employee feels respected, included, and heard.

We know that technology will play a key role in building a resilient, reliable electric grid that delivers 100% clean energy. Our employees will need strong technical skills to operate, monitor and maintain advanced energy infrastructure. We provide continuous state-of-the-art training and development to our employees in a wide variety of areas, including technical and operations training, as well as strengthening leadership competencies.

Customer Engagement

We will deliver increased value for customers through an industry-leading, dynamic customer experience and enhanced engagement that meets evolving expectations, encourages & empowers customers to achieve climate goals, and improves their daily lives. This includes informing customers on their best energy options and serving as a trusted advisor to help them accomplish their energy goals.

As part of this energy transition, hundreds of thousands of individual customers will have to make energy decisions that align with climate targets and the realities of climate change. Making these decisions is a challenge; there can be a lack of energy data to inform how and when customers use energy and significant upfront costs for clean energy solutions. Our Customer Engagement strategy is designed to support these decisions with impactful services and tools, including the following examples:

- **Electric AMI program** that provides customers with detailed data about their energy usage.
- **Energy Efficiency and Clean Heat programs** that offset some of the upfront costs of energy efficiency and building heating electrification measures.
- **Energy Efficiency Marketplace** that provides customers with various subsidized technology options to reduce at-home energy consumption.
- **Online Customer Project Center** for customer upgrades which provides one stop for all project information and artificial intelligence for quick responses to inquiries.

Our customers continue to expect us to deliver on our core services. We need to get the basics right: be on-time to turn on their service, make it easy to pay bills, secure customer data and information, and communicate frequently and proactively with affected customers in the event of equipment failure or power outages. We continue to invest in programs, such as our new customer service system (CSS) and customer relationship management (CRM) system upgrades, to improve our customers' experience and interactions.

Cost-Effectiveness

Significant utility and customer investments are required to achieve the clean energy future value expected by our communities and customers. In addition to the core safety, reliability, security, and improved customer experience that we are providing, our future investments will emphasize enhanced climate resilience and GHG emissions reductions. Recent analyses estimate that societal benefits due to avoided GHG emissions and improved health will outweigh the costs needed to get to net-zero GHG emissions by 2050.[3]

To deliver on these objectives, we anticipate making investments of more than $53 billion through 2031 in our electric system, with approximately:

- 44% of our projected expenditures supporting a combination of Core, Clean, and Climate Resilience strategic objectives (i.e., multi-value investments that include resilience)
- 25% will support Core Services
- 26% will support Clean Energy
- 5% will support Climate Resilience

The investments needed for Customer Engagement are included in each of these categories.

Some of these investments will provide operating efficiencies and offset energy costs incurred by customers. For example, customers who adopt EVs will no longer purchase gasoline. Similarly, heating oil or natural gas costs will be eliminated for customers moving to electric building heating technologies.

Our efforts include identifying investments that deliver on multiple objectives, prioritizing lower cost solutions, and continuing to focus on operational efficiency. We continue to advocate for cost-based rates that provide customers with price signals that promote the efficient use of the delivery system to curb rising overall system costs.

The Road Ahead

We are committed to meeting societal goals to combat climate change and meet customer expectations for the electric system. We must act now because the need for clean energy and expanded electric service are expected to increase dramatically over the next few decades. These ongoing actions will deliver value for customers and society, but they require significant investments.

Our electric utility is well-positioned to advance this transition. Utility investments are a cost-effective way to meet societal goals. We are focused on:

- Continuing operating improvements and efficiencies
- Investing in transmission and distribution infrastructure to provide system reliability and enable connections to renewable generation

[3] Supporting reports by NYSERDA and the New York State Climate Action Council can be found **here** and **here**, respectively.

- Preparing the system for probable impacts of the near-complete retirement of fossil fuel generation and the consequent requirements for long duration storage
- Empowering customers to make informed energy decisions with greater access to information on their electric usage
- Supporting electrification efforts, including EV charging infrastructure and deep building heating electrification
- Preparing for the move from a summer peaking to a winter peaking system
- Advocating for utility-owned renewables to connect our customers to clean generation and provide discounts to our low-income customers
- Supporting energy policies that foster adoption of new technologies essential to achieving net-zero GHG emissions by 2050—including building heating electrification, EV charging infrastructure for LDVs and MHDVs, and distributed generation (DG)
- Investing in our diverse, inclusive, and talented workforce

We look forward to working with our customers, stakeholders, and regulators as we lead the transition to a clean energy and climate resilient future. Ultimately, this transition is about the people and communities that we serve, and we are proud to be the primary energy provider for New York City and Westchester County. Please refer to the **Gas** and **Steam** **Long-Range Plan** for further information about our gas and steam systems, respectively. For a combined view of our strategies across the three commodities, please see our **Integrated** **Long-Range Plan.**

1. Background

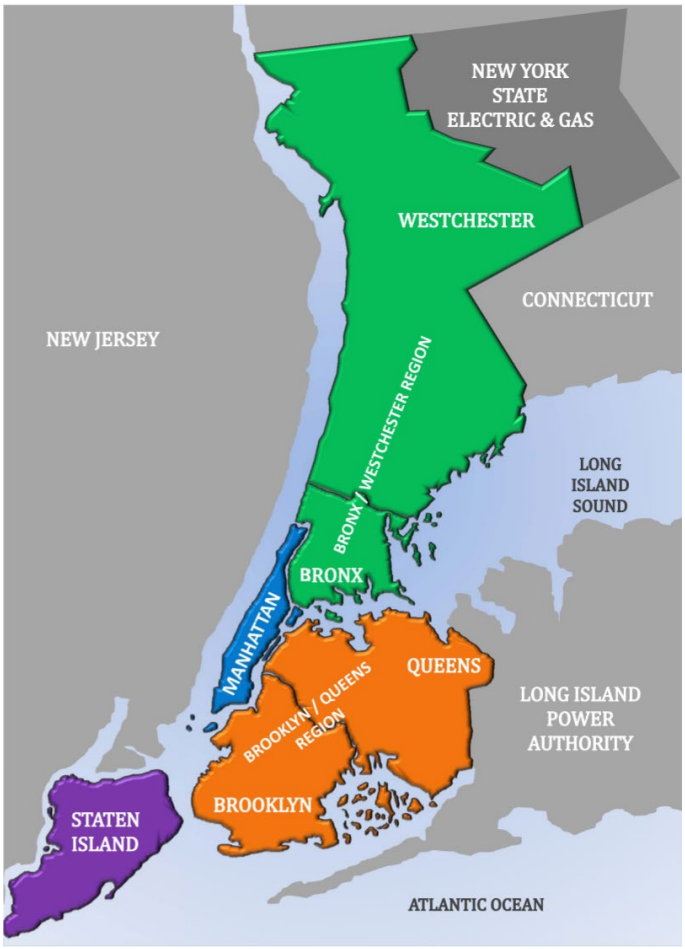
Since its debut in 2010, CECONY's Electric Long-Range Plan has articulated the strategies, actions, and investments needed to deliver value to our customers. Today, the Electric Long-Range Plan continues to evolve as a strategic framework and roadmap that guides our programs and investments through 2050. It also provides additional details about initiatives that support our strategic objectives and describes that strategy in the context of the electric system, as well as the tangible capital and operational investments we are making in the system.

In this chapter, we provide a history and overview of our electric system as it stands today, along with the accomplishments of which we are proud.

1.1 Our History

We have had the privilege of delivering electricity to customers since 1882, when Thomas Edison created the first electric grid connecting the Pearl Street Station to buildings in lower Manhattan. Since then, we have expanded the system to serve more than 3.4 million customers in New York City and Westchester County (Figure 4). We have switched fuel sources for the electricity we deliver from coal to oil, nuclear, natural gas, and now to an increasing share of renewables. Most electricity consumed by our customers is produced by large third-party generating stations and delivered via our transmission and distribution system.[4]

Figure 4. Our Service Territory Map



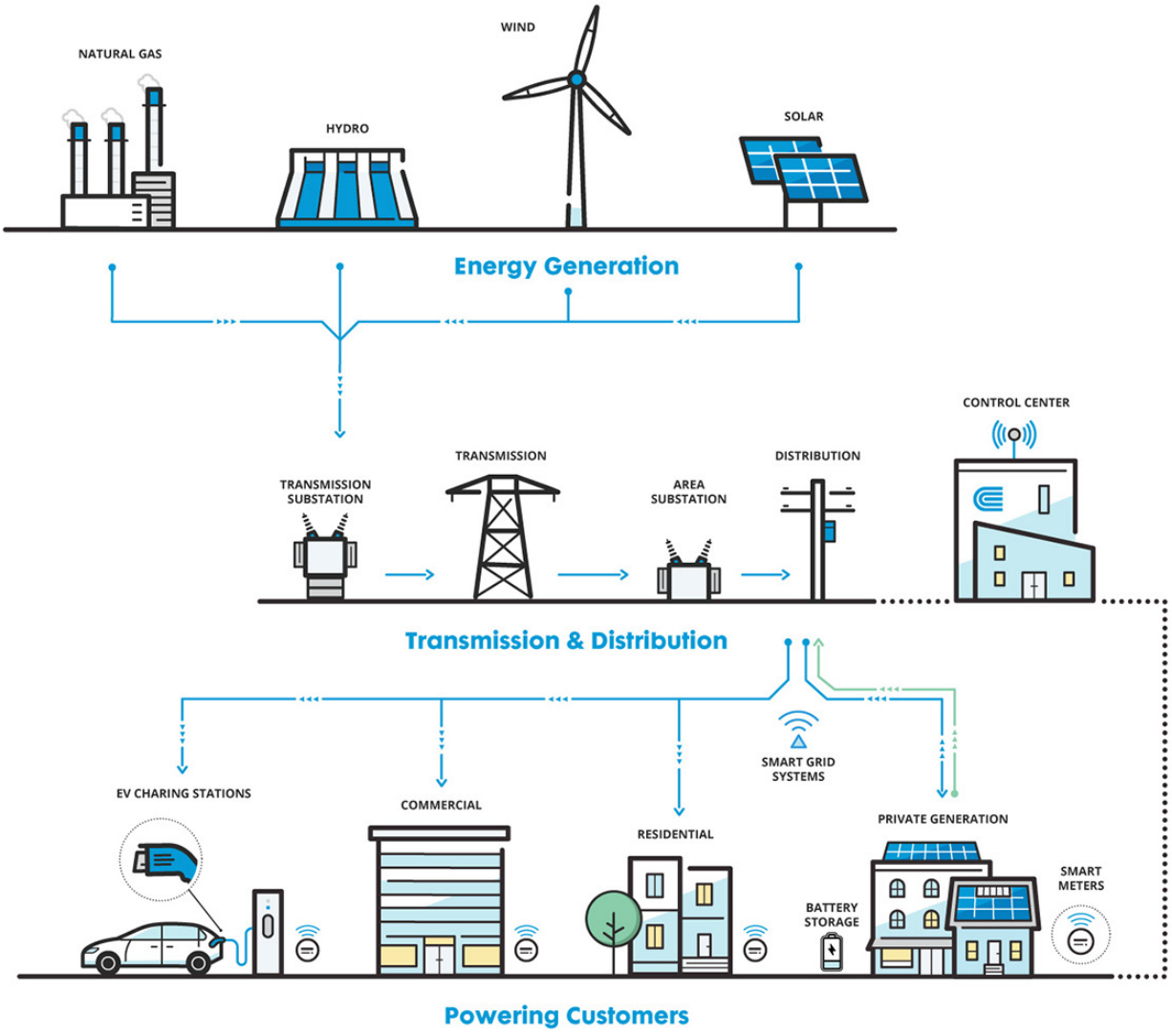
Our transmission infrastructure delivers energy from generating stations to transmission substations. We solely or jointly own a system of overhead transmission lines and operate the largest underground transmission system in the US. Transmission substations route power to individual area substations, which then provide power to the overhead and underground distribution system that directly serves our customers. It is in the distribution system where utility and customer-sited technologies—like distributed energy resources (DER), smart

[4] We own less than 5% of the generation assets supplying our customers. All CECONY-owned generation assets are associated with our steam system; the remaining 95% of generation assets are owned and operated by market suppliers.

meters, and sensors—are integrated into the grid. Our system is networked and largely underground, which promotes safety, reliability, and resiliency.

The basic elements of the Company's electric system are illustrated in Figure 5.

Figure 5. Elements of the electric system



1.2 Our Accomplishments

As a result of focused investments and efforts to continuously improve our energy system operations, we have achieved a breadth of accomplishments in recent years. We highlight our achievements across safety, reliability, and security, storm hardening and response, sustainability, and customer experience within this section. We are proud of the evolution of our energy systems and the important changes we have made.

1.2.1 Safety, Reliability, and Security

We have a long record of providing world-class safety, reliability, cybersecurity, and physical security as evidenced by regional and national recognitions. These include:

- Company-wide average Occupational Safety and Health Administration (OSHA) incidence rate[5] of <1.5 from 2012 to 2021
- 2020 and 2021 ReliabilityOne Award for Outstanding Metropolitan Service Area Performance in the Northeast Region
- A SAIFI value that is 8 times better than the state and national averages

1.2.2 Storm Hardening and Response

Uninterrupted service is important to our customers, and we are continuously improving our storm hardening and response efforts to mitigate potential service interruptions. Following the aftermath of Superstorm Sandy, we have invested more than $1 billion to underground electric cables, replace over 1,600 electric poles, replace over 850 aerial electric sections, and installed over 1,750 fuses and 650 sectionalization switches.

Our recent investments in hardening measures across our electric system include:

- Removed trees that pose a risk to our transmission and distribution infrastructure
- Upgraded electric equipment to withstand a FEMA +3[6] flooding event
- Installed over 1,000 smart switches on our overhead systems
- Deployed approximately 3.58 million smart meters to give near-real-time visibility into customer outages

As a result of our investments, we have:

- Avoided over 680,000 outages on our electric system since 2014
- Leveraged AMI outage data to improve operational efficiency through the avoidance of nearly 33,000 truck rolls, resulting in fuel savings and a reduced carbon footprint

Lastly, our transformer asset management strategy has enabled us to continuously reduce our transformer failure rate, despite the increasing average age of these assets.

1.2.3 Sustainability

We have grown sustainability efforts economy-wide through investments in our electric system. Our recent sustainability accomplishments include:

[5] An incidence rate of injuries and illnesses may be computed from the following formula: (Total # of OSHA Recordable injuries and illnesses X 200,000) / Employee total hours worked = OSHA Incidence rate.

[6] The Federal Emergency Management Agency (FEMA) publishes flood-maps indicating flood-prone areas. FEMA +3 refers to upgrading equipment to withstand the flood expected based on the flood-map, plus an additional 3 feet, whereas FEMA +5 refers to upgrading equipment to withstand the flood expected based on the flood-map, plus an additional 5 feet

- Implemented energy efficiency programs that have exceeded 2021 targets, achieving energy reductions of 740 GWh—equivalent to the electricity consumed by over 43,100 US households in a year—and achieving 128 MW of incremental peak reduction.
- Electrified the heat or hot water of more than 8,800 projects in 2021, resulting in over 560,000 of annual MMBtu savings in the process, which exceeded our 2021 target by over 4.5 times.
- Achieved energy savings in 500 affordable multifamily housing buildings and distributed LEDs to more than 62,000 customers through local food bank partners.
- Issued an inaugural green bond offering of $1.6 billion in 2020, with another $750 million offered in 2021, for improving energy efficiency and supporting changes in customer energy usage.
- Interconnected a total of 275 distribution-connected energy storage systems, totaling 18,326 kW of capacity.
- Facilitated integration of 386 MW DG with grid updates[7].

1.2.4 Customer Experience

We strive to improve our customers' experience with our services, offering them high levels of comfort, convenience, choice, and control. We have achieved several milestones in improving customer experience, including:

- Enhanced our website and mobile app to offer more customer tools in our My Account portal, including online negotiated payment plans, personalized web content/offers, a new Home Energy Analysis tool and a landlord portal
- Launched our first generation of virtual assistants including Watt, AVA, and Google/Amazon voice
- Modernized our bill based on customer feedback to improve understanding and highlight the most important information
- Launched special rate structures and capacity maps for current and potential EV customers

Customer experience efforts have resulted in continued positive long-term trends in Customer Experience metrics, including above average JD Power Customer Satisfaction scores.

[7] Completed PV, Wind and Hydro projects as of Nov. 2021 according to PSC data found **here.**

2. Industry and Societal Trends

To develop our long-range plan, we monitor industry and societal trends that may impact the future of our electric system. We have identified five critical industry and societal trends that will affect how electric systems may evolve over time:

Changing customer and stakeholder expectations include additional need for choice, convenience, and control. Customers expect seamless experiences and journeys with easy-to-use apps and interactions.

A changing climate will have direct ramifications to electric systems. Utilities will need to prepare for the climate of the future when engineering upgrades to their infrastructure.

Clean energy legislation, such as the **Climate Leadership and Community Protection Act** (CLCPA) and the **Climate Mobilization Act** (CMA), and potential future legislation will continue to impact the energy choices customers make, our energy supply and utility investments.

Technological advancement from building heat pump technologies to EVs will continue to make the clean energy transition possible. Advancements in technology will help societies decarbonize in a more cost-effective manner.

Equity and environmental justice are at the forefront of the clean energy transition. Any change in our energy systems must consider the impact to historically disadvantaged and low-income communities and enable these communities to receive the benefits of clean energy.

2.1 Customer and Stakeholder Expectations

Customers and stakeholders increasingly expect more from their energy provider, including intuitive user experiences and quick answers to their questions. They rely on their utility to provide safe, reliable, and increasingly resilient energy. They are also looking to their energy provider to be a trusted advisor in the clean energy transition.

Good utility practice requires a continuous monitoring of customers' experiences through satisfaction surveys and external metrics such as J.D. Power,[8] Escalent,[9] and App Store[10] reviews. This feedback helps utilities proactively align programs with evolving customer expectations. Across the industry, utilities are seeing customer expectations evolve in four key areas:

- **Choice:** Customers want more energy offerings and have more supply and technology choice than ever before
- **Convenience:** Customers are seeking a convenient and seamless experience when interacting with their energy provider

[8] J.D. Power is a data analytics and intelligence company that releases business rankings.

[9] Escalent is a market research firm that releases business rankings and surveys of company performance.

[10] Includes customer reviews on our mobile applications through Apple's App Store and Google's Android Store. As of June 2021, our mobile app has a 4.8/5 rating on Apple and a 4.8/5 rating on Android.

- **Comfort:** Customers want to feel comfortable in their homes and businesses and rely on their utility to provide them energy that enables this comfort
- **Value:** Customers are seeking value for the price they are paying for energy. Value includes cleaner, more resilient, and reliable service

As a result of these evolving expectations, CECONY anticipates that customers will drive a major shift in when, where, and how energy is used.

2.2 A Changing Climate

There is broad consensus that the climate is changing. Communities around the globe, and specifically in the New York metro area, have already seen the impacts that climate change has had on energy systems, as they experience increased heat waves, more intense storms, sea level rise, and unpredictable cold spells. Under current projections for the CECONY service territory, we expect the following climate conditions by 2050:

- **Twenty-three days per year** where temperatures exceed 95°F, representing a six-fold increase compared to historical averages
- **Five-day precipitation** totals exceeding **11.8 inches,** representing a 17% increase compared to historical averages
- **Sea level rise** of almost 2 feet, significantly increasing the risk of flood in our low-lying communities
- **More extreme events** such as Nor'easters and hurricanes like Superstorm Sandy and Hurricane Ida

Because these climate risks have affected our communities and electric system, we have proactively performed a **Climate Change Vulnerability Study** to understand current climate risks and projected future risks on our energy systems. As part of this study, we reviewed the electric system impact against these climate risks. A high-level summary is included in Figure 6.

Figure 6. Climate Risks and Potential Impact on our Electric System

	Ambient Temperature/ Heat Waves	Precipitation, Sea Level Rise, and Storm Surge	Extreme Events
Description	Includes more extreme and frequent heat waves spurred on by climate change, and warmer seasons on average	Includes general sea level rise and heavy precipitation that may cause flooding and storm surges	Includes hurricanes, tornados, Nor'easters, and other extreme events
Potential Impact on Electric System	Heat waves often induce greater electric demand as customers seek to regulate temperature in living spaces through air conditioning powered by electricity	Flooding risk and heavy precipitation are a concern for many electric grid assets including substations, transmission lines, and network transformers	Risk from extreme events varies by location but can interrupt generation, transmission, and distribution lines

2.3 Clean Energy Legislation

Legislators have responded to the threat of climate change, as described in Section 2.2 above, through their passage of the **Climate Mobilization Act** (CMA) and **Climate Leadership and Community Protection Act** (CLCPA). These policymakers note that scientific consensus points to unabated GHG emissions as the driver of climate change, and that further GHG emissions will amplify extreme weather and sea level rise. Table 2 describes aspects of the ambitions and goals of the CLCPA and CMA that impact the electric system.

Table 2. CMA and CLCPA Requirements

CMA (New York City Law)	CLCPA (New York State Law)
• **Local Law 92**: Requires smaller buildings to comply with green roof standards • **Local Law 93**: Requires the Office of Alternative Energy to post information on its website regarding the installation of green roofs • **Local Law 94**: Requires buildings undergoing major roof renovations to consist of either solar PV or a green roof • **Local Law 95**: Requires buildings over 25,000 square feet to indicate energy grades on entrance • **Local Law 96**: Provides long-term, low-interest Property Assessed Clean Energy financing (PACE) to fund energy efficiency projects • **Local Law 97**: Requires buildings over 25,000 square feet to significantly reduce GHG emissions	• **70%** renewable energy by **2030** • **100%** emissions-free electricity supply by **2040**[11] • **9,000 MW** of offshore wind by **2035** • **6,000 MW** of distributed solar by **2025** and **10,000 MW** of distributed solar by **2030** • **3,000 MW** of energy storage capacity by **2030** • **185 TBtu** end-use energy reduction by **2025** • **Net-zero** economy-wide GHG emissions by **2050** • **35%-40%** of clean energy benefits to **disadvantaged communities**

Our plans and analysis are based on clean energy policies as of April 2021 and reflective of the policies and goals outlined in Table 2. However, we recognize New York State, New York City, and local municipalities continue to enact nation-leading clean energy policies and may continue to develop future legislation.

For example, recently enacted legislation updated New York's Environmental Conservation Law to effectively ban the sale of new GHG-emitting light duty vehicles (LDVs) by 2035 and medium and heavy duty vehicles (MHDVs) by 2045, further accelerating EV adoption in our territory. Additionally, the City of New York recently passed **Local Law 154 of 2021**, which generally bans new gas service connections for buildings under seven stories beginning in 2024 and new gas service connections for buildings greater than seven stories beginning in 2027.

CECONY is supportive of these initiatives and is well positioned to help achieve these goals. We continue to closely monitor and help shape this rapidly evolving landscape to create

[11] While green hydrogen will likely be an approved zero emissions generation source, the New York State Climate Action Council can influence green hydrogen and renewable natural gas's market viability. The New York State Climate Action Council's final scoping plan may impact our Long-Range Plan analysis.

beneficial outcomes for our customers and stakeholders. We will continue to review and appropriately modify our plans and supporting strategies as necessary.

2.4 Technological Advancement

Rapid advances and innovations in energy technologies are helping utilities operate reliable energy delivery systems in the 21st century and offer clean energy options to customers. Table 3 provides an overview of some of these technologies as applicable to our electric business.

Table 3. Innovative Clean Technologies

Technology	Description	Value of Technology
Building Envelope and Insulation	Technology that reduces the total energy requirements of a building by improving thermal insulation	Reduces energy consumption, GHG emissions, customer energy costs, and capital costs for building heating/cooling equipment
Air Source and Ground Source Heat Pumps	Highly efficient electric system that uses a refrigerant to move heat from one area to another to provide building water heating, space heating, and air conditioning within buildings	Enables customers to transition from less energy efficient and more polluting on-site fossil fuel combustion systems (such as boilers, water heaters, and furnaces) for water and space heating in buildings
Advanced Metering Infrastructure (AMI)	Digital meters that remotely and continuously read customer energy usage information	Provides customers with valuable consumption information and enables innovative pricing and demand response capabilities
Energy Storage	Technologies such as lithium-ion batteries that can store excess renewable energy and optimally discharge when needed to meet demand	Further enables the adoption of renewable energy by allowing intermittent renewable energy to be stored and discharged at different times
Electric Vehicle (EV) Chargers	Charging points that supply power to EVs in our service territory	Enables customers to transition off less efficient and more polluting fossil-fuel based vehicles by alleviating specific customer barriers to EV adoption such as charger availability and range anxiety
Large-Scale and Distributed Solar	PV solar panels installed on the ground or on rooftops that generate electricity from solar irradiance	Increases the proportion of renewable energy on the electric system and reduces power system GHG emissions
Offshore Wind	Large-scale wind turbines located in the Atlantic Ocean that benefit from stronger and more consistent winds	Increases the proportion of renewable energy on the electric system and reduces power system GHG emissions
Low-to-Zero Carbon Gaseous Fuels	Gaseous fuels with a lower GHG impact than natural gas that could supplement our gas delivery system (e.g., green hydrogen)	Reduces or eliminates GHG emissions from thermal energy generation facilities, and from gas delivered directly to customers
Carbon Capture and Storage	Technology that absorbs carbon from the source of combustion or directly from the air to offset carbon emissions from other activities	Reduces GHG emissions from the source and supports economy-wide net-zero GHG emissions goals

Beyond the technologies listed above, there are various information technology innovations that affect how utilities and energy providers operate. Please refer to the **Integrated Long-Range Plan** for an overview of these IT advancements.

2.5 Equity and Environmental Justice

Equity and environmental justice are at the forefront of the clean energy transition conversation.

Environmental Justice has recently become a priority for policy makers not only at the state level, but also at the federal level. The Biden Administration's Executive Order 12898 directs all federal agencies to address the disproportionally high public health impacts to vulnerable communities, namely through the Justice40 initiative. At the state level, the CLCPA has advanced the discussion and focused on providing equitable benefits from clean energy investments to disadvantaged communities.

Importance of Disadvantaged Communities in CLCPA

"Climate change especially heightens the vulnerability of disadvantaged communities, which bear environmental and socioeconomic burdens as well as legacies of racial and ethnic discrimination. Actions undertaken by New York State to mitigate greenhouse gas emissions should prioritize the safety and health of disadvantaged communities, control potential regressive impacts of future climate change mitigation and adaptation policies on these communities and prioritize the allocation of public investments in these areas."

New York's CLCLPA acknowledges the need to dedicate attention and benefits to these communities through establishing the Climate Justice Working Group and including stipulations that disadvantaged communities should receive no less than 35% of the overall benefits of spending on clean energy and energy efficiency programs, projects, or investments.

The Climate Justice Working Group began in 2020 and, as of the writing of this plan, is in the process of establishing criteria to identify "disadvantaged communities." While the PSC has historically focused on low- and moderate-income customers for energy efficiency and other programs, the definition for disadvantaged communities is expected to be broader, considering aspects of geography, public health, environmental hazard, and socioeconomics. In doing this, investments can be directed, and benefits measured, at a community level instead of at an individual level. Table 4 provides working definitions for low- and moderate-income and disadvantaged communities as well as their populations in our service territory. We are following the actions of the Working Group to more clearly understand the population for which this applies in our territory and expand our programs accordingly.

Table 4. Communities with Equity and Environmental Justice Focus

	Low- and Moderate-income (LMI)	Disadvantaged Communities
Current Criteria	Households earning up to 80% of the area or state median income, whichever is greater, are qualified as LMI for energy efficiency and electrification programs. To qualify for bill discount programs, low-income households must receive other governmental benefits such as food or housing assistance. The thresholds for receiving governmental public assistance typically exclude moderate-income customers.	**Draft definition:** The Climate Justice Working Group (CJWG) and the New York State Energy Research and Development Authority (NYSERDA) have a draft definition of disadvantaged communities according to various interim criteria such as areas having low to median incomes, public health vulnerabilities, climate change risks, and environmental burden. CJWG will issue a draft methodology that outlines the criteria and parameters for definitions of "Disadvantaged Communities" in January 2022.

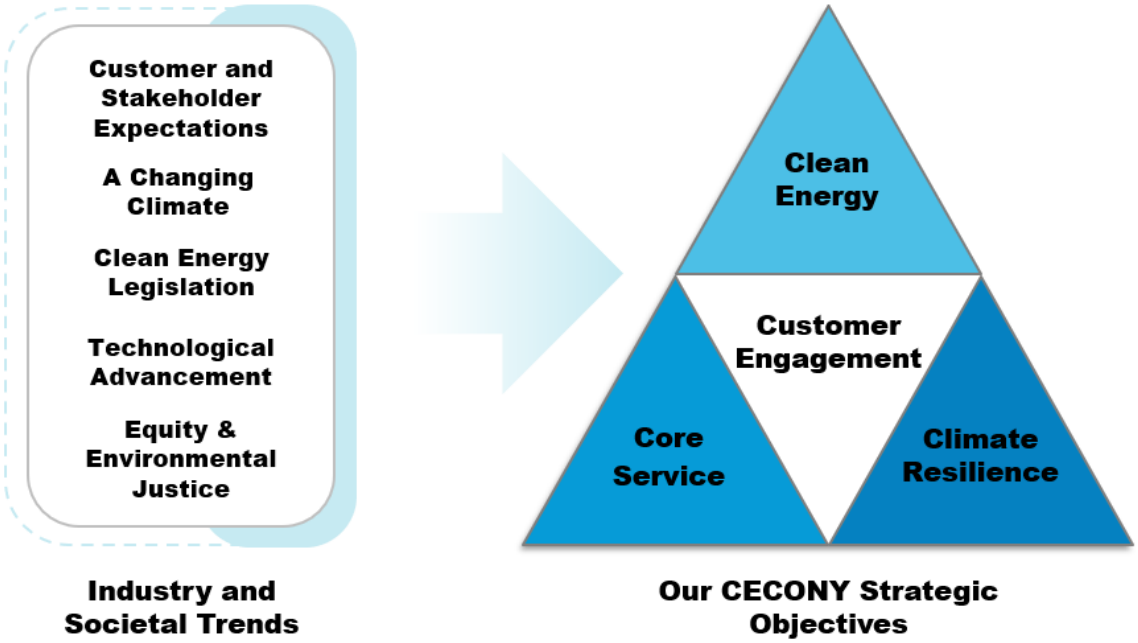
	Low- and Moderate-income (LMI)	Disadvantaged Communities
Population in Service Territory	Approximately 440,000 low-income households (those receiving assistance programs) and 1.3 million moderate-income households (as of the date of release of this document).	**Population in our service territory:** To be determined based on the final definition provided by CJWG. Based on initial geographical estimates using the NYSERDA interim disadvantaged community definition, there are 855,000 low-moderate income households outside of disadvantaged communities and 900,000 low-moderate income households residing within disadvantaged communities in our service territory.

3. Our Strategies

We are committed to meeting societal goals and our customer expectations. Our Electric Long-Range Plan articulates the strategy, actions, and investments needed to advance our commitment and our four strategic objectives:

- **Clean Energy:** Economy-wide net-zero GHG emissions in our service territories by 2050
- **Climate Resilience:** Increased resilience of our energy infrastructure to adapt to climate change
- **Core Service:** World-class safety, reliability, and security, while managing the rate impacts and equity challenges of the energy transition
- **Customer Engagement:** Industry-leading customer experience and facilitation through the energy transition

Figure 7. Our Strategic Objectives



As the main energy provider of New York City and Westchester County, we are a leader in this energy transition. In the following section, we describe our pathways analysis, which utilizes both demand and supply forecasting to inform how to invest in our electric system going forward.

Further on, we describe our strategies to transition to net-zero GHG emissions by 2050, our investments in climate resilience, our continued commitment to a core of safety, security, and reliability, and the value and enablement we deliver to customers throughout as informed by our pathways analysis. Our strategies to achieving these objectives are highlighted in Table 5.

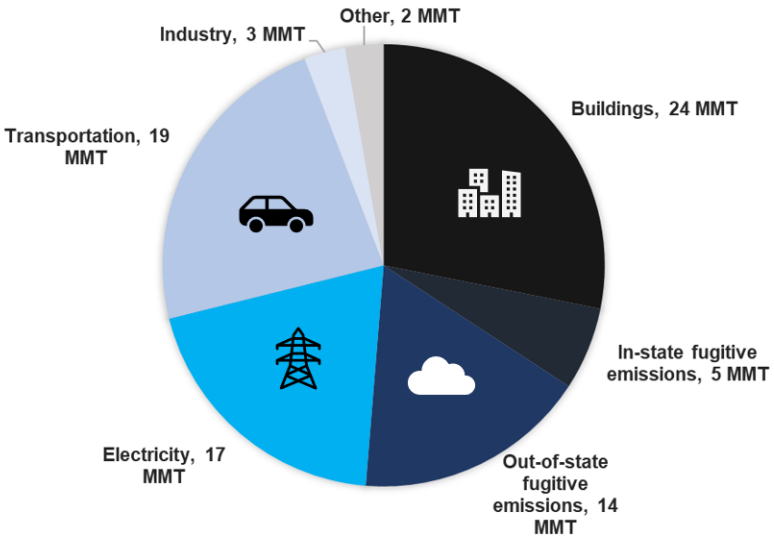
Table 5. Strategies to Support Our Strategic Objectives

Clean Energy	Climate Resilience	Core Service	Customer Engagement
Transform the energy supply: • Enhance transmission to enable clean energy growth • Enable distributed energy resources (DER) and electrification through distribution system investments • Grow storage to optimize renewable generation • Support 100% renewable electric generation **Enable a fundamental change in energy consumption:** • Enable transportation electrification • Drive growth in energy efficiency • Drive growth in building heating electrification	• Prevent: Harden Infrastructure • Mitigate: Minimize Disruptions • Respond: Reduce Recovery Time	**Execute our managed risk portfolio program:** • Enhanced safety • Enhanced security • Enhanced reliability **Manage the transition for our customers:** • Manage rate impacts of transition • Enable an equitable transition	• Facilitate our customer energy choices • Continue to improve the customer experience

3.1 Representative Pathways

To achieve the net-zero GHG emissions goals, we must understand the sources of emissions and the solutions required to reduce them. Based on our analysis, in New York City and Westchester County, the main sources of GHG emissions are buildings, transportation, electricity generation, and fugitive methane emissions, as shown in Figure 8.[12]

Figure 8. GHG Emissions, New York City and Westchester County, 2019 (MMTCO2e) [13]



No single set of clean energy solutions exists to address these GHG emissions. In fact, many combinations of solutions could achieve 2050 goals. We will remain open to considering all decarbonization solutions that may advance societal goals and increase value to customers. Further, we will continue to provide customers choice for their clean energy solutions, and advocate for policies and solutions that are cost-effective and reflect the value of clean energy.

We expect technology to improve and costs to decline such that some decarbonization solutions that are cost-prohibitive today will become cost-effective in the future. These solutions are at different levels of maturity and the pace and cost of adoption is uncertain, as is the emergence of policy over the next 30 years. We identified three representative pathways to capture a wide range of potential futures so that we remain flexible until a pathway emerges (see Table 6). Each pathway differs in technology breakthroughs required and expected relative cost in achieving the clean energy transition. Each pathway assumes that carbon offsets are needed to meet net-zero GHG after the direct GHG emissions reductions targets are met.

[12] As the GHG emissions accounting methodology continues to evolve at city and state levels, these emissions estimates are subject to change. As such, they may not fully align with the most recent draft emissions factors released by the New York State Department of Environmental Conservation.

[13] Note that this figure and value includes National Grid's gas service territory.

Table 6. Representative Pathways

	Full Electrification	Targeted Electrification	Hybrid Consumption
Energy Efficiency	Buildings achieve 120 TBtu of incremental energy efficiency through improved appliance efficiency and building envelope upgrades; an additional 60 TBtu of energy efficiency achieved through deeper building envelope upgrades	Buildings achieve 120 TBtu of incremental energy efficiency through improved appliance efficiency and building envelope upgrades	Buildings achieve 120 TBtu of incremental energy efficiency through improved appliance efficiency and building envelope upgrades
Building Heating	Renewable electricity and decarbonized steam serve 100% of the building stock in our service territory, and the gas distribution system is decommissioned	Renewable electricity and decarbonized steam serve between 70% and 80% of the New York City building stock with targeted full electrification zones and use of low-to-zero carbon gaseous fuels for remaining heating needs.	Renewable electricity and decarbonized steam serve between 50% and 60% of the New York City building stock; the gas system uses low-to-zero carbon gaseous fuels to support difficult-to-electrify buildings
Electric Generation	100% carbon-free generation; 33 GW of capacity in our service territory	100% carbon-free generation; 30 GW of capacity in our service territory	100% carbon-free generation; 25 GW of capacity in our service territory
Transportation	85%-90% of light duty vehicles (LDVs) and 75% of medium and heavy duty (MHDVs) will be electric, with the remaining being a mix of fuel cell and internal combustion vehicles	85%-90% of light duty vehicles (LDVs) and 75% of medium and heavy duty (MHDVs) will be electric, with the remaining being a mix of fuel cell and internal combustion vehicles	85%-90% of light duty vehicles (LDVs) and 75% of medium and heavy duty (MHDVs) will be electric, with the remaining being a mix of fuel cell and internal combustion vehicles
Cost Impact: Customer	$$$$$	$$$	$$
Cost Impact: Utility Infrastructure	$$$$$	$$$$	$$$
Cost Impact: R&D (Societal)[14]	$	$$	$$

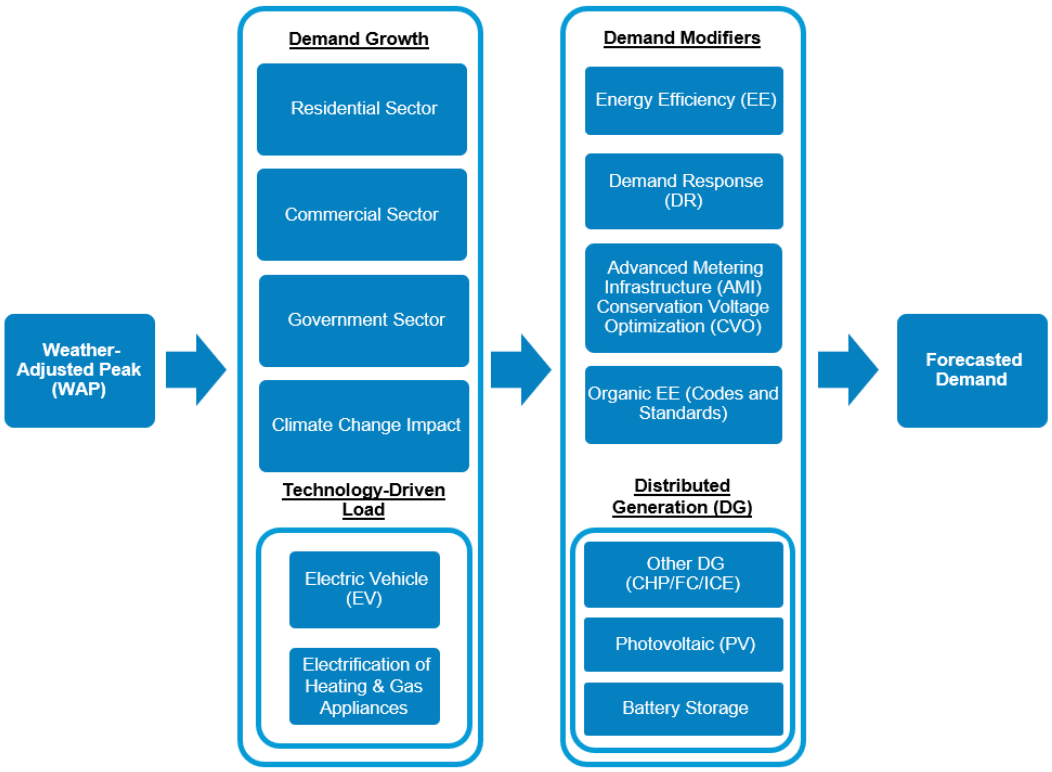
The pathways study informs our analysis of future demand and supply, which are further documented in the following sections.

[14] Research and development (R&D) for the Targeted Electrification and Hybrid Consumption pathways requires advancement in low-to-zero carbon gaseous fuel technologies, including technologies to develop the fuels at scale, transport the fuels, and consume the fuels for heat or power. While building heating electrification technologies exist, adopting them for all end-use cases will result in a larger total cost impact across our entire system even if R&D costs are lowered in the “Full Electrification” pathway.

3.1.1 Demand Forecasting

Our long-term, system-level forecast for electric demand informs our overall electric system planning process. Figure 9 depicts our demand forecasting process and relevant planning factors.

Figure 9. Our Forecasting Process

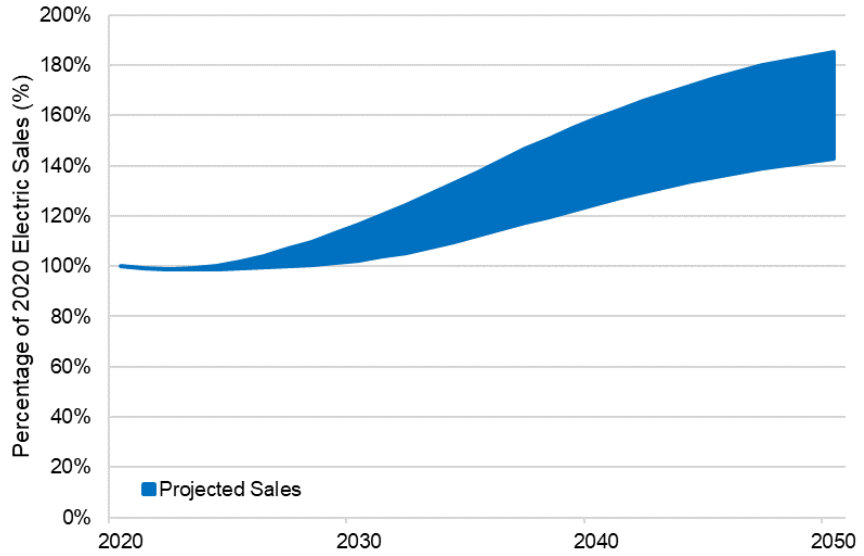


The weather-adjusted peak reflects the impact of climate change on the temperature variable.[15] The variables listed in demand growth indicate sources from which additional demand occurs, with a notable focus on technology-driven additional demand from increasing electrification. We then adjust the forecast based on the factors listed in demand modifiers, highlighting variables within distributed generation (DG). The forecasts derived from this process allow us to map out the system expansion upgrades needed to support future demand.

This process informed our peak demand projection, which indicates a 45%-85% total increase in peak electricity demand by 2050 across our territory depending on the viability of low-to-zero carbon gaseous fuels in buildings. Figure 10 depicts the view on future electric sales based on the three pathways. Note that these representative pathways are not intended to be near-term forecasts that change year-to-year based on actual experience and influences; rather, they are tools for understanding implications of long-term programs and their impacts.

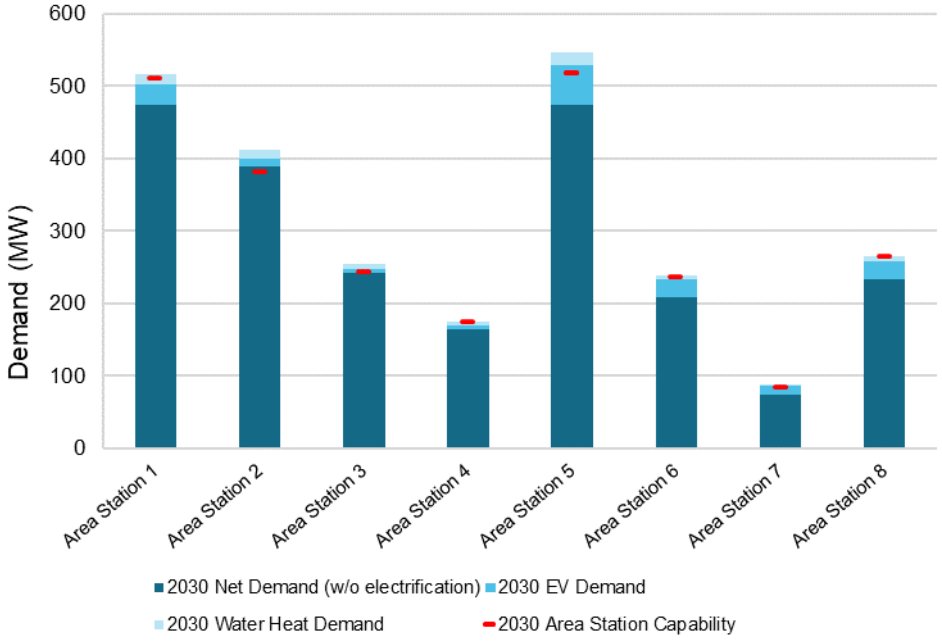
[15] It is common practice in the industry to consider temperature and humidity together in the demand forecasting and planning process. Con Edison's approach to this practice is the calculation of temperature variable. In the summer months, the temperature variable for the electric system is calculated as the 3-day weighted sum of the maximum rolling 3-hour average of wet and dry bulb temperatures.

Figure 10. Projected Electric Sales Across Pathways through 2050



Given anticipated trends in electrification through increased adoption of EVs and electric building heating systems, the growth rate of demand is going to be substantial. Along with our system-level projections, we determined the projected increase in local demand across the area substations in our territory. The onset of building heating electrification and electric passenger vehicles, fleets, trucks, and buses have ramifications on our assets, as illustrated in Figure 11.

Figure 11. Anticipated 2030 Impacts of Electrification on Area Substations



The critical takeaway from this demand analysis is that electrification could push certain area substations past their capacities in the next 5-10 years. By 2030, increased adoption of EVs could cause summer electric peak to increase up to 10%, whereas the electrification of building heating could eventually double the winter peak.

Accordingly, by 2050, we expect to be managing two large electric peaks in a regular year—summer and winter—which our electric system has never encountered at this scale. It is imperative that we strategically plan our operations in advance of this projected transition to a summer and winter peaking system, which is set to occur in the next 10-20 years.

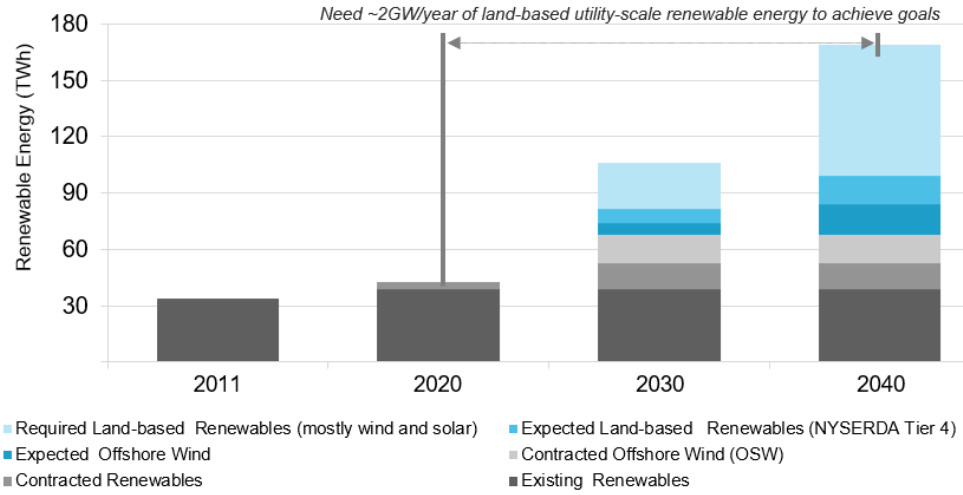
3.1.2 Supply Forecasting

As in our demand forecasting, we monitor the evolution in electric supply and use supply forecasts to inform our approaches. The dominating trends within electric supply are the transition away from fossil fuel generation and the proliferation of renewable energy. The scale at which this occurs is vital to our forecasting to appropriately prepare the electric system to support clean generation.

Scaling renewable generation capacity is central to the city and state's decarbonization goals. New York State's **Greenhouse Gas Inventory 1990-2016** report found that the greatest GHG emissions reductions were delivered by the electricity sector, with a 51% reduction in GHG emissions from electricity generation since 1990. The state's intent to build on this success in decarbonizing electric generation is embodied in the CLCPA.

New York State has established renewable energy goals that require at least 70% of the electricity in 2030 to be generated from renewable energy resources (referred to as the 70x30 goal) and 100% of the electricity in 2040 come from emissions-free generation (referred to as the 100x40 goal). There are also technology-specific goals including 10 GW of distributed solar by 2030, 3 GW of energy storage by 2030, and 9 GW of offshore wind by 2035. Figure 12 shows our projection to achieve New York's renewable energy goals.

Figure 12. CLCPA Renewable Energy Goals (70% by 2030, 100% by 2040)



The interim goal of meeting 70% of the state's electricity with clean generation by 2030 is ambitious as this is more than double the current level of renewable energy. Achieving this goal will require substantial incremental investment in offshore wind, solar, onshore wind, and hydro generation.

Utility-owned renewables—which is currently prohibited—will improve the efficiency with which the state achieves its renewable electricity goals. Utility participation in the renewable

generation market is likely to increase customer access to clean electricity by lowering the long-term costs of clean energy. This is achievable through our lower cost of capital (compared to third-party investors) and our cost-of-service model, which provides significant savings by giving customers access to the residual value of renewable electricity projects that are nearing end of life. As operators of the transmission and distribution electric grid to the customer premise, we can offer customers a variety of clean generation resources including on-site, large-scale, and community.

While we do not generate electricity (besides a small amount of cogenerated electricity associated with our steam system), we do procure energy for our full-service customers, whose energy consumption in 2020 accounted for approximately 39% of all delivered electricity. We work diligently to achieve reasonable supply costs for these customers in three ways:

- Participation in wholesale market processes (such as those overseen by the New York Independent System Operator [NYISO] and Pennsylvania New Jersey Maryland Independent System Operator [PJM]) to advocate for competitive market structures that provide customers with cost-effective and reliable electricity supply
- Informed and strategic purchase decisions, incorporating our own generation and selecting a cost-effective mix of direct purchases from the energy market and short-term contracts
- Financial hedging products to protect our customers from the volatility of spot energy purchases

Figure 13 and Figure 14 illustrate how we expect the resource mix to shift over the next 10 years, based on NYISO's **Congestion Assessment and Resource Integration Study** (CARIS) and our internal projections. The capacity resource mix and associated generation resource mix meet the 70x30 goals and lay the groundwork for meeting 100x40 goals.[16]

[16] Tier 4 Energy includes hydropower delivered directly to NYC via high voltage direct current and compensated under New York State Energy Research and Development Authority (NYSERDA)'s Tier 4 program. Other future Tier 4 projects may or may not be hydro-electric.

Figure 13. New York State Projected Resource Mix through 2030

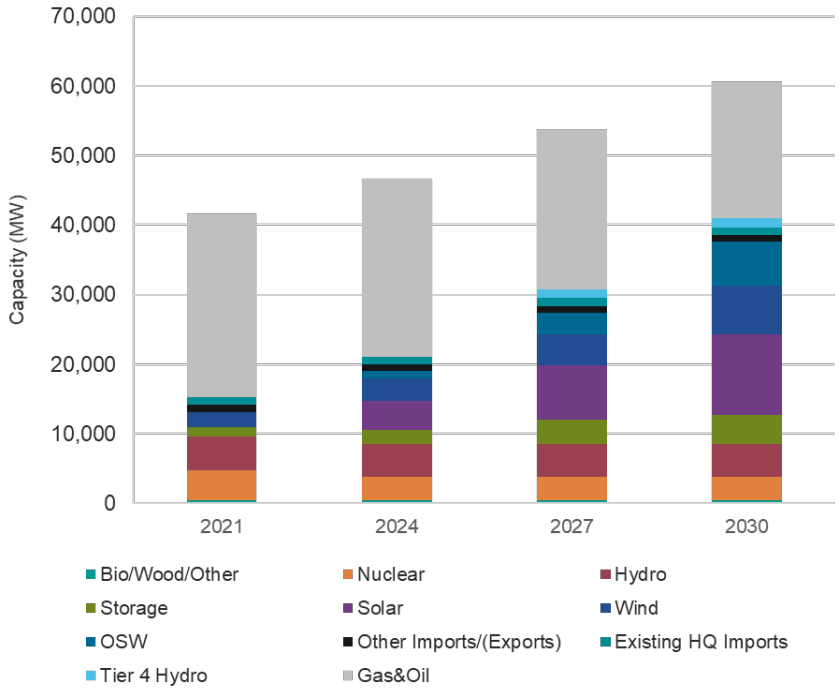
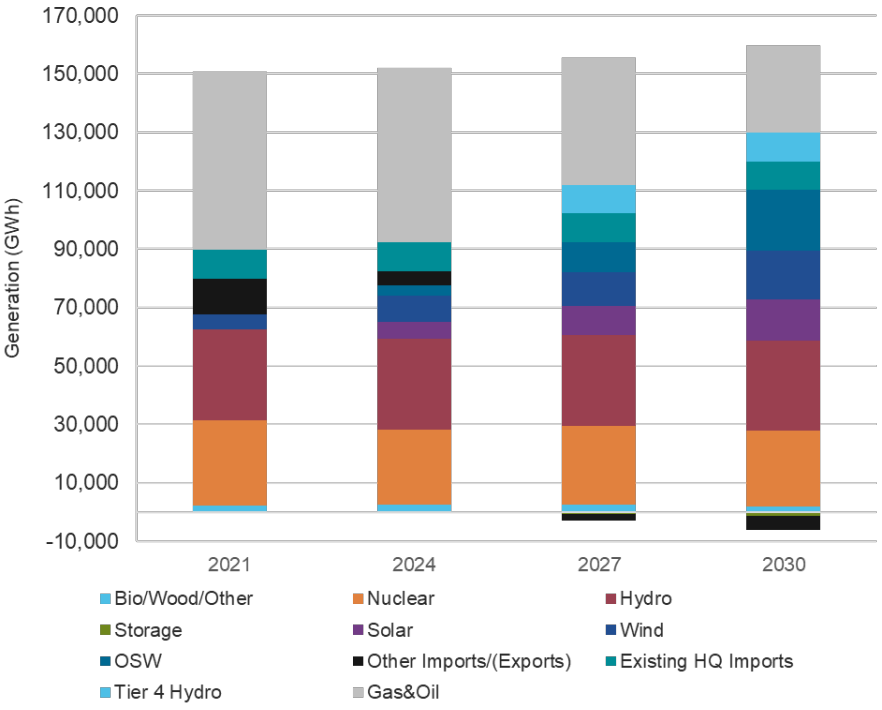


Figure 14. New York State Projected Generation through 2030



Given the many uncertainties inherent in this forecast—including the pace and mix of renewables built, the availability of renewable natural gas (RNG) and hydrogen, and the

required resources to maintain reliability—this supply mix could vary significantly from our projections.

Our combined demand-side and supply-side forecasting informs our holistic electric strategy and industry trends inform our infrastructure planning. We describe our strategy as demand-leading, highlighting our commitment to build capacity in a timely manner to meet customer needs in a rapidly electrifying future. As we prepare for a clean energy future, a demand-leading strategy accounts for the fact that electric infrastructure often requires extensive lead time to build and implement. Our strategy enables us to target specific constrained areas on our system, while proactively planning for areas we expect to be constrained due to significant demand increases. System expansion, specifically within our transmission and distribution assets, is foundational to implementing this strategy. We will also use peak demand optimization tools, such as energy efficiency and demand response, to reduce the need for new capacity where possible.

Although our pathways analysis shows three distinct futures, the pathways follow similar trajectories through 2030. Therefore, we have clarity in the near-term investments that will help prepare us for these multiple possibilities, including growing storage to optimize renewables, driving growth in energy efficiency, and continuing to enhance safety, security, and reliability.

We will refine our investment strategy over time to reflect how policy, customer expectations, and technology evolve (as further detailed in Section 5). This may include ramping up investments that bring additional value, scaling down investments that have reached maturity, and discontinuing investments that no longer serve our customers and stakeholders.

3.2 Clean Energy

We aim to position our electric system to support a 40% GHG emissions reduction by 2030 and ultimately support net-zero GHG emissions by 2050. While we have already reduced GHG emissions through our clean investments across the electric system, we remain vigilant in observing the market and planning for actions we can take in the future. Our parent company, Con Edison, recently released its expanded **Clean Energy Commitment**, which highlights our commitment to build a resilient electric grid that delivers 100% clean energy by 2040 (Figure 15).

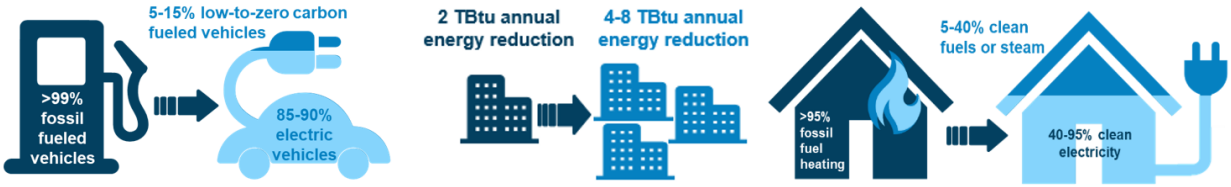
Figure 15. Our Clean Energy Commitment

OUR CLEAN ENERGY COMMITMENT

We will take a leadership role in the delivery of a clean energy future for our customers. We will do that by investing in, building, and operating reliable, resilient, and innovative energy infrastructure, advancing electrification of heating and transportation, and aggressively transitioning away from fossil fuels to a net-zero economy by 2050.

As part of this energy transition, hundreds of thousands of individual customers will have to make clean energy decisions. This includes a massive scale up of technologies to supply clean energy, as well as significant shifts in customers consumption of energy. Figure 16 exemplifies this rapid scale-up across a variety of technologies.

Figure 16. Expected Customer Adoption Needed to Meet Clean Energy Goals



Vehicles on the road will need to transform from **more than 99% fossil-fueled** vehicles to **85%-90% EVs** and **5%-15% low-to-zero carbon gaseous-fueled** (fuel cell) vehicles.

Energy efficiency will have to significantly increase annually from **2 Tbtu to 4-8 Tbtu** incremental savings.

Building heating will need to transform from **more than 95% fossil-fueled** to **40%-95% clean electricity-fueled** and **5%-40% low-to-zero carbon gaseous fuels** or clean steam.

To enable this massive shift, we have developed initiatives informed by two main strategies, Transforming the Energy Supply and Enabling a Fundamental Change in Energy Consumption. The strategies are further outlined in Table 7 below.

Table 7. Summary of Clean Energy Strategies

Strategy	Sub-Strategy	Initiatives
Transform the Energy Supply	**Enhance transmission to enable clean energy growth**	Develop transmission projects to: • Enable **fossil fuel retirement** • Expand **renewable generation capacity** • Prepare for **future demand growth**
	Enable DERs and electrification through distribution system investments	• Support **distribution system expansion** to accommodate DER and electrification • Enable **two-way power-flow** to enable DER and electrification
	Grow storage to optimize renewable generation	• Encourage **customer-owned systems** • Construct and operate **utility-owned** projects • Contract with **larger bulk storage systems**
	Support 100% renewable electric generation	• Advocate for **utility-owned renewable electricity** generation
Enable a Fundamental Change in Energy Consumption	**Enable transportation electrification**	• Continue initiatives to **lower the upfront costs** of charging infrastructure and **provide managed charging** incentives • Expand our support for **medium and heavy-duty vehicle** (MHDV) electrification and other **creative mobility solutions**
	Drive growth in energy efficiency	• Enhance **energy efficiency** to achieve 40 TBtu absolute energy savings through 2030
	Drive growth in building heating electrification	• Promote **building heating electrification** for between 10% - 20% of building square footage in our territory by 2030
Align Actions to Climate Policy		

3.2.1 Transform the Energy Supply

3.2.1.1 Enhance Transmission to Enable Clean Energy Growth

We recognize that transmission is at the core of making renewable energy integration possible. Clean generation resources, such as offshore wind and large-scale solar, must be built remote

from demand centers to optimize resource capacity factors. Accordingly, our proactive planning for transmission upgrades is guided by the following focus areas:

- Enable fossil fuel retirement
- Expand renewable generation capacity
- Prepare for future demand growth

We are targeting multi-value transmission projects within our territory that can deliver electricity supplied by intermittent renewables and balance increasing demand to help ensure the statewide achievement of clean energy goals. Our transmission planning approach[17] focuses on identifying projects that enable delivery of renewable electricity to reach the demand needs of New York City where the largest statewide GHG emissions reductions are possible.

Traditionally, utilities have employed the metrics of reliability, safety, and compliance when planning for future grid development. These criteria are set by a myriad of planning, safety, and environmental agencies. They include critical infrastructure regulations and cybersecurity guidelines. When considering CLCPA goals and other state policies, we have expanded our criteria to encompass more elements. These criteria include the following:

- **Renewable utilization:** Ability to use more renewables by moving renewable generation into the bulk system (on-ramps) and enabling flow from the bulk system into the local transmission and distribution system where it can be used by customers (off-ramps)
- **Timing:** Sensitivity to CLCPA goals and accelerating or expanding projects as needed to accommodate them
- **Expandability:** Ability to accommodate future project expansion
- **Cost-effectiveness:** Ability to achieve CLCPA goals while mitigating economic impacts on customers
- **System flexibility:** Ability to reliably deliver energy by managing the intermittency related to certain renewable resources
- **Project certainty:** Ability to enable existing or planned renewable generation in a region. Also considers whether renewable generation proposals in a utility or New York Independent System Operator (NYISO) interconnection queue are sufficiently firm to justify the transmission investment

We will seek synergies with projects that address both traditional and new CLCPA planning criteria, emphasizing projects that provide value across our strategic objectives. As a result of our transmission planning activities, we have identified transmission focus areas to prioritize investments and developed a project pipeline that aligns with our principles of enabling fossil fuel retirement, expanding renewable generation capacity, and preparing for future demand growth.[18]

In New York City, fossil fuel generation has historically been built close to demand, which required fewer long transmission lines to serve local customers. As a result, our service territory

[17] Our transmission planning approach is discussed in further detail in our Joint Utilities filing, which can be found online **here**.

[18] Our 2021 Local Transmission Plan (LTP) can be found online **here**.

is made up of transmission load areas (TLAs), which are served by a combination of generation units located within the TLA and imported external generation. The volume of electricity imports into and between TLAs is limited by the existing local transmission capacity. As fossil fuel-fired generation is retired and replaced by more distant renewable generation, limits on the transmission capability into and between TLAs constrains the delivery of renewable energy.

Many of the existing fossil fuel-fired generators within these TLAs will need to be retired or repurposed to achieve the mandates of the CLCPA and to comply with the New York State Department of Environmental Conservation 2019-enacted nitrogen oxide (NOx) emissions regulations.[19] Storage and non-wires solutions (NWS) can mitigate the need to run fossil generation in TLAs. Such solutions by themselves are, however, unlikely to be sufficient given the magnitude of future transmission needs.

New transmission connections will be necessary to reliably serve customer demand as local fossil fuel-fired generators retire and as we connect renewable generation to our customers. Such transmission projects provide local and statewide benefits. Local benefits are gained by providing air quality improvements and renewable energy delivery directly to our customers. Statewide benefits are achieved by contributing to the economy-wide GHG emissions reduction goals of the CLCPA.

We have developed a plan to optimize the upcoming shift from fossil fuel generation to renewables while considering local transmission constraints. Our core transmission projects to support renewable connections focus on clean energy hubs.

Additionally, as we are projecting a large increase in electric demand from building heating and transportation electrification, we will need additional transmission infrastructure to deliver this clean electricity to customers.

Our planned transmission projects are documented in further detail in Table 8.

[19] NYCRR, Subpart 227-3 available at: **https://www.dec.ny.gov/docs/air_pdf/siprevision2273.pdf**

Table 8. Our Electric Transmission Initiatives

Transmission Focus Area	Example Initiative	Description and Value Delivered
Enabling Fossil Fuel Retirement *Relieve existing transmission bottlenecks and potential voltage constraints on local transmission networks*	**Reliable Clean Cities (RCC) Projects**	This initiative addresses future local transmission deficiencies caused by the planned retirement or unavailability of fossil fuel-fired generation while enabling the further retirement of fossil fuel generation and the delivery of renewable electricity to our customers. RCC projects will enable continued reliability of the electric system across our service territory.
	Voltage Support Solutions	This initiative supports grid management, specifically in maintaining the range of system voltage needed to sustain overall system integrity and health. This initiative prepares the electric system for increased variability from the retirement of fossil fuel generation and the injection of new renewable generation.
Expanding Renewable Generation Capacity *Create new points of interconnection*	**Brooklyn Clean Energy Hub**	These initiatives will provide cost-effective points of interconnection for offshore wind or other large-scale renewables to be directly connected to the 345 kV system in New York City while limiting the need for local upgrades. In addition, it supports continued safe and reliable electric service.
	Additional Clean Energy Hubs	
	Energy Storage Hubs	This initiative will identify optimal locations on the 138 kV system within our service territory to introduce energy storage and guide more efficient system interconnections. In addition, it will provide storage developers with clearer signals for interconnection location and lower interconnection costs; it will also increase customer use of clean energy.
	Additional Feeders in New York City	This initiative addresses expected transmission constraints that would curtail the delivery of land-based and offshore wind, as well as optimize the flow of renewable energy throughout our system.
Preparing for Future Demand Growth *Increase system capacity for expected future demand*	**Substation Replacement/ Upgrades**	This initiative replaces poorly performing assets with new upgrades that redirect system flows to alleviate expected constraints. Replacement/upgrades prepare the system for future demand growth in a timely manner by making upgrades before the electric system becomes over-constrained and improves resiliency and reliability.

Enabling Fossil Fuel Retirement:

Reliable Clean Cities (RCC) Projects

We recently received approval for three projects that will optimally solve local transmission security deficiencies in two TLAs. These security deficiencies are caused by the planned retirement or unavailability of fossil fuel-fired generation units that are willing or able to comply with the Peaker Rule.[20] The RCC projects solve these reliability needs by alleviating the local transmission system constraints to the extent necessary to achieve clean energy goals by enabling the retirement of downstate fossil fuel-fired peaking units. Additionally, as these peaking units are in communities that have long been plagued with environmental pollution, facilitating their retirement will bring near-term air quality improvement to those communities.

Each of the RCC projects will create an off-ramp for renewable power from offshore wind and upstate renewable generation to reach New York City, enabling further access to clean

[20] The Peaker Rule is a regulation by the New York State Department of Environmental Conservation. More information on recent DEC Air Pollution Regulations can be found **here**.

electricity. In this way, the RCC projects are high impact, multi-value projects that address multiple elements within the transmission focus area.

Voltage Support Solutions

Grid management requires us to maintain a narrow range of voltage to maintain the overall integrity and health of the grid. The transition from baseload fossil fuel power plants to intermittent renewable resources adds complexity to the task of maintaining overall grid voltage requirements. Our initial studies have identified transient voltage response issues driven by the impending retirement or seasonal unavailability of fossil fuel-fired generation. To address the transient voltage response issues, we are in the early stages of integrating a dynamic voltage support facility—a STATCOM[21] on the 345 kV system—to regulate voltage for the grid in transition.

Expanding Renewable Generation Capacity:

To support 9,000 MW of offshore wind in New York by 2035, offshore wind will need to connect to New York City or Long Island. We have identified a plan to accommodate the injection of offshore wind into our service territory, considering local transmission constraints.

Brooklyn Clean Energy Hub

Our plan outlines one make-ready clean energy hub located in Brooklyn that will provide cost-effective interconnections for offshore wind while addressing local system constraints. This hub will enable up to 6,000 MW of new large-scale resource interconnections such as offshore wind and could be placed in commercial operation by summer 2027.

The Brooklyn Clean Energy Hub will provide on-ramps and clearer signals to clean energy developers, such as offshore wind developers, on the optimal places to interconnect in New York City. This improves the current process to efficiently establish optimal interconnection locations. Reliance exclusively on the current process often results in delays and added expense and could impair achievement of the CLCPA offshore wind goals.

Additional Clean Energy Hubs

We are in the early stages of designing additional energy hubs that would prepare the electric system to meet the needs of the CLCPA 9,000 MW offshore wind requirement and stand ready to accommodate future clean energy injections, including high voltage direct current (DC) connections.

One of the clean energy hubs could provide enhanced resiliency in Queens, creating new connections that will support future area stations to meet expected demand from electrification. The other clean energy hub, potentially in Manhattan, could create interconnections to accommodate up to 1,500 MW while transferring demand from other constrained TLAs. This transfer enables renewable resources to access unconstrained demand in decongested TLAs and reduces dependency on fossil fuel plants to maintain system reliability.

Energy Storage Hubs

In addition to directing the interconnection of large renewable projects through clean energy hubs, we plan on enabling interconnections for energy storage to reduce costs and provide greater certainty to developers.

[21] A static synchronous compensator (STATCOM) is a device that regulates reactive power on transmission systems.

We are in the early stages of conceptually designing energy storage hubs, with at least one within New York City (NYISO Zone J) and the other in our northern service area (NYISO Zone H or I). Energy storage developers need clear signals about the optimal places to interconnect in and around New York City. We aim to proactively address these issues ahead of the NYISO interconnection process to achieve the following:

1. Invest in energy storage to advance the CLCPA goal of 3,000 MW statewide by 2030.
2. Increase renewable energy consumption by storing potentially curtailed clean energy for subsequent use by customers.
3. Augment grid services such as capacity, ancillary services, and voltage support.

Additional Feeders into New York City

We have identified off-peak transmission constraints that may prevent the export of offshore wind into the New York City system at certain times of the year. These constraints, if not addressed, would limit offshore wind production and its delivery throughout the local and statewide electric system. We have identified three potential cost-effective local feeders that will address the identified constraints. Each feeder located in our service territory will allow upstate renewable resources access to downstate demand. This streamlined connection between upstate clean generation and downstate demand effectively uses generation during peak and off-peak periods, allowing electricity to be exported during periods that would otherwise lead to curtailment.

Preparing for Future Demand Growth:

Substation Upgrades

We have successfully deployed a combination of traditional infrastructure construction and non-wires solutions (NWS) through the Brooklyn Queens Demand Management program to defer the need to expand our existing transmission system and upgrade substations. However, indicators from our demand forecasting and planning process require us to accelerate the development of new and upgraded substations to prepare the system for future demand growth.

We expect increases in demand due to building heating and transportation electrification, which will result in several local networks being faced with overloads in the ensuing years. To address reliability design criteria, build greater resiliency for various contingency events, and comply with CLCPA goals, we plan on making several substation expansions or upgrades over the next few years. These substations will work in tandem with the planned clean energy hubs, enabling renewable energy supply to access local demand and reduce dependency on local fossil fuel plants.

3.2.1.2 Enable DERs and Electrification through Distribution System Investments

We have made significant progress in advancing the state's goals by building distribution capabilities. A detailed outlook on our plans for the Distributed System Platform is available through our **Distributed System Implementation Plan**. Here, we summarize those plans and how they support our strategic objectives.

Key features of the electric transition, including DG integration, electrification, and large-scale energy storage, add a layer of complexity to distribution. This complexity stems from the increased demand across the system and the proliferation of two-way electricity transfer such as through DER and energy storage. For example, EV charging creates an opportunity for

customer-side storage and demand balancing services to the grid, while posing the risk of increasing peak demand. Managing transient demand due to electrification is critical to maintaining reliability and optimizing grid resources.

To continue providing safe, reliable, and efficient distribution service, we must leverage emerging technologies to further develop intelligent, nimble, and expansive grid capabilities. Improving our distribution capabilities will allow us to support clean energy targets, including within renewable generation, storage, and EVs, and maximize customer access to these energy solutions within the electric system.

Support Distribution System Expansion to Accommodate DER and Electrification

We intend to provide full support to our customers in adopting DER, building heating electrification, and transportation electrification through our new business services. This includes support for new connections to the electric system, including new construction and service upgrades for existing buildings. Our New Business and System Expansion initiatives support the build out of our distribution system. Specifically:

- Our New Business Capital Project prepares for new customers by continued support for growth and economic development throughout our service territory. We prioritize meeting our clean energy goals and support electrification of transportation, heating, and appliances.
- The addition of capacity requires changes to system design such as converting the 4 kV system to 13 kV or 27 kV loops and preparing our infrastructure to meet growing customer needs.

Depending on the pathway, up to 35,000 service upgrades may be required in the next 10 years to connect EVs and heat pumps to the electric grid. Averaged over the period, this could represent a roughly 30% increase in annual service upgrades. This volume of new business is significant and may require additional workforce and project resources. To support the growth of new business, we plan to invest approximately $4.2 billion over the next 10 years.

Enable Two-Way Power-Flow to Enable DER and Electrification

In addition to significant EV and heat pump adoption, we expect over 10 GW of distributed solar photovoltaic (PV) development across the state by 2030 that will add further complexity to managing an intermittent grid. Accordingly, we identified a series of hardware and software upgrades to our distribution system to further enable two-way power flows along with end-use electrification and DER. A high-level overview of these upgrades is shown in Table 9.

Table 9. Two-Way Power Flow Software and Hardware Upgrades

Distribution Initiative	Description	Value Delivered
Modernized Network Protector Relays (MNPR) and Supervisory Control and Data Acquisition (SCADA)	MNPRs minimize trips from back-feed due to two-way electric assets, such as DG or energy storage. This allows for bidirectional communication with the SCADA system.	MNPRs and SCADA networks increase our ability to monitor two-way power flow. As a result, we can host a greater variety of DER and create additional hosting capacity during minimum demand conditions and shift more capacity to peak demand hours.
DER Monitoring and Forecasting	We are developing a DER forecasting tool to better incorporate new technologies and end uses, such as storage and building heating electrification. This tool will also provide us with the architecture and design required for future extension to EVs, DG, and other DER technologies.	Greater DER monitoring and forecasting abilities will allow us to adapt the DER and electric demand forecasts as trends shift and new policy actions are implemented.
DER Management System (DERMS)-Advanced Distribution Management System (ADMS) Upgrade	Upgrades to our DERMS-ADMS systems that enables two-way communications with customer-sited distributed energy assets	Increased decision tools that allow for more optimal use and dispatch of resources and additional visibility into customer-sited resources
Geographic Information Systems (GIS)	Provides a modern mapping and connectivity environment inclusive of DER assets	Refines the way in which we view electricity flows through the system and enhances our hosting capabilities and DERMS integration
Advanced Metering Infrastructure (AMI)	AMI allows for instant, detailed information in energy usage and is a tool that provides customers greater visibility and efficacy on their energy usage.	Allows us to share and analyze more granular data with customers, priming us to manage increased demand due to electrification. Also connects customers that adopt AMI with value-added features including outage notifications, high bill alerts, enhanced customer data sharing, and pricing pilots.

Modernized Network Protector Relays (MNPRs) and Supervisory Control and Data Acquisition (SCADA)

MNPR and SCADA systems are high impact, multi-value investments that offer a myriad of benefits to the distribution system. MNPRs enable DG or energy storage discharge to flow in the reverse direction through the network protector and for bidirectional communication with SCADA systems. As a result, we can monitor two-way power flow with greater certainty and offer greater flexibility to host DER. MNPRs increase available hosting capacity and enable lower cost interconnection while providing greater grid edge visibility, which reduces the need for crews to physically visit locations. We are on track to support greater installation of MNPRs and SCADA with 600 microprocessor relay upgrades and 200 SCADA-enabled locations scheduled per year.

DER Monitoring and Forecasting

Customer-owned DER are another tool that support the electric system in balancing demand with generation. Since 2017, we employed ConnectDER meter collars, which serve as a cost-effective option for DG customers during interconnection. Through this technology, we can perform more detailed behind-the-meter generation analysis and refine our system models, create solar forecasts, and continue to build the database that will be the foundation for future hosting capacity calculations, system analytics, and planning efforts associated with DER deployment.

We are working on a new DER forecasting tool that will better incorporate new technologies and end uses, such as storage and building heating electrification, and will have the architecture and design in place to allow for future extension to EVs, solar PV, and other DER technologies. The new tool and other advancements in forecasting will allow us to adapt our forecast as trends shift and new policy actions are implemented.

DERMS-ADMS Upgrade

The electric distribution system must evolve to support advances in DER, new policy goals, and increased customer expectations. The resulting DER integration, two-way power flows, and their impacts will generate the need for new and more complex ways to manage the grid.

While ADMS are employed by utilities worldwide for distribution grid management, existing commercial ADMS products are based on the prevalent legacy grid model of overhead, high voltage, radial distribution systems. Our service territory is a dense urban environment, and the distribution grid architecture differs from the legacy grid model in that energy is delivered through an underground low voltage mesh network. Off-the-shelf ADMS solutions that would be applicable to our system (without significant testing and development effort) are not currently available.

We plan to use an ADMS as a key component to enable the smart grid of the future, so it is necessary to work with ADMS vendors and suppliers to develop an applicable solution. The objective of this project is to scope, plan, assess, and demonstrate ADMS technology that can support our underground low voltage mesh topology as a full implementation within 5-7 years. Investing in an ADMS supports clean energy goals and maintains our pace of Distributed System Platform development.

An ADMS will provide the following benefits:

- **Real-time monitoring and control of devices on the grid:** Coordinates the operation of power flows and optimizes the capacity of existing feeders and transformers, minimizing costs to us and our customers. Enables customer DER to interoperate on the grid safely and reliably without causing power quality concerns.
- **Dynamic demand analysis and forecasts:** The on-again, off-again nature of wind and solar DER requires near-real-time calculations of demand to allow accurate and cost-effective participation in energy markets. Regulatory actions and customer demand for hosting capacity data necessitates that DER supply and capacities be part of the analysis. Dynamic demand analysis and forecasts will enable regulators and customers to see where DER opportunities are available via hosting capacity maps.
- **Integrated outage management:** Existing OMSs derive outages from customer call-ins, AMI data, the distribution management system, and, in some cases, SCADA data. Each of these separate systems is integrated to the OMS, and there are time delays moving the data from one to the other. An ADMS has an outage management functionality built in as a module and can see and respond to outages in real-time. An ADMS can automate the response to outages and orchestrate mitigation actions across the distribution automation equipment to restore power quickly and safely. As the number of distribution automation devices and DER in the field increase, automation is required to augment human operators.
- **DERMS:** The DERMS' functionality is to monitor, control, and optimize the operation of DER (including solar PV, wind turbines, battery storage, and EV chargers). This

functionality is available as a module within an ADMS or as a separate standalone application. DERMS monitoring and control functions require tight coupling to legacy distribution management system and SCADA or ADMS operations because they can have significant demand impacts on grid operations as their numbers increase. Achieving that tight coupling by leveraging the built-in DERMS functionality of an ADMS is optimal. A DERMS optimizes functions related to operations and markets. The DER capacity that is or is not encumbered through market transactions can have significant financial impacts to the company and to customers or DER owners. A DERMS will optimize DER market operations to the benefit of both.

Geographic Information Systems (GIS)

GIS is a repository that maps utility equipment, power lines, gas lines, and steam lines and stores descriptive information about each. Just as platforms like Google Maps have given individuals visibility to map out a trip, GIS provides critical visibility to utility operations and field crews to prevent and respond to grid outages.

Our IT organization will implement a common enterprise-wide GIS that will offer a consolidated mapping and visualization system across electric, gas, steam, and construction that enables quicker access to data, more accurate data, a platform for common processes, and enhanced operations and field tools for outage management, damage assessments, and storm response.

The common GIS platform will also improve the accuracy of outage counts in the OMS and facilitate faster restoration of customer outages during normal blue-sky events and major storms. It will also enable advanced analytic capabilities when integrated with other systems:

- Integrate with AMI data to forecast outage locations using predictive analytics
- Integrate with spatial mobile data for crowdsourced damage assessments
- Integrate with unmanned aerial vehicle systems for situational awareness during emergency events

Advanced Metering Infrastructure

We are rolling out more than 3.5 million smart meters across our electric system throughout our service territory with an expected completion date of 2022. AMI remotely and continuously reads customer energy usage information which allows us to better balance real-time electric demand with supply. The rollout of AMI will provide customers with valuable consumption information and will enable more innovative pricing and demand response capabilities, along with visibility into end-use consumption.

AMI provides visibility to system conditions at the customer level and operational flexibility to strategically reduce targeted demand to avoid system overloads that lead to long-term outages. Voltage data from AMI allows us to optimize voltage regulation across the electric system and reduce losses in electricity.

Beyond the customer and distribution system benefits, the AMI project will result in operational efficiencies, including enhanced outage management, and reduction in manual meter reading costs. Additionally, we will be performing software enhancements from 2022-2025 to improve data connectivity across our information systems and to optimize for additional processing needs.

3.2.1.3 Grow Storage to Optimize Renewable Generation

As clean generation expands, energy storage will significantly increase utilization of renewable resources by storing excess intermittent electric supply during periods of over-generation. This avoids stranded energy and provides additional resources to serve peak demand needs.

Energy storage also enables us to quickly respond to real and volt-amps reactive power, making it an important operational tool that provides reliability benefits and reduces the need to operate traditional fossil fuel-fired peaking units. Smart inverters in the energy storage system enable sub-transient response, making them adaptable to real-time grid conditions and planning.

Implementing energy storage will provide value to a range of stakeholders and support our strategic objectives. For customers, energy storage provides the opportunity for backup power, increased PV self-consumption, and demand charge reduction. As a utility, we also benefit in resource adequacy, transmission congestion relief, and transmission or distribution capital investment deferral. Lastly, NYISO receives greater electric grid benefits such as frequency regulation, voltage support, and reserve capacity.[22]

The CLCPA has set a statewide goal of achieving 3,000 MW of energy storage by 2030. We are committed to supporting this goal and energy storage solutions at all levels of the electric system. We have a goal of installing up to 1,500 MW of energy storage on our system by 2030. Because there is significant opportunity to achieve our 2030 ambition, specifically within new storage models, bulk requests for proposal, and utility-owned storage, we are advocating for greater investment to be made in increasing our energy storage capacity. Cost-effective deployment of energy storage can generate net customer benefits by providing environmental, wholesale, and, where applicable, distribution services. We have been incorporating energy storage into our planning and operations functions, engaging in several demonstration projects, and learning how to capture the full potential of energy storage benefits for our customers.

We project 499 MW to be installed onto our system by 2025. To achieve this growth, we are taking a three-pronged approach to deploying energy storage:

- Targeted incentives and programs to encourage **customer-owned systems** to be interconnected to our distribution system.
- Construction and operation of **utility-owned projects** typically installed at or near our substations.
- Contracting with larger **bulk storage systems** interconnected at higher voltages.

Each piece of our storage deployment strategy drives our overall focus of optimizing the value of storage systems to reduce or possibly even eliminate the cost burden they might impose on utility customers.

Advancing Energy Storage

CECONY and GI Energy recently installed a **1 MW / 1 MWh battery** system in the Bronx, further enhancing reliability and enabling clean energy.

Encourage Customer-Owned Systems

Customer-owned storage systems offer a breadth of benefits to our customers and to the greater electric grid. For example, customer-site storage offers

[22] For more information on the benefits of energy storage, refer to: **"Economics of Battery Energy Storage" – Rocky Mountain Institute.**

customers a source of backup power and enables them to take advantage of time-of-use rate structures. Customer-owned storage also contribute to systemwide storage goals, ultimately enabling optimal use of renewable generation.

We recognize that customer-owned storage is a growing use case with barriers to overcome before they are adopted at scale. To accelerate the adoption of customer-owned systems, we are working with stakeholders to overcome these technical and logistical barriers. For example, we are working with municipalities to address permitting concerns regarding energy storage devices in and around buildings and are actively participating in stakeholder forums, particularly the New York Battery and Energy Storage Technology Consortium.

Construct and Operate Utility-Owned Projects

Utility-owned projects provide the greatest opportunity to balance intermittent generation of renewable resources like solar and wind. In addition, they allow us to better manage system peaks and increase the hosting capacity of our distribution circuits to integrate DERs.

We are well-positioned to strategically support energy storage resources in locations and use cases that benefit our customers. This is highlighted through our commercial battery storage initiative in which we partnered with GI Energy (now Endurant Energy) to deploy four 1 MW/1 MWh storage systems across the grid (including City Island, shown in the Advancing Energy Storage callout box). Through the initiative, we aim to demonstrate how distributed front-of the meter energy storage can be used to provide transmission and distribution support, earn wholesale market revenue to offset customer costs, and increase the market size of participating customers by aligning the interests of the company, customers, and third-party developers. We have first rights of dispatch for the batteries and get priority in determining when the batteries can discharge. Similarly, we have also deployed utility-owned batteries to support grid needs, as with Brooklyn Queens Demand Management demand relief needs.

Energy storage will also help the NYISO fulfill future capacity needs and provide other bulk power services. By directly participating in the NYISO markets, energy storage will reduce the need to operate traditional fossil fueled generation, increase customer use of carbon-free generation, and capture market revenue that reduces the effective cost to customers. We are actively working with the NYISO to develop market rules that allow energy storage resources and all DER to participate across wholesale capacity, energy, and ancillary service markets while providing distribution services

Contracting with Larger Bulk Storage Systems

Contracting with third-party, larger bulk storage systems at higher voltages allows us to leverage the voltage support that greater storage capacity provides. We continue to encourage third-party owned storage deployments through our bulk solicitation to contract with larger utility-scale projects connected at higher voltages. The type of projects we engage in include facilitating energy storage paired with EV charging, storage paired with solar generation, and developing monitoring and control mechanisms. These larger storage projects are essential to achieving the scale necessary to meet the state’s goals.

Each facet of our energy storage strategy—customer-owned systems, utility-owned projects, and third-party bulk storage systems—are necessary to meet our forecasts for storage within our electric system. Storage drives multiple strategic objectives, namely integrating renewable generation and enhancing reliability, and we have worked closely with City of New York and other municipalities in our service territory to define battery installation rules that balance safety

with the expectations of future battery growth. We will continue to work with the New York City Department of Buildings and Fire Department to establish a standardized testing and permitting process for energy storage systems. In addition, we are looking to reduce the cost to site and interconnect storage systems to further catalyze the growth of storage capacity within our service territory.

3.2.1.4 Support 100% Renewable Electric Generation

Advocate for Utility-Owned Renewable Electricity Generation

Policy goals mandate that electric generation will be 100% clean by 2040. Therefore, the generation fleet will need to transition away from fossil fuel-fired generation. In the future, we expect continued cost declines for these solutions as the policy goal will push the markets to mature and technologies to improve. Due to the variability of renewables, a combination of long duration storage and low-to-zero carbon gaseous fuel-fired generation is required to meet reliability requirements of the bulk power system.

We project that a significant increase in renewable energy generation capacity within our service territory is necessary to achieve clean energy targets. Accordingly, utility ownership of renewables is an important strategy in further accelerating the scale of renewable generation in the state. Utility ownership of renewable energy best connects customers with the long-term value of clean generation, which would not be realized in a traditional power purchase contract. Distinct benefits of utility-owned renewables include the following:

- Creating new clean generation to benefit customers for the life of the project
- Ongoing operation of the asset with utility standards for safety and reliability
- Opportunity to generate bill credits for our low-income customers through revenue generated from selling renewable power and using renewable energy credits
- Ability to install clean generation on the electric system where it makes the most sense in terms of demand need and transmission capacity

Some immediate benefits that renewable generation can provide to our customers include greater air quality achieved with the reduced operation of fossil fuel generation and jobs created for the construction and maintenance of renewable generation.

If approved in our rate case, we plan to conduct annual solicitations to procure 100 MW of solar generation each year, with the first solicitations conducted in 2023 and assets in service during 2024. Each 100 MW of solar capacity would be acquired through a competitive solicitation process with the winning bidder(s) responsible for designing, permitting, constructing, interconnecting, and commissioning an operating solar facility. Ownership would be transferred to us upon commercial operation. The projects selected will be developed and constructed by third-party developers and market participants. Revenue will be generated by selling capacity and electricity generated by the assets into the NYISO wholesale market and monetizing renewable energy credits at New York State Energy Research & Development Authority (NYSERDA) prevailing Tier 1 price. Each project will be maintained by a third-party contractor, and project sites will be determined by the results of the solicitation.

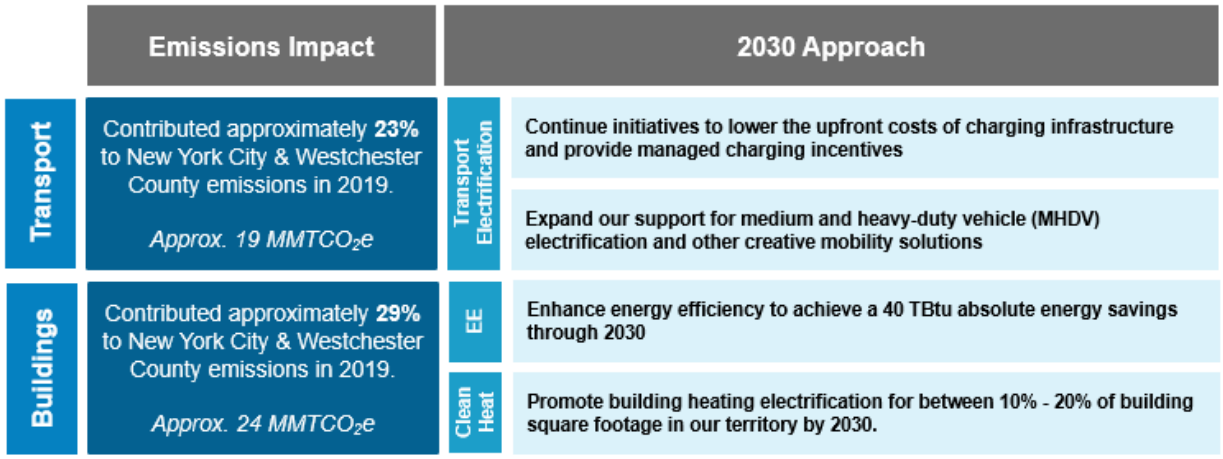
Allowing utility ownership will enable us to develop renewable projects, significantly expanding potential development and increasing the likelihood of reaching the State’s goals. For more

information about how we plan to pair renewable energy development with benefits for low- and moderate-income communities, please refer to Section 3.4.2.2.

3.2.2 Enabling a Fundamental Change in Energy Consumption

We recognize that achievement of ambitious policy goals will require our customers to make changes in electric consumption including adopting energy efficiency, building heating electrification, and transport electrification technologies. We intend to support this fundamental change on our electric system through the approaches outlined in Figure 17.

Figure 17. Enabling a Fundamental Change in Energy Consumption



Our transportation electrification initiatives are based on current policy goals and the aspirations for charging infrastructure for different vehicle types. A summary of vehicle types and associated policy goals and initiatives is included in Table 10.

Table 10. Transportation Electrification LDV/MHDV Initiative Overview

Vehicle Type	Current Policy Goal	Charging Infrastructure	No. of Plugs Supported by Public Service Commission-Authorized Initiatives	Current Initiatives
LDVs ~ 2.3M in our service territory	100% tailpipe emissions free new sales by 2035	>19,000 Level 2 and direct current fast charging (DCFC) by 2025	>19,000 L2 and DCFC by 2025	PowerReady SmartCharge
MHDVs ~100,000 in our service territory	100% tailpipe emissions free new sales by 2045	10,000-15,000 Level 2 and DCFC by 2030	<100	Medium, Heavy Duty Pilot SmartCharge

We are working with stakeholder groups, including policymakers and customers, to achieve these goals. We are constantly monitoring the following factors that could indicate the rate of EV adoption in our territory:

- **Availability of chargers** throughout our service territory

- **Affordability of EVs** in comparison to traditional combustion engine vehicles from a total cost of ownership perspective
- **Range of EVs** available in the market
- **Model availability**, which increases likelihood of adoption across a wider range of customer groups
- **Awareness** of EVs and charging solutions
- **Policy and regulatory mandates** that may result in significant growth of EV adoption

Additionally, we analyzed the barriers to decarbonization across different categories of buildings within our service territory. A summary of this analysis is included in Figure 18.

Figure 18. Energy Efficiency and Building Heating Electrification Strategies

Building Type	Approximate Market Footprint	Barriers to Decarbonization	Decarbonization Strategy	
			Energy Efficiency	Building Heating Electrification
 **Single family residential**	**80% of total buildings** in New York City **20% of building emissions** in New York City	**Lack of knowledge** of electrification opportunities **Difficulty** determining appropriate contractors and services for their needs **High upfront cost** to deep retrofits limits accessibility	✓ Engage energy efficiency value chain, such as manufacturers, distributors, retailers, and contractors to grow awareness of CECONY programs ✓ Tailor incentives by customer segment to address upfront capital needs and support clean energy decisions	✓ Engage building heating electrification value chain, such as manufacturers, distributors, retailers, and contractors to grow awareness of CECONY programs ✓ Tailor incentives by customer segment to address upfront capital needs and support clean energy decisions
 **Multifamily and Commercial**	**20% of total buildings** in New York City **80% of building emissions** in New York City	Complexities related to **rent-regulated** units **Lost rent** during retrofit **Non-uniform decision-making** process between tenants and landowners **Insufficient electric infrastructure** to support electrification **Difficult to determine business case** and projects that maximize return on investment	***Initially prioritize buildings that hold the following characteristics:*** ✓ Building owners with sufficient capital to upgrade building envelopes, including with reasonable incentives ✓ Buildings with minimal rent restrictions or ability to recoup lost rent revenue ***Continue scaling our go-to-market strategies for more difficult building types:*** ✓ Rent-regulated buildings ✓ Buildings with complex technical characteristics that make building envelope upgrades challenging ✓ Engaging comprehensive multifamily program and affordable housing owners	***Initially prioritize buildings that hold the following characteristics:*** ✓ Buildings with sufficient electric capacity and/or buildings that can be reasonably incentivized to increase electric capacity ✓ Buildings with technical characteristics conducive to electric heating, e.g., ducted HVAC systems with central heating and/or air-conditioning ✓ Buildings with minimal rent restrictions or ability to recoup lost rent revenue ***Pilot technologies and go-to-market strategies for more difficult building types:*** ✓ Rent-regulated buildings ✓ Buildings with complex technical characteristics that make electrification challenging (e.g., buildings that use on-site boilers for steam heating)

Section 3.2.2.1, Section 3.2.2.2, and Section 3.2.2.3 further document our strategies in each of these areas, including the level of investment we believe is needed for both low- and moderate-income buildings and non-low- and moderate-income buildings to achieve clean energy targets.

3.2.2.1 Enable Transportation Electrification

There are several barriers to the widescale adoption of clean transportation technologies needed to meet GHG emissions targets. Specifically, upfront costs can be 20%-90% higher than internal combustion engine vehicles, and there is concern around the range of EVs and availability of charging or fueling infrastructure. The attractiveness of EVs may depend on how many vehicle miles a customer plans to travel, and fuel cell vehicles may be more attractive for heavy-duty, long-distance applications. We expect declines in battery costs to drive reductions in EV costs such that they are cost-effective by 2035. Fuel cell vehicles may need to overcome policy barriers in New York City before they are feasible for widespread adoption in our service territory.

To achieve net-zero GHG emissions by 2050, it is critical that deep decarbonization of the transportation sector is achieved statewide. We are prepared to support the acceleration of the transition to EVs, as well as electrifying non-automobile transport sectors ranging from micro-mobility to more incipient marine and aviation sectors, by facilitating the expansion of transport related charging infrastructure throughout our service territory. We will also help our customers better manage their energy use through incentives.

We are focused on supporting electrified transportation centers with availability of charging, affordability, and awareness. We are actively facilitating growth of charging infrastructure and preparing the electric system to support increased demand from EV charging. We continue to ideate ways to influence the affordability of EVs and find cost savings for EV owners. Through our programs and advocacy of charging, we will be positioning ourselves as a trusted source and a reliable partner for market participants and customers.

New York State, New York City, and other overlapping regions have ambitious goals for the adoption of electric LDVs and MHDVs. Table 11 outlines a number of these EV policies.

Table 11. State and City EV Policies

Organization	Policy	Impact
Northeast States for Coordinated Air Use Management	Zero-Emission Vehicle Memorandum of Understanding	Commits signatories to a collective target of at least 3.3 million zero-emission vehicles (ZEVs) on the road by 2025. This represents an addition of approximately 238,000 vehicles in our service territory and 850,000 across New York State.
New York State	Legislation (A.4302/S.2758)	Target for all new passenger cars sold in New York to be zero tailpipe - emissions by 2035. Trucks classified under MHDV have a target of 2040.
New York State Department of Environmental Conservation	Advanced Clean Truck Rule[23]	Requires original equipment manufacturers sell an increasing portion (30-50% by 2030 starting in 2024-25 model year and 40-75% by 2035) of EVs. Additionally, a reporting requirement for large fleets to report their vehicle numbers and use patterns for planning purposes.
New York City	Intro 455-A	Requires electrification of all school buses by 2035.
New York City	Local Law 130	20% of parking spaces in new parking garages and open parking lots must be capable of supporting EV charging stations by January 1, 2030.
New York City	Local Law 97	Buildings over 25,000 square feet must significantly reduce GHG emissions starting in 2024, EV charging is exempt; buildings that add EV charging will not be penalized.[24]
New York City Department of Transportation [25]	Clean Transportation Strategy	Promotes smarter freight, shared use mobility, intelligent vehicles, real-time management of our streets, and the use of cleaner vehicle technologies. Set goals such as 40,000 publicly available Level 2 (L2) and 6,000 direct current fast chargers (DCFC) plugs, 10,000 curbside L2 chargers installed by 2030.
New York City Housing Authority	Sustainability Agenda	Sets goals for reducing GHG emissions, building efficiency, building decarbonization, shift away from fossil-fuel vehicles, and supporting the deployment of EV chargers in environmental justice neighborhoods with targets through 2050.
New York City Department of Citywide Administrative Services[26]	New York City Clean Fleet Plan	Sets goals for New York City to become the most sustainable fleet in the country, transitioning to all electric on-road fleet units by 2040. Plans are in place to build over 250 fast chargers with 100 fast chargers already built.
Port Authority of New York and New Jersey[27]	Electric Fleet Commitments	Commits to 100% electric LDV fleet by 2030 and 50% electric MHDV fleet by 2035, among other commitments.

Decarbonizing the transportation sector is highlighted as a priority in several regulatory rules and state policy goals related to EV adoption. We are cognizant that electrified transportation is

[23] Details on New York State Department of Environmental Conservation efforts to control air pollution from motor vehicles can be found **here**.

[24] Details on this exception can be found on the New York City Department of Buildings Bulletin **here**.

[25] Details on New York City Department of Transportation's Strategic Plan can be found **here**.

[26] Details on New York City Department of Citywide Administrative Services' fleet sustainability initiatives can be found **here**.

[27] Details on the Port Authority of New York and New Jersey's Electric Fleet Commitments can be found **here**.

an emerging sector where the total cost of ownership is still higher than fossil fuel-based transport and will require robust support from a variety of stakeholders, including ourselves, to grow.

We will support policies through 2030 that provide continued make-ready infrastructure support for EV chargers designed for LDVs, as well as the expansion of make-ready infrastructure and other financial support for MHDVs and fleets. We also support enhancements and continuation of the New York State Public Service Commission orders requiring utilities to develop charging management initiatives. We will improve EV demand forecasting and develop managed charging programs to better predict and manage the growth of electric demand due to transportation electrification.

Future laws, regulations, and changes in vehicles as well as market factors are likely to influence EV adoption in our service area and consequently our role in facilitating the development of charging infrastructure. Laws directed at original equipment manufacturers to achieve certain levels of zero tailpipe-emission vehicle sales, at fuel distributors to meet a certain level of clean fuel sales, and at fleets or rideshare companies to meet minimum electrification mandates will likely influence EV adoption, in addition to laws that generally center around GHG emissions.

We expect expanded policy support will be needed to achieve statewide goals for EV adoption. Such expanded support should also include subsidies for upfront costs of vehicles and tax credits. EV adoption is in its early stages, and customers look to incentives to lessen the burden of being an early adopter. As the customer and policy landscape in New York City and New York State continues to evolve, we stand ready to fill the utility role in accelerating EV adoption.

Continue initiatives to lower the upfront costs of charging infrastructure and provide managed charging incentives

We maintain a demand-leading strategy, meaning a focus on proactively meeting customer demand for EV charging infrastructure in a timely manner supported by EV forecasts. In this way, we can consistently supply EV charging infrastructure needs while efficiently allocating resources.

Our operational focus with respect to EVs generally falls into two categories: financial incentives for upfront infrastructure costs and pricing to encourage managed charging.

- **Incentives for upfront infrastructure costs** currently means EV make-ready infrastructure including on the customer side, but eventually these incentives could be expanded to include grid integration technology or even subsidization of new vehicles. This type of market engagement is captured in the PowerReady program described below.
- **Managed charging incentives** focus on reducing the impact of electric demand growth from EVs during peak times by rewarding both avoidance of charging during peak hours and for charging during overnight hours. SmartCharge New York (SCNY) is our managed charging program and caters to all customer segments. This program is designed to discourage on-peak charging and increase off-peak charging, to influence third parties to choose locations to build chargers that have adequate grid capacity and that are not peaking when customers' operational charging needs are highest.

In the future, we would like to expand the reach of managed charging initiatives to include price signals that influence:

- When and at what capacity chargers should operate during various times of the day with a goal to minimize peak use and maximize off-peak use.
- Where charger owners and operators—and fleets—should locate their chargers to avoid exacerbating grid constraints.
- What charger customers should choose for a certain vehicle, with the goal of picking a charger location at their desired time of charging when that location is at optimal off-peak time.

The following are detailed descriptions of our existing programs to support transportation electrification:

PowerReady Program

The PowerReady program is one of the nation's largest EV incentive programs offered to facilitate the buildout of thousands of chargers in our service territory. Established in July 2020,[28] the program aims to increase installation of EV charging stations for LDVs by reducing the upfront costs of the infrastructure upgrades through utility incentives.

The current market is nascent and requires development of widespread and visible EV charging to provide confidence to consumers. This will encourage consumers to adopt EVs with the knowledge that they will be able to charge whenever and wherever necessary. The market also requires financial support to developers that are hesitant to invest in infrastructure due to insufficient EVs on the road and the risk of low charger utilization. The PowerReady program seeks to incentivize the development of charging infrastructure and lower the threshold of economic viability.

Fast Chargers

We supported the installation of 25 publicly available fast chargers in Brooklyn, New York through incentives awarded through our PowerReady program.

PowerReady supports the installation of more than 18,000 Level 2 plugs and more than 400 direct current fast charging (DCFC) plugs by 2025, with an intermediate goal of 3,708 Level 2 plugs and 91 DCFC plugs by the end of 2022. The program is focused on LDV infrastructure for public, commercial, and multifamily charging

Additionally, we plan to propose infrastructure incentives into an expanded program to support additional vehicle classes, particularly MHDVs and fleets. This can be accomplished by expanding the current, highly limited MHDV pilot make-ready to a full-scale program that provides incentives to both third-party developers and EV owners. We plan on building upon current practice and experience to understand the charging station market needs and design incentives that will appeal broadly across customer segments and their operational needs throughout our service territory.

The current strategy to support development for early adopters and market makers seeks to immediately scale the program through outreach, key partnerships, and developing support tools such as informative mapping layers. This will enable the market to better deploy the thousands of Level 2 and DCFC plugs needed to meet our goals and make us a national leader

[28] Details on the EV Make-Ready Order can be found online **here**.

in charging deployment. We stand ready to support future policy goals that drive charging infrastructure deployment for LDV and MHDV customers alike.

SmartCharge New York (SCNY)

In its current form, SCNY is designed to incentivize EV owners to charge their EVs in our service territory during off-peak hours when demand for electricity is at its lowest. We see managed charging as an opportunity to use positive incentives to facilitate consumer habits that encourage EV charging in a grid-beneficial manner.

We anticipate that price signals can be effective when targeting the charging infrastructure owners in our service territory in addition to vehicle owners. Additionally, we are taking an engagement-based approach to set the stage for future technologies, such as vehicle-to-grid, if the market moves in that direction.

SCNY has several goals:

- Minimize system and network peak demand
- Educate EV owners about when is best to charge their vehicle to minimize the demand on our electric system, making service more reliable for all customers
- Increase the SCNY enrollment of EV owners who charge in our service territory
- Reduce the overall cost of charging by lowering operating costs in our service territory

Approximately 15% of all electric LDVs registered in our service territory are enrolled in SCNY. We plan to maintain and increase enrollment throughout 2022 by:

- Evaluating and employing alternative technologies that eliminate the need to install a connect car device[29] and allow for timely support of new makes and models.
- Improving awareness of our managed charging initiatives and educating customers on the benefits to them and to the grid by participating in such programs. We aim to raise awareness of SCNY by partnering with Westchester Municipality and County government, sending marketing emails and postcards to existing and potential EV owners and participating in monthly PowerReady information sessions with charging station installers.

Expand our support for medium and heavy-duty vehicle (MHDV) electrification and other creative mobility solutions

We expect to grow our program offerings to better support MHDV fleet operations within our service territory across multiple classes of vehicles. Most of this effort will be through the engagement of electrification through make-ready investments as well as tools to support site and fleet assessments; the remainder will be through the electrification of our own fleet.

Over the next 10 years, we plan on investing in the infrastructure required to support our service territory's share of transportation electrification. We recently signed on to participate with the National Electric Highway Coalition and are committed to facilitating development of charging resources that are available to those traveling to and through our service territory. We plan to use incentives to facilitate infrastructure buildout and enable private investment to transform and

[29] A connect car device is a separate device that attaches to an automobile's computer, to track mileage, usage patterns, and other information.

decarbonize the transportation sector. We will guide the development of standards and protocols that work best for stakeholders in our service territory while working to provide all communities with the benefits of transportation electrification.

We are monitoring the marine and aviation sectors and the evolution of electric micro-mobility with an eye toward supporting local and regional initiatives as those sectors become increasingly prevalent. To date, the marketplace for marine and aviation electrification is incipient, but is expected to be an area of focus within the 5-year horizon. Micro-mobility is emerging, with a sizable variety of e-bikes and scooters available to date. We are attentive that making these options more available to customers in transit deserts may be an initiative we can support to provide more communities access to electrified transportation.

3.2.2.2 Drive Growth in Energy Efficiency

Enhance energy efficiency to achieve 40 TBtu absolute energy savings through 2030

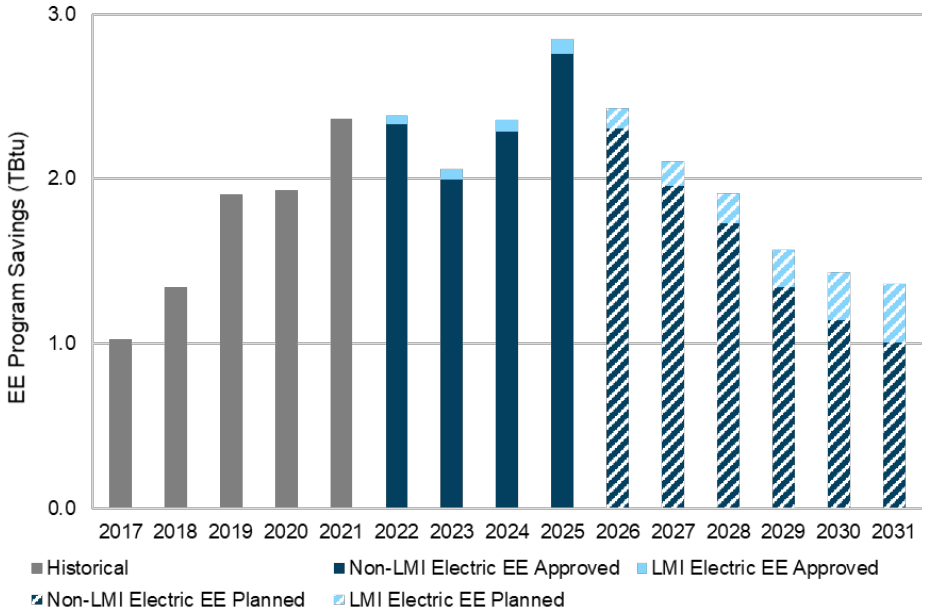
Our investments in deep energy efficiency continue to reduce end-use energy consumption and lower our customers' recurring energy bills. Energy efficiency further enables building heating electrification efforts and increases the share of renewable energy on our system by reducing total and peak electric demand. Additionally, energy efficiency will partially offset the substantial anticipated growth of electric demand due to the proliferation of building and transportation electrification. Well-designed energy efficiency can address time sensitive and location specific needs of the electric system, providing a more diverse solution set for systemwide demand balancing.

The benefits of energy efficiency to our customers are clear: it offers greater control of their energy usage, increased comfort of their living spaces, lower GHG emissions, increased bill savings, and adheres to local building GHG emissions requirements such as those set forth in **Local Law 97**. We have found that our existing energy efficiency programs improve our relationship with customers through increased communication and transparency.

Thus far, electric efficiency measures have primarily focused on converting existing incandescent, fluorescent, and compact fluorescent (CFL) lighting to light-emitting diodes (LEDs). For example, 59% of our total energy efficiency portfolio in 2020 was from lighting efficiency measures. To continue driving electric energy efficiency savings, our strategy will need to shift toward more advanced and complex solutions, including building envelope and controls (further discussed in our **Integrated Long-Range Plan**) in addition to electric device efficiency.

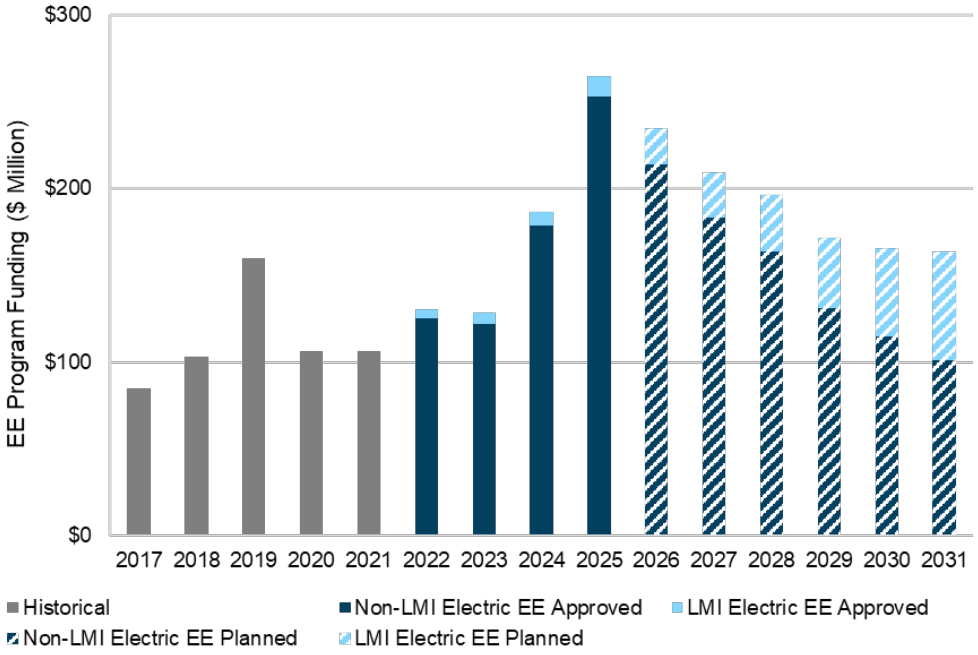
To further support energy efficiency, New York State established a statewide goal of reducing customer energy usage by 185 TBtu by 2025, with the New Efficiency: New York (NENY) order supporting that effort. These ambitious goals require increased energy efficiency savings through 2030 and beyond, with an increased focused on supporting low- and moderate-income (indicated as "LMI" in the below figures) customers. As part of NENY, our programs have been approved through 2025. To continue providing the electric energy efficiency savings needed to support economy-wide decarbonization targets, we propose to continue the program through 2031, as indicated in Figure 19.

Figure 19. Electric Energy Efficiency (EE) Program Savings (2017-2031)



This includes $1.5 billion approved for incentive programs through 2025, with dollars specifically allocated to electric (low- and moderate-income and non low- and moderate-income) programs:

Figure 20. Electric Energy Efficiency (EE) Program Funding (2017-2031)[30]



The electric energy efficiency program primarily includes financial incentives, technical support, and customer outreach to help customers lower electricity usage throughout our service territory. We see lighting efficiency savings lowering over time due to market saturation, with

[30] The drop in program funding between 2019-2020 is due to the impacts of the COVID-19 pandemic and resulting shut-down, which paused ongoing energy efficiency projects.

electric device efficiency upgrades as the primary driver of savings in the outer years. Electric device efficiency includes more efficient electric chillers, pumps and motors, and refrigeration equipment.

To better implement and target these measures, we are identifying and engaging high energy use customers who could see significant positive outcomes from energy efficiency. Opportunities for these outcomes can be found in residential multifamily buildings, hospitals, schools, banking, and low- and moderate-income multifamily buildings. They can also be found by proactively identifying customers undergoing major renovations or retrofits and timing upgrades with these activities. and expanding our network of contractors.

We will seek to create synergies by pairing building envelope with electrification upgrades, which lower the total cost of building heating electrification for customers and help to reduce electric peak demand impacts. As customers become more familiar with their energy usage, we can take steps to facilitate a robust set of service providers to join the energy efficiency market. We have provided training programs to more than 1,000 independent contractors and will continue to engage market partners through such programs to best leverage our incentives, education, and tools.

Innovation in Energy Efficiency

As we move forward, we will introduce new efficient products, services, and program models as technologies develop, economic trends shift, and customer preferences and behavior patterns change. We seek to increase customer engagement and choice through our energy efficiency programs, providing customers with actionable insights and the ability to efficiently manage their energy needs while creating broader system, grid, and environmental benefits. We will continue to provide energy audits, educational materials, access to information on efficient products and services, and promotion of new and effective technologies.

We will also aim to add new technologies and services, and test these using pilots. These pilots would be executed using the following strategies:

- First, we are looking to test and pilot new building electrification technologies and configurations to address more challenging segments.
- The second area of focus is building envelope. These measures have historically been difficult to implement, so there is opportunity to innovate program design to address barriers.
- Third, we are focused on offerings and program innovations to better reach low-moderate income customers.

We will also look to strengthen our collaboration with NYSERDA in driving benefits to disadvantaged communities. We commend NYSERDA’s work in supporting the disadvantaged community framework and interim disadvantaged community maps and will look to partner in administering programs, complement offerings, and integrate learnings from their pilot activities into our offerings for disadvantaged communities and the communities we serve more broadly. For additional information about how we support an equitable transition through energy efficiency initiatives, please refer to Section 3.4.2.2.

3.2.2.3 Drive Growth in Building Heating Electrification

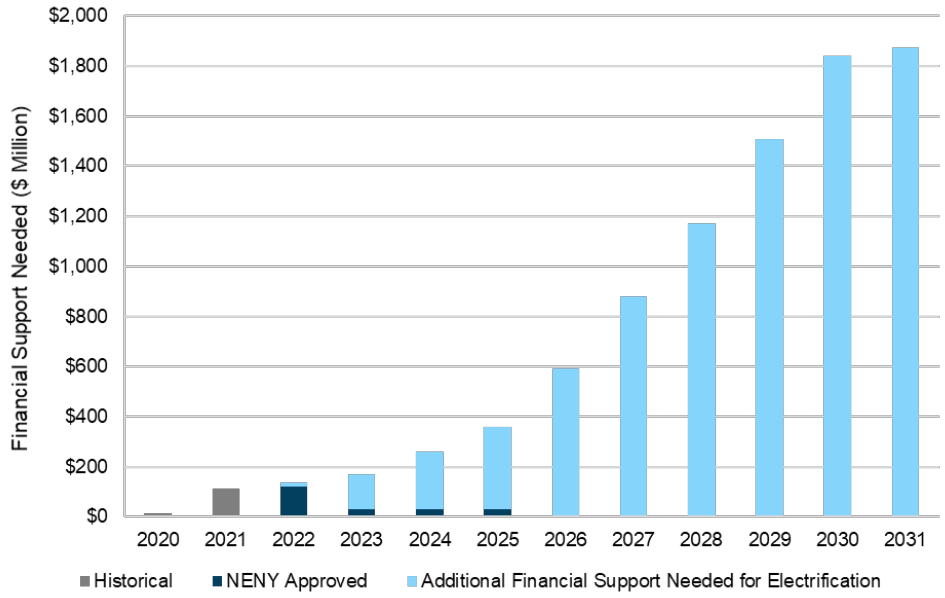
Promote building heating electrification for between 10% and 20% of building square footage in our territory by 2030

Electrification of building heating is feasible in most buildings, but there are several barriers to adoption: upgrade economics, electrical upgrade requirements, design and technical challenges, and lack of awareness and consideration. There is a wide range of costs and technical challenges due to the distinct building stock in our service territory which can be divided into two large buckets with respect to heat pump adoption:

- **Electrification is feasible during equipment replacement:** Buildings where the retrofits required for a heating upgrade are either minimal or can be coordinated while the building is occupied. In these buildings, electrification is possible when the existing equipment reaches end-of-life. Absent incentives, however, installation costs can be double the costs of fossil fuel-fired systems. Examples include ducted buildings with forced air distribution, buildings heated via electric resistance, single family homes converting to mini-split heat pumps, low-rise buildings converting to mini-split heat pumps, and buildings with hydronic distribution.
- **Electrification is feasible during a major renovation:** Tall buildings with internal steam distribution, which represent approximately 30% of the building space in our service territory, will only be feasible to electrify during a major renovation. There is no efficient heating electrification technology available to replace existing boilers while maintaining the internal steam distribution. As a result, a new distribution system will need to be installed, which is a disruptive and expensive upgrade. Absent incentives, installation costs can be 2-4 times more expensive than fossil fuel-fired systems. Electric boilers and boilers fueled by low-to-zero carbon gaseous fuels may provide an alternative path for decarbonization outside of gut renovation cycles.

We plan to invest $337 million from 2020 through 2025 in space and water heating electrification upgrades through the NENY. This includes $227 million that was authorized specifically for electrification and transferring additional funding from other budgets within the program. Our specific program associated with this is called the New York State Clean Heat Program. We provide financial incentives to offset high up-front costs of installation to drive customer adoption of heat pumps for space and water heating, as well as envelope retrofits to reduce overall heating demand. Figure 21 shows our baseline and proposed Heat Pump program expenditure and funding requirements.

Figure 21. Electrification Financial Support (2020 – 2031)



We project the total financial support needed to enable CLCPA-aligned adoption through 2031 is between $5 and $7 billion. The identified investments will focus on solutions that address customer-sited electrical constraints and enable approximately 6% of building space heating and 15% of building water heating electrification (by square footage) in our territories' buildings by 2031. We expect that with additional funding and policy support, we could enable up to 10% adoption of building space heating in our service territory.

Although the identified investments are a considerable increase from today's approved funding, it falls short of what may be necessary to achieve 2030 GHG emissions reduction goals, which we estimate at 10%-20% of square footage for total heating needs (building and space). This shortfall is largely due to a lack of available technologies, contractor networks, and expected consumer adoption. We will continue to re-assess the building heating electrification market as we move forward.

If concentrated in specific areas, building heating electrification may enable us to cap certain parts of our gas distribution system to align with our long-term expected decline in gas system utilization. In addition, prioritizing fuel oil customers to convert to electric can be cost-effective today. As electric heating technologies continue to decline in cost and improve in performance, we expect that gas-to-electric conversions will become more cost-competitive and increasingly efficient for decarbonization.

3.2.3 Alignment of Our Actions with Climate Policy

Our clean energy actions align with various climate policy goals for New York City and Westchester County, and we have mapped our strategies to the applicable legislation. Table 12 lists how our strategies align with each policy goal.

Table 12. Aligning Our Actions with Climate Policy

Legislation/Law	Climate Policy	Our Strategy
CLCPA	70% renewable energy by 2030.	• **Transforming the Energy Supply:** 100% Renewable Electric Generation, Transmission, Distribution, and Storage
CLCPA	100% emissions-free electricity supply by 2040.	• **Transforming the Energy Supply:** 100% Renewable Electric Generation, Transmission, Distribution, and Storage
CLCPA	9,000 MW of offshore wind by 2035.	• **Transforming the Energy Supply:** 100% Renewable Electric Generation, Transmission, Distribution, and Storage
State Target	10,000 MW of distributed solar by 2030.	• **Transforming the Energy Supply:** Distribution and Storage
CLCPA	3,000 MW of energy storage capacity by 2030.	• **Transforming the Energy Supply:** Storage
CLCPA	185 TBtu end-use energy reduction by 2025.	• **Enabling a Fundamental Change in Energy Consumption:** Energy Efficiency, Building Heating Electrification
CLCPA	Net-zero GHG emissions economy-wide by 2050.	• **Transforming the Energy Supply:** 100% Renewable Electric Generation, Transmission, Distribution, and Storage • **Enabling a Fundamental Change in Energy Consumption:** Energy Efficiency, Building Heating Electrification, Transportation Electrification
CLCPA	35%-40% of clean energy benefits to disadvantaged communities.	• **Enabling a Fundamental Change in Energy Consumption:** Energy Efficiency, Building Heating Electrification *Refer to 3.4.2.2 for more details*
CMA	**Local Law 97:** Buildings over 25,000 square feet must significantly reduce emissions.	• **Transforming the Energy Supply:** 100% Renewable Electric Generation, Transmission, Distribution, and Storage • **Enabling a Fundamental Change in Energy Consumption:** Energy Efficiency, Building Heating Electrification
CMA	**Local Law 94:** Buildings undergoing major renovations must consist of either solar PV or a green roof.	• **Transforming the Energy Supply:** Distribution

We are assessing the impact of New York City's **Local Law 154 of 2021** on our business strategy and initiatives going forward. Our current understanding of the law is as follows:

- Legislation prohibits combustion emitting more than 25 kg of CO_2 per MMBtu of energy within a building, triggered by when an application is submitted for either new construction or gut renovation thresholds, as established by the New York City Department of Buildings.
- The law provides various exceptions, including for those where combustion is required such as laboratories, laundromats, hospitals, crematoriums or commercial kitchens and those fuels burned occasionally and not connected to service lines (such as propane for outdoor grills). There are additional exceptions for power or steam generation by utilities (e.g., CECONY), and management of food waste and sewage.
- There is an implementation timeline with key dates in 2023 through 2028, which includes additional adoption time for affordable housing units given the financial and technical constrains of such buildings.

Given the volume of construction and renovations in our service territory, we expect that this legislation will have a major impact on our current and future customers. Our strategy is aligned with providing both financial and technical support to customers looking to adopt electric building heating.

We will continue to advocate for near-term policy that incentivizes clean energy adoption and eliminates the company's obligation to provide service/main beyond the statutory requirement for new gas connections, and for a technology-neutral policy approach to decarbonization that allows cost-optimal solutions across our electric, gas, and steam infrastructure.

3.3 Climate Resilience

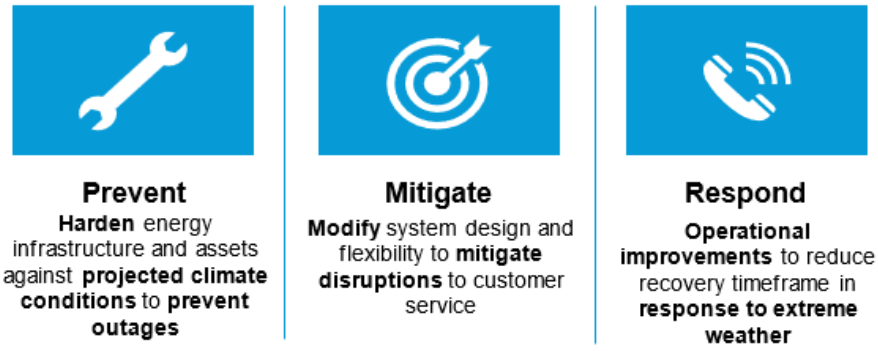
As described in Section 2.2, we engaged in a 3-year **Climate Change Vulnerability Study** to identify the climate risks to our territory and consequently the risks to our electric system. The critical risks identified to our electric system are included in Figure 22 below.

Figure 22. Critical Risks from Climate Events

Ambient Temperature	Heavy Precipitation, Sea Level Rise, and Storm Surge	Extreme Events
Annually **4 days** over 95°F By 2050, **23 days**	Sea level will rise **2 feet** by 2050	**More frequent** Nor'easters and hurricanes
Longer and more frequent heat waves increase energy usage and reduces asset life	Water may infiltrate our infrastructure and cause damage to equipment	Storms may physically damage significant portions of our infrastructure

The **Climate Change Vulnerability Study** highlighted the need to incorporate future climate projections when planning assets and designing our electric system to address future risks and to maintain the service that our customers expect us to provide in a changing climate. We have been working with our stakeholders to adapt to these risks through our **Climate Change Implementation Plan** and apply our three guiding strategies (Figure 23) to address climate risks.

Figure 23. Strategy to Address Climate Risks



The **Climate Change Implementation Plan** is a comprehensive plan to maintain and/or enhance the resiliency and reliability of our electric system in a changing climate. It includes the application of a Climate Change Planning and Design Guideline to our specifications and procedures, and management through a dedicated resilience group with executive oversight. By reviewing our specifications and procedures against anticipated changing climate conditions, we better understand how to proactively adapt our planning, operations, and emergency response. We have identified a portfolio of investments to address the risks of climate events. Examples of critical investments are summarized in Figure 24.

Figure 24. Initiatives to Address Climate Risks

Prevent	Mitigate	Respond
• Unit substation **switchgear** flood protection • Transformer **replacements** to optimize fleet health and useful life • Advanced **forecasting** to enable better visibility into vulnerable assets • **Primary** feeder upgrades • Additional climate risk **prevention** programs such as submersible equipment • Overhead distribution and transmission hardening	• Selective **undergrounding** of electric distribution equipment • Primary **feeder relief** and network reliability programs to prevent cascading feeder outages during heat events • Additional climate risk **mitigation** programs such as smaller flexible networks	• Continue improving our **outage management system** to respond to outages more swiftly • Improvements to **operational programs** to reduce outage times through improved, visibility, dispatch, and efficiency
Climate Change Planning & Design Guideline		

Our climate resiliency investments are multi-faceted and generate a variety of benefits across the electric system, including increased reliability, long-term cost savings, and preparing for future integration of new technologies and grid capabilities. Many of these initiatives are already in progress, and customers are seeing the benefits. We need to employ both new solutions and build upon current efforts to deliver excellent service in unprecedented weather conditions. Through 2031, we are committed to investing more than $2 billion to support our portfolio of resilience initiatives and $22 billion in multi-value investments which address climate resilience.

We continue to work closely with New York City and Westchester County to develop an integrated strategy that recognizes the interplay between different infrastructure (such as seawalls, sewage systems, and rain gardens) with our ability to deliver energy to our customers during climate events. For example, New York City's stormwater resiliency study[31] identifies areas of inland flooding where the drainage system becomes overwhelmed under projected future storm conditions.

We will consider equity and environmental justice in our system planning process. Project prioritization for the proposed selective undergrounding program includes environmental justice

[31] New York City's stormwater resiliency study can be found online **here**.

considerations to better serve those in our communities who are most vulnerable to the impacts of extreme weather.

3.3.1 Prevent: Harden Energy Infrastructure

Hardening the electric system to withstand extreme weather events and prevent outages requires adding or replacing system components to prevent damage from future climate events. Hardening our system necessitates appropriate planning and implementation lead times. To ensure timely investments, we have adopted a more forward-looking strategy to consider changes in climate. Examples of initiatives that target climate resilience include:

Transformer Replacements

Transformer replacements address known climate risks due to increased extreme events. A transformer's useful life is shortened with greater usage due to electrification and extreme temperatures. We expect both summer and winter peaks to intensify and induce greater strain on assets. As a result, we are increasing replacements to outpace increased climate risk.

Advanced Forecasting

System and network peak demand forecasts guide infrastructure investment decisions, directing capital to the areas of greatest need and setting the stage to identify non-wires solutions (NWS). We can more accurately determine where upgrades are needed for increased reliability and the use of electric system resources is optimized. The inclusion of climate change projections in the forecast will help design infrastructure that can withstand future weather events.

4 kV Unit Substation (USS) Switchgear House Replacement Program

The 4 kV USS Switchgear House Replacement program provides increased resiliency through a combination of placing critical components above anticipated flood levels and converting to recloser switches and other standard equipment. This eliminates dependency on legacy switchgear and the costs associated with third-party vendors required to maintain them. In addition, the upgrades will provide remote, secure access to digital data to prioritize system restoration while enhancing cybersecurity measures.

Primary Feeder Relief Program

This Primary Feeder Relief Program focuses on proactively reinforcing primary distribution feeders that have been projected to operate above their thermal ratings during the summer peak demand period. Reinforcement may include cable replacement, transferring demand between feeders, balancing demand on a given feeder, bifurcating an existing feeder, and establishing new feeders.

Updating Design Guidelines

To recognize and promote readiness for climate change impacts in our design guidelines, CECONY has developed a Climate Change Planning and Design Guideline. This Guideline serves as a reference for departmental specifications to aid in the design, construction, operations, and maintenance of our assets and facilities, and planning for emergencies in response to a changing climate. The Guideline provides explanations of climate change pathways, their purpose and supporting science, and climate projections for increased precipitation, temperature rise, and sea level rise.

Additional Programs

System hardening is top of mind as we pursue continuous improvement for climate resilience. Undergrounding will continue to be a priority in our prevention efforts with a comprehensive review of undergrounding underway, including an ongoing pilot program. Additional programs in the future could include:

- Installing additional submersible distribution equipment to protect against flood risk
- Installing additional underground ties on feeders within the same network
- Continuing to improve our modeling of more severe weather events on our energy systems

3.3.2 Mitigate: Minimize Disruptions

When extreme weather impacts our infrastructure, we mitigate disruption to our customers by building redundancy, diversity, and flexibility into electric delivery (e.g., electric system sectionalizing that allows us to isolate a power outage to a smaller section of the grid, mitigating additional outages when an event has already occurred).

Undergrounding

Based on the vulnerability of overhead systems to major storms, we are conducting a pilot program to underground vulnerable overhead circuits that have been affected by major storms in the past. Along with mitigating the impact of a weather event and avoiding customer outages, undergrounding also removes the risk associated with falling poles and downed live wires.

Interrupter Switches

Interrupter switches installed on distribution network feeders minimize the likelihood of cascading feeder outages during extreme events. They are strategically placed to keep the un-faulted part of the feeder energized, which keeps more network transformers in service to meet customer needs.

Interrupter switches increase the resiliency of the distribution system by optimizing the number of network transformers kept in service during outages and extreme weather events. They can also be adapted to transfer demand on network feeders like the feeders on our overhead system.

Additional Programs

We are continuously introducing new mitigation capabilities and functionalities in our design process to augment the resiliency of our electric system. These efforts include the following:

- Designing smaller and more flexible networks, including incorporating loops, switches, and ties between networks
- Expanding design standards for critical services

3.3.3 Respond: Reduce Recovery Timeframe

Rapid and comprehensive response to extreme events is paramount to providing customer excellent service. This includes improving our ability to comprehensively respond to outages on

our system from future climate events (e.g., our OMS upgrade that enables us to more quickly dispatch crews to respond to and repair an outage). Example initiatives include:

Outage Management System Upgrade

OMSs are used to identify and inform customers of outages, and they help us internally manage deployment of resources to respond to an outage. These systems improve system resiliency by quickly identifying where outages exist so that we can swiftly and effectively respond to them.

We are undertaking an upgrade of our OMS[32] software to support increased stability, reliability, and resiliency. This will include new system enhancements offered by the software upgrade as well as ensuring adequate support from the vendor. This initiative also includes implementing a mobile application platform.

Our OMS will also be integrated with our electric GIS and support more detailed analyses of our electric operations.

Clean Energy Hub Projects

Please refer to Section 3.2.1.1 for a detailed overview of our Clean Energy Hub Projects initiative.

Additional Programs

We recognize that our ability to respond is crucial to customers, and we are continuously improving our ability to respond in the face of extreme climate events, including:

- Enhancing event response guidelines and rigorously testing response planning
- Coordinating with stakeholders to determine additional system functionality needed to further improve storm response efforts
- Procuring additional utility vehicles and utilizing contractor retainers to expedite emergency crew procurement for faster restoration of damaged electric infrastructure

3.4 Core Service

We understand that despite the many changes we must make to our electric system to adapt to climate change and support net-zero GHG emissions by 2050, we have a core foundational role in powering the New York City and Westchester County economies with safe, secure, and reliable electricity while managing rate impacts and equity challenges. Highly reliable electric delivery is an expectation of our customers and stakeholders and one we fully embrace. Our commitment to reliability will only grow as customers depend more on the electricity we deliver.

We will continue to enhance this core while managing costs, sharing benefits, and promoting the cost-effectiveness of the energy transition. Our Core Service strategy consists of the key components outlined in Figure 25.

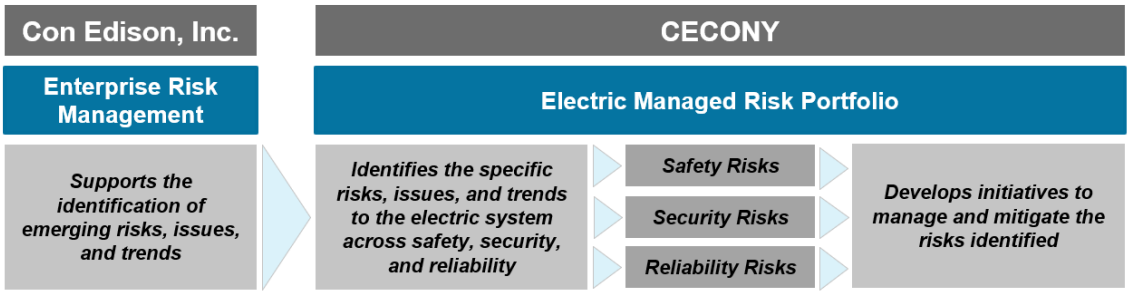
[32] Additional details about our OMS upgrade can be found in our IT Strategic Plan.

Figure 25. Key Components of Core Service

3.4.1 Enterprise Risk Management

To continue delivering on our Core Service, we must understand the risks to our electric system and effectively manage those risks. Con Edison, CECONY's parent company, established the Enterprise Risk Management (ERM) program to help protect the company's long-term value for its customers, the communities it serves, and its shareholders. The risk management team, operated at the Con Edison level, works closely with senior management and employees within CECONY to identify and mitigate risks to our electric system. An overview of how ERM supports the identification and mitigation of risks to our electric system is presented in Figure 26 below.

Figure 26. How ERM Supports Our Electric Managed Risk Portfolio



The ERM program is designed to focus on managing relevant and material risks to its strategy and operations and to recognize emerging issues and trends that may shape future risk exposure. Based on the framework, ERM has designed the cadence of its risk identification and assessment review cycle to align with the annual business planning and budgeting process, as documented in Figure 27.

Figure 27. ERM Framework

Our ERM team reviews newly identified and existing risks, assesses the adequacy of the existing controls and mitigations in place to address these risks, and proposes new or modified mitigations. These new mitigations are, in turn, planned for and funded through the annual budget process. In addition, the company's capital optimization process is designed to directly evaluate a project or program on its risk mitigation benefits. Lastly, ERM partners with cost managers in our enterprise Finance Planning and Analysis to develop dashboards that communicate the magnitude and allocation of risk mitigation expenditures to management.

The composition of our corporate risk profile is reflective of the business mix, which largely consists of four categories: Safety and Environment, Operations, Strategic, and Regulatory and Compliance. Our corporate risks include:

- **Cybersecurity:** A cyber-attack on, or a breach of, a company's information technology systems, can have a materially adverse impact on the company.
- **Loss of substation:** Loss of an electric transmission or distribution substation for 24 hours or longer, which may result in an immediate loss of customers, a lengthy customer outage, and a negative effect on the transmission and distribution systems.
- **Low voltage cable failure:** A low voltage distribution cable failure injures the public or employees.
- **Network shutdown:** We shut down an electric distribution network or experience an extended outage for a significant number of customers.
- **Safety:** An employee or contractor causes a fatality or near-fatality by not following procedure or by unsafe acts.
- **Underground transformer failure:** An underground distribution transformer fails catastrophically with potential to injure the public and/or employees or cause damage to property.

These corporate risks are monitored quarterly by the risk owners and reported to senior management through an assessment of key risk indicators and through the auditing process. These risks are then communicated to the CECONY teams, which work with the ERM team to

identify the specific risks applicable to the relevant commodity system. Our Electric Managed Risk Portfolio takes these relevant risks, and identifies specific projects, programs, or initiatives to address them.

Electric Managed Risk Portfolio

Within the electric system, our programs for managed risk embody the elements of our foundational Core Service as we continue to invest in and develop a clean and resilient electric system. The ability to manage and mitigate risk is critical as the evolution of our infrastructure further serves as a foundation to a clean energy future. Our electric managed risk portfolio includes initiatives to address these risks as per Figure 28.

Figure 28. Electric Managed Risk Portfolio

3.4.1.1 Enhanced Safety

Our safety programs are designed to minimize safety incidents for our employees and to promote public safety for our customers and stakeholders that interact with our electric system.

- **From an employee perspective**, we promote a first-class safety culture, proactively identifying, and addressing high-risk injury hazards and leveraging data and tools to drive us to an incident-free workplace. We prioritize creating a zero-harm culture for employee safety by implementing corporate policies and engineering designs to protect the environment and maintain health and safety.
- **From a public perspective**, we invest in engineering designs that prevent and detect safety incidents from occurring in the first place, including manhole and transformer explosions, stray voltage, and electric shocks. Prevention efforts include a comprehensive inspection program, proactive replacement of high-risk components with modern alternatives, and installation of vented and latching manhole covers. Detection efforts include stray voltage scans and monitoring sensors; data analytics prioritize response times using deployed sensors. Additionally, we educate the public on safety, for example, what to do in the event of downed power line(s).

Examples of specific safety initiatives are described below:

Overhead Emergency Response Program

This Overhead Emergency Response program supports system reliability, reducing safety risk to the public and employees associated with failing equipment and minimizing risk of regulatory penalties related to reliability.

Critical Facility Program

For targeted critical customer and municipal facilities, the Critical Facility program allows for minimized risk to employee and public safety via proactive replacement of high-risk components

and use of data science and analytics to prioritize our response to any potential problems revealed.

Underground Secondary Reliability Program

The Underground Secondary Reliability program proactively removes or replaces low performing secondary cable to mitigate low voltage distribution cable failure injuries to the public or employees.

Synthetic Ester Filled Power Transformers

Synthetic Ester Filled Power Transformers replaces traditional mineral oil in transformers with ester, which increases fire safety due to higher flash and fire points. Additionally, this program reduces environmental impact due to its biodegradability, and extends transformer life with greater water solubility.

3.4.1.2 Enhanced Security

Our security programs identify potential internal and external threats to physical and cyber security, and we implement controls, procedures, and processes to mitigate them.

Physical Security

Corporate Security's core mission is that of a comprehensive security program that allows for a proactive partnership with both our operating and support organizations along with external law enforcement, and governmental and regulatory agencies. To meet our mission, we have incorporated comprehensive security processes to protect critical infrastructure. These processes encompass a wide array of functional responsibilities, including policies and procedures, investigative and tactical response, cyber forensic investigations, electronic security systems, physical security measures, central station monitoring, compliance with governmental and regulatory initiatives and standards, security awareness training, and regular interaction with law enforcement at every level.

To adequately safeguard our facilities, we continue to incorporate comprehensive security processes to protect the company, our employees, and our physical assets. Our security strategy is 'defense-in-depth', continually adding layers to mitigate risk. We deploy a range of mitigation measures which tie into our security platform all coordinated through our 24/7 Security Operations Center. These include over 2,000 cameras, various intrusion detection systems, biometrics, anti-cut/anti climb fencing; various alarms, shot spotters, and a card access system which incorporates layers of restrictions within our facilities. We also employ hundreds of contract guards throughout our company. The Security Operations Center coordinates incoming security events with the appropriate response protocols.

Cybersecurity

As we move into this digital world, we understand the need to protect our system from threats that could disrupt the operation of our corporate IT network and critical energy infrastructure. Our cybersecurity program is managed at the enterprise level by the IT Security group. The program uses a framework combining defense-in-depth (multiple security layers) with defense-in-breadth (utilize multiple tools at each layer). IT Security intends to increase cybersecurity capabilities by growing the cybersecurity organization, advancing new technologies, and increasing process maturity.

Our cybersecurity initiatives focus on standardization, simplification, agility, and modernization to reduce the risk and severity of cybersecurity incidents on our integrated energy system. More data is available to the utility and its customers, and the data pool is proliferated by things like DER, AMI smart meters, and third-party technology companies that now are part of the customer experience. The utility must manage sensitive customer data like personally identifiable information and financial information and ensure that customer trust is kept.

We are committed to mitigating the risks of data loss and service disruption, while continuing with digitization initiatives that support customer engagement by providing access to necessary system and customer information. In addition to mitigating the threat of data breaches and cyber threats, our security framework also allows for enhanced automation, remote control, and data acquisition. We are investing through 2026 in cybersecurity programs to effectively manage this risk.

3.4.1.3 Enhanced Reliability

Our reliability program spans our electric system and includes both operational programs to manage the ongoing performance of our electric system, as well as proactive asset management investments. Our customers expect a high level of electric system reliability, and we have an obligation to consistently meet that expectation. Based on our success in doing so, we have received the 2020 and 2021 ReliabilityOne Award for Outstanding Metropolitan Service Area Performance in the Northeast Region.

The strengths of our reliability programs are the protections built into our electric distribution system designs, our underground distribution capabilities, and our system performance modeling abilities. Redundancy in our designs allows us to continue supplying power despite the failure of any one component such as a supply feeder or transformer in areas of high population density; the design allows continued operation despite the loss of one or two major components. CECONY also ranks the reliability of these distribution circuits by standard industry metrics so that it can identify and target the worst performing ones for remediation. A key service reliability metric includes the SAIFI in which our system performance is bolstered by design redundancy, resulting in continuity of customer service and an average outage frequency 8 times lower than the state and national averages.

Our underground distribution network continues to serve most of our customers (approximately 75%), while our remaining customers are served by our overhead distribution systems with targeted undergrounding underway. With the potential for more intense and frequent weather events, this underground distribution system delivers the reliability and resiliency needed to manage risk to our electric distribution services. Our reliability models are informed by our Network Reliability Index, which considers various reliability and resiliency factors to produce a statistical value to assess a network’s susceptibility to a shutdown.

Operational Reliability

We have a variety of operational programs to maintain and enhance reliability throughout our system. Examples of these include the following:

Vegetation Management

Our vegetation management program included an inspection of over 3,400 and removal of 2,700 hazardous trees in 2021. Vegetation management improves reliability, as it prevents trees and other shrubbery from interfering with our electric equipment.

Primary Feeder Reliability Program

The Primary Feeder Reliability program uses the Network Reliability Index to measure and gauge the reliability and resiliency of all 65 networks on our distribution system and reach the design goal of all networks with a Network Reliability Index of less than 1.0 by 2030. We are incorporating a gradual temperature rise over the next 9 years to increase the network design temperature variable to 87°F, with the intention to keep the present design goal and margin below 1.0 at 2030.

Asset Programs

Our managed risk portfolio includes systematic assessment and maintenance of our electric assets. We are constantly assessing the physical health of our transmission and distribution assets and comparing their capabilities to forecasts for future electric demand. We analyze, assess, and adjust capital programs to focus expenditures on systems and components in most need of attention, driven by risk of asset failure, demand growth, impacts of climate change, and other factors. Electric infrastructure requires significant lead time to approve and implement with minimal interruption to service, so it is critical that we stay proactive in our asset management.

Our asset management programs consider assets at the individual and portfolio levels based on how they relate to overall enterprise risks. Using our asset management tools and methodologies, we:

- Collect ongoing asset data from a variety of sources, such as inspection, sensors, and predictive analytics
- Rank applicable assets with respect to overall risk using a health index
- Build asset management lifecycle models and strategic plans
- Implement strategic plans through capital and operations and maintenance (O&M) programs
- Evaluate results and adjust lifecycle models and plans

The overall relative risk or health index expresses the condition of an asset relative to others in its class. The score includes the probability that the asset will fail to perform its intended function and its criticality (i.e., the impact of failure on service and safety). The probability of failure is calculated based on age, location, manufacturer, failure history of its class, operational history, and inspection and test findings. Failure probabilities are recalculated periodically, and probabilities for assets fitted with remote sensors can be calculated automatically, signaling changes in asset condition or performance. Asset criticality considers factors such as public proximity, type of demand served, amount of system capacity lost on failure, and cost of replacement.

Benefits of our asset management strategy include fewer and more targeted inspections, proactive identification of faulty equipment, and upgrading equipment with more robust designs that fit the needs of the system based on our analysis. For example, our study in lifecycle data for poles showed that certain poles never had inspection results that pointed to replacement or replacement in the first several years. This led to the deferment of first inspection to 12 years rather than 5, avoiding unnecessary inspections and allowing us to optimize resources where they are most needed. Similarly, our review of lifecycle data on USS equipment showed that the bulk of USS switchgear are reaching the end of their useful life, implying greater risk of failure.

This informed our asset management strategy and led to accelerated replacement of these assets.

Asset Management Prioritization Platform

We recently developed the Asset Management Prioritization Platform program to automatically prioritize work in regions with greatest impact on the distribution system, giving engineering visibility into overlapping programs and activities and allowing for efficient bundling of work to maximize productive time at each facility. The inclusion of demand flow and operational data in decision-making processes promotes a resilient distribution system and helps maintain system performance during weather events caused by climate change.

Transmission and Substation Asset Strategy

Our transmission and substation assets are prioritized based on health indices, employing a lifecycle model to decide on strategic plans via capital and O&M programs, and evaluating results to adjust plans accordingly. For example, our transmission feeder health index is based on an aggregation of various data, including lifecycle costs, emergency response frequency, dielectric fluid loss, spare cable inventory, and history of leak-prone circuits with forced outages. Based on some of the index parameters, we have employed technologies to manage and mitigate risks to feeder condition and undertaken capital projects aimed at restoring feeder integrity. Our substation asset programs are designed to improve reliability while employing technologies to mitigate future environmental, supplier, and financial risks.

Our transmission and substation health assessments prioritize substations in need of wholesale replacement or overhauls, such as leak-prone equipment, those with forced outages, and those relying on technology that will not be supported in the future. We have been proactively investing capital in the 422 power transformers in the transmission and sub-transmission system—but over 180 have been in service for over 40 years and some are approaching the end of their useful life. As these transformers age, they present a risk to our energy system's reliability and resiliency because they are more prone to fail.

Though we have made strides in our asset management strategy, changing climate conditions and an impending increase in electric demand calls for further acceleration of our transformer replacement program. Our system has also increasingly shown signs of strain. Greater summer demand from heat waves and winter demand from building heating electrification will transform our system from a single summer peak system to a double winter and summer peaking system.

Proactive replacement analyses on average fleet age and future fleet demographics have led to the same conclusion: we must increase our proactive transformer replacement rate. An annual rate of six proactive replacements would help us maintain our low failure rates. While this would be sufficient to stop the steady increase in transformer failure rates, we should revisit proactive replacement rates in a couple of years and potentially increase it to eight replacements a year, as growth in peak demand and the number of heat waves are likely to increase strain on the system. A higher annual replacement rate may also help us avoid a failure incidence that exceeds our inventory of long lead-time transformers and instead achieve a more predictable budget and manageable outage scheduling.

Supervisory Control and Data Acquisition System Upgrades

SCADA upgrades enable DER to inject power to our network system, increase visibility into grid operations, improve reliability, and provide the ability to operate the equipment remotely. This upgrade, which enables opening or adjusting settings on network protectors from the control

center (rather than sending a crew) allows for much quicker operations and frees up crews to conduct higher value work.

Critical Infrastructure Support

Within New York City and Westchester County, we understand the interdependencies between our energy systems and the critical infrastructure supporting our service territory and customers. For example, we continue to support the Metropolitan Transportation Authority to prevent power-related delays on the New York City subway system.

Spill Prevention, Control, and Countermeasure

Spill Prevention, Control, and Countermeasure is an upgrade to containments for major oil-containing equipment, such as power transformers. In addition to supporting reliability, this initiative reduces environmental risks related to leaks.

Other Initiatives

Please refer to Section 3.2.1.1 for a detailed overview of the following initiatives:

- Reliable Clean Cities
- Voltage Support Solutions
- Clean Energy Hubs
- Additional Feeders in New York City
- Substation Replacements and Upgrades

3.4.2 Manage Transition

We understand that we must continue to enhance our foundation of Core Service while we undergo the energy transition. We want to support an equitable transition by managing rate impacts and providing the benefits of a clean and resilient energy system to all our customers and stakeholders.

3.4.2.1 Manage Rate Impacts of Transition

We see energy burden—what percentage of a customer's income goes toward energy expenses—as a particularly important consideration for the energy transition. The American Council for an Energy-Efficient Economy defines a high energy burden as one where 6% or more of household spending is dedicated to paying for energy. We will continue to support bill discount programs to lower energy burdens to manageable levels for our low income customers.

By taking an integrated approach, we can coordinate and align investments across our electric, gas, and steam systems that mitigate the increase of total bill impacts while supporting decarbonization goals and continued climate resilience. As such, we will continue to advocate for technology neutral policy that enables us to pursue lowest cost decarbonization strategies.

3.4.2.2 Enable an Equitable Transition

We recognize that delivering an equitable transition to a net-zero GHG emissions future is important to our customers. We are constantly seeking new ways to support engagement by low- and moderate-income customers in renewable generation measures and building measures (such as energy efficiency and building heating electrification).

Low- and Moderate-Income Renewable Bill Discount Program

In the current rate case, we propose to acquire utility-scale solar through competitive solicitations. This solar will be designed to reduce the energy burden on our low-income electric customers. Most low- and moderate-income customers are renters and often lack the resources to make efficiency upgrades or otherwise reduce the energy cost and associated carbon footprint of their homes.

Adoption rates of current opt-in solar programs indicate the need to increase our efforts. Approximately 0.5% of our low-income bill discount customers have access to on-site solar. Only 0.01% of bill discount customers are signed up for community DG and account for just 3% of all community DG residential subscriptions. This program is designed to encourage sign ups from this group.

Large-scale solar projects can produce clean, low-cost power for decades, in addition to providing a sustainable fund for ongoing bill discounts. When fully implemented over 10 years, the 1,000 MW of solar power could enable us to increase funding for the low-income bill discount program.

Across all our programs, we will look to strengthen our collaboration with NYSERDA in providing benefits to disadvantaged communities. NYSERDA supported the establishment of a disadvantaged community framework and interim disadvantaged community maps. We will look to partner with them in administering programs, complementing offerings, and integrating learnings from their pilot activities into our offerings for disadvantaged communities and the communities we serve more broadly.

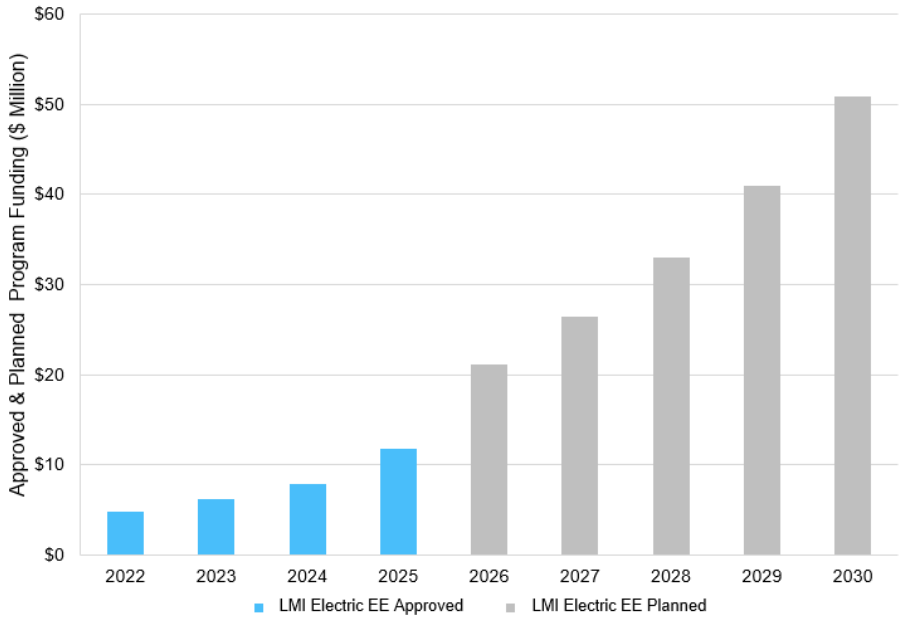
Low- and Moderate-Income Building Measures

We plan to further engage with affordable housing associations, the largest affordable housing owners, and other community organizations to spread awareness of our efficiency and electrification programs for owners and tenants. We seek to provide decision makers, including tenants and owners, with the right information to make choices that further expand energy efficiency efforts. We anticipate significant benefits from energy efficiency for this cohort, as buildings that house low- and moderate-income tenants tend to be older with a higher proportion of on-site fuel combustion[33].

We aim to significantly increase our low- and moderate-income electric energy efficiency program between now and 2031 (Figure 29).

[33] Per our internal analysis, 79% of NYC multi-family low-moderate income buildings site consumption is from oil (12%) or natural gas (67%) and ~50% were built before 1947 (pre-war), and 87% were built before 1980 (post-war)

Figure 29. Low- and Moderate-Income Electric Energy Efficiency Approved & Planned Funding (2022-2031)



There are four aspects to growing energy efficiency achievement for our low- and moderate-income electric customers:

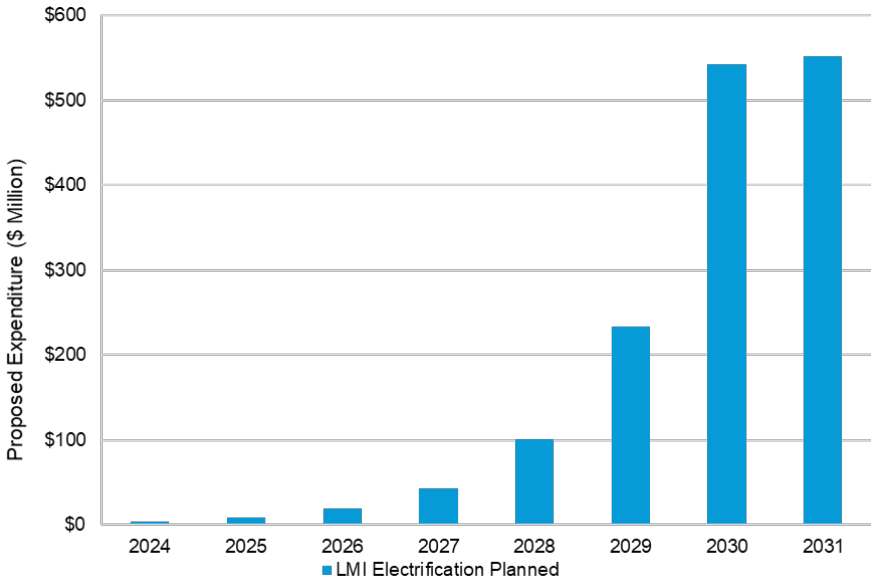
- **Continue to refine and grow statewide low- and moderate-income offerings:** In November 2021, together with the rest of the utilities in the state, we launched a comprehensive energy efficiency offering for low- and moderate-income multifamily buildings. The program incorporates new incentive structures and offerings designed to better reach low- and moderate-income multifamily buildings and help them undertake more comprehensive projects that generate greater savings. We look forward to continuing to collaborate with the rest of the New York State utilities and NYSERDA to refine and standardize our low- and moderate-income energy efficiency offerings to help these buildings more easily participate in our programs.
- **Integrate programmatic offerings with state and city programs:** We recognize that low- and moderate-income buildings often pursue many other financing programs, and there is an opportunity to streamline processes for buildings. We plan to strengthen our engagement with state and local agencies like New York State's Homes and Community Renewal or New York City's Housing Preservation and Development to make it easier for low- and moderate-income buildings to participate in energy efficiency and electrification programs.
- **Expand offerings to the New York City Housing Authority:** Many low- and moderate-income customers in New York City live in New York City Housing Authority-owned and operated units. New York City Housing Authority buildings are currently ineligible for our electric energy efficiency and electrification incentive programs. We see a large opportunity to expand program eligibility to New York City Housing Authority to help reduce their ongoing energy costs and to support their alignment with state and city clean energy goals.

- **Collaborate with stakeholders and regulators to assist low- and moderate-income tenants:** The majority of our low- and moderate-income customers are renters, and we recognize that the incentives for building owners are not always aligned with those of the tenants they serve. We seek to engage affordable housing stakeholders and regulators to find long-term solutions that create clear pathways for owners to make efficiency and electrification upgrades while protecting low- and moderate-income tenants from owners shifting the costs to tenants.

As we move forward, we will introduce new efficient products, services, and program models as technologies develop, economic trends shift, and customer preferences and behavior patterns change. We seek to increase customer engagement and choice through our energy efficiency programs, providing customers with actionable insights and the ability to efficiently manage their energy needs while creating broader system and grid benefits. We will continue to provide energy audits, educational materials, access to information on efficient products and services, and promotion of new and effective technologies. We will also aim to add new technologies and services using pilot testing methodology.

Although we do not have dedicated building electrification budgets for low- and moderate-income customers, they can participate in our Clean Heat offerings. We look forward to engaging regulators and stakeholders to extend the Clean Heat framework to include dedicated offerings for low- and moderate-income customers as part of the NENY midpoint review. These programs will be necessary going forward to decarbonize our energy system and to equitably provide benefits of the clean energy transition to our low- and moderate-income communities. Our proposal includes a rapid scale-up of this program (if approved) starting in 2024 (Figure 30).

Figure 30. Proposed Expenditure for Low- and Moderate-Income Building Heating Electrification



Many low- and moderate-income customers live in older, less efficient buildings, making access to electrification especially challenging (if not impossible) given current technology and space availability for energy upgrades. After exhausting reasonable energy efficiency and electrification measures, investment in low-to-zero-carbon gaseous fuels can support long-term decarbonization for a subset of these customers. Further discussion on low-to-zero-carbon gaseous fuels can be found in our **Integrated and Gas Long-Range Plans.**

3.4.3 Employees

Our employees represent the heart and engine of our company. We are more than 14,000 employees coming from many backgrounds, ethnicities, ages, and races, and we bring different skills, experiences, and viewpoints to the workplace. Our diversity is central to our success—it makes the company stronger and helps us lead the industry on every level, from maintaining our best-in-class reliability to achieving a sustainable, clean energy future for our company.

We aim to make sure every individual feels respected, included, and safe to speak up. Making sure our workplace is inclusive and respectful means we can bring our best and do our best—and helps us attract and retain the best talent. By regularly examining and improving our hiring process and retention policies, we are making our company a better place to professionally develop and build careers. With change coming faster than ever, ensuring that our workforce has the right skills, knowledge, and capabilities is essential to achieving our clean energy goals.

We know that technology will play a key role in building a resilient and reliable electric grid of the future, that delivers 100% clean energy. Our employees need strong skillsets to operate, monitor, and maintain a range of technically advanced energy infrastructure and systems. In doing so we must step-up our focus on STEM fields, as well as continuing to attract strong engineering and computer science graduates. Generating successful partnerships with customer advocacy groups, regulators, governmental partners, and other stakeholders means attracting and retaining employees that are customer-oriented, flexible, innovative, strategic, risk-taking, agile, and willing to learn. It also means focusing on other important skills such as financial acumen, project management, data analytics, and marketing.

Other competencies critical to our vision include cross-cultural communication, collaboration, and empathy to address environmental, equity, and social justice issues associated with the clean energy transition. Our goal includes relying on our existing workforce to develop many of the job skills and requirements that will be needed. Through in-person and remote options, we provide continuous state-of-the-art training and development to our employees in a wide variety of areas, including technical training in electric, gas, steam, and field operations, as well as strengthening leadership competencies. These programs ensure employees work safely, effectively, efficiently, and in a way that is compliant with company policies, procedures, regulatory expectations, and embodies continuous improvement.

We know achieving our clean energy goals will require an evolution in how we deploy and develop our workforce. And we are committed to ensuring our employees are prepared, highly-skilled, and adaptable to advance this transition for our customers and community.

3.5 Customer Engagement

To deliver customer value, we need to deliver on our strategic objectives of Clean Energy, Climate Resilience, and Core Service. This strategy is only achievable if we create customer outcomes that resonate and if we provide the right information, data, and messages to help our customers make informed energy choices.

Our customer engagement programs are designed to improve the customer experience, provide customers with the right data and tools, and further integrate the journey across our electric, gas, and steam businesses. We strive to connect our customers with the latest, intelligent technology so that they can reap the benefits of greater access and understanding of their

energy usage. Additionally, increased adoption of electrification technologies, such as heat pumps and EV chargers, will require more optimized management of demand and supply on our system. By having a greater understanding of our customers' energy usage, we can better develop grid management tools.

To enhance the customer experience across our business, we are investing in:

- Customer service system (CSS) improvements and a customer relationship management (CRM) upgrade that facilitates common transactions, such as starting new service, paying a bill, or changing personal information.
- OMS improvements to better identify and deploy resources to manage and repair outages and improve our communications with customers.

To support the customer in making informed energy choices, we are investing in:

- Tools, data, and analysis to support our customers in better understanding their energy usage, including our AMI program.
- Our energy efficiency and building heating electrification (Clean Heat) programs are designed to offset some of the upfront costs of energy efficiency and building heating electrification measures.
- Supporting new business, including new service connections and upgrades to existing customers, that enable customers to better use innovative, clean technology.

3.5.1 Continue to Improve the Customer Experience

Our customer experience initiatives include a portfolio of projects that support the delivery of customer value. These projects are designed to create an impactful customer outcome and to provide our customers with accurate information to make informed energy choices. We aim to create a unified customer journey that allows greater visibility across our commodity systems and better enables us to empathize with our customer needs. Additionally, we work closely with our partners and service providers that directly interface with our customers.

For example, our CRM and CSS upgrades are significant undertakings that will improve how we develop understanding of relationships with our customers. These upgrades will further enable our Clean Energy, Climate Resilience, and Core Service investments by providing more usable and granular customer information, more seamlessly connecting our customer accounts across commodity types, and allowing us to deliver the analysis and information our customers need to make more informed energy decisions. These upgrades will not be possible without additional technology initiatives. Below, examples of these initiatives are further described.

Customer Service System and Customer Relationship Management Upgrades

Our CSS is the critical backbone of customer care operations. Interfacing with over 400 company systems, over 1,800 users rely on it to provide billing services, credit and collections, payment processing, and customer care spanning functions across Customer Operations, Customer Energy Solutions, Electric Operations, Rate Engineering, Legal Services and Corporate Accounting. We are taking action to modernize the CSS and replacing the legacy customer information systems with a consolidated, commercial off-the-shelf solution from Oracle.

The CRM system works with the CSS as the main platform that the customer contact center uses to manage customer interactions, including both voice and non-voice such as email, chat, and process requests that come from the web or MyAccount. It is a core capability that, combined with CSS, underpins all customer service processes.

The upgraded CSS/CRM will provide a 360-degree view of the customer. It can include, for example, how customers prefer to interact, history of contacts with the utility, service orders, what programs they participate in, payment plans, and paperless billing preferences. By providing the contact center with this information in a single view, it ensures that customer needs will be met efficiently, and it helps us be proactive by taking next best actions with the customer. This will also support a deeper understanding of what solutions the customer can benefit from to enhance further targeting efforts.

Outage Management System

Our OMS is an example of a multi-value investment that provides benefits in both Climate Resilience and Customer Engagement strategic objectives. Improving the quality of our electric system recovery and response in the face of outages is critical to improving our customers' experience with electric service.

Please refer to Section 3.3.3 for additional discussion of our OMS.

3.5.2 Facilitating Customer Energy Choices

We aim to reduce friction in the many personal decisions and changes that our customers will make in the future, especially as they relate to clean energy. Points of friction identified include the following:

- Lack of knowledge or information about clean energy solutions, such as heat pumps
- Significant upfront costs for energy efficiency and building heating electrification retrofits
- Lack of contractors to perform energy efficiency and building heating electrification retrofits
- Lack of insight or data behind energy usage patterns and energy options

These customer challenges require us to integrate the end-to-end experience we have with the customer, no matter what system the customer is connected to. We will do this by:

- Enabling the customer to make the best individual energy choices in alignment with the state's climate goals. Examples include providing incentives to reduce the upfront costs of energy efficiency and building heating electrification upgrades and working with New York City and Westchester County building permit agencies to better integrate incentive programs.
- Serving as a trusted advisor to the customer by establishing trust and mutual respect. An example includes providing calculators for how customers can save energy through various energy choices.
- Creating an energy products and services marketplace through contractor and ecosystem relationships. An example includes collaborating with NYSERDA to integrate workforce training programs to align with the needs of the clean energy transition.

- Managing the costs of the energy transition by recognizing cost-effective considerations. An example includes our many low-income programs.

This strategy is the impetus behind large-scale customer investments such as our CSS enhancement, which allows us to aggregate, collect, and analyze data across our customers' various utility services to provide personalized recommendations and insights.

Facilitating our customers' ability to make informed energy choices is complementary to our customer experience initiatives in support our Customer Engagement strategic objective. Our main investments in facilitating customer choice include supporting new business, advanced metering infrastructure (AMI), energy efficiency and building heating electrification programs, and supporting public infrastructure improvement.

Other Programs

- **New Business and Electric AMI:** See Section 3.2.1.2 for a detailed overview of these programs.
- **Energy Efficiency:** See Section 3.2.2.2 for a detailed overview of our Energy Efficiency Program.
- **Building Heating Electrification (Clean Heat):** See Section 3.2.2.3 for a detailed overview of our Clean Heat Program.

Public Improvement

We acknowledge the many private- and municipal-owned facilities we share space with above our streets and beneath them. Oftentimes municipal construction and other government activities occur in our service territory, such as installation of water, sewer, and drainage facilities; reconstruction of roads, highway bridges, curbs, and sidewalks; and the repaving of roadways. Where these public improvement activities are performed, we are required to remove or relocate our facilities. To support these efforts, we anticipate expending approximately $1.6 billion in public improvement over the next 10 years. As new business drives growth in electric demand throughout our service territory, we will continue to support public improvement activities and mitigate interference costs where possible.

4. Investments to Deliver Value

Our strategic objectives of advancing Clean Energy, Climate Resilience, Core Service, and Customer Engagement will provide valuable benefits to our customers, the economy, and society. Through 2030, we will support the transition to 70% renewable electricity, putting us well along the path to achieving net-zero GHG emissions. Recent NYSERDA analyses estimate that societal benefits due to avoided GHG emissions and improved health are expected to outweigh the costs needed to get to net-zero GHG emissions by 2050.[34] Additionally, various forums point to the significant number of green jobs that will be created through achieving clean energy goals.

From a climate resilience perspective, our plans will mitigate and respond to current and projected climate risks such as heat waves, extreme weather events, sea level rise, and storm surge to prevent outages, minimize customer impact, and restore service faster in the event of an outage. Our core programs will provide continued safety and reliability, in addition to being more operationally efficient. At the customer level, our IT programs improve customer experience and engagement, providing customers with more choice, control, and convenience.

Our electric system is the backbone of the decarbonization of our integrated energy system. As electrification scales—a core aspect of city and statewide decarbonization goals—the electric system will be the essential hub in the transition to net-zero GHG emissions by 2050.

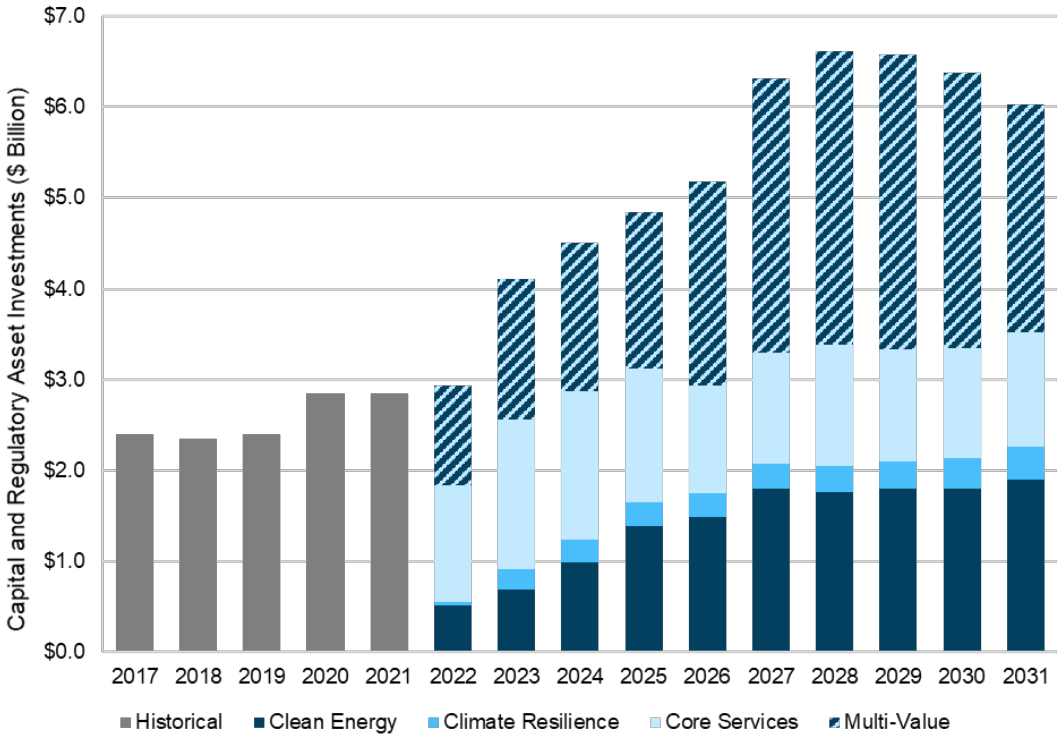
The shift from fossil fuels to electric power and a general increase in electric demand is a trend that permeates planning across our electric system. To support this increase in electricity demand, we have enacted and continue to prepare a wide range of initiatives and programs that implement our strategic objectives and advance the capabilities of our electric system.

Historically, our Electric Long-Range Plan has served to articulate our strategies well into the future. Given the long asset lives of the electric system, the need to plan over longer time horizons, and 2050 net-zero GHG emissions goals, this plan includes potential investment strategies out to 2050.

We include our expected capital expenditures through the next 10 years in Figure 31. The figure represents our best estimate of what is necessary to support 2030 GHG emissions goals, continue delivering our core services, and adapt our system to a changing climate. We will seek regulatory approval for investments during subsequent rate cases and proceedings.

[34] Supporting reports by NYSERDA and the New York State Climate Action Council can be found **here** and **here**, respectively.

Figure 31. Electric Capital and Regulatory Asset Investments (2017 – 2031)



Some of the critical initiatives included in these categories have been detailed throughout this plan and contribute to the total projected investments included in Figure 31. We have identified and prioritized multi-value investments—investments that support multiple strategic objectives—such as Clean Energy Hubs and Asset Reinforcement and Reliability, as these cost-effectively bring multiple sources of value to our customers. Table 13 shows some of these initiatives, and how they are categorized across our strategic objectives.

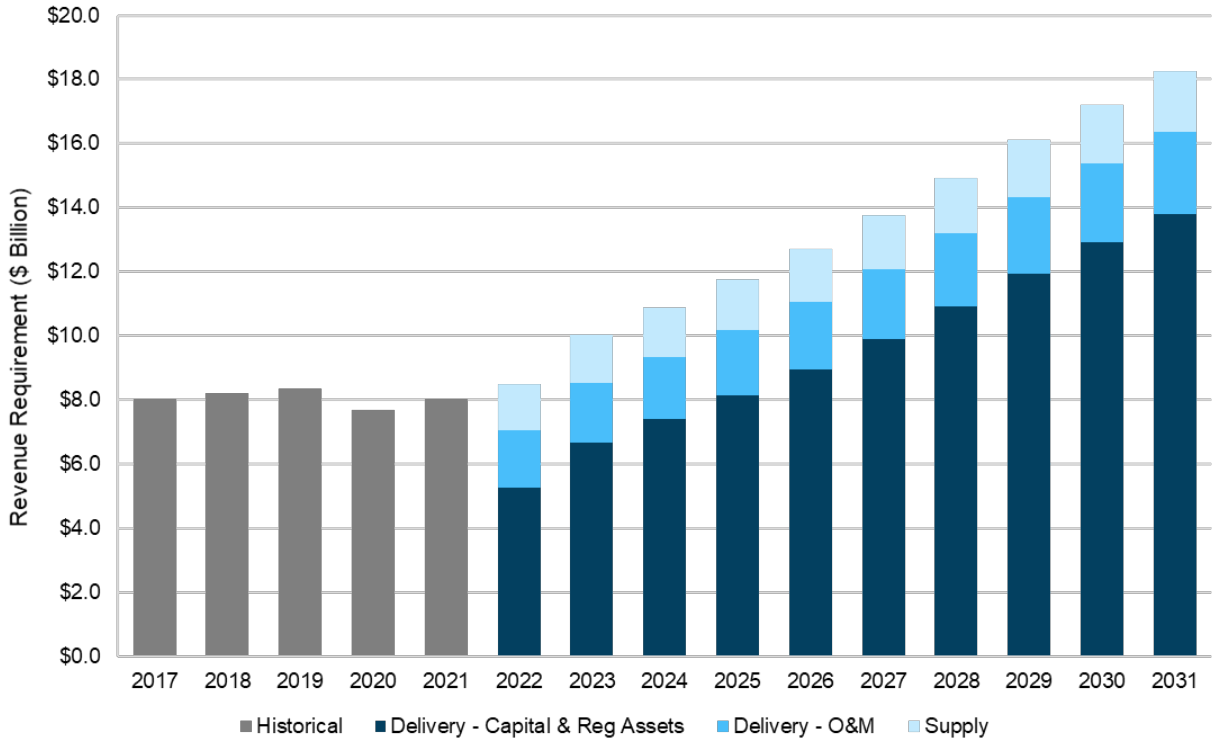
Table 13. Example Initiatives across Strategic Objectives, including Expenditure

Strategic Objective	Example Initiative(s)	Approximate Expenditure 2022-2031 ($ Millions)
Multi-value	Clean Energy Hubs Asset Reinforcement and Reliability + *Other initiatives*	$23,300
Clean Energy	Energy Efficiency Electrification of Building Heating Electrification of Transportation + *Other initiatives*	$14,100
Climate Resilience	Selective Undergrounding Transformer Climate Adaptation + *Other initiatives*	$2,600
Core Service	Customer Experience Grid Modernization Cybersecurity + *Other initiatives*	$13,500
Total		**$53,500**

4.1 Cost-Effectiveness

Customer costs are expected to increase to fund required investments. We estimate that the identified utility investment plan will increase the electric revenue requirement—a proxy for overall customer costs—by approximately 9% per year through 2031[35] (Figure 32). This cost estimate is based on assumptions that can change and excludes items such as deferred costs the company is entitled to recover, and increased costs resulting from changes in state policy and unanticipated events. Some of these investments will offset costs currently incurred by customers. For example, customers who adopt EVs will no longer pay gasoline bills and similarly, heating oil or natural gas costs will be eliminated for customers moving to electric building heating technologies. From a broader economy-wide perspective, we estimate the revenue requirement will increase from 0.7% of regional gross domestic product today to 1.0% in 10 years.

Figure 32. Electric Revenue Requirement (2017 – 2031)



To mitigate these increases, we are focused on cost efficiency and cost-effectiveness in our operational and capital investments. Our efforts include identifying investments that deliver on multiple objectives, prioritizing lower cost solutions, and continuing to focus on operational efficiency.

We are also attentive to a future of increased reliance on the electric system and an expected decrease in fossil gas and potential decrease in steam usage. We are proactively assessing the implications of this shift across all customers we serve and systems we operate. For example,

[35] Revenue requirement estimates based on identified investment plan and financial assumptions derived from other company filings, outcomes, and prior experience.

electrifying a building that is currently on the gas or steam system will increase our electric demand and decrease our gas or steam demand.

4.2 Low- and Moderate-Income Customers

Our programs aim to be inclusive of all customers; in addition to assisting customers in managing costs through our energy efficiency programs, we intend to support the participation of low and moderate-income customers in our clean energy programs. Our initiatives include increased program offerings and financing incentives for energy efficiency and electrification for low- and moderate-income buildings, partnerships with the New York City Housing Authority, and engagement with stakeholders and regulators to align incentives of building owners with those of tenants.

Moreover, pursuant to New York State policies that the company supports, we will implement assistance programs to help support low- and moderate-income customers and manage energy transition costs. The bill discount program, for example, is designed to keep the energy burden of low-income customers from exceeding 6%.

See Section 3.4.2.2 for further discussion on our low- and moderate-income customer programs.

4.3 Rate Design

An important consideration for delivering a cost-effective energy transition and mitigating needed investments is rate design. For example, growth in electric demand due to electrification of transportation and building heating will require new electric delivery infrastructure. Cost-based rates would provide customers with price signals that promote the efficient use of the electric delivery system and help mitigate required system cost increases.

Delivery system costs are primarily fixed or driven by customer demand, not volumetric (per kilowatt-hour) use, so demand-based rate structures, with an appropriate level of fixed cost recovery through fixed charges, better align prices with costs. This improves the economic efficiency of the rate structure and encourages customer technology adoption and operation that reduces delivery system costs for the benefit of all customers.

The demand-based rate construct largely exists today for the medium and large commercial and industrial customers, and these rates encourage demand management and efficient use of the delivery system. Mass market customers should be similarly incentivized through demand-based rates. Redesigning our mass market rate structure will encourage more efficient use of the electric delivery system, lower customer bills, and distribute delivery costs more equitably, all while allowing us to fairly recover costs.

The desire for electrification of transportation and building heating can bring about proposals for special technology-specific rates to improve the economics of electrification technologies. However, properly designed cost-based rates can be technology-neutral and special rates for specific technologies can be avoided. Rate design should send appropriate price signals that encourage customers to use and generate electricity in ways that benefit the system as a whole and thereby benefit all customers. To the extent that particular technologies may require support for economic viability, direct and separate incentives are transparent, effective, and nimble

tools. Incentive programs outside the rate structure can reduce cost burdens on customers because they can be tailored to cost-effectively meet specific needs and policy objectives.

While some operating cost incentives may be needed in the nascent stages of electrification, they should be coupled with properly designed demand-based price signals to encourage demand management in the adoption and operation of electrification technologies.

5. The Road Ahead

We are committed to meeting societal goals, including net-zero GHG emissions by 2050, and the evolving expectations of our customers. To meet expectations for energy delivery and meaningfully advance progress toward our goals, we will continue to collaborate with our regulators, customers, and stakeholders.

Our Long-Range Plan has detailed the actions that will help us accomplish our goals, with our four strategic objectives at the center of this plan. Specifically, we will accomplish the following:

- **Clean Energy:** Economy-wide net-zero GHG emissions in our service territories by 2050
- **Climate Resilience:** Increased resilience of our energy infrastructure to adapt to climate change
- **Core Service:** World-class safety, reliability, and security, while managing the rate impacts and equity challenges of the energy transition
- **Customer Engagement:** Industry-leading customer experience and facilitation through the energy transition

We know rapid electrification is needed to achieve GHG emissions reduction goals, and we are focused on meeting these needs. In anticipation of increased electric demand, we are increasing electric system capacity in a timely manner to meet our customers' new business and system expansion requirements. We are simultaneously maintaining our commitment to climate resilience with our grid hardening measures and improving our customers' experience with more energy management tools and better avenues for communication.

Supporting our strategic objectives will deliver value to our customers and society, and it will require significant investment over time. We are well-positioned to enable these changes and partner with stakeholders to enact meaningful change. Utility investments are an efficient means to meeting societal objectives, and we are determined to seek out customer and societal benefits through:

- Continued **operational improvements** and efficiencies
- Advocating for solutions that focus on **cost-effectiveness**, including investments that deliver on multiple strategic objectives
- **Building timely infrastructure** that balances the lead time required to meet anticipated demand and potential for underutilization of assets

Beyond the utility, the clean energy future will require cooperation, collaboration, and innovation from many different parties and market participants. To support the market buildout, we will continue to advocate for technology-neutral policy that:

- Enables us to be flexible in our pursuit of net-zero GHG emissions in New York City and Westchester County by 2050
- Provides our customers cost-effective options in adopting clean energy solutions
- Allows for utility ownership of renewable generation

As we move forward, we understand that industry and societal trends in policy, technology, and customer adoption are uncertain. To meet this uncertainty, we look to our pathway framework which allows for flexibility while staying on track to achieve net-zero GHG emissions by 2050. Signposts within these pathways will continuously inform our strategy and planning for maximum operational efficiency and optimal allocation of resources. Table 14 includes an overview of our analysis of potential signposts.

Table 14. Signposts by Representative Pathway

	Full Electrification	Targeted Electrification	Hybrid Consumption
Policy Signposts	Policies **mandate** electrification in New York City and Westchester County.	Policies **mandate** or **strongly support** electrification in New York City and Westchester County.	Policies support **decarbonization** while being technology-agnostic in New York City and Westchester County.
Technology Signposts	Electric building heating technology **rapidly declines** in cost and improves in quality.	Electric building heating technology **declines as expected** in cost and improves in quality; **low-to-zero carbon gaseous fuels** are viable in **specific use cases.**	**Electric building heating technology** and **low-to-zero carbon gaseous fuels** decline in cost as expected; **low-to-zero carbon gaseous fuels** are viable for difficult-to-electrify buildings.
Customer Adoption	All customers **rapidly** adopt electric building heating technologies.	Most customers **rapidly** adopt electric building heating technologies, with some customers opting for **low-to-zero carbon gaseous fuels** due to technical and economic constraints.	Most customers **rapidly** adopt electric building heating technologies, with many customers in difficult-to-electrify buildings opting for **low-to-zero carbon gaseous fuels.**

When it comes to policy, we understand that New York State, New York City, and local municipalities continue to enact nation-leading clean energy rules and may continue to develop future legislation. Accordingly, the company's long-range plans and analysis are based on the clean energy policies as of April 2021.

We will continue to closely monitor and help shape this rapidly evolving landscape to create beneficial outcomes for our customers and stakeholders. We will review and appropriately modify our plans and supporting strategies, as policy, technology, and customer expectations evolve.

We will be highlighting additional details in a concurrent Electric Rate case. Simultaneously, we have released **Integrated** and **Gas Long-Range Plans** that provide insight into our overall and commodity-specific views of each system. We look forward to working with our many stakeholders, regulators, customers, and constituents to bring this future into reality.

Acronyms and Abbreviations

ADMS: advanced distribution management system

AMI: advanced metering infrastructure

Btu: British thermal unit(s)

CAGR: Compound annual growth rate

CECONY: Consolidated Edison Company of New York, Inc.

CLCPA: Climate Leadership and Community Protection Act

CMA: Climate Mobilization Act

CRM: customer relationship management

CSS: customer service system

DCFC: Direct Current Fast Chargers(ing)

DER: distributed energy resource(s)

DERMS: distributed energy resources management system(s)

DG: distributed generation

EV: electric vehicle

GHG: greenhouse gas

GIS: geographic information system

GW: gigawatt(s)

GWh: gigawatt hour(s)

kV: kilovolt(s)

LDV: light duty vehicle

MHDV: medium and heavy duty vehicle

MMtCO_2e: Million Megatons of CO_2 equivalent

MNPR: modernized network protector relay

MW: megawatt(s)

NOx: nitrogen oxide

NWS: non-wires solutions

NYISO: New York Independent System Operator

NYSERDA: New York State Energy Research & Development Authority

O&M: operation and maintenance

OMS: outage management system

OSHA: Occupational Safety and Health Administration

PV: photovoltaic

RCC: Reliable Clean City

RNG: renewable natural gas

SCADA: supervisory control and data acquisition

SCNY: SmartCharge New York

TBtu: Trillion British thermal unit(s)

TLA: transmission load area

US: United States

USS: Unit Substation

ZEV: Zero-Emission Vehicle

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