conEdison, inc.

Long-Range Plan

Our Integrated Energy System

An Integrated View of Our Energy 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.

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Executive Summary

For 198 years, the Consolidated Edison Company of New York, Inc. (CECONY) has provided energy solutions to support the needs and growth of the economies, communities and people of New York City and Westchester County. Today, our electric, gas, and steam utility services provide energy for 10 million people. The economies we serve represent $1.1 trillion of gross metropolitan economic output, or approximately 5% of the US economy. We serve the tenth densest urban area in the world, home to the world's business and financial capital as well as leading cultural, educational, healthcare, and transportation centers. We have invested in, built, and operated our electric, gas, and steam systems to deliver energy with world-class reliability, safety, security, and sustainability.

The communities we serve continue to grow and our customers expect increased value in the energy solutions we provide. They are more environmentally conscious than ever, and their passion mirrors CECONY's commitment to combat climate change. The New York metro area is experiencing an increase in violent storms, extreme heat, and major flooding. The higher frequency of extreme weather underscores the need for greater resilience of our energy systems, especially as dependence on energy in our daily lives grows. We understand the threats posed by climate change. It is a looming problem which requires us to take bold steps to mitigate these threats and create a better world for present and future generations.

To address the immediate and long-term impacts of climate change, we are committed to being the next-generation, clean energy company that our customers deserve and expect. We will play a critical role in delivering on 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. In addition, the need for safe, reliable, and secure energy infrastructure remains paramount.

Our utility Long-Range Plans articulate the strategy, actions, and investments needed to advance our commitment. We have developed a comprehensive strategy and supporting Electric, Gas, and Steam Long-Range Plans to achieve 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

A variety of solutions to advance these strategic objectives exist. However, these solutions vary substantially in maturity and complexity. Significant uncertainty in customer adoption levels, technology improvements, and policy developments creates a multitude of paths to the future.

Considering this uncertainty, we studied several scenarios to reach net-zero GHG emissions by 2050. We then selected three pathways that inform our near-term decarbonization strategy and represent a range of possible solutions. These pathways imagine energy futures ranging in

composition from highly electrified building heating and transportation to a more heterogeneous mix of electrified building heating and use of low-to-zero carbon gaseous fuels (e.g., renewable natural gas [RNG] and hydrogen) in building heating. Each pathway foresees significant increases in clean power generation, adoption of energy efficiency, and a transition away from fossil fuel use to cleaner fuels in buildings and transportation.

Our strategies and plans are designed to be flexible. Each can adapt to developments such as technology improvements, customer adoption and policy developments. This allows us to continually modify our efforts in specific programs and achieve the future value our communities and customers need.

We recognize this transition to a net-zero GHG emissions energy system will require significant investment. We seek to make investments that achieve the goals of this transition as cost-effectively as possible, which necessitates growing our electric system while maintaining our gas and steam systems to achieve clean energy goals. Studies, such as the **Scenarios for Decarbonizing New York's Economy**, have shown that a future which relies solely on electrification incurs greater cost to achieve deep GHG emissions reductions than a future that leverages existing pipeline infrastructure to deliver low-to-zero carbon gaseous fuels alongside deep electrification. These studies also highlight that maintaining fuel diversity in the form of gaseous fuels provides cost-effective generation capacity required to meet the reliability requirements of the bulk power system and resiliency for individual buildings during peak heating or cooling hours.

Clean Energy

Figure 1. 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 the main energy provider for New York City and Westchester County, we are positioned to be a leader in the clean energy transition. In November 2021, CECONY's parent company, Con Edison, published an updated **Clean Energy Commitment** which is echoed in many of our plans.

Achieving this goal will require fundamental changes in how energy is sourced and consumed. We will work to transform the energy supply to our service territories from relying on fossil fuels to being powered by clean electricity generation and low-to-zero carbon gaseous fuels by 2050. Simultaneously, we will enable a fundamental change in how energy is consumed in our service territories. Our strategies to deliver on the clean energy transition are shown in Figure 2.

Figure 2. Summary of Our Clean Energy Strategy

Transform the Energy Supply	Enable a Fundamental Change in Energy Consumption
Build an electric grid that integrates, delivers, and balances **100% renewable electric generation**	Accelerate customer adoption of **clean transport, energy efficiency, and decarbonized building heating**
	Enable **clean energy markets**
	Prepare required **electric infrastructure** ahead of market need
Support the development of **low-to-zero carbon gaseous fuels**	Reimagine the **gas system**
	Transform our **steam system**

Transform the energy supply:

Build an electric grid that integrates, delivers, and balances 100% renewable electric generation

We have developed plans to build the necessary electric transmission and distribution infrastructure by 2050 to:

- Facilitate retirement of fossil-fueled electric generation plants in our service territories
- Interconnect and balance new renewable generation from:
  - Up to 41 GW of utility-scale solar generation from across New York State
  - Up to 19.4 GW of offshore wind from the Atlantic Ocean
  - Up to 13.8 GW of onshore wind from upstate New York
  - 3.5 GW of renewable hydropower from Canada
- Increase the capability of our distribution system to integrate more than 10 GW of distributed solar PV
- Develop and facilitate up to 12.6 GW of energy storage through direct utility investments and customer programs at customer and utility scales
- Help New York State with its renewable energy goals and provide funding for low-income bill discounts by owning and operating large-scale solar generation
- Continue to advocate for the ability of our utilities to develop, own, and operate thousands of megawatts of medium- and large- scale renewable generation, like solar and wind, in New York State

Support the development of low-to-zero carbon gaseous fuels

A key component of our strategy to develop clean energy supply is to support the development of low-to-zero carbon gaseous fuels such as green hydrogen, RNG, and synthetic natural gas (SNG) produced using renewable electricity. These clean gaseous fuels provide a way to achieve deep GHG emissions reduction in production of steam we deliver, difficult-to-decarbonize sectors of our economy, and for customers who may find it difficult or impossible to adopt electric-only solutions. In addition, these gaseous fuels provide fuel diversity in meeting our energy needs, which in turn results in increased energy resilience and reliability. Furthermore, these solutions allow us to balance the energy consumption of our customers with the intermittent availability of renewable resources which can vary by season, day, and hour.

CECONY already supports industry-leading collaborations in production, storage, and transport of low-to-zero carbon gaseous fuel alternatives for customers. Additionally, we secured language in our last rate case that allows RNG producers to connect to our gas system.

Enable a fundamental change in energy consumption:

Accelerate customer adoption of clean transport, energy efficiency, and decarbonized building heating

To achieve net-zero GHG emissions by 2050, we have developed a flexible strategy to transform energy use in transportation, buildings, and other end uses. Our strategy explicitly focuses on accelerating customer adoption, enabling clean energy markets, and building out the required energy infrastructure to serve anticipated electrification demand ahead of customer needs.

In all the pathways we analyzed, customers will need to dramatically change how they consume energy over the next three decades. Our analysis of the required changes in energy use to achieve deep GHG reductions shows that there is significant uncertainty in the evolution and adoption of customer solutions. What is certain is that we will need to work together with our customers to achieve the required transformation in energy use.

Our pathway analysis addresses this uncertainty by presenting a range of potential outcomes that represent different combinations of clean energy solutions and levels of customer penetration to achieve net-zero GHG emissions by 2050. Our projections show that:

- Building energy efficiency will have to increase annually from 2 TBtu to 4-8 TBtu.
- Vehicles on the road will need to transform from more than 99% fossil-fueled (internal combustion engine [ICE]) vehicles to 85%-90% clean electricity-fueled vehicles (EVs) and 5%-15% low-to-zero carbon gaseous-fueled (fuel cell) vehicles.
- Building space 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.

Given such significant changes for end-use customers, our plan reflects the need to increase customer awareness and develop incentives to improve customer economics. We will need to address customer and market considerations such as technical constraints, customer adoption complexities, and concerns about the performance of clean energy alternatives.

Enable clean energy markets

We are prepared to support market participants, such as EV charging companies or heating, ventilation, and air conditioning (HVAC) service providers, to successfully offer the products and services needed to expand these markets meaningfully. As an example, we are pursuing pilot and demonstration projects to address significant market barriers like the complexity and cost to electrify existing buildings. Electrification of heating is feasible in most buildings, especially single-family houses, and low-rise buildings. However, the existing conditions of buildings dictate the complexity and cadence of upgrade opportunities. Some buildings can be converted during normal appliance turnover or when existing equipment fails. Others, such as high-rise buildings circulating heat via steam, can only be converted during a gut renovation and may also lack the space to convert. In addition, we are evaluating low-to-zero carbon gaseous fuel alternatives for customers who may find it difficult or impossible to adopt electric-only solutions.

Prepare electric infrastructure for electrification

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 the transformation in energy use. Our analysis projects a marked increase in electricity use as electric transportation and electric building heating grow over the next three decades. We anticipate summer system peak demand will grow by 35%-45% by 2050. Additionally, by 2035 we project our system will experience a winter peak demand exceeding the summer peak due to an increase in electric building heating. This will increase system peak demand by 45%-85% by 2050. Hence, there will be a need to build new system capacity. We will use peak demand optimization, such as energy efficiency and demand management, to reduce the need for new capacity where possible. Furthermore, there will be an increase in electric service connections required during the next 5-10 years to serve customers adopting electric transportation and electric building heating.

Reimagine the gas system

Our Long-Range Plans anticipate maintaining the gas pipeline system for select uses. Maintaining the gas system is projected to enable the lowest cost pathway to a decarbonized New York while eliminating or significantly reducing the use of fossil natural gas. Thus, we are preparing the gas system to integrate and deliver low-to-zero carbon gaseous fuels.

Reimagining our gas system means supporting policy reforms and programs that reduce fossil natural gas consumption and provide customers with clean energy alternatives. In the near term, it means:

- Providing customers with clean alternative building heating options
- Reducing the growth of our system through policy advocacy that eliminates our obligation to provide service/main beyond the statutory requirement for new gas connections
- Implementing Non-Pipeline Alternatives (NPAs) that allow us to defer or eliminate the need for gas infrastructure investment
- Investing in programs that reduce fugitive methane emissions across the natural gas production and delivery value chain
- Making capital investments that improve on public safety and system reliability, leveraging our ongoing main replacement program (MRP)
- Prudently investing in a low-to-zero-carbon gaseous fuels portfolio to serve those customers that are the hardest to electrify and preparing our energy delivery system for that transition
- Managing rate effects of the transition by proposing to accelerate the depreciation of our gas assets to mitigate long-term bill impacts

This strategy provides an additional benefit in that fuel diversity has historically increased the resilience and reliability of our energy systems.

Transform our steam system

Our steam system can also play a critical role in offering a low carbon alternative for buildings in which electrification would be prohibitively complex and expensive. To implement this strategy, we are committed to driving growth in energy efficiency for steam customers and reducing GHG emissions across the system. We support several decarbonization strategies for our steam system, including use of low-to-zero carbon gaseous fuels, carbon capture, and electric boilers powered by renewable energy. As policy and technologies develop, we can narrow down which decarbonization strategies provide the most value to our communities and customers.

Climate Resilience

Climate change is expected to result in more frequent and intense weather impacts on our systems and customers. We are building on our efforts to address the impact of climate change on our energy systems. Our utilities are implementing Con Edison's industry-leading **Climate Change Implementation Plan** and have identified several investments and initiatives to increase the resilience of our energy systems:

- Underground overhead electric distribution lines to avoid wind and tree impacts and 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.
- Modify energy network designs to reduce the number of customer disruptions caused by extreme weather events, such as installing sectionalizing switches in our electric distribution networks.

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

Core Service

CECONY has a long record of providing world-class safety, reliability, cybersecurity, and physical security, as is evidenced by regional and national recognitions. It is critical that we continue to operate energy systems that are safe, reliable, and secure in one of the densest cities in the world.

We are investing in utility infrastructure and other technologies to advance grid capabilities. Equipment replacement and risk management programs reduce our risk of failures while furthering operational excellence. Cybersecurity solutions secure our computer and energy systems against hacking threats. Sensors installed on our energy delivery systems allow us real-time monitoring and control of an increasingly distributed grid.

We view managing rate impacts and an equitable transition as part of our core service to our customers and communities. Our efforts include identifying investments that deliver on multiple objectives, prioritizing lower cost solutions, and continuing to focus on operational efficiency.

Investing in our diverse, inclusive, and talented workforce 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 future for our company and making sure every employee feels respected, included, and heard.

Customer Engagement

Customers today expect higher levels of comfort, convenience, choice, and control in all aspects of their lives. Our plans include actions and investments needed to deliver increased value 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.

We will provide easier access to program information for customers who want to reduce their use of fossil fuels, manage their energy use and GHG emissions profile, and transition to new

clean energy solutions. We will expand the use of digital resources, including self-service options and interactive tools, alongside in-person engagement, to amplify our clean energy offerings. We are also investing in new information systems, advanced metering infrastructure (AMI), and customer interaction process improvements to enable seamless and personalized interactions for an enhanced customer experience.

The transition to a clean energy future will be accomplished in collaboration with our customers and stakeholders to improve the quality of life of the neighborhoods we serve and live in. We will collaborate with interested stakeholders, including local municipalities and the real estate community, to identify key changes needed to foster a more electrification-ready environment to ensure infrastructure investments, planning, land use, building codes, and other policies are in place for a more seamless energy transition. We will also explore opportunities to develop partnerships with third parties including distributed solar and heat pump installers, EV manufacturers, and HVAC contractors.

In support of improved social equity, our plans include a focus on disadvantaged communities. We will advocate for cost-effectiveness and work with customer advocacy groups, regulators, governmental partners, and other stakeholders to prioritize affordability for low- and moderate-income (LMI) customers throughout the transition to a clean energy future. We will continue to engage environmental justice advocates to build bridges within disadvantaged communities and enhance our efforts to provide equitable distribution of benefits when designing programs and implementing projects.

Cost-Effectiveness

Significant utility and customer investments will be required to achieve the clean energy future 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 encompass GHG emissions reductions and enhanced climate resilience. Recent NYSERDA 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.[1]

We have identified $68 billion in investments over the next 10 years to deliver this value, with approximately:

- 34% supporting two or more of our strategic objectives (i.e., multi-value investments that include resilience)
- 33% supporting Core Service
- 28% supporting Clean Energy
- 5% supporting Climate Resilience

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

We estimate the revenue requirement—a proxy for overall utility customer costs—will increase from 1% of regional gross domestic product today to 1.3% of regional gross domestic product in 10 years. Some of these investments will provide operational efficiencies and offset costs currently incurred by customers. For example, customers who adopt EVs will no longer

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

purchase gasoline, and heating oil or natural gas costs will be eliminated for customers moving to electric building heating technologies.

To mitigate cost 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. In addition, 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

In summary, our Long-Range Plans articulate CECONY's comprehensive utility strategy to enable:

- **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

Ongoing actions to support this strategy will deliver value for customers and society but require significant investments. Our utilities are well positioned to enable and partner in this transition. Utility investments are a cost-effective means to meeting societal objectives, and we are focused on driving effectiveness and efficiency in both our operations and capital investments.

We understand the criticality of the energy services we provide and embrace the immense responsibility of enabling the daily lives of our customers and the communities we serve. Ensuring our customers have safe and reliable energy to light their streets, commute on a train or subway, power their appliances, heat and cool their homes, and run their businesses is a source of pride for our business and employees.

As the world around us changes, including the continuing impacts of climate change, we will continue to focus on our core energy delivery services while taking a leadership role in the clean energy future. We are increasing the resilience of our energy infrastructure and enhancing our engineering design standards to reduce the number of customers impacted during extreme weather events and improve recovery time when events occur.

Our Long-Range Plans represent a major step forward in our continued commitment to meeting these societal goals and our customers' expectations. CECONY is acting now to lead and deliver on our comprehensive utility strategy and support New York's energy and policy goals.

1. Background

Since their debut in 2010, CECONY's Long-Range Plans have articulated the strategies, actions, and investments needed to deliver value to our customers. Today, these Long-Range Plans continue to evolve as the strategic framework and roadmap that guide our programs and investments through 2050. This Integrated Long-Range Plan takes a comprehensive approach across our electric, gas, and steam businesses.

Our commodity-specific plans, including the **Electric**, **Gas**, and **Steam** Long Range Plans, provide additional details about initiatives that support our strategic objectives within each business. In each plan, we describe the role of the system in the future, detail our strategy, and describe the investments we are making in the respective systems and how they will benefit customers.

In this chapter, we provide a history and overview of our systems today, along with the accomplishments of which we are proud.

1.1 Our History

Over the past 198 years, CECONY[2] has been focused on providing energy solutions to support the needs and growth of the New York City and Westchester County economies, communities, and residents. Today, our electric, gas, and steam systems provide safe and reliable energy for 10 million people across the New York City metropolitan area. This energy system has been instrumental in catapulting New York into the global economic, cultural, and financial center that it is today.

Our **gas system** began in 1823 and has significantly evolved and expanded to serve over 1.1 million customers. Included in this customer count is more than 80,000 commercial building heating customers, 70,000 commercial building non-heating customers, and 650 large-volume dual-fuel interruptible customers that include in-city electric and steam-generating plants. From manufactured gas to natural gas, from gas streetlighting to electric, and from wooden and cast-iron piping to plastic pipe, the system has evolved to meet the ever-changing needs of our customers. Our gas system is responsible for the most energy delivered (in terms of TBtu) across our three commodities.

Our **electric system** dates to 1882 when Thomas Edison first created the direct current (DC) system connecting the Pearl Street Station to lower Manhattan. Since then, we have expanded the system to serve more than 3.4 million customers in New York City and Westchester County, transitioned from DC to alternating current (AC), and switched our fuel sources from coal to oil, to natural gas, and now to an increasing share of renewables. We primarily own transmission and distribution assets and no generation aside from our steam co-generation. Our system is networked and largely underground, which promotes reliability and resiliency.

Our **steam system,** which exists south of 95th Street in Manhattan, also originated in 1882. Like the gas and electric systems, it has gone through several evolutions to make it cleaner, more resilient, safer, and more reliable over time. The steam system, once powered by coal, transitioned to oil, and now consists of over 95% natural gas-fired equipment with approximately

[2] CECONY is a subsidiary of Consolidated Edison, Inc. (commonly known as Con Edison).

60% of production coming from our steam-electric cogeneration plants. Our steam system provides approximately 1,650 customer accounts in Manhattan with heating, hot water, cooling, humidification, and other critical services. Currently, steam is one of the cleanest energy sources available to our customers.

1.2 Our Accomplishments

As a result of focused investments and efforts to continuously improve our energy system operations, we have achieved numerous accomplishments in recent years. In this section, we highlight our achievements across safety, reliability, and security, storm hardening and response, sustainability, and customer experience.

We are proud of the evolution of our energy systems and the important changes we have made. Please refer to the individual Long-Range Plans for additional details of our achievements within the electric and gas systems.

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[3] of <1.5 from 2012 to 2021
- 2020 and 2021 ReliabilityOne Award for Outstanding Metropolitan Service Area Performance in the Northeast Region
- A System Average Interruption Frequency Index (SAIFI) value that is 8 times better than the state and national average

We are continuously seeking projects and investments that improve the operational safety, reliability, and security of our energy systems. Our recent initiatives include:

- Introduced a first-of-its-kind AMI-enabled natural gas detector program installed in customer homes to provide 24x7 leak monitoring and immediate response
- Replaced 1,000 miles (52%) of leak-prone cast iron, wrought iron, and unprotected steel gas piping from 2005 to 2020
- Delivered steam within the normal pressure range over 99.9% of the time from 2016 to 2020

1.2.2 Storm Hardening and Response

Uninterrupted service is paramount 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, replaced over 1,600 electric poles, replaced over 850 aerial electric sections, and installed over 1,750 fuses and 650 sectionalization switches.

[3] 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.

Our recent investments in hardening measures across our energy systems include:

- Removed trees that pose a risk to our electric transmission and distribution infrastructure
- Upgraded electric equipment to withstand a FEMA +3[4] flooding event
- Installed over 1,000 smart switches on our overhead systems
- Built flood walls and submersible pumps in our steam generating stations
- Implemented remote operating valves across our steam distribution system to allow sectionalization
- Deployed mobile transformers and switch gears in our electric grid that enable us to swiftly replace faulty equipment in response to climate events
- Deployed remote transformer monitoring in the grid that allows us to detect faulty transformer equipment and perform proactive maintenance
- Installed steam isolation valves to minimize steam customer impacts
- Replaced over 10 miles of flood-prone gas lines

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

1.2.3 Sustainability

We have grown sustainability efforts economy-wide through investments in our energy systems. Our recent sustainability initiatives include:

- Replaced 1,000 miles (52%) of leak-prone cast iron, wrought iron, and unprotected steel gas piping between 2005 and 2020, significantly reducing fugitive emissions
- Interconnected a total of 275 distribution-connected energy storage systems, totaling 18,326 kW of capacity
- Achieved 2.1 TBtu in savings through our energy efficiency programs in 2020 alone, offsetting the annual energy requirements of approximately 220,000 detached single-family homes[5]
- 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
- Achieved energy savings in 500 affordable multifamily residential buildings and distributed LEDs to more than 62,000 customers through local food bank partners

[4] 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

[5] Assumes approximately 94.6 MMBtu per household.

- Provided training programs on energy efficiency to more than 1,000 independent contractors
- 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 more than 4.5 times

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 bills 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.

2. Industry and Societal Trends

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

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

A changing climate will have direct ramifications to our energy delivery systems. These effects are already having an impact on utility asset design specifications and system operations to adapt to weather and climate conditions.

Climate 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 affect the role our energy delivery infrastructure plays in the energy transition, our investments, and the energy choices our customers make.

Technological advancement from building heat pump technologies to low-to-zero-carbon gaseous fuels will continue to make our clean energy transition possible. We will monitor advancements in technology and the impact on the path to decarbonization.

Equity and environmental justice are at the forefront of the clean energy transition. Across the utility industry, the equity and environmental justice impacts of energy system change on historically disadvantaged and low-income communities are being examined. From a societal perspective, the objective is to 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 also have ubiquitous data at their fingertips—smart meters enable our customers to see hour-by-hour and real-time energy usage and to get personalized recommendations to lower energy bills. Those interested in adding rooftop solar can get quotes online from multiple developers in mere minutes. Customers also rely on us to provide safe, reliable, and increasingly resilient energy, to respond swiftly to service interruptions, and to be a trusted advisor through this energy transition.

Good utility practice requires a continuous monitoring of customers' experiences with customer satisfaction surveys and external metrics such as J.D. Power,[6] Escalent,[7] and App Store[8] 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:

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

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

[8] 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.

- **Choice:** Customers want more energy offerings and have more supply and technology choice than ever before.
- **Convenience:** Customers seek a convenient and seamless experience when interacting with their energy provider.
- **Comfort:** Customers want to feel comfortable in their homes and businesses and rely on their energy provider to deliver 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. For example, across the utility industry it is anticipated that customers will increasingly adopt clean energy solutions, such as electric heat pumps for building heating and cooling (building electrification) or EVs (transportation electrification). These shifts are occurring for a variety of reasons further described in the following sections.

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. They are experiencing 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 already affect communities and energy systems, we have proactively performed a **Climate Change Vulnerability Study** to understand current climate risks and project future risks on our energy systems. As part of this study, we reviewed our systems against these climate risks. A high-level summary of these risk impacts is included in Figure 3.

Figure 3. Climate Risk and Potential Impacts to CECONY's System

	Ambient Temperature/ Heat Waves	Precipitation, Sea Level Rise, and Storm Surge	Extreme Events
Expected Weather Trends in Our Service Territory	• Warmer seasons on average • Extreme cold spells • More extreme and frequent heat waves	• Flooding risk due to heavy rainfall • Higher than average humidity • General sea level rise that extends flooding and storm surge areas	• Hurricanes • Tornadoes • Nor'easters • Ice storms • Other extreme weather events
Potential Implications to Energy Systems	• Decreased equipment lifespan for electric and steam systems • Significant peak demand increases for electric system	• Flooding of equipment	• Storm damage to equipment

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 1 describes the ambitions and goals of the CMA and CLCPA.

Table 1. 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** [9] **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** Economy-wide **Net-zero** 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 1. However, we recognize New York State, New York City,

[9] 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

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. The utility industry, among other sectors, needs to implement a comprehensive strategy to enable these ambitious goals in a timely, cost-effective manner.

Additionally, New York City legislators recently passed **Local Law 154 of 2021**, which generally bans new gas service connections for buildings under seven stories beginning in 2024, and generally bans 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 the goals. 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.

2.4 Technological Advancement

Rapid advances and innovations in energy technologies are helping utilities operate reliable energy systems in the 21st century. Also, customers can increasingly choose and afford clean energy options. Accordingly, it is important to monitor technology improvements and breakthroughs that may substantially influence the energy transition. Table 2 provides an overview of technologies that are part of the energy system transformation.

Table 2. 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 Pump	Highly efficient electric system that uses a refrigerant to move heat from one area to another to provide 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
EV Chargers	Charging points that supply power to EVs in our service territory	Enables customers to transition from less efficient and more polluting fossil fuel-based vehicles by alleviating 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 our system and reduces power system GHG emissions

Technology	Description	Value of Technology
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 our 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)	Greatly reduces or eliminates GHG emissions from energy generation facilities
Carbon Capture and Storage	Technology that absorbs carbon from the combustion source 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
Electric Boilers	Electric technology that generates steam without fuel combustion; can be paired with energy storage to optimize renewable energy	Transforms dedicated steam plants into net-zero GHG emission generators and balances the electric grid when there is excess electricity production from renewables

Additionally, information technology (IT) advancements across industries, including for utilities, offer new ways to unlock value for customers. Table 3 describes the IT trends that will help shape the energy systems of tomorrow.

Table 3. IT Trends

Technology	Description
Cybersecurity	Cybersecurity technology and the mitigation of cybersecurity risks are top-of-news events on a weekly basis around the world. The application of artificial intelligence and machine learning capabilities to existing cybersecurity tools can enhance prevention, detection, and mitigation capabilities. New challenges from quantum computing technologies must be evaluated to determine if they are defensive challenges or offensive protection capabilities.
Cloud Computing	Cloud computing greatly expands the capability to handle large volumes of data, to handle highly variable processing loads, and to rapidly deploy or shed compute infrastructure. Cloud computing also provides high resiliency and ubiquitous global access to leading-edge innovation platforms across multiple industries.
Artificial Intelligence and Machine Learning	Artificial intelligence and machine learning technologies are poised for enterprise-level expansion in many industries. They have matured from specific point solutions (graphics animation, software chatbots, Roomba vacuums) to enterprise-level analytics and operations solutions. Artificial intelligence and machine learning-enabled solutions for distributed energy resource management systems (DERMS) and advanced distribution management systems (ADMS) will provide real-time analysis and operation of grid distributed energy resources (DER), switches, autotransformers, etc. These artificial intelligence and machine learning systems will dynamically respond to changing events in the grid, like a human operator, but will be able to do so with the high number of DER and Internet of Things (IoT) devices anticipated in the future.
Blockchain	Blockchain is a combination of cryptographic and shared ledger technologies that can be used to enable highly secure transactions between two entities. These transactions can be applied between grid devices that must interoperate such as solar panels and EV chargers, or they can be applied between systems that must interoperate such as company financial and open-market trading systems. Blockchain can enable companies to interact with a much wider variety of DER owners or operators and aggregators.
Internet of Things	IoT is the concept that as the miniaturization and cost-effectiveness of incorporating internet connectivity into devices increases, it will enable the monitoring and control and data acquisition from those devices. The greatest impact to utilities is the proliferation of grid, building, and traffic/transportation sensors. Managing the communications and security of data, and possibly control, to IoT devices will be a challenge. However, the benefits of insight into energy consumption and grid performance could be of significant value to companies.

Technology	Description
5G Communications and Connectivity	5G is the state-of-the-art broadband cellular wireless communications network technology currently in operation in many major cities. 5G technology expands the coverage area, increases download speeds by a factor of 10,000, improves data quality, and decreases the cost for fixed and mobile wireless service. This enables utilities to cost-effectively connect sensors, meters, monitoring, and control devices from the field operation to enterprise-level systems. This real-time data coming can then be used to optimize power flows, prevent outages, make use of spare capacity, and detect imminent device failures.

2.5 Equity and Environmental Justice

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

Environmental justice has only recently become a priority for policy makers, not only at a 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. It also stipulates 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[10] 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 hazards, 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.

[10] The New York State DEC 13-member Climate Justice Working Group, was established under the Climate Leadership and Community Protection Act (CLCPA) and works in parallel to the Climate Action Council to ensure environmental justices issues are aligned with their Scoping Plan recommendations

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 low- and moderate-income 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.
Population in CECONY Service Territory	Approximately 440,000 low-income households (those receiving assistance programs) and 1.3 million moderate-income households. [11]	**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.

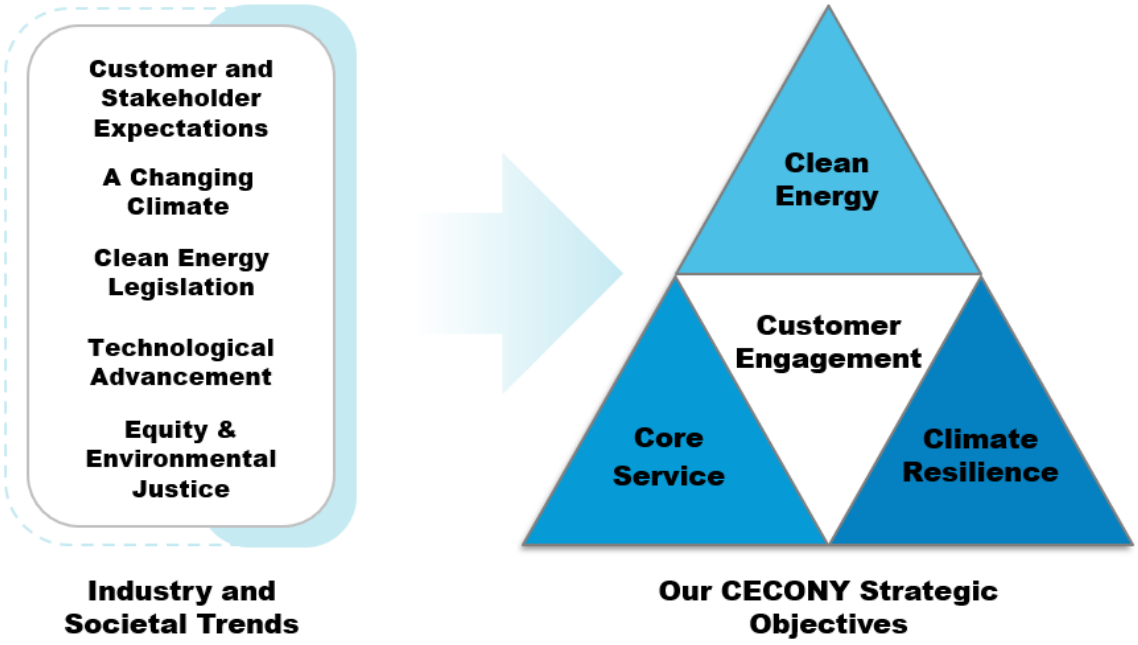
[11] As of the date of release of this document.

3. Our Integrated Strategy

We are committed to meeting societal goals and our customer expectations. Our utility Long-Range Plans articulate the strategy, actions, and investments needed to advance our commitment. We developed this integrated strategy and supporting Electric, Gas, and Steam Long-Range Plans to achieve four strategic objectives:

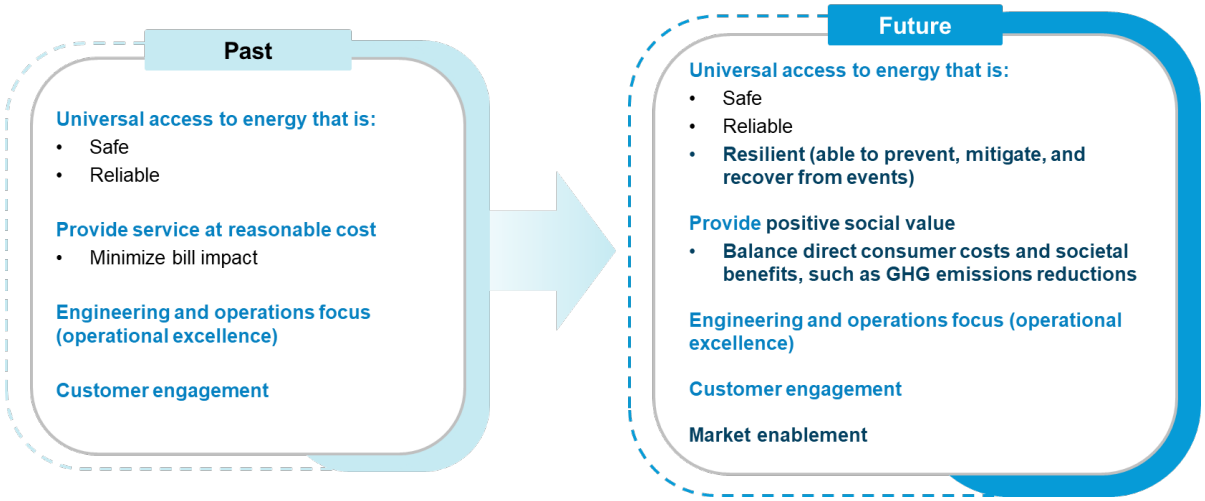
- **Clean Energy:** Economy-wide net-zero GHG emissions in our service territories by 2050
- **Climate Resilience:** Increased resilience of our energy infrastructure to adapt to climate change
- **Core Service:** World-class safety, reliability, and security, while managing the rate impacts and equity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

Figure 4. Our Strategic Objectives



Projected industry and societal trends are not only changing the world we live in, but they are also changing and evolving the role of utilities, as Figure 5 shows. The utility role is changing from providing customers universal access to safe and reliable energy at a reasonable cost to delivering clean energy solutions and universal access to safe, reliable, and resilient energy that provides positive societal value. Utilities must become more flexible, expand their offerings, and enable or facilitate new markets in response to market forces and evolving customer expectations. Consistent throughout these past and future roles are the core principles of safety, engineering and operational excellence, and customer experience and engagement.

Figure 5. Changing Role of Utilities



In the following section, we describe our pathways analysis, that utilizes technology, policy, and customer adoption projections to inform how we should invest in our integrated system going forward.

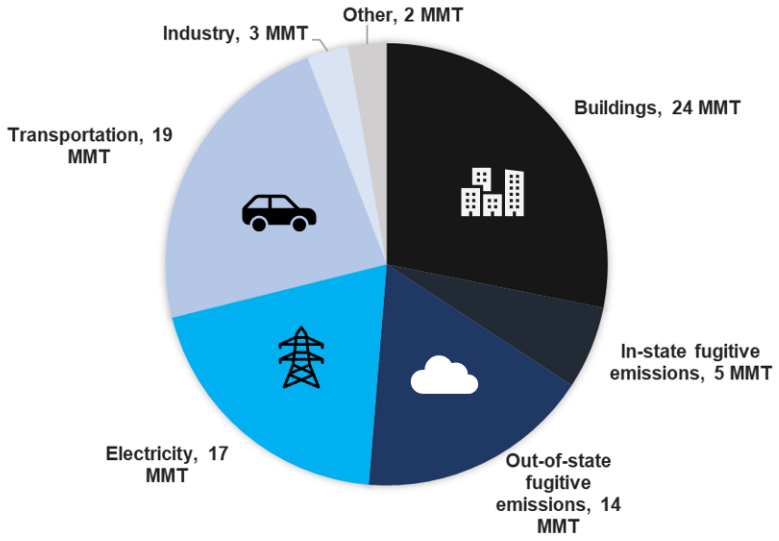
Further on, we describe our strategies to transition to net-zero GHG emissions by 2050, our investments in climate resilience, our continued commitment to a core of safety, security, and reliability, and the value and enablement we deliver to customers throughout as informed by our pathways analysis.

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 6.[12]

[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.

Figure 6. 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, an infinite number of combinations of solutions could achieve 2050 goals. As a result, we will remain open to considering all clean energy solutions that may advance societal goals and increase value to our customers. Further, we will 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 clean energy solutions that are cost-prohibitive today will become cost-effective. 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. Therefore, we identified three representative pathways to capture a wide range of potential futures so that we remain flexible until a pathway emerges. The representative pathways are described in Table 5. Each pathway differs in the technology breakthroughs required and the expected relative cost to achieve the clean energy transition.

Table 5. Representative Pathways

		Full Electrification	Targeted Electrification	Hybrid Consumption
Description		Relies on existing technology solutions to eliminate GHG emissions in the buildings sector. Significant breakthrough in energy storage occurs, and policies mandate electrification of fossil energy use.	Balances use of existing technologies and innovation in low-to-zero carbon gaseous fuel technologies for flexibility and cost-effectiveness.	Significant breakthroughs in low-to-zero carbon gaseous fuels occur. Leverages existing electric, gas, and steam infrastructure to mitigate customer complexity and disruption.
Relative Cost Impact	Customer	$$$$$	$$$	$$
	Utility Infrastructure	$$$$$	$$$$	$$$
	Market Innovation	$	$$	$$

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

These pathways detail combinations of different levels of policy, technology, and customer adoption that will achieve 2050 goals. As Table 6 shows, all three energy systems play a role in each pathway to enable the energy transition; our electric system will be the backbone and our gas and steam systems will rely on the emergence of low-to-zero carbon gaseous fuels. These representative pathways are tools designed for understanding implications of long-term programs and their impacts and are not intended to be near-term forecasts that change year-to-year based on actual experience and influences.

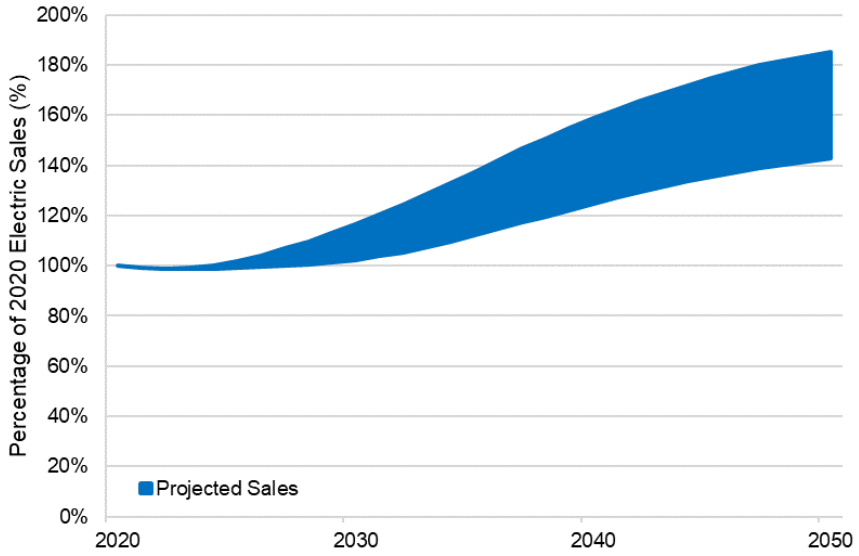
Table 6. Implications of Pathways on Our Systems

	Electric	Gas	Steam
End-Use Sales[14] in 2050	Increases by 42%-85%	Decreases by 60%-100%[15]	Decreases by 20%-40%
Supply in 2050	Fossil-fueled generation is retired as we transition to 100% clean generation.	Pipeline infrastructure is maintained to deliver low-to-zero carbon gaseous fuels to buildings and electric and steam generation facilities.	Generation plants shift from using natural gas as their fuel source to low-to-zero carbon gaseous fuels.

Implications of Pathways on our Electric System

Our total electric sales will increase across all pathways and possible scenarios, as shown in Figure 7.

Figure 7. Projected Electric Sales Across Pathways through 2050



We anticipate a 42%-85% increase in electricity sales by 2050 as electrification of transportation and buildings expands in our service territory, and we are committed to build capacity in a timely manner to meet customer needs. This growth is expected to increase the existing summer peak

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

[15] Excludes gaseous fuel delivered to electric and steam generation facilities

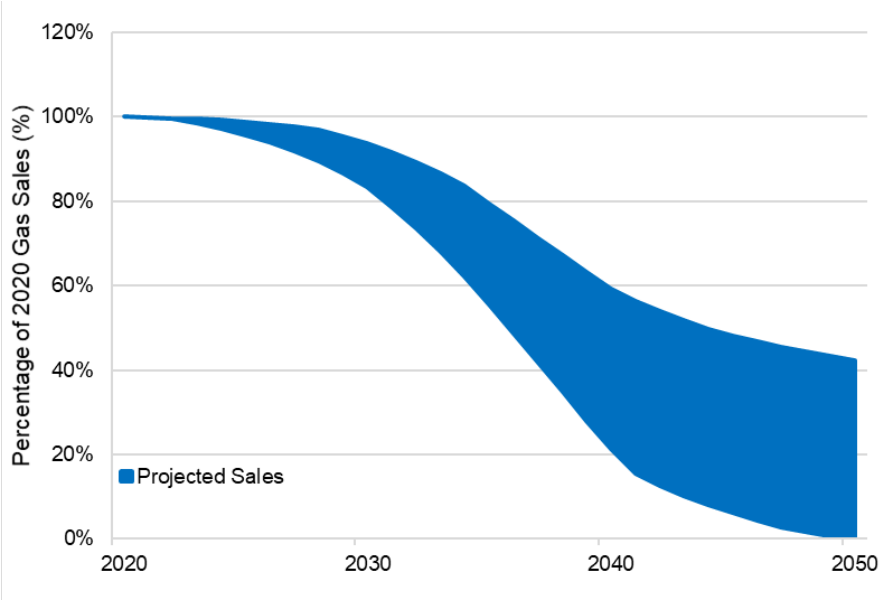
demand. Furthermore, as the electrification of building heating proliferates, it will add significant winter demand to our electric system (the winter heating capacity requirement is much higher compared to the summer cooling capacity requirement, even with energy efficiency). The transition to a winter peaking system will result in an annual two-peak cycle, which our electric system has yet to encounter at this scale.

Implications of Pathways on our Gas System

We project that our gas system will continue to play a critical role in supporting our energy system through 2030, and a supporting role between 2030 and 2050. Maintaining the gas system provides benefits such as lowering costs of the overall clean energy transition, providing fuel diversity, and effectively meeting reliability the requirements of the entire bulk power system, as well as providing resiliency for individual buildings. We expect this value will continue well into the future.

In alignment with the net-zero GHG emissions by 2050 goal, we project that gas sales will decrease over time while more buildings adopt electrification and additional energy efficiency measures, as Figure 8 shows.

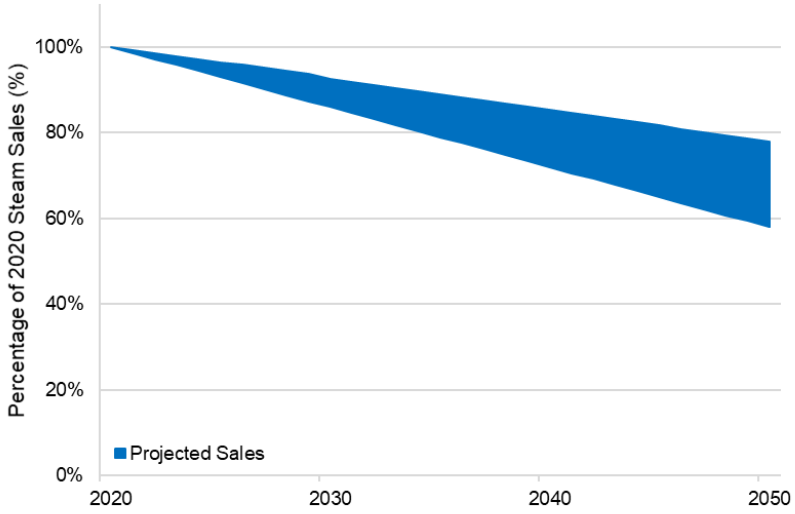
Figure 8. Projected Gas Sales Across Pathways through 2050



Implications of Pathways on our Steam System

We project that most of our current customers will stay on the system and continue enjoying the benefits of no on-site combustion, increased retail space, and on-demand cleaner heat. As such, we expect a linear decline in steam sales through 2050 (see Figure 9), due to milder winters, energy efficiency, and some customers transitioning to electric building heating. However, we do anticipate new customers will offset some of the decline.

Figure 9. Projected Steam Sales Across Pathways through 2050



Although the pathways end in three distinct futures, they follow similar trajectories through 2030. Our strategies and actions documented below address changes required in energy end-use and supply over the next 10 years, and that will prepare us for the increased uncertainty through 2050. In the long term, our specific actions will depend on how policy, customer, and technology trends evolve. We have also identified signposts (outlined in Section 5) that will provide us with the insights required to adapt our strategy as needed.

3.2 Clean Energy

Figure 10. Our Clean Energy Commitment

OUR CLEAN ENERGY COMMITMENT

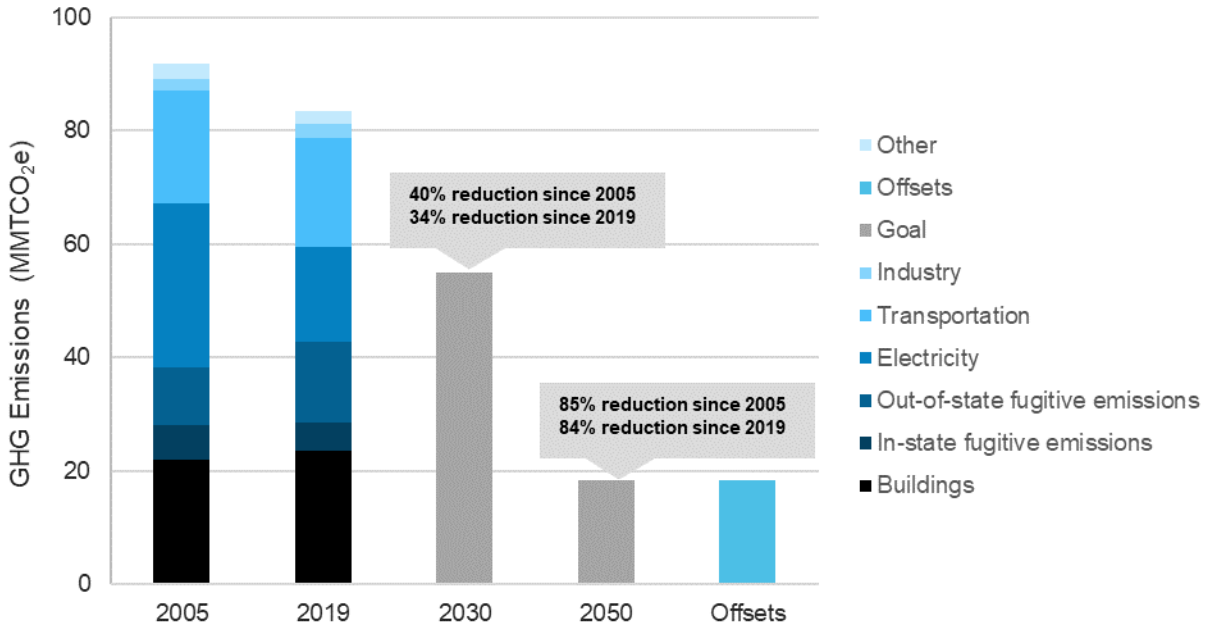
We will take a leadership role in the delivery of a clean energy future for our customers. We will do that by investing in, building, and operating reliable, resilient, and innovative energy infrastructure, advancing electrification of heating and transportation, and aggressively transitioning away from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

As the main energy provider of New York City and Westchester County, we are a leader in the energy transition. In the following sections, we describe our strategy within each of our four strategic objectives and how we will leverage them to support a transition to net-zero GHG emissions by 2050. This call to action is echoed in Con Edison's recently updated **Clean Energy Commitment**. [16]

We have made strides toward our own clean energy goals, as well as NYS and NYC goals, as described in Section 1.2.3 and in our **Sustainability Reports**, but together with our stakeholders we still have a long way to go to achieve net-zero GHG emissions by 2050. Figure 11 highlights the past, present, and future GHG emissions reductions needed across the New York City and Westchester County economies to meet legislative goals.

[16] Con Edison is the parent company of Con Edison Company of New York (CECONY)

Figure 11. GHG Emissions of New York City and Westchester County

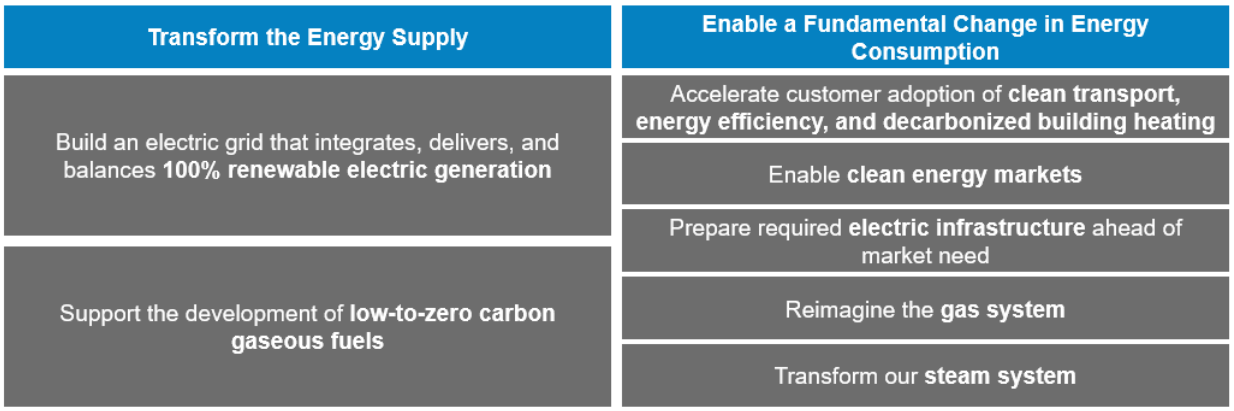


To achieve these GHG emissions reductions as informed by our pathway analysis, we have developed a Clean Energy strategy with the following priorities:

- By 2050, **transform the energy supply** to our service territories from one primarily relying on fossil fuels to one powered by clean electricity generation and low-to-zero carbon gaseous fuels. We will enable this transformation by building an electric grid that integrates, delivers, and balances **100% renewable electric generation** and by supporting the development of **low-to-zero carbon gaseous fuels.**
- **Enable a fundamental change in how energy is consumed** in our service territories from one that primarily uses fossil fuels to one that is fueled by clean electricity and low-to-zero carbon gaseous fuels. This includes accelerating customer adoption of clean energy solutions (energy efficiency, clean transportation, and decarbonized building heating), enabling clean energy markets, and advancing our electric, gas, and steam systems to support decarbonization efforts.

This strategy, with supporting approaches is summarized in Figure 12.

Figure 12. A Summary of Our Clean Energy Strategy



3.2.1 Transform the Energy Supply

Our strategy to transform our energy supply and achieve net-zero GHG emissions by 2050 is built upon two key actions:

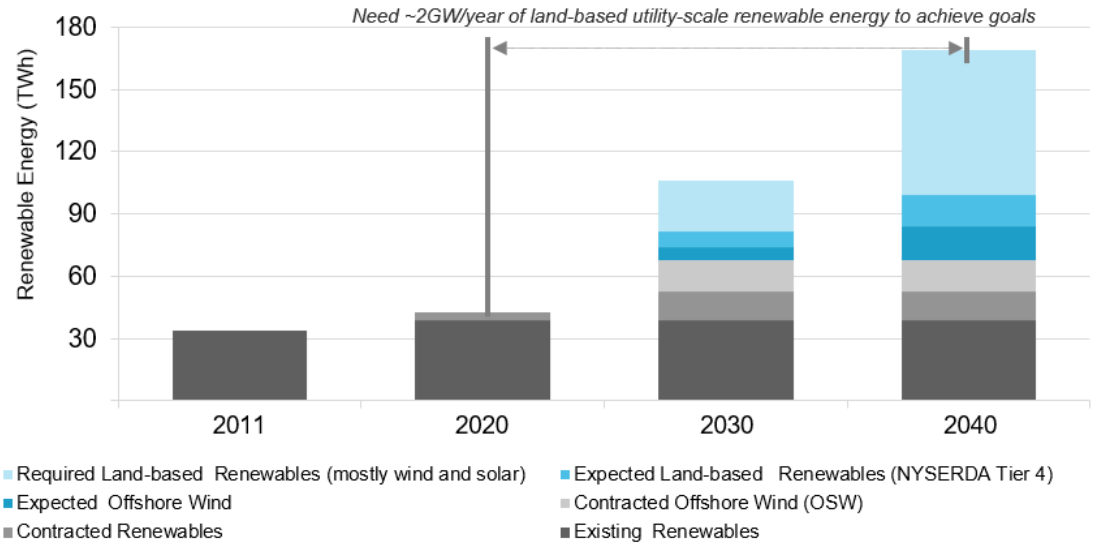
- Build an electric grid that can integrate, deliver, and balance 100% renewable electric generation
- Support the development of low-to-zero carbon gaseous fuels

3.2.1.1 Build an Electric Grid that can Integrate, Deliver, and Balance 100% Renewable Electric Generation

For a sustainable future, the energy supply must be transformed. Policy goals indicate that electric generation should be 100% clean by 2040. To meet our strategic objectives and these goals, the electric generation fleet will need to transition away from fossil fuel-fired generation. Currently, renewable generation such as offshore wind and utility-scale solar can be up to three times more expensive than fossil-fueled generation, but they are becoming increasingly cost-competitive. Additionally, due to the variability of renewables, a combination of long-duration storage and low-to-zero carbon gaseous fuel-fired generation will be needed to meet the reliability requirements of the bulk power system. In the future, we expect continued cost declines for these solutions as policy goals will push the markets to mature and technologies to improve.

Scaling this renewable generation capacity is central to the city and state's decarbonization goals. The CLCPA establishes a renewable energy program where at least 70% of the electricity in 2030 must be generated from renewable energy resources (referred to as the 70x30 target), zero GHG emissions associated with electricity in 2040 (referred to as the 100x40 target), and net-zero GHG emissions economy-wide by 2050. There are also technology-specific goals including 10 GW of distributed solar by 2035, 3 GW of energy storage by 2030, and 9 GW of offshore wind by 2035. Figure 13 shows our projection to achieve New York's renewable energy goals.

Figure 13. CLCPA Renewable Energy Goals (70% by 2030, 100% by 2040)



Given the substantial need for new renewable energy, we believe allowing utilities to own renewable generation assets will increase the likelihood that the state achieves its renewable electricity goals. Moreover, utility participation in the renewable generation market is likely to increase customer access to clean electricity by lowering long-term costs. 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 their end of life. In addition, as the operators of the transmission and distribution electric grid to the customer premise, we can offer a variety of clean generation options, including on-site, large-scale, and community sourced.

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 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; this facility would be transferred to and owned by CECONY upon commercial operation.

Transmission

We recognize that transmission is critical to integrating renewable energy as clean generation resources such as offshore wind and large-scale solar must be built remotely and require transmission infrastructure to connect to demand centers. We also recognize that demand for electricity in our service area is only expected to grow. As such, we are investing in multi-value transmission and storage projects within our territory that can deliver electricity supplied by remote intermittent renewables and balance increasing demand to help ensure the statewide achievement of clean energy goals.

Our planned transmission projects are documented in further detail in Table 7.

Table 7. 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 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 retiring fossil fuel generation and injecting 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, 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 Peak Demand Growth *Increase system capacity for expected future peak demand*	**Substation Replacement/ Upgrades**	This initiative replaces poorly performing assets with new upgrades that redirect system flows to alleviate expected constraints. Replacement/upgrades proactively prepare the system for future peak demand growth by making upgrades before the electric system becomes over-constrained and improves resiliency and reliability.

Distribution

Expanding the capabilities of our distribution system is important to enabling 100% renewable generation. The electric distribution system plays a critical role in delivering and balancing electricity for our customers, which will only become more complex due to the intermittency of many distributed generation (DG) resources. Some technology-specific goals, such as 10 GW of distributed solar by 2035 for the state, will add a layer of complexity to the role of the distribution system as they will introduce two-way electricity transfer at new levels.

Our investments in distribution include a Distributed System Implementation Plan that provides capacity, reliability, resiliency, and operational flexibility to the grid and enables DG integration. Table 8 lists examples of planned projects in our Distributed System Implementation Plan.

Table 8. Examples of Our Distributed System Implementation Plan Initiatives

Initiative	Description	Value Delivered
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 and location-specific pricing.	Use of electric system resources is optimized, and we can more accurately determine where upgrades are needed for increased reliability.
Grid Operations	We are continuously building out the electric grid and adding new grid capabilities. This includes increased grid flexibility [17] and allows greater integration of foundational initiatives such as AMI and geographic information systems (GIS). This also includes investment in DERMS and optimizing use of DER technologies.	This prepares the electric grid for the expanded deployment of large-scale renewables, energy efficiency, demand response, and distributed resources. It also allows the grid to facilitate greater electrification in the transportation and building sectors.
DER Monitoring and Forecasting	We are developing a DER forecasting tool to better incorporate new technologies and end uses, such as storage and building 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 peak demand forecasts as trends shift and new policy actions are implemented.
Modernized Network Protector Relays and Supervisory Control and Data Acquisition (SCADA)	Modernized network protector relays 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.	Modernized network protector relays 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.
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 demand.	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.

Storage

Energy storage technologies will play an essential role in enabling a clean electric system. As clean generation expands, energy storage will significantly increase the utilization of renewable resources by storing excess electric supply during periods of over-generation. This avoids stranded energy in the network and provides additional resources to serve peak demand needs.

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 our electric system. We have a goal to install up to 1,500 MW of energy storage on our system by 2030. 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

[17] The Electric Power Research Institute (**EPRI**) defines grid flexibility as "the ability to adapt to dynamic and changing conditions, for example, balancing supply and demand by the hour or minute, or deploying new generation and transmission resources over a period of years."

- 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.

3.2.1.2 Support Development of Low-to-Zero Carbon Gaseous Fuels

Low-to-zero carbon gaseous fuels have significant potential to reduce GHG emissions in our service territory. To better understand these solutions, we have worked collaboratively with peer utilities and other stakeholders (e.g., Pathways to Carbon Neutral NYC, and The Role of Gas Networks in a Low-Carbon Future). Through our collaboration, research, and analysis, we have identified three low-to-zero carbon gaseous fuels on which our plans focus: RNG, green hydrogen and SNG.

- RNG is a pipeline compatible gaseous fuel derived from biomass feedstocks (i.e., animal manure, food waste, landfills, and water resource recovery facilities) Although both RNG combustion and fossil gas combustion would emit CO_2, leading industry sources agree that RNG has lower lifecycle GHG emissions than fossil natural gas. RNG also has other benefits, including local air quality and fuel diversity benefits. Further, because RNG has the same chemical composition as fossil gas, it can be used as a direct replacement in existing infrastructure and customer equipment.

- Green hydrogen uses renewable electricity to separate hydrogen from water molecules to produce a fuel. Because it is produced using renewable electricity, green hydrogen does not emit CO_2 during production and is considered a non-emitting fuel. In addition to being used as a clean alternative to fossil gas, green hydrogen can be used as storage for renewable energy.

- SNG combines hydrogen with captured CO_2 to create methane via methanization. As a result, this process also produces no GHG emissions during production. The lifecycle GHG emissions impact of SNG is lower than fossil gas because it uses captured CO_2. SNG, like RNG, can be used as a direct replacement for fossil gas.

For additional information, refer to our **Gas Long-Range Plan**.

We see continued value for the gas system in the future if low-to-zero carbon gaseous fuels become viable for injection into the current infrastructure. The gas system is a large and already existing asset that can be repurposed in a decarbonized world; repurposing could be significantly more cost-effective than full electrification, including a specialized role for difficult-to-electrify buildings in dense urban locations. Low-to-zero carbon gaseous fuels can also be used to balance energy consumption with intermittent electricity generation from renewables. As such, we are prudently investing in building a low-to-zero carbon gaseous fuels portfolio. This includes:

- Securing language in our last rate case that allows RNG producers to connect to our gas system. We are open to facilitating these interconnections to integrate RNG onto our system and meet customer needs.

- Participating in a variety of industry groups to research the impact that low-to-zero-carbon gaseous fuels may have on our system.

Additionally, our MRP is critical in future pathways that require delivery of low to zero carbon gaseous fuels.

Hydrogen Pipeline Research, Analysis, and Studies

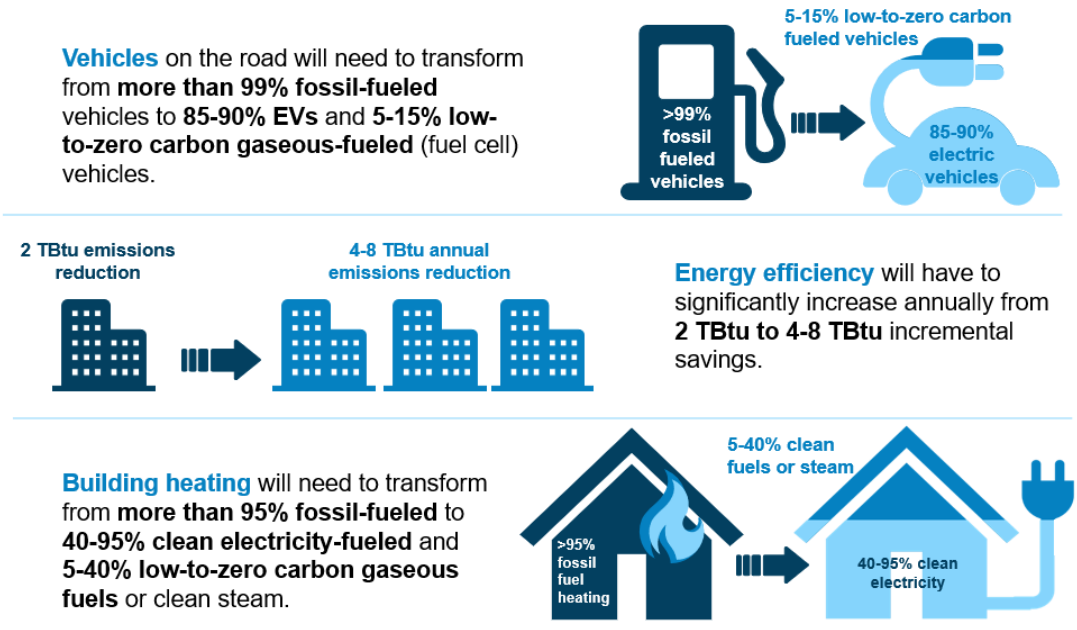
We are participating in a number of industry working groups such as the Low-Carbon Resources Initiative with EPRI, the Gas Technology Institute, and a Guidehouse Hydrogen Consortium to further explore the viability of hydrogen in our service territory. We also joined the Institute for Gas Innovation and Technology with Stony Brook University. These industry working groups allow us to collaborate with and learn from leading organizations. Through these interactions, we will better understand how to incorporate hydrogen successfully and safely into our gas system.

We need to coordinate with multiple parties, including other gas utilities and gas consumers in the areas that we serve. Joining these working groups enables us to better collaborate as future hydrogen infrastructure will need to be shared and a robust market ecosystem will need to be developed with multiple different players. If advanced, this technology could support decarbonization for difficult-to-electrify customers throughout our service territory. Hydrogen could also have the benefit of decarbonizing our steam generation and co-generation units.

3.2.2 Enabling a Fundamental Change in Energy Consumption

To meet the fundamental change in how energy is consumed, we will need to rely on significant customer adoption of clean energy solutions, as shown in Figure 14.

Figure 14. Expected Customer Adoption Needed to Meet Clean Energy Goals



In the near term, we are focused on increasing adoption of clean transportation, energy efficiency, and decarbonized building heating. Specifically, we plan to facilitate **PowerReady** EV

charging infrastructure buildout to support adoption of electric LDVs and advocate for regulatory support for make-ready infrastructure to help support new sales of zero-emission MDHVs.

We also aim to triple investment in building energy efficiency and electrification programs through 2031 and promote and facilitate significant building heating electrification for space and water heating in our territory.

We recognize that many customers face technical constraints, adoption complexity, and concerns about the performance of clean alternatives. We aim to provide our customers with helpful information about different clean energy solutions and how to identify the optimal combination of them. Our clean initiatives across electric, gas, and steam have explicit plans to facilitate customer awareness and develop incentives to improve customer economics, further accelerating customer adoption.

Through these near-term priorities, we aim to catalyze the long-term shift in our energy system necessary to achieve net-zero GHG emissions by 2050. While the individual plans for our energy system will enable meaningful progress, achieving the levels of new technology required to achieve societal goals will require the collective commitment of all market participants, policymakers, regulators, and customers. As such, a complementary near-term priority will be for us to advocate for policies that support regulations and emerging technologies that are critical to the energy transition.

3.2.2.1 Clean Transportation

Transportation accounts for 23% of GHG emissions in our service territory. To achieve net-zero GHG 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 We will facilitate the expansion of EV charging infrastructure throughout our service territory and help our customers better manage their energy use through positive incentives.

There is clear policy support for zero-emission vehicles (ZEVs) (i.e., EVs and fuel cell vehicles that do not produce tailpipe emissions). By 2035, New York's updated Environmental Conservation Law will ban GHG-emitting LDVs. However, industry trends have shown that there are several barriers to the widescale adoption of the clean transportation technologies needed to meet GHG emissions targets. Specifically, upfront vehicle costs can be 20%-90% higher than ICE vehicles. There is also concern around the range of EVs and availability of charging infrastructure. The attractiveness of EVs may depend on how many vehicle miles a customer plans to travel, while fuel cell vehicles may be most attractive for heavy duty, long distance applications. We expect declines in battery costs to drive reductions in EV prices 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.

New York State recently announced a new target for sales of all off-road vehicles and equipment sold in the state to be net-zero GHG emissions by 2035, and MHDVs to achieve the same by 2040.[18] 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:

[18] Details on the state's goals can be found online **here**.

- **Availability of charging** throughout our service territory
- **Affordability** of EVs in comparison to traditional ICE vehicles when considering total cost of ownership
- **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

We are cognizant that transportation electrification is an emerging sector where the total cost of ownership is still higher than fossil fuel-based transport and will continue to require robust support from a variety of stakeholders, including CECONY, to grow. Our focus in supporting electrified transportation centers around availability of charging, affordability, and awareness. We are actively facilitating the growth of available charging infrastructure and preparing the electric system to support increased peak demand from EV charging. We continue to ideate on ways to influence the affordability of EVs and find cost savings for EV owners. Through our programs and advocacy, we are positioning ourselves as a trusted source and a reliable partner for market participants and customers.

We support foundational policies through 2030 that provide continued make-ready infrastructure for EV chargers enabling LDVs, and the expansion of make-ready infrastructure and other financial incentives for MHDVs and fleets. This will also require the continuation of New York Public Service Commission orders requiring utilities to develop charging management initiatives. We will improve EV peak demand projections and develop managed charging programs to better predict and manage the growth of electric peak demand caused by transportation electrification.

Table 9. 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

Future laws, regulations, and changes in vehicles and market factors are likely to influence EV adoption in our service area and our role in facilitating the development of charging infrastructure to accommodate EV adoption. Laws directed at original equipment manufacturers to achieve a certain level of zero-emission vehicle sales, directed at fuel distributors to meet a certain level of clean fuel sales, and directed 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.

Initiatives to Support Transporation Electrification

We maintain a demand-leading strategy[19] meaning a focus on proactively meeting customer peak 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** mean EV make-ready infrastructure, including on the customer side. 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.
- **Managed charging financial incentives** focus on reducing the impact of electric demand growth from EVs during peak times by rewarding avoidance of charging during peak hours and for charging during overnight hours. SmartCharge New York is our managed charging program, and it caters to all customer segments. This program can influence multiple behaviors such as discouraging on-peak charging and increasing off-peak charging, choosing locations to build chargers that have adequate grid capacity and where the local networks are not peaking when customers' operational charging needs are highest, and additional price signals to mitigate other grid constraints.

Over the next 10 years, we plan to invest 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 positive incentives to facilitate infrastructure buildout and enable private investment to transform and 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 our communities with the benefits of transportation electrification.

Additionally, we expect to grow our program offerings to better support MHDV fleet operations within our service territory. This effort will encourage electrification through make-ready investments and tools to support site and fleet assessments. CECONY will lead by example electrifying its own fleet.

We are also monitoring the marine and aviation sectors and the evolution of electric micro-mobility to support local and regional initiatives. The market for marine and aviation electrification is nascent, but it is expected to become an area of focus within 5 years. Micro-mobility offers a sizable variety of e-bikes and scooters today. Making these options more available to customers in areas that lack public transportation access will help us increase community access to clean transportation.

3.2.2.2 Drive Growth in Energy Efficiency

Buildings are a significant source of GHG emissions—approximately 26% of total GHG emissions within our service territory—making it a critical sector to address on the path to net-zero GHG emissions. Energy efficiency, electrification of building heating, and low-to-zero

[19] Further discussion on our demand-leading strategy can be found in our Electric Long-Range Plan

carbon gaseous fuels are at the center of our strategy to decarbonize buildings. We analyzed the barriers to decarbonization across different categories of buildings within our service territory, as indicated in Figure 15:

Figure 15. Barriers to Decarbonization and Building Heating Decarbonization 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 ***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	✓ 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 ***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
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		

For buildings that are prohibitively difficult-to-electrify, we will seek to support decarbonization with new connections to our steam system or the use of low-to-zero carbon gaseous fuels.

For every building type, deep energy efficiency continues to be a bedrock initiative to reduce end-use energy consumption, to lower our customers' recurring energy bills, and to achieve GHG emissions reductions goals. Energy efficiency further enables our building heating electrification efforts and increases the share of renewable energy on our system by reducing expected increases in total electric sales. Further, stemming peak demand through energy efficiency helps to offset the significant anticipated growth of our electric system from building and transport electrification and may reduce the need to expand our gas distribution system.

Additionally, well-designed energy efficiency can address the 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 emissions requirements such as those set forth in **Local Law 97**.

To further support energy efficiency, New York established a statewide goal of reducing customer energy usage by 185 Tbtu by 2025 with the New Efficiency: New York (NENY) order. These ambitious goals require increased energy efficiency savings through 2030 and beyond, with an increased focus on supporting low- and moderate-income customers. Under the NENY framework, we project to achieve 20 Tbtu of annual reduction by 2025, or the equivalent of the annual electricity usage of approximately 340,000 households—exceeding our cumulative NENY goal. We expect to dedicate approximately $1.4 billion in energy efficiency program funds across our market rate and low- and moderate-income customer segments through 2025.

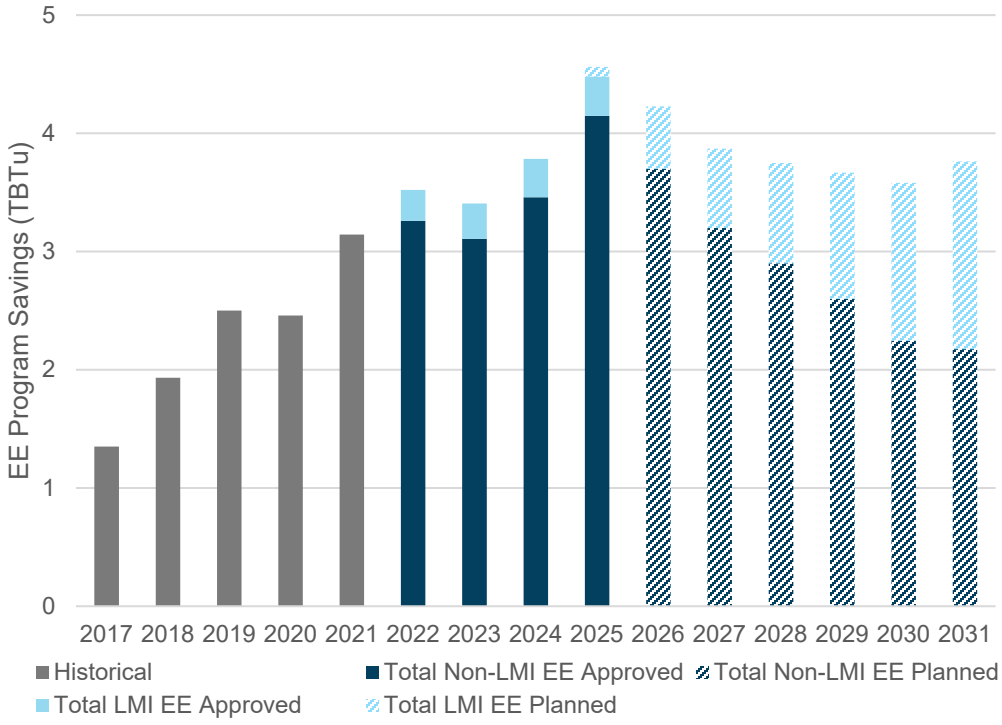
We need to support up to 40 Tbtu of cumulative annual end-use energy reduction through 2030, meaning a 20 Tbtu incremental increase in addition to what we are projecting. Incentives and policy support will be required to grow energy efficiency to achieve the end-use reduction. The current gap exists due to the following market challenges:

- Lack of awareness of energy efficiency opportunities
- Poor customer economics and price signals
- Lack of access to incentives and financing
- Technical barriers for customers and contractors

We aim to address gaps and grow the energy efficiency market by providing further financial incentives, technical support, and customer outreach. We will also continue to integrate energy efficiency into our system planning to lower societal costs across all categories of customers.

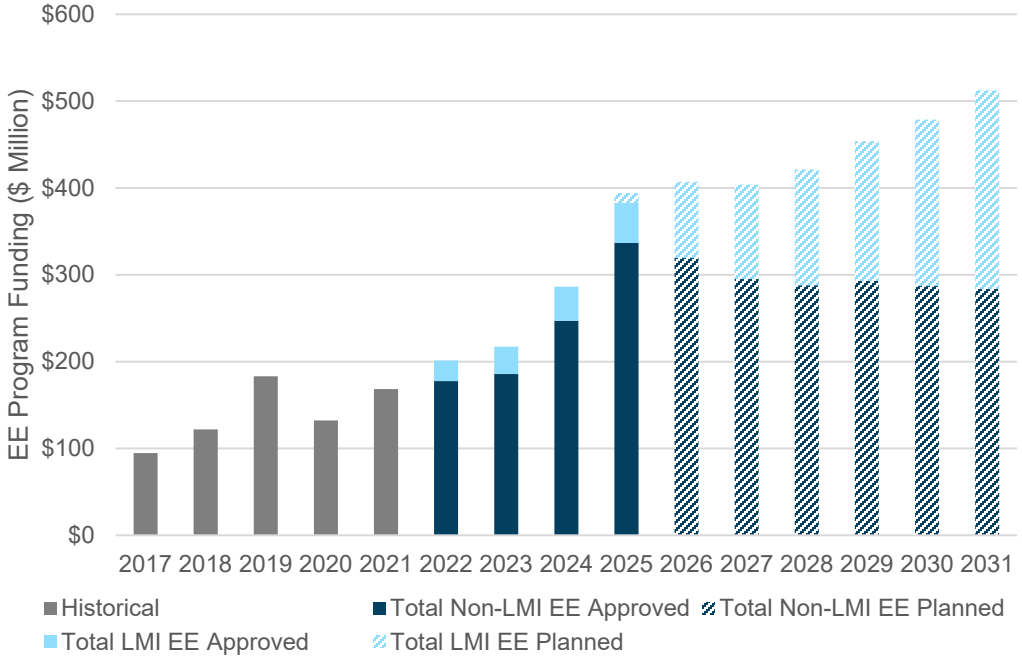
The projected savings and expenditures through 2025 are consistent with the System Energy Efficiency Plan that CECONY files annually. Figure 16 shows the projected energy efficiency program savings through 2031; Figure 17 demonstrates the level of additional support needed to achieve CLCPA savings goals from 2026 onward. Our programs to support customers are projected to become more efficient and make the increasingly complex upgrades needed as part of this clean energy transition.

Figure 16. Energy Efficiency (EE) Program Savings (2017 – 2031)



To achieve the 40 Tbtu goal, we will need an additional $2.1 billion in incremental budget across our market rate and low- and moderate-income programs to continue to fund programs going forward.

Figure 17. Energy Efficiency (EE) Program Funding (2017 – 2031)



Energy Efficiency Measures

Thus far, efficiency measures have primarily focused on converting existing incandescent, fluorescent, and compact fluorescent lighting (CFL) to LED. Moving forward, energy savings will need to come from building envelope, electrification, and controls in addition to gas and electric device efficiency. We are actively diversifying our energy efficiency portfolio away from lighting and have increased the share of acquired electric savings from non-lighting sources from 28% in 2019 to 56% in 2021. We have also identified a potential program to support steam customer energy efficiency. The decline in energy efficiency program savings for non-low- and moderate-income customers during the 2026 to 2031 period is due to market saturation of lighting and other mature energy efficiency measures (see Figure 16) . In response, we plan to dramatically grow the number and categories of our low- and moderate-income efficiency programs.

Specifically, the dynamics for each major efficiency measure category include:

- **Building envelope:** Building envelope upgrades include improving insulation, windows, and materials to reduce the amount of energy wasted to the outside environment. Building envelope programs have historically been challenging due to the need to retrofit significant portions of a customer's building, and prohibitively large upfront costs. This program will bring on new delivery challenges, as these complex projects require greater lead time and intentional project timing to align with renovations. These programs can offset some of the anticipated increases in electric peak demand because of building electrification. We expect to ramp up this program with incentives.
- **Controls:** Control upgrades help to automatically manage and schedule heating and other uses, reducing waste and improving customer comfort. Control upgrades can unlock further programs such as demand response using smart thermostats or preheating and precooling buildings to reduce GHG emissions during peak electric periods.
- **Gas devices:** Gas device upgrades include more efficient furnaces, water heaters, stoves, and boilers that require less gas consumption to achieve the same thermal output. Between now and 2030, we will shift to electrifying buildings. In the meantime, our gas energy efficiency programs will increasingly focus on measures that help existing equipment operate more efficiently like controls, repairs, or gas equipment upgrades for the buildings that are hardest to electrify.
- **Electric devices:** Electric device upgrades include more efficient electric chillers, pumps and motors, and refrigeration equipment. Given the rapid advances in electric device energy efficiency and the maturity of these measures, we do not see significant opportunity to keep operating these programs at scale over the long-term.
- **Lighting:** Lighting includes replacing interior and exterior light fixtures using older technologies such as incandescent and CFL with LEDs. Given the maturity of our LED lighting programs, we do not see a significant opportunity to continue operating this program after 2025.
- **Steam end use:** We are assessing the viability of a steam-specific energy efficiency program that will include various measures to directly reduce steam usage at our customer premises. We will evaluate the applicability of these programs and continue to develop them throughout 2022. Certain steam customers are eligible for incentives if they participate in controls or building envelope energy efficiency programs in the existing commercial and industrial program.

To better implement and target these measures, we are actively identifying and engaging high energy use customers who could see significantly positive outcomes from energy efficiency. We see these opportunities in market rate residential multifamily buildings, hospitals, schools, banking, and low- and moderate-income multifamily buildings. We are proactively identifying customers who will be undergoing major renovations or retrofits and timing upgrades along with these activities. We are also 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 electrification for customers and help to reduce electric peak demand impacts.

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 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- and 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. See Section 3.4.2.2 for more about our strategies to enable an equitable energy transition.

3.2.2.3 Decarbonized Building Heating

Buildings are a significant source of GHG emissions—approximately 26% of total GHG emissions within our service territory—making it a critical sector to address on the path to net-zero GHG emissions by 2050. Electrification of building heating, energy efficiency, and low-to-zero carbon gaseous fuels are at the center of our strategy to decarbonize buildings.

We see the largest opportunity to reduce GHG emissions in buildings in electrifying space and water heating. Beyond decarbonization, electric heat pumps also provide cooling and are up to 4 times more efficient than traditional fossil fuel heating devices. Electrified buildings also provide additional comfort and convenience benefits to our customers due to improved control and room by room zoning. We also see building electrification as a critical tool to reduce the use of natural gas.

Electrification of 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. There is a wide range of costs and technical challenges due to the distinct building stock in our service territory. In general, the building stock in our service territory can be divided into two 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, 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 the 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.

Achieving New York City and State clean energy goals depends on widespread adoption of building electrification upgrades. Within policy, there are some explicit goals set for building emission reductions such as New York City's **Local Law 97**, which sets forth a goal of reducing building emissions by 40% in 2030 and by 80% by 2050. By 2050, we project that most of our customers will adopt electric building heating or connect to our steam system. Low-to-zero carbon gaseous fuels may be a viable option for the most difficult-to-electrify[20] buildings.

To reach these 2050 outcomes, the adoption of space and water heating technology must be accelerated immediately. Through our pathway analysis (see Section 3.1), we estimate that approximately 10% of space heating and 18% of water heating needs to be electrified by 2030.[21]

We project the total financial support needed to enable CLCPA-aligned adoption through 2031 is between $5 billion and $7 billion. We plan to invest $337 million from 2020 through 2025 in space and water heating electrification upgrades through the NENY framework. This investment includes the $227 million that was authorized specifically for electrification in NENY as well as the transfer of additional funding from other budgets within the NENY framework. Further acceleration is needed by 2025 to continue developing the market, and our programs must be positioned to scale to meet the need. We will seek additional funding to support this acceleration. From 2026 to 2031, the need for financial support will continue to grow. Our programs will have an important role to play in delivering that financial support, but other funding

[20] 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.

[21] When measured by gross square feet of building area. Equivalent to electrifying the space heating of more than 150,000 buildings and the water heating of more than 200,000 buildings.

sources and policy will be required to meet the need. Figure 18 depicts the support needed to drive adoption through 2031, including our planned investment.

Figure 18. Electrification Financial Support (2020 – 2031)

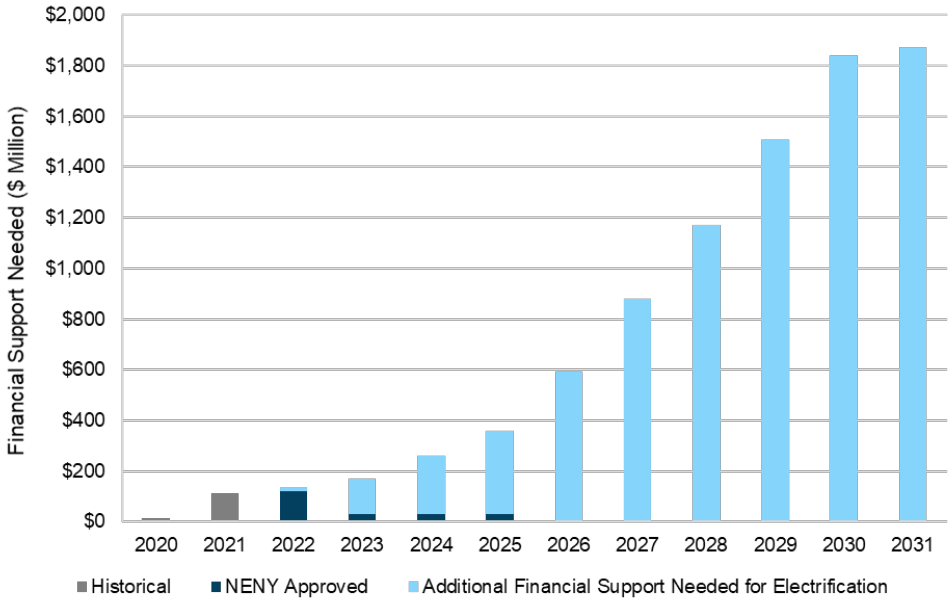
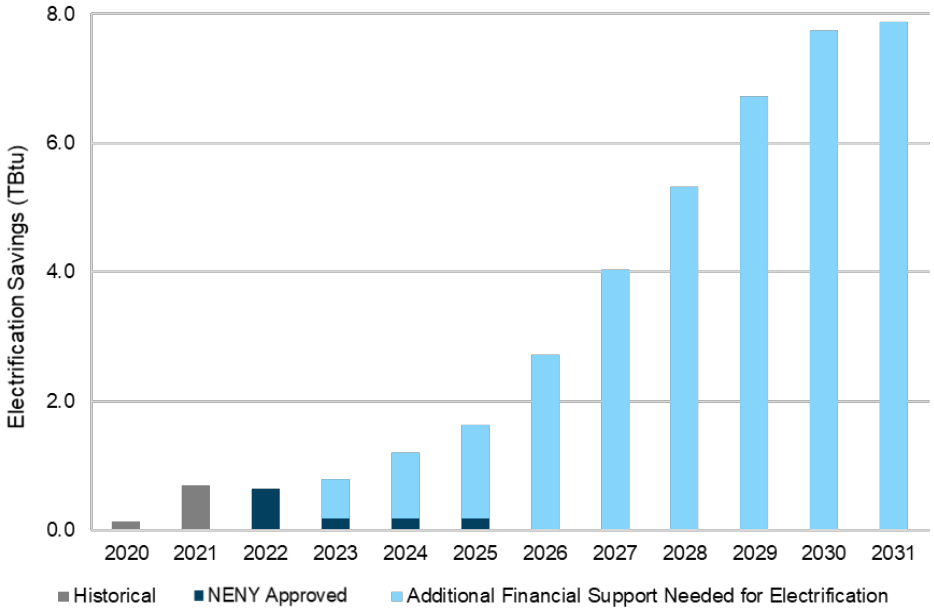


Figure 19. Electrification Savings (2020 – 2031)



Building Electrification Considerations

The building stock in our service territory is old, dense, and large, and our support with building electrification is a critical bridge to accelerating the path to net-zero GHG emissions by 2050. We plan to address the most common barriers to electrification to encourage adoption:

- **Upgrade economics:** As of today, few electric heating conversions generate positive monetary value to building owners without an incentive to offset installation or operating costs. We expect this to shift over the coming years as technology improves and costs decline.
- **Electrical upgrade requirements:** Building heating electrification upgrades can require expensive behind-the-meter electrical upgrades, further challenging upgrade economics and complicating retrofit projects.
- **Design and technical challenges:** New York City's building stock makes heating electrification a design and technical challenge, particularly in tall multifamily and commercial buildings. Typical challenges include limited space to locate outdoor equipment, limitations to the length of refrigerant lines, and the lack of options for direct in-kind replacement of central equipment, among other challenges.
- **Lack of awareness and consideration:** Customers frequently do not consider heat pump technologies as a solution to their heating need. Customers are often unfamiliar with the technology as a heating solution or end-of-life equipment failure results in replacement of like equipment. If a customer hires a professional to replace their heating system, that professional may not present heat pumps as an available option, further limiting the number of customers considering heat pumps.

Given the economic and technical barriers to electrifying all buildings in our service territory, we believe that the gas pipeline system will continue to play a complementary role as the market resolves uncertainties in technological performance, conversion cost, customer adoption, and other challenges. We also believe the steam system will continue to provide critical building heating services to customers in Manhattan and is a viable option for difficult-to-electrify building customers. Continued use of steam may help reduce increases in electric peak demand and its associated electric infrastructure and provide a transition option to oil and gas customers. Finally, as part of our overall Clean Energy strategy, we are researching the role that low-to-zero carbon gaseous fuels may play in the future of a decarbonized system.

Initiatives to Support Building Electrification

We have begun providing support for the adoption of building heating electrification technology by administering the New York State Clean Heat Statewide Heat Pump Program. This program provides financial incentives for heating electrification technology to customers to offset high upfront installation costs. The program also provides financial support for building envelope retrofits when paired with heating electrification to manage heating demand. Through this program, we have begun engaging with the market to develop strategies to overcome barriers to electrification. The continuation and expansion of this program and the financial support it provides will be critical to driving adoption.

We need to go further to achieve widespread electrification within our service territory and drive the transition. In addition to the continued delivery of customer incentives, our long-term priorities include the following:

- Creating a streamlined customer experience, from education to incentive programs and service upgrades
- Continuing coordination with and support of NYSERDA's efforts to:
    - Develop the skilled workforce necessary to deliver upgrades at the required pace and scale

  - Support technical innovations such as higher temperature for air-to-water heat pumps (to facilitate retrofits for high-rise buildings with water distributed heating), wastewater heat recovery, and district ground source systems (including loops)
  - Facilitate deployment of innovative third-party financing models
- Bundling electrification with building envelope upgrades to improve customer economics and mitigate the increase in peak electric demand
- Propose a building electrification make-ready program that helps customers afford the behind-the-meter electrical upgrades required to support building electrification [22]
- Addressing near-term capacity constraints on our transmission and distribution networks and supporting new service or service upgrades needed for increased building electrification
- Supporting regulatory change, including:
  - Protections for low-income customers who do not currently pay directly for heating such that landlords cannot shift these costs to tenants' electric bills
  - Compression of building permitting cycle for building electrification and envelope upgrades

Our strategy to accelerating heating electrification through 2030 is grounded in the realities of our service territory's building stock and the challenges that our customers will face in electrifying their buildings, as Table 10 summarizes.

Table 10. Roadmap for Building Electrification

	Horizon One (2021-2022)	Horizon Two (2023-2025)	Horizon Three (2026-2030)
Target Customer Segments	1 to 4 family homes, low-rise buildings Begin engaging multifamily and commercial buildings	Focus on growth from large multifamily and commercial buildings Focused engagement of longer lead time customers including condominiums and co-ops	Continued engagement and growth from harder to convert buildings or decision makers, including condominiums, co-ops, and rent-regulated buildings
Planned Financial Incentives	Use existing NENY incentive budget to accelerate heat pump conversions and prioritize building envelope and heat pump combined projects	Continue to support new electric service connections and expanding existing electric service connections Expand access to financing offerings	Continue proactively assessing future grid infrastructure based on penetration of heating electrification by area or neighborhood
Operations Focus	Launch customer outreach and partnership programs and improve access to financing programs	Streamline customer journey for incentives for larger multifamily and commercial buildings Work with city agencies to address barriers for rent-regulated buildings	Leverage successful electrification efforts to advocate for further conversion in more challenging segments

[22] We have existing programs to support new and expanded electric service connections at the customer site, which is further documented in our Electric Long-Range Plan. This proposed initiative would specifically focus on customers looking to electrify their buildings.

3.2.2.4 Enable Clean Energy Markets

Important stakeholders in the clean energy transition are third-party market participants, such as EV charging companies and HVAC service providers that connect customers to our energy supply. We are committed to supporting market participants in successfully offering their products and services and in expanding their reach in a meaningful way. For example, as customers become more engaged in their energy decisions, we are taking steps to facilitate a robust set of third-party service providers to join the energy efficiency market. We continue to engage market partners through such programs so they can best leverage our incentives, education, and tools.

Due to the economic and technical challenges of building heating electrification, we need to continue supporting a robust marketplace of contractors, service providers, and suppliers to scale up the market. Electrification of heating is feasible in most buildings, but the market has not adopted the technology at scale due to limited contractors with this skillset. In many buildings, existing conditions may increase the complexity and limit the frequency of electrification opportunities. We are pursuing pilots to better understand this complexity so we can build informed solutions that will support third parties in growing their market reach and help our customers adopt electrified heating.

We are also developing tools to help third parties more efficiently design and deploy clean energy solutions. For example, our hosting capacity tools help renewable energy, storage, and EV supply equipment developers to best site their projects. Similarly, improved application and interconnection processes can help get decisions and approvals to third parties.

Additional details on market enablement are described in Sections of 3.2.2 and in Section 3.2.2.4.

3.2.2.5 Prepare Electric Infrastructure for Electrification

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 the transformation in energy use. Our analysis projects an increase in electricity use as electric transportation and electric building heating grow dramatically over the next three decades. We anticipate summer system peak demand will grow by 35%-45% by 2050. Additionally, by 2035 we project our system will experience a winter demand peak exceeding the summer peak due to an increase in electric building heating. This will increase system peak demand 45%-85% by 2050. Hence, there will be a need to build new system capacity. We will use peak demand optimization, such as energy efficiency and demand management, to optimize the need for new capacity where possible. There will also be an increase in electric service connections required during the next 5-10 years to serve customers who adopt electric transportation and electric building heating.

In our **Electric Long-Range Plan**, we detail our efforts and strategies in preparing the electric infrastructure for electrification.

3.2.2.6 Reimagine the Gas System

We are reimagining our gas pipeline system, with a focus on reducing fugitive methane emissions & the use of fossil gas and supporting customers that are difficult or prohibitively expensive to electrify with low-to-zero carbon gaseous fuels. As part of this reimagining, we will

work with our customers to support building electrification, ongoing energy efficiency, and the transition to decarbonized steam where available.

In all pathways, we expect to see gas volumes decline. However, we project that our gas system will continue to play an important role in supporting our customers energy needs through 2030, and a supporting role between 2030 and 2050, as the energy transformation progresses. Maintaining the gas system provides various benefits such as lowering costs of the overall clean energy transition, providing fuel diversity, and effectively meeting reliability requirements of the entire bulk power system, as well as providing resiliency for individual buildings. We expect this value will continue well into the future.

Our ongoing initiatives, such as the MRP, will continue to reduce fugitive methane emissions, improve resiliency, and enhance safety and reliability through the short and medium term. We are also actively proposing a Certified Gas pilot to further reduce upstream supply chain fugitive methane emissions. We recently facilitated market responses for NPAs to continue serving customers with crucial building heating services without expanding our gas network. Further, we are exploring options and pilots for managing and operating the gas system using low-to-zero carbon gaseous fuels in a decarbonized future.

To make this re-imagined future possible, we continue to seek regulatory changes that eliminate our obligation to provide service/main beyond the statutory requirement for new gas connections, accelerate the depreciation of our gas assets to mitigate long-term customer bill impacts across the customer base, and regulatory frameworks that allow technological flexibility in achieving clean energy goals. For additional information, refer to our **Gas Long-Range Plan**.

3.2.2.7 Transform Our Steam System

We will continue to provide safe, reliable, and clean energy through our steam system over the long term, as maintaining and transforming the steam system supports decarbonization across our service territory. We will work closely with our gas and electric colleagues to appropriately target difficult-to-electrify building customers that would benefit from transitioning to steam from oil or gas. The steam system also strengthens New York City's energy resiliency, as it can offset peak electric demand.

We are also committed to transforming our steam system. This includes analyzing the potential of various technologies such as low-to-zero carbon gaseous fuels, electrification of steam boilers with clean electricity, and carbon capture and sequestration to decarbonize our steam production. We will continue to focus on cost-effectiveness by selecting the clean energy solutions that deliver the largest GHG emissions reductions for the lowest cost. We have identified ongoing initiatives such as our steam AMI rollout that will further enable us to build our clean and resilient steam system with a foundation of our core service. For additional information, refer to our **Steam Long-Range Plan**.

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 energy system. The critical risks identified to our energy systems are included in Figure 20 below.

Figure 20. 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 **Cold snaps** may cause an increase in peak heating demand	Water may **infiltrate** our infrastructure and cause damage to equipment	Storms may **physically damage** significant portions of our infrastructure

We have invested more than $1 billion to protect our customers against past storms such as Superstorm Sandy. The **Climate Change Vulnerability Study** highlighted the need to incorporate future climate projections when planning assets and designing our energy systems to address expected risks and to maintain the service that our customers demand in a changing climate. We have been working with our stakeholders to adapt to climate risks through our **Climate Change Implementation Plan** and applied our three guiding strategies (Figure 21) to address climate risks.

Figure 21. Strategies to Address Climate Risks

Prevent

Harden energy infrastructure and assets against **projected climate conditions** to **prevent outages**

Mitigate

Modify system design and flexibility to **mitigate disruptions** to customer service

Respond

Operational improvements to reduce recovery timeframe in **response to extreme weather**

The **Climate Change Implementation Plan** is a comprehensive plan to maintain and/or enhance the resiliency and reliability of our energy systems in a changing climate. It includes the application of a Climate Change Planning and Design Guideline to our specifications and procedures and management of this guideline 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 identified a portfolio of investments across our electric, gas and steam systems to prevent, mitigate, and respond to climate events. These investments are summarized in Table 11.

Table 11. Initiatives to Address Climate Risks

Prevent	Mitigate	Respond
• Unit **substation switchgear** flood protection • **Transformer replacements** to optimize fleet health and useful life • **Clean Energy Hub** projects • Gas **main replacement program** to replace leak-prone pipe	• Selective undergrounding of overhead electric lines • Interrupter **switches** to minimize likelihood of cascading electric failures • Installation of **gas remote operating valves** to isolate gas outages • Installation of **steam remote operating valves** to isolate steam outages	• Continue improving our **outage management system** to respond to outages more swiftly • Improvements to **operational programs** across electric, gas, and steam systems to reduce outage times through improved visibility, dispatch, and efficiency

Climate Change Planning & Design Guideline

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 $3 billion to support 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) that are integral to our ability to deliver energy to our customers during climate events. New York City's stormwater resiliency study[23] identifies areas of inland flooding where the drainage system becomes overwhelmed under projected storm conditions. We have steam, electric, and gas infrastructure throughout these areas, so we continue to coordinate with the City of New York on the impact of this study on our climate resiliency.

We will consider equity and environmental justice as a key tenet in determining investments and programs to serve our communities that are most vulnerable to climate change.

Additional detailed investments for specific systems can be found in the **Electric**, **Gas**, and **Steam Long-Range Plans**.

3.3.1 Prevent: Harden Energy Infrastructure

Hardening existing energy systems to withstand extreme weather events and prevent outages requires adding or replacing system components to prevent damage from future climate events (e.g., our gas MRP replaces old cast iron, wrought iron, and unprotected steel mains with upgraded piping thereby preventing water intrusion). To ensure timely investments, we have adopted a more forward-looking strategy to consider climate projections in our design standards. Examples of initiatives that target climate resilience include:

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

Electric: Transformer Replacements

Transformer replacements address known risks due to increased extreme climate 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 before the system will need to support both summer and winter peak demand.

Proactively replacing transformers enhances the resiliency of our system. More frequent and intense weather events are predicted to test the limits of our assets, simultaneously increasing asset fatigue. Our transformer replacement efforts mitigate the risk of asset failure due to extreme climate events.

Gas: Winter Load Relief (WLR) Program

The WLR program improves the safety, reliability, and resiliency of the gas system by ensuring that gas customers receive adequate pressure during winter peak demand periods, which usually occur during the coldest days of the year. If the system cannot meet this significant peak demand, it results in poor pressures, which can lead to customer outages.

Each year, we use models to identify areas of our gas system that will not meet pressure requirements on the coldest days. As part of this program, we reinforce the system to ensure reliable service and reduce the potential for pressure-related customer outages. This includes identifying the lowest potential pressure areas and targeting upgrades and work to get them above minimum requirements.

Gas facilities replaced under the WLR program promote resiliency as the replacement piping has greater ability to withstand water intrusion during flooding events. Additionally, increasing the pressure of our system further protects against water intrusion events as the outward pressure of the gas may shield against water intrusion within the pipeline infrastructure.

Steam: Trap Replacements

Steam traps across the system are being replaced with newly designed universal trap assemblies. These devices filter out condensate from the steam main, preventing outages by enabling better debris removal capability, while improving safety and reliability. Additionally, all traps will be replaced annually going forward.

3.3.2 Mitigate: Minimize Disruptions

When extreme weather impacts our infrastructure, we mitigate disruption to our customers with investments that bolster flexibility to safely isolate damaged infrastructure and provide redundant supply (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). Example initiatives include:

Electric: 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.

Electric: 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.

Gas: Remotely Operated Valve (ROV) Program

ROVs are installed at strategic locations to minimize potential impacts to the gas transmission and distribution systems, maintain supply to firm gas customers, and protect the public at large. The ROV program involves installing new ROVs or converting existing transmission valves to operate as ROVs. ROVs are installed to achieve rapid isolation of:

- A compromised section of the transmission system to minimize affected areas
- Strategic or vulnerable sections of the transmission system, specifically at river and tunnel crossings and at the outlet of gate stations.
- Mains feeding electric and steam generating facilities from our gas transmission system

The ROVs would significantly reduce the possibility of a widespread customer outage and would minimize collateral damage associated with a catastrophic event. Once the program is complete, the closure of any two consecutive ROVs will not negatively impact supply mains or the distribution system on an average winter day (20°F).

Steam: Main Valve Replacement Program

This initiative includes replacing valves that are used for isolating steam mains during outages so that work can be safely performed. If a valve is defective, additional valves must be closed for work to be performed, thereby increasing the affected area. This allows us to isolate specific areas of the steam system for repairs and maintenance thereby reducing the total impact of an outage and improving system reliability.

3.3.3 Respond: Reduce Recovery Timeframe

Rapid and comprehensive response to extreme events is paramount to providing excellent customer service. This includes improving our ability to comprehensively respond to outages from future climate events (e.g., our outage management system (OMS) upgrade that enables us to more quickly dispatch crews to respond to and repair an outage). Example initiatives include:

Integrated: 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, enabling swift and effective response.

We are undertaking an upgrade of our OMS[24] 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.

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 equipment repair and service restoration

3.4 Core Service

We understand that despite the many changes we must make to our integrated energy 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. CECONY must continue to provide safe, secure, and reliable energy while managing rate impacts and equity challenges. Highly reliable energy 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 delivered energy service we provide to improve their daily lives.

We will continue to enhance this core while managing costs, sharing benefits, and promoting the cost-effectiveness of the energy transition. We have defined sub-strategies to continue delivering safety, security, and reliability while supporting a managed transition (Figure 22).

Figure 22. Key Components of Core Service

3.4.1 Enterprise Risk Management

Con Edison 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.

[24] Additional details about our Outage Management System upgrade can be found in our IT Strategic Plan

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 integrated energy system. An overview of how ERM supports these goals is shown in Figure 23.

Figure 23. How ERM Supports CECONY Integrated Energy System Risk Identification

The ERM program is designed to focus on managing relevant and material risks to CECONY's 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. Organizations review newly identified and existing risks, assess the adequacy of the existing controls and mitigations in place to address these risks, and propose 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 Finance Planning and Analysis to develop dashboards that communicate the magnitude and allocation of risk mitigation expenditures to management.

Figure 24. ERM Framework

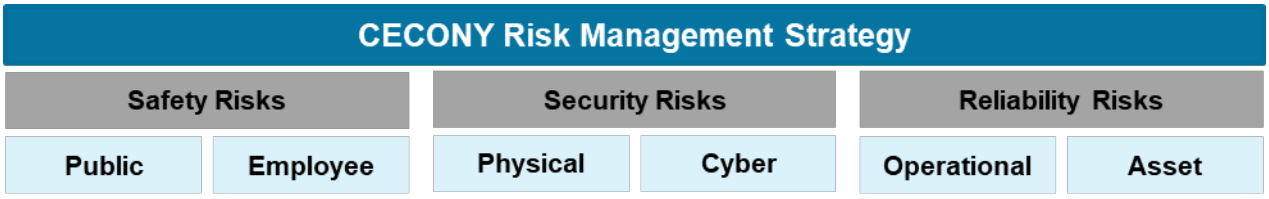
The composition of a company's corporate risk profile is reflective of its business mix, which largely consists of four categories: Safety and Environment, Operations, Strategic, and Regulatory and Compliance. CECONY's corporate risks include:

- **Cybersecurity:** A cyber-attack on, or a breach of, a company's IT systems can have a materially adverse impact on the company and its communities and customers.

- **Large-scale gas customer outage:** Wide-scale firm gas customer outages (including curtailments) result in potential public safety hazards and hardships for customers with substantial and lengthy service restoration efforts.
- **Loss of substation:** Loss of an electric transmission or distribution substation for 24 hours or longer, which may result in an immediate loss of service for customers, a lengthy customer outage, and a negative effect on the transmission and distribution systems.
- **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.
- **Steam main rupture:** A steam main rupture causing injury to the public or employees, impact to the environment, or significant damage to property.
- **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 risk management strategy is described in Figure 25.

Figure 25. Risk Management Strategy



3.4.1.1 Enhanced Safety

Our programs are designed to minimize adverse events for our employees and to promote public safety for our customers and stakeholders that interact with our systems.

- **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, electric shocks, and carbon monoxide releases. 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 a gas leak or downed power line(s).

Examples of specific safety initiatives include:

Overhead Emergency Response Program

The 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.

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 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 public, 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 (SOC). 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 SOC coordinates incoming security events with the appropriate response protocols.

Cybersecurity

Cybersecurity is one of the biggest risks businesses face today. It is an even bigger factor for businesses operating critical infrastructure and managing sensitive data. While utilities have avoided a catastrophic attack on the grid to date, cyber incidents and cyber-probing have increased for years and present a clear warning sign of the potential for future harm.

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 (multiple tools at each layer). IT Security intends to increase cybersecurity

capabilities by growing the cybersecurity organization, advancing new technologies, and increasing process maturity.

More data is available to the utility and its customers than ever, 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 needs to manage sensitive customer data, such as Personal Identifiable Information (PII) and financial information, to 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 integrated energy systems and includes both operational programs to manage the ongoing performance of our systems, as well as proactive asset management investments.

From an electric perspective, our customers expect a high level of system reliability, and we have the obligation to consistently meet that expectation. Based on our success in doing so, we 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 energy 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. We also rank the reliability of these distribution circuits by standard industry metrics so that we can identify and target the worst performing ones for remediation. A key service reliability metric includes 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 overhead distribution systems with targeted undergrounding underway. In the wake of 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.

From a gas standpoint, we have been managing acute supply challenges in Westchester County that led us to issue a new gas connection moratorium in the county in 2019. We have been able to maintain system reliability through a combination of measures, such as supply-side measures like our Liquified Natural Gas (LNG) projects and supported by demand-side measures such as building heating electrification, and energy efficiency.

We will continue to monitor both the success of supply-side and demand-side measures, including natural gas pipeline approvals and/or compressed natural gas projects, to determine if this moratorium could be lifted in the future. Currently, we do not have plans to add additional compressed natural gas to our transmission or distribution systems. Our ongoing reliability programs include the following:

Supply-Side:

- Proactive, risk-based replacement of existing infrastructure, such as gas distribution pipe through our MRP, WLR, Gas Reliability Improvement Program or Transmission Replacement Programs.
- Ongoing upgrades and maintenance of LNG, and other facilities
- Upgrades on our regulator stations

Demand-Side:

- Building heating electrification (e.g., our “Clean Heat” program)
- Energy efficiency
- Gas demand response

Recently, our regulators have initiated a gas planning proceeding[25] that prompts gas utilities to consider alternatives to traditional infrastructure while continuing to deliver energy to customers safely and reliably. Additionally, this proceeding proposes new rules for gas connection moratoriums. Our current gas reliability strategy reflects many of the considerations discussed in the proceeding, such as the use of NPAs, and rate design to address gas supply and/or gas distribution system constraints. We are currently awaiting additional feedback but will work closely with our regulators to plan our system accordingly.

From a steam standpoint, we are proud of our commitment to ongoing system reliability. Many of our core programs are focused on continuing to maintain high levels of reliability by maintaining our system, training our staff, and monitoring the system continuously.

Examples of specific steam system reliability initiatives include:

Steam Main Assessment and Inspection Program

As part of the Steam Flatiron Action plan, the Steam Operations and Engineering Teams have developed a Steam Main Inspection and Assessment Program. The assessment portion of the program uses existing system information to determine if there are any vulnerabilities in the steam distribution network. If areas of concern are identified, visual internal pipe inspections are conducted using a specially designed steam pipe inspection robot. These inspections are reviewed and evaluated by the Engineering Team. Since 2019, the team has inspected 4,923 feet of steam mains. In 2021, the group inspected 2,497 feet. In addition to inspections, the Assessment Team has determined that pre-1906 piping should be replaced due to the lower strength of the material used at the time of construction. The Operations Team is in the process of replacing these sections of piping with six replacement locations completed and three additional pending.

Smart Robot

A steam main inspection robot was developed to perform internal visual inspection and measure remaining wall thickness in steam pipes. A pairing software was also developed to operate the

[25] Official proceeding documents are available **here**

robot and perform qualitative analysis of the inspection data. The smart robot enables routine detailed steam pipe inspections, improving system safety, and providing better customer service by informing customers of steam conditions.

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 customers and stakeholders.

3.4.2.1 Manage Rate Impacts of the 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 currently operate a set of programs that provide clean energy benefits to our low- and moderate-income customers. We propose to continue funding, expanding, and introducing new programs to provide the benefits of a clean and resilient energy system to all our customers.

Low-Income Renewable Bill Discount Program

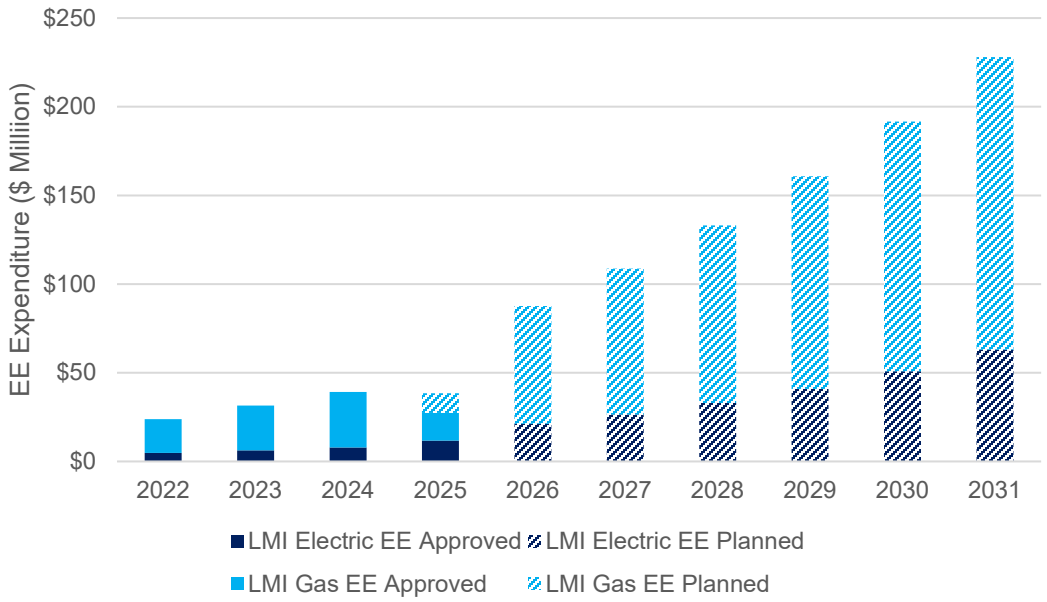
In the current rate case, we are proposing to acquire utility-scale solar through competitive solicitations; this solar will be used to reduce the energy burden on our low-income electric bill discount customers. It is vital that low-income customers are included in the energy transition.

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 projects will enable us to increase funding for the low-income bill discount program.

Low- and Moderate-Income Energy Efficiency

For low- and moderate-income customers specifically, we will seek to further engage with affordable housing associations, the largest affordable housing owners, and other community organizations to spread awareness of our programs to owners and tenants. We will also seek to provide decision makers, including tenants and owners, with the right information to make choices that support greater energy efficiency. We see a huge benefit from energy efficiency for this cohort and significant potential to increase savings, as buildings that house low- and moderate-income tenants tend to be higher emitting and less efficient. As such, we aim to significantly increase low- and moderate-income energy efficiency expenditure through 2031 (see Figure 26).

Figure 26. Low- and Moderate-Income Energy Efficiency (EE) Expenditure (2022 – 2031)



We see four aspects to growing energy efficiency achievement for low- and moderate-income 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

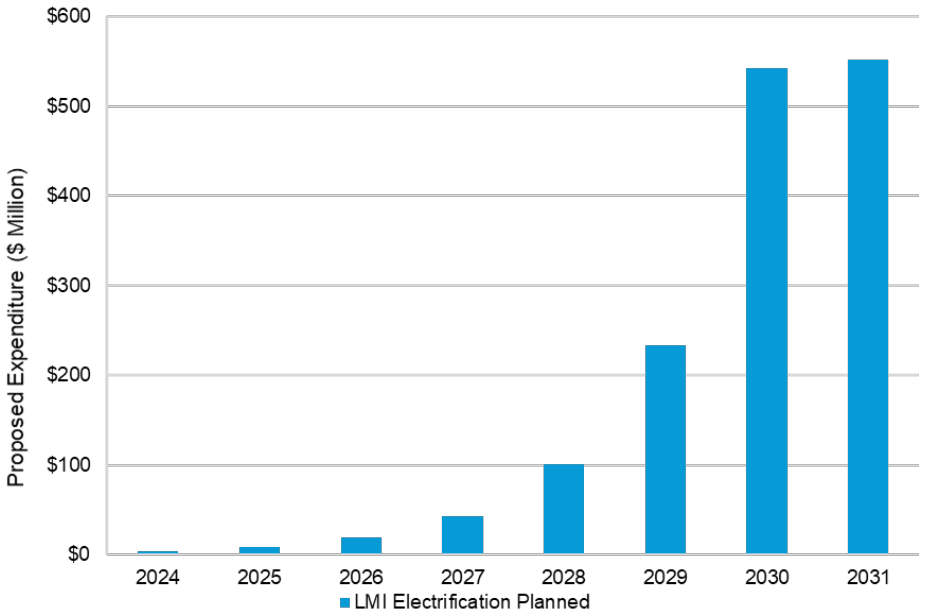
tenants they serve. We seek to engage affordable housing stakeholders and regulators to find long-term solutions that create clear pathways for owners to make efficiency and electrification upgrades while protecting low- and moderate-income tenants from owners shifting the costs to tenants.

We are also committed to extending these programs to disadvantaged communities and developing new programs to align with the CLCPA goal of achieving 35%-40% benefits for disadvantaged communities.

Low- and Moderate-Income Building Heating Electrification

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 will be necessary going forward both to decarbonize our energy system and to equitably provide benefits of the clean-energy transition to our low- and moderate-income communities. We also believe that we will need to extend these programs to disadvantaged communities when those have been officially defined. Our proposal includes a rapid scale-up of this program (if approved) starting in 2024 (Figure 27).

Figure 27. 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 **Gas Long-Range Plan**, and in Section 3.2.1.2 of this plan.

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 our 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 the customer with the data and tools to make informed energy choices, and to further integrate the customer journey across our electric, gas, and steam businesses. We strive to connect our customers with the latest, most intelligent technology so that they can reap the benefits of

greater access to 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 also better develop grid management tools.

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 customer relationship management and customer service system 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. Examples of these customer experience initiatives are included in Table 12.

Table 12. Examples of Ongoing Customer Engagement Initiatives

Customer Engagement Initiative	Description	Value Delivered
Customer Surveys and Metrics	Issuing surveys and metrics such as our customer satisfaction survey and reviewing external metrics such as J.D. Power and App Store reviews	Helps us to better understand how customers view us and what we can do to improve the customer outcome and user experience
Customer Journey Mapping	Mapping end-to-end interactions that the customer has with our systems, people, and processes	Enables us to empathize with the interactions that our customers have with us so that we can improve the end-to-end experience
Energy Efficiency Marketplace	Online Energy Efficiency Marketplace that provides low-cost energy efficiency solutions to a variety of our customers	Provides customers with low-cost energy efficiency solutions via an easy-to-use platform to help them save money and live cleaner
Customer Relationship Management Upgrade	Software upgrade that enables us to view customer data and interactions across experiences	Gives us the ability to aggregate important customer data points and develop a holistic understanding of each customer's needs and programs best suited to them
Customer Service System Upgrade	Significant software overhaul of our customer-facing service system that includes billing, credit and collection, payment processing, call center, and self-service activities	Improves our ability to capture granular customer energy usage data, enables us to roll out different rate structures more quickly, and more responsive handling of customer data requests
Customer Education and Empowerment	Companywide customer education program that provides useful information on energy options including key facts on technology, availability, and costs and offers monthly customer seminars to educate customers on topics such as safety and maintenance	Improves customer knowledge about clean energy solutions, including transitioning from building oil heating to steam or electric, and empowers customers to make informed energy choices

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 adopting lower carbon products and services. Potential points of friction include the following:

- Lack of knowledge or information about clean energy solutions, such as heat pumps
- Significant upfront cost for energy efficiency and building electrification retrofits
- Lack of contractors to perform energy efficiency and building 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 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 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.

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

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. In the next 10 years, our plans put us on track to achieve 40% GHG emission reductions from 2005 levels by 2030, and on the path to achieving net-zero GHG emissions by 2050. 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.[26] Additionally, various forums point to the significant number of green jobs that will be created through achieving clean energy goals. Examples of 10-year investments to be made across sectors are shown in Table 13.

Table 13. Representative Investments to Deliver Value Across Sectors

Strategy	Sector	Examples of value being delivered	10-year adoption	Planned 10-year investment
Transform the energy supply	**Renewable electricity**	**Transmission**	Enables Interconnection of up to 6 GW of offshore wind & Retirement of up to 1.5 GW of peaker plants	$6,000 M
		Utility-owned solar	1 GW	$500 M
		Utility-owned storage	1 GW	$1,100 M
Enable a fundamental change in energy consumption	**Transportation**	**LDV chargers**	40,000 – 50,000 Level 2 and DCFC	$1,500 M
		MHDV chargers	10,000 – 15,000 Level 2 and DCFC	$1,700 M
	Buildings	**Energy efficiency (including low- and moderate-income)**	40 TBtu	$3,500 M
		Low- and moderate-income	7 TBtu	$1,200 M
		Electrification of space heating	6 – 10% of floorspace	$5,000 M – $7,000 M
		Electrification of water heating	15 – 20% of floorspace	
Climate resilience	**Resiliency**[27]	**Temperature variable (TV)**[28]	+1 TV	$470 M
		Sea-level rise	FEMA +5	$600 M
		Max temperature > 95°	11 days	$700 M
		Extreme events (undergrounding)	Initially 3 pilot locations	$900 M

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

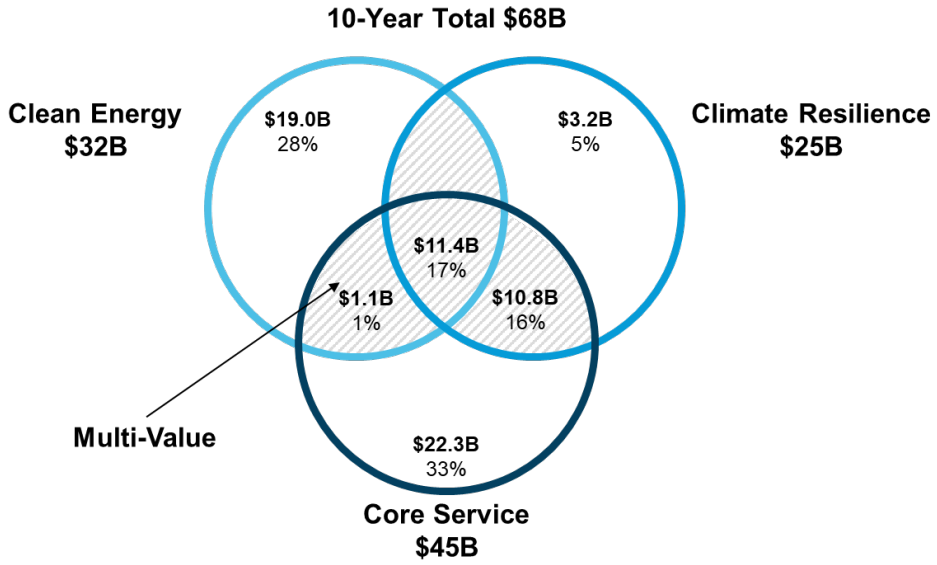
[27] Incremental investments associated with climate variables.

[28] It is common practice in the industry to consider temperature and humidity together in the peak 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.

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 help prevent outages, minimize customer impact, and restore service faster in the event of an outage. Our core programs will provide continued safety and world-class reliability, in addition to being more operationally efficient. At the customer level, our programs will improve customer experience and engagement.

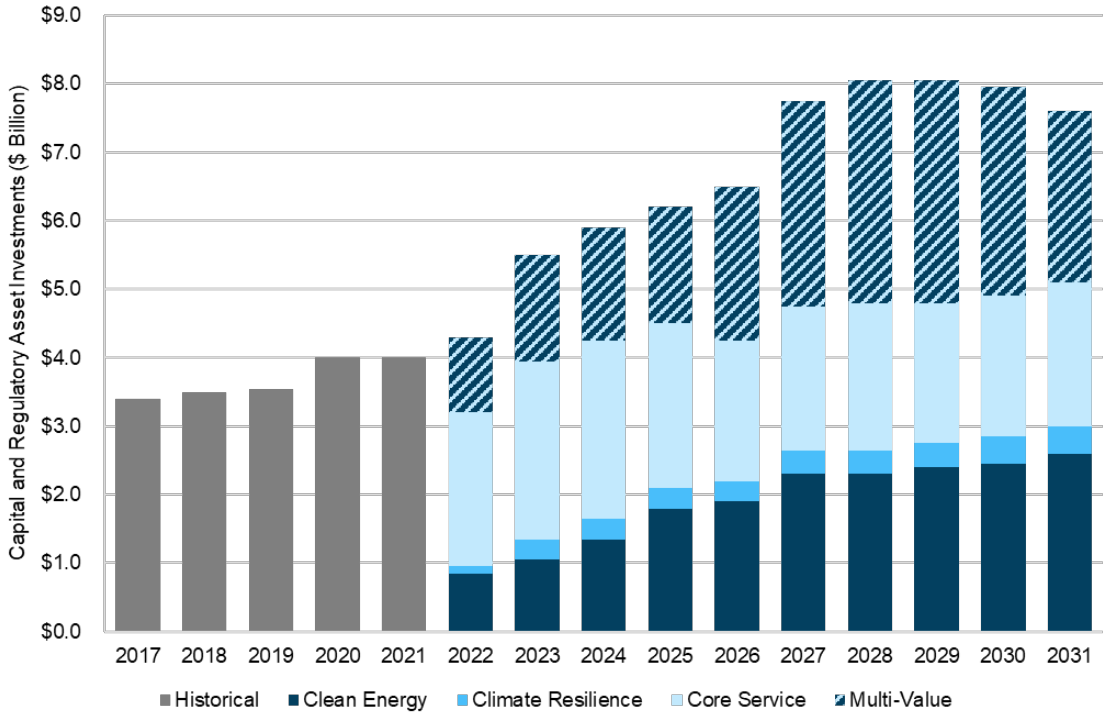
To unlock these benefits and achieve policy goals and customer needs, we have identified Clean Energy, Climate Resilience, and Core Service investments required over the next 10 years. Approximately $45 billion of investments will deliver value to core services, including our customer experience, IT, and risk reduction programs. About $32 billion of investments will deliver value to clean energy objectives, primarily driven by our energy efficiency, electrification of building heating, and clean transportation programs. Roughly $25 billion will support climate resilience objectives, such as selective undergrounding, upgrading to submersible equipment, and enhancing overhead reliability. Nearly $25 billion of these investments provide benefits to more than one category, therefore our total investment plan over the next 10 years is $68 billion (Figure 28).

Figure 28. CECONY 10-Year Capital and Regulatory Asset Investments by Category



We include our expected capital expenditures through the next 10 years in Figure 29. 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.

Figure 29. CECONY Annual Capital and Regulatory Asset Investment by Category



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 overall revenue requirement—a proxy for overall customer costs—by approximately 8% per year through 2031.[29] This cost estimate is based on assumptions that can change and excludes such items as deferred costs that CECONY 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; 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 1.0% of regional gross domestic product today to 1.3% in 10 years.

To mitigate cost 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.

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

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 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 more discussion of programs for low- and moderate-income customers in Section 3.4.2.

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 peak 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 customers' 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.

Rate design for gas and steam service should also be based on the costs to support customer use of these systems. Such rates should provide customers with price signals that promote efficient use of the delivery system and slow rising system costs. To make gas rates more cost reflective, CECONY is planning to gradually phase out the use of rates that decline with increased usage.

Additional information on investments and value delivered can be found in the **Electric**, **Gas** and **Steam Long-Range Plans**.

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 need to act now.

Our Long-Range Plans detail the actions across our integrated, electric, gas, and steam systems that will help us accomplish our goals. 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

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

- Continued **operational improvements**
- 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 peak demand and potential for underutilization of assets

We understand the importance of our energy services and embrace the immense responsibility of enabling the daily lives of the communities we serve. Ensuring our customers have safe and reliable energy to light their streets, commute on a train or subway, power their appliances, heat and cool their homes, and run their businesses is a source of pride for our company and our employees.

The clean energy transition requires cooperation, collaboration, and innovation from different parties and market participants. We will enhance our collaboration and interactions with our customers and stakeholders to accelerate the energy transition in a cost-effective, equitable, and timely manner. This includes:

- Advocating for **policies that address societal goals** in ways that partner the strengths of a regulated utility with the capabilities of the market to create choice for customers
- Pursuing **energy solutions that are cost-effective** and mitigate complexity for our customers
- Continuing to support **rate reform** that promotes **customer choice**

- Continuing to **engage key stakeholders** and seek their alignment with our strategic objectives, plans, and investments.

We acknowledge there is more work to be done with respect to equity and environmental justice. We are committed to evolving our programs and will also reach out to environmental justice groups and other stakeholders as we grow and learn from work in these areas.

We actively consider uncertainty in industry and societal trends (policy, technology, and customer adoption). To account for this uncertainty, we look to our pathway framework that allows for flexibility to stay on track to achieve net-zero GHG emissions by 2050. Signposts within these drivers 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** electrification or **strongly discourage** fuel combustion 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 densely populated urban centers	**Electric building heating technology** and **low-to-zero carbon gaseous fuels** decline in cost and improve in quality 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 goals and may continue to develop future legislation. Accordingly, the company's long-range plans and analysis are based on 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 know this new phase of the energy transition is a challenge, but we have evolved many times before. We are proud to have been there for New Yorkers for multiple generations and will continue to be there for our customers and stakeholders throughout this transition.

Our Long-Range Plans represent a major step forward in our continued commitment to meeting societal goals and our customers' expectations. We are acting now to deliver on our comprehensive utility strategy and to support New York's energy and policy goals. We look forward to working with our many stakeholders, regulators, customers, and constituents to bring

this future into reality. Our energy system-specific plans, including the **Electric**, **Gas**, and **Steam** **Long-Range Plans**, provide additional details about the initiatives that support our strategic objectives within each commodity.

Acronyms and Abbreviations

ADMS: advanced distribution management system(s)

AMI: advanced metering infrastructure

Btu: British thermal unit(s)

CAGR: compounded annual growth rate

CECONY: Consolidated Edison Company of New York, Inc.

CFL: compact fluorescent lighting

CLCPA: Climate Leadership and Community Protection Act

CMA: Climate Mobilization Act

DER: distributed energy resource(s)

DERMS: distributed energy resources management system(s)

DG: distributed generation

EPRI: Electric Power Research Institute

ERM: Enterprise Risk Management

EV: electric vehicle

GHG: greenhouse gas

GIS: geographic information system

GW: gigawatt(s)

GWh: gigawatt hour(s)

HVAC: heating, ventilation, and air conditioning

IT: information technology

kV: kilovolt

LED: light-emitting diode

LDV: light duty vehicle

MHDV: medium- and heavy-duty vehicle

Mlb: million pounds of steam

MMBtu: million British thermal unit(s)

MMT: million megatons

MMtCO2e: million megatons of CO2 equivalent

MRP: main replacement program

MW: megawatt(s)

NENY: New Efficiency: New York

NYSERDA: New York State Energy Research & Development Authority

OSHA: Occupational Safety and Health Administration

PACE: Property Assessed Clean Energy (financing)

PV: photovoltaic

RNG: renewable natural gas

SCADA: supervisory control and data acquisition

SNG: synthetic natural gas

Tbtu: Trillion British thermal unit(s)

US: United States

ZEV: Zero-emission vehicle

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