conEdison, inc.

Long-Range Plan

Our Gas System

A Comprehensive View of Our Gas 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

The Consolidated Edison Company of New York, Inc. (CECONY) operates a gas transmission and distribution system in New York City and Westchester County. This system delivers critical building heating, cooking, and backup power generation services to over 1.1 million customers and supports our overall energy system by providing fuel diversity and source fuel for our dedicated steam plants, electric and steam cogeneration plants, and other local power plants owned by third parties.

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

Customers and stakeholders expect greater comfort, convenience, choice, and control in all aspects of their lives, including energy solutions. Climate change is leading to severe weather and increasing the potential for extreme weather events such as devastating Nor'easters and dramatic cold spells. In response, New York State and New York City want to achieve net-zero greenhouse gas (GHG) emissions by 2050 through policy and market enablement as well as supporting resilience efforts to prepare energy production and delivery systems for a changing climate. At the same time, technological improvements are expected to cause rapid building heating electrification and improve the viability of low-to-zero carbon gaseous fuel alternatives to fossil natural gas. The world is also paying close attention to equity and environmental justice matters. Many of our customers and stakeholders want action now.

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

Specifically, this commitment calls for us to **reimagine our gas system.** 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)

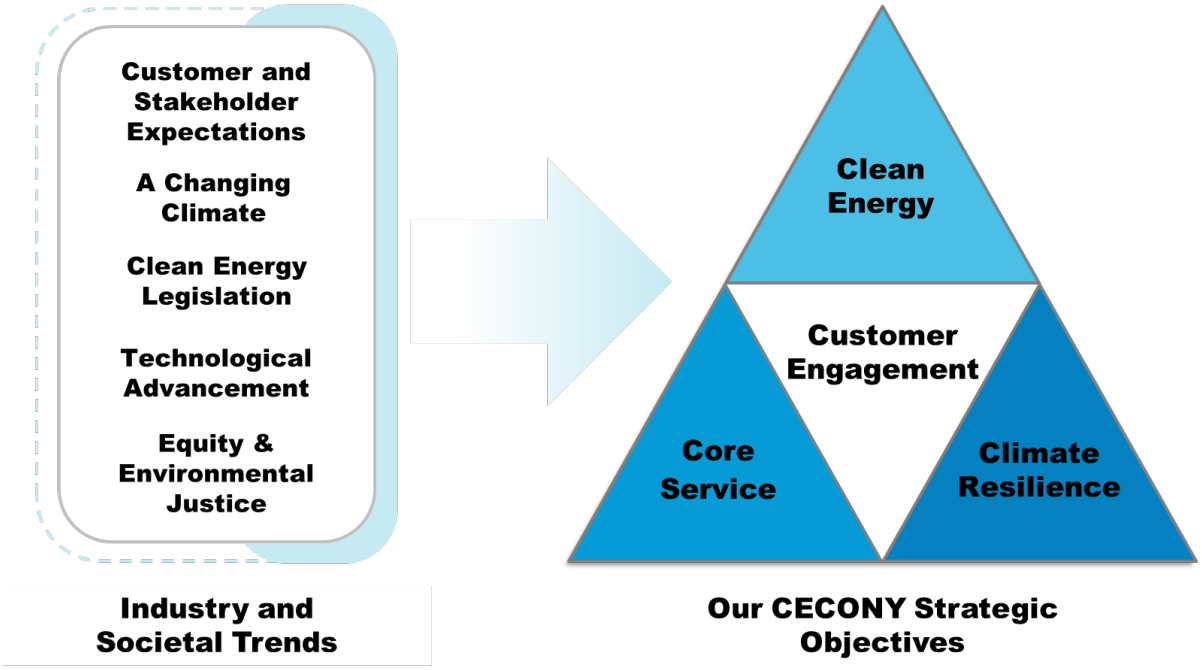
- Prudently investing in a low-to-zero-carbon gaseous fuels portfolio to serve those customers that are the hardest to electrify and preparing our energy delivery system for that narrower purpose

- Managing rate effects of the transition by proposing to accelerate the depreciation of our gas assets to mitigate long-term customer bill impacts

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

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

Figure 1. Industry and Societal Trends Influence Our Strategic Objectives



To deliver on these strategic objectives, we anticipate investing approximately $13 billion over the next 10 years. Beyond 10 years, we will need to continue to invest in our system to ultimately achieve net-zero GHG emissions economy-wide in our service territories by 2050. Given some degree of uncertainty in the trajectory of technology, policy, and customer adoption, we will build flexibility into our planning and in future long-range plans.

Considering this uncertainty, we studied several scenarios to reach net-zero GHG emissions by 2050. We then selected three pathways that inform our decarbonization strategy and that

represent a range of possible solutions. The pathways depict energy futures ranging from full electrification (including building heating and transportation) to a mix of electrification and low-to-zero carbon gaseous fuels, such as renewable natural gas (RNG) and hydrogen. Each pathway relies on significant increases in clean power generation, adoption of energy efficiency, and a transition away from fossil fuel use to clean electricity or low-to-zero carbon gaseous fuels in buildings and transportation. Our strategy and plans maintain optionality and flexibility based on signposts (indicators to ramp up or down specific programs or actions based on technological or policy developments) to achieve the future value our societies, communities and customers expect. Each of these pathways is detailed in Table 1.

Table 1. Representative Pathways

	Full Electrification	Targeted Electrification	Hybrid Consumption
Building Heating	Renewable electricity and decarbonized steam serve 100% of the building stock in our service territory, and the distribution system is decommissioned.	Renewable electricity and decarbonized steam serve between 70% and 80% of the New York City building stock with targeted full electrification zones and use of low-to-zero carbon gaseous fuels for remaining heating needs.	Renewable electricity and decarbonized steam serve between 50% and 60% of the New York City building stock; the system uses low-to-zero carbon gaseous fuels to support difficult-to-electrify[1] buildings.
Gaseous Fuel Usage	170 TBtu of gaseous fuels are used for electric and steam generation (100% low-to-zero carbon); no gaseous fuels are used for buildings as the distribution system is decommissioned;	250 TBtu of gaseous fuels are used across all sectors (100% low-to-zero carbon).	296 TBtu of gaseous fuels are used across all sectors (70% low-to-zero carbon).

In all pathways, we expect our gas volumes to decline and will plan system needs accordingly. 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.

These representative pathways help us understand what investments are prudent no matter what the future holds, such as initiatives to accelerate energy efficiency, electrify buildings where cost-effective, swiftly reduce fugitive methane emissions, and research and pilot new technologies (such as a low-to-zero-carbon gaseous fuels portfolio) as they become viable and necessary in the future to achieve net-zero GHG emissions by 2050.

As a regulated utility, with a customer-first business model that allows us to provide services and solutions to our customers at a reasonable cost, we are well-suited to make these investments. In the nearly two centuries we have operated our gas distribution system, we have

[1] Our definition of difficult-to-electrify buildings includes 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.

evolved our business multiple times to continue serving our customers with safe, secure, and reliable energy while mitigating cost increases in the face of industry and technology changes.

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

We are experienced and well-positioned to support our customers and provide value throughout the clean energy transition, but we cannot do it alone. We will collaborate with customers, regulators, policymakers, capital providers, and other stakeholders to partner in achieving this future with the principles of equity and environmental justice in mind.

Clean Energy

New York State and New York City legislators have passed nation-leading legislation—**the Climate Leadership and Community Protection Act** (CLCPA) and the **Climate Mobilization Act** (CMA)—that target economy-wide net-zero GHG emissions by 2050.

The objectives of this legislation align with our own views, informed by industry trends and customer expectations, toward a clean energy future. By reimagining our system, we can reduce the consumption of fossil natural gas and use our existing energy delivery infrastructure to support this legislation and our goals. We have developed a strategy to help achieve net-zero economy-wide GHG emissions in our service territories by 2050. Our clean energy strategy and related system initiatives are detailed in Figure 2.

Figure 2. Gas Clean Energy Strategies

Transforming the Energy Supply		Enabling a Fundamental Change in Energy Consumption	
Reduce methane emissions across the value chain	Build a low to zero-carbon gaseous fuels portfolio	Drive growth in electrification and efficiency	Slow the growth of the gas customer base
Immediate investments in methane emissions reduction programs, pilot investments in certified gas, and short to long-term investments in our main replacement program	Pilot investments in low and zero-carbon gaseous fuels, including research and analysis on synthetic methane, RNG, and hydrogen	Immediate investments in heat pump incentives and energy efficiency, short-to-medium term investments in addressing electric system capacity	Advocate for the elimination of our obligation to provide service or main beyond the statutory requirement for new gas connections

Transforming the energy supply means making prudent investments in both downstream and upstream methane emissions reductions programs, including our MRP and proposed pilot to procure Certified Gas. Prudent investments also include continuing our research and analysis of how low-to-zero carbon gaseous fuels may be implemented at scale throughout our system,

and how we could build a portfolio of these fuels to support those of our customers that will be difficult to electrify.

Enabling a fundamental change in energy consumption means supporting the electrification of fossil fuel building heating, while supporting our difficult-to-electrify customers with low-to-zero carbon gaseous fuels. This means continuing our support of gas energy efficiency programs to reduce our customers energy usage. This also means building out a network of skilled resources, advocating for the appropriate incentives, and enabling the market to further facilitate customer adoption of clean energy solutions.

Climate Resilience

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

- **Heavy precipitation:** Heavy precipitation can cause water intrusion into our gas lines, disrupting service
- **Sea level rise and storm surge:** Sea level rise and storm surge can likewise cause water intrusion into our gas lines, disrupting service
- **Cold spells:** Dramatic cold spells can cause a significant increase in peak demand, potentially exceeding the supply available from our upstream providers
- **Extreme weather events:** Events such as hurricanes, tornadoes, and Nor'easters may disrupt service lines through rapid water intrusion

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

Prevent: Harden Infrastructure

- Enhancing 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.
- Evaluating and continuing to retrofit existing infrastructure to enhanced design standards, including through our MRP, which upgrades leak-prone pipe in flood prone areas.
- Providing customers adequate pressure during winter peak demand periods, including through our Winter Load Relief (WLR) program.

Mitigate: Minimize Disruptions

- Deploying remotely-operated valves (ROVs) at strategic locations to minimize potential impacts and protect the public at large.
- Upgrading our liquid natural gas (LNG) plant including upgrading equipment to meet new emissions standards and support further decarbonization.

Respond: Reduce Recovery Timeframe

- Updating our outage management system (OMS) and network of advanced metering infrastructure (AMI) to improve our visibility and ability to respond to events quickly and comprehensively.

We also anticipate that our system will continue to support resiliency for those customers with on-site backup power generation during more extreme weather and its fallout. We will continue to invest in our system to support energy delivery during those critical moments.

Core Service

We understand that, despite the many changes we will need to make to our system to adapt to climate change and to support net-zero GHG emissions goals, we have a legal obligation and a core foundational role in meeting the heating, cooking, and other essential needs of our existing customers. In the near term, we expect that the delivered energy provided by fossil natural gas will continue to be critical for a significant segment of our customers. In turn, we must maintain the rigorous safety and reliability standards our customers and our society have come to expect. Longer term, we are committed to managing this transition for customers and evolving our core service to meet our customers' expectations. The key components of our Core Service strategic objective are included in Figure 3.

Figure 3. Key Components of Core Service

Enhanced safety continues to be a top priority no matter what the future holds. Accordingly, we have several initiatives, including a first-of-its-kind natural gas detector (NGD) program, where we are installing these devices at the point of entry to the customer premise and they automatically notify us if there is a gas leak. We employ best-in-class practices for emergency response to odor calls and leak management. Through our MRP, we will replace leak-prone pipe with more resilient materials, further improving system safety and reducing fugitive methane emissions.

Enhanced security is critical as we transition to a more digitally enabled energy delivery system. We have a dedicated cybersecurity team that identifies, prevents, and mitigates cyber threats from internal and external sources. We have also installed physical security measures at critical sites to prevent unauthorized entry and to allow for early detection if there are breaches in the security perimeter of these facilities.

Enhanced reliability is a baseline expectation. We have acute gas supply challenges that we are managing actively through our Westchester gas moratorium and that are supported by various supply-side investments. This includes LNG investments to secure supply during peak demand periods. Demand-side investments, such as building heating electrification, ongoing

energy efficiency, NPAs, and demand response support our ability to deliver energy to customers reliably.

Managing the rate impact of the transition is imperative to make this clean energy transition equitable for all our customers. We have a bill discount program aimed at reducing the energy burden for our low-income gas customers. As we reduce the use of fossil gas on our system, we are exploring ways to mitigate long-term rate impacts, including beginning the adjustment of depreciation of our gas assets to not overburden future customers**.**

Enabling an equitable transition means making sure that historically disadvantaged communities are not disproportionately burdened by the energy transition and that they can receive the benefits of clean energy. Accordingly, we are actively pursuing programs to reduce cost barriers for building heating electrification and gas energy efficiency for buildings that house low-income tenants. A reimagined gas system supports this goal by enabling low-to-zero carbon gaseous fuels delivered through resilient pipeline infrastructure to those who otherwise would not have access to clean energy.

Investing in our diverse, inclusive, and talented employees is central to our success. Investing makes our company stronger and helps us lead the industry on every level, from maintaining our best-in-class reliability to achieving a clean energy future, while creating a sustainable future for our company and making sure every employee feels respected, included, and safe to speak up. Furthermore, we know that technology will play a key role in building a resilient, reliable gas system of the future that delivers 100% clean energy. Our employees will need strong technical skills to operate, monitor and maintain advanced energy infrastructure. We provide continuous state-of-the-art training and development to our employees in a wide variety of areas, including technical and operations training, as well as strengthening leadership competencies.

Customer Engagement

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

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

- **Gas AMI program** that provides customers with detailed data about their energy usage
- **Energy efficiency and Clean Heat programs** that offset some of the upfront costs of energy efficiency and building heating electrification measures
- **Energy Efficiency Marketplace** that provides customers with various subsidized technology options to reduce at-home energy consumption

Our customers continue to expect us to deliver our core services. We need to do the basics right: be on-time to turn on their service, make it easy to pay bills, secure private customer data and information, quickly inform them of gas leaks or other safety concerns, and communicate frequently and proactively in the event of an outage. We continue to invest in programs, such as our new customer service system (CSS), to improve our customers' experience interacting with us.

Cost-Effectiveness

Significant utility and customer investments will be required to achieve the clean energy future value expected by our communities and customers. In addition to the core safety, reliability, security, and improved customer experience that we are providing, our future investments will provide enhanced climate resilience and GHG emissions reductions. 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.[2]

To deliver these objectives, we anticipate investing $13 billion through 2031 in our gas system, with approximately:

- 60% of our projected expenditures supporting our Core Services, many of which also support Clean Energy and Climate Resilience
- 35% supporting Clean Energy
- 5% supporting Climate Resilience

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

Our biggest investment of approximately $4.6 billion is dedicated to our MRP, which benefits all strategic objectives. Additional material investments include up to $1 billion for transmission replacement related to the regulatory requirements of state and federal gas safety rules,[3] up to $1.3 billion for public improvement,[4] and up to $1 billion for service replacements.[5]

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. We also seek to accelerate the depreciation of our gas assets to mitigate long-term customer bill impacts and continue to advocate for cost-based rates that provide customers with price signals that promote efficient use of the delivery system to curb rising overall system costs.

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

[3] Pursuant to the Federal Pipeline and Hazardous Materials Safety Administration (PHMSA) Code 49 CFR 192.624(a)(1) and State Code 255.624(a)(1)

[4] Public Improvement refers to utility relocation when New York City and/or Westchester County seeks to use a right-of-way for municipal infrastructure, such as sewer and water

[5] Service Replacement refers to proactive replacement of gas infrastructure during new and/or upgraded service connections

The Road Ahead

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

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

- Continued operating improvements and process optimization
- Ongoing investment in innovative programs that manage acute gas supply challenges
- Implementing solutions that focus on cost-effectiveness, including the use of low-to-zero carbon gaseous fuels for difficult-to-electrify customers to complement building heating electrification and energy efficiency
- Driving toward a more integrated energy system where we provide customers with the best energy options for them, whether it be electrification, steam, or low-to-zero-carbon gaseous fuels
- Advocating for policy reform that eliminates our obligation to provide service/main beyond the statutory requirement for new gas connections and supports technology neutrality that offers flexibility in achieving net-zero GHG emissions
- Investing in our diverse, inclusive, and talented workforce

We look forward to working with our customers, stakeholders, and regulators as we lead the transition toward a clean energy and climate resilient future. Ultimately, this transition is about the people and communities that we serve, and we are proud to be a primary energy provider for New York City and Westchester County. For more information about building heating electrification and energy efficiency, please refer to our **Integrated Long Range Plan**. For further information about our electric and steam systems, please refer to the **Electric** and **Steam Long-Range Plans**, respectively.

1. Background

Since their debut in 2010, our 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 a strategic framework and roadmap that guide our programs and investments through 2050. The Integrated Long-Range Plan takes a comprehensive approach across our electric, gas, and steam businesses.

Our commodity-specific plans, including the Electric Long-Range Plan, the Gas Long-Range Plan, and the Steam Long-Range Plan, provide additional details about initiatives that support our strategic objectives within each business. In each plan, we describe the strategy in the context of the commodity, as well as the tangible capital and operational investments we are making in the respective systems.

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

1.1 Our History

Our system began in 1823 and has significantly evolved and expanded to serve more than 1.1 million customers. From manufactured gas to natural gas, from gas streetlighting to electric, and from wooden and cast-iron piping to polyethylene pipe, we are proud of the evolution of this system since its inception. Our distribution systems have evolved along with the fuels they deliver.

We manage this large, complex, underground energy transmission and distribution system in alignment with rigorous reliability and safety standards. The system consists of thousands of miles of pipelines throughout Manhattan, the Bronx, Queens, and Westchester County (Figure 4). It contains various regulator stations, valves, and other hardware components to manage the safe, efficient, and reliable transport of energy. Pertinent facts about our gas system are included in Figure 5.

Figure 4. Our Gas System

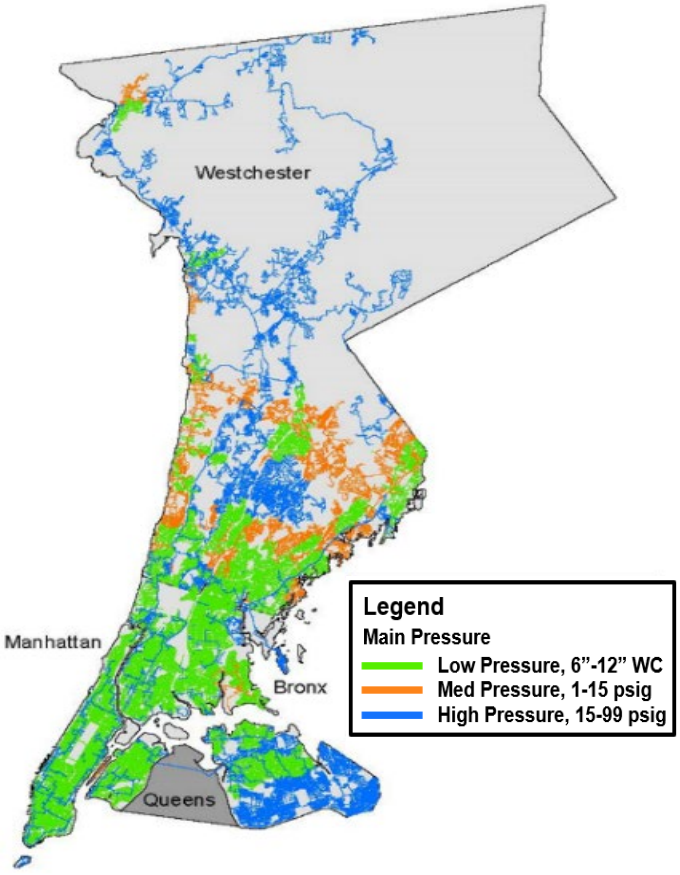
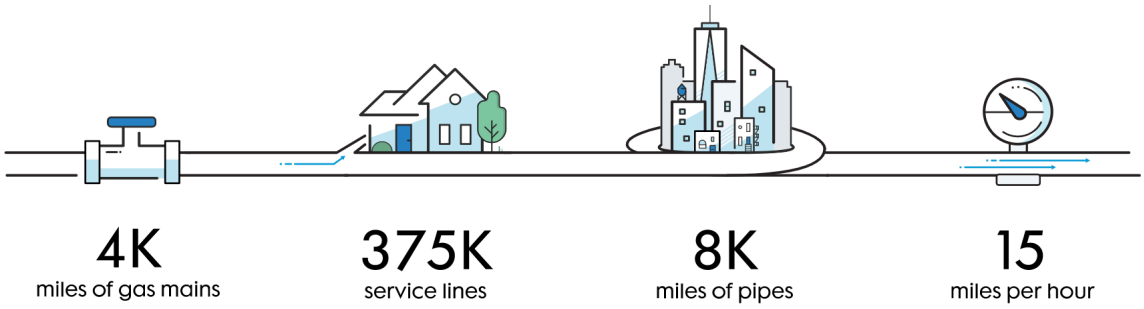


Figure 5. Gas System Facts



Our evolutions to date have brought additional system reliability, reduced local pollutants[6] and GHG emissions,[7] and given us the ability to continue to meet our customers' evolving expectations.

1.2 Our Accomplishments

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

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[8] of <1.5 from 2012 to 2019
- For our gas detector program, CECONY Gas Operations won the **Itron Innovator Award** in 2019

We are continuously seeking projects and investments that improve the operational safety, reliability, and security of our system. Recent initiatives include the following:

- 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 of leak-prone cast iron, wrought iron, and unprotected steel gas piping from 2005 to 2020

[6] According to the **New York City Community Air Survey**, from 2009 to 2019, New York City has reduced particles less than 2.5 microns in diameter by 38%, nitrogen dioxide by 33%, nitrogen oxide by 52%, and winter sulfur dioxide by 95%. We have supported these reductions primarily by converting buildings from heating oil to cleaner heating sources such as gas, electricity, or steam.

[7] Collectively, we have reduced methane emissions by 40% from 2005 to 2020.

[8] 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.

As a result of our focus on safety, we have accomplished a continuously improving made-safe[9] rate (see Figure 6). Additionally, we have consistently improved our best-in-class leak response times.[10] Quicker response times allow investigations to occur sooner, and the proper mitigation actions can take place to protect our employees, the public, and property (see Figure 7).

Figure 6. Made-Safe Rate 2015 - 2021, % of Successful Responses Within 60 Minutes

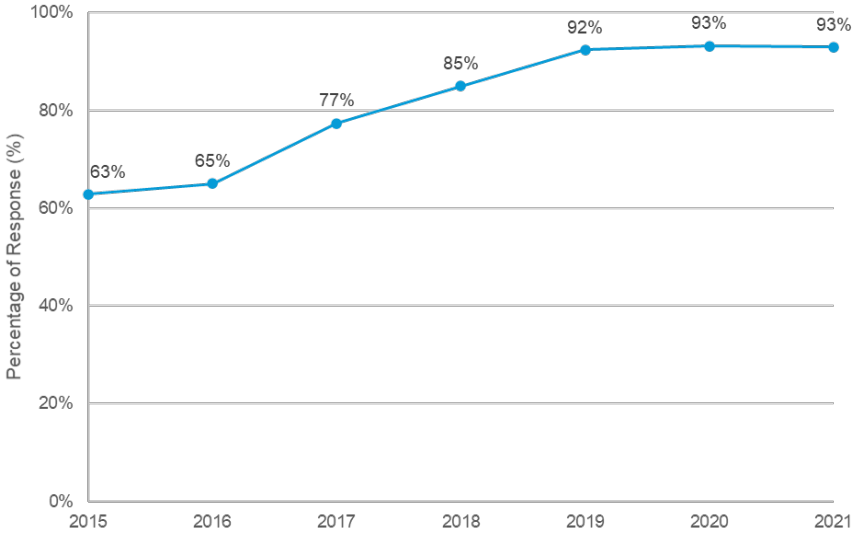
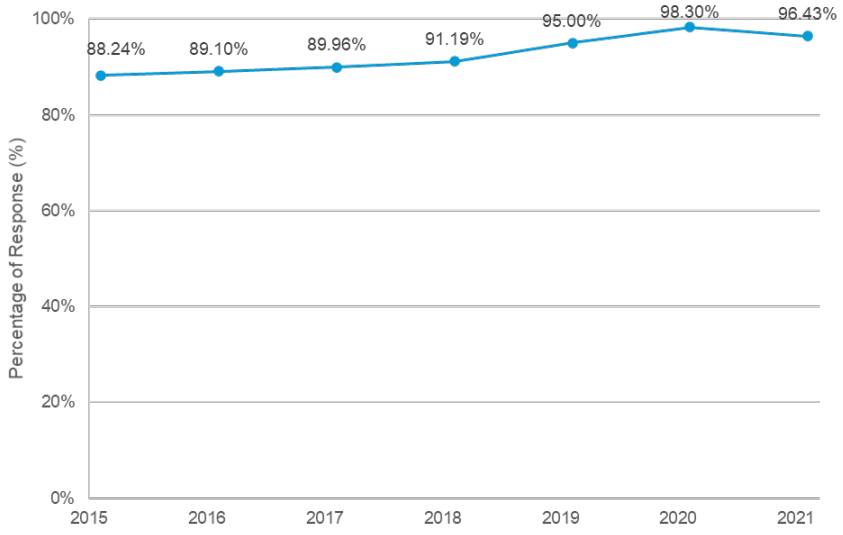


Figure 7. Percentage of Leaks Responded to Within 30 Minutes of Odor Call



[9] A leak is made safe when positive physical action is taken and the threat to life and property is eliminated (applies only to T-1 leaks and inside leak investigations where a leak is found).

[10] Leak response times are measured from the time the control center receives a report of natural gas odor or a leak from the public, FDNY, NYPD, local municipalities, company employees or other sources to the time qualified company personnel arrive on location

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. Our recent investments in hardening measures across our system include the following:

- Incorporated more robust climate design standards, including FEMA analysis (e.g., 100-year flood plain)
- Replaced over 10 miles of flood-prone gas lines

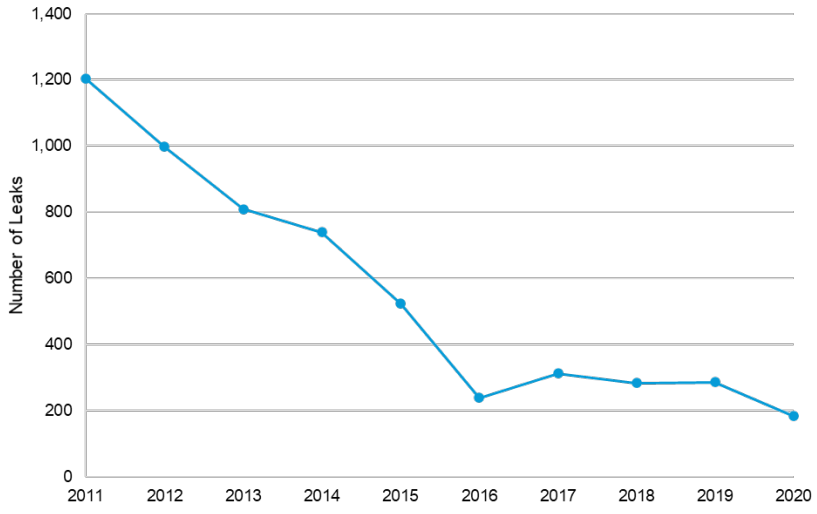
1.2.3 Sustainability

We have a longstanding commitment to sustainability that benefits our customers and the communities we serve through investments in our system. Our ongoing sustainability initiatives include the following:

- In 2016, our MRP became a part of the Environmental Protection Agencies Natural Gas STAR Methane Challenge Program to replace 4% of our remaining cast iron and unprotected steel gas mains on our gas distribution system
- Converted over 8,000 large building and residential customers from oil heating to cleaner natural gas, reducing fine particulate matter emissions by more than 560 tons (the equivalent of taking 1.8 million cars of the road) since 2011
- Achieved 1.6 million MMBtu in gas energy efficiency savings in 2020 alone

Our attention to leaks and reducing our backlog has supported a continuous reduction in methane emissions. Figure 8 highlights an 85% reduction in our annual leak backlog through operational improvements between 2011 and 2020. An end of year leak backlog at or near 200 is the target we plan to maintain. This metric is important because the end of the year generally aligns with the beginning of our frost season, which is when leaks can potentially be more hazardous. Frost prevents natural gas from escaping into the atmosphere, increasing the chance of natural gas migrating into buildings.

Figure 8. End of Year Leak Backlog, 2011-2020



1.2.4 Customer Experience

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

- Enhanced our website and mobile app to offer more customer tools in our My Account portal, including online negotiated payment plans, personalized web content/offers, a new Home Energy Analysis tool and a landlord portal
- Launched our first generation of virtual assistants including Watt, AVA, and Google/Amazon voice
- Modernized our bill based on customer feedback to improve understanding and highlight the most important information
- Customer experience efforts have resulted in continued positive long-term trends in Customer Experience metrics, including above average JD Power Customer Satisfaction scores
- On track to install over 1 million gas AMI devices across our network by 2022

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 business 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 gas system. 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. Any change in our energy systems must consider the impact to historically disadvantaged and low-income communities and enable these communities to receive the benefits of clean energy.

2.1 Customer and Stakeholder Expectations

Customers and stakeholders increasingly expect more from their energy provider, including intuitive user experiences and quick answers to their questions. Customers rely on utilities to provide reliable and increasingly resilient energy and to respond swiftly to service interruptions. They will also look to their energy provider to be a trusted advisor through the clean energy transition.

Good utility practice requires a continuous monitoring of customer experience through satisfaction surveys and external metrics such as J.D. Power,[11] Escalent,[12] and App Store[13] reviews. This feedback helps utilities to proactively align programs with evolving customer expectations. Overall, across the industry, utilities are seeing customers' evolving expectations in four key areas:

- **Choice:** Customers want more energy offerings and have more supply and technology choice than ever before

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

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

[13] 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.

- **Convenience:** Customers are seeking 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 utility to provide energy that enables this comfort
- **Value:** Customers are seeking value for the price they pay for energy; value includes cleaner, more resilient, and reliable service

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

2.2 A Changing Climate

There is broad consensus that the climate is changing. Communities around the globe, specifically in the New York metro area, have already seen the impacts of climate change in the form of increased heat waves, more intense storms, sea level rise, and unpredictable cold spells on energy systems. Under current projections for the CECONY-specific 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 the gas system impact against climate risks. A high-level summary of these risks is included in Figure 9.

Figure 9. Climate Risks and Potential Impact on Our Gas 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	• 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 • Other extreme weather events
Implications to Energy Systems	• Increase in peak demand	• Potential for water intrusion	• Potential for storm damage on infrastructure

2.3 Clean Energy Legislation

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

Table 2. CMA and CLCPA Requirements

CMA (New York City Law)	CLCPA (New York State Law)
• **Local Law 97:** Buildings over 25,000 square feet must significantly reduce GHG emissions	• **185 TBtu** end-use energy reduction by **2025** • **Net-zero** economy-wide GHG emissions by **2050** • **35%-40%** of clean energy benefits to **disadvantaged communities**

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

For example, New York City legislators recently passed **Local Law 154 of 2021**, which generally bans new fossil-fuel service connections for buildings under seven stories beginning in 2024, and generally bans new fossil-fuel service connections for buildings greater than seven stories beginning in 2027. The law does carve out special end-use applications for natural gas.

CECONY is supportive of these initiatives and is well positioned to help achieve these goals. We continue to closely monitor and help shape this rapidly evolving landscape to create beneficial outcomes for our customers and stakeholders. We will continue to review and appropriately modify our plans and supporting strategies as necessary.

2.4 Technological Advancement

Rapid advances and innovations in energy technologies are helping utilities operate reliable energy delivery systems in the 21st century and offer clean energy options to customers. Table 3 provides an overview of these technologies as applicable to our gas business. Beyond the technologies listed below, there are various information technology hardware and software innovations that affect how utilities and energy providers operate. Please refer to the **Integrated Long-Range Plan** for an overview of these IT advancements.

Table 3. Innovative Clean Technologies

Technology	Description	Value of Technology
Building Envelope and Insulation	Technology that reduces the total energy requirements of a building by improving thermal insulation	Reduces energy consumption, emissions, customer energy costs, and capital costs for heating/cooling equipment
Air Source and Ground Source Heat Pumps	Highly efficient electric system that uses a refrigerant to move heat from one area to another to provide water heating, space heating, and air conditioning	Enables customers to transition off less energy efficient and more polluting on-site fossil fuel combustion systems (such as boilers, water heaters, and furnaces) for water and space heating
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
Low-to-Zero Carbon Gaseous Fuels	Gaseous fuels with a lower GHG impact than natural gas that could supplement our energy delivery system (e.g., green hydrogen)	Reduces or eliminates GHG emissions from our energy generation facilities.
Carbon Capture and Storage	Technology that absorbs carbon from point-sources (such as steam boilers) 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

2.5 Equity and Environmental Justice

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

Importance of Disadvantaged Communities in CLCPA

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

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

The Climate Justice Working Group began in 2020 and, as of 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 identify the population for which this applies in our territory and expand our programs accordingly.

Table 4. Communities with Equity and Environmental Justice Focus

	Low- and Moderate-Income (LMI)	Disadvantaged Communities
Current Criteria	Households earning up to 80% of the area or state median income, whichever is greater, are qualified as 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.[14]	**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.

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

3. Our Strategies

We are committed to meeting societal goals and our customer expectations. As articulated in the previous section we have analyzed industry and societal trends in-depth and researched the range of potential policies, technologies, and customer adoption levels to reach net-zero GHG emissions by 2050 in New York City and Westchester County. We developed this plan 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

As the main energy provider of New York City and Westchester County, we are positioned to be a leader in this energy transition. In the following section, we describe our pathways analysis which informs our system planning.

Further, we describe our investments to support clean energy, our investments in climate resilience in anticipation of future climate challenges, our continued commitment to a foundational core of safety, security, reliability while managing the energy transition, and the value and enablement we are delivering to our customers throughout. Our strategies to achieving these strategic objectives are highlighted in Table 5.

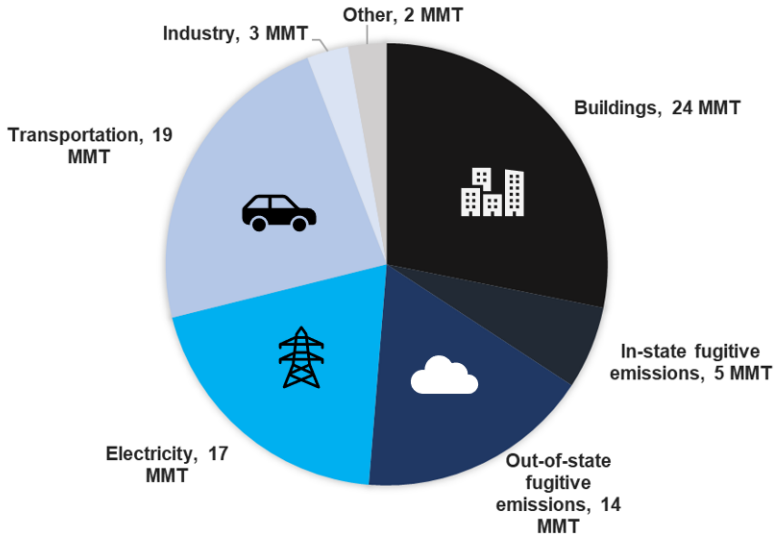
Table 5. Strategies to Support Our Strategic Objectives

Clean Energy	Climate Resilience	Core Service	Customer Engagement
Transform the energy supply • Reduce methane emissions across the value chain • Build a low-to-zero-carbon gaseous fuels portfolio **Enable a fundamental change in energy consumption** • Drive growth in electrification and efficiency • Slow the growth of the gas customer base	• Prevent: Harden Infrastructure • Mitigate: Minimize Disruptions • Respond: Reduce Recovery Time	**Manage risks across our gas system:** • Enhanced safety • Enhanced security • Enhanced reliability **Manage the transition for our customers:** • Manage rate impacts of transition • Enable an equitable transition	• Continue to improve the customer experience • Facilitate customer energy choices

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 10.[15]

Figure 10. GHG Emissions, New York City and Westchester County, 2019 (MMTCO2e) [16]



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

We expect technology to improve and costs to decline such that some decarbonization solutions that are cost-prohibitive today will become cost-effective in the future. These solutions are at different levels of maturity and the pace and cost of adoption is uncertain, as is the emergence of policy over the next 30 years.

We identified three representative pathways to capture a wide range of potential futures so that we remain flexible until a single pathway emerges (see Table 6). Each pathway differs in technology breakthroughs required and expected relative cost in achieving the clean energy transition. For the gas business there will be a twofold effort to transition customers to electrification of fossil fuel building heating while pursuing low-to-zero carbon gaseous fuels through renewable natural gas and hydrogen solutions. Each pathway assumes that carbon offsets are needed to meet net-zero GHG after the direct GHG emissions reductions targets are met.

[15] 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.

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

Table 6. Representative Pathways

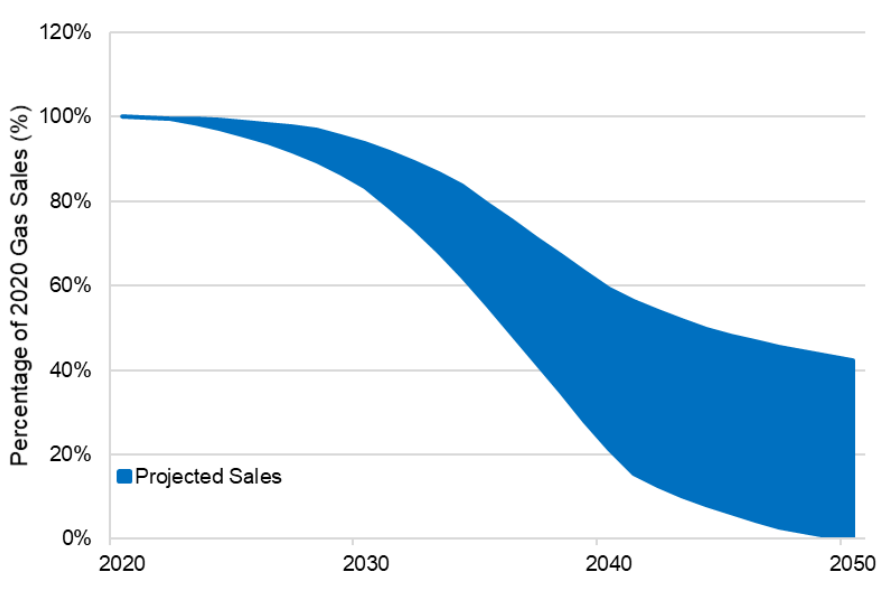
	Full Electrification	Targeted Electrification	Hybrid Consumption
Building Heating	Renewable electricity and decarbonized steam serve 100% of the building stock in our service territory, and the gas distribution system is decommissioned.	Renewable electricity and decarbonized steam serve between 70% and 80% of the New York City building stock with targeted full electrification zones and use of low-to-zero carbon gaseous fuels for remaining heating needs.	Renewable electricity and decarbonized steam serve between 50% and 60% of the New York City building stock; the system uses low-to-zero carbon gaseous fuels to support difficult-to-electrify buildings.
Gaseous Fuel Usage	170 TBtu of gaseous fuels are used for electric and steam generation (100% low-to-zero carbon); no gaseous fuels are used for buildings as the gas distribution system is decommissioned.	250 TBtu of gaseous fuels are used across all sectors (100% low-to-zero carbon).	296 TBtu of gaseous fuels are used across all sectors (70% low-to-zero carbon).
Implications for the Gas System	Gas distribution **is fully phased out.** Building heating and cooking needs are met through **electrification** and **steam.** Gas distribution volumes **decline 100%**. Our gas transmission system continues to provide service to thermal generators. Customers **must transition to electric** or steam, which will require additional regulatory support.	Gas distribution is **mostly phased out** except in a **dense urban center** (e.g., Manhattan, W. Bronx). Gas distribution volumes **decline over 85%** relative to business-as-usual with hydrogen meeting the needs of remaining customers. Customers outside the urban center **must transition to electric,** which will require additional regulatory support.	**Most buildings retain a gas connection** to minimize upgrades and strengthen energy resiliency. Gas distribution volumes **decline over 60%** with a mix of low-to-zero carbon gaseous fuels meeting the needs of the remaining customers. Customers are incentivized to transition but retain the option to **use low-to-zero carbon gaseous fuels**.
Cost Impact: Customer	$$$$$	$$$	$$
Cost Impact: Utility Infrastructure	$$$$$	$$$$	$$$
Cost Impact: R&D (Societal) [17]	$	$$	$$

In all three of these representative pathways, we project total gas sales[18] to decline as buildings get more efficient, adopt electrification, and new buildings connect to electric instead of gas service. Figure 11 shows our view on future sales across the system, whereas Figure 12 shows our view on future peak demand. This projection includes the effects of the passage of the **CLCPA** and **CMA** and adoption of more aggressive GHG emissions reduction plans.

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

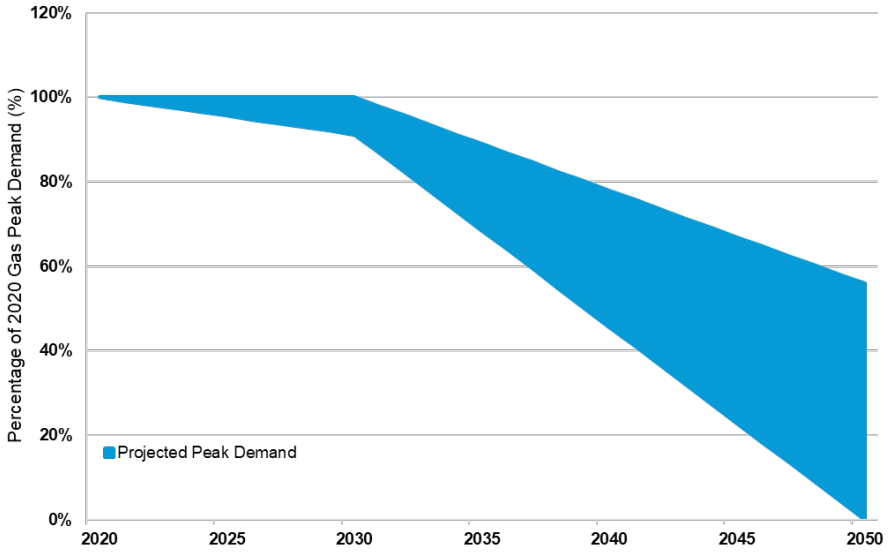
[18] Sales are defined as the volume of energy delivered

Figure 11. Projected Gas Sales through 2050



As we approach 2050, we project that any remaining gas sales would consist of low-to-zero carbon gaseous fuels such as hydrogen and RNG, with the potential to offset remaining GHG emissions with carbon capture and storage. Our gas peak demand is expected to decrease as customers adopt electrification technologies:

Figure 12. Projected Gas Peak Demand through 2050



This pathway study also indicates that there may be an overall reduction in the size or use of our gas transmission and distribution system as more customers electrify and the system is kept for the most difficult-to-electrify customers and to transport low-to-zero carbon gaseous fuels.

Our pathway study highlights the need to be flexible in our programs and be cognizant of technology, policy, and customer changes that may impact the optimal strategy to

decarbonizing our system. We will continuously review signposts (indicators to ramp up or down specific programs or actions based on technological and policy shifts) and adjust our programs accordingly to deliver on our targets. We will do so by monitoring regulatory changes, reviewing technology cost decline curves, and monitoring broader industry and societal trends.

Although our pathways analysis shows three distinct futures, the pathways follow similar trajectories through 2030. As such, we have clarity in the near-term investments that will help us prepare for these multiple possibilities. Examples of these near-term investments include reducing methane emissions across our value chain, driving growth in electrification and energy efficiency, and continuing to enhance safety, security, resilience, and reliability.

We will refine our investment strategy to reflect how policy, customer expectations, and technology evolve, as further detailed in Section 4.1. This includes ramping up investments that bring additional value, scaling down investments that have reached maturity, and discontinuing investments that no longer serve our customers and stakeholders needs.

3.2 Clean Energy

While we have already reduced GHG emissions through our clean investments across the system, we remain vigilant in observing the market and planning for actions we can take in the future to reimagine our gas system. Our parent company, Consolidated Edison, Inc., recently released its expanded **Clean Energy Commitment**, which highlights our commitment to deliver a net-zero economy by 2050 (see Figure 13).

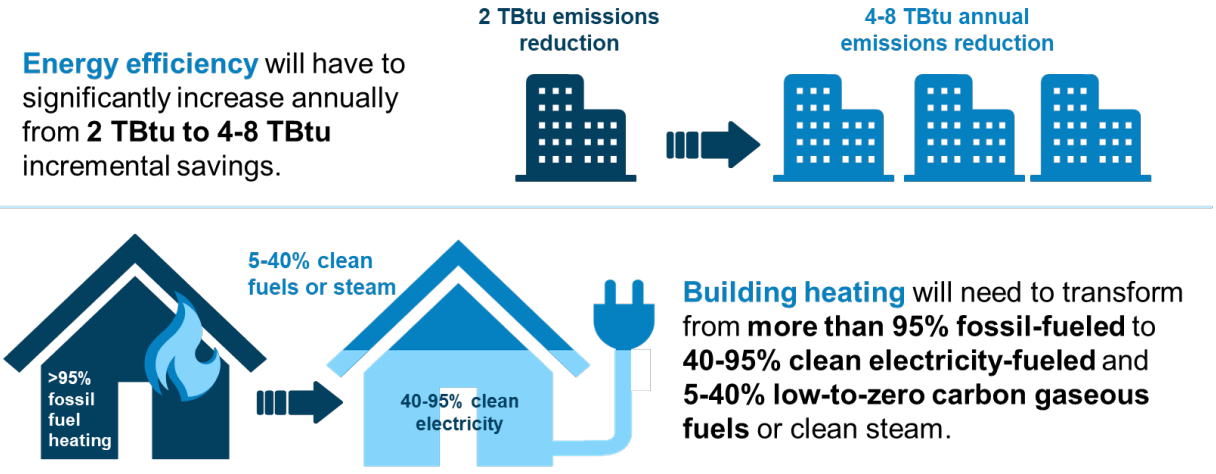
Figure 13. Our Clean Energy Commitment

OUR CLEAN ENERGY COMMITMENT

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

As part of this energy transition, hundreds of thousands of individual customers will have to make clean energy decisions. This includes a massive scale up of technologies to supply clean energy, as well as significant shifts in customers consumption of energy. Figure 14 exemplifies this rapid scale-up across a variety of technologies.

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



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

Table 7. Summary of Clean Energy Strategies

Strategy	Sub-Strategy	Initiatives
Transform the Energy Supply	**Reduce methane emissions across the value chain**	• Replace leak-prone pipe on our gas distribution system via our MRP • Continue executing our methane emissions reductions program to improve leak repair times and reduce our leak backlog • Pursue reduced upstream fugitive methane emissions across the natural gas production and delivery value chain through a Certified Gas (CG) pilot
	Build a low-to-zero carbon gaseous fuels portfolio	• Target research and development and pilot investments to facilitate a build out of low-to-zero carbon gaseous fuels portfolio, including the development of hydrogen technologies, renewable natural gas (RNG), and synthetic natural gas (SNG) produced using electricity
Enable a Fundamental Change in Energy Consumption	**Drive growth in electrification and efficiency**	• Continue to provide customers building heating options through our Clean Heat program, including clean energy alternatives, such as air and ground source heat pumps • Continue to expand energy efficiency programs and other demand-side management technologies
	Slow the growth of the gas customer base	• Advocate for the elimination of our obligation to provide service/main beyond the statutory requirement for new gas connections • NPA solutions that allow us to defer or eliminate the need for gas infrastructure investment
Align Actions to Climate Policy		

We are also actively researching carbon capture and storage, and other carbon offset mechanisms that may need to be in place to ultimately achieve our net-zero GHG emissions target.

3.2.1 Transform the Energy Supply

There are two key actions as part of our strategy to transform our energy supply and achieve net-zero GHG emissions by 2050:

- Reduce Methane Emissions Across the Value Chain
- Build a Low-to-Zero Carbon Gaseous Fuels Portfolio

3.2.1.1 Reduce Methane Emissions Across the Value Chain

According to our analysis of GHG inventories in New York City and Westchester County, in-state fugitive methane emissions account for over 5,000,000 TCO_2e and out-of-state fugitive methane emissions account for over 14,000,000 TCO_2e to territory-wide GHG emissions as of 2019. These contribute almost 21% of total GHG emissions in our territory.

Fugitive methane (CH_4) is a highly potent GHG with a large global warming potential. Additionally, fugitive methane emissions in energy delivery pipelines lead to lost fuel that could otherwise be used productively. According to our internal studies, we see reducing fugitive methane as a highly cost-effective way to reduce GHG emissions on a $/$TCO_2e$ equivalent basis.

Accordingly, our methane emissions reduction strategy focuses on the entire value chain (including both in-state and out-of-state). The details of these initiatives are included in Table 8.

Table 8. Our Methane Emissions Reductions Initiatives

Methane Emissions Reductions Initiatives	Description	Value Delivered
Main Replacement Program (MRP)	We plan to continue replacing approximately 85 miles of aging cast iron and unprotected steel distribution mains per year. This program is spread across our service territory and will replace gas mains and services on both a planned and emergent basis. We will continue to monitor gas demand trends, and the viability of other alternatives, and modify the targeted areas of this initiative accordingly.	The MRP will provide safety and reliability benefits for our employees and customers. Additionally, leak-prone pipe replaced in flood-prone areas helps improve the resiliency of the system by reducing the risk of water intrusion. This program will deliver reduced fugitive methane emissions, as leak-prone pipes are a main source of fugitive methane emissions for our system. Lastly, this program will help our system accept low-to-zero-carbon gaseous fuels on our distribution network for our most difficult to electrify customers.
Methane Emissions Reduction Programs	This includes a variety of ongoing operational programs and industry efforts to reduce methane emissions and to swiftly identify and remediate gas leaks throughout our system, such as the use of ZEVAC[19].	These operational programs and industry efforts reduce GHG emissions and improve public safety through the prevention, detection, and elimination of methane leaks.
Certified Gas (CG) Pilot	We are proposing a CG pilot as part of our upcoming rate case. This initiative includes the purchase of CG from upstream suppliers.	This pilot could lower upstream GHG emissions through contracting with natural gas producers that implement practices and technologies to significantly reduce fugitive methane emissions. According to our internal studies, this is one of the most cost-effective ways (on a $/$TCO_2e$ equivalent basis) to support GHG reductions.

Main Replacement Program (MRP)

Between 2023 and 2025, we will replace approximately 85 miles of leak-prone mains per year. This program includes replacing leak-prone gas mains, defined as small diameter (12-inch and smaller) cast iron, wrought iron, and unprotected steel mains. Along with gas main replacement, roughly 2,800 unprotected steel services are also replaced per year to remove leak-prone pipe from our system. This program will be spread across our entire service territory and will replace

[19] The ZEVAC unit is used to capture methane that is being removed from the gas main during a cut out and it injects the gas back into the pipe upstream of the valve or stopper that is being used to stop the flow of gas.

gas mains on both a planned and emergent basis. The total replacement cost over this period is approximately $1.2 billion. Maintaining this level of replacement will eliminate all leak-prone pipe by 2040. This program is supported by our risk model which helps us prioritize the segments that pose the most risk to public safety.

The elimination of leak-prone mains has a direct impact on our objective to continue to reduce methane emissions from the distribution system. Specifically, cast iron pipe comprises 19.7% of our distribution system mileage; however, it is responsible for 50% of fugitive methane emissions from the system. As such, we are prioritizing cast iron replacement, and it will make up more than half of the replacement in this program. Additionally, main replacement can support the use of low and zero-carbon gaseous fuels (such as RNG or hydrogen) on this infrastructure, providing further decarbonization benefits for our most difficult to electrify customers.

The MRP has additional cost and safety benefits. Some leak-prone mains targeted for replacement contain active leaks. Their replacement will reduce the ongoing costs associated with surveillance and repair of these leaks. The scope of the MRP may be adjusted downward depending on the success of some of our gas demand reduction programs, such as targeted NPA projects that support building heating electrification and other means. For example, if full electrification of all customers in certain, targeted areas of the distribution system can be achieved, the leak-prone pipes in those areas may not need to be replaced as gas will no longer flow through them. We will continue to monitor the success of these programs, their impact on gas demand, and how they may contribute to a reduction in the scope of main replacements. If we see rapid reductions in gas demand, we will adjust and scale the program accordingly.

Methane Emissions Reduction Programs

We execute a variety of additional operational programs to reduce fugitive methane emissions on our gas transmission and distribution system. As fugitive methane poses both an environmental risk as a GHG, as well as an acute safety risk, projects that target methane reduction provide benefits for both.

These programs are comprehensive, and often exceed regulatory requirements. For example, we aim to fix 85% or more of our leaks in 60 days, including non-hazardous leaks. This includes leaks that do not have a mandated repair time. Examples of specific programs include:

- **Monthly leak surveys:** Periodically surveying infrastructure to identify leak-prone areas, which both improves safety and reduces methane emissions.
- **Acceleration of repair times:** Operational improvements have reduced our repair backlog and shortened the time between leak identification and repair. These both improve safety and reduce methane emissions.
- **Methane capture technologies:** Deploying technologies that capture leaked methane before they are released into the atmosphere, such as the use of Zevac.
- **Use of NGDs:** Deploying technologies that automatically indicate if a methane leak is present on a customer-premise.[20]

[20] Our natural gas detectors (NGDs) program is described in further detail under our Core Service section.

- **Software and hardware technology:** Use of sensors and data analytics to identify high emitting areas on our system, including the use of advanced leak detection software.[21]

Beyond our current methane reductions efforts, we are committed to being industry leaders through continued research and development and participation in the Environmental Protection Agency's Natural Gas STAR Methane Challenge Program and commitment to the ONE Future Emissions Intensity Commitment:

- The Methane Challenge is a voluntary program managed by the Environmental Protection Agency. Participants publicly commit to specific targets for methane emission reductions and report on their progress towards those targets on an annual basis. We have committed to replace at least 4% of leak-prone pipe annually and have met or exceeded that goal since the inception of the program.
- The ONE Future collaborative is made up of a large group of companies across the natural gas value chain that have committed to reduce methane emissions to less than 1% of total throughput. Public reporting by the ONE Future collaborative is not on a company-by-company basis, but on an industry segment basis (e.g., production, transmission, distribution, etc.). We have contributed to the distribution segment's portion of the ONE Future goal since joining the collaborative.

Certified Gas (CG) Pilot

As part of our rate filing, we intend to propose pilot funding for a CG program like what we proposed for Orange and Rockland (O&R).[22] We see CG as a quick and effective way to reduce our out-of-state fugitive methane emissions. If we can execute a successful pilot, we could scale the program to help drive the market and push additional natural gas producers to implement technology and operations measures that reduce their wellhead methane emissions.

3.2.1.2 Build a Low-to-Zero Carbon Gaseous Fuels Portfolio

While all pathways are possible, we see continued value for the gas system in the future, especially if low-to-zero carbon gaseous fuels become viable for injection into the current infrastructure. The system is a large and already existing asset that can be repurposed in a decarbonized world; this could be significantly more cost-effective than full electrification and play a specialized role for difficult-to-electrify buildings in dense urban locations.

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 system
- 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 will be critical if we wish to deliver low-to-zero carbon gaseous fuels throughout our system in the future.

[21] We use Picarro which is an advanced leak detection, emissions quantification and reduction, and pipeline replacement optimization software.

[22] Orange and Rockland (O&R) is a Con Edison-owned regulated utility that operates electric and gas infrastructure in northern New Jersey, Orange County, New York, and Rockland County, New York.

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, hydrogen, and SNG.

Renewable Natural Gas

RNG is defined as pipeline compatible gaseous fuel derived from biomass feedstocks (i.e., animal manure, food waste, landfills, and water resource recovery facilities). There are two main methods of RNG production: anaerobic digestion, in which bacteria break down organic matter to produce biogas, and thermal gasification, or the breakdown of biomass material into component gases and ash in an enclosed reactor. Both processes produce RNG that has the same chemical composition as fossil natural gas.

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 production uses captured methane—a potent GHG—from renewable or waste sources, preventing that methane from venting directly to the atmosphere as it otherwise would. RNG also does not produce emissions inherent to traditional oil and gas upstream production." [Excerpt from Pathways to Carbon Neutral NYC study]

There are different methodologies to calculate the exact net GHG emissions benefit of RNG compared to 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. This can accelerate RNG adoption and mitigate the costs compared to other low-to-zero carbon gaseous fuels. Early analysis also shows that implementing RNG can be more cost-effective for decarbonization than electrifying buildings with fossil gas heating systems. RNG may still be five to eight times more expensive compared to fossil natural gas, depending on the feedstock source, due to the immaturity of the market and high capital costs for production.

An analysis done by NYSERDA[23], estimated RNG's potential to be 272 TBTU at maximum in New York State. Today, we source natural gas from most of the area east of the Mississippi river. Similarly, we do not expect our RNG supply to be limited to our state boundaries. The ability to leverage that RNG will largely depend on the construction of production facilities outside of our service territory and pipeline infrastructure to transport it. As a result, the technical potential in our service territory may be considerably lower; our pathways assume that 11 TBtu of RNG, less than 5% of New York's technical potential, is used in our service territory by 2050.

RNG Interconnection

We secured language in our last rate case that allows RNG producers to connect to our system. We are open to facilitating these interconnections to integrate RNG to our system and meet customer needs. This initiative can potentially lower GHG emissions and will help

[23] NYSERDA's analysis can be found **here**.

us understand the impact of RNG on our distribution system. This could also help us secure additional supply.

Hydrogen

Hydrogen is a lower-carbon alternative fuel to natural gas. Because hydrogen fuel does not include methane, there are no GHG emissions resulting from transportation or combustion. So, the full decarbonization potential depends on the process used for production. We are focused on green hydrogen, which is produced using dedicated or curtailed renewable electricity, and blue hydrogen, which is produced with natural gas and paired with carbon capture.

Hydrogen can either be blended into the system with RNG or fossil gas, or it can be used as a complete replacement. However, because the chemical composition is different from natural gas, upgrades may be required to existing infrastructure and equipment across the gas value chain.[24] We are continuing to research and study the extent of these upgrades in our service territory. Today, the market for hydrogen is immature and costs are over ten times more than fossil gas. As the market matures and there is more understanding around the value that hydrogen can provide, we expect costs to decline. Across our pathways, we explore the use of hydrogen as a blend in our system and as a complete replacement. Overall, our pathways rely on 160-250 TBtu of hydrogen.

Green Hydrogen

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. In periods when renewable energy production exceeds demand, this excess production can be converted into green hydrogen and used later to power dispatchable generation, heat homes, and power vehicles. The potential for green hydrogen is directly tied to the appetite to build renewable generation that is solely dedicated to the production of hydrogen. This is significantly more expensive; we expect that initial green hydrogen production will be from curtailed renewable electricity during periods when intermittent renewable generation exceeds demand.

Blue Hydrogen

Blue hydrogen uses natural gas to power steam methane reformers to produce a fuel. This process is paired with carbon capture to capture over 90% of GHG emissions from the production process. While blue hydrogen has higher GHG emissions than green hydrogen, it is still considerably cleaner than fossil gas. Blue hydrogen production relies on the development of dedicated production facilities that may be less expensive than dedicated renewable generation facilities. Therefore, we consider it to be the nearer-term solution to develop hydrogen at scale for use in buildings and electric generation. However, it is dependent on the development of carbon capture technology and the GHG emissions accounting methodology used for clean energy policy goals.

Hydrogen Research, Analysis, and Studies

We joined a number of industry working groups such as the Low-Carbon Resources Initiative with the Electric Power Research Institute and Gas Technology Institute and a

[24] Initial studies from other regions indicate that hydrogen can be blended up to 20% by volume without needing to upgrade infrastructure.

Guidehouse Hydrogen Consortium to further explore the fuel source. We also joined the Institute for Gas Innovation and Technology with Stony Brook University. These industry working groups allow us to continue to share with and learn from leading organizations. Through those learnings, we will be able to better understand how to incorporate hydrogen successfully and safely into our system. There is a 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 have to be developed with multiple different players.

If advanced, this technology could bring decarbonization for difficult-to-electrify customers throughout our service territory. Additionally, this could have the co-benefit of decarbonizing our steam generation and cogeneration units.

Hydrogen Pipeline

Hydrogen could potentially transform our cogeneration facilities into net-zero GHG emissions for electric and steam, while eliminating GHG emissions from dedicated steam generation plants, and providing gaseous fuels to end-use customers.

Our internal gas planning studies assume that green and/or blue hydrogen is manufactured outside of New York City, and local storage will not be available at the level needed to meet demand. The continuous supply of hydrogen at a reliable rate is one of the biggest challenges to powering our systems with hydrogen. As part of our internal gas studies, we analyzed different routes and sizes of hydrogen pipeline infrastructure that would need to be built to sufficiently power our cogeneration system and dedicated steam boilers. We are actively investigating whether our equipment and storage systems can operate with hydrogen or a hydrogen blend safely and efficiently.

A hydrogen pipeline project could have various co-benefits with other existing gas users in the dense urban core areas surrounding our facilities. For example, the hydrogen pipeline can support these users by supplying their facilities with a consistent flow of hydrogen, like how the system supports them currently. These customers would likely need to update equipment, such as boilers and furnaces, to burn hydrogen.

Synthetic Natural Gas (SNG)

SNG combines hydrogen with captured CO_2 to create methane via a process known as methanization. This process produces no GHG emissions. There are, however, still concerns around methane leakage during transportation and CO_2 emissions at the point of combustion. Still, because it uses captured CO_2, the lifecycle GHG emission impact of SNG is lower than fossil gas. SNG, like RNG, can be used as a direct replacement for fossil gas, which mitigates costs on the distribution and customer ends. However, SNG will always be more expensive than hydrogen because it uses hydrogen as an input for the methanization process; SNG costs are estimated to be 20%-30% higher than hydrogen. Further, the technical potential of SNG depends on the availability of hydrogen. In the pathways, SNG is used only in the Hybrid Consumption scenario (52 TBtu).

The role of our gas system will depend on the development of low-to-zero carbon gaseous fuels over the next 30 years. The supply availability and cost of these fuels are currently uncertain, particularly for use in our service territory. Further, the market is immature and there remain many barriers to the market, including upstream infrastructure and alignment on GHG emissions accounting methodology. As such, our plans do not include wide

adoption of these fuels until after 2030. However, in the near term, we support the development of low-to-zero carbon gaseous fuels and are working towards adopting them as they become available. In keeping with these plans, we are working on an interconnect which will be online in a few years.

3.2.2 Enable a Fundamental Change in Energy Consumption

3.2.2.1 Drive Growth in Decarbonized Building Heating and Energy Efficiency

In 2019, buildings in New York City and Westchester County accounted for over 23.5 $MMTCO_2e$ of GHG emissions. This contributed to more than 26% of the total GHG emissions in our service territory. Primarily, this is through the combustion of on-site fossil fuels like fuel oil or fossil natural gas for building space and water heating. As such, decarbonizing buildings is critical to reaching net-zero GHG emissions by 2050.

Electrification is the primary focus to decarbonize building heating and is feasible in most single-family homes and low-rise buildings, but there are several barriers to adoption: upgrade economics, electrical upgrade requirements, design and technical challenges, and lack of awareness and consideration. There is a wide range of costs and technical challenges due to the distinct building stock in our service territory. 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 twice 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 area 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.

To inform our strategy to influence change in how energy is consumed, we analyzed the barriers to decarbonization across different categories of buildings within our service territory. A summary of this analysis is included in Figure 15.

Figure 15. Building Heating Electrification and Efficiency 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 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 (e.g., buildings that us on-site boilers for steam heating)	✓ 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 multi-family program and affordable housing owners
 **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 ROI		

Our analysis indicates that there are multiple specific challenges where our programs can provide support. Namely, we can offset the high initial costs for our customers by offering targeted incentives for installing electric heat-pumps and performing other energy efficiency retrofits. For example:

- Our Clean Heat program offers incentives to offset the upfront cost of converting to building electric heating
- Our Energy Efficiency[25] programs offer incentives to offset the upfront costs of more efficient gas appliances and building envelope upgrades

[25] Includes our participation in the New York State New Efficiency New York program, which includes incentives for customers to adopt energy efficiency measures.

We will also continue to support alternative decarbonized heating solutions for our customers that are difficult-to-electrify, including supporting new steam service connections and low-to-zero carbon gaseous fuels for those where electrification and/or steam are not viable options.

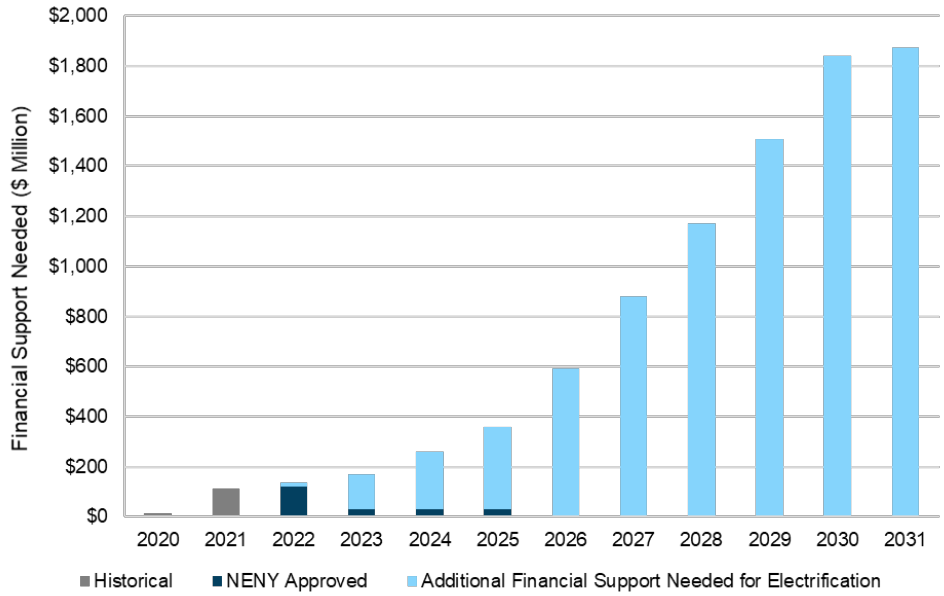
From a communciations standpoint, we aim to increase collaboration with our commercial and multifamily customers. We will work with them to time electrification retrofits alongside major renovations to reduce the impact of lost rent. We are also investing in customer outreach programs to inform our customers on the benefits of energy efficiency and building heating electrification, which include reducing GHG emissions and ongoing operating costs, and improving comfort.

Clean Heat

Electrification, alongside energy efficiency measures, is a key strategy for decarbonizing buildings. We also see building heating electrification as a critical tool to slow the growth of our fossil natural gas system. Our “Clean Heat” program helps to switch customers running fossil-based heating systems to electric.

We plan to invest $337 million from 2020 through 2025 in space and water heating electrification upgrades through the New Efficiency: New York (NENY) framework. This includes $227 million that was authorized specifically for electrification and transferring additional funding from other budgets within the program. Specifically, our program—the New York State Clean Heat Program—provides financial incentives to offset high up-front installation costs. This is designed to drive customer adoption of heat pumps for space and water heating, as well as envelope retrofits to reduce overall heating demand. Figure 16 shows our baseline and proposed Heat Pump program expenditure.

Figure 16. Electrification Financial Support (2020 – 2031)



We project the total financial support needed to enable CLCPA-aligned adoption through 2031 is between $5 and $7 billion. The identified investments will focus on solutions that address customer-sited electrical constraints and enable approximately 6% of building space heating and 15% of building water heating electrification (by square footage) in our territories’ buildings

by 2031. With additional funding and policy support, we could enable up to 10% adoption of building space heating in that timeframe.

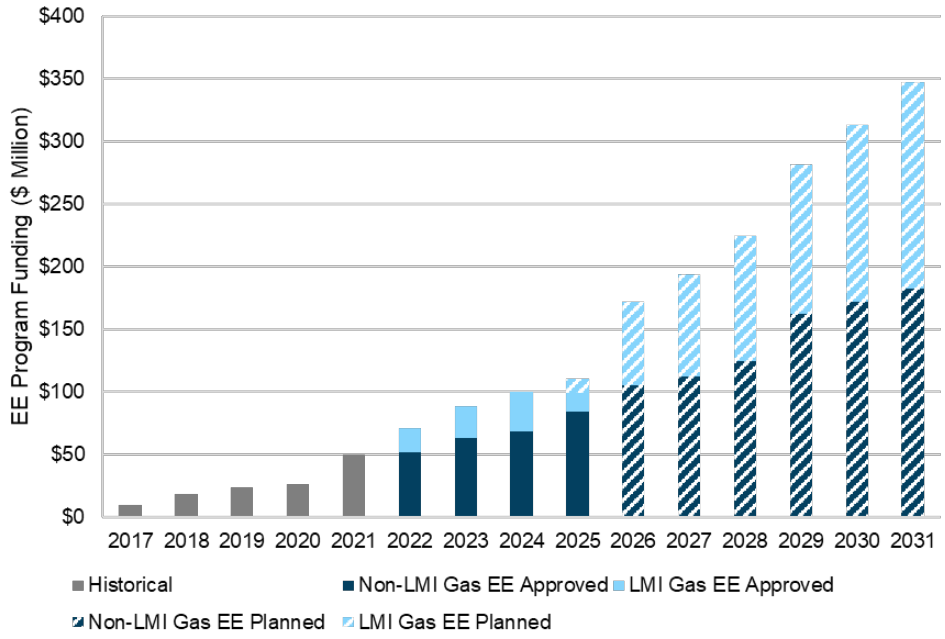
Through our pathway analysis, we estimate that 10%-20% of square footage in our service territory will need to adopt electric heat pumps to reduce economy-wide GHG emissions 40% by 2030. This means more will need to be done to accelerate this market and drive consumer adoption. We will continue to re-assess the building heating electrification market as we move forward.

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

Energy Efficiency

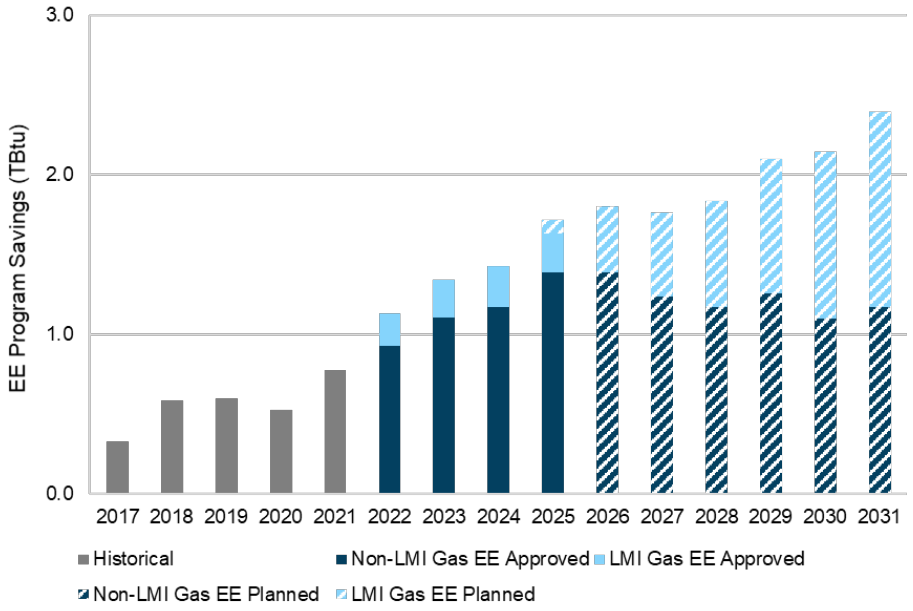
We will continue supporting our energy efficiency program with dedicated gas efficiency investments. As it currently stands, our gas energy efficiency program is approved through 2025. We proposed to further support the program from 2025 to 2031 as documented in Figure 17.

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



This program will support up to 6.7 TBtu of cumulative savings through 2025, with additional 12 TBtu savings accumulated through 2031, as indicated in Figure 18.

Figure 18. Gas Energy Efficiency (EE) Program Savings (2017-2031)



The program includes financial incentives, technical support, and outreach to help our customers reduce gas usage throughout our service territory. Specifically, it is dedicated to gas-related efficiency upgrades for both non low- to moderate- income and low- to moderate-income customers.

Gas device upgrades include more efficient furnaces, water heaters, stoves, and boilers that require less gas consumption to achieve the same thermal output. Our gas energy efficiency programs will increasingly focus on building envelope improvements and measures that help existing equipment operate more efficiently, like controls and repairs.

We expect that building envelope upgrades will account for a large percentage of future gas energy efficiency (TBtu) and gas emissions (TCO_2e) reductions. This is because approximately 90% of emissions reductions due to envelope upgrades are a result of lowered building heating needs due to improved thermal insulation. This, combined with the ubiquity of gas building space heating in our service territory, means a larger and larger portion of ongoing energy and emissions savings will come from building envelope upgrades.

However, envelope upgrades are generally more expensive on a $ per TBtu or $ per TCO_2e abated basis than gas device upgrades. Accordingly, we expect that our gas energy efficiency investments in later years will cost more per on $ per TBtu or $ per TCO_2e abated basis as we transition from more cost-effective gas device upgrades to more expensive building envelope upgrades.

In the near-term, our programs will continue to incentivize gas equipment upgrades for the buildings that are hardest to electrify. We will also continue to explore solutions that can complement building electrification, such as hybrid heat pumps and gas heat pumps.

Innovation in Energy Efficiency

Moving forward, we will introduce new efficient products, services, and program models as technologies develop, economic trends shift, and customer preferences and behavior patterns

change. We seek to increase customer engagement and choice through our energy efficiency programs, providing customers with actionable insights and the ability to efficiently manage their energy needs while creating broader system and 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 will 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 an opportunity to innovate program design and address adoption barriers.
- Third, we are focused on offerings and program innovations to better reach low- and moderate-income customers.

We will also strive 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 both disadvantaged communities and the communities we serve more broadly. For additional information about how we support an equitable transition through energy efficiency initiatives, please refer to Section 3.4.2.2.

Additional information about our cross-cutting energy efficiency program is available in our **Integrated Long-Range Plan**.

3.2.2.2 Slow the Growth of the Gas Customer Base

To achieve net-zero GHG emissions by 2050, we plan to implement initiatives that will slow growth on the system. Our ongoing strategy of slowing the growth of the system is in alignment with our Clean Energy Commitment and we will continue serving new customer connections with electric and steam energy in accordance with the requirement of these rules.

To fully embrace this change, we are seeking to revise several provisions in our gas tariff that go beyond the statutory requirement for new gas connections. These include:

- Eliminating our obligation to provide an extra 100 feet of service or main to residential heating customers;
- Eliminating the ability of multiple connecting customers to pool their main/service allotments;
- Eliminating the "revenue test" that allows customers to avoid charges for exceeding their allotment if they can show they will generate revenues above a certain level; and
- Eliminating the reimbursement customers currently receive for new main installations above their allotment when additional, subsequent customers connect to the new main.

Because these existing tariff provisions artificially lower the upfront connection cost to the customer, these provisions will be increasingly at odds with electrification and decarbonization

targets as they may entice the customer to elect natural gas service over electrification. They also encourage the creation of net-new fossil fuel infrastructure and harm other ratepayers by supporting gas lines that may contribute to incremental GHG emissions when better options could be available. To achieve state and city goals and provide customers with the best energy option, we should consider the customer's need (such as building heating and cooking) and how to best serve that customer from a cost-optimal and GHG emissions-optimal strategy.

Additionally, we have created and sought approval from the Public Service Commission for a NPA framework, which includes solutions that allow us to defer or eliminate the need for gas infrastructure investment. This framework is being integrated into the system planning process to support continued reliability of our system and to provide clean energy options to our customers. Through the framework, we will evaluate as many planned traditional system infrastructure investments as feasible and try to match those with targeted implementation of demand side management solutions (e.g., building electrification, energy efficiency) that may defer or eliminate the infrastructure need. These solutions can allow us to meet our clean and reliability goals by reducing gas peak demand and overall gas demand. The proposed NPA framework allows us to offer increased incentives for our demand side management solutions, like building electrification and gas energy efficiency, and incorporates societal costs when comparing alternative solutions. Appropriate targeting of NPA's may also support reduced scope of our MRP program, as this can lower gas demand in areas of the system where we would otherwise replace mains. Examples of specific demand side management programs we seek to leverage in the implementation of NPAs include:

Building Heating Electrification (Clean Heat) and Energy Efficiency

Please refer to Section 3.2.2.1 for a detailed overview of our Clean Heat and Energy Efficiency programs.

Whole Building Electrification Services: Request for Proposal

We have an outstanding Request for Proposal (RFP) that targets leak-prone gas mains on radial portions of our grid and calls for whole building electrification of existing gas customers. Specifically, these are endpoints of the gas network that would be easier to convert to electrification, as they have uni-directional flow of gas directly to the end user.

We will continue to monitor the success of this program, its impact on gas demand, and how it may contribute to a reduction in the scope of main replacements. If we see rapid reductions in gas demand, we will adjust and scale the program accordingly.

Gas Demand Response Pilot

We have proposed and been approved for a gas demand response pilot. This pilot consists of a performance-based offering for commercial, industrial, and large multifamily customers, and a direct load control offering for residential and small business customers using Wi-Fi-enabled thermostats. By applying for the program through an approved aggregator, participants in the performance-based offering can earn up to $6,000 per winter for every 100 therms in reduced consumption. In the smart thermostat offering, customers can earn up to $85 for enrolling. This pilot is assessing the ability of gas demand response to help reduce demand during peak periods when supply is particularly strained.

3.2.3 Align Our Actions with Climate Policy

We are committed to supporting New York City and Westchester County in achieving climate policy targets. As the primary energy provider for this territory, we have a leading role in moving the market and supporting our customers and constituents in achieving these targets. As far as the CMA, CLCPA, and additional New York State/New York City targets and laws are concerned, we have identified the strategies to support each target in Table 9.

Table 9. Aligning Our Actions with Climate Policy

Area	Specific Target	How the Gas System Will Support
CMA	**Local Law 97:** Buildings over 25,000 square feet must significantly reduce GHG emissions	**Drive growth in electrification and energy efficiency -** incentivize electrification, energy efficiency, and demand-side management, among other GHG emission reduction measures
CLCPA	**Net-zero** economy-wide GHG emissions by **2050**	**Reduce methane emissions across the value chain** – Reducing methane emissions across our value chain helps us to reduce both in-state and out-of-state GHGs **Build a low-to-zero-carbon gaseous fuels portfolio –** Low-to-zero carbon gaseous fuels could use our existing energy delivery system to deliver energy for customers
CLCPA	**35%-40%** of clean energy benefits to disadvantaged communities	**Drive growth in electrification and energy efficiency -** Develop new and continue existing gas energy efficiency programs targeted for LMI communities and incorporate disadvantaged community[26] plans in our specific programs
NYS: New Efficiency New York	**185 TBtu** end use energy reduction by **2025**	**Drive growth in electrification and energy efficiency -** incentivize electrification, energy efficiency, and demand-side management, among other GHG emission reduction measures

We are further assessing the impact of New York City's recent (December 22, 2021) enactment of **Local Law 154 of 2021** on our business strategy and initiatives going forward. Our understanding of the legislation is as follows:

- Legislation prohibits combustion emitting more than 25 kg of CO_2 per MMBtu of energy within a building, triggered by when an application is submitted for either new construction or gut renovation thresholds, as established by the New York City Department of Buildings.
- The law provides various exceptions, including for those where combustion is required such as laboratories, laundromats, hospitals, crematoriums or commercial kitchens and those fuels burned occasionally not connected to service lines (such as propane for outdoor grills). There are additional exceptions for power and/or steam generation by utilities (e.g., CECONY), and management of food waste and sewage.

[26] The Climate Justice Working Group 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. We will continue to monitor Climate Justice Working Group's progress in defining disadvantaged communities for further clarity.

- There is an implementation timeline with key dates beginning in 2023 through 2028, which includes additional adoption time for affordable housing units given the financial and technical constraints of such buildings.

We expect that this will have a major impact on our current and future customers. Our gas strategy is already aligned with slowing the growth of our gas network and providing both financial and technical support to customers looking to adopt electric building heating.

While the decarbonization targets are highly specific, our strategy may vary if there are technological and policy changes that cause us to change course. As a result, we will continue to advocate for near-term policy that incentivizes clean energy adoption, eliminates our obligation to provide service/main beyond the statutory requirement for new gas service connections, and for a technology-neutral policy approach to decarbonization that allows cost-optimal solutions across our electric, gas, and steam infrastructure.

3.3 Climate Resilience

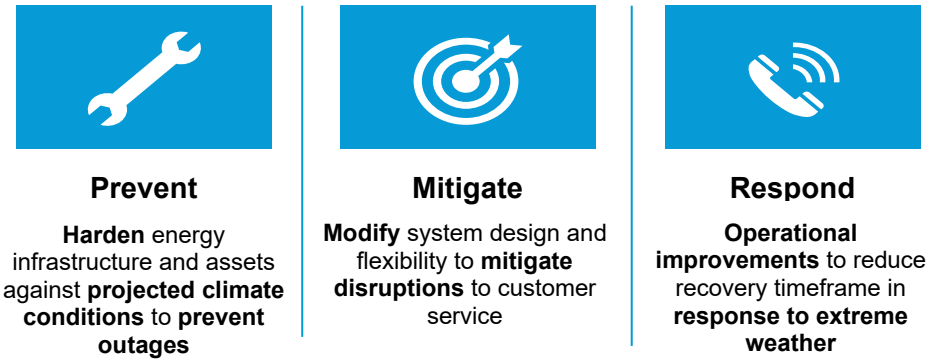
As described in Section 2.2, we engaged in a 3-year **Climate Change Vulnerability Study** to identify the climate risks to our territory and consequently the risks to our gas system. The critical risks identified to our gas system are included in Table 10 below.

Table 10. Critical Risks from Climate Events

Ambient Temperature	Heavy Precipitation, Sea Level Rise, and Storm Surge	Extreme Events
More **intense cold** snaps	Sea level will **rise 2 feet** by 2050	More frequent **Nor'easters** and **hurricanes**
Drastic regional cold spikes will increase demand and strain supplies. Ground heaving can damage lines	Water may infiltrate our pipes and other equipment, potentially causing outages or damage	Storms may physically damage our pipes and other equipment, potentially causing outages

The **Climate Change Vulnerability Study** highlighted the need to incorporate future climate projections when planning assets and designing our gas system to address future risks and to maintain the system reliability that our customers expect in a changing climate. We have partnered with our stakeholders to create the **Climate Change Implementation Plan** to adapt to these identified risks while applying our three guiding strategies (Figure 19).

Figure 19. Strategy to Address Climate Risks



The **Climate Change Implementation Plan** is a comprehensive plan to maintain and/or enhance the resiliency and reliability of our gas system in a changing climate. It includes the application of Climate Change Planning and Design Guideline to our specifications and procedures and management through a dedicated resilience group with executive oversight. By reviewing our specifications and procedures against anticipated changing climate conditions, we better understand how to proactively adapt our planning, operations, and emergency response. Using these strategies, we have identified a portfolio of investments that collectively help prevent, mitigate, and respond to the identified climate risks. These specific investments, in concert, support a more climate resilient gas system that stands up to anticipated future climate events. These investments are summarized in Table 11 below.

Table 11. Initiatives to Address Climate Risks

Prevent	Mitigate	Respond
• Continue **distribution main replacement** across our system to better secure mains against water intrusion • Harden **LNG facilities** against flood and high winds • Invest in **LNG upgrades** to better accommodate demand spikes	• Install **remote operated valves** to better isolate outages and manage demand during spikes • Create better system **networking** so that gas can flow around outages	• Continue improving our **outage management system** to respond to outages more swiftly • Continue improving our outage **operations**

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. We are committing up to $550 million on these climate resiliency investments over the next 10 years. The bulk of this dedicated system investment will go toward accounting for climate change in our asset design and construction.

As we move forward, we will continue to work closely with New York City and Westchester County to develop an integrated approach that recognizes the interplay between different infrastructure (such as seawalls, sewage systems, and rain gardens) that may affect our ability to deliver energy to our customers during climate events. An example of this includes the East Side Coastal Resiliency Project, which aims to build coastal protection on Manhattan's East

Side from East 25th Street to Montgomery Street.[27] We also anticipate that our system will continue to support resiliency for those customers with on-site backup power generation during more extreme climate events.

A strategic portfolio of investments will help to prevent, mitigate, and respond to ongoing climate risks. Further information about initiatives designed to prevent, mitigate, and respond are documented in the following sections.

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 with upgraded equipment to prevent damage to our system from future climate events.

Main Replacement Program

Please refer to Section 3.2.1.1 for a detailed overview of our MRP. Note that the MRP will benefit resilience, as a sub-set of our leak-prone pipe is also located in flood prone areas.

Winter Load Relief (WLR) Program

The WLR program improves the safety, reliability, and resiliency of the 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 demand, it results in poor pressures, which can lead to customer outages.

Each year, we use models to identify areas of our 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 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.

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.

Remotely Operated Valve (ROV) Program

ROVs are installed at strategic locations to minimize potential impacts to the 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:

[27] Additional details about the East Side Coastal Resiliency project can be found **on their website: https://www1.nyc.gov/site/escr/index.page .**

- 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 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).

LNG Plant Upgrades

Our LNG plant in Astoria, Queens, put in service in 1974, is critical for the reliability of our system as it provides gas for peak demand. Our LNG plant is even more important in our current supply-constrained environment. During the heating season, this LNG plant can support up to 15% of the daily supply needed to meet demand on peak winter days.

Ongoing modernization of the LNG plant continues, with upgrades to critical components and systems. We will need to make significant investments in our LNG plant to maintain critical components and operations. These investments will permit us to continue to deliver natural gas to our customers when they need it most and to provide services for gas peaking and unplanned upstream system interruptions. New equipment will meet tighter NOx emissions standards (NO_X Reasonable Achievable Control Technology or NO_XRACT). Details on our planned investments are included below:

- A new nitrogen refrigeration cycle will allow our LNG plant in Astoria to inject more quickly, maximizing use of the tank where the LNG is stored. This investment will allow us to fill the tank faster, supporting full withdrawal for peaking and increasing system reliability. Additionally, this equipment will meet newer emissions standards. Our plan is to build the new system in parallel with operating the existing system to minimize the outage window and to ensure we meet the winter peak.

- New LNG plant instrumentation, which controls and captures a variety of measurements, will be installed. The new instrumentation and control system will create additional monitoring and control capabilities for our LNG plant. It will also allow us to consolidate and centralize the plant's controls into one supervisory control and data acquisition system.

Main Replacement Program

Please refer to Section 3.2.1.1 for a detailed overview of our MRP. Note that the Main Replacement Program will benefit resilience as a sub-set of our leak-prone pipe is also located in flood prone areas.

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.

Outage Management System (OMS) Upgrade

We are undertaking a software upgrade of our OMS[28] to the latest version to support continued stability, reliability, and resiliency. This will include new system enhancements offered by the software upgrade as well as ensuring adequate support in terms of service packs and patches from the vendor. This initiative also includes implementing a mobile application platform.

Our OMS will also be integrated with our electric Geographic Information System. Gas assets within OMS will be stored and visualized in real world coordinates which will improve outage identification accuracy and allow future opportunities to further enhance processes like damage assessment, site safety and outage analytics.

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 identify additional system functionality that can strengthen storm response efforts over time

3.4 Core Service

We recognize our role in enabling the New York City and Westchester County economies with safe, secure, and reliable energy service. We will continue to enhance this foundational core while managing the energy transition, 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. Our Core Service strategy consists of the components shown in Figure 20.

Figure 20. Key Components of Core Service

3.4.1 Enterprise Risk Management

To continue delivering on our Core Service, we need to understand the risks to our system and effectively manage those risks. 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. The Con Edison risk management team works closely with senior management and employees within CECONY to identify and mitigate risks to our system. An

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

overview of how ERM supports the identification and mitigation of risks to our system is shown in Figure 21.

Figure 21. How ERM Supports Identification of Gas System Risks

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, as shown in Figure 22.

Figure 22. ERM Framework

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

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

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 23.

Figure 23. Risk Management Strategy

3.4.1.1 Enhanced Safety

Our safety programs are designed to minimize safety incidents for both our employees and the public. Our anchor capital project, the MRP, will provide significant safety benefits by eliminating leak-prone pipe throughout our system. This project is supported by other capital investments and operational programs to improve safety across our system.

We have identified the following focus areas to continue improving safety:

Employee safety – Creating an interdependent zero harm culture

- Promote a first-class safety culture by supporting employees to use their voice to participate in safety every day, every task, and every job
- Focus on high hazard injury prevention by proactively identifying and addressing unseen hazards and closing gaps prior to injury
- Use and develop tools by leveraging data and thorough job briefings to drive us toward a zero-accident workplace

Public safety – Preventing serious injuries and fatalities associated with our system

- Educate the public on gas safety and what to do in the event of a gas leak or emergency
- Install AMI-enabled NGDs on customer premises to identify hazardous leaks on our system and quickly inform customers
- Ongoing operational programs such as monthly leak surveys, rapid repair, and damage prevention
- Proactively replace problematic equipment with modern, safer alternatives to protect against public harm caused by failing equipment

All the above areas, and more, fall under various facets of our Pipeline Safety Management System, a comprehensive safety management system used extensively in the airline and nuclear industry and now gaining widespread use in the natural gas industry.

From a capital investment perspective, we are committed to the following initiatives to continue improving safety:

Main Replacement Program

Please refer to Section 3.2.1.1 for a detailed overview of our MRP.

Natural Gas Detectors

NGDs are safety devices that are installed at gas customers' premises to provide continuous monitoring of the area for methane leaks. The accumulation of natural gas can occur from customer pipe or our buried distribution infrastructure outside the building. Gas can migrate in through the soil, through a foundation wall or through a utility service point of entry. When a NGD detects a leak, information is transmitted through the AMI network to our Gas Emergency Response Center (GERC). The GERC then dispatches the fire department and our qualified gas mechanics to respond to the potential leak.

Using NGD technology improves public and employee safety by identifying potential leaks as they emerge and responding to them in real time. This new technology complements our traditional leak surveys and customer awareness programs. It allows service crews to arrive earlier in an event, make the location safe, and evacuate people if necessary. We are bundling the NGD installations with service line inspections to improve our operational efficiency by reducing visits to customer premises.

The installation of the NGDs in combination with the continued rollout of our gas AMI communications network presents a first-of-a-kind and unique opportunity to pair remote methane detection with the AMI communications infrastructure. We plan on installing NGDs for all our gas customers by the end of 2025.

3.4.1.2 Enhanced Security

Our security programs identify potential internal and external threat risks, and we implement controls, procedures, and processes to mitigate them. Our mitigation measures tie into our security platform, all coordinated through our 24/7 Security Operations Center (SOC).

Physical Security

Corporate Security's core mission is to provide and execute 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 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.

Examples of how we incorporate comprehensive security processes to protect our employees, the public, and physical assets include:

- Routine site assessments of critical gas facilities to identify opportunities to reinforce physical security. Security measures have been installed to prevent unauthorized entry and allow for early detection if there are breaches in the security perimeter.
- Penetration testing is also done routinely to ensure physical security practices are adhered to.
- All Gas Operations employees are required to take security awareness training to reinforce the importance of adhering to security policies and staying vigilant.

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 our utilities have avoided a catastrophic attack on our energy systems 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 before, and the data pool is expanded by devices such as distributed energy resources (DER), AMI smart meters and third-party technology companies that are now 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 upheld.

We recently expanded our use of next-generation intrusion detection and prevention tools to further protect our customers' personal information. This is particularly important as we continue to roll out gas AMI devices at customer premises, as we will continue to collect and analyze a significant amount of customer energy usage data. We also provide regular trainings to our employees to stay aware of potential cyber threats, which is particularly important because our gas and other systems are considered critical infrastructure. 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

From a reliability standpoint, we have been managing acute supply challenges in Westchester County that led us to issue a new gas connection moratorium in 2019. We have been able to maintain system reliability through a combination of measures, such as supply side measures like our 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. However, if current pipeline projects are not approved and/or delayed beyond regulatory timeframes, we may be required to lift our Westchester County moratorium. In that case, we will need to add a new injection point in our system to accommodate additional gas service connection. Our ongoing reliability programs include the following:

Supply Side:

- Proactive, risk-based replacement of existing infrastructure, such as distribution pipe through our MRP, WLR, gas reliability improvement program, or transmission replacement programs
- Ongoing upgrades and maintenance of LNG and other facilities
- Upgrades to 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[29] that prompts gas utilities to consider alternatives to traditional infrastructure while continuing to deliver energy to customers safely and reliably. 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 distribution system constraints. We are awaiting additional feedback but will work closely with our regulators to plan our system accordingly.

Main Replacement Program

Please refer to Section 3.2.1.1 for a detailed overview of our MRP.

Transmission Replacement Program

We are undertaking a significant transmission main replacement program with plans to replace 35 miles through 2035, at a cost of about $90 million per year. Recently, the Pipeline and Hazardous Materials Safety Administration (PHMSA) adopted new pipeline safety regulations, which modify integrity management requirements, verification of maximum allowable operating pressure, records for material verification, repair criteria, and the expansion of integrity management beyond high consequence areas.

We support the new pipeline safety regulations because they will improve the overall safety, reliability, and resiliency of our system for our customers and employees. To comply with these regulations, we will replace portions of our existing transmission mains with higher strength steel mains that will allow us to adhere to all new regulations.

This program consists of various smaller replacement projects across our service territory. Example projects include:

In Queens, we plan to replace 4 miles of 24-inch transmission mains with new modern 36-inch mains; in the Bronx, another 6 miles will be replaced. The Queens installation will require the reconnection of supply to an existing National Grid interconnect. The newly installed mains are compliant with the new pipeline safety regulations and will allow us to continue to deliver safe, reliable service.

[29] Official proceeding documents are available **here.**

If we see rapid reductions in gas demand, we will adjust and scale the program accordingly. This program will also provide significant operations and maintenance reductions, as it will allow us to discontinue use of several regulator and compression stations. This program will also help improve reliability, as we will no longer need these regulator and compression stations to deliver gas to a large sub-set of customers.

LNG Projects

Please refer to Section 3.3.2 for a detailed overview of our LNG projects.

Regulator Station Projects

We are making upgrades on several regulator stations throughout our service territory. These upgrades include deploying technology and undertaking retrofits and critical repairs. These gates serve a critical role in controlling pressure in gas transmission and distribution. The upgrades will help improve over pressure protection on our system. Example projects include the following:

Our regulator automation project will install automated control equipment, which includes sensors, controls, and communications technologies, at 231 gas system regulator stations across our service territory. The installation of this automation equipment will provide real-time system visibility and system disturbance response. Overall, this project will enable us to better monitor and control our regulator stations, increasing the safety of our system.

Our regulator revamp program will identify several target regulator stations in need of retrofit and repair. The work will vary in scope depending on the station's needs, but may include replacing vaults, piping, and technology hardware, including communications systems. The goal of the project is to ensure that regulator stations provide the capacity to meet existing and future demand, including peak demand, and to provide system flexibility.

3.4.2 Manage Transition

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

3.4.2.1 Manage Rate Impacts of 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.

In addition to our bill discount programs specifically targeted at low-income customers, we propose to accelerate the depreciation of our gas assets to mitigate long-term customer bill impacts across our entire customer base. This includes shortening the asset life of gas assets so that in the long-term, gas delivery rates can remain at stable or lower levels even as projected gas sales continues to decline. This proposal is supported by an analysis performed

by Concentric Energy Advisors on the impact of climate change and legislation on asset depreciable lives[30]. Key takeaways from this analysis include:

- Climate legislation, technological advancement, and customer adoption will likely lower the utilization of fossil gas by creating more demand for building electric and geothermal heating.

- Initial estimates of the useful service life of many existing gas assets, including facilities, transmission, and distribution networks were made prior to climate legislation and prior to the rapid technological advancement seen in building electric and geothermal heating.

- Many gas assets have very long useful lives that were determined during construction of the asset prior to enactment of many GHG targeting climate policies and before viable heating, power generation, and cooking alternatives existed (e.g., 80 years). Changing depreciable lives to reflect the reality of market conditions, for example, from 80 years to 70 years for an asset that has been in service for 20 years, results in a yearly depreciation change (straight-line) from 1.25% to 1.50%. As such, shortening the depreciable lives for long lived assets will have an increased impact on customer bill impacts in the short term, while preventing costs from being imposed on future customers in the long term.

Accordingly, our proposal recommends shortening gas asset lives by at least 5 years, and up to 10 years, to better align our practices with CLCPA legislation and the anticipated value of the current system over time. If depreciation lives are too long today, future customers will have to pay an excessive share of the cost of the gas assets as a transition to other energy sources takes place. Further, there is the risk that customers will leave the system as they electrify their energy usage. This would push additional costs to remaining future customers, as there will be fewer customers left to pay for the gas assets, creating intergenerational inequity. Lastly, there are additional equity concerns because the customers who remain may be disproportionately low- and moderate-income customers who are not able to electrify their energy usage as readily as those with more resources.

Rate design for gas service should be based on the costs to support customer use of the system, including both fixed costs, such as the maintenance of pipelines, and variable costs, such as purchased fuel for delivery. Such rates should provide customers with price signals that promote efficient use of the delivery system and curb rising system costs. To make gas rates more cost-reflective, we are planning to gradually phase out the use of rates that decline with increased usage.

Lastly, by working toward 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 targets and continued climate resilience. As such, we will continue to advocate for technology neutral policy that enables us to pursue the lowest cost decarbonization strategies.

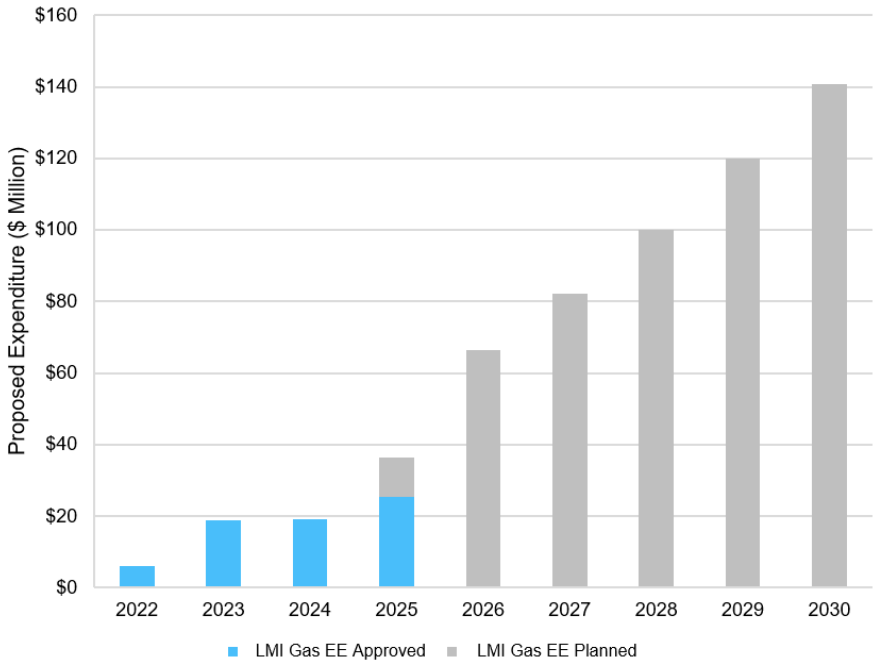
[30] Case Nos,19-E-0065 and 19-G-0066 Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric and Gas Service. Item No 266 CECONY Climate Change and Depreciation Study (June 1, 2021).

3.4.2.2 Enable an Equitable Transition

We are sensitive to the needs of our disadvantaged and low- to moderate- income communities and want to ensure that they are not disproportionately burdened by the clean energy transition. Additionally, these communities should fully participate in the benefits of a clean energy economy. Therefore, our clean energy programs, such as our Energy Efficiency incentives, have specific low- to moderate- income targets and funding.

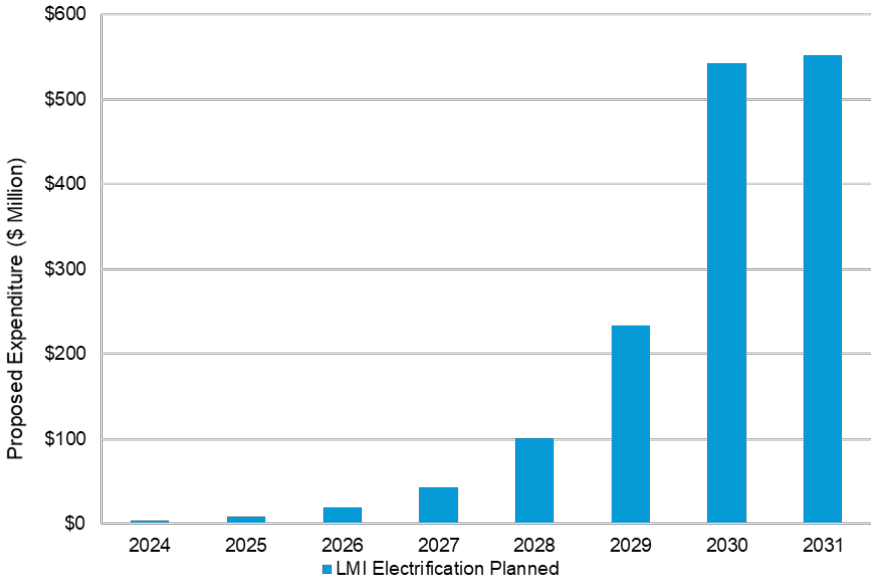
We are committed to increasing our funding for low- and moderate- income gas energy efficiency programs at a 24% Compound Annual Growth Rate (CAGR) from 2022 through 2031 as shown in Figure 24.

Figure 24. Low- and Moderate- Income Gas Energy Efficiency Expenditure (2022—2031)



Currently, our low- and moderate- income specific building heating electrification programs have not been approved. However, these will be necessary going forward both to decarbonize our system and to equitably provide benefits of the clean-energy transition to our low- and moderate-income communities. We also will need to extend these programs to disadvantaged communities when they have been officially defined. Our proposal includes a rapid scale-up of this program (if approved) starting in 2024 (Figure 25).

Figure 25. Proposed Expenditure for Low- and Moderate- Income Building Heating Electrification



Enabling an equitable transition is particularly challenging for these communities, as our analysis indicates that these customers tend to live in older, less-efficient buildings that are less conducive to electrification. As such, after exhausting reasonable energy efficiency and electrification measures, investing in low-to-zero-carbon gaseous fuels can support long-term decarbonization for a sub-set of these customers.

3.4.3 Employees

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

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

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

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

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

3.5 Customer Engagement

To deliver customer value, we need to deliver on our strategic objectives of Clean Energy, Climate Resilience, and Core Service. This strategy is only achievable if we provide the right information, data, and messages to help our customers make informed energy choices that align with their lifestyle and we continue improving their experiences – such as enabling our customers to access self-service applications on their own terms.

Our customer engagement programs are designed to improve the customer experience, provide customers with the right data and tools, and further integrate the journey across our electric, gas, and steam businesses. We strive to connect our customers with the latest intelligent technology so that they can reap the benefits of greater access and understanding of their energy usage. These customer engagement initiatives can also reduce the carbon footprint of the system and creatively alleviate our supply challenges, including energy efficiency (to reduce total system demand) and demand response (to incentivize customers to reduce gas demand during peak periods). Additionally, customer and company software help us better communicate with customers during outages and reduce response times during those events.

To facilitate customer energy choices, we are investing in:

- Tools, data, and analysis to support our customers in better understanding their energy usage, including our AMI program
- Our energy efficiency and Clean Heat programs are designed to offset some of the upfront cost of energy efficiency and building heating electrification measures
- Gas Demand Response pilot to encourage gas conservation during times of peak-demand

To support our continued ability to improve the customer experience, we are investing in:

- OMS improvements to better identify and deploy resources to manage and repair outages and improve our communications with customers
- Customer Service System (CSS) improvements and a Customer Relationship Management (CRM) upgrade that makes common transactions, such as starting new service, paying a bill, or changing personal information, easier to navigate

3.5.1 Continue to Improve the Customer Experience

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

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

Outage Management System

Please refer to Section 3.3.3 for a detailed overview of our OMS.

Customer Service System and Customer Relationship Management Upgrades

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

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

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

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. Points of friction identified include the following:

- Lack of knowledge or information about clean energy solutions

- 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 building comfort level 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 CSS enhancement, which allows us to aggregate, collect, and analyze data across our customers' various utility services to provide personalized recommendations and insights.

Gas Advanced Metering Infrastructure

We are in the process of rolling out more than 1.1 million smart meters throughout our service territory with an expected completion by the end of 2022. These are digital meters that remotely and continuously read customer energy usage information.

This rollout will help provide customers with valuable consumption information and will enable innovative pricing and demand response capabilities. This investment will support our customers energy lifestyle choices and provide them with the information they need to make informed energy decisions.

After the implementation of the initial hardware (smart meters) and underlying software, we plan to perform additional software enhancements from 2022-2025 to improve data connectivity across our systems and to optimize for additional processing needs as our demand response, rates, and analytics programs mature. More information about our AMI Enhancements can be found in our **IT Strategic Plan**.

Building Heating Electrification (Clean Heat) and Energy Efficiency

Please refer to Section 3.2.2.1 for a detailed overview of our Clean Heat and energy efficiency programs.

Gas Demand Response

Please refer to Section 3.2.2.2 for a detailed overview of our Gas Demand Response program.

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 will enable a 22% reduction in GHG emissions from natural gas compared to today and set us on the path to achieving net-zero GHG emissions. 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.[31] Additionally, various forums point to the significant number of green jobs that will be created through achieving clean policies.

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

To unlock these benefits and achieve policy goals and customer needs, we have identified nearly $13 billion of investments required over the next 10 years. Of these investments

- 60% of our projected expenditures support our Core Service, much of which also benefits Clean Energy and Climate Resilience
- 35% supporting Clean Energy
- 5% supporting Climate Resilience

Identifying and prioritizing these multi-value investments, such as our MRP, is an example of how we are seeking to achieve strategic objectives in the most efficient and cost-effective manner. Our multi-value investments are highlighted in Table 12.

Table 12. Our Multi-Value Investments (2022-2031)

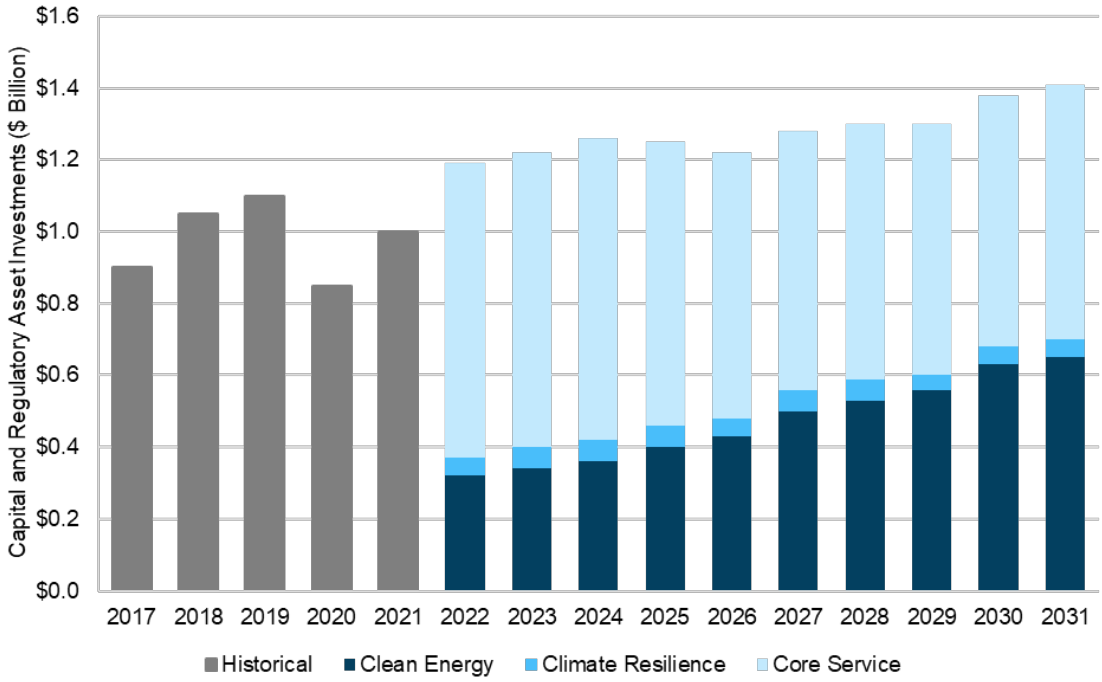
Project Description	Areas Supported	Approximate Expenditure ($ Millions)
MRP and Service Replacement	Clean Energy, Climate Resilience, Core Service	$5,600
Other Programs (e.g., Customer Operations, Facilities, and other Overhead)	Clean Energy, Climate Resilience, Core Service	$800
LNG Plant Upgrades	Climate Resilience, Core Service	$100
Regulator Station Projects	Clean Energy, Climate Resilience, Core Service	$90
Total		**$6,590**

We include our expected capital expenditures through the next 10 years in Figure 26. This figure represents our best estimate of what is necessary to support 2030 GHG emissions goals,

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

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 26. Gas Capital and Regulatory Asset Investments (2017 – 2031)



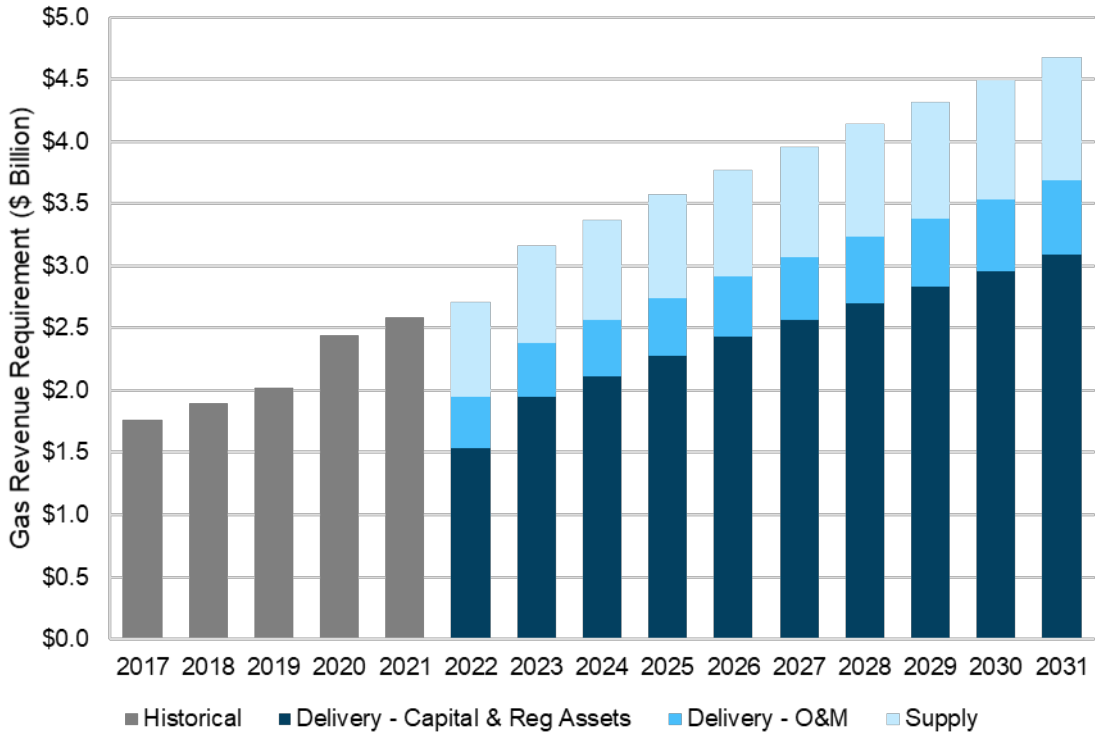
4.1 Cost-Effectiveness

Customer costs are expected to increase to support required investments. We estimate that the identified capital plan will increase the gas revenue requirement—a proxy for overall customer costs—by approximately 6% per year through 2031[32]. This cost estimate is based on assumptions that can change and excludes items such as deferred costs the company is entitled to recover, and increased costs resulting from changes in state policy and unanticipated events. Some of these investments will offset costs currently incurred by customers. For example, costs for heating oil and/or natural gas will be eliminated for customers moving to electric building heating technologies.

Cost-effectiveness is an important consideration to keep expenses manageable for our customers. Our efforts to maintain cost-effective solutions include identifying and prioritizing investments, such as our MRP, that deliver on multiple objectives, prioritizing lower cost solutions that deliver GHG emissions reductions, providing resilience of our existing infrastructure to extreme weather impacts, and delivering on operational efficiency to mitigate cost increases.

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

Figure 27. Gas Revenue Requirement (2017 – 2031)



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 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- to 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 we support, we have implemented assistance programs to help support low- and moderate-income customers manage energy transition costs. The bill discount program, for example, is designed to keep the energy burden of low-income customers from exceeding 6%.

4.3 Rate Design

An important consideration for delivering a cost-effective energy transition and mitigating needed investments is rate design. Rate design for gas service should be based on the costs to support customer use of the gas system. 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, we are planning to gradually phase out the use of rates that decline with increased usage.

5. The Road Ahead

As we move forward to a cleaner, more resilient future that maintains our foundational core and brings value to our customers, we cannot forget who we serve. Ultimately, this evolution is about our stakeholders and improving their communities and experiences.

As referenced throughout this document, we have done a significant amount of research and analysis on what it will take to support this future. We have shared our **Climate Change Vulnerability Study**, our **Climate Change Implementation Plan**, our view on how we can achieve a net-zero GHG emissions energy delivery system by 2050, and other details. We know what we need to achieve, and we have a credible path to get there:

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

We will manage the reimagining of the gas business, where we will see a significant decline in fossil gas sales and a significant reduction in GHG emissions, while continuing to provide safe, secure, and reliable service to our customers. We will need to inform potential customers of the benefits of building heating electrification and for those who are eligible, how our steam system can serve as an alternative option to a gas connection, and how low-to-zero carbon gaseous fuels may support those customers that are hardest to electrify. We will need to work diligently with our electric colleagues to accelerate initiatives in building heating electrification, and we will need to create customer communication processes that recognize multiple energy options rather than defaulting to new gas connections.

Supporting our strategic objectives 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 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, such as replacing gas mains to reduce emissions and improve efficiency and safety and supporting low-to-zero carbon gaseous fuel development in the pursuit of a decarbonized future

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

- Enables us to be flexible in our pursuit of net-zero GHG emissions in New York City and Westchester County by 2050
- Provides customers cost-effective options in adopting clean energy solutions
- Eliminates our obligation to provide service/main beyond the statutory requirement for new gas service connections

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.

Accordingly, industry and societal trends in policy, technology, and customer adoption are uncertain; to account for this uncertainty, we look to our pathway framework that allows for flexibility to achieve net-zero GHG emissions by 2050. Signposts will continuously inform our strategy and will help us plan for maximum efficiency of operations and optimal allocation of resources. An overview of our analysis of potential signposts is included in Table 13.

Table 13. Signposts by Representative Pathway

	Full Electrification	Targeted Electrification	Hybrid Consumption
Policy Signposts	Policies **mandate** electrification in New York City and Westchester County.	Policies **mandate** or **strongly support** electrification in New York City and Westchester County.	Policies support **decarbonization** while being technology-agnostic in New York City and Westchester County
Technology Signposts	Building electric heating technology **rapidly declines** in cost and improves in quality.	Building electric heating technology **declines as expected** in cost and improves in quality; **low-to-zero carbon gaseous fuels** are viable in **specific use cases.**	Building electric **heating technologies** and **low-to-zero carbon fuels** decline in cost as expected; **low-to-zero carbon gaseous fuels** are viable for difficult-to-electrify buildings.
Customer Signposts	Customers **enthusiastically** adopt building electric heating for compelling cost and comfort and convenience reasons.	Customers **generally** adopt building electric heating for a combination of cost, comfort, and convenience reasons. Some customers see value in **low-to-zero carbon gaseous fuels**.	Many customers **adopt** building electric heating for either cost, comfort, or convenience reasons. Many customers see value in **low-to-zero carbon gaseous fuels**.

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

We will be highlighting additional details in a concurrent Gas Rate Case. Simultaneously, we have released **Integrated**, **Electric**, and **Steam Long-Range Plans** that provide insight into our overall and commodity-specific views of each system. We will also be releasing a 10-Year IT Strategic Plan, which describes the important investments we are making in technology to make our strategic objectives of Clean Energy, Climate Resilience, Core Services, and Customer Engagement possible. We look forward to working with our many stakeholders, regulators, customers, and constituents to bring this future into reality.

Acronyms and Abbreviations

AMI: advanced metering infrastructure

BDR: behavioral demand response

Btu: British thermal unit(s)

CAGR: compound annual growth rate

C&I: commercial and industrial

CECONY: Consolidated Edison Company of New York, Inc.

CG: Certified Gas

CLCPA: Climate Leadership and Community Protection Act

CMA: Climate Mobilization Act

CO_2: carbon dioxide

CRM: customer relationship management

CSS: customer service system

GERC: Gas Emergency Response Center

GHG: greenhouse gas

kg: kilogram

LNG: liquified natural gas

MMBtu: million Btus

MRP: main replacement program

NGD: natural gas detector

NPA: non-pipeline alternatives

NYSERDA: New York State Energy Research and Development Authority

O&R: Orange & Rockland

OMS: outage management system

OSHA: Occupational Safety and Health Administration

PHMSA: Pipeline and Hazardous Materials Safety Administration

R&D: research and development

RNG: renewable natural gas

ROV: remotely operated valve

SCADA: supervisory control and data acquisition

SNG: synthetic natural gas

TBtu: trillion Btus

TCO_2e: tons of carbon dioxide equivalent

WLR: Winter Load Relief (program)

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