



Orange & Rockland

Orange and Rockland Utilities, Inc.

Long-Range Plan

January 2021





Table of Contents

Executive Summary.....	3
Introduction	7
Planning Scenarios – Pathway to 2050	12
Strategy – Areas of Focus.....	28
Energy Efficiency (Gas and Electric)	31
Electrification of Heating	38
Electrification of Transportation.....	46
Energy Storage	59
Solar Photovoltaic (“PV”)	72
Integrated System Planning	89
Role of Gas in a Clean Energy Future	104
Customer Experience	121
Planning Uncertainties.....	134
Infrastructure Planning and System Resiliency.....	139
Cost Management.....	145
Conclusion.....	149
Appendix A: Acronyms.....	150



Executive Summary

Industry Background

By 2050, the utility industry is expected to have undergone a remarkable evolution. The ambitious clean energy goals and requirements of New York State's Climate Leadership and Community Protection Act ("CLCPA")¹ and New Jersey's 2019 Energy Master Plan ("EMP")² will shape the future of Orange and Rockland Utilities, Inc.³ ("O&R"). Societal and industry trends indicate that the way energy is sourced, delivered, and consumed will all experience significant changes in the coming decades. The three major components driving this change are:

- **Customers** –increasing expectations of customers for the Company to deliver safe, reliable, reliant and cost-effective energy in new and innovative ways is pushing the Company to play an increased role in realizing the clean energy future; the Company must engage customers on a personalized level that gives customers greater choice, control and convenience over their source of energy, how it is used, and how they interact with the Company.
- **Policy** –ambitious clean energy goals and requirements set by the CLCPA and EMP, specifically achieving the required greenhouse gas reductions of 85 percent (from 1990-levels) and 80 percent (from 2006-levels) by 2050, respectively, will require significant Company investments throughout the transmission and distribution system.
- **Technology** –declining costs and increasing availability of clean energy technologies present significant opportunities for the Company; innovative clean energy technologies are and evolving rapidly and the Company must be prepared to leverage their capabilities to enable a dynamic, reliable, grid and educate stakeholders (e.g., developers, municipalities, customers) about potential benefits.

The Company expects these three components to impact the electric load profile significantly. This includes shifts in peak demand throughout a given day, or seasonal peak shifts from the summer to the winter and even change to the role of gas in the clean energy future. Potential for increased incidents of extreme weather events caused by climate change will also continue to shape the Company's actions and investment priorities to support enhanced system resiliency and restoration capabilities. As the clean energy future's goals are realized, the Company will provide a greater variety of services to its customers and, in turn, the Company's customers' reliance on the Company to deliver safe, reliable energy service will increase. It is critical that the Company be prepared to assume this increased responsibility of creating an enhanced energy delivery system that is safe, reliable, and resilient now and into the future.

To plan for these impacts, the Company has developed this Long-Range Plan ("LRP") as a roadmap for managing this evolution and delivering on the clean energy future safely, reliably, and resiliently. The Company's LRP assumes a 30-year planning horizon, designed to match the timing for both the CLCPA and EMP. The LRP is guided by the Company's integrated vision and mission and is

¹ NY State Senate Bill S6599, Climate Leadership and Community Protection Act. Full text of the legislation is available online. See <https://www.nysenate.gov/legislation/bills/2019/s6599>.

² 2019 New Jersey Energy Master Plan: Pathway to 2050. See <https://nj.gov/emp/>.

³ Orange and Rockland Utilities, Inc. ("the Company") refers collectively to O&R's operations in New York (gas and electric) and Rockland Electric Company's ("RECO") operations in New Jersey (electric). RECO is a wholly owned subsidiary of O&R.



strategically focused on meeting the needs of key stakeholders: customers, employees, regulators, policy makers, communities, and investors.

The Company's **vision** articulates what it aspires to in delivering energy services to its customers. It states:

The Company is a trusted provider of safe, reliable, clean, innovative, cost-effective energy services and solutions that enhance the lives and businesses of our customers. It focuses on the customer experience in all aspects of its daily operations.

The Company's mission statement reinforces its vision and extends beyond the Company's commitments to its customers to all stakeholders. The Company's mission is to:

- Provide energy to its customers safely, reliably, resiliently and sustainably;
- Cultivate a workplace that allows employees to realize their full potential;
- Improve the quality of life in the communities it serves;
- Provide value to its investors.

Strategic Focus Areas

The Company's efforts to realize the priorities and objectives laid out in the LRP are centered on the eight strategic focus areas set forth below. The Company has developed actions and initiatives to support the goals of each focus area, as well as identifying risks and mitigating factors.

- **Energy Efficiency (“EE”):** The Company continues to build upon and increase its EE investments. These investments increase substantially under the New Efficiency: New York (“NENY”) Order⁴ and as part of increased EE targets established in New Jersey.⁵ EE will be foundational to the Company’s pursuit of the clean energy future. However, due to the maturity of the EE programs, yields may diminish as implementation continues.
- **Electrification of Heating and Electrification of Transportation:** The Company is targeting the decarbonization of these two strategic focus areas—which make up over three-fourths of the greenhouse gas (“GHG”) emissions in the Company’s service territory—through efforts to electrify systems which are currently fueled primarily with natural gas, fuel oil and gasoline. To support these efforts, a dedicated Electrification Portfolio Management Portfolio (“EPM”) team has been established to drive programs that improve customer awareness of existing and upcoming electrification technologies, lower their total cost of ownership, simplify the process of implementing electrification solutions, and mitigate the impact of peak electric loads on the Company’s electric infrastructure.
- **Energy Storage:** The Company understands the critical role energy storage will play in the clean energy future to provide flexibility and incorporate increasing amounts of intermittent renewable generation. The Company will support increased energy storage adoption across

⁴ NY DPS website. <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=18-m-0084>

⁵ <https://www.nj.gov/bpu/newsroom/2020/approved/20200610.html>



residential and commercial customer-sited storage projects, along with distribution- or transmission-connected storage projects that provide increased reliability, resiliency, and market revenues. To realize New York and New Jersey energy storage deployment goals the Company will also support large-scale energy storage deployment either owned by third parties or the utility. The Company will support these objectives by maximizing understanding and awareness of energy storage and its benefits among its customers and within the communities that it serves.

- **Solar Photovoltaic (“PV”):** The Company expects thousands of MW of Solar PV to be installed over the next 30 years. To meet the CLCPA’s mandates, New York will see distributed solar PV grow from 2,150 MW today to 6,000 MW by 2025. Likewise, New Jersey’s EMP includes significant growth in solar deployments from approximately 3,000 MW today to 17,000 MW by 2035, and 32,000 MW by 2050. The Company will facilitate the deployment of Solar PV by conducting outreach and educating its customers and their communities about the benefits of Solar PV and actively engaging developers and contractors to identify opportunities to install Solar PV. The Company will also focus on providing a robust, customer-centric interconnection process that is simple and enables high Solar PV adoption rates. In addition to these efforts, the Company will work with various agencies and utility peers to incorporate new technologies that support the integration of Solar PV on the Company’s electric delivery system.
- **Integrated System Planning:** The Company’s integrated system planning process is designed to identify current and future operating requirements, risks, and potential solutions, to provide a safe, reliable, and resilient electric system. The Company continues to refine its approach, which includes working closely with New York Independent System Operator (“NYISO”), New York Public Service Commission (“NYPSC”), Pennsylvania Jersey Maryland Power Pool (“PJM”), and the New Jersey Board of Public Utilities (“NJBPU”) so that its systems are ready for the growing portfolio of small and large-scale renewable generation and Distributed Energy Resources (“DERs”) coming onto its system. In response to New York’s Transmission Planning Order,⁶ the Company will implement a transparent planning process that will guide future investments and identify new and innovative models for cost recovery and cost allocation in alignment with the LRP and New York’s clean energy goals.
- **Role of Gas in the Clean Energy Future:** While the push to reduce GHG emissions will put pressure on the gas business, the Company sees a long-term, important role for gas in the clean energy future. With the overarching focus of delivering safe and reliable service to its customers at a reasonable cost, the Company is pursuing a multi-pronged approach for the gas business. The Company will work to decarbonize the gas business by lowering emission intensity and exploring new carbon-friendly technologies (e.g., heat pumps, heating electrification, ground loops, low- or no-carbon fuels, etc.). The Company will reposition gas for the future, identifying new potential business opportunities while advocating for these alternative low carbon heating technologies to serve its customers. Throughout the transition to the clean energy future, the Company will manage the transition of the gas business to leverage existing infrastructure and resources and minimize the risk of stranded assets to maintain the integrity of the gas system.
- **Customer Experience:** The Company’s drive to deliver an enhanced customer experience will require meeting customers’ growing desire to be empowered in all facets of their energy experience, while delivering safe, reliable, resilient energy. This includes giving customers more

⁶ <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=20-E-0197>



choice and information on options available to meet their energy needs (e.g., solar PV, energy storage solutions) so they can understand and optimize their energy usage. The Company will deliver increased convenience through tailored interactions based on customers' preferences. Specific initiatives include the rollout of an enterprise system for customer care and billing that allows customers a view of their electric and gas usage in a comprehensive, informative way. The Company will also launch a customer relationship management platform to manage and promote excellence and consistency in all aspects the Company interacts with its customers. In addition to delivering enhanced operations and experiences, all Company investments are strategic, recognizing the need to minimize customer bill impacts.

Resource and Business Planning

There are multiple factors shaping the future energy landscape. The Company is committed to becoming a leader in implementing the clean energy future, powering and improving the lives of its customers. To deliver on this commitment, the Company is making additional changes in its resource and business planning approach by actively managing its infrastructure planning and cost management processes:

- **Infrastructure Planning:** With the transition to the clean energy future, customers will become increasingly more reliant on the essential services provided by the Company to power their daily lives. As a result, the Company must continue to enhance its ability to provide safe, reliable, and resilient energy. To do this, the Company will invest in improving the core infrastructure of the electric system through a variety of storm hardening, resiliency, and emergency response measures. The Company will also invest heavily in clean energy-enabling technology and capabilities, as outlined in the LRP's strategic focus areas. Finally, the Company will be required to develop new capabilities to support the modern grid. The Company currently expects to invest approximately \$995 million over the next five years (2021-2025 to deliver this portfolio of projects and enable the clean energy future.
- **Cost Management:** While striving to enable the clean energy future, the Company is also focused on balancing the need for those investments with the need to ensure that its energy products remain affordable for its customers. The Company will take action to mitigate the impact of the costs of its clean energy investments by identifying sustainable operation and maintenance ("O&M") cost improvements, including those enabled by technology reducing transactional costs and enabling process improvements, as well as organizational redesign. The Company's Business Cost Optimization ("BCO") program will coordinate the identification, development, and execution of cost savings actions and initiatives designed to deliver improvements and sustain these savings. The Company will also optimize its capital investments through a comprehensive, integrated Capital Optimization Process, aimed at efficiently and cost effectively meeting the Company's operating, strategic, and regulatory requirements, including consideration of multi-value projects to optimize costs. Finally, the Company will continue to promote policies that are focused on lower-cost clean energy efforts.

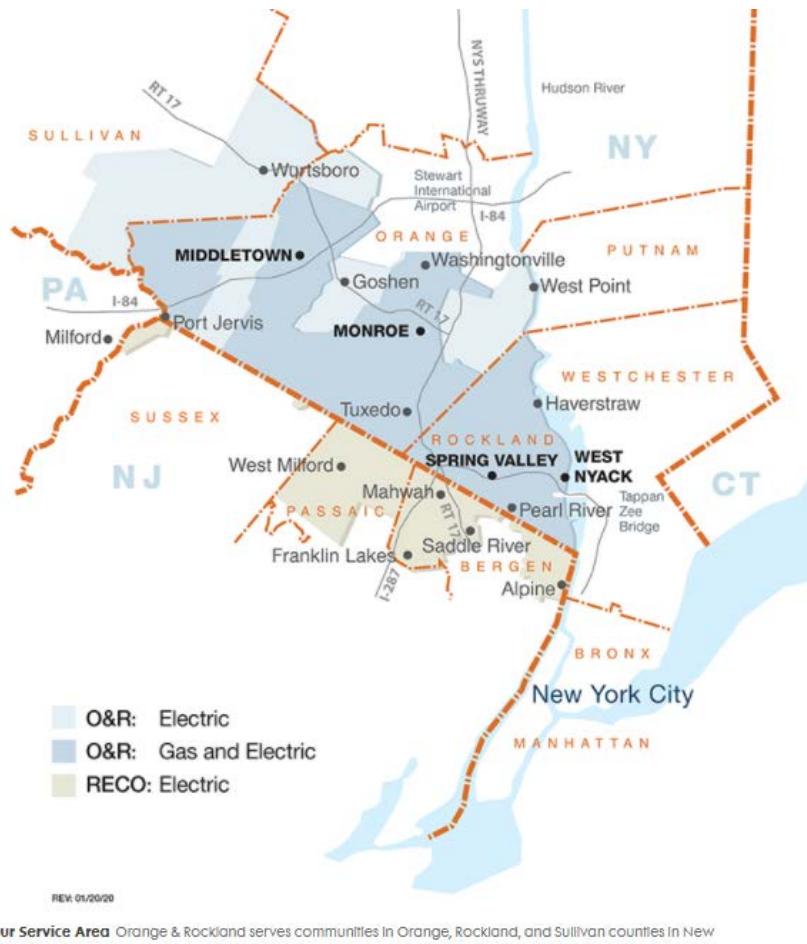
The Company is committed to New York's and New Jersey's environmental goals for a low-carbon, clean energy future. This clean energy transition is occurring across the country, with the pace accelerated for the Company by aggressive New York and New Jersey state policy and regulatory initiatives. The Company's portfolio of initiatives will leverage technology to enhance reliability and resiliency and empower customers as partners. While the ultimate path to meeting these societal goals remains uncertain, the Company is committed to this transition and will align its investments to this transformation and demonstrate leadership in delivering the clean energy future.



Introduction

Since 2010, the Company has reviewed its LRP periodically to make updates on key programs and initiatives spanning a 20-year time horizon. This update is the first comprehensive rewrite of the LRP since 2013. The Company is in the midst of a significant industry transformation. The way energy is sourced, delivered, and consumed is changing as a result of government policy requiring ambitious GHG emissions reductions, customers' demands for more choice, control and convenience in meeting their energy needs, and technologies impacting energy production, consumption and delivery.

Figure 1: The Company's Service Territory



By 2050, the utility industry is expected to undergo a remarkable evolution to adhere to ambitious clean energy goals articulated in New York's CLCPA and New Jersey's EMP. To align with these goals and timelines, the Company has broadened the scope of its LRP from a 20-year to a 30-year outlook.

New York State has made significant progress toward realizing its vision to develop a cleaner, more resilient, and more affordable energy system. The state's journey began in 2014 with the NYPSC



initiation of the Reforming the Energy Vision (“REV”) initiative,⁷ which laid the groundwork for the state’s clean energy vision. To further the state’s agenda, in 2019, New York passed the CLCPA, which established decarbonization targets and policies designed to realize the state’s goal of net-zero GHG emissions over the next decade. In 2020, seeking to expand on the CLCPA, New York State enacted the Accelerated Renewable Energy Growth and Community Benefit Act⁸ (“Benefit Act”), which establishes state organizations and processes to expedite the development of renewable energy in New York. With the passage of the CLCPA and the Benefit Act, the clean energy landscape in New York is expanding to incorporate and prioritize large-scale resources, such as offshore wind, utility-scale solar, and utility-scale energy storage, in addition to DERs.

New Jersey has made similar progress. On January 27, 2020, Governor Murphy unveiled New Jersey’s 2020 EMP, which outlines strategies to achieve the goal of 100% clean energy by 2050. In order to fulfill the commitment to achieve 100% clean energy by 2050 and the Global Warming Response Act’s (“GWRA”)⁹ mandate of reducing GHG emissions by 80% below 2006 levels, the EMP addresses New Jersey’s energy system, including electricity generation, transportation, and buildings. The EMP defines its clean energy goals as achieving 100% carbon neutral electricity generation and maximum electrification of transportation and buildings by 2050. To accomplish this, the EMP outlines seven key strategies, including a roadmap with timelines and next steps:

- Reducing energy consumption and emissions from the transportation sector;
- Accelerating deployment of renewable energy and DERs;
- Maximizing EE, conservation, and reducing peak demand;
- Reducing energy consumption and emissions from the building sector;
- Decarbonizing and modernizing New Jersey’s energy system;
- Supporting community energy planning and action in underserved communities;
- Expanding the clean energy innovation economy.

The Company’s LRP is guided by its integrated vision and mission, which provide a roadmap that focuses on meeting the needs of its key stakeholders: customers, employees, regulators, policy makers, communities, and investors.

Vision

The Company’s **vision** articulates the Company’s aspirations in delivering energy services to its customers. It states:

The Company is a trusted provider of safe, reliable, clean, innovative, cost-effective energy services and solutions that enhance the lives and businesses of our customers. It focuses on the customer experience in all aspects of its daily operations.

⁷ Case 14-M-0101, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision (“REV Proceeding”)*.

⁸ *Accelerated Renewable Energy Growth and Community Benefit Act*. Full text of the legislation is available online. See <https://www.budget.ny.gov/pubs/archive/fy21/exec/30day/ted-artvii-newpart-jji.pdf>.

⁹ See <https://www.state.nj.us/dep/aqes/oce-publications.html>.



Mission

The Company's mission statement reinforces its vision and extends beyond the Company's commitments to its customers and to all stakeholders. The Company's mission is to:

- Provide energy to our customers safely, reliably, and sustainably;
- Cultivate a workplace that allows employees to realize their full potential;
- Provide value to our investors;
- Improve the quality of life in the communities the Company serves.

Strategic Priorities

Delivering the Company's mission is centered on three core strategic priorities of (1) improving public and employee safety; (2) enhancing the customer experience; and (3) achieving operational excellence. To realize these priorities, the Company has identified eight strategic focus areas, and developed actions and initiatives within each area aligned to its goals and objectives. Each of these areas are discussed in detail in the Strategy – Areas of Focus section.

Improving Public and Employee Safety

Nothing is more important to the Company than the safety of its employees and the public that the Company serves. The Company approaches safety through a framework of prevention, detection, and response, which is fully integrated into its planning and operations processes.

The Company's first priority is to prevent safety issues. This is done through proactive planning, design and continuously improving operating practices. The Company uses technologies and processes to detect events as they develop. This helps to both mitigate the impact of the event, as well as improve the response and recovery. The Company conducts follow-up and review of events to help inform and enhance its practices and processes, thereby improving the Company's ability to prevent, detect, respond to and recover from any future events. Going forward it will be important for the Company to continue to revisit its safety initiatives and incorporate new processes and procedures necessitated by the introduction of new technologies and services.

Enhancing the Customer Experience

The Company's strategic priority of enhancing the customer experience is based on a customer-first mentality. The Company understands that successful companies are the ones that are most responsive to consumers' desires and needs. This includes developing initiatives to deliver an enhanced experience that meets and exceeds its customers' current needs and is flexible enough to anticipate and meet their future needs. In order to achieve the objectives of the clean energy future, delivering exceptional customer experience will be critical. Customers increasingly want personalized experiences, choice, and added value.

The successful transformation to the clean energy future will rely on customers to choose and adopt new technologies, products and services. The Company plays a critical role in helping educate, advise and guide customers as they make these choices, empowering them to engage fully in this new energy future. As customers come to rely more on the Company to provide essential services, the Company needs to be ready to provide more than safe, secure, reliable and affordable energy to



customers. The Company also needs to be ready to meet the customers need for more choice, control, and convenience across all facets of their energy experience.

The Company recognizes that products and services should be customized to provide customers with products and services that meet their needs. The Company is also keenly aware of the impact of energy costs on customers. The Company strives to provide energy and related services cost effectively by managing its investments and by helping customers optimize their energy use.

Achieving Operational Excellence

Achieving operational excellence focuses on strategically planning for the future and effectively executing work every day. The Company does this by engaging its employees and integrating appropriate technologies to improve its processes, and better enable the Company to deliver the clean energy future. The elements of its operational excellence strategy are described below:

Managing Risk to Deliver Energy with High Reliability and Resiliency

The Company recognizes the importance of providing reliable energy to its customers. There are multiple threats that can impact the reliability of its electric and gas systems, including the increased frequency of significant weather events caused by climate change, as well as cyber and physical attacks. The Company's goal is to provide reliable service during normal conditions and take proactive measures to minimize the disruptions that may occur as a result of these threats.

Advancing System Design to Integrate DERs

The Company's energy delivery system is a modernized grid that continues to evolve to support the growth in distributed and bulk power resources. NWAs and non-pipes solutions, such as EE and other DERs, will be integrated with traditional delivery system investments to provide the capacity necessary to meet demand. The Company continues to seek new ways to integrate DERs and make the delivery system more adaptable to changing conditions. The Company's grid modernization investments have focused on building the necessary interfaces to engage customers, increase the volume and granularity of data, enable greater DER penetration, and improve system reliability and operating conditions. These investments focus on the roll out of new technologies (*e.g.*, DSCADA system, ADMS, and DERMS)¹⁰ that will leverage the full functionality of the field equipment deployments. These systems will ultimately provide the visibility, monitoring, and control required to plan effectively for and manage a growing number of DERs on the system, accommodate bi-directional power flow, and provide market and enhanced customer services.

Promoting Employee Engagement, Diversity, and Inclusion

The Company is committed to advancing employee engagement, diversity, and inclusion. The Company has made significant progress in attracting and hiring a workforce that reflects the diversity of the communities it serves and will continue to pursue that goal. To benefit fully from the knowledge, skills, and experience of its employees, the Company is also establishing and nurturing an inclusive environment, where all employees feel valued, engaged, and motivated to contribute their best work. This includes preparing employees for the critical role they will play delivering the clean energy future.

¹⁰ Distribution Supervisory Control and Data Acquisition (“DSCADA”); Advanced Distribution Management System (“ADMS”); Distributed Energy Resource Management System (“DERMS”). Details on ADMS and DERMS are discussed in the Solar PV section of this LRP.



This will entail enhancing existing skills, as well as enabling them to learn and develop new skillsets and capabilities.

[LRP Objective](#)

The Company's overarching objective is to enable the clean energy future. The Company is committed to leading the transition to the clean energy future that its customers deserve and expect. The Company will continue to work with policymakers, its customers, industry, and other key stakeholders to help reduce the use of fossil fuels, and deliver clean, safe, and reliable energy, now and in the future.

To realize its objective, the Company will need to accommodate new business and system expansion, driven by clean energy requirements and growth in the service territory. This evolution of energy needs will result in new business opportunities and expanded requirements for its system. The Company has well-defined processes to deliver these energy needs, with both traditional energy investments and NWAs and non-pipeline solutions. In all cases, the Company will focus on delivering the most cost-effective options to meet its customers' and system's needs, with a continuous emphasis on safe, reliable, and resilient energy delivery.

The success of the Company's long-range plan will depend on a strong partnership with its customers, regulators, policymakers, team members, investors, and other key stakeholders. This will require a highly collaborative approach as the Company advances toward the clean energy future.



Planning Scenarios – Pathway to 2050

Societal and industry trends are changing the way energy is sourced, delivered, and consumed. The Company's customers, investors, and other key stakeholders expect the energy delivered will be increasingly clean, while maintaining safety, reliability, and enhancing resilience. The three key factors shaping the strategic direction for the Company and informing its LRP are:

- Increasingly ambitious policy focused on climate goals requiring economy-wide reduction in GHG emissions;
- Customers' increased dependence on energy and evolving expectations for how their energy needs are met, with increasing desire for choice, control, and convenience; and
- Market forces driving technology innovation and cost reduction of low-carbon solutions.

By 2050, the utility industry is expected to undergo a significant evolution to achieve the clean energy goals legislated by the CLCPA and EMP. The Company developed the LRP scenarios to examine the implications of the states' long-term decarbonization goals.

There are significant variables and current unknowns associated with the above factors. Developing scenarios allows the Company to examine potential views of policy, customer expectations, and technology innovation to achieve the clean energy future to help guide the development of its long-range plan. The scenarios explored here represent an opportunity for the Company to look at plausible decarbonization pathways in order to meet New York's and New Jersey's policy goals. The scenarios present a framework to develop actions the Company will consider and examine potential implications for its electric and gas systems in achieving GHG emissions reduction goals.

Industry Trends

The energy industry is in the midst of a significant transformation. By 2050, both energy demand and energy supply are expected to look very different from today, driven primarily by trends and developments in government policy, technology improvements, and customer expectations.

Policies, such as the CLCPA and EMP, will require fundamental changes in the way energy is sourced, delivered, and consumed to develop a cleaner, more resilient, and more affordable energy system. Technology improvements in EVs, electric heat pumps, solar PV, and battery storage systems are making these solutions more economically viable and increasingly accessible for customers. Finally, in this quickly evolving digital age of smart devices and instant access to information, customers expect an enhanced experience and increased level of engagement and control in meeting their energy needs.

Government Policy

CLCPA

Following the NYPSC's REV introduction in 2014, the state raised the bar on climate action in 2019 with the passage of the CLCPA. Some of the CLCPA's major decarbonization provisions are:

- **Net Zero Emissions.** The mandate covers all sectors of the economy and includes electricity and fuels that are imported from other states. The law requires GHG emission reductions from 1990 levels of 40% by 2030 and of 85% by 2050. To reduce the remaining 15% of the emissions, the CLCPA allows for the use of carbon offsets.
- **Electric Sector.** The CLCPA sets out ambitious electric sector targets. The specific targets include:



- 70% of the state's electricity must come from renewable energy by 2030, and 100% of the state's electricity supply must be emissions free by 2040.
 - 9,000 MW of offshore wind must be installed by 2035.
 - 6,000 MW of solar generation must be installed by 2025.
 - A statewide goal of using EE improvements to reduce the overall energy consumption by 185 trillion British thermal units ("TBTUs") from the 2025 forecast.
 - 3,000 MW of energy storage capacity installed by 2030.
- **The Climate Action Council.** The CLCPA established the Climate Action Council ("CAC"), a 22-member body co-chaired by the Commissioner of the Department of Energy Conservation and the President of the New York State Energy Research and Development Authority ("NYSERDA"). The CAC must prepare and approve the first-scoping plan to achieve the state's clean energy agenda within two years of the CLCPA's passage and then update the plan at least every five years. The scoping plan will be incorporated into the state's energy plan and will inform the actions of the state's regulatory agencies.
 - **New Jersey's EMP.** On January 27, 2020, Governor Murphy unveiled New Jersey's latest EMP, which outlines strategies to achieve the goal of 100% clean energy by 2050. In order to fulfill the commitment to achieve this goal and the Global Warming Response Act ("GWRA")¹¹ mandate of reducing GHG emissions by 80% below 2006 levels, the EMP addresses New Jersey's energy system, including electricity generation, transportation, and buildings. The EMP defines 100% clean energy by 2050 as 100% carbon-neutral electricity generation and maximum electrification of transportation and buildings, the three main drivers of GHG emissions in the state. New Jersey contracted with the Rocky Mountain Institute to develop the Integrated Energy Plan ("IEP")¹² in March 2019 to inform the EMP by modeling least-cost pathways that meet both the energy needs of New Jersey's growing economy and the state's emissions reduction targets. The IEP was completed in December 2019. The findings from the IEP were incorporated into the final EMP.

New Jersey's EMP outlines the following seven key strategies, including specific targets, a roadmap with timelines, and next steps:

- Reducing energy consumption and emissions from the transportation sector:
 - Support the deployment of 330,000 light-duty EVs by 2025.
- Accelerating deployment of renewable energy and distributed energy resources:
 - 100% clean power by 2050, so that at least 75% of electricity demand is met by carbon-free renewable generation by 2050.
 - Develop 7,500s MW of offshore wind energy generation by 2035.

¹¹ GWRA originally signed into law 2007. Updated 2019. www.njleg.state.nj.us/20062007/PL07/112_.PDF; (P.L. 2007 c.112; P.L. 2018 c.197)

¹² <https://nj.gov/emp/pdf/NJ%20IEP%20Public%20Webinar%20Nov1%20Final.pdf>

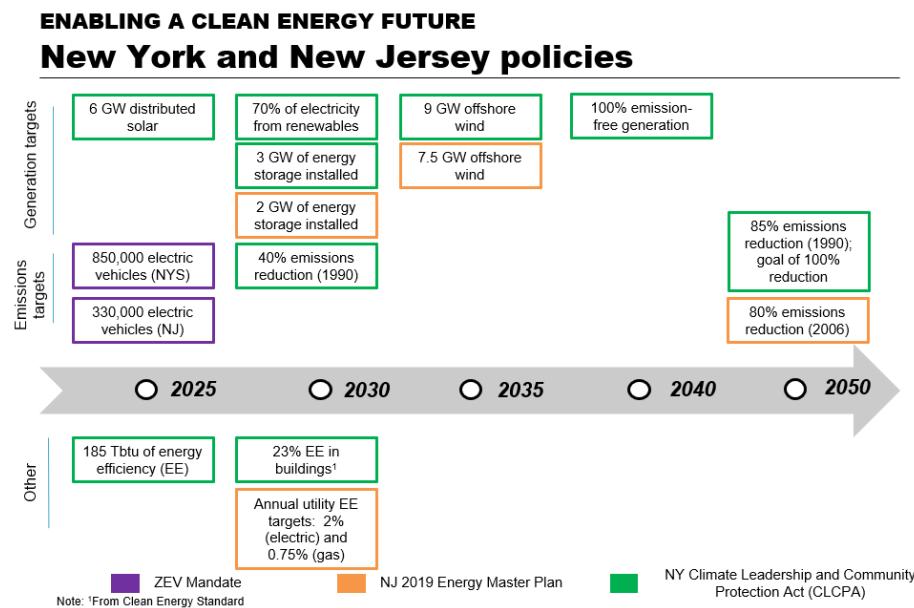


- 600 MW of energy storage by 2021 and 2,000 MW of energy storage by 2030.
- Maximizing EE and conservation and reducing peak demand:
 - Implement the Clean Energy Act (“CEA”) requirement that electric and gas utilities reduce consumption by at least 2% and 0.75% annually, respectively, by 2030.
 - Reducing energy consumption and emissions from the building sector including 80% reduction in gas consumption by 2050.
 - Decarbonizing and modernizing New Jersey’s energy system.
 - Supporting community energy planning and action in underserved communities.
 - Expanding the clean energy innovation economy.

The NJBPU is the lead agency tasked with the development and oversight of the EMP Committee. The EMP Committee is organized into the following five working groups:

- Clean and Renewable Energy;
- Sustainable and Resilient Infrastructure;
- Reducing Energy Consumption;
- Clean and Reliable Transportation; and
- Building a Modern Grid.

Figure 2: Summary Clean Energy Policy Requirements: New York and New Jersey



Technology

Technology innovation and improvements are at the core of the energy transition that will occur over the next 30 years. From heating and cooling to electronics and appliances, a significant amount of energy is required to power the needs of customers. The way energy is produced and consumed is



changing. Renewable energy sources, such as wind and solar, are accounting for an increasing share of energy production. EE standards and advances in technology are helping customers consume less energy. Transportation's shift to electric and fuel cell technologies will have significant impacts on the overall energy markets. Space heating and cooling technologies, such as heat pumps, will enable significant reduction in GHG emissions from buildings. In short, technology will have a central impact in facilitating the transition to a clean energy future.

Demand Management

Demand management includes both EE (reducing energy consumption) and demand response ("DR"), which shifts energy consumption away from peak hours.

The use of energy efficient technologies is often the most immediate and economic way to reduce energy demand and could lead to a reduction in GHG emissions and potentially lower both individual household and societal energy costs. Some simple EE measures include use of higher efficiency appliances, low-energy lighting solutions such as LEDs, and energy management systems such as smart/programmable thermostats. More systemic and involved EE solutions include improved building envelopes (insulation) components—walls, floors, roofs, ceilings, windows, and doors.

Figure 3: Building Envelope Improvement Measure Performance¹³

Building envelope measure	Residential energy savings	Commercial energy savings
Roofs (increase insulation)	N/A	8%
Walls (vacuum insulated panels)	14%	20%
Infiltration (building wrap)	12%	15%
Windows (R-10)	25%	23%
Windows (visible light redirection technologies)	13%	29%
Potential savings up to:	65%	90%

Note: Percentages based on 2010 national averages

Source: U.S. Department of Energy, Strategic Planning

Space Heating and Cooling

Building heating accounts for approximately 50% of the Company's total emissions, driven primarily by both natural gas and oil-fueled equipment. Achieving GHG reduction requirements will require a change in customers' HVAC equipment to electric technologies, specifically heat pumps.

¹³ Source: U. S. Department of Energy; CEI Strategic Planning



Heat Pump Technologies

Heat pumps use electricity to power a compressor. There are two types of heat pumps—Air Source Heat Pumps (“ASHP”) which use the outdoor air for heat and Ground Source Heat Pumps (“GSHP”) which use the thermal energy from the ground or nearby body of water. Regardless of the source, heat pumps use a refrigerant to absorb the heat energy from the outdoor source (air, water, or ground) to heat the building. Working in reverse, the heat pump can be used to provide cooling as well. The primary advantage of heat pumps is that they transfer heat, rather than generating it. This causes heat pumps to have efficiencies greater than 100% (a coefficient of performance greater than 1).¹⁴

Types of Heat Pumps

ASHPs absorb energy from the ambient air outside of the building that it is servicing. ASHPs have a lower upfront cost and are simpler to install as compared to GSHPs. Manufacturers of ASHPs claim that the systems tend to work effectively in temperatures as low as 5°F. However, a decline in outdoor temperatures negatively affects the efficiency of ASHPs. Over the years, ASHP technology has evolved. Technology advances allow for the installation of cold climate heat pumps to deliver heating in extremely cold regions (in temperatures as low as 20°F below zero).

GSHPs absorb the thermal energy from the ground or body of water through a system of pipes buried in the ground (or submerged in water). There are two types of underground piping systems—horizontal piping, requiring trenches to be dug, and vertical piping, requiring boreholes. While horizontal piping tends to be a less expensive option, it requires a significant amount of space for the piping system. While vertical piping is more expensive to install, it has lower space requirements than horizontal trenches. In either case, GSHPs tend to have a higher upfront cost than most other heating options and are complex to install.

Since 2012,¹⁵ United States heat pump sales have trended upwards, with new home construction being the key growth driver. Geographically, the South has the largest share of this growth due to lower electricity prices and the milder winter weather benefitting the heat pump coefficients of performance (“COPs”). Colder climate regions, like the Midwest and Northeast, are experiencing a slow but increasing rise in the number of homes relying on heat pumps as their primary source of heat.¹⁶ Within the United States, available federal, state, and utility-led tax credits help support the continued adoption of air and ground source heat pumps.¹⁷ In addition, due to regional and local infrastructure constraints and to meet GHG reduction targets, several utilities and municipalities have imposed or are considering moratoriums on new gas grid connections limiting heating options for new homes and making it more likely that heat pumps and electric furnace penetration could continue to increase.¹⁸

¹⁴ Efficiency measure for heating (known as coefficients of performance or COPs) is measured as the quantity of useful heat provided divided by the input energy.

¹⁵ Source: Through BNEF Report “Decarbonizing U.S. Heat Getting Started:
<http://www.ahrinet.org/resources/statistics/historical-data/central-air-conditioners-and-air-source-heat-pumps>

¹⁶ Source: Through BNEF Report Decarbonizing U.S. Heat Getting Started:
https://www.census.gov/construction/chars/pdf/mfb_heatsystem.pdf

¹⁷ https://www.energystar.gov/about/federal_tax_credits/geothermal_heat_pumps

¹⁸ Source: BNEF Report “Decarbonizing U.S. Heat Getting Started; DSIRE; AGA report:
https://www.aga.org/globalassets/research-insights/reports/AGA_Study_On_Residential_Electrification



Transportation

Today, it is nearly impossible to imagine modern civilization without the innovation of the internal combustion engine. However, over the next 30 years, significant changes in transportation technology, such as EVs and fuel cell vehicles, will dramatically reshape the transportation sector.

There are two categories of Plug-In Electric Vehicles (“PEV”): Battery Electric Vehicles (“BEVs”) and Plug-In Hybrid Vehicles (“PHEV”). BEV adoption is outpacing PHEV and now represents 75% of the global plug-in market, helped largely by global sales of Tesla vehicles, which accounted for 19% of all EVs sold globally in 2019.¹⁹

Adoption of PEVs is being helped by both battery technology and pricing improvements. To enable the adoption of PEVs, there is an increase in statewide focus on installing EV charging infrastructure and subsequently an increase in charging speeds. Witnessing the increase in EV sales, several automakers have made significant investments in developing a line of EV offerings.

Recently, there has been renewed interest from a number of government and private entities in the potential of fuel cell technology, specifically for heavy-duty transport applications. Fuel cells, like batteries, provide high efficiency conversion of energy to automotive power. Since fuel cells are combustion-free, this process produces no carbon emissions. In addition, hydrogen can be easily stored in refillable onboard tanks on trucks, similar to current diesel tanks. This provides the benefits of zero-emissions similar to battery EVs and refueling times and performance capability approximate to conventional diesel trucks. This is especially advantageous for meeting the needs of heavy-duty applications for regional and long-haul trucking. It is important to note, however, that there is currently no mass market application of the fuel cell systems, limited existing hydrogen refueling infrastructure, and the price of hydrogen is currently more expensive than other transport fuels.²⁰

Energy Storage

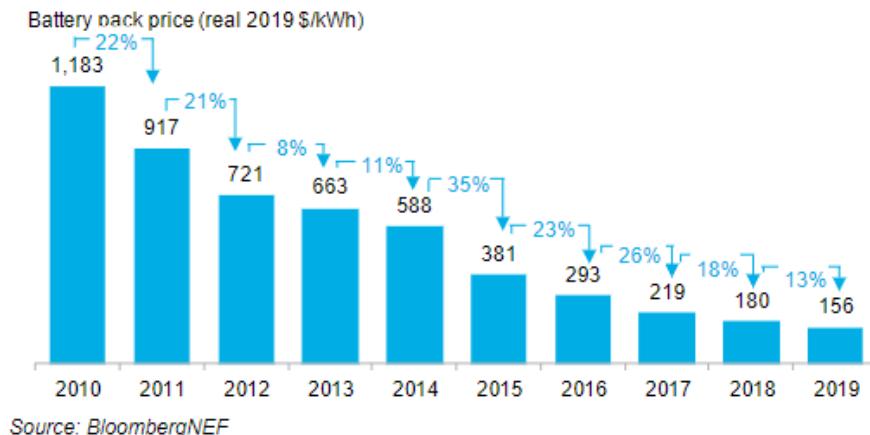
Energy storage allows for energy capture and storage to deliver it for future use. Energy storage technologies offer several benefits namely improved stability of power quality, reliability of power supply, improved grid efficiency, balancing the intermittency of renewables, deferring transmission and distribution investments, and reducing the need for carbon-producing peaking generators.

While there are varied energy storage technologies (*e.g.*, pumped hydro, flywheels, compressed air), batteries, specifically lithium-ion batteries, have become the dominant technology. The main driver for lithium-ion adoption is its low price in comparison to other technologies. Lithium-ion battery costs have fallen significantly since 2010 due to market-scale development from increased production of EVs.

²⁰ Source: BNEF “Long Term EV Outlook 2020” May 19, 2020



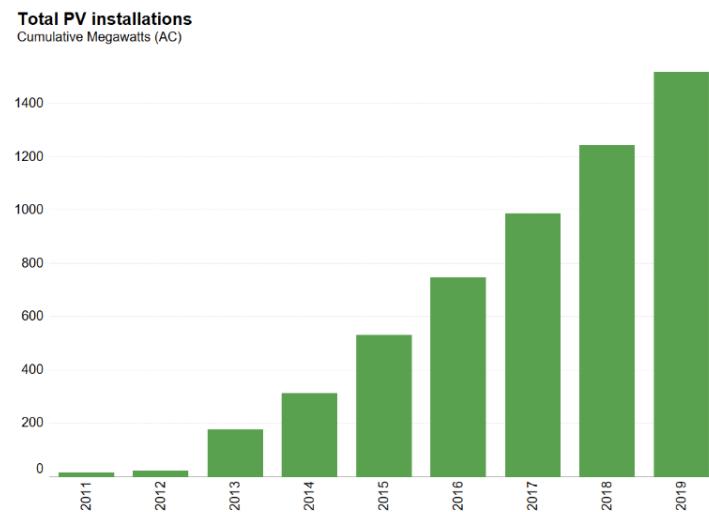
Figure 4: 2019 Lithium-ion battery price survey results²¹



Solar PV

Solar PV continues to gain traction as one of the more widely adopted solutions for renewable generation on the electric grid, thanks to generous tax incentives and rebates, rapidly declining costs, and increasing demand across the private and public sectors for clean electricity.

Figure 5: Total PV Installation (Residential, Commercial and Industrial) in New York State from 2011 to 2019²²



Solar PV installations continue to expand, driven primarily by declining solar module and module component prices and increasing efficiencies.²³ Solar PV is expected to contribute the most to US renewable generation, increasing from 13% of the total renewable generation in 2018 to 46% by 2050.²⁴

²¹ Source: BNEF “2019 Lithium-Ion Battery Price Survey” Dec 3, 2019

²² BNEF interactive dataset tool

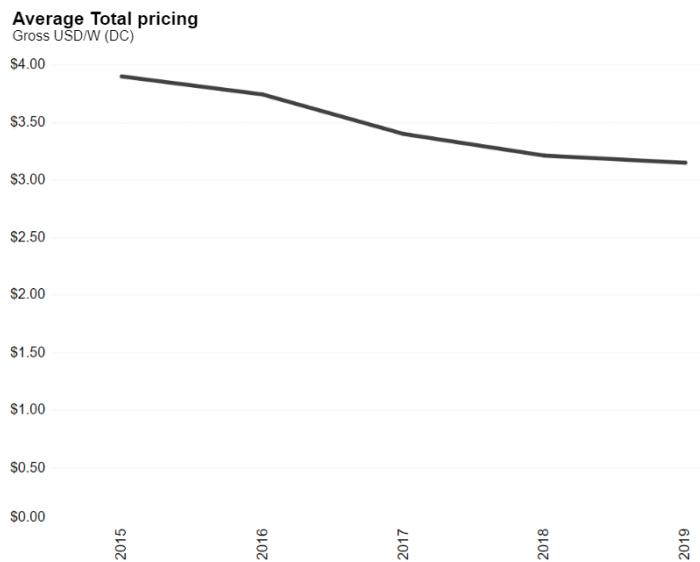
²³ Source: <https://www.eia.gov/outlooks/aoe/pdf/AEO2020%20Full%20Report.pdf>

²⁴ Forecast for the United States. Source: <https://www.eia.gov/outlooks/aoe/pdf/AEO2020%20Electricity.pdf>



Although hardware costs have fallen, other costs, such as labor, permitting, inspection, interconnection, supply chain, customer acquisition, and other costs, have increased as their share of the total system costs have increased, primarily due to increased customer acquisition costs, inconsistent building codes, and permitting practices across jurisdictions.²⁵

Figure 4: Average Price of Solar Installation in New York State (USD/W)²⁶



Over the past few years, the recent trend has been the pairing of solar systems with battery storage, both in utility-scale and residential/small commercial installations. While the pairing is still relatively new, the ability of batteries to balance solar's predictable yet intermittent production profile by storing excess renewable power and discharging it when needed, enables access to new revenue streams and increased reliability, both of which are expected to stimulate market growth.

Low-Carbon Resources

Renewable Natural Gas ("RNG")

RNG is pipeline-quality gas derived from organic waste material and biomass sources, such as food waste from landfills, animal and plant waste from dairies, organic waste from wastewater treatment plants, and organic waste from landfill-diversion facilities. While it is fully interchangeable with conventional natural gas, the "raw" gas typically needs to be conditioned to become pipeline quality. There are currently two primary RNG production methods: (1) Anaerobic Digestion – a process that takes place in a controlled, oxygen free environment (digester) where microorganisms break down organic material; and (2) Thermal Gasification – a controlled process where biomass is converted to hydrogen and other products. This process generally occurs at high and varying temperatures (depending on the gasification system) and without combustion.

Anaerobic Digestion methodology is commercially viable today. The benefits of RNG include reduction of GHG emissions (both from conventional natural gas drilling and from landfills and wastewater treatment plants), use of the existing gas network to deliver the renewable fuel, and

²⁵ Source: <https://www.seia.org/solar-industry-research-data>

²⁶ BNEF interactive dataset tool

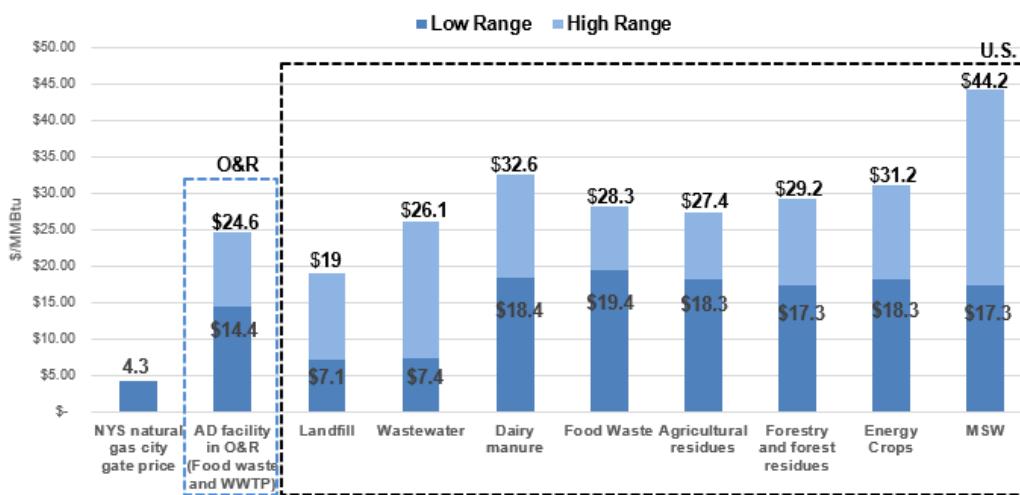


diversification of supply mix. End-use applications could include vehicle fuel, power generation, heating and cooking gas, and industrial applications.

However, RNG is not without its challenges. RNG is currently significantly more expensive than conventional natural gas. Interconnecting RNG facilities to existing gas networks is more expensive than on-site use of the RNG. The interconnection cost is related to conditioning the raw biogas to meet minimum heating value and other quality specifications for pipeline gas. The cumulative costs of gas treatment and interconnection facilities are potentially challenging to the economic viability of RNG development projects. These costs are often too high for RNG producers to absorb, and utilities cannot invest in most RNG infrastructure without regulatory approval. In addition, RNG renewable energy certificate (“REC”) markets are nascent, except for transportation and electric generation sectors.

The RNG industry has seen significant growth in production over the past five years. As of February 2020, there are now more than 100 RNG projects operating in 34 states, and approximately 40 additional projects are under construction.²⁷

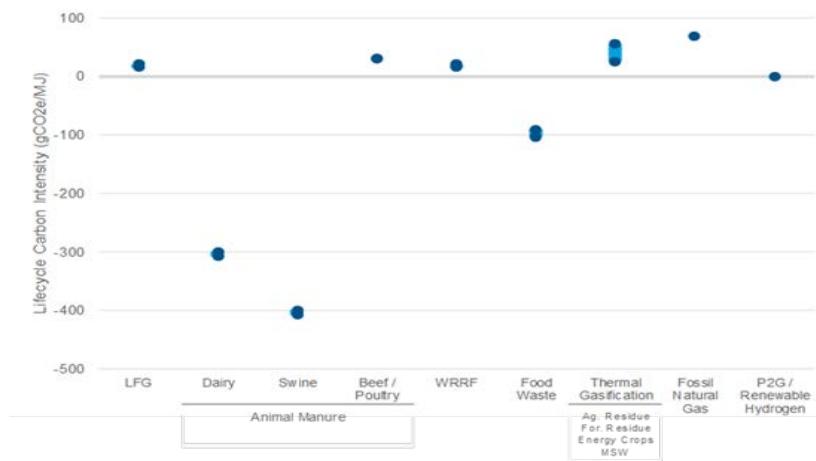
Figure 5: RNG Cost Comparison (by Source and Feedstock) versus Conventional Natural Gas²⁸



Sources: "Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment" by ICF/AGF, 2010; "Renewable Natural Gas Analysis" by NAVIGANT, 2020; EIA 2019 City Gate Price by State

²⁷ Source: https://www.epa.gov/sites/production/files/2020-07/documents/lmop_rng_document.pdf

²⁸ Source: "Renewable Natural Gas Analysis" report by NAVIGANT for O&R, et. al.

Figure 6: Lifecycle Emission Factor Ranges for RNG Feedstocks, Mid-Atlantic Region²⁹

Power to Gas

Power to Gas (“P2G”) is a technology that uses electricity sourced from renewable sources (*i.e.*, wind and solar) to generate clean fuel (either in the form of hydrogen or synthetic methane) for end uses (*e.g.*, cooking and space heating). The process consists of using electricity to separate water into hydrogen (H₂) and oxygen (O) through electrolysis. The resulting hydrogen is either stored or injected into the gas distribution system. In addition, through a process called methanation, the resulting hydrogen can be combined with carbon dioxide (CO₂) to produce synthetic methane (CH₄), which can be injected into existing gas distribution grid or gas storage systems. The hydrogen or synthetic methane can also be used for transportation fuel or industrial processes. However, hydrogen injections into the gas network may be limited by technical constraints of the delivery network and end-use equipment.

The main driver for the development of P2G is the potential benefit to decarbonize the energy system. The overall GHG impact is highly dependent on the carbon intensity of the electricity supply and the components of its supply chain.

The number and scale of P2G projects is currently small due to the uncertainty of future costs. Again, the cost of P2G is highly dependent on the price of the electricity and the load factor or number of hours of operation per year for the production facility. The most economic use of P2G could vary by location and over time.

Market opportunities for low-carbon resources (*e.g.*, RNG and hydrogen) are not yet mature and therefore longer-term considerations. They require significant technology cost reductions through economies of scale and dedicated or excess renewable production to compete with traditional fuels. The repurposing of the existing gas network does make this a potentially attractive opportunity in addition to diversifying the fuel supply. Nevertheless, switching from fossil-derived natural gas to low-carbon alternatives will need some form of government support, similar to what was done to incentivize the development of renewable generation, in determining the path forward.

Some countries have begun to evaluate ways to scale hydrogen use within electric, gas, and transportation sectors. Several countries — including the US, Germany, and the EU, among others have

²⁹ Source: ICF, 2020. Adapted from ICF’s American Gas Foundation Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment, 2019.



developed roadmap documents that outline a pathway for scaling hydrogen technology with some targeting hydrogen use within specific sectors. Others have provided funding resources to encourage research, development, and demonstration projects that test and scale different hydrogen production technologies and hydrogen utilization strategies. Some examples:

- Australia's Advancing Hydrogen Fund to support hydrogen projects (\$300 million dollar fund)
- Germany's National Innovation Program for Hydrogen and Fuel Cell Technology to support hydrogen and fuel cell development (over €1.6 billion in funding from 2008-2016, €250 million from 2016-2019, and €481 million from 2020-2022)
- Two United Kingdom programs that address both production and utilization project development to further deploy hydrogen within the UK's heating sector: (1) the Low Carbon Hydrogen Supply Competition funds low carbon bulk hydrogen production projects and (2) the Hydrogen for Heating project explores the feasibility of replacing natural gas with hydrogen for gas appliances.
- Southern California Gas (SoCalGas) and San Diego Gas and Electric (SDG&E) announced the creation of the Hydrogen Blending Demonstration Program in November 2020. This program would be the first in California and among the first in the U.S. The first proposed project will blend hydrogen into an isolated section of primarily polyethylene plastic distribution system in SoCalGas's service territory, beginning at 1 percent by volume and potentially increasing to as much as 20 percent. SoCalGas expects to choose the location of the initial project in 2021. Subsequent projects are scheduled in SDG&E's service territory and will build upon the knowledge learned in the first demonstration.³⁰

Customer Expectations

In addition to delivering safe, secure, reliable, and affordable energy, utilities are increasingly focused on enhancing the customer experience. The Company is committed to investments in technologies, communications, and innovations that align to its expectations of choice, control, and convenience, and processes that allow the Company to better serve customers.

The Company will continue to make significant and prudent investments to meet customer expectations and enable customers' adoption of clean energy alternatives.

Choice

With ever-expanding customer expectations, customers are constantly seeking new and improved options when addressing their energy needs. Customers want an increasing range of solutions, such as energy management options, innovative rate plans, incentives and rebates, and energy efficiency solutions, that are personalized to their needs and deliver costs savings. In addition, customers also expect these solutions to have a minimal impact on the environment.

Control

While demanding increasing choice of clean energy solutions, customers expect to have immediate and constant access to data, information, and options for varying programs. The Company has positioned itself both in the near- and long-term to be the customers' trusted energy advisor. As

³⁰ Source: https://www.mjbradley.com/sites/default/files/MJBA_Long-term-Vision-of-Gas%20Networks-in-a-Low-Carbon-Future _December2020.pdf



customers are demanding direct and continual access to their data, the Company has incorporated additional features, such as self-service applications, enhanced digital communications, smart metering technologies, and advanced data analytics, to assist them in making their selections.

Convenience

Customers continue to place high value on convenience and ease of use, as industry surveys indicate. The Company's services are evolving to meet customers' preferences in order to deliver a seamless experience. As modes of communication have expanded (e.g., text, mobile apps, and social media), the Company has evolved to engage customers on these platforms. Utility providers are expected to supply customers with relevant and current data about their energy usage at any given moment. They also expect easy access to the most current information on service work, outage information, and estimated restoration time.

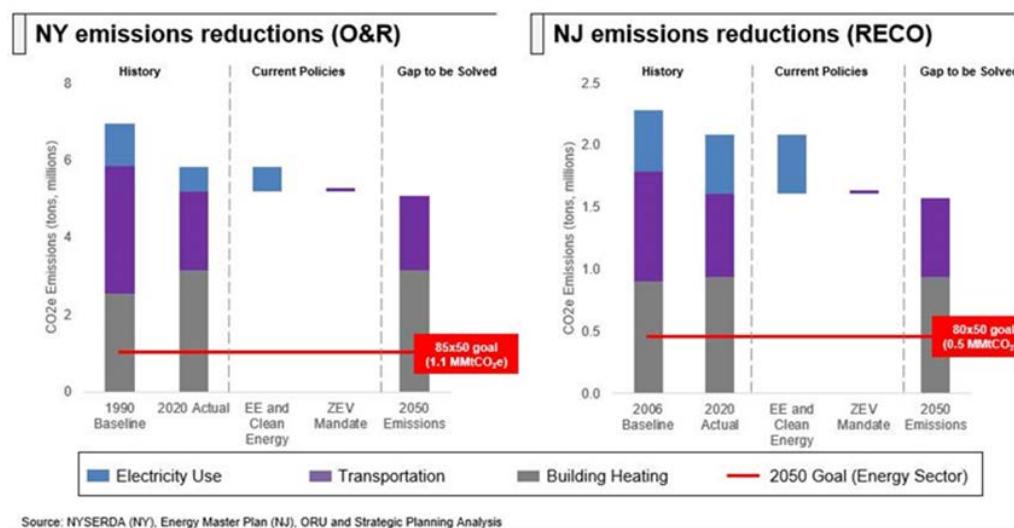
Scenarios

Scenario Design

The Company operates gas and electric systems in states with progressive GHG emissions reduction targets. To achieve New York's and New Jersey's GHG reduction targets, the Company looked at emission-reduction opportunities across the three sectors that contribute a vast majority of the GHG emissions within its service territory: (1) electric generation; (2) building heating; and (3) transportation.

Understanding the source of the Company's carbon emissions and the projected impact of legislated policies helps illustrate the scope of the challenge meeting 2050 policy goals. Figure 9 below highlights the energy sectors that must decarbonize to address the remaining emissions gap.

Figure 7: Orange and Rockland Utilities GHG Emission Profiles³¹



Current policies and market attractiveness of EE and renewable generation will help eliminate all emissions from electricity use by 2050. Decarbonization of transportation and buildings will be necessary, as these end uses account for greater than three-fourths of energy sector GHG emissions in the Company's service territory. There is growing focus and policy emphasis on electrification of

³¹ Source: NYSERDA (NY); EMP (NJ); CEI Strategic Planning Analysis



transportation in its service territory. Combined with improving costs and market maturity, this provides confidence that emissions reductions from this sector can be realized in the future. The buildings sector is not only the highest source of emissions, but it is also the most challenging and complex sector to decarbonize, as electrified heating solutions are currently not cost competitive for most customers today, and the pace of Heating Ventilation and Air Conditioning (“HVAC”) equipment and building turnover provides a small window of opportunity to capture new market share.

To investigate how these three sectors may result in carbon reductions across the Company’s service territory, the Company developed a set of plausible decarbonization scenarios to meet New York’s and New Jersey’s policy goals. To meet these ambitious carbon-reduction goals, there are several combinations of solutions across the energy value chain that will be required. To model each scenario, the Company disaggregated each of these three segments into sub-segments, collected the historical usage mix for each, and translated that actual usage into carbon emissions.

- The electric generation segment was sub-divided into fossil (*i.e.*, natural gas, coal, and oil), biomass, zero emission (*i.e.*, hydro, nuclear, and renewables), and decarbonized gas.
- The building heating segment was sub-divided into single-family homes (“SFH”), multi-family homes (“MFH”), and commercial by fuel source (*i.e.*, natural gas, oil, propane, wood, and electric and gas heat pumps).
- The transportation segment was sub-divided into light-duty vehicles (“LDV”), medium-duty vehicles (“MDV”), and heavy-duty vehicles (“HDV”) by fuel source (*i.e.*, internal combustion engine (“ICE”), electric, and fuel cell).

With the historical carbon emissions by sub-segment, the Company then developed two distinct scenarios (A and B). Each of these scenarios meet the required New York and New Jersey carbon reduction goals, but vary by source of energy, type of technology deployed, and level of customer adoption. By 2050, the analysis assumes carbon reductions through reduced consumption from base load EE measures, a clean electric generation mix via renewables, and low-carbon resources, almost a complete elimination of emissions from transport enabled by clean generation and very high penetration of zero-emission vehicles. The remainder of emissions reductions are projected to come from building heating through a combination of varied building envelope efficiency, electrification, low-carbon resources, and gas heat pumps. This approach allows building heating, the most challenging and complex sector to decarbonize, different avenues to meet the emissions reduction targets.

Common assumptions across the scenarios include the level of EE relied upon, zero-emission electric generation by 2050, and all non-natural gas-fueled heating converted to heat pumps or natural gas fueled by 2050.

Scenario A relies most heavily on electrification and includes no low-carbon fuels. This scenario leverages established, commercially mature energy solutions to achieve the carbon-reduction goals. Specific assumptions are:

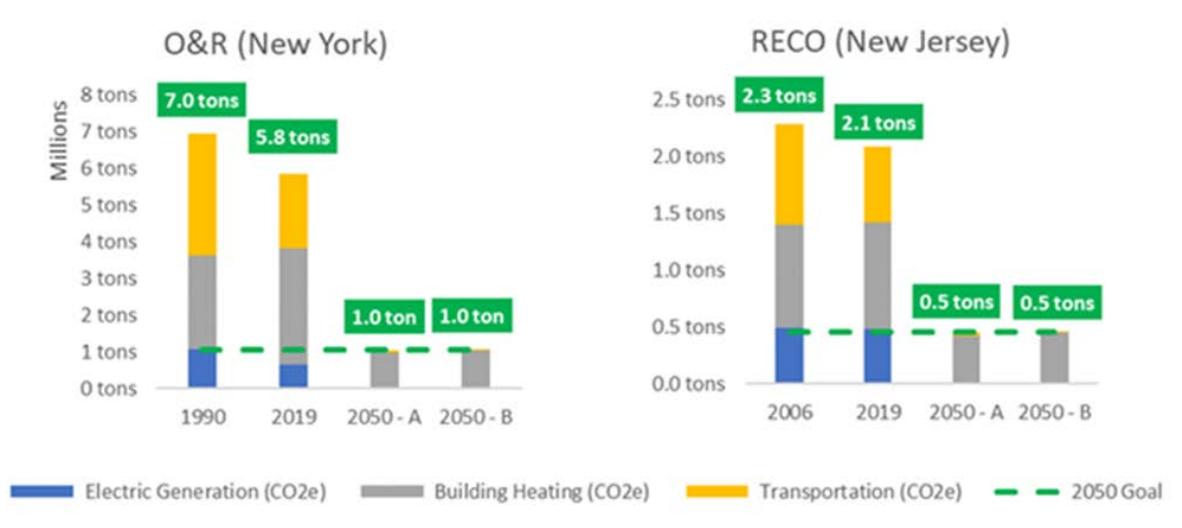
- **Transportation.** All LDVs are electrified. 50% of MDVs/HDVs are electrified with the rest remaining ICE.
- **Building Heating.** All buildings with non-natural gas heating (*e.g.*, oil, propane, wood) are converted to electric ASHPs. In addition, 30% to 40% of existing SFHs with natural gas heating convert, resulting in 50% to 60% of SFH heating being supplied through ASHPs. Ten percent of MFHs and commercial buildings on natural gas convert to ASHPs.



Scenario B introduces low-carbon fuels as an energy source for transportation and buildings, resulting in less reliance on electrification of end uses to achieve the carbon-reduction goals. This scenario assumes all transportation is decarbonized through either electric or fuel cell vehicles, and 10% of natural gas demand will be supplied by RNG. This assumption improves the overall carbon intensity of the gas system and would lower the amount of SFH heating supplied through ASHPs to 40% to 50%. Specific assumptions are:

- **Transportation.** Seventy-five percent of LDVs are electrified, and the balance are fuel cells. Fifty percent of MDVs and HDVs are electrified. The balance of MDVs are fuel cells, while 40% of HDVs are fuel cells, with the balance remaining ICE.
- **Building Heating.** All buildings with non-natural gas heating (*e.g.*, oil, propane, wood) are converted to electric ASHPs. This results in approximately 45% of SFHs converting to electric heat pumps. MFHs and commercial buildings, currently with natural gas heat, remain on natural gas.

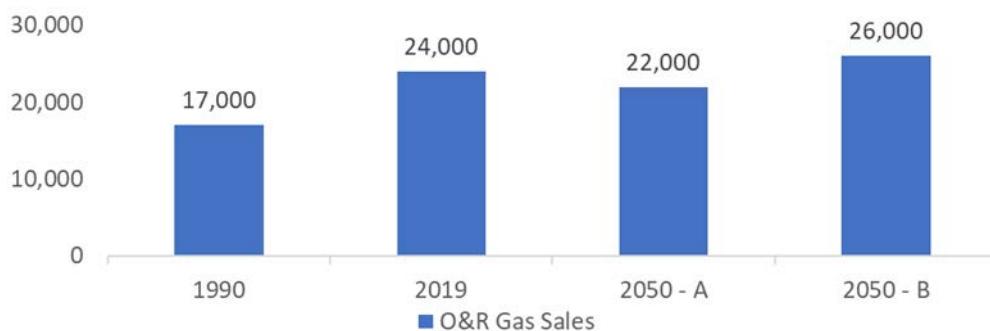
Figure 8: GHG Emissions Forecast Comparisons by Scenario³²



These two representative scenarios illustrate the wide range of technology and energy source combinations that can achieve carbon-reduction goals. Ultimately, meeting these goals over a 30-year period may result in electric sales increases greater than 2X today (Scenario A: O&R) or 1.5X (Scenario A: RECO) and gas sales ranging from a 10% reduction (Scenario A: O&R) to an increase of approximately 10% (Scenario B: O&R). The projected electric and gas sales impacts are largely driven by modelling assumptions for electric heating penetration which rely mostly on the conversion of all buildings with non-natural gas heat to ASHPs. The significant composition of non-natural gas heating in existing O&R and RECO building systems today results in less required conversion of existing natural gas heating customers and only minor changes in future natural gas sales.³³

³² O&R Team analysis. Measured in carbon dioxide equivalent (CO₂e) emissions

³³ See Figure 14: O&R Heating Source Profile.

Figure 9: Electric Sales Forecast Comparison by Scenario (GWh)³⁴Figure 10: Gas Sales Forecast Comparison by Scenario (MMCF)³⁵

The projected system impacts signal a need for significant future investment in electric system infrastructure to accommodate demand growth from electrification of buildings and transportation. Further, investments to strengthen core infrastructure and building new grid capabilities (e.g., integration of DERs, peak demand management) are needed to continue to deliver energy consistent with customers' needs as well as enable realizing clean energy goals.

Conclusion

The analysis of the two scenarios shows that achieving New York's CLCPA and New Jersey's EMP decarbonization goals within the Company's service territory is possible using various technology solutions and assuming varied adoption levels. The four main levers at the Company's disposal are: (1) EE, (2) renewable generation, (3) electrification of transportation, and (4) electrification of heating and cooling.

In order to enable a clean energy future, the Company requires collaboration with its customers, the regulators, and other stakeholders. Although these clean energy goals are to be achieved by 2050, a

³⁴ O&R Team analysis

³⁵ O&R Team analysis



successful transition requires preparation and planning to account for key influencing factors, including technology feasibility, market readiness, customer adoption, technology, and infrastructure lifecycle. Required service territory-wide GHG emissions reductions will transform the way the Company currently plans for and operates its electric and gas systems. While there is much uncertainty in the ways the goals can be achieved, the Company is advancing carbon reductions today, while maintaining flexibility to adopt a preferred emerging pathway in the future.



Strategy – Areas of Focus

Overview

To align with the CLCPA's and NJ EMP's objectives and timing, the Company's LRP assumes a 30-year planning horizon. As a result, there is a significant degree of uncertainty about how the drivers influencing the Company (e.g., policy, customer expectations, technologies) and the actions required by these drivers will evolve over this planning period, particularly in later years. To address this, the Company looks at possible alternate futures (Pathways in the previous section) and planning periods (e.g., next five years, next six to ten years) to identify key signposts and indicators of where the landscape is heading and develop action and advocacy plans to help shape this future.

This approach allows the Company to establish a framework from which to develop the actions required to execute this plan successfully. Some of these actions are of an immediate nature and no regrets moves (e.g., new customer information system deployment), while others result in optionality and flexibility in the Company's systems to meet a range of potential future scenarios (e.g., multi-value transmission and distribution system investments).

The Company's efforts to realize the priorities and objectives laid out in this LRP are centered on eight strategic focus areas. The Company will develop actions and initiatives within each area to realize its goals and objectives. To further guide this process, the Company has developed the following guiding principles which will shape each of the focus area's actions:

Guiding Principles

- Maintain public and employee safety;
- Support the achievement of the states' clean energy goals;
- Support competitive market enablement;
- Minimize customer bill impact;
- Consider utility advancement of policy mandates where competitive markets fail to deliver or do not materialize;
- Advance utility participation where it is best positioned to deliver benefits; especially in underserved markets and/or where utilities have a lower cost;
- Pursue opportunities that provide a business return and provide societal benefits;
- Advocate for rate reform and legislative changes that enable utility support of clean energy targets and help customers transition safely and cost effectively to a clean energy future; and
- Focus on opportunities for Low and Moderate Income ("LMI") customer participation and address environmental social justice concerns.

Strategic Focus Areas

EE (Gas and Electric). The Company's EE efforts focus on programs and initiatives for demand side management ("DSM") (EE and DR) reducing both electric and gas usage to realize GHG emission reduction targets, reducing energy demand, and delivering cost savings for customers. The Company



also develops plans to expand current programs and introduce new programs to achieve these targets now and in the future.

Electrification. By shifting the Company's customers from fossil-fuel based heating and transportation to electric, significant reductions in GHGs will be realized. For the Company to meet the challenge of environmentally beneficial electrification, the Company will establish a dedicated EPM team to focus on the implementation of New York's and New Jersey's initiatives aimed at achieving the states' ambitious electrification goals.

- **Electrification of Transportation.** The focus will be to develop and execute programs that promote and encourage the adoption of EVs by the Company's customers and the development of public-charging infrastructure. This will include actions taken under the New York State Make-Ready Program and New Jersey's electric vehicle straw proposal and EMP.
- **Electrification of Heating.** The focus will be to develop and execute programs that promote the adoption of electric-heating options, either as a supplement or replacement for existing fossil-fueled equipment or in new construction. The Company is also considering its role and possible business models for large-scale, community-sized heat pump system developments. This will include the potential for the Company to own these systems and assessing how this could provide a benefit to the community and customers served.

Energy Storage (“ES”). In addition to promoting the development of ES throughout its service territory, the Company is also incorporating storage solutions into its transmission and distribution infrastructure to enhance reliability, resiliency, and flexibility of the electric system.

Solar PV. The growth of renewable generation/DERs in the territory needed to meet New York's and New Jersey's clean energy future objectives will require a robust, customer-centric interconnection process to enable optimal integration of these assets onto the electric system. In addition, the Company will continue to promote the adoption of solar and educate its customers on the benefits and available options to meet their energy needs.

Integrated System Planning. The objective of the integrated planning process is to identify current and future operating requirements and risks and determine potential solutions to maintain a safe and reliable electric system. The Company continues to refine its approach to integrated planning, including prioritization of deferral or replacement of major capital infrastructure investments with less costly traditional infrastructure investments, or NWA solutions. The Company will also work closely with NYISO, NYPSC, PJM, and the NJBPU so that its systems are ready for the growing portfolio of renewable generation and DERs coming onto its system.

Role of Gas in the Clean Energy Future. The goal to reduce GHG emissions from all sources throughout the Company's service territory will continue to put pressure on the natural gas distribution business. While delivered natural gas volumes will likely decrease over time, the Company continues to plan based on the following principles:

- Pursue foundational investments that align with clean energy policy aspirations and maintain the integrity of its system to preserve flexibility for the future role of the gas infrastructure;
- Deliver safe and reliable service to its customers at a reasonable cost;
- Decarbonize by lowering emission's intensity of operations and by exploring new technologies; and



- Increase customer awareness and education of low-carbon heating alternatives.

The Company is using a multi-pronged approach to position it to deliver on these principles and policy requirements:

- **Decarbonizing the Gas Business.** Identify actions and technologies that can reduce emissions in daily operations or through transformational change, estimate the GHG emissions reduction potential, identify a path to commercialization/wide-scale adoption, and assess the role of the Company in integrating/enabling the actions/technologies.
- **Repositioning for the Future.** The Company will identify new business opportunities, leveraging its experience in natural gas distribution, while adding new skills and capabilities. The Company does this while also recognizing that its existing gas operations will need to continue to deliver customers' needs for the foreseeable future. This will be done with a focus on safety.
- **Managing the Transition of the Gas Business.** The Company anticipates a potential decrease in natural gas consumption from current levels. As it navigates this future, the Company will optimize all of its existing infrastructure and resources to best meet the needs of its customers, shareholders, and regulators in the most responsible way.

Customer Experience. Customer experience is about meeting the expectations of the Company's customers around the key areas of choice, control, and convenience. The Company's objective of delivering an enhanced customer experience will be delivered by investing in programs and technologies to meet and exceed its customers' evolving preferences and expectations.



Energy Efficiency (Gas and Electric)

Introduction and Background

EE is a cornerstone of advancing the clean energy future for both New York and New Jersey. EE and load management are often the most cost-effective means for meeting customer needs, and they are critical to meeting GHG emissions reductions goals successfully.³⁶

Studies show that EE efforts will be significant contributors to GHG emission reductions. EE is projected³⁷ to deliver nearly one-third of the GHG emission reductions needed to meet New York's 2030 goals. In addition, a recent NJBPU study³⁸ on EE states that these efforts in New Jersey could deliver a 21% reduction in electric energy demand and a 20% reduction in peak electricity demand by 2029.

In December 2018, the NYPSC issued its NENY Order adopting the statewide EE target of 185 TBTU cumulative energy savings for the period 2015–2025. This is a level of savings equivalent to fueling and powering 1.8 million homes by 2025.

The NENY Order approved utility-specific budgets and targets governing the deployment of EE and heat pumps through 2025. For the Company, an additional \$102 million was allocated to EE programs through 2025, including \$5 million allocated to help increase EE in the LMI sector to reduce customer bills.

In June 2020, the NJBPU approved its next generation of EE and peak demand reduction programs. Specifically, the Board set the fifth-year target for energy reduction of total retail sales (by program year 2025–2026) at 2.15% for electric distribution companies ("EDCs") and 1.10% for gas distribution companies. The Company plans to invest \$14.9 million over the next three years for the implementation of core New Jersey EE programs, in addition to proposing several pilot programs. On June 10, 2020, the NJBPU issued its order, which directed each electric and gas distribution company in the New Jersey to establish EE and peak demand reduction ("PDR") programs pursuant to the EE provisions of the Clean Energy Act of 2018. Prior to the issuance of this order, RECO offered limited EE programs to its customers in New Jersey. These EE programs were limited to low-income customers receiving assistance from the state's Universal Service Fund ("USF") and has served approximately 500 customers since the program's inception in 2010.

To support these targets, the Company has deployed robust, comprehensive EE programs. These programs are designed according to the following principles:

- Deliver cost effective, meaningful benefits to our customers;
- Advance the clean energy requirements and help meet energy savings and GHG emissions reduction objectives for New York and New Jersey; and
- Build customer awareness of EE programs through outreach and education.

The Company forecasted the benefits from implementing EE programs over a 20-year period based on the direction of relevant state orders and historical and future trends. These are then

³⁶ New York's 85% by 2050 requirement (from 1990-levels) and New Jersey's 2050 goal of 80% (from 2006-levels)

³⁷ Source: NYSERDA - Department of Public Service whitepaper: New Efficiency: New York, April 2018.

³⁸ Source: NJBPU Energy Efficiency Market Potential Study, May 2019.



incorporated into the Company's economic forecasts to help adjust system growth for its electric and gas businesses to guide investment planning.

The Company developed specific initiatives to address the drivers of customer adoption of EE solutions and measures. These drivers are:

- **Knowledge.** Knowing what is available to deliver EE energy savings and what can best meet customers' needs.
- **Affordability.** The initial and ongoing costs of these solutions, the value of implementing the solutions, and the ability to offset these costs.
- **Performance.** How well the options or solutions work.
- **Convenience/Ease.** Making it easy for customers to find, access, and implement the solution and use it going forward.

Since 2009, more than 45,000 customers in New York have participated in the Company's EE programs and received more than \$34 million in rebates. These programs have reduced energy consumption by 226,400 MWhs and 159,100 Dth and peak demand by 47 MWs. These savings are equivalent to reducing carbon emissions by 592,000 tons or taking more than 126,000 cars off the road.

Current Actions

The Company's current portfolio of EE programs is designed to provide energy and peak demand savings across its service territory, focusing on DSM targeted to meet current energy savings goals.

- **Residential Electric Rebate Program.** This program provides residential electric customers rebates for high efficiency appliances and HVAC equipment, EE lighting (LEDs), and smart thermostats. It also incorporates a behavioral component, providing customers with Home Energy Reports ("HER": print and email) containing detailed energy usage, energy-saving tips, EE program promotions, and usage comparisons to neighbors. An online portal function shows real-time and historic energy usage, develops customized energy savings recommendations, and allows customers to receive emails or texts during peak system events, so they can reduce usage accordingly.

The Company has added a midstream/upstream element to this program, providing incentives to existing lighting distributor networks to ensure availability of high efficiency lighting equipment and help influence the purchasing decisions of contractors and customers. The Company has expanded this to provide incentives to HVAC equipment distributors and manufacturers to increase the availability and stocking of high efficiency equipment.

- **Commercial and Industrial ("C&I") Electric Program.** The program provides rebates to customers for equipment upgrades and custom-designed energy savings solutions. While lighting upgrades have contributed the majority of energy savings historically, the focus will shift to a more comprehensive view of commercial building energy needs (e.g., refrigeration, motors, HVAC, and building controls).

The Company is integrating analytics capabilities into the program, leveraging the data from its advanced metering infrastructure ("AMI") deployment to enhance this capability. This provides C&I customers with comparative views of their energy usage with their respective



business/industry peers. The Company has a data analytics tool which is used internally to identify customers who may achieve benefits from energy upgrades. This information can be presented to the customer in report form, and AMI enhances the accuracy of the data. This capability will also be used to develop targeted recommendations for solutions to improve customer energy usage.

The Company can also pair C&I customers with low-interest financing options available through NYSERDA's Green Bank, the New York Power Authority ("NYPA"), or other institutions. In New Jersey, there will be options for residential customers to secure financing through partner vendors. The Company will be working with third-party providers to offer financing to commercial customers. This can accelerate the installation of energy savings measures, enabling customers to invest in more sophisticated equipment.

This program has a midstream element similar to the residential program. Currently, this is only for lighting and gas HVAC equipment distributors, providing lower cost EE equipment for the Company's customers. Other measures will be implemented in the near future (e.g., pool pumps and commercial kitchen equipment).

- **Small Business Direct Install Program.** This program provides a turnkey customer experience to businesses with an average peak demand of less than 110 kW. The program provides a free site audit report, which includes recommendations specific to the customer's needs and the simple payback for the associated investment. The program covers up to 70% of the installed cost of recommended improvements, targeting lighting, refrigeration, and cooling. Customers can also apply for short-term, no-interest payment plans offered by the implementation contractor, funded through the customer's energy bill savings.
- **Gas HVAC Program.** Designed for both residential and C&I customers, this program provides incentives and rebates for the purchase of EE space and water heating equipment and custom designed solutions for customers' facilities. The rebates are provided to HVAC midstream players (distributors and contractors) incenting equipment availability and making cost savings easier for customers.

Similar to the residential electric program, this program also includes a behavioral component, allowing customers to receive HERs and access to real-time and historical usage via an online portal.

Demand Response and Dynamic Load Management("DLM")

The Company's DR programs provide system reliability benefits, reducing system peak when resources are needed. They also help to defer or avoid construction of distribution infrastructure upgrades, reducing customer costs and environmental impacts while maintaining system reliability.

The Company offers three DR programs. Two of these programs target C&I customers—Distribution Load Relief Program ("DLRP") and Commercial System Relief Program ("CSRP")—and one targets residential customers—Bring Your Own Thermostat ("BYOT") Program. These provide incentive payments to participating customers who are willing to decrease energy usage when requested (for DLRP and CSRP programs) or allow the Company to adjust thermostat settings remotely (for BYOT program) during periods of peak electric demand.

In addition to these programs, O&R, in coordination with its affiliate, Consolidated Edison Company of New York, Inc. ("CECONY"), will be launching Auto-DLM programs. These programs will



solicit long-term contracts with stringent participation standards, increasing the expected performance factor during load relief events. Auto DLM programs will provide additional resources in conjunction with other DR Programs. Currently, the Company gives two or more hours of notification to the customers enrolled (usually 24+), but Auto DLM will enable O&R to contact customers and shed load with a 10 – 15-minute notification. In addition, participating customers will have to sign long-term contracts to provide some assurance and will likely provide higher incentives compared to existing programs, which will be determined via an RFP that will be issued in conjunction with CECONY in late 2020.³⁹.

LMI Outreach

A key objective for the Company's EE programs is providing access for its LMI customers, who may not otherwise be able to afford the upfront investment and/or equipment needed for upgrades for EE solutions.

- **EmPower.** This New York program provides EE upgrades to income-eligible customers to improve their homes' EE. This assistance is free to those O&R customers who qualify, and the Company helps its customers to access this program. O&R is collaborating with NYSERDA to develop a statewide LMI portfolio. This will allow investments to be positioned in a more complementary manner, expanding the reach of EE programs, advancing the state's energy affordability goals, and increasing the impact of customer-funding dedicated to LMI customers.
- **New Jersey Weatherization Assistance Program.** This program provides similar assistance to LMI customers, helping to improve the EE of customers' homes. By reducing LMI customers' energy bills with longer-term EE solutions, a more sustainable model emerges that will lower customers' bills.

LMI EE programs not only help meet the overarching objectives of EE and corresponding carbon reductions for the Company, but they are also a tool to improve the affordability of energy for participating households.

Other Key Actions

- **My ORU Store.** Recognizing that customer adoption is essential to the future success of its EE programs, the Company continues to build upon its Customer Engagement and Marketplace Platform ("CEMP"), known as the My ORU Store. The My ORU Store offers customers information about and access to EE products, services, and savings (e.g., energy-wise products, home services, and instant rebates). In 2019, the My ORU Store contributed to more than 35% of the gas portfolio energy savings. For 2020, the My ORU Store has contributed 34% of the gas portfolio energy savings.⁴⁰

By continuing to expand product offerings, the Company has developed the My ORU Store into a pivotal initiative of the residential EE portfolio. For more information on the My ORU Store, please see the Customer Experience section of this LRP.

- **AMI.** Another critical component supporting EE effectiveness is the Company's completed rollout of AMI. AMI will enhance the Company's EE and DLM programs, providing customers

³⁹ The RFP was released the week of November 30, 2020. Responses are due mid-Jan 2021 and decisions made in mid-Feb 2021 in time for the upcoming summer period.

⁴⁰ Year to date through November 18, 2020.



with the ability to access near real-time information on how and when they use energy. The Company will also use this AMI data and capabilities to recommend specific EE and DLM offerings to particular customers, helping them receive the maximum benefit available through these programs.

- **NWA/ Non-Pipes Alternatives (“NPA”) Program Support.** EE and demand reductions are an important component of the Company’s NWA/NPA opportunities aimed at deferring capital investment for infrastructure upgrades. EE is often the most cost-effective solution to provide the demand reduction required to defer or avoid infrastructure investment. Because the reduction load shape and needs of NWAs/NPAs are unique, the solutions are specific to them. EE rebates in NWA/NPA areas are often higher to account for than the additional deferral value of the capital investment and to increase participation to meet the demand reductions necessary for the deferral.

Future Opportunities and Focus

The Company recognizes that EE will continue to be an extremely important contributor to meeting the goals and objectives of the clean energy future. The Company will continue to develop EE programs, looking at a variety of solutions.

The Company also recognizes there may be diminishing returns for EE programs in the future. As the costs of energy decline (both in the base costs of the commodity and environmental costs due to cleaner generation), the savings benefits from EE programs will decline. In California, EE budgets are declining as the cost of the next kWh is now lower and cleaner. Ameren⁴¹ has seen the benefits of some EE investments decline over 40%. How this evolves for The Company over the longer term will be driven by policy and associated investments on specific GHG emission reductions actions.

That said, the Company recognizes that EE will continue to be an extremely important contributor to meeting the goals and objectives of the clean energy future. The Company’s future focus will be on developing and delivering ways to improve EE adoption and participation. The Company will also use its experience with EE to date as a foundation on which to build future programs and inform areas to focus on. The Company believes these programs will be one of the first and most cost-effective solutions that can be deployed to reduce consumption and provide savings opportunities for its customers. The continuation and advancement of EE and load management programs will be critical to meeting 2050 GHG emissions reductions goals.

Equipment Upgrades

A majority of the Company’s actions to date have focused on discrete upgrades and improvements, principally with lighting and HVAC equipment. This has been primarily focused at the individual customer level, providing them with information and incentives. This has allowed customers to better understand what solutions are available and help with the costs of the upgrades.

Building on this experience with equipment upgrades and some of its midstream activity, the Company sees value in moving further up the value stream, providing and expanding incentive availability to contractors, distributors, and equipment manufacturers. The objective is to enhance the EE

⁴¹ Ameren Corporation provides electric and natural gas service (2.4 million electric customers; 900,000 natural gas customers). It has three main subsidiaries: Ameren Missouri, Ameren Illinois, and Ameren Transmission Company (<https://www.ameren.com/>).



expertise and knowledge of the installer base, improve the availability of EE equipment in the market, and encourage the ongoing improvement of EE equipment performance and technology. For customers, this can facilitate access to lower-cost equipment, provide a sufficient pool of installers and service resources, and enhance the energy savings opportunities.

Building Envelope Improvement

The Company will also focus on improving overall building EE, both through building retrofits and new construction. While there are existing state-level programs which the Company has helped customers access, there could be an opportunity for the Company to play a more active role, serving as a partner with builders and retrofitters/contractors. Such partnership can expand customers access to building upgrades. For retrofits, in addition to HVAC and lighting upgrades, this would include installing high efficiency doors and windows, insulation and air sealing, and upgrading appliances.

For new construction, the Company may seek to partner with Energy Star certified builders. As an example of the value of such programs, studies show that homes built to Energy Star standards are 20% more EE than those built to standard building codes. There are also builders delivering “net-zero energy” homes, combining home construction efficiency measures (high efficiency windows, super insulation), solar panels, and geothermal systems. Such partnerships will not only deliver access to valuable energy savings for the Company’s customers, but also can serve to advance the Company’s NWA/NPA, heating electrification, and DER objectives.

Other Efforts

Recognizing that cost is a barrier to increasing customer adoption, the Company will focus on improving affordability. Building on current financing offerings through third parties, the Company will look to expand these programs and consider other options. One area could be Company provided financing programs, like those that have been successful with other utilities. This could be done by providing customers with the opportunity to pay for equipment and upgrades on their utility bill with no money down. Public Service Electric & Gas (“PSE&G”) offers this option to C&I customers for certain upgrades. Alternatively, the Company could partner with other financing sources with the option of possibly underwriting the costs to implement these solutions.

The Company believes that EE is an investment on par with traditional utility infrastructure. Allowing these costs to be treated as a regulatory asset will demonstrate the importance of these programs, produce a long-term sustainable EE model, and optimize the benefits to customers. Accordingly, O&R will follow CECONY’s model and pursue approval of this treatment, with a target amortization of these investments over a ten-year period.

Energy Efficiency-as-a-Service (“EEaaS”) is another area that the Company is considering. EEaaS is a pay-for-performance solution that allows customers to implement EE projects with no upfront capital expenditure. The provider pays for project development, construction, and maintenance costs. Once the project is operational, the customer makes service payments that are based on actual energy savings or the performance metrics of other equipment, resulting in the immediate reduction of operating costs.

The opportunity to leverage data and conduct analytics resulting from AMI deployment in the service territory could prove to be significant in helping shape the effectiveness of EE programs. Providing detailed insight into customer energy usage can help identify EE improvement opportunities, allowing for customized and optimized solutions for the customer.



The information provided and timeliness of this data will be invaluable to further advance the development of new demand response and load management offerings. Combined with the growth in “smart”, connected equipment and appliances, The Company could see a significant opportunity in new linked product offerings and programs. This can help customers better manage their energy usage and costs, as well as support the Company’s system reliability.

This type of information can also be used to inform manufacturers of the performance of equipment and identify improvement opportunities to further advance technology.

The Company will also work with various organizations shaping the future of EE, including Electric Power Research Institute (“EPRI”), the Association of Energy Services Professionals (“AESP”), the Peak Load Management Alliance (“PLMA”), and state-level working groups. This will help guide the EE programs of the future, enhancing the ongoing value of these programs to meet the needs of the Company’s customers and helping deliver the clean energy future.

Risks and Mitigation

EE Targets

As discussed above, both New York and New Jersey have recently updated efficiency targets (New York’s January 2020 NENY order and NJBPU’s June 2020 approved next generation EE targets). Meeting these targets will continue to require the Company to develop more robust programs.

To address this, the Company maintains strong relationships with all regulatory and governing entities in New York and New Jersey, and it participates in utility-working groups focused on providing input into EE program design, development, and implementation. The Company works closely with the regulators and staff to help both understand and shape policy and program requirements.

Adoption

The Company’s customers are demanding more choice, control, and convenience in the energy they use and how they meet their energy needs. EE is a critical component of meeting these needs. The start of considering an EE measure is awareness. It is critical that customers have the knowledge of which EE measures are available to them and which may be the best choices for what they may be seeking. The Company maintains ongoing customer outreach to educate customers on EE programs and options. This includes print (bill inserts) and through its website. While currently limited due to the COVID-19 pandemic, the Company sees home shows and other similar events as important to this outreach. The Company also has a network of partners to help with this messaging.

Being able to afford the solutions is also key. Economic conditions will affect this and the ongoing challenge for the Company’s LMI customers and communities, who can most benefit from EE. The Company will continue to advocate for incentives and rebates to help improve affordability. The Company sees opportunities for new programs and possible rate structures to also enhance affordability to broader groups of customers, as well as enhancing those specifically targeting LMI customers.

There may be a long-term change in C&I building utilization. While this is a recent impact of the COVID-19 pandemic, the demonstrated ability of a significant amount of service sector employees to work remotely could have longer-term impacts on both the numbers and sizes of buildings. From an EE and DR perspective, this could be a longer-term benefit, reducing the need to heat, cool, and power these buildings.



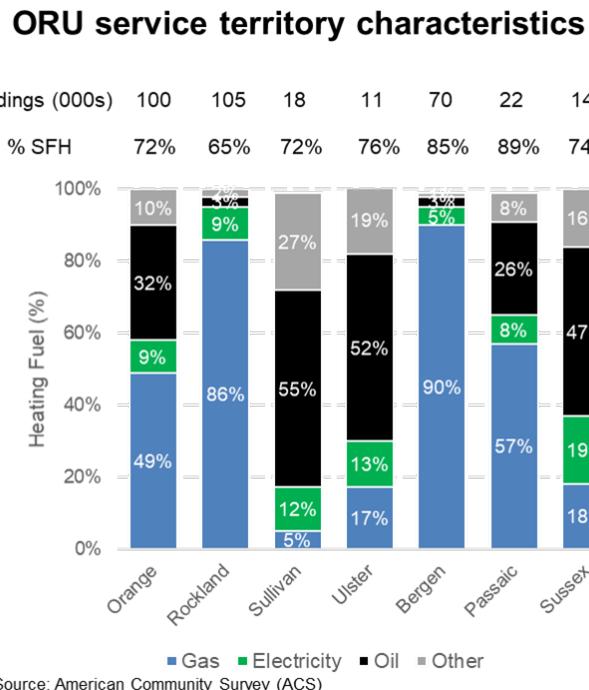
Electrification of Heating

Introduction and Background

Almost 51% of current GHG⁴² emissions in the Company's territory come from space and water heating that rely on fossil-fueled equipment (e.g., natural gas, fuel oil, propane). Approximately 85% of residential customers (single- and multi-family homes)⁴³ and nearly 100% of commercial customers use fossil-fueled heating equipment. Converting that equipment to cleaner, more renewable electricity presents a significant opportunity to reduce GHG emissions and is essential to meet New York's and New Jersey's GHG emission reductions goals.

Electrification of heating will likely have a significant impact on peak electricity demand and could increase winter electric usage to the point where the system peak shifts from summer to winter. At the same time, electrification of heating may contribute to resolution of potential gas supply and delivery constraints and will be factored into the gas-planning process.

Figure 11: O&R Heating Source Profile⁴⁴



The most significant opportunity for building electrification is the use of electric heat-pumps systems to replace traditional emissions-producing equipment. When supplied by renewables, this solution provides a cleaner source for both space and water heating.

⁴² O&R Heating GHG contribution Breakout: 53% of O&R; 44% of RECO; 51% of O&R.

⁴³ Residential fossil-fueled heat breakout: 83% of O&R; 89% of RECO; 85% of O&R.

⁴⁴ Due to numbers of buildings, the opportunity for conversions are in Orange County territory (32% oil and 10% other on base of approximately 100,000 buildings), while Sullivan, Ulster, and Sussex Counties have larger percentages of oil and other, smaller base of buildings.



Heat pumps offer customers an alternative to traditional HVAC that can reduce energy bills and carbon emissions, but they have not been widely adopted in the Company's service territory. While in the past heat pumps have been used primarily in warmer climates, recent advances in technology allow them to meet both the heating and cooling needs for customers in colder climates.

The Company can play an important role in the transition to electric heating. Its programs and actions will pursue all forms of clean-heating technologies (*e.g.*, air- and ground-sourced heat pumps). The Company designs its programs to address the key factors shaping a customer's and other stakeholder's decision to adopt and advocate for electrified heating solutions. These factors are:

- **Awareness.** Knowing what is available to deliver the heating needs and the overall value of switching to electric solutions.
- **Affordability.** The total cost of ownership (initial and ongoing costs) of these solutions, as well as the value of implementing them and the ability to offset these costs.
- **Complexity.** The ability of the solution to meet the customer's heating needs (overall performance) and ease of accessing and implementing the solution (*e.g.*, availability of equipment, availability of qualified installers/contractors, ease of use after installation).
- **Infrastructure:** The ability of the Company to minimize peak electric loads and target the electrification of heating in constrained areas on the gas system.

Current Actions

The immediate focus in electrification of heating for the Company lies with these customers:

- Customers currently using fuel oil, propane, or wood.
- New housing (single and multi-family). Ideally, the Company would seek new subdivision developments to establish a critical mass for pursuing heating electrification with a specific focus on LMI, environmental justice communities, and otherwise disadvantaged communities.
- The Company customers using natural gas where the current system requires infrastructure replacement or where there may be future gas constraints.

The following is a summary of the Company's current programs and initiatives:

NYS Clean Heat Pump Program and O&R Heat Pump Implementation

In April 2020, the Company along with other New York utilities took over the administration of the New York State Clean Heat Statewide Heat Pump Program ("Clean Heat Program") from NYSERDA. The Clean Heat Program provides a foundation for this effort to increase heating electrification, targeting the key adoption factors of awareness, affordability, and complexity.

The Company's implementation of the Clean Heat Program provides a multi-faceted statewide framework to advance the adoption of heat pump systems. This program is aimed at supporting the state's heat pump targets and building a market for the electrification of heating. The program is designed to support customers in transitioning cost effectively to EE electrified space and water heating technologies.

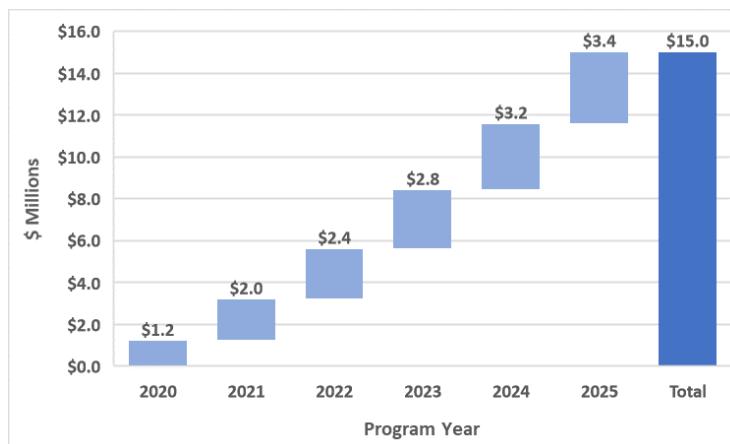
The Company seeks to expand the use of heat pumps by working to develop supply chains and expand service networks, so they are available in the market and supported by key stakeholders, such as



installation contractors and distributors that provide the equipment. The Company will focus its efforts on best practices related to sizing, selecting, and installing heat pumps in cold climates. The Company will also promote consumer education, including how to operate and maintain heat pump systems. The Company has developed web-based training on program requirements and partnered with NYSERDA to provide additional training on the appropriate sizing methodology. The technologies eligible for program incentives are:

- **Cold Climate Air Source Heat Pumps (“ccASHPs”)** provide heating and cooling through a vapor-compression refrigeration cycle. For heating, the system will extract heat from outdoor air and transfer the extracted heat into the conditioned spaces by various means (e.g., ducts, ductless). They also provide space cooling by reversing the cycle to extract heat from a building and transfer the heat to the outside air.
- **GSHPs** (also known as geothermal systems) achieve high efficiency by transferring heat with the ground or with groundwater instead of outside air. These systems work well in cold climates because of the constant ground temperature regardless of the air temperature. GSHPs are used in all building sectors and are sized to provide heating and cooling to the whole home or building.
- **Heat Pump Water Heaters (“HPWHs”)** are storage tank-based water heaters that typically replace electric-resistance storage tank water heaters or fossil fuel-fired storage tank water heaters. These systems provide most of the heat to domestic hot water through a heat pump, with a secondary electric-resistance coil as a backup, so the water temperature meets the desired set point during high-demand periods. HPWHs can be installed in a variety of conditioned or unconditioned spaces where there is adequate air supply for heat exchange. HPWHs are available to customers through appliance retail channels and through heating and plumbing contractors. HPWHs can be used in any type of building.
- **Gas Heat Pumps** (also referred to as absorption heat pumps) may be a technology that emerges to provide another heating alternative. The concept of these is similar to ASHPs, but rather than using electricity as the power source, natural gas is used to provide the heat needed for the system. More discussion on this technology is provided in the Role of Gas in a Clean Energy Future section of this LRP.

Figure 12: Clean Heat Program Budget (2020–2025)





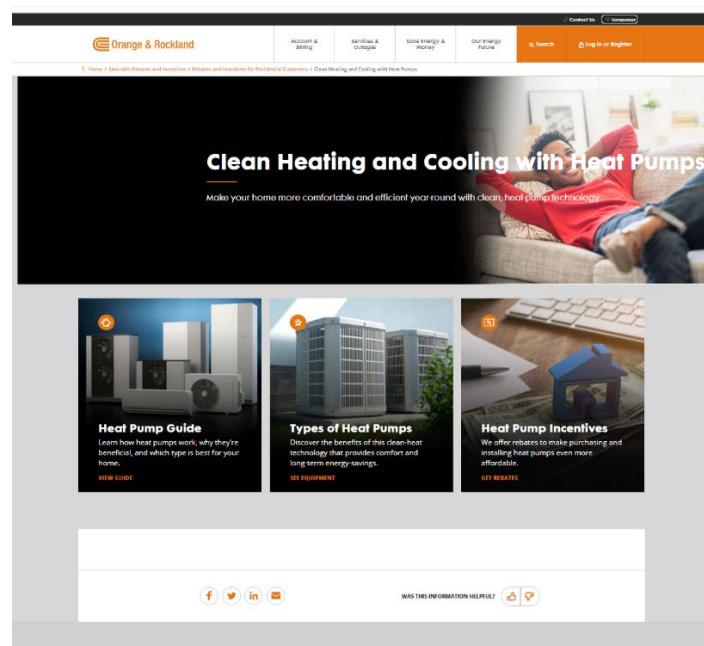
Awareness

The Company is conducting a variety of internal and external⁴⁵ outreach efforts (e.g., home show participation, internal training, customer and developer surveys, and installing technology at the Company's locations) to raise the understanding of the benefits and availability of electric heating solutions/technologies. Target audiences include customers, installers, and equipment distributors.

The Company website provides extensive information on current heating technologies, applications most relevant to customers' needs, and advantages over higher GHG emission technologies. The Company has developed a heating solution selection tool which will include available technologies, an interactive cost-benefit analysis tool that provides customers with a total cost of ownership assessment, as well as GHG emission profiles for various heating options. The tool was launched by the end of 2020⁴⁶.

Educating and informing installers and distributors is critical to the ultimate success of this effort. Developing this support infrastructure will increase the availability of the needed technologies, qualified installers, and certified service technicians that customers will need as they decide and execute on this conversion. The Company continues to plan events (e.g., home shows, trade shows). While traditional in-person events are currently limited due to COVID-19, the Company is looking at "virtual" events and will be prepared to continue in-person events when restrictions are lifted.

Figure 13: Company website heat pump information⁴⁷



⁴⁵ During current COVID-19 pandemic the company is following all state guidelines and mandates for outreach effort conduct.

⁴⁶ Launched week of December 21, 2020.

⁴⁷ <https://www.oru.com/en/save-money/rebates-incentives-credits/rebates-incentives-tax-credits-for-residential-customers/clean-heating-cooling-with-heat-pumps>.



Affordability

A significant hurdle in customer adoption of new electric heating solutions is cost. For an average single-family home in the Company's service territory, installing a GSHP system can cost more than \$35,000, while a ccASHP can cost more than \$14,000 (before rebates or incentives). Compared to the \$5,500 cost of replacing a fuel oil furnace and central AC system, this presents a significant challenge to adoption.

To help close this cost gap, the Company offers rebates to customers for qualifying heat pumps (ground and air-sourced). Combining these with other state and federal incentives and the ongoing savings in annual fuel/energy costs, makes the economics of ASHP and GSHP technologies more attractive.

Figure 14: Company incentives for Heat Pumps

Sq. Ft. / Size of Heat Pump	Mini-Split Cold-climate Heat Pump	Geothermal Heat Pump
1375 - 1624 sqft 3 ton	\$6,760	\$18,300
1625 - 1874 sqft 3.5 ton	\$7,720	\$19,760
1875 - 2124 sqft 4 ton	\$8,680	\$21,220
2125 - 2374 sqft 4.5 ton	\$9,640	\$22,680
2375 - 2625 sqft 5 ton	\$10,600	\$24,140

The Company has also developed innovative rate offerings to make switching to lower GHG emitting heating sources more attractive. These include:

New York

- A proposed voluntary three-part rate for delivery charges (consisting of fixed, demand, and usage charges) available to customers using geothermal systems.
- A residential time of use rate.

New Jersey

- A special rate for customers using electric storage water heaters and/or permanently installed space heating equipment.

Complexity

Customers need to be convinced that electric technologies can meet their heating and cooling needs more efficiently and cost effectively than other options. Customers also need to be convinced technology is readily available and that contractors and installers are available. Showcasing the long-term benefits of heating electrification will help to convince customers to convert and convince installation contractors and equipment distributors that this is an attractive business. This will create a



pool of qualified contractors and available equipment able to meet customers' needs quickly and efficiently.

The Company is planning to implement a Geothermal Neighborhood Demonstration Project. This project is designed to test whether utility ownership of heat pump technologies and/or infrastructure is beneficial to customers. This project is also intended to explore customer outreach, utility investment, rate design, and recovery models, with a specific focus on LMI customers. The project is designed to:

- Evaluate the effectiveness of the technology in meeting the heating and cooling needs of customers;
- Demonstrate a potential economically viable option for electric-heating adoption;
- Assess models to provide ready access to cleaner, more efficient heating and cooling solutions for a broader customer population, specifically helping LMI customer realize these benefits;
- Demonstrate the attractiveness of this market, possibly incenting more contractors and distributors to participate; and
- Develop a potential new business opportunity for the Company.

Future Opportunities and Focus

Electrification of heating is critical for the successful reduction of GHG emissions in the Company's service territory. Using the results of its current programs and looking at what other utilities and jurisdictions are doing, the Company is developing areas to focus on for its future efforts.

The outcomes of the Geothermal Neighborhood Demonstration Project will also shape future Company programs. These programs may include scaling up the current pilot to broader market offerings, executing additional pilots targeting specific customer sectors (e.g., college/university campuses), and informing and expanding the utility ownership business model. The Company can also leverage the results of some other large-scale, district heating deployments to inform its future actions and focus (e.g., Ball State University in Indiana, in service 2015; Lulu Island Energy Company in the City of Richmond, British Columbia, in service 2012).

The Company's experience can help shape policy and support the development of new codes and standards to influence electric-heating adoption and technology development. This will include the Company working with municipalities, industry trade groups, and equipment manufacturers.

The Company will continuously assess rate offerings to encourage beneficial consumption behaviors. Various electrification technologies (e.g., ASHPs, GSHPs, EVs) will result in different load profiles. The Company will take these differing load profiles into account when developing future rate offerings which incentivize off-peak consumption.

Electrification Portfolio Management Team

To rise to the challenge of environmentally beneficial electrification, the Company has established a dedicated EMP team that will focus on the implementation of New York and New Jersey initiatives aimed at achieving the states' electrification and decarbonization targets. The EPM team will be responsible for developing an electrification strategy that satisfies customer needs and meets local and state regulations while promoting the adoption of clean energy technologies throughout the service territory. The EPM team will outline potential opportunities to support this strategy including new



business models, demonstration projects, online marketplaces, customer resources, etc. This team will lead the implementation of the Company's electrification programs, including projects related to the electrification of the building and heating sector, such as the Geothermal Neighborhood Demonstration Project

Risks and Mitigation

Adoption

The most significant risks to increasing the electrification of heating for the Company and achieving the GHG emission requirements are related to its adoption.

As customers look at options for heating, the awareness of the types and benefits of electric-heating technologies is limited relative to more traditional or "incumbent" heating and cooling system technologies. Contractors and distributors, who have generations of experience and knowledge procuring, installing and maintaining fossil-fueled systems, will also need to be made aware of the benefits of electric heating technologies, the options available, and how to work with these new systems. To achieve this, the Company will conduct targeted outreach and education programs to inform all key stakeholders. The Company will also work with equipment suppliers to expand the availability of rebates and incentives "upstream" to make stocking new technologies more attractive to distributors and incent contractors to advocate for, install, and service these systems.

Some customers may not fully trust ASHPs and GSHPs to meet their heating and cooling needs. For most, this is an unfamiliar technology. To address this, the Company will conduct targeted outreach and education to provide information to customers. The Company will also continue the development of pilot programs to demonstrate the suitability of these technologies for its customers.

Both the initial cost of the equipment and the ongoing fuel and maintenance costs for these systems can be significant. Combined with recent historically low-commodity costs for fossil fuels (specifically natural gas), the willingness of customers to switch may be adversely impacted. The Company will address this challenge by:

- Advocating for and administering rebate and incentive programs;
- Developing and publicizing total cost of ownership decision tools; and
- Advocating for alternative business models to improve the affordability of, and access to, new technologies.

Increased electrification could cause a substantial increase to the Company's customers' electric bills. This will be of particular concern for LMI customers. There are several efforts that can help mitigate this increase, both perceived and real. While customers' electric bills will increase when they switch, they will also see their prior heating source (oil, propane, wood, gas) bill go down. By providing tools to assess total energy costs from all sources before and after electrification, the real impact can be determined. The Company's forecasts show there to be an actual decrease in total customer HVAC costs post-electrification. The Company sees opportunities to combine heating electrification with other programs, specifically EE, to help alleviate cost pressures.

The recent COVID-19 pandemic will have an impact on all stakeholders and the adoption of electric-heating solutions. The adverse financial impact of the pandemic on the Company's customers will affect their willingness to consider replacing equipment versus "getting by" with their current systems. The Company's partner contractors could see an associated decrease in work and potential



difficulty getting equipment due to impacts to supply chains. Limitations placed on some of the Company's outreach efforts (*e.g.*, home show participation) could have an immediate impact on programs and adoption. While this is currently a factor, the Company believes this will be confined to a relatively short-time period and will have limited long-term impacts to these programs.

The Company can also engage with customers, leveraging other outreach channels (*e.g.*, targeted digital, website) to inform them about solutions, total cost/benefits, and available rebates and incentives. The Company will work with the contractor community to develop innovative solutions to maintain a flow of work.

System Impacts

The readiness of the Company's electric system to meet the needs of increased electrification will be another key factor. Impacts of electric-heating adoption will depend on the use and type of technology and possible supplemental-heating requirements. Significant long-term electric-heating penetration with electric-resistance backup will require significant investments in distribution, transmission, and customer service upgrades. The Company's planning process is being revised to consider the impact of various assumptions about electric-heating adoption on forecasts and investments needed. More details on system planning are provided below in the Integrated System Planning section of this LRP.

Increased heating electrification will also impact the Company's gas system, trading off current gas demand for electric. This will require closely coordinated, seamless gas and electric system planning. In this way, the Company will provide for the safety, reliability, and affordability of both systems for the foreseeable future. There is more discussion of the impact on the gas system in the Role of Gas in the Clean Energy Future section below.

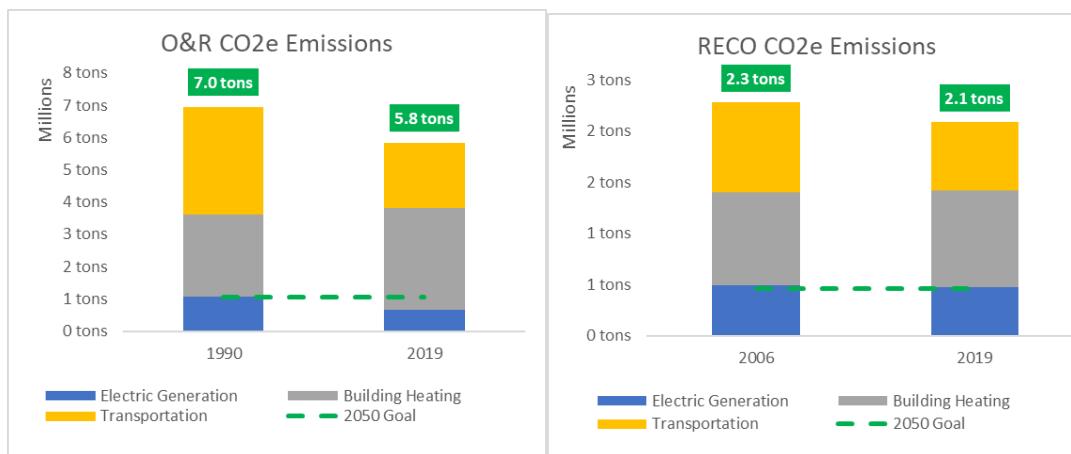


Electrification of Transportation

Introduction and Background

The electrification of transportation is a critical component for both New York's and New Jersey's plans to meet their GHG emission reduction goals. Transportation contributes more to baseline GHG emissions (1990; 2006) than any other source in both states, making reductions in this area critical to meeting GHG targets.⁴⁸ In recognition of the crucial role that EVs will play in reducing emissions, both New York and New Jersey are signatories of the Multi-State Zero Emissions Vehicle ("ZEV") Memorandum of Understanding ("MOU")⁴⁹ establishing a collective target of at least 3.3 million ZEVs on the road by 2025 for the ten MOU states. The New York and New Jersey portions of the target are 850,000 and 330,000 vehicles, respectively, which together represent more than one-third of the collective target.

Figure 15: GHG Emission by source⁵⁰



Over the coming decades, the adoption of EVs is forecast to grow dramatically. EPRI estimates that by 2030 more than 50% of all light-duty passenger vehicle sales in New York will be EVs, accounting for approximately 2.3 million light-duty EVs on New York roads. By 2050, 75% of all passenger vehicle miles traveled in New York will be fueled by electricity⁵¹. Likewise, New Jersey has an established target of two million light duty EVs by 2035.⁵² These projections are reinforced by a January 2020 survey of the Company customers, wherein nearly 20% expressed interest in purchasing an EV in the next 12 months.⁵³

⁴⁸ New York "Department of Public Service Staff Whitepaper Regarding Electric Vehicle Supply Equipment and Infrastructure Deployment," January 13, 2020; New Jersey Energy Master Plan.

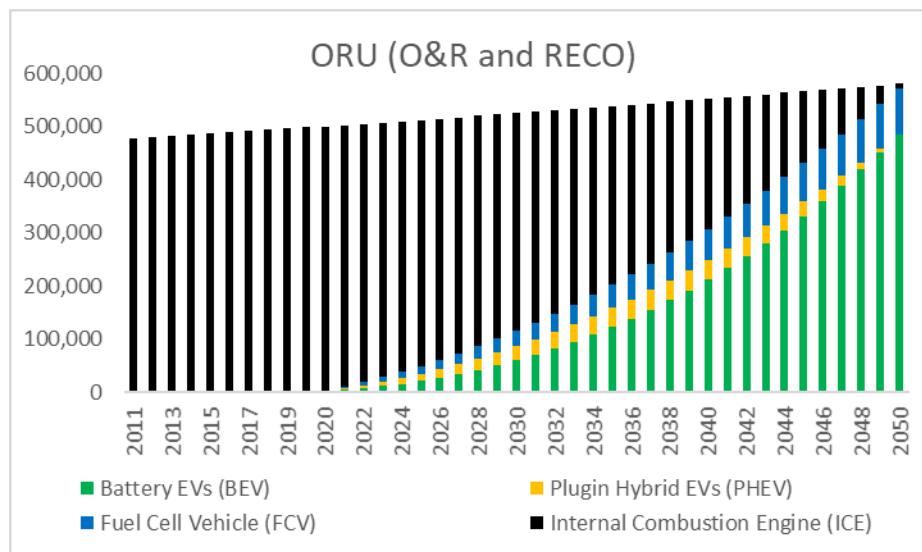
⁴⁹ <https://www.zevstates.us/>

⁵⁰ Source: O&R Team analysis. Excludes "other" contributors (*i.e.*, agriculture, industrial).

⁵¹ EPRI, Electrification Scenarios for New York's Energy Future, February 2020.

⁵² The New Jersey Assembly and Senate approved legislation ([S2252/A4819](#)), January 9, 2020.

⁵³ O&R Exchange Survey, conducted in January 2020, not published.

Figure 16: Forecast EV Penetration for ORU by Percent of Light-Duty Vehicles, 2019-2050⁵⁴

Although the COVID-19 pandemic is expected to impact sales of EVs in the short-term, long-term projections of EV adoption suggest significant growth in the number of EVs in the Company's service territory, as well as nationwide. As of September 2020, there were approximately 1,800 EVs in the Company's New York service territory and approximately the same number in its New Jersey service territory.⁵⁵ To meet New York's and New Jersey's EV targets, the Company will need to support the adoption of 34,000 EVs in the Company's New York territory and 16,500 in the Company's New Jersey territory by 2025.

EV growth at the rates projected may present challenges to utilities' ability to manage the grid. The National Renewable Energy Laboratory ("NREL") estimates that the growth in EVs will increase electricity demand in the United States by 813–1,424 TWhs by 2050.⁵⁶ This would represent a 17–30% increase in total electricity demand. In order to accommodate this demand, infrastructure investment will be needed. In New York alone, it is estimated that up to 140,000 public Level 2 ("L2") chargers and 4,000 direct current fast chargers ("DCFC") will be needed to support the level of adoption necessary for the state to achieve its ZEV mandate.⁵⁷

The Company's Support of Transportation Electrification

The Company is committed to supporting the transition of the transportation industry from fossil-based fuels to electricity. To guide growth, the Company has focused its efforts on education and awareness to drive customer adoption of EVs and in facilitating the development of charging infrastructure throughout its service territory.

⁵⁴ O&R 2020 Analysis Forecast

⁵⁵ Orange, Rockland, and Sullivan Counties

⁵⁶ NREL, Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States, 2018. Reference case forecast is 4,722 TWhs in U.S. electricity demand by 2050.

⁵⁷ New York Public Service Commission Order Establishing Electric Vehicle Infrastructure Make-Ready Program and Other Programs, July 2020.



The following principles guide the Company's EV strategy:

- Pursue all classes of vehicles—*e.g.*, light-duty, medium-duty, and heavy-duty;
- Align activities to encourage EV adoption with the Company's core strengths, competencies, and business model:
 - Build and incentivize EV charging infrastructure, which is reliable, affordable, and available to all customers with emphasis on solutions in low and moderate income, and environmental justice and disadvantaged communities;⁵⁸
 - Consider partnerships where advantageous (*e.g.*, dealerships, manufacturers, local municipalities); and
 - Pursue technology-agnostic rate design and managed charging to mitigate peak impacts.

Applying these principles and its core capabilities, the Company has focused its efforts in three key areas:

- **Customer Awareness and Enablement.** Providing customers with information and tools to build an understanding of EV makes and models available, the total cost of ownership, federal and state rebates available, charging options, and environmental benefits;
- **Charging infrastructure.** Deploying a sufficient number of public L2 and DCFC charging facilities; and
- **Affordability.** Offering rebates, incentives, and rate design options as a means to reduce the total cost of ownership (initial and ongoing costs) of EVs and EV-charging infrastructure.

Current Actions

Awareness

According to the Edison Electric Institute ("EEI"), lack of customer education and familiarity with EVs are leading barriers to adoption.⁵⁹ To counter the lack of awareness, the Company has launched several initiatives to improve its customers' knowledge of the many benefits of EVs. These include hosting Ride & Drive events, developing online tools, and offering information on incentives and rebates through its EV Advisor site. These interactions are frequently a customer's first exposure to EVs and play an important role in informing their purchase decision.

- **Ride & Drive Events.** Since 2019, the Company has partnered with Electric Car Insider ("ECI") to conduct five Ride & Drive events in the Company's service territory. These events are a "one-stop shop" for all things EV: available models, test drive opportunities, charging options, purchasing process, available rebates/incentives, EV advantages, and total cost of ownership. In addition to helping identify customers interested in EVs, these events offer potential EV buyers a

⁵⁸ For definition of "environmental justice and disadvantaged communities" see <https://www.nyrenews.org/equity-memo>.

⁵⁹ Improving the Customer EV Experience: Education & Outreach. EEI. See https://www.eei.org/issuesandpolicy/electrictransportation/MembersDocuments/Education_and_Outreach.pdf (paywall).



chance to talk to and interact with actual EV owners to learn about the practicalities of EV ownership.

- **EV Website.** The Company's EV website provides customers with useful information on EVs such as total cost of ownership, available EV programs, EV rates, available rebates and incentives, and nearby charging infrastructure. The site also includes an interactive calculator that can help customers determine which EVs can best meet their needs and compare the total cost of ownership between ICE vehicles and EVs.
- **Third-Party Partnerships.** The Company works with third-party partners (e.g., manufacturers) to increase education and awareness to customers of EV benefits, available rebates, and incentives when purchasing an EV.

Charging Infrastructure

Robust and visible public-charging infrastructure is critical to increasing EV adoption and meeting EV goals. Charging station deployment will serve to reduce consumer range anxiety and encourage the transition to EVs.

New York has two programs targeting public-charging infrastructure development: the DCFC Incentive Program and the Make-Ready Program ("MRP") to encourage the development of public DCFC and L2 chargers. These programs will support the development of public-charging infrastructure by reducing the upfront cost to customers of developing EV-charging sites and, in the case of DCFC, providing an incentive to offset demand charges. Each of these is expected to advance the growth of public-charging infrastructure, and by extension, EVs in New York by 2025.

- **DCFC Incentive Program.** The DCFC Incentive Program encourages the deployment of publicly accessible DCFCs by providing developers an annually declining incentive to offset the cost of operating public DCFC charging stations in the early years of operations, when charger utilization is expected to be low.
- **Make-Ready Program.** In July 2020, the NYPSC issued an order⁶⁰ approving more than \$700 million (Company portion of \$23.7 million) in statewide spending over the next five years to support the development of electric infrastructure and equipment necessary to accommodate increased deployment of EVs within New York state by reducing the upfront cost of building charging stations for light-duty EVs. This program will offset certain infrastructure costs associated with preparing a site for EV-charging installation for light-duty EVs in the Company's service territory by providing an incentive to eligible projects.

The Order sets a target of approximately 2,845 L2 chargers and 71 DCFCs within the Company's New York territory as part of the New York MRP.

Workplace Charging

The availability of workplace charging has been shown to be the third most significant driver of EV adoption behind only vehicle model availability and public direct-current fast charging.⁶¹ Workplace

⁶⁰ Case 18-E-0138, *Proceeding on Motion of the Commission Regarding Electric Vehicle Supply Equipment and Infrastructure*, Order Establishing Electric Vehicle Infrastructure Make-Ready Program and Other Programs (issued July 16, 2020).

⁶¹ ICCT. "The Continued Transition to Electric Vehicles in U.S. Cities," p.36



charging enables managed charging and may provide grid benefits. In areas of high-renewable energy penetration, workplace charging during the day may help manage the intermittency associated with integrating renewables into the grid. Workplace charging will also extend the charging load to more hours in a day-leveling demand on the grid. Workplace daytime charging will also help EVs to have higher state of charge (“SOC”) when they return home so there is higher likelihood that users can wait until later in the evening (past the peak) to begin charging at home.

As part of the Company’s strategy to promote EV adoption in its New Jersey service territory, RECO plans to allocate approximately 10% of the overall Charger Ready Program budget to deploy chargers at other companies’ workplace locations. RECO estimates these funds will result in the build out of more than 100 L2 plugs for workplace use. The Company will allocate the number of plugs across RECO’s territory in a strategic manner. Pending applicant interest, it will aim to deploy at least 5% of the plugs in Sussex county and 15% in Passaic county. RECO submitted its EV filing on November 23, 2020.

Beyond the Company’s proposed workplace charging carveout for the Charger Ready Program, the Company will focus on developing partnerships and conducting marketing to advance the adoption of charging infrastructure at workplace locations. The Company will focus partnership efforts on engaging with municipalities and will prioritize workplace locations which are publicly accessible and highly visible. Examples of these types of locations include town centers, malls, municipal locations and other high traffic areas.

In addition, the Company is installing workplace chargers at its offices throughout its service territory to promote EV adoption among its employees. By Q2 2021, the Company plans to deploy more than 20 L2 chargers at four workplace locations for employee use. Installing a robust workplace charging infrastructure will support those employees with EVs, encourage adoption of EVs by others, and demonstrate the impact and benefits of workplace charging to other companies.

Affordability

In addition to the incentives and rebates associated with EV purchases and infrastructure development, the Company has worked on rate design and DSM initiatives focused on reducing the cost of customer charging and providing incentives to charge off-peak. The Company will use the results of these programs to inform and shape future programs.

- **Rate Design.** Since April 2019, the Company has offered whole-home time-of-use (“TOU”) rates that provide a price guarantee to residential customers with EVs who register their vehicles with the Company and elect to use the TOU rate. This program compares the bill paid by the customer on the TOU rate to that paid on the residential service class rate. If the customer pays more on the TOU rate, then the difference is refunded to the customer. This allows customers to try the TOU rate, incenting them to charge their EV during off-peak hours. The TOU rate also may encourage customers to move their overall electricity usage to off-peak times.

The Company will also leverage its digital platform and available AMI data to gain insight into customers’ EV-charging behavior. This information will be used to help the company develop innovative rate structures that will encourage EV adoption.

- **Managed Charging Program.** The Company is considering a managed charging program to move vehicle charging to off-peak periods. This type of program is especially critical in the Company’s territory (versus more urban environments), where up to 80% of charging is likely to occur at



home⁶². The potential benefits include avoiding stress on the grid driven by charging loads during peak periods and providing customers with monetary rewards for charging off-peak.

In New York, the Company has partnered with two vendors (Uplight and JuiceBox) to offer a pilot program called the "Charge Smart Program." Customers who purchase an eligible L2 charger on the ORU Store receive a \$450 rebate and are automatically enrolled in a managed charging program which schedules charges during times of high-renewable generation.

In addition, coordinating with CECONY and in partnership with FleetCarma (a Geotab company), the Company is developing a SmartCharge program to be deployed in its New York and New Jersey territories. The SmartCharge Program will offer incentives to motivate drivers to charge at off-peak times. The program will utilize data reported by a device, which customers plug in to the vehicle's on-board diagnostics system. The device will track the location and time of charging, and customers will receive an incentive for charging in RECO's service territory during off-peak times.

The Company will continue to evaluate the Charge Smart and SmartCharge programs to develop future programs and rate designs to encourage EV adoption, while potentially mitigating stress on the grid.

- **Manufacturer Partnering.** In 2017, the Company partnered with Nissan to offer rebates for its customers and employees. The Company promoted these rebates, as well as available state and federal rebates. The outcomes of this program will be used to shape future manufacturer partnerships.

Future Opportunities

As the Company considers its future efforts, there will be an evolution of its focus over the course of the 30-year period of this LRP. In the near-term, its focus will continue to be on customer enablement, deploying charging infrastructure, actions to support light-duty EV adoption goals, and how to best influence the identified adoption factors. In the long-term, the Company's focus will gradually shift from driving adoption of light-duty vehicles to advancing the adoption of MDVs and HDVs, analyzing usage data to inform beneficial rate design, and exploring opportunities to fully leverage the benefits of EVs. Throughout this time, the Company will focus on providing electricity that is economical and environmentally responsible, through a system that is safe, reliable, and resilient.

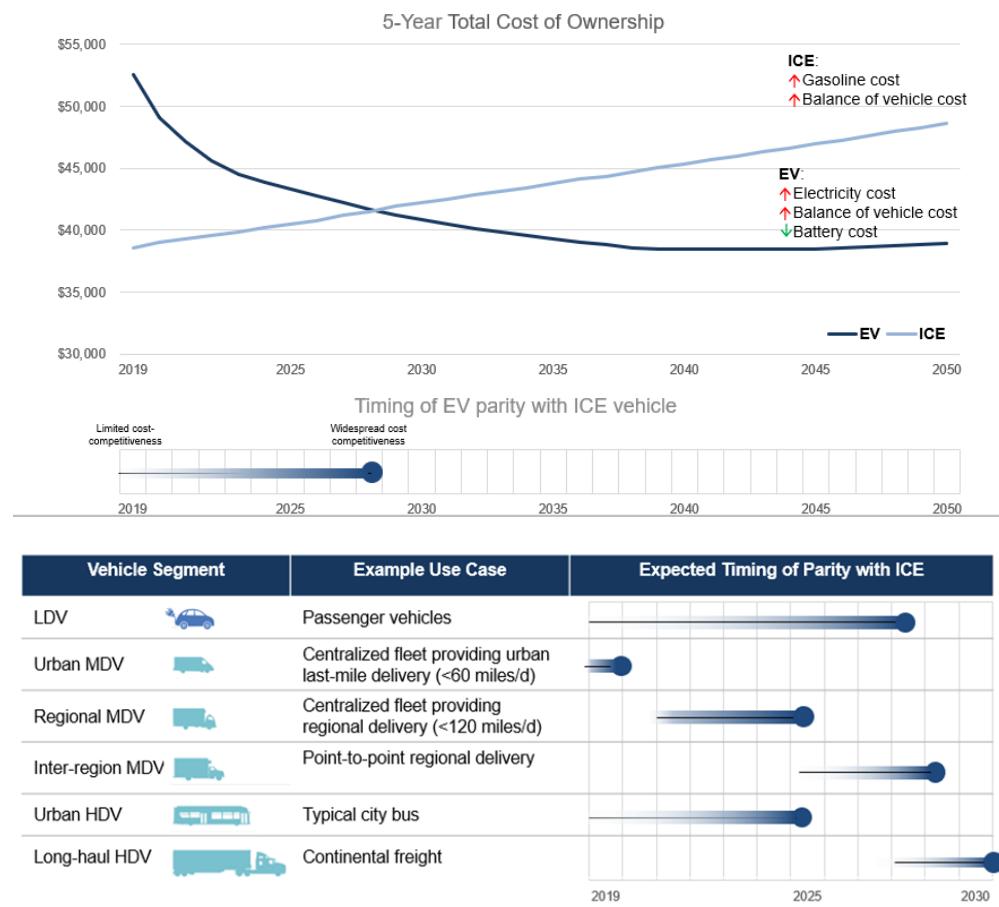
Near-Term

As battery prices continue to fall (87% reduction in cost per kWh between 2010 and 2019⁶³), the economic argument to adopting an EV will strengthen as they reach price parity with ICE vehicles. Certain vehicle segments will reach price parity sooner than others, but it's reasonable to project that the majority of LDVs will reach price parity by 2030. High-end vehicles (e.g., the Tesla Model 3) sell at near comparable prices to their ICE counterpart, while industry experts forecast mass market LDVs to reach price parity by 2024.⁶⁴

⁶² ICCT. "Quantifying the Electric Vehicle Charging Infrastructure Gap Across U.S. Markets," p. 36.

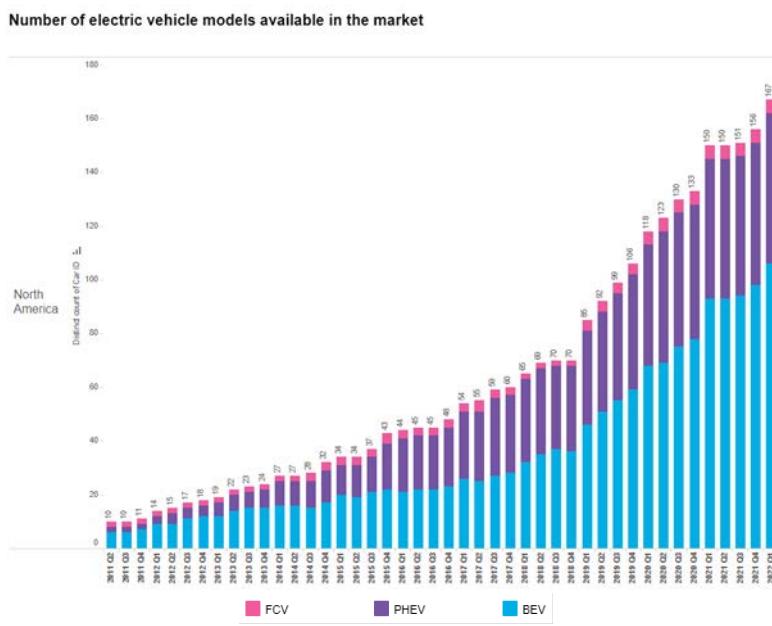
⁶³ <https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/>

⁶⁴ <https://www.woodmac.com/press-releases/323-million-electric-vehicles-will-be-on-the-roads-by-2040/>

Figure 17: Price Parity Forecasts: Overall and By Segment (5-Year Total Cost of Ownership)⁶⁵

In addition, manufacturers are rapidly expanding their portfolio of EV types (cars, trucks, SUVs) in order to appeal to a broader customer base. As an increased number of model types become available at comparable prices to their ICE equivalents, customer adoption is expected to increase.

⁶⁵ Source: McKinsey, BNEF and CEI Strategic Planning

Figure 18: EV Model Availability Forecast (North America) (Q2, 2011 – Q1, 2022)⁶⁶

Awareness

The Company will continue to engage in promoting EV awareness during this period. In addition to existing programs, the Company will undertake targeted awareness campaigns such as expanding partnerships with EV manufacturers, dealerships, and community colleges. Partnering with dealerships will allow the Company to provide potential EV customers with key facts about EV ownership, including available charging options, EV rate programs, and other incentives directly at the point of sale. Partnerships with EV manufacturers offer the opportunity to promote Company customer-specific discounts or other programs. Working with community colleges, the Company can help guide the development of EV technician programs, building the EV workforce needed to support the growing numbers of vehicles and infrastructure.

The Company believes that more should be done to support municipalities' efforts to electrify transportation and educating them of the benefits of EV fleets will be a focus of near-term awareness efforts. The Company is developing education and outreach tools to provide information to municipal leaders on the benefits of EVs, charging infrastructure, incentives, and considerations for public-charging development. This outreach will include providing specific advice on municipal fleet electrification.

Similarly, it is important for the Company to work with local officials to update zoning laws to facilitate the location and installation of EV chargers. These updates will be critical as more residential developments include EV chargers in their plans and public-charging infrastructure grows.

Approximately 93% of current GHG emissions from transportation across the Company's service territories come from LDVs, which make up 98% of all vehicles. While MDVs and HDVs make up only 2% of vehicles in the Company's service territory, they contribute 7% of all GHG emissions. Consequently, the Company sees the need to target all vehicle classes for EV adoption within its service territory.

⁶⁶ Source: BNEF "Electric Vehicle Outlook 2020", [.bnef.com/electric-vehicle-outlook/](http://bnef.com/electric-vehicle-outlook/)



Specific to MDVs and HDVs, the Company has launched a pilot program which will incentivize charger make-ready costs beyond LDVs⁶⁷. The Company will also launch a Fleet Assessment service, which will supplement the MHDV Pilot and provide fleet owners with tools to analyze the costs and benefits of electrifying their fleets. This service is currently under development and is scheduled to be launched some time in 2021.

Charging Infrastructure

The Company sees ongoing efforts in support of the development of a robust-charging infrastructure as essential to driving customer adoption of EVs. Current incentive programs have been designed to improve station economics, serving to kickstart the development of public-charging infrastructure in advance of levels of adoption that are necessary for public-charging business models to become self-sustaining. The \$700 million in statewide incentives for charger development provided in the MRP demonstrates a significant commitment to developing this infrastructure.

The Company recognizes that even at high levels of EV adoption, there may continue to be areas within its service territory that remain underserved by commercial charger developers. To address this concern, the Company will work with NY Department of Public Service (“DPS”) Staff and NJBPU Staff, third-party developers, and other key stakeholders to adjust programs and consider alternative models. This could include utility ownership of the charging infrastructure, particularly in underserved areas.

Today utility ownership has more traction in New Jersey, which identifies utility ownership of EV-charging infrastructure as a stop-gap alternative in areas underserved by private development.⁶⁸ As an example, Atlantic City Electric (“ACE”), as part of its Plug-In Vehicle Charging program, plans to own 45 DCFCs and 200 L2s at public locations. Siting will give special consideration to LMI areas, in addition to current and forecasted density of EVs. This program does include private ownership of up to 120 DCFCs. That said, in New Jersey’s recent EV Order, the NJBPU concluded that electric distribution companies should only own the infrastructure as a last resort.⁶⁹

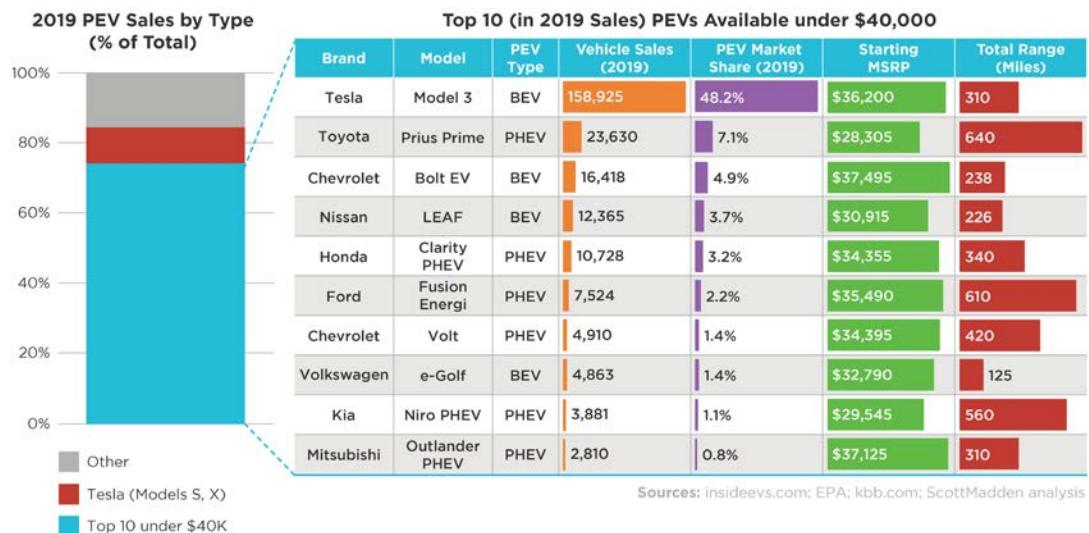
Affordability

As previously stated, the initial cost of EVs is expected to reach parity with ICE vehicles within the decade, driven by the forecasted decline in the cost of EVs over that period. However, until parity is reached, rebates and incentives will continue to be necessary to reduce the barrier to purchase for potential EV customers. In the near-term, the Company will continue to inform customers of available EV incentives and explore additional rebate opportunities, similar to the current manufacturer program.

⁶⁷ <https://www.oru.com/en/our-energy-future/technology-innovation/about-electric-vehicles/electric-vehicle-make-ready-program>.

⁶⁸ New Jersey Energy Master Plan. <https://nj.gov/emp/>. Page 89.

⁶⁹ Source: BPU DOCKET NO. QO20050357, Order Adopting the Minimum Filing Requirements for Light-Duty, Publicly Accessible Electric Vehicle Charging (dated September 23, 2020).

Figure 19: EV Model Sales under \$40,000 Performance⁷⁰

From a cost of charging standpoint, the Company will use what it learns from current rates and future managed charging programs to explore the potential for future innovative rate designs and improved managed charging to enhance EV affordability. In addition, the Company will review programs offered by other leading utilities to inform and shape possible EV-targeted rate programs. Some examples of benchmarked programs include:

- Discounted demand charge (Atlantic City Electric and Eversource (CT))
- Sliding scale tariff where energy rates decrease, and demand charges increase over time as charger utilization increases (recommendation of Connecticut's Department of Energy and Environmental Protection or "DEEP")

Fleet Assessment and Activity

For EV fleets, the Company will launch its Fleet Assessment Service to broaden the opportunities and reduce the business risks for ICE fleets to electrify. Services, such as vehicle duty cycle analysis and charging optimization, may help fleet operators to understand the opportunities that EVs provide in terms of managing vehicle-charging costs. Understanding fleet-duty cycles and routes will provide the Company with a better understanding of where in the service territory additional public-charging may be required to support mid-route refueling. Working closely with fleet operators in the Company's service territory will allow the Company to encourage fleet EV adoption while making prudent infrastructure investments.

In support of its clean energy commitment, the Company is transitioning its light-duty fleet to EVs. To accelerate that transition, 100% of new LDVs purchased will be EVs, and the Company will expand the availability of fleet-charging stations. As a further commitment, the Company has established a goal that 100% of the light-duty fleet will be EVs by 2040. The Company will also explore, through research and development, alternative technologies to reduce the use of fossil fuels for its medium- and heavy-duty vehicles.

⁷⁰ Source: insideevs.com; EPA; KBB.com; Team analysis. Full year 2019 most current data available



Long-Term

Near-term efforts (*e.g.*, MRP, fleet actions, managed charging) will inform the Company's future strategy for EVs. The level of adoption by vehicle class and the impact on the system achieved by existing programs will inform future actions. These actions may include continuation of current programs, considering new rate structures, and pursuing new opportunities for EVs (*e.g.*, vehicle to-grid services).

The Company expects EVs to reach the point of being the "standard" vehicle choice, particularly for LDVs. While the level of EV adoption for MDVs and HDVs may not be as high, there will be a significant increase in these classes as well. Consequently, over time the Company's focus will shift from enabling EV adoption to that of becoming the fuel provider of choice for its EV customers.

System Impact

Providing safe, reliable, resilient EV "fuel" will be a critical long-term mission of the Company. The increase in EV adoption may result in changes in peak loads, transformer and substation impacts, and potential reliability issues. The increasing load may also result in the need for infrastructure upgrades to maintain system reliability. The growth of EVs and the associated infrastructure development will need to be integrated with the Company's load forecasting. There is also an ability to address this by pairing EV charging with a combined solar PV and energy storage system. This will allow charging using the location's own solar generation paired with energy storage. This not only mitigates the system impacts, but it also provides a more reliable and resilient solution for the customer.

Key to success is proper coordination and management of this EV load to best manage the possible reliability risks. This needs to account for the differences in load presented by vehicle type. The impact of LDVs, while making up roughly 98% by type for the Company, is not expected to be as significant as that of MDVs and HDVs. This is driven by the battery pack sizes and charging requirements for these vehicles. The Company forecasts that eighty percent of LDV charging will happen at an owner's residence. As a result, the Company will structure incentives to promote more off-peak charging to minimize grid impacts. The Company will provide additional data to charging infrastructure developers via load serving capacity maps to inform them of available capacity by geographical location. This will further help to deploy publicly available chargers in areas that have adequate distribution capacity, lowering costs for all customers.

In the long-term, the Company will consider Vehicle-to-Grid ("V2G") technologies and programs, where the EV's battery can be used to provide grid benefits. In some concepts, EV owners would be compensated for allowing the use of their vehicles to provide services to the grid. This opportunity is still nascent and will require significant analysis and study.

Rate Structure

EVs have great potential to support the states' GHG emissions reduction goals, while at the same time are likely to drive significant new demands on the electric system through EV charging. In the early years of EV adoption, when utilization of charging infrastructure is relatively low, it will be important to support EV growth through tailored programs that help station owners and operators manage operating costs, while also retaining key price signals that encourage demand management and off-peak charging. From a rate perspective, the Company will continue to offer rates which reflect cost causation as well as provide appropriate price signals to encourage customers to manage their overall impacts on the system, including through consuming electricity at times which minimize stress on the grid. EV charging is one electrification use-case which could result in additional stress on the grid, if not



managed properly. In addition to O&R's TOU EV Rate and RECO's Voluntary TOD Rate – which both encourage off-peak charging – the Company proposes to offer rewards for customers who charge off-peak.

Operating expenses relative to other alternatives will be one critical variable that determine economics for EV fleets. For ICE vehicles, fuel is the largest (non-wage) operating cost for fleet managers, making up 30–40% of O&M costs for ICE trucks.⁷¹ To manage this, fleet managers develop fuel procurement strategies, including bulk purchases and commodity hedging to manage this cost. Electricity costs will also be a significant component of O&M expenses for EVs as well. The Company will work with customers to help fleet managers understand and manage this cost to their business.

Risks and Mitigation

Adoption

Current historically low oil prices have reduced potential cost-savings associated with owning an EV, adversely affecting the number of potential EV buyers. With oil prices expected to rise over the duration of this plan, this is expected to only have a near-term effect.⁷² The Company will continue to monitor this and update its plan and EV selection tools as necessary.

Adoption could also be shaped by state/local policy. In September 2020, California announced a ban on all new ICE vehicle sales by 2035 that could be a model adopted by other ZEV states.⁷³ Similarly, in a report published in October 2020 by the New Jersey Department of Environmental Protection, the state recommended that by 2035 all new cars, SUVs, and light trucks sold in the state be zero-emission vehicles. While this new recommendation is currently non-binding, it would surpass the two targets already set by state law (330,000 EVs by 2025 and two million by 2035). For comparison, more than 6.3 million cars and light trucks were registered in New Jersey at the end of 2019.⁷⁴ This points to the significant role that legislation and regulation play in adoption. While these actions are expected to drive adoption, potential rulemaking that ends or limits EV requirements and/or current incentives could significantly curtail adoption of EVs.

The current variety of model types available in the consumer market also impacts adoption. Currently, more than 70% of LDVs sold in the United States are crossovers, SUVs, or pickup trucks,⁷⁵ but only 19% of currently available EV models are of these types. However, manufacturers are developing soon to be released new models, targeting these segments.

The current COVID-19 pandemic has impacted EV adoption. Per BNEF's 3Q 2020 Electrified Transport Market Outlook, "global passenger EV sales were down 15% in 2Q 2020," and the Company expects "EV sales in the U.S. to drop 28% in 2020." However, these setbacks are expected to be short-lived as long-term EV adoption forecasts remain unchanged driven by the near- to medium-term growth in Europe and China and an increase in forecasted SUV and pickup EV models in the United States.

⁷¹ Source: American Transportation Research Institute; total cost per mile

⁷² Source: EIA Annual Energy Outlook 2020, January 29, 2020. www.eia.gov/aeo

⁷³ Source: California Executive Order N-79-20 (State of California, Executive Department, signed September 23, 2020)

⁷⁴ Source: <https://www.govtech.com/fs/transportation/New-Jersey-Eyes-All-Electric-Vehicle-Shift-by-2035.html>

⁷⁵ Source: <https://www.nytimes.com/2020/05/21/business/suv-sales-best-sellers.html>. IHS Markit quoted



Charging Infrastructure

Meeting New York's and New Jersey's 2025 EV goals (850,000 and 330,000, respectively) will require a robust public-charging infrastructure. Deployment of this charging infrastructure—even with incentives like those proposed in the MRP and DCFC Incentive Programs—will depend on station use to result in favorable charging station economics. The Company will closely study the effectiveness of current programs and work with developers, regulators, and other key stakeholders to make adjustments as necessary.

System Impact

As previously stated, the impact of EV charging could be significant to the Company's system. This will require a proactive, coordinated, robust-planning process so that the system is ready when needed to accommodate this increased load in a cost-effective manner. The input to planning is described in the Integrated System Planning section. The Company will work to both increase adoption through both targeted marketing and facilitating EV charger development, as well as manage the impact on its system by both coordinating charger development and developing and enabling managed charging.

In addition, the Company can explore combining vehicle charging with a solar PV and ESS as part of demonstration or NWA projects to understand the benefits this may provide to the system. Please see the Energy Storage section of this LRP for further discussion of pairing DERs with vehicle charging.



Energy Storage

Introduction and Background

Energy Storage continues to establish its role as a transformative technology with the potential to change the electric system fundamentally. As New York and New Jersey work to incorporate greater amounts of intermittent renewable resources, ES is expected to provide flexibility to help integrate these resources into both the transmission and distribution (“T&D”) systems. The Company expects storage at both levels to play an increasing role in enhancing the reliability, resiliency, and flexibility of its electric system, and it has an important role in facilitating the integration of these resources into the planning and operation of the T&D system.

Recognizing this critical value, ES deployment has been mandated by both New York and New Jersey. Specifically, in 2018, the NYPSC issued the NY Energy Storage Order⁷⁶ establishing state goals for ES of 1,500 MW by 2025 and 3,000 MW by 2030. In 2019, the CLCPA⁷⁷ codified these targets into law and directed the state’s administrative agencies to develop policies to accomplish these goals. The New Jersey EMP established ES deployment goals of 600 MWs by 2021 and 2,000 MW by 2030.⁷⁸ Deployment is nascent, but growing, in both states. As of October 2020, New York has 91.8 MW installed throughout the state, and New Jersey has more than 44 MW of storage installed throughout the state (as per the PJM interconnection queue).⁷⁹

In order to facilitate the deployment of storage throughout its territory, the Company needs to be flexible in its approach and incorporate storage into as many of its future plans as possible. The Company’s efforts in integrating storage into the distribution system have focused largely on the development of NWAs and demonstration projects, driven by the New York’s REV Track One Order. As these projects are deployed, the Company is learning valuable lessons in stakeholder engagement, contracting, storage system implementation such as operational and safety protocols, siting, permitting, and the development of potential business models. In 2019, in compliance with the NYPSC’s Storage Order, the Company participated in a bulk ES procurement intended to increase the deployment of bulk electric storage systems in New York state.

ES is flexible and able to provide value to multiple stakeholders. It is important for the Company to enable storage to participate in different markets to reduce the overall cost of deployment for ES projects. Access to wholesale markets (energy, capacity, and ancillary services) may be critical to the cost-effective deployment of ES. The Company is continuing to explore the various markets in which storage may participate in the future and is working with the Joint Utilities of New York (“JU”),⁸⁰ the NYISO, NYPSC, and others to achieve these objectives.

⁷⁶ NY DPS website. (Case 18-E-0130, *In the Matter of Energy Storage Deployment Program*, Order Establishing Energy Storage Goal and Deployment Policy)

⁷⁷ <https://climate.ny.gov/>

⁷⁸ <https://nj.gov/emp/>

⁷⁹ <https://pjm.com/planning/services-requests/interconnection-queues.aspx>

⁸⁰ The Joint Utilities are CECONY, O&R, New York State Electric and Gas Corporation, Rochester Gas and Electric Corporation; Central Hudson Gas & Electric Corporation, and Niagara Mohawk Power Corporation d/b/a National Grid.



The adoption of ES in the Company's territories is dependent on several factors, including:

- **Storage Benefits.** Increased understanding of the non-monetary benefits such as the continued evolution of wholesale market revenue opportunities and increased resilience that could improve project economics over the long-term.
- **Awareness.** Increased stakeholder understanding and knowledge of ES, its benefits, operations and available technologies will be critical to increasing ES adoption. This includes customers, developers, and authorities having jurisdiction ("AHJs").⁸¹
- **First Responders/Fire Departments Collaboration.** It is important for the Company to work with first responders/local fire departments to understand how to respond to emergencies involving an energy storage system. The Company has brought in fire protection engineers to further mitigate any concerns and have clear action plans in case of emergencies.
- **Project Development Experience.** Increased experience with storage technology and its deployment by the Company and other key stakeholders will improve future deployment efficiencies and facilitate the deployment of additional storage projects.
- **Market Enablement.** Advances in wholesale market rules to allow for inclusion of both bulk system and distribution-connected projects. Early lessons learned and appropriate advocacy will be important to advancing the role of storage in the wholesale market.

Current Actions

As described above, the Company is focused on increasing awareness of storage as a resource, gaining project development experience, advancing policy and projects that enable favorable project economics, and furthering policies through the NYISO that expand the benefits storage can provide. The work to date and ongoing is described below. As the market for storage in New York and New Jersey continues to develop, these projects will provide valuable lessons learned to inform the Company's future deployments.

The Company is committed to promoting the deployment of ES throughout its service territory. The Company has focused its efforts in three areas:

1. Addressing storage deployment through facilitating the awareness and adoption of ES solutions for customers, third-party developers, and AHJs;
2. Exploring, planning, and developing various use cases for ES, allowing the Company to determine those uses that most benefit itself and its customers; and
3. Exploring ways to improve the project economics of ES. This includes identifying opportunities to decrease the total cost of ownership and optimize the revenue opportunities for ES systems.

Awareness

It is critical for customers and developers to understand the value ES can provide. To this end, the Company has established a dedicated ES webpage.⁸² This provides customers with a general

⁸¹ AHJs refers to local officials in municipalities, towns, and other local governments that have the authority to enforce codes, issue permits, etc.

⁸² <https://www.oru.com/en/our-energy-future/technology-innovation/energy-storage>



overview of ES technology, answers to frequently asked questions to address common concerns regarding ES, and links to external ES resources. In addition, the Company developed a solar plus storage marketplace (“S+S Marketplace”). This allows residential customers to input basic information and receive bids from approved contractors for ES, rooftop solar, solar paired with ES, and/or Community Distributed Generation (“CDG”) products. The S+S Marketplace provides a platform to receive competitive bids in one location, which may result in up to a 10% price reduction for customers.

Figure 20: Solar + Storage Marketplace Performance (Launched in 7/24/20)

Leads	154
Opportunities	113
Proposals	62
Sold	5
Installed	0
Unqualified	4
Cancelled	11
Inactive	43
Future opportunity	1

The Company has also actively worked with local governments and municipalities in New York to lay the groundwork for storage projects, providing information about the performance, value, and safety of these assets. Additionally, the Company has initiated outreach to first responders in the Company’s service territory to educate them on the benefits and safe operation of ES systems.

In addition to external stakeholders, the Company has engaged internal stakeholders to further facilitate the deployment of ES. Through the initiation of an internal DER Integration Working Group, the Company is developing internal ES processes and procedures to enable the successful development and operation of storage assets throughout its service territory.

The Company also regularly meets with vendors regarding new technologies to assess what would be a good fit for future storage solicitations. In addition, the Company continues to work with NYISO to understand wholesale participation and determine how NYISO revenues can lower the cost of storage deployment. The Company has collaborated with its third-party developers to assess the potential for leveraging wholesale market revenues to lower program cost to customers. In addition, the Company has presented on the Company’s ES projects at conferences, including the distribute 2020 conference, NY-Best’s Annual Technical conference, and East by Northeast’s Greentech conference.

NWAs

According to Wood Mackenzie, New York is currently the number one market for NWAs. Combined, New York and California host a total of 72% of the NWA projects in the Wood Mackenzie database.⁸³ As the Company plans the T&D system, NWAs are emerging as a critical component of the Company’s management of capital project costs, allowing the deferral or elimination of traditional capital expenditures.

⁸³ Source: <https://www.greentechmedia.com/articles/read/where-are-all-the-non-wires-alternatives>



The Company employs NWAs to increase the penetration of DERs and most project proposals continue to rely heavily on ES to meet the load relief specified in NWA requests for proposals (“RFPs”). Currently, three NWA projects in the Company’s service territory (Pomona, Monsey, and West Warwick) have passed the benefit-cost analysis (“BCA”) and are in various stages of implementing ES systems to meet their distribution needs. The Company continues to evaluate other potential NWA projects, which may also rely on ES. In addition, Sparkill (2 MW/6 MWh) and Nyack (3 MW/18 MWh) are being evaluated for possible development, both with possible 2023 in service dates. Combined, these projects could add up to approximately 33 MW of ES within the next two years.

The Company’s NWAs have provided an opportunity for the Company to gain valuable experience deploying ES to meet electric system needs. These lessons learned include siting and permitting of ES systems, developing a legal framework for ES including appropriate contractual documentation, conducting ES stakeholder education and outreach sessions, developing new ES-related internal processes and procedures, and evaluating novel ES business models.

The Company is in the process of installing and energizing the battery storage system for their Pomona NWA project. This is the first large-scale ES system on the Company’s system (3 MW/ 12 MWh) is scheduled to come online in December 2020. To implement this project, the Company collaborated with multiple internal stakeholders (System Operations, New Business and Distribution Engineering) as well as external stakeholders (town and municipal authorities, local fire departments and first responders). The experience on this project has allowed the Company to improve and streamline its internal processes to help with the implementation of future ES.

Innovative Storage Business Model (“ISBM”) Demonstration Project

Resiliency of the energy delivery system is critical, as shown by the impact of California wildfires, Tropical Storm Isaias, and the number of hurricanes impacting the Gulf region. The Company anticipates the majority of ES installations in its service territory to be residential systems, paired with rooftop solar.⁸⁴ That trend, coupled with the fact that the majority of the Company’s load is driven by residential demand, led to the development of the Company’s ISBM demonstration project.

The Company is partnering with Sunrun Inc. (“Sunrun”) to provide residential solar plus storage to customers within the Company’s service territory. The ISBM project will aggregate behind-the-meter residential ES to test the hypothesis that batteries can provide a range of services across multiple use cases, maximizing the use of battery storage, improving economics, and increasing battery deployments. The proposed business model allows for sharing of costs and benefits across multiple stakeholders. Stakeholders include residential host customers who receive resiliency benefits, the Company which will realize peak reduction and shared wholesale revenues, and Sunrun which will benefit from peak services payments and shared wholesale revenues. This project will provide actionable data on how an aggregation of behind-the-meter batteries can provide benefits to the Company’s distribution system, NYISO markets, and the host customer.

If proven successful, this project will demonstrate a business model that enables storage to provide greater value at lower cost than is possible under current business models, which as mentioned above, could then lead to accelerated deployment across New York.

⁸⁴ 733 kW of ES deployed on O&R’s system as of September 2020. All behind-the-meter residential ES installations



Bulk Storage

The NYPSC's December 2018 Energy Storage Order established the statewide ES goal, as well as a deployment policy to support that goal. As part each utility was required to issue an RFP by the end of 2019 for at least 10 MW of bulk-level ES services to be in service by December 31, 2022.⁸⁵

In response, O&R and CECONY conducted a joint solicitation in 2019. For O&R, this bulk solicitation focused on supporting the distribution system, as well as having third parties develop, own, and operate the ES systems to provide services within O&R's territory. Since none of the bids were economically viable, the Company did not move forward with the 2019 solicitation. The Company is currently updating the RFP and is working with NYSERDA and NYPSC to develop and incorporate any needed changes. The Company anticipates it will conduct another solicitation in the second quarter of 2021.

Market Enablement

Access to wholesale markets (energy, capacity, and ancillary services) is critical to the cost-effective deployment of ES. Participation in wholesale markets improves ES project economics, giving assets access to additional revenue opportunities when not needed to meet distribution system or customer needs.

In February 2018, the Federal Energy Regulatory Commission ("FERC") issued its final rule on Order 841, which requires regional transmission organizations ("RTOs") and independent system operators ("ISOs") to allow ES sized 100 kW or above (total or in aggregate) to participate in wholesale market. In addition, FERC Order 2222 (issued September 17, 2020)⁸⁶ mandates that RTOs and ISOs allow aggregated DER assets to participate in wholesale markets to promote additional competition in the marketplace. These two FERC mandates, along with the NYISO led initiatives described below, will expand the opportunities for ES participation in wholesale markets.

In New York, there are two projects in development by NYISO to facilitate ES participation in the wholesale market:

- The Energy Storage Resource ("ESR") model allows non-aggregated ES assets greater than 100 kW to participate in the energy, capacity, and ancillary services markets. Rules are expected to be released in fourth quarter 2020.
- The DER model allows aggregated ES assets to participate in a portfolio (multiple ES systems or other DERs). Rules are expected to be released in Q2 2021.

As of May 2020, NYISO is also allowing dual participation of ES in the wholesale market. This means that an ES in an NWA project can participate in the NYISO market. As these rules are implemented, O&R will work closely with NYISO and the JUs to monitor their effectiveness. In addition, these models will inform the types of storage deployments the Company may pursue to meet the mandates in New York and New Jersey.

⁸⁵ The NYPSC mandated that each of New York's investor-owned utilities procure 10 MW of energy storage through the bulk procurement, with the exception of CECONY which was required to procure 300 MW.

⁸⁶ Source: <https://www.ferc.gov/news-events/news/ferc-opens-wholesale-markets-distributed-resources-landmark-action-breaks-down>



New Jersey Actions

New Jersey has established storage goals and objectives. As stated earlier, the EMP has stated goals of 600 MW by 2021 and 2,000 MW by 2030. The NJBPU is preparing to establish a process and mechanisms to achieve the state's ES goals. The Company will continue to look for opportunities within RECO's territory for storage opportunities in support of these goals.

Learnings to Date

Through the various ES projects that the Company has pursued to date, the Company has identified several lessons learned which will guide future storage implementations.

Operations

The Company has developed a series of processes to manage ES as it comes online. In Phase 1, the Company will rely on manual processes, such as email and telephone conversations between stakeholders, to coordinate charging and discharging of ES. In Phase 2, the Company will move to a more automated process to charge and discharge ES using ADMS and DERMs. Advancing to Phase 2 (target sQ2 2022) assumes that additional storage projects are deployed on the Company's T&D grid and that ADMS and DERMS are fully functional.

The Company understands that training of internal stakeholders is an important process to developing its DER plans and procedures. The Company has periodic DER integration meetings involving stakeholders from various Company organizations. These sessions allow internal stakeholders to learn about and develop plans and processes to further streamline the deployment and integration of DERs. This allows all key internal stakeholders to have a clear line of sight to the Company's future plans when it comes to ES deployment and allows them to provide input and feedback on these deployments.

Siting and Permitting

The Company's experience with NWAs has served to identify challenges to project development, specifically siting and permitting of large-scale assets. While the most benefit from ES is obtained by siting it close to the load, this also leads to challenges, specifically when in the vicinity of densely populated residential areas. The process also brought to light the importance of coordination and partnership with multiple stakeholders specifically, local municipalities, third-party vendors, and landowners. A specific risk highlights the potential uncertainty of siting grid-scale storage on private property. If a mutually agreed upon site drops out of the process, this can lead to unforeseen delays and prolong the project.

The Company also found that engaging municipalities early in the process to educate them on ES, reduces the timeline for permitting. Many local building codes currently do not include provisions for ES assets, and the Company will continue to work with and support municipalities in developing updated building codes and statutes to permit ES. This will be key to accommodate the forecasted growth of ES and other DERs within the Company's service territory. As a trusted advisor and energy expert, the Company will help address the municipalities' questions and concerns as this development occurs. This will include helping them understand the benefits and capabilities of existing and evolving ES technologies and help them make informed decisions.



Education and Outreach

Recognizing the importance and need for ES education and outreach, the Company has developed plans and materials to educate commercial and residential customers and other stakeholders on the benefits of and safety processes for ES. To that end, the Company has worked with internal and external stakeholders to draft emergency response procedures and developed multiple resources to educate customers as mentioned earlier.

Safety

Maintaining public and employee safety is imperative. A key to maintaining safety is having plans in place to respond to an event, should it occur. With ES being a relatively new technology, partnership and coordination between the Company, developers, and first responders is critical.

To develop robust emergency response plans, the Company's internal emergency response experts have worked with third-party vendors to draft emergency response plans and then review them with first responders. Where gaps were identified, designs were modified, and safety and communications mitigations were implemented to address them. the Company is committed to public and employee safety and will continue to work with first responders and other external parties to design and implement effective emergency response plans.

Project Economics

As different markets and products are being introduced, the Company will capture those revenue stream opportunities to improve overall cost of ES deployment. For example, the Company's ISBM project and its efforts in wholesale market enablement are focused on learning about the various economic levers that will drive adoption of storage as a resource. These will be important guides for future projects.

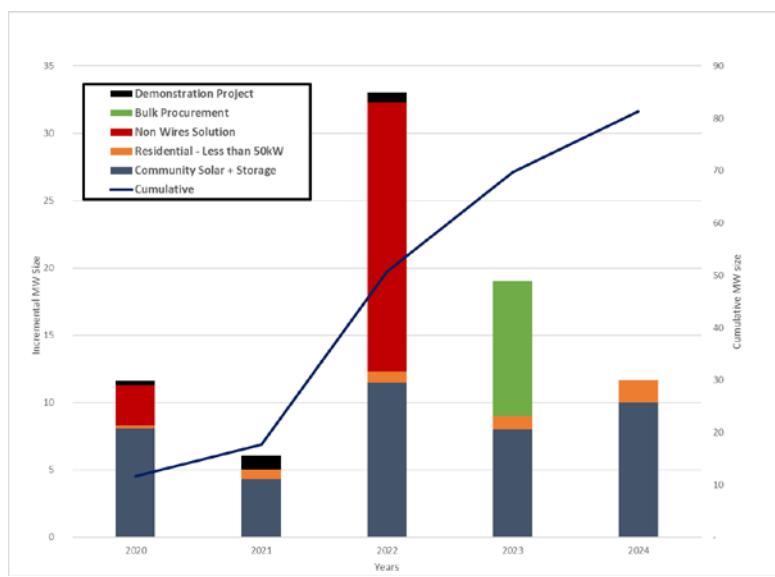
As the Company conducts further solicitations either for NWAs or bulk storage, it will gather additional feedback about what the various players in the market require to participate, whether they be developers or customers.

Future Opportunities and Focus

Meeting NY's and NJ's aggressive emission free generation goals will require significant, utility-scale renewable generation. ES is expected to play an important role in ensuring reliable, resilient energy delivery, as this renewable generation displaces current fossil-fueled sources.



Figure 21: Company ES Forecast (to 2024)



The Company is using the projects described above to inform its future efforts and meet states' goals. In addition, there are a variety of storage implementations in progress across the United States from which it can learn. Future deployment of ES on the Company's system will continue in the following areas:

- Customer-sited (both residential and commercial);
- Distribution-connected ES (includes ES deployed for reliability and resiliency as well as for market revenues); and
- Transmission-connected ES (includes ES deployed for reliability and resiliency as well as for market revenues).⁸⁷

These deployments, and the business models that enable them, will shape the Company's future ES strategy.

Customer-Sited Storage

As of September 2020, all of the 733 kW of ES deployed on O&R's system came from behind-the-meter residential ES installations. Future nationwide development of customer-sited storage is expected with more than 1,000 MW of ES forecasted to be behind-the-meter.⁸⁸ Growth will be driven by increasingly favorable project economics and development of DER participation models for wholesale markets and pairing of behind-the-meter storage with residential rooftop solar PV.

⁸⁷ Currently three projects are in the NYISO interconnection queue in O&R's service territory: 20 MW Little Pond Solar (Sparrow Bush, NY-Cypress Creek developer); 100 MW Huckleberry Ridge Energy Storage (Middletown, NY-Energy Resources developer); and 20 MW Rising Solar II (Warwick, NY-Geronimo Energy developer). All are in the study phase.

⁸⁸ Wood Mackenzie, U.S. Energy Storage Monitor, Q4 2019 Report



The Company will gain first-hand experience in residential solar plus storage through the ISBM demonstration project. The Company will be able to assess the results of the project and determine the degree to which other similar aggregated storage assets may be deployed.

There may be opportunities to expand this model into the C&I sector or to pair storage with other types of DERs. Although the model for behind the meter (“BTM”) ES for C&I customers has lagged, NYSERDA’s retail program incentive should drive growth of this sector in the future.⁸⁹ Targeting the C&I sector, this NYSERDA program provides incentives for retail energy storage (5 MW or below). The incentives vary depending on the in-service date of the project and its discharge duration. The C&I sector will be able to leverage this program to pair their solar project with storage. The Company will monitor this market as it evolves.

Distribution-Connected Storage

To achieve the states’ storage goals (3,000 MW for New York and 2,000 MW for New Jersey, both by 2030), the Company understands that it has to integrate ES in its overall planning and operations process. To facilitate deployment of more ES, the Company sees an opportunity to deploy ES as part of the traditional capital-planning process. The benefit of this type of use case would be to site ES at strategic locations (such as a new or existing substation) to provide operational flexibility (such as to integrate renewable generation or manage system conditions such as power quality).

Additional coordination is required to implement ES in this manner, with the Company expecting this to become a common tool used in the distribution planning process within the next five years. Over time, ES will become yet another technology to be installed to address contingencies or capacity constraints on the distribution system, not requiring a discrete regulatory mandate or other incentives. This will further increase the efficiency of the overall power system.

Other utilities have had success integrating ES into their systems, and the Company expects to learn from these deployments in the years to come. For instance, Arizona Public Service (“APS”) has successfully integrated ES to meet a distribution capacity need. To support the growing energy needs of a remote community in its service territory, APS was looking for alternatives to a traditional distribution system expansion. The traditional project would have required the installation of more than 20 miles of 21 kV distribution lines over mountainous terrain. The alternative was a 2 MW/8 MWh ESS. Coming online in March 2018, the Punkin Center system has met its design objective of reliably meeting 20-30 peak demand response day, as well as providing grid services to APS. It also did so for less cost than the traditional T&D alternative.⁹⁰ Lessons from this facility may also inform the Company’s provision of grid services and demand response capabilities from storage installations.

Importantly, the Company will continue to follow the developments of utilities investigating the services and value that storage can provide. For example:

- In Vermont, Green Mountain Power is exploring battery storage to support the T&D system and increase the hosting capacity of certain circuits. This effort is also considering different procurement alternatives (RFP, bring your own device, fixed price).

⁸⁹ [https://www.nyserda.ny.gov/All/20Programs/Programs/Energy Storage/Developer /Contractors and Vendors/Retail Incentive Offer](https://www.nyserda.ny.gov/All/20Programs/Programs/Energy%20Storage/Developer%20/Contractors%20and%20Vendors/Retail%20Incentive%20Offer)

⁹⁰ Source: <https://aeic.org/wp-content/uploads/2019/10/Arizona-Public-Service-Punkin-Center-Energy-Storage-Project.pdf>



- The Massachusetts Clean Energy Center and Department of Energy Resources are together deploying a series of projects to inform a variety of potential business models, including behind-the-meter solar plus storage, clean transportation, merchant solar plus storage, investor-owned utility grid modernization asset, municipal light plant, residential storage dispatched by utility, resiliency/microgrid, and LSE/competitive electricity supplier portfolio optimization.
- Energy Eversource leverages the peak demand management benefits of battery storage through its ConnectedSolutions active demand management program for both residential and C&I customers.
- California's Self-Generation Incentive Program ("SGIP") offers rebates for the installation of ES technology in residential and non-residential applications. Funding prioritizes communities in high fire-threat areas as well as low income and medically vulnerable customers through a three-tiered incentive structure. Residential customers must transition to qualifying home-charging TOU rate schedules to receive the incentive. Base incentives may be increased or decreased depending on the manufacturing location, storage performance, GHG emissions associated with the system, duration of ES, energy capacity, and power rating.

These projects will all provide important lessons about business models and planning, installation, and operation of storage by the utility. They may also provide guidance regarding the regulatory treatment of these assets as the market for distribution-connected storage further develops in New York and New Jersey.

The Company also sees the opportunity to pair ES (and other DERs) with traditional distribution system projects as a way to either defer or eliminate large capital investment. This hybrid-NWA approach could provide an alternative to traditional investment in situations where a standalone NWA may not be viable (*i.e.*, pass the BCA test). An example here could be combining ES with traditional infrastructure investment as an alternative to a potentially more expensive substation rebuild. In addition, the Company is looking at alternative designs which will make considering the incorporation of ES standard to new substations.

The Company also sees an opportunity to pair ES with EV-charging stations. As discussed above in the previous Electrification of Transportation section of this LRP, EV charging infrastructure is critical to EV adoption and achieving the states' EV and CLCPA goals. One hurdle to the deployment of more DCFCs is potential high-demand charges. Pairing ES with DCFC charging stations may allow the operator to store energy during times of low utilization and call on stored energy during times of high utilization to limit peak demand and resulting demand charges. The Company is currently monitor and assessing this opportunity.

Large-Scale Storage

To meet the storage goals for New York and New Jersey and to support the states' increasing deployment of large-scale, intermittent renewables, the Company will focus on utility-scale storage deployment. The advancement of utility-scale storage may proceed through third-party ownership or through utility ownership. The Company is poised to advance both business models.

These deployments may include standalone projects and those coupled with large-scale renewables to support grid reliability and efficiency. Pairing ES with large-scale renewables would allow developers to better align supply with demand. This integration could drive economic benefits, improving the value of these renewables, and could also lead to increased efficiency and less strain on the distribution system, thereby lowering costs for the customer. Importantly these projects may be



owned by third parties or by utilities in New York and New Jersey. The bulk solicitations conducted to date and planned will inform these processes over time.

As wholesale markets for ES continue to develop, expanded market opportunities are expected to further drive the development of bulk ESRs. Recent developments include initiatives at PJM and NYISO in response to FERC 841 and FERC 2222, which requires system operators to develop market rules for the participation of ESRs in wholesale markets.

As other utilities are deploying storage through these models, their efforts may inform the Company's approach. For instance, in Massachusetts, Eversource Energy is developing two utility-owned, large-scale storage projects. One is a 14.7 MW ESS on Martha's Vineyard designed to provide auxiliary power during peak demand and act as a backup in the event of an emergency, replacing the current reliance on diesel generators. The other is a 25 MW lithium-ion system for the Cape Cod region, which is designed to serve as backup power and help defer construction of a 13-mile distribution line. National Grid won the 2019 Energy Storage North America Innovation award for a similar project in Nantucket, which eliminated the need to install an underground cable.

Recently announced large-scale projects in California could also serve as an example of a deployment model and development process to be considered. Southern California Edison ("SCE") announced the procurement of 770 MWs of ES in May 2020 (7 projects ranging in size from 50 MWs to 230 MWs). This single procurement represents a size larger than the entire United States' 2019 storage market. These projects are all scheduled to come online by August 2021.

Pacific Gas and Electric ("PG&E") requested California PUC's ("CPUC") approval to procure 423 MWs of storage projects in May 2020. This total procurement is for five projects ranging in size from 50 MWs to 150 MWs, all scheduled to come online by July 2021.

Both of these are in support of the CPUC's decision requiring all load-serving entities to procure 3.3 GW of system-level resource adequacy capacity to enhance system reliability, supporting the growing renewable generation portfolio.

Learning from these larger-scale projects, the Company could identify development processes, contract terms, business model structures, and asset operation processes to adapt and apply in meeting its objectives. In addition, novel approaches to hybrid ESS and new business models in other jurisdictions provide opportunities to develop innovative approaches to deploying ES in the Company's service territory.

The Company will also monitor the development of the various marketplaces. The Company will need to understand the interplay between the various markets (*i.e.*, retail, wholesale, and NWA). Understanding the interplay between these markets will further help the utility to promote and facilitate the deployment of ES assets.

Long-Term ES Considerations

Advances in ES will be a critical factor in the successful realization of the clean energy future, helping to transform the electric delivery system. As large-scale renewables (*e.g.*, off-shore wind, utility-scale solar) become mainstream, increasing demands will be placed on the electric delivery system to integrate and manage these large, variable resources. Long duration energy storage (greater than six hours) will be critical to integrating these resources effectively and helping to manage the variability of when, and how much, energy these sources produce. While pumped hydro is currently the only widespread long-duration storage technology, there are a host of new technologies being developed



that may make storing significant quantities of electricity over long time frames cost-effective and practical. These include compressed air energy storage, thermal energy storage and new battery technologies such as sodium metal-halide technologies.

Beyond long duration ES, there will also be a need to store energy on a seasonal basis that can last weeks, even months. Using excess renewable generation, it may be possible to produce green hydrogen to provide seasonal energy storage for later use. As discussed in other sections of this LRP, green hydrogen has other beneficial uses, such as blending on the gas system. The ability for seasonal energy storage may become even more important with the impact of electrification of heating on winter peak load, as previously discussed in the Electrification of Heating section of this LRP.

Finally, as a result of FERC Orders 841 and 2222, wholesale markets continue to open providing more expected opportunities for energy storage to participate in these markets. This may have a variety of impacts on O&R: (1) there may be more privately-owned merchant storage seeking to interconnect with the Company's electric delivery system in order to participate in wholesale markets; (2) prices for distribution connected energy storage systems that provide grid services will come down as wholesale market opportunities provide alternative revenue streams that offset the cost of storage; and (3) more developers will seek to deploy and aggregate BTM C&I and residential storage systems for participation as virtual resources in the wholesale market. All of these developments will impact the manner in which the Company manages energy storage on its system.

Risks and Mitigation

- **Siting and Permitting.** Siting and permitting any energy project can take years. With a new technology like ES, which is not fully known to key local municipality decision makers, this could take even longer. This adds both time and cost to the development of projects.

To address this, the Company has developed targeted outreach to educate and inform municipalities and local decision makers on ES (e.g., technology, benefits, risks). For specific ES projects being considered, the Company actively reaches out to the targeted community leadership and decision makers to begin an early dialogue, providing details of the project, explaining the benefits to the community, and answering questions. This helps facilitate acceptance and improve the overall development process.

The Company is also actively working with the local AHJs, as they update their zoning laws to incorporate storage. It is important for the Company to be a trusted advisor to these AHJs and inform their zoning laws, as this may facilitate future ES development.

- **Safety.** If not properly mitigated, fire safety is a risk associated with lithium-ion battery storage. To mitigate this risk, the Company has worked with industry experts to develop and deploy mitigation measures, develop emergency response plans, and educate and engage with local officials and first responders. The Company has also incorporated these safety measures into its operating procedures to inform and keep its own team members safe.
- **Supply Chain.** The global nature of the ES supply chain has brought the advantage of accessing the best, most cost-effective technologies. However, as the COVID-19 pandemic has shown, this supply chain can be impacted by global events. The Company works to mitigate this by proactively engaging with its vendors and seeking alternative supply sources as needed.
- **Wholesale Markets.** Wholesale market development is key to ES assets future revenue earning potential. Currently the application of buyer side mitigation ("BSM") is a key barrier to the



entrance of storage into the capacity market. Most energy storage assets fail the two tests required to pass the BSM.

Since May 2020, ES is allowed to participate in wholesale markets and provide value to both the distribution utility and earn revenues in the wholesale market. The Company is still exploring the proper protocol and process to register the ES asset for wholesale market participation. The Company will continue to monitor the evolving and developing rules for participation.

As NYISO's DER participation rules in markets are implemented in 2020, solar paired with storage will be able to participate in the wholesale market. The NYSERDA retail incentive, along with the NYISO DER participation model, may accelerate the deployment of solar and storage throughout the Company's service territory.

The Company will continue to monitor developments and participate in working groups as the models and rules are defined and implemented. Once the wholesale market rules are released, the Company will assess how to best enable assets to participate in the markets.



Solar Photovoltaic (“PV”)

Introduction and Background

Infrastructure Requirements/Build-Out

New York’s CLCPA and New Jersey’s EMP⁹¹ reaffirmed the importance of large-scale renewables and DERs in meeting their respective clean energy goals. As discussed above in the Scenarios section of this LRP, New York and New Jersey have established ambitious emission-free generation targets.

New York currently has 2,150 MW of distributed solar and is expected to grow to 6,000 MW to meet the CLCPA’s mandate by 2025. Likewise, New Jersey’s EMP includes significant growth in solar deployments to meet 2050 goals. The current portfolio of approximately 3,000 MW of solar is expected to grow to 17,000 MW by 2035 and 32,000 MW by 2050. In order to meet these goals, the utilities must take an active role educating and enabling solar development and bringing these assets onto the energy delivery system.

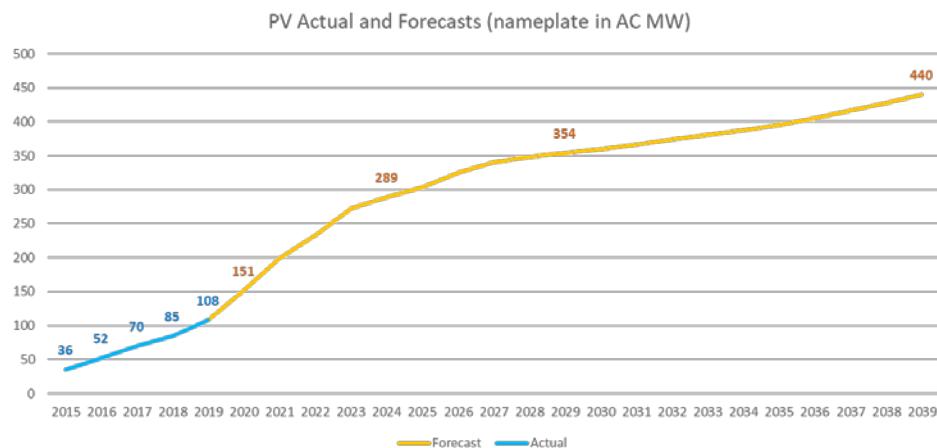
The Company is facilitating the deployment of renewables and DERs by:

- Developing and executing comprehensive education and outreach programs targeting both end-use customers and their communities. These programs explain the value and benefits of solar and how to get started pursuing a solar energy option.
- Actively engaging and working with the developer and contractor community to identify solar opportunities, helping with the siting and permitting process, and educating them on how to best work with the Company and to manage the interconnection process at both T&D.
- Having a robust, customer-centric interconnection process that will continue to be enhanced to accommodate new rules and the growing number of DERs/renewables coming onto the system.
- Working with various agencies and the Company’s utility peers to evaluate new technologies that will facilitate the integration of DERs onto the grid more effectively and support grid operations.

Through October 2020, the Company had interconnected a total of 9,323 solar PV installations in its service territory, interconnecting a total of 147.5 MWs. In addition, there were 835 projects currently proposed, totaling an additional 129.7 MWs of capacity, 106.21MWs of which are CDG projects.

Through October 2020, the Company has interconnected 26.3 MWs of PV installations and projects to have interconnected a total of 33.6 MWs by the end of 2020. The Company expects this increase in installations will continue, as more DER technologies are adopted within the Company’s service territory. In fact, the Company currently projects installed solar capacity to grow to 413 MWs by 2040 driven primarily by residential installations, an increase of more than 300% (annual growth rate of more than 13% between 2020 and 2040).

⁹¹ New Jersey’s Clean Energy Act (“CEA”) establishes renewable portfolio standard (35% from qualifying facilities by 2025; 50% by 2030). The EMP establishes goal of 100% clean energy by 2050. <https://www.nj.gov/dep/aqes/opea-clean-energy.html>

Figure 22: Company Solar PV Installations (Actual and Forecast): 2015 2039⁹²

Current Actions

The Company is focused on advocating for and facilitating the development of solar in its service territory. As these numbers grow, the Company will continue to improve and simplify the interconnection process to enhance the customer experience, reduce barriers, and facilitate greater penetration of DERs. With the expected increase of renewable development to meet CLCPA and EMP requirements, the Company also recognizes the importance of testing and implementing new technologies to help accelerate and enhance solar interconnections.

The Company focuses on three main areas of solar development: residential/small commercial, large commercial, and utility-scale.

- **Residential/Small Commercial Solar.** The objective of the residential/small commercial program is to increase access to solar energy for these end-use customers and efficiently bring solar energy onto the grid (rooftop, CDG, and aggregation).
- **Large Commercial.** The objective of the large-commercial program is to work closely with customers/developers to determine appropriate and safe configurations for both onsite and energy allocations for customers' accounts for remote net-crediting programs (which is similar to CDG but available to a greater number of large-commercial customers/subscribers).
- **Utility-Scale Solar.** The objective of utility-scale solar is to support the change in generation mix to enable achieving GHG emission targets and work with NYISO and PJM to integrate large-scale resources into the bulk power system. The Company is considering various ways to support renewable growth in its territory including the cost advantages of possible utility-ownership⁹³.

⁹² 2020 O&R System Peak Forecast (Slide 19/29) PV Long-Term Forecast

⁹³ Filings by CECONY and National Grid indicated utility-owned generation (UOG) benefits of up to 17% less costly than power purchase agreement structure. Case 15-E-0302 - Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard. June 6, 2016. Navigant investigation provided this analysis.



In addition to these areas, the Company also emphasizes supporting customers, suppliers, and developers' wants and needs:

- Individual end-users want ready access to clean energy, solar in particular. The Company provides customers with specific data and tools to help them make decisions.
- Suppliers/developers want to know where opportunities are located for development and have an easy, efficient process to connect their DER projects to the grid.

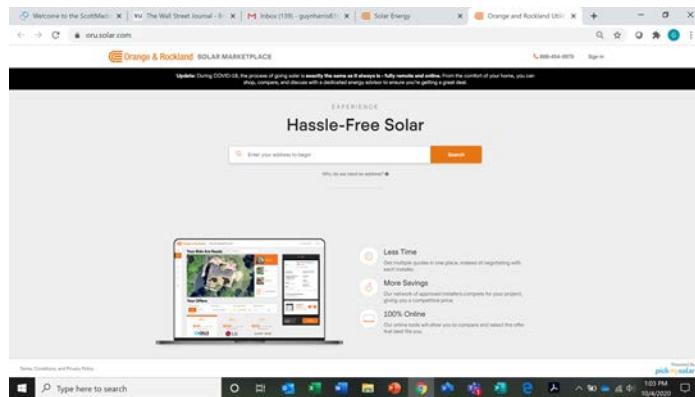
The Company also works with the state regulators to develop appropriate incentives for adoption and development, while also making sure the costs associated are fairly and equitably borne by those receiving the benefits.

Residential Solar

Rooftop Solar

The Company has developed a dedicated website to provide customers access to information on installing solar and storage, including their capabilities, benefits, and applicability to their needs. This site includes access to a solar and storage marketplace. the Company has partnered with **Pick My Solar**, giving customers access to *Pick My Solar*'s site and online tools. This site contains an interactive tool where customers' input information about their location, home, energy usage, and needs. This website then links them to qualified installers in New York and New Jersey and provides the customers with the ability to compare quotes from these installers. This 100% online tool provides an easy way for customers to have pre-screened, qualified installers compete for their business, helping them save time and money.

Figure 23: *Pick My Solar* site⁹⁴



⁹⁴ https://myorustore.com/content_solar_energy.html

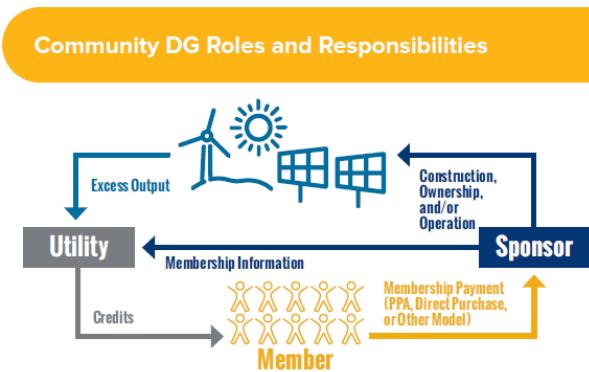
Figure 24: *Pick My Solar* Activity (2020)⁹⁵

Stage	Number
Pick My Solar account created	171
Consultation with Energy Advisor	140
Project bid received	75
Installer selected and contract signed	7
Installation completed; permission to operate	0
Site not suitable	8
Cancelled	11
On hold	54
Future opportunity	1

Community Distributed Generation

Approximately half of U.S. households and businesses are unable to install rooftop solar due to space, lack of sun exposure, or ownership limitations according to NREL. The costs of solar can also be a hurdle for many customers, even with the various incentives that exist. Other customers may want access to clean energy, but they simply do not want panels installed on their home.

CDG (also known as Community Solar) provides the opportunity for a broader group of customers to have access to solar energy without having to install and maintain a solar system onsite. CDG allows customers to buy into, or collectively invest in, a renewable project in their service territory and receive the benefits. This means that even if they do not have a suitable site for solar, they can participate in a community renewable project sited elsewhere as a subscriber. The utility will credit their share of the power produced to their monthly utility bill.

Figure 25: CDG Roles and Responsibilities⁹⁶

The Company plays a key role by providing the participating subscribers (identified as members in the figure above) with the proper bill credits.

In addition, the Company provides critical information to facilitate and advance the development of these projects.

- **Hosting Capacity.** Hosting capacity is the amount of DERs that can be accommodated without adversely impacting power quality or reliability under existing control configurations and

⁹⁵ Activity through October 2020

⁹⁶ Source: altenergystocks.com site; "Clearing up some confusion over Community Solar in New York"



without requiring infrastructure upgrades to the primary line and secondary network systems. Sharing hosting capacity data helps guide DER investments and third-party marketing activities. This information allows prospective interconnection customers to make more informed business decisions.

The Company's Hosting Capacity Map is an important tool for DER developers investigating potential project locations. The Company evaluates and integrates increasingly granular and complex data into its hosting capacity analysis. In October 2019, the Company started providing sub-circuit-level hosting capacity and incorporating existing DERs into the modeling. With such enhanced visibility, developers are better equipped to identify specific locations with higher levels of hosting capacity and potentially lower interconnection costs.

- **Beneficial Location of DERs.** As the owner and operator of the electric system, the Company recognizes the importance of proactively identifying locations where DERs can provide the greatest benefit to this system and its customers. By identifying these locations, the Company provides opportunities to DER developers and other third parties to deploy DER assets in areas that maximize their value and furthers the large-scale deployment required to meet the states' targets. By making these areas public, the Company is playing an important role in achieving these objectives.

There are also actions underway to move to new tariff structures for compensating DER owners.

- **Transitioning Away from Net Metering ("NEM").** In 2017, New York began to transition away from NEM for DERs and move toward the Value of Distributed Energy Resources ("VDER") tariff structure as a more equitable method of compensating DERs. This includes the value stack as a tariff methodology used to compensate energy produced by DERs. Compensation under the value stack is based on the actual benefits a resource provides to the electric grid. This is determined by a DER's energy value, capacity value, environmental value, demand reduction value, and locational system relief value. Currently, the value stack methodology applies to onsite non-residential projects larger than 750 kW AC and remote-metered projects including those using a CDG configuration. The value stack compensates energy producers with monetary credits. Customers receive compensation via a dollar credit on their electric bill.

The goals of the VDER tariff structure are to provide temporal and locational value for DERs and compensate them accordingly for providing this value.

The VDER tariff is being phased in over a period of time. The Company is working closely with NYPSC, the JU, and other stakeholders so that this transition is executed smoothly and delivers the objective of aligned compensation and costs for those benefitting from the CDG project.

- **Mass Market NEM Replacement.⁹⁷** As part of New York's transition away from NEM for DERs, the NYPSC began to explore options for mass market customers that gradually transitions to more cost-effective rates. After an extensive collaboration process with stakeholders, DPS staff issued a white paper.⁹⁸ In July 2020, the NYPSC approved the continuation of Phase One NEM with the addition of a customer benefit contribution charge for residential and commercial

⁹⁷ Case 15-e-0751, *In the Matter of the Value of Distributed Energy Resources*.

⁹⁸ Whitepaper dated 12/9/19 Staff Whitepaper on Rate Design for Mass Market Net Metering Successor Tariff.



projects less than 750 kW interconnecting after December 2021.⁹⁹ The customer benefit contribution charge is designed so that these customers continue to contribute to the cost recovery of public benefit programs, including low-income, energy efficiency, and clean energy fund programs.

New Jersey Community Solar Energy Pilot Program

New Jersey's Community Solar Energy Pilot Program, launched in 2019, is a key component of Governor Murphy's goal of achieving 100% clean energy by 2050. The pilot is designed for three years (2019–2021), with the objective of using the results of the pilot to develop a permanent program. The program reserves 40% of the program's capacity for LMI projects. All projects are approved by the NJBPU. Subscribers' energy credits are based on service class retail rate.

For 2019, the NJBPU approved approximately 78 MW of projects, exceeding the target of 75 MW, but none of the projects are located in RECO's service territory. All approved projects will serve LMI households. For 2020, almost 3 MW of the program's 150 MW target is allocated to RECO's service territory. The program application window is scheduled to close February 5, 2021. The Company will continue to work with all stakeholders to advance the pilot, assist with the development of the resulting permanent program, and facilitate the growth of solar deployments in its territory.

Interconnection Process Enhancements

The Company has focused significant effort developing robust, customer centric DER interconnection processes. This is critical to the successful adoption and growth of DERs in the Company's territory.

New York established the Standard Interconnection Requirement ("SIR"), a uniform interconnection standard for DERs up to 5 MW capacity. SIR provides technical guidelines for interconnection and application procedures. It covers the entire process, from the initial inquiry to final utility acceptance for interconnection and includes interconnection timelines, responsibility for interconnection costs, and procedures for dispute resolution. It also provides a standard contract and application forms. Utilities are required to maintain a web-based system for providing information on the status of interconnection requests to customers and contractors. SIR contains minimum content requirements for this information system and requires that utilities offer a web-based application process for systems of 25 kW or less.

New York's SIR has two separate sets of interconnection procedures and processes depending on the capacity of the proposed DERs. Systems up to 50 kW are eligible for a simplified or expedited six-step process. Systems up to 300 kW may be eligible for this provided their inverter meets certain UL 1741 standards. All other systems up to 5 MW follow the basic, 11-step process for interconnection.

New Jersey has three levels for its interconnection procedures depending on the capacity of the proposed DERs (all required to meet certification requirements of N.J.A.C. 14:8-5.3):

- Level 1: The facility has a generating capacity of 10 kW or less;
- Level 2: The facility has a generating capacity of 2 MWs or less; and
- Level 3: The facility does not qualify for either Level 1 or Level 2.

⁹⁹ Order Establishing Net Metering Successor Tariff (issued July 16, 2020).



Interconnection Online Application Portal (“IOAP”) and DER Interconnection Handbook (“DERIH”)

A critical component to delivering the Company’s interconnection process and delivering SIR requirements is the IOAP.¹⁰⁰ This tool, PowerClerk, provides customers/developers with a streamlined, automated application process. To meet its requirements for a smooth DER interconnection, the Company has incorporated New York’s SIR for DERs of up to 5 MW into PowerClerk. The Company has also reformatted and updated its process for DERs greater than 5 MW to resemble the SIR process more closely. PowerClerk provides ease of use for developers of multi-sized projects, helping to accelerate the deployment of all DERs. The Company uses this same tool and process for solar development interconnection in New Jersey.

The Company is also developing the DERIH, which is scheduled to be available by the end of 2020. This handbook lays out the details of the interconnection procedures to assist contractors and developers, further facilitating their work with the Company to interconnect DERs.

Energization

In addition to IOAP improvements, the Company continues to improve its DER energization process and identify opportunities to implement best practices. The energization process consists of five steps that outline the key tasks and internal responsibilities from application to energization.

In August 2019, the Company updated its energization process to include interim developer testing. Developers can now request the opportunity to test their equipment and momentarily generate electricity prior to the formal witness test. This additional step helps developers avoid delays caused by multiple witness tests.

New Technology

The Company is investigating new technologies to help accelerate and enhance the interconnection process and support DER development, including participating in multiple innovation projects focused on validating and implementing these new technologies.

Smart Inverters

Smart inverters surpass the basic functionality of traditional inverters and provide grid services such as voltage regulation and frequency support. This technology will allow more efficient integration of DERs onto the Company’s system and will enable the Company to tailor inverter settings to leverage the operational benefits of the DERs in its territory.

The Company’s participation in the JU’s Smart Inverter Working Group (“SIWG”) will lay the groundwork for the next stage of smart inverter facilitated DER implementation. The overall objective of SIWG is to frame the current state of industry progress in establishing smart inverter standards, functionalities, testing, and certification. SIWG also considers stakeholder impacts associated with a proposed roadmap for implementation in New York state. During the investigation stage, utilities outside New York state provided guidance to SIWG that steers the effort to focus on building a common understanding and framing the value proposition of smart inverters. One of the key deliverables of the SIWG will be a multi-phased plan for implementing smart inverter functionality throughout the state.

¹⁰⁰ The Company's IOAP aligns with both New York's SIR as well as New Jersey's standard: N.J.A.C 14:8-5.



In addition, the Company is collaborating with NYSERDA on two key projects helping to understand smart inverter functions and the manner in which smart inverters can best support grid operations.

- **Smart Inverter Settings Guidance for High-Performing Smart Grid Applications** project (PON 3770) will allow the Company to understand how smart inverters should react in various situations and highlight areas where additional research is needed to further the understanding of smart inverter use cases. This project, started in June of 2019, is currently expected to be completed in May 2021.
- **Smart Inverter Functionality and Integration into Distribution System Operations** project (PON 4128) is designed to evaluate and demonstrate the ability of smart inverters to support distribution system operations. This project is currently expected to be completed in 2022.

Through active participation in industry and technical groups (both national and state-level), the Company continues to identify innovation opportunities and gain insights on industry best practices. In addition to SIWG, these groups include EPRI, the JU Interconnection Policy Working Group (“IPWG”), the Interconnection Technical Working Group (“ITWG”), and the Institute of Electrical and Electronics Engineers (“IEEE”).

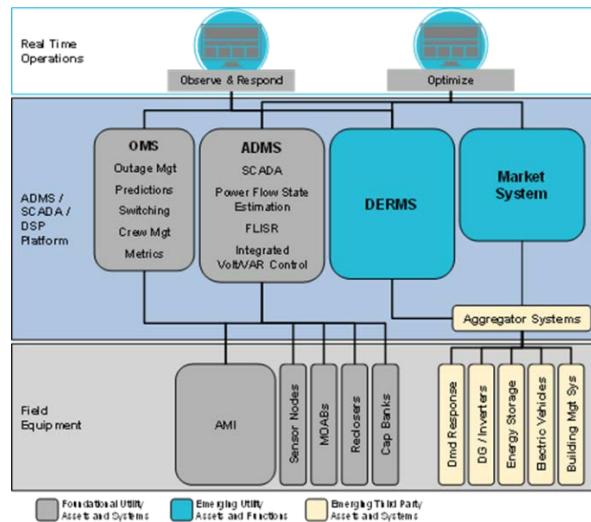
[Advanced Distribution Management System](#)

ADMS is a software and hardware platform that integrates distribution management and optimization tools and provides operators decision making support, making use of the increased volume of inputs from communicating distribution system devices. ADMS functionality includes outage management, power flow modeling, contingency analysis, alarm management, state estimation, and switching and tagging management. DERMS Comment

ADMS is a foundational tool for enabling future functionality in distribution operations. This system will provide the Company with a technology platform with a shared network model and a common user experience for all roles that are required to monitor, control, and optimize the secure operation of the electrical distribution network. The Company’s deployment of its ADMS began in 2019 and is expected to be completed in quarter one 2021. Please see the discussion on DERMS in Future Opportunities and Focus below.



Figure 26: Distributed System Platform (“DSP”) Enabling Technologies



Utility-Scale Solar

As of December 31, 2019, there was approximately 170 MW of operational renewable capacity in New York. While there are no large-scale solar deployments operational in New York, as of the end of 2019, there are 68 large-scale renewable projects under development, totaling more than 4,300 MW of new capacity, 54 of these being large-scale solar, totaling almost 2,800 MW (NYSERDA defines large-scale as any site with a capacity of > 5 MW).¹⁰¹

Figure 27: New York State Large-Scale Renewable Projects (as of end of 2109)¹⁰²

	MW Capacity by Status			Number of Projects		
	MW Operational	MW Under Development	Total MW	Operational	Under Development	Total Project
Biogas - ADG	1.24	0.00	1.24	1	0	1
Fuel Cell	2.37	0.00	2.37	2	0	2
Hydroelectric	9.61	2.18	11.79	6	1	7
Solar	0.00	2,786.58	2,786.58	0	54	54
Wind	156.10	1,552.38	1,708.48	2	13	15
Total	169.32	4,341.14	4,510.46	11	68	79

To encourage new large-scale renewable energy projects to meet the CLCPA’s requirements, NYSERDA will issue periodic solicitations to enter into long-term contracts with generators and developers of renewable energy projects. These NYSERDA contracts provide a secured source of revenue to move the projects through the development process. The addition of new large-scale

¹⁰¹ Source: NYSERDA website (https://www.nyserda.ny.gov/All_Programs/Programs/Clean_Energy_Standard/Renewable_Generators_and_Developers/RES_Tier_One_Eligibility/Solicitations_for_Long_term_Contracts)

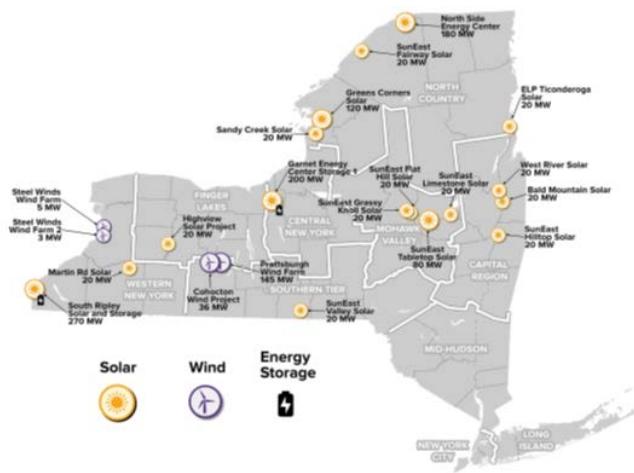
¹⁰² https://www.nyserda.ny.gov/All_Programs/Programs/Clean_Energy_Standard/Important_Orders_Reports_and_Filings/Filings_Orders_and_Reports. New York State Clean Energy Standard: Results of Renewable Energy Standard, Offshore Wind Standard, and Renewable Portfolio Standard Solicitations for Long-Term Contracts through December 31, 2019 (Final Report, March 2020)



renewable energy projects will be instrumental in meeting the state's 70% of electricity from renewables goal by 2030.

In 2019, NYSERDA¹⁰³ awarded \$1 billion for 21 new large-scale renewable energy projects from the 2019 Renewable Energy Standard solicitation. This is projected to spur more than \$2.5 billion of direct investment over the life of the projects. Expected to be operational by 2024, the awarded projects are located throughout New York and include 17 solar farms, two featuring ES, three wind farms repowering upgrades, and one new wind farm. Once operational, these projects will add more than 1,278 MW of new renewable capacity.

Figure 28: 2019 NYSERDA Renewable Energy Standard Solicitation Projects¹⁰⁴



While this current large-scale development is outside of the Company's service territory, meeting the requirements of CLCPA will require a geographically diverse deployment of renewable generation. This could lead to large-scale renewable deployment in the Company's service territory. The Company needs to be ready to efficiently integrate these assets into its system. It will also have an opportunity to learn from other New York utilities' experience where this development is currently occurring.

Figure 29: O&R Transmission Interconnection Status¹⁰⁵

	Pre-application	Feasibility Study	System Impact Study	Facilities Study	Other	Permission to Operate	Total
PV	40	55	20	20	20	0	155
ESS	50	287	0	100		0	437
Hybrid	0	0	0	0	0	0	0
PAR*	0	0	164	0	0	0	164
* Phase Angle Regulator							

¹⁰³ O&R is working with NYSERDA to assist in the vetting of projects to verify that they are viable prospects.

¹⁰⁴<https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard/Renewable-Generators-and-Developers/RES-Tier-One-Eligibility/Solicitations-for-Long-term-Contracts/2019-Solicitation-Resources>.

¹⁰⁵ As of 9/30/2020



NYISO Interconnection Processes

NYISO has robust, well-documented, FERC-approved interconnection processes and rules that are specifically designed for various types of interconnections. These are described in detail in four specific Open Access Transmission Tariffs ("OATT") attachments:

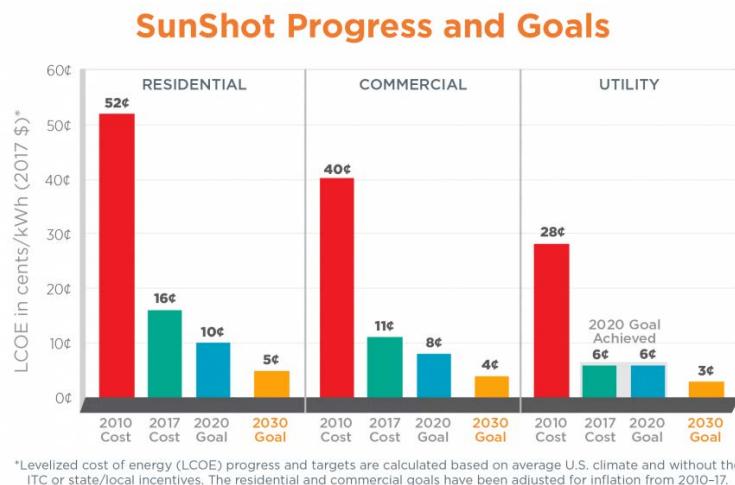
- OATT 22 Attachment P – Transmission Interconnection Procedures;
- OATT 25 Attachment S – Rules to Allocate Responsibility for the Cost of New Interconnection;
- OATT 30 Attachment X – Standard Large Facility Interconnection Procedures; and
- OATT 32 Attachment Z – Small Generator Interconnection Procedures.

Future Opportunities and Focus

The Company will use the results from its current activities and programs designed to support the growth of renewable generation/DERs within its service territory to shape its future actions. This will include developing enhancements to ongoing efforts and programs, as well as identifying new opportunities to improve its capabilities in the most effective way for the customer and the Company. The Company is also considering the experience of other utilities to identify new opportunities to consider for adoption.

Residential Solar

With the costs of solar PV forecasted to decline as the technology advances, the deployment of solar in the Company's territory is expected to grow (please see previous graph and numbers for current planned deployments).

Figure 30: Levelized Cost of energy for Solar PV¹⁰⁶

The Company will continue to refine and expand its current *Pick My Solar* offerings of solar and solar plus storage using qualified contractors. Looking at other utilities' offerings, the Company could also consider more active marketing and programs to incent solar adoption. Some options to consider may include:

- **PSE&G: Solar Loan Program (Alternative Project Financing).** PSE&G provides loans to qualified residential and commercial customers for PV solar energy systems that are repaid using standard renewable energy certificates ("SRECs"). The customer is not required to make any out-of-pocket payments, though they can decide to make cash payments if desired. PSE&G provides a minimum floor value for the SRECs to provide stability in pricing for the customer and allow for predictable economic returns on the project. The loan is sized according to the SREC floor price, interest rates, loan term, and expected generation of solar system over the loan term. The loan typically funds 35–65% of project costs, and PSE&G maintains a lien position on the solar system for the term of the loan.
- **Green Mountain Power ("GMP") (Vermont): Energy Bundle – Pilot Program (Product Bundle and Funding/Ownership Alternative).** GMP is piloting a ten-year whole-home energy transformation offering that provides energy independence and resiliency at one predictable, flat monthly price for the customer. GMP partners with solar companies to offer a solar and battery storage bundle. The bundle includes the financing of a solar PV system, two home batteries to provide whole home backup power, a set monthly purchase price for customer's solar power (currently at a rate of \$12.75 per DC kW), and a fixed monthly fee for grid energy guaranteed to increase by no more than 2% per year for 20 years. GMP is also offering an EV option which includes both financing and incentives. (Note: Currently Tesla is the only provider of the energy bundles.)

The monthly payments for the system will depend on the specific configuration required and the chosen payment option (e.g., term, down payment). The battery storage is provided by two Tesla Powerwalls. These are owned by GMP, with customers paying \$30 per month for ten years. GMP is responsible for warranty issues and maintenance of the battery system. Maintenance on the solar system is managed separately from the battery, as set in the

¹⁰⁶ Source: DOE website-SunShot 2030



agreements associated with the solar purchase and installation. The flat monthly payment for grid energy is set based upon historical consumption. GMP will review the payment amount at the end of each year and adjust to match the usage during the previous 12 months.

Monthly payments are shown in following chart based on system size and customer's usage (pre-solar installation)

Electricity Consumption Before Solar	PV System Size of 6kW	PV System Size of 8 kW	PV System Size of 12 kW
6,000 – 8,000 kWh per year	Solar*: \$76 Grid Energy: \$44 Powerwall: \$30 Total: \$150	Solar: \$102 Grid Energy: \$18 Powerwall: \$30 Total: \$150	Solar: \$153 Grid Energy: \$5 Powerwall: \$30 Total: \$188
8,000 – 10,000 kWh per year	Solar: \$76 Grid Energy: \$69 Powerwall: \$30 Total: \$175	Solar: \$102 Grid Energy: \$43 Powerwall: \$30 Total: \$175	Solar: \$153 Grid Energy: \$5 Powerwall: \$30 Total: \$188
10,000 – 12,000 kWh per year	Solar: \$76 Grid Energy: \$94 Powerwall: \$30 Total: \$200	Solar: \$102 Grid Energy: \$68 Powerwall: \$30 Total: \$200	Solar: \$153 Grid Energy: \$17 Powerwall: \$30 Total: \$200

**Solar payments are based on a 20-year loan at 4.99% APR that includes a 30% prepayment by month 18*

DER Compensation

O&R will continue to work with project developers, NYPSC, and other utilities as the transition to a post-NEM compensation model for DERs continues and the application of the VDER value stack is phased in for broader classes of customers.

The Company expects the evolution of a post-NEM compensation model for DERs, including solar PV, to continue to evolve as DER adoption grows and market access expands. In the near-term, the development of a post-NEM tariff for mass market customers will complete the transition of new DERs away from retail net metering in New York. In addition, the existing value stack methodology will likewise evolve to provide more accurate valuation of value stack components. External developments, such as the potential NYISO carbon-pricing scheme, may also require changes to the value stack to prevent overcompensation for some value stack components.

Long-term issues, such as DER participation in wholesale markets, will present alternate compensation models for DER owners other than through utility tariffs, even while interconnecting DERs and serving host load continue to be the responsibility of the utility. With the issuance of FERC 2222 and the upholding of FERC 841, the role of DERs in wholesale markets continues to be asserted at the federal level.

The impact of DERs on the Company will shape what role utilities play in distributed generation and how utilities and DSP are defined. Core functions, such as billing and account management for DER customers, are expected to remain a core capability of the Company. However, layered compensation mechanisms for different types of technologies and iterations of the value stack tariff places a significant demand on billing systems and processes. For instance, NEM customers, grandfathered for 20 years under VDERs, will continue to be served under the existing NEM tariff through 2037, while new customers will be required to take service under the value stack.

NJBPU will also be evaluating the compensation mechanism for DERs by looking at the various services that DERs provide. The Company will engage with NJBPU and stakeholders in this process,



sharing lessons learned in New York, while cognizant of its service territory and the bill impacts to all customers.

Interconnection Process

Recognizing the forecasted growth of DERs within its service territory, the Company will continue to improve and enhance its interconnection portal functionality and process.

SIR is expected to continue to change over time as the number of interconnection applications increases, further experience is gained, and utility and developer needs evolve. Potential modifications to SIR will continue to be vetted in the ITWG and IPWG forums. In addition, the Company will work with NJBPU, other energy delivery companies, and stakeholders to update and enhance interconnection processes. As these changes are incorporated, interconnecting customers can expect benefits, such as faster application turnaround times and reduced interconnection costs.

As the integration of DERs increases, the Company foresees a need to develop a comprehensive power quality program. Increased levels of DERs may result in various power quality challenges. Because each distribution system has its own distinct characteristics, the Company expects that a power quality subject matter expert (“SME”) will be a key resource needed to develop an overall program. The program would incorporate the latest power quality analysis tools, as well as integrate various departments involved with power quality.

New Technology

Smart Inverters

The immediate future focus will be informed by the outcomes of the various studies and projects in which the Company is currently engaged. The outcomes and lessons learned from the various projects focused on smart inverters and the eventual deployment of these on the system will enable the advanced functionality provided by smart inverters for interconnected DERs to deliver enhanced integration of DERs and improve overall system operations.

As with its efforts with smart inverters, the Company will continue to engage in similar projects. Working with technology developers, NYSERDA, Department of Energy (“DOE”), and other partners, the Company will continue to identify, test, and assess new innovations and systems to deliver better service to customers, better integrate DERs onto the system, and enhance the overall operations of its grid.

Distributed Energy Resource Management System (“DERMS”)

In order to obtain optimal benefits from the ADMS deployment and provide this platform with real-time situational data from DERs, a DERMS application will be required. This will allow the Company to realize the full potential of the DERs that are currently being deployed and planned throughout the service territory. The purpose of DERMS is to manage diverse DERs, to understand the unique status and capabilities of each, and present these capabilities to other supporting applications to facilitate enhanced monitoring and control of the T&D system. DERMS will provide visibility and control of a diverse portfolio of resources to address local constraints, while flexibly addressing system-wide concerns. The system will visualize, predict, and optimize demand response and distributed generation at the circuit, feeder, or segment level, presented in a dashboard suitable for operational use.



The Company will use the results of the various smart inverter projects being completed in conjunction with NYSERDA to lay the groundwork for its DERMS implementation. The Company plans to begin the DERMS implementation in early 2023.

Utility-Scale Solar

New York “Accelerated Renewable Energy Growth and Community Benefit Act”

Recognizing that achieving the CLCPA’s targets requires large-scale renewables development and associated electric transmission and distribution infrastructure, Governor Cuomo signed into law the Benefit Act on April 3, 2020. Among other things, the Benefit Act directs the NYPSC to develop and implement plans for future investments in the electric grid. The NYPSC on May 14, 2020, issued its Order on Transmission Planning Pursuant to the Benefit Act to begin the implementation of this plan. This will have significant impact on the Company, NYISO, and renewable development, as the state works to prepare the electric grid to accommodate the anticipated renewable deployment. More details on the Benefit Act and NYPSC order are located below in the Integrated System Planning section of this LRP.

Bulk or Large-Scale Storage

Adding ES to solar significantly improves the overall value of these projects. As shown in the NYSERDA map above, 2 of the 17 solar projects in development include storage. As the reliance on renewable generation grows, it is likely that the number of solar plus ES projects will increase.

As an example of this, California’s 2019 Integrated Resource Plan foresees just more than 11 GWs of solar power generation capacity and at least 11 GW—with a possibility of up to 19 GW—of ES necessary to meet resource adequacy as part of the state’s legally required 60% renewable portfolio standard by 2030. This plan suggests that solar and ES will “dominate” through 2030 and beyond. There are a number of large-scale solar plus storage projects announced and under development.

The Eland Solar and Storage Center is one example. It combines 400 MW of solar and a 300 MW storage facility, making this one of the largest projects of its kind in the world. Announced in 2019, the project is expected to begin operation some time in 2022 and reach full operation in 2023. The power will be provided to Los Angeles Department of Water and Power (“LADWP”) under a long-term power purchase agreement (“PPA”) at a fixed cost of less than two cents per kWh for the solar power, a record low-cost for this type of facility.

Risks and Mitigation

The Company has identified potential risks to the development of DERs and other renewables needed to support the achievement of the clean energy future. While some are outside its direct ability to control, the Company has identified actions as well as key stakeholders to help mitigate and minimize these risks, as discussed below.

Tax Credits and Incentives Expiring

Some of the success of solar development to date has been driven by the availability of customer incentives and tax credits. These were designed to help bridge the cost differential between solar and conventional energy sources. As the price for solar drops, the need for these incentives will decline. However, the customer may continue to expect this given prior practice. As these incentives expire (e.g., federal tax credit for residential solar is set to expire end of 2021), there may be a decrease in new installations. While there are multiple state-level programs still in existence, even some of these



are expiring in 2021. The Company may also consider some innovative financing opportunities as certain other utilities have put in place to help.

Figure 31: Available Solar Incentives¹⁰⁷

New York State

Incentive	Value
Federal Solar Investment Tax Credit (ITC)	26% of the final cost of the home solar system in 2020. It drops to 22% in 2021 and ends in 2022.
New York State Solar Energy System Equipment Credit	25% of the final cost of the home solar system (Up to \$5,000)
NY-Sun Megawatt (MW) Block Program	Eligible homeowners can receive up to \$1,000 for every kilowatt (kW) of solar power installed.
Solar Electric Generating System Tax Abatement (SEGS)	Property tax exemption on the added home value from the home solar system.
Sales Tax Exemption	4% home solar system state sales tax exemption.

New Jersey

Incentive	Value
Federal Solar Investment Tax Credit (ITC)	26% of the final cost of the home solar system in 2020. It drops to 22% in 2021 and ends in 2022.
New Jersey Solar Renewable Energy Credits (SREC)	Varies depending on market value. Homeowners earn SRECs for the first 10 years of owning your system. An SREC in New Jersey is worth approximately \$200, with the average household earning around six SRECs per year. Ten year value of \$12,000
Sales Tax Exemption	6.6% home solar system state sales tax exemption.

Note: New Jersey's SREC program is closed to new applicants. A transition program ("TREC") is now in existence with a fixed amount. The state is currently developing the successor program.

Interconnection Process and DER Activity

With the increase of DERs connecting to the Company's distribution system, it is even more important that the Company's interconnection process is accurate, consistent, and efficient. This becomes more challenging as the volume and complexity of projects increase, and the ability to connect DERs quickly, safely, and reliably relies on the Company's processes and ability to identify and implement technology alternatives. Any significant process gaps and/or limitations in available technology could impact the Company's ability to integrate larger volumes of increasingly complex DERs in a timely manner.

The Company is mitigating these risks by continuously identifying opportunities for process improvements and working with NYSERDA, DOE, EPRI, and other utilities to assess new technologies.

Grid Operations

As the penetration of DERs increases across the Company's service territory, the requirements, opportunities, impacts, and challenges generated by DERs continue to expand. There will be an increased and ongoing need for situational awareness and control, which will require systems and

¹⁰⁷ Sunrun website (<https://www.sunrun.com/solar-lease/cost-of-solar/state-rebates>)



applications to acquire data and produce actionable information in a near real-time environment. Establishing the appropriate level of visibility, monitoring, and control is critical to realizing optimization of the grid and gaining the highest value from interconnected DERs.

Further, near real-time monitoring of DERs will be essential for the Company to understand DER performance and capabilities on the system. As the amount of information gathered grows, the need for a system that will aggregate, analyze, validate, and display the data to the operator will become a necessity. Information will have to move among systems on a common information model as it becomes increasingly integrated with data sources, historical measurements, and advanced applications.

The Company's current ADMS and planned DERMS deployments will enhance the ability to optimize and manage DERs deployed on the system. In addition, the Company will train team members and design operating processes to obtain the optimal benefits from these new systems and deployed DERs.

New York Transmission Planning and Development Timing

The outcome of the ongoing transmission planning efforts to meet the requirements of the Benefit Act are still not known. While the objective is to enhance the integration of DERs, large renewables and the system, the specifics and impact such integration may have on the Company are in development. The Company will provide input as required and work closely with the DPS Staff and other New York utilities.

Even with a new redesigned process, the time to develop new or upgrade existing transmission infrastructure can take many years. As seen in some of the examples above (NYSERDA 2019 awarded projects), the time to develop large-scale renewables from concept to operation is three to five years. This could result in a scenario where the renewables to meet CLCPA are operational, but the transmission infrastructure to deliver energy from such renewables is not operational. The Company believes that this risk will be effectively mitigated by the CLCPA Transmission Planning Study output, current efforts underway to expedite approvals under the NY DPS Law Article VII process,¹⁰⁸ and internal Company planning improvement efforts. It should be noted that most transmission projects are completed in the five-year range.

¹⁰⁸ *The Certification Review Process for Major Electric and Fuel Gas Transmission Facilities;*
<http://www.dps.ny.gov/articlevii.htm>



Integrated System Planning

Introduction

The CLCPA outlines aggressive targets for electrification and the integration of renewables. These targets will have significant implications for the manner in which the Company plans its T&D system.

As electrification of transportation and heating sectors increases in New York and New Jersey, and other DERs are integrated into the system, electric system loads will change, with peaks loads potentially emerging at different times of the day or year. Forecasts of these resources will be critical to guiding the Company's infrastructure investment in its T&D system both for ongoing reliability and to increase the flexibility needed to respond to these changing dynamics on the grid.

Increasing penetration of renewables at the T&D levels will also have a significant impact on the manner in which the Company plans these systems. The work to date on planning related to the DSP aligns with these goals but has focused primarily on the distribution system and facilitating interconnection of DERs. However, at the transmission level, there is work to be done to both plan and build a transmission system that can accommodate large projected amounts of onshore wind, solar, and offshore wind, while reducing reliance on fossil fuels as either baseload or balancing resources.

In order to begin to address this challenge, New York state and the NYPSC have taken a number of actions as discussed below.¹⁰⁹

Accelerated Renewable Growth and Community Benefit Act (New York State)

In April 2020, recognizing the importance of timely system upgrade actions to meet the CLCPA's goals, New York state passed the Benefit Act (previously mentioned in the Introduction and Solar PV sections of this LRP). The Benefit Act has three primary components:

- Office of Renewable Energy Permitting – a new, dedicated office and streamlined process for siting renewable energy projects greater than 25 MW;
- Clean Energy Resources Development and Incentives Program – a program to identify “build ready” sites that are good candidates for renewable energy projects; and
- Transmission Investment Program – a program to accelerate the development of necessary T&D upgrades.

The Transmission Investment Program provision of the Benefit Act directs the DPS Staff to undertake the following activities related to T&D planning:

- Conduct a comprehensive power grid study to identify cost-effective distribution and local and bulk electric system upgrades that will facilitate reaching the goals of CLCPA (referred to as “Power Grid Study”, to be completed by December 31, 2020);
- Direct the establishment of a distribution and local transmission system capital program based on the results of the Power Grid Study, with associated milestones and reviews, for each utility

¹⁰⁹ As of the date of this plan, New Jersey has not yet launched special initiatives. The Company does use the same/similar methodologies/design standards as both New York and New Jersey.



service territory where local upgrades are deemed necessary; The transmission plan will be submitted to NYISO to be incorporated into its studies and plans; and

- Establish an accelerated transmission investment program to speed development of transmission through existing processes and will authorize NYPA to build these lines by itself or in partnership with others.

In addition, the NYPSC was directed to establish a nine-month expedited process for considering transmission upgrades constructed within existing rights of way or would not result in any significant adverse environmental impacts.

As mentioned in the Introduction and Solar PV sections of this LRP, on May 14, 2020, the NYPSC, issued its ***Order on Transmission Planning Pursuant to the Accelerated Renewable Growth and Community Benefit Act*** (“Transmission Planning Order”),¹¹⁰ to begin implementation of the Transmission Investment Program. The Transmission Planning Order provides the details of two NYPSC proceedings required by the Benefit Act.

- The first proceeding will focus on establishing “a distribution and local transmission capital plan” for each utility (filed on November 2, 2020¹¹¹). These utility plans will describe and prioritize the local T&D upgrades that the Commission determines are “necessary or appropriate” to meet CLCPA targets. The Benefit Act provides that these upgrades will be implemented according to existing procedures under the Public Service Law.
- The second proceeding relates to the bulk transmission system and requires a state-wide plan to identify and implement transmission-level investments that are “necessary or appropriate” to meet CLCPA targets. The Benefit Act specifies two different approaches to project implementation. Transmission investments that the Commission determines need to be “completed expeditiously” are referred to NYPA for development and construction. Other projects are to be selected for implementation through NYISO’s public policy planning process. This plan is expected to be developed in early 2021.

O&R Planning

Integrated system planning plays a critical role in advancing O&R’s role as the DSP provider. The objective of the integrated planning process is to identify current and future operating risks and determine potential solutions that maintain a safe and reliable electric delivery system, while advancing the states’ goals. The Company continues to refine its approach to integrated planning, including prioritization of deferral, or even replacement, of major capital infrastructure investments with less costly traditional infrastructure investments, as well as alternative solutions, such as distributed generation (“DG”), ES, EE, and DR. In situations where a large capital project cannot be deferred, the Company considers multi-value transmission, substation, and distribution (“TS&D”) investments that can address system needs, improve reliability and safety, replace obsolete equipment, improve DER hosting capacity, integrate renewables, and provide the future capacity needed to support beneficial electrification.

¹¹⁰ The Transmission Planning Order states: “For purposes of this discussion, we understand 'local transmission to refer to transmission line(s) and substation(s) that generally serve local load, and transmission lines which transfer power to other service territories and operate at less than 200 kV. However, as the Utilities consider the issues outlined in this order, we recognize that an alternative definition may emerge.”

¹¹¹ Utility Transmission and Distribution Investment Working Group Report, November 2, 2020. Case 20-E-0197



The Transmission Planning Order directs the utilities to implement a transparent planning process to support the achievement of the CLCPA's clean energy goals. This combined with the Benefit Act will shape how system planning will need to be conducted to support CLCPA. As the results of the various studies and initiatives to support the Benefit Act and the Transmission Planning Order are released, O&R will further modify its Electric System Planning/Design Standards to account for the CLCPA's benefits, as well as prioritize high-value projects that promote attainment of the CLCPA's goals. More details on the Company's activity are discussed below in the Future Opportunities-Planning for Large-Scale Renewables section of this LRP.

Current Activities

Planning for Increased DERs

The Company's Planning Process

Each year, the Company completes a detailed weather adjusted forecast and a contingency analysis of the entire T&D system. This includes both a ten-year weather normalized coincident peak and independent peak forecast for each distribution bank and circuit. In addition to load data, the forecast contains detailed information for several key load modifiers (*e.g.*, EE, solar PV, ES). The Company then conducts a thorough assessment of each asset by applying T&D design standards and risk-assessment methodologies to the results for each year of the forecast period. This process involves looking at both normal and contingency conditions to identify potential operating risks and corrective solutions. Once the Company identifies a deficiency, a planning charter is developed to begin documenting the identified deficiency, relevant decisions made, proposed solutions, and any corrective measures taken.

Figure 32: Planning Process

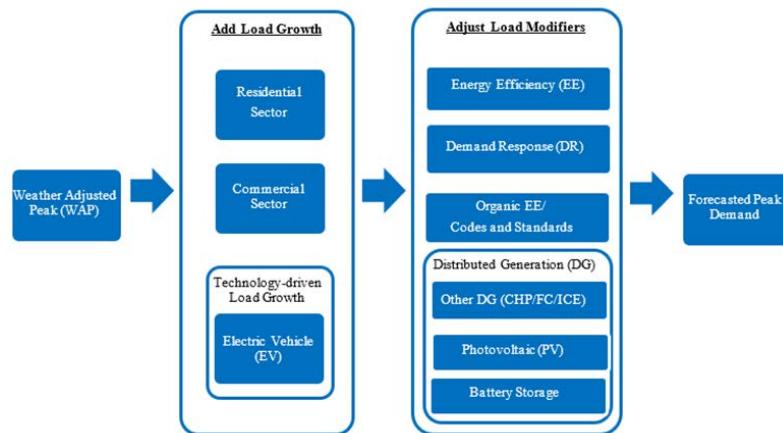
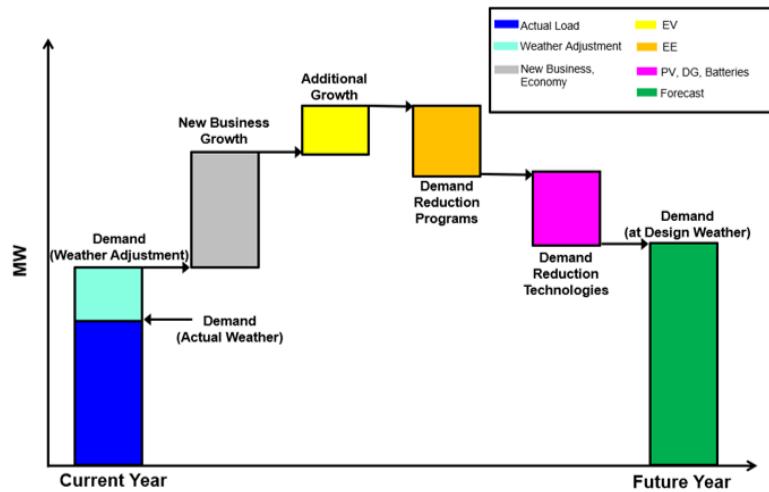




Figure 33: Example of Peak Demand Development



The next step in the process is to identify all potential traditional solutions that can defer or solve a system need. The Company considers the qualitative and quantitative aspects for each solution, as well as cost effectiveness. Once a traditional project is identified, the Company investigates whether the capital investment can be substantially deferred, reprioritized, or eliminated through an NWA using DERs, EE, DSM, or ES. If the NWA does not pass the Company's suitability criteria, the Company proceeds with the traditional solution based on the timing determined in the contingency analysis.

Once a set of projects has been selected, the Company employs a two-step process for prioritizing major substation projects in its overall electric capital investment plan. The first step is a prioritization conducted by the Electrical Engineering organization within the planning process. The second step is prioritization against other Company projects through a corporate-wide optimization process and methodology.

The Company continues to refine the integrated planning process. One innovative approach being considered is the combination of smaller traditional infrastructure improvements combined with DERs to defer or eliminate large capital investment. This hybrid approach is currently being evaluated as another alternative to traditional investment in areas where standalone NWAs are not viable. If successful, this approach will be incorporated into the planning process and give planners another tool that can be effectively used to meet the needs of the system as well as support clean energy targets.

In certain cases, traditional infrastructure cannot be avoided due to reliability, safety, or equipment obsolescence. In these instances, the Company considers alternate designs that can also increase local hosting capacity, provide for onsite ES, and build in additional capacity where appropriate to support the future goals of the clean energy future. Ultimately, the new designs will improve distribution reliability, improve bank/circuit hosting capacity, reduce developer interconnection costs, improve station load factor, reduce peak demand, and further support the clean energy goals.

The most recently completed annual cycle of the integrated planning process in 2019 yielded impactful results for the identification of new NWA opportunities. The Company identified three new potential NWA opportunities in advance of the need, providing more time for developers to develop and propose solutions, and give the Company additional time to evaluate and implement potential solutions.



The Company is continuing its commitment to support the growth of DERs and implementing solutions that support clean energy goals. For future load-growth based system expansion projects, the Company expects to be able to implement non-traditional and alternative solutions far enough in advance to mitigate associated operating risk prior to critical need timeframes, while preserving adequate timing for potential traditional infrastructure solution commitment dates. The Company's system plan will include multi-value projects that will meet clean energy goals and targets and will enable utility-scale distributed energy resources and storage interconnections, unbottle capacity-limited facilities, and facilitate the upgrade of aging and obsolete infrastructure.

Forecasting

CECONY's Electric Forecasting Services Group,¹¹² operating as a shared services organization for both O&R and CECONY, develops the annual System Peak Forecast based on summer month peak-load data. In addition, O&R produces both independent and coincident peak weather-normalized forecasts for each substation, bank, and circuit using a top-down and bottom-up methodology. This includes forecasts for two-, five-, and ten-year periods, incorporating impacts of DERs, EVs, and DSM programs. The ability to track and report the contribution of each load modifier provides engineers and operators with a better understanding of the impact of DERs and other modifiers individually. Such ability is the starting point for future sensitivity analysis for various modifier effects and DER adoption.

Planning for Large-Scale Renewables

The Company will need to consider both the possible changes to planning driven by the NYPSC Transmission Planning Order and NYISO's planning requirements, as more large-scale renewables are deployed in support of the CLCPA.

Order on Transmission Planning: Distribution and Local Transmission Planning Study

To develop actionable local system upgrades through the power grid study, the utilities were directed to identify distribution and local transmission upgrades needed to achieve the CLCPA's objectives. The Technical Analysis Group undertook this study,¹¹³ which is intended to:

- Evaluate the local T&D system of the individual service territories to understand where capacity "headroom" is on the existing system;
- Identify existing constraints or bottlenecks that limit energy deliverability;
- Consider synergies with traditional capital expenditure projects (example synergy drivers could be aging infrastructure, reliability, resilience, market efficiency, and operational flexibility);
- Identify least cost upgrade projects to increase the capacity of the existing system;
- Identify potential new or emerging solutions that can accompany or complement traditional upgrades;
- Identify potential new projects which would increase capacity on the local T&D system to allow for the interconnection of new renewable generation resources; and

¹¹² CECONY only does the system-level forecast. The O&R Planning Group does the remainder (e.g., banks, circuits).

¹¹³ Study filed November 2, 2020.



- Identify the possibility of fossil generation retirements and the impacts and potential availability of those interconnection points.

As part of this study, the Company identified six Phase 1¹¹⁴ transmission system projects and nine Phase 1 distribution system projects. Details of these projects are in the filing.¹¹⁵

NYISO Comprehensive System Planning Process (“CSPP”)

NYISO executes its CSPP to prepare for the expected changes in supply and demand of power on the reliable operations of the New York transmission system over a ten-year period. The CSPP was approved by the FERC and is comprised of four components:

- Local Transmission Planning Process (“LTPP”);
- Reliability Planning Process (“RPP”);
- Congestion Assessment and Resource Integration Study (“CARIS”); and
- Public Policy Transmission Planning Process (“Public Policy Process”).

Under the LTPP, the local transmission owners (“TOs”) perform transmission studies for their transmission areas according to all applicable criteria. This includes identification and evaluation of solutions to local transmission needs driven by Public Policy Requirements.

The RPP is a biennial process approved by FERC and revised to conform to FERC Order No. 1000. It consists of two studies:

- **Reliability Needs Assessment (“RNA”).** NYISO performs a biennial study in which it evaluates the resource and transmission adequacy and transmission system security of the New York Bulk Power Transmission Facilities (“BPTF”) over a ten-year study period.
- **Comprehensive Reliability Plan (“CRP”).** After the RNA is complete, NYISO requests the submission of market-based solutions to satisfy the reliability need. NYISO also identifies a responsible TO(s), requests that the TO submit a regulated backstop solution, and that any interested entities submit alternative regulated solutions to address the identified reliability needs. NYISO evaluates the viability and sufficiency of the proposed solutions to satisfy the identified reliability needs and evaluates and selects the more efficient or cost-effective transmission solution to the identified need. In the event that market-based solutions do not materialize to meet the need in a timely manner, NYISO triggers regulated solution(s) to satisfy the need.

During the economic planning process, NYISO performs the CARIS. CARIS utilizes the results from the viability and sufficiency assessment portion of the CRP process. CARIS Phase 1 examines congestion on the New York bulk power system and the costs and benefits of generic alternatives to

¹¹⁴ Phase 1 projects are immediately actionable projects that satisfy reliability, safety, and compliance purposes but that can also address bottlenecks or constraints that limit renewable energy delivery within a utility’s system. These projects may be in addition to projects that have been approved as part of the utility’s most recent rate plan or are in the utility’s current capital pipeline. Phase 1 projects will be financially supported by the customers of the utility proposing the project.

¹¹⁵ Utility Transmission and Distribution Investment Working Group Report, November 2, 2020. Pages 228 – 250. Case 20-E-0197

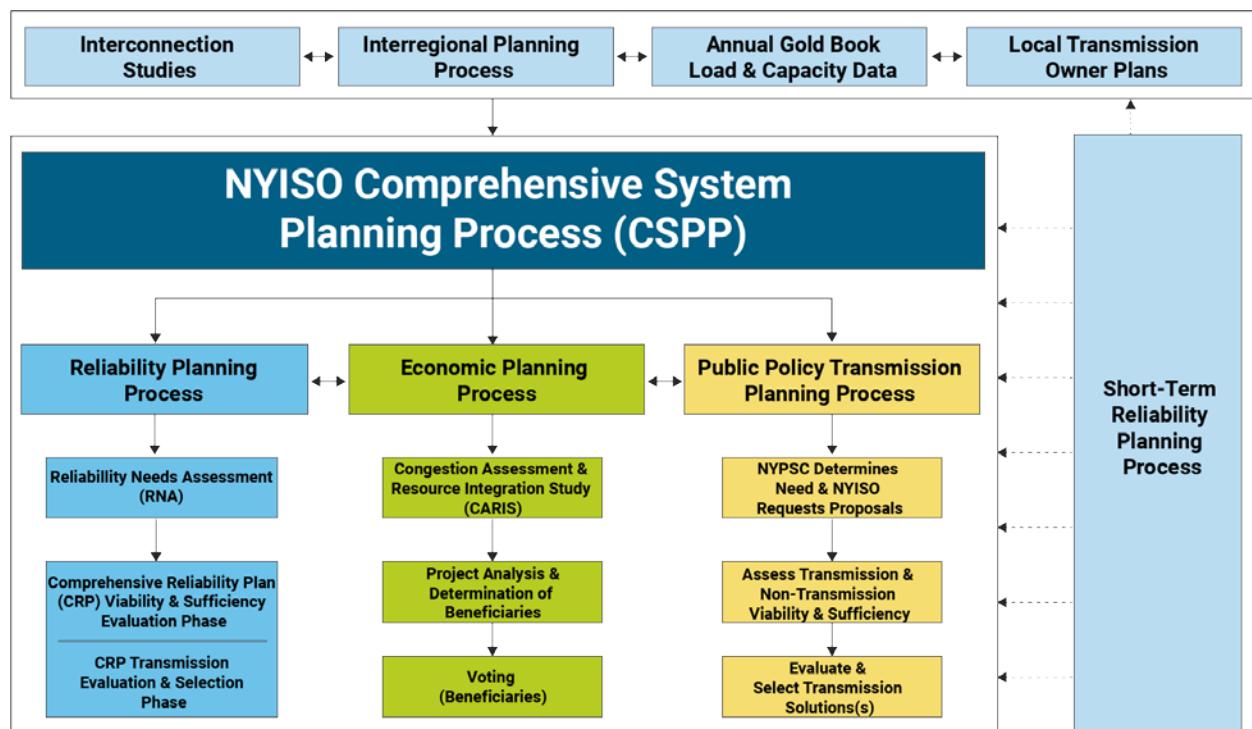


alleviate that congestion. During CARIS Phase 2, NYISO evaluates specific transmission project proposals for regulated cost recovery.

Under the Public Policy Process, interested entities propose and NYPSC identifies transmission needs driven by public policy requirements. NYISO then requests that interested entities submit proposed solutions to a public policy transmission need, which is “[a] transmission need identified by the NYPSC that is driven by a public policy requirement . . .” (Source: OATT § 31.1.). NYISO evaluates the viability and sufficiency of the proposed solutions to satisfy each identified public policy transmission need and may select the more efficient or cost-effective transmission solution to each identified need.

NYISO also administers a short-term reliability process (“STRP”), providing NYISO and stakeholders the means to conduct scheduled, orderly reliability assessments that evaluate changes impactful to the reliability of the BPTF in the short-term. This includes BPTF and non-BPTF impacts from initiating generators that have completed their generator deactivation notice (“GDN”), all under one process.

Figure 34: NYISO’s CSPP



Key NYISO Public Policy Projects

As the transmission system needs to meet the CLCPA are identified, the application of the Public Policy Transmission Planning Process will increase given the public policy nature of the CLCPA. Two recent examples of NYISO using this process and FERC Order No. 1000 provisions are set forth below.

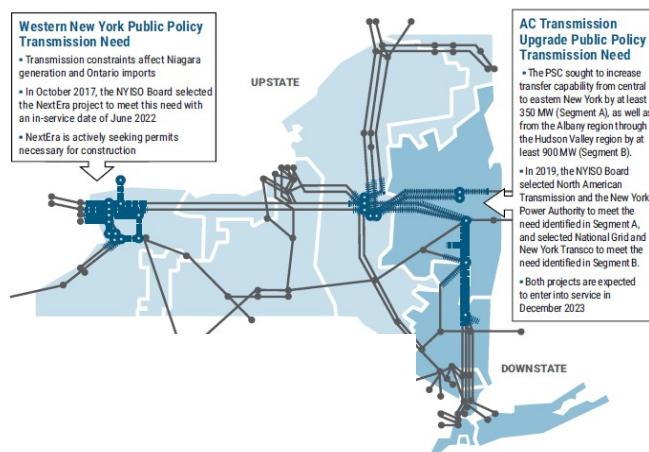
- **Western New York Public Policy Transmission Need.** This was the first project approved under NYISO’s Public Policy Transmission Planning Process. In response to a July 2015 order from the NYPSC, the project will ease grid congestion in western New York and enable the delivery of 2,700 MW from the NYPA’s Robert Moses Niagara hydro facility as well as 1,000 MW of power imports from



Ontario. In October 2017, NYISO's board selected NextEra Energy Transmission's New York's Empire State Line proposal. The project's scheduled in-service date is June 2022.

- **AC Transmission Public Policy Need.** This is another project using NYISO's Public Policy Transmission Planning Process. NYPSC identified the need to expand the state's AC transmission capability to deliver additional power from generating facilities located in upstate New York, including important renewable resources, to the population centers located downstate. To provide additional capability to move power from upstate to downstate, NYPSC identified the Public Policy Transmission Needs to increase transfer capability from central to eastern New York by at least 350 MW ("Segment A") and from the Albany region through the Hudson Valley region by at least 900 MW ("Segment B"). In 2019, NYISO's board selected the joint proposal by North America Transmission ("NAT") and NYPA for Segment A and the joint proposal of National Grid and Transco for Segment B. Both projects are scheduled to enter service in December 2023.

Figure 35: New York State Public Transmission Needs¹¹⁶



NYISO Interconnection Processes

NYISO has a robust, well-documented, FERC-approved interconnection processes and rules that are specifically designed for various types of interconnections. These are described in detail in four specific OATT attachments:

- OATT 22 Attachment P – Transmission Interconnection Procedures;
- OATT 25 Attachment S – Rules to Allocate Responsibility for the Cost of New Interconnection;
- OATT 30 Attachment X – Standard Large Facility Interconnection Procedures; and
- OATT 32 Attachment Z – Small Generator Interconnection Procedures.

The Company performs studies and develops its long-range transmission plan (*i.e.*, ten-year study). The results of these long-range studies are the Company's local transmission plans ("LTP"), which

¹¹⁶ Report by ScottMadden for WIRES. *Informing the Transmission Discussion: A Look at Renewables Integration and Resilience Issues for Power Transmission in Selected Regions of the United States*, January 2020



include system reinforcements and improvements on its transmission system (*i.e.*, 138 kVs and below). Furthermore, O&R presents its LTPs at NYISO's stakeholder meetings every two years.

Future Opportunities

Planning for Increased DERs

The Company will continue to advance its integrated planning and forecasting methodologies. This includes building on best practices with CECONY, the JUs, industry experts, and developers. This approach will lead to the identification and development of key process improvements necessary to facilitate probabilistic planning and further enhance the ability to deliver on time the required infrastructure to support the clean energy future. As these improvements are implemented, the Company will update design standards to include the most advanced methods to support the safe and reliable operation of the distribution system, as well as the widespread integration/adoption of DERs and NWA technology.

The Company is developing the capabilities to determine sensitivities for load modifier growth levels that will advise scenarios to be used in the Company's planning processes, ultimately enabling scenario and probabilistic planning. With the inputs from probabilistic planning, the Company can have a more defined window of opportunity for the identification of potential NWA projects that might alleviate the constraints and allow for a committable date range in which a traditional solution might be required. The Company anticipates that this approach will bring more renewable resources on to the grid and support GHG emission reductions, ready infrastructure to accommodate more DERs, and increase the amount of ES and solar capacity on the grid.

The key to this data is accessing it, monitoring it, maintaining it, and analyzing it. Enhancing capabilities to monitor field-level data is a priority for the Company. As part of the ADMS project, interval data from various field devices (smart devices, reclosers, power quality ["PQ"] meters) will be stored in the Company's data historian. The Company's AMI program rollout, completed in late-2020, provides interval meter data and customer voltage. This additional data granularity will support improvements in the forecasting methodology.

As the Company implements solutions to increase access to data, the Company will adjust the forecasting approach to include all appropriate available data. The Company has also started to consider the growth and system impact scenarios attendant to clean energy future initiatives, including growing EV adoption, heating electrification, focused EE and DR programs, and penetration of large-scale DERs that will likely have T&D system impacts and require system upgrades. These studies will be updated and refined on an annual basis to identify appropriate system investment that will support clean energy goals.

As the clean energy initiatives advance, the need will increase for an integrated model that can analyze the TS&D levels as one cohesive system. As DER density increases on the distribution system, the Company must be able to evaluate the impact to the T&D systems, so that upstream systems continue to operate safely, reliably, and within design limits/standards. The Company is currently evaluating whether this functionality can be incorporated into its existing engineering analysis model software and is exploring other software platforms that can provide this type of integrated analysis.

The Company expects load profiles will change at the TS&D circuit level with the adoption of new technologies and the impacts of initiatives enabling the clean energy future. In the short-term, the annual forecast and contingency analysis will continue to focus on the summer period. Medium and longer-term, shoulder periods will need to be evaluated more closely, as DER penetration increases and



winter peak demand forecasts will be required to ensure that all parts of the electric delivery system continue to operate within design standards at all times of the year. As such, the company will continue to monitor DER deployment and identify any need for capacity and corresponding infrastructure expansion.

Moving forward, the Company will continue to refine the forecasting process using more granular data, JU collaboration, and other sources to project future system loads more accurately. This includes estimates of “native load” (*i.e.*, load masked by various DER technologies) so that all components of the T&D systems continue to perform within design standards. To enhance its forecasting capabilities, the Company is planning to develop a new forecasting tool to assist in the forecast of specific load modifiers. This new tool will be an application software that will organize data and sources of information, and contain algorithms designed to forecast the quantities of specific load modifiers and their impacts to electric volumetric energy at the system level and electric summer and winter peak demand at the system, substation, and circuit level, all for a 20-year period. This tool is scheduled to be operational by May 2023¹¹⁷.

Planning for Large-Scale Renewables

The Benefit Act and resulting NYPSC Orders are designed to develop a state-wide plan to identify and implement transmission-level investments that are necessary or appropriate to achieve CLCPA targets. Specifically, these actions focus on developing a transmission system that can support the 70% renewable generation target by 2030 and 100% emission-free electric supply by 2040, reliably and safely integrating at least 6 GW of solar PV generation by 2025, at least 3 GW of ES by 2030, and at least 9 GW of offshore wind generation by 2035, as specified in the CLCPA.

NYPSC Order: Transmission Investment Planning

The NYPSC's Transmission Planning Order will significantly change the way T&D projects will be planned. The Benefit Act requires the NYPSC and utilities to “revisit the traditional decision-making framework that they have relied on up to now for investing in transmission and distribution infrastructure.” Recognizing the importance of timely execution of any system upgrades or enhancements to meet the CLCPA’s objectives and requirements and those of the Benefit Act, the NYPSC has established the following goals:

- Identify a strong portfolio of potential T&D projects that can support the development and delivery of renewable energy in order to support climate goals;
- Evaluate and weigh the contribution of those projects to the state’s climate goals in system planning and project prioritization, while preserving the obligation of the state’s utilities to ensure safe, reliable, and cost- effective service;
- Re-examine cost-containment and cost-recovery mechanisms, especially for projects that serve local reliability, as well as policy and systemic goals; and
- Continue to take advantage of new technology and other innovation in the planning process.

To accomplish these goals, there is a requirement to:

¹¹⁷ Details on this planned new tool is located in the Orange and Rockland Utilities, Inc. Electric Infrastructure and Operations Panel (“EIOP”) Testimony 2021



- Establish criteria to guide the utilities in making these evaluations and scheduling CLCPA-supporting projects; and
- Explore and consider all available options to fund these essential investments; this latter task may require a re-examination of traditional utility cost-recovery mechanisms and develop new approaches where existing mechanisms are deficient.

Proposals Guiding Future Investments

Seeking detailed input on the planning process requirements, the JUs will need to achieve the CLCPA's objectives. The Order requests the JU's Policy Working Group to develop proposals for a planning process that will guide their future investments. Proposals the Commission seeks input on include:

- A transparent planning process to be implemented by the utilities with as much consistency and interoperability as possible that will identify additional projects on the distribution and local transmission systems that support achievement of CLCPA's goals;
- An approach to account for CLCPA's benefits in the utilities' planning and investment criteria;
- An approach to prioritizing any such recommended projects in the context of the utilities' other capital expenditures and CLCPA's time frames;
- A BCA to apply in assessing potential investments in CLCPA's upgrades to the distribution and local transmission systems, as well as any other criteria the utilities believe should be applicable to evaluating these investments; and
- Cost-containment, cost-recovery, and cost-allocation methodologies applicable to these investments and appropriate to the state's climate and renewable energy, safety, reliability, and cost-effectiveness goals.

The last task raises issues of ratemaking policy. The NYPSC recognizes that the results of these and future-planning processes will identify projects that contribute in different ways to the CLCPA's goals and provides the following guidance on possible models for cost recovery and cost allocation to be considered for these types of projects:

- Distribution projects that are needed according to the utilities' traditional investment criteria may simultaneously provide support for renewable integration or other CLCPA goals. The NYPSC proposes that the working groups consider whether the costs of such projects should be recovered from ratepayers, as they would be in the ordinary course. NYPSC refers to these as "business as usual" projects.
- Some "business as usual" projects may present opportunities to expand or enhance the existing system's ability to realize the benefits of renewable resources. Where the utility can modify an already needed project to capture that additional benefit, a cost-allocation methodology that recognizes the state-wide benefit of the modification might qualify as just and reasonable. This assumes that the benefit can be identified and secured at a reasonable cost.
- The planning process may identify upgrades that would not be built according to traditional investment criteria but do meet specific needs toward meeting the CLCPA's goals. No method for recovering the costs of these projects currently exists and developing one will require resolving a number of issues. In particular, utilities will have to define the benefits of such a



project in a way that is fair and objectively quantifiable and then develop mechanisms for recovering costs from the identified beneficiaries. Issues with this recovery concept include how to identify who benefits from these CLCPA-targeted investments and by how much, as well as how to recover these costs. Recognizing that projects of this type may be identified in the future, the NYPSC urges the utilities to propose solutions so that funding uncertainties do not hinder achieving the CLCPA's goals.

The JU's Technical Analysis Group (developing the Distribution and Local Transmission Planning Study) and Policy Working Group (developing the Planning Process) developed responses to these NYPSC requirements and filed them on November 2, 2020.¹¹⁸ The Company will be adjusting its planning process to deliver against the requirements as the exact outcome and impact of this action are assessed and finalized.

NYPSC Order: Bulk Transmission Planning

The NYPSC initiated a second proceeding as part of the Transmission Planning Order to establish decisional criteria for the bulk transmission planning and investments necessary to meet the CLCPA's mandates. The NYPSC directed DPS Staff to identify the key issues to be resolved in developing the bulk investment plan, including the scheduling and prioritization of projects and the appropriate methodologies for funding these investments. The NYPSC intends to use this as the basis for future stakeholder input on the NYPSC's implementation of the statute's bulk planning requirements. The intent is to have this decisional process established in time to act on the results of the power grid study early in 2021.

On July 2, 2020, DPS Staff submitted its proposed criteria for the NYPSC's use to evaluate and prioritize transmission needs and determine which bulk transmission investments would qualify as defined priority projects under the Act (Section 7(5)), that is, to identify what project, in the context of the bulk transmission plan, is "needed expeditiously" to support the CLCPA's targets. The proposed criteria are:¹¹⁹

1. The transmission investment's potential for unbottling existing renewable generation for delivery to load centers in the state;
2. The transmission investment's potential for avoiding future congestion that could impede delivery of expected renewable energy to load centers in the state;
3. The transmission investment's potential for increasing the deliverability of existing and anticipated baseload renewable or low-carbon generation in the state, thereby reducing the amount of new generation that must be constructed to meet demand and/or CLCPA's targets;
4. Whether an early in-service date for the transmission investment would: (a) increase the likelihood that the state will meet CLCPA's targets; and/or (b) enhance the value of recent, ongoing, or anticipated distribution, local transmission, and/or bulk transmission investments, and/or help the state realize benefits from such investments;

¹¹⁸ Utility Transmission and Distribution Investment Working Group Report, November 2, 2020. Case 20-E-0197

¹¹⁹ Source: Petition Requesting Adoption of Criteria for Guiding Evaluation of Whether a Bulk Transmission Investment Should Be Designated as a Priority Transmission Project, and for Designation of Certain Transmission Investments in Northern New York as a Priority Transmission Project: July 2, 2020, NYPA and New York DPS petition.



5. The ability of the transmission investment to progress expeditiously based on such factors as the planning and design status of the transmission investment and the transmission investment's eligibility for expedited review under Article VII and its implementing regulations;
6. The ability of NYPA (alone or with other participants) to expedite development, considering such factors as:
 - o Availability of NYPA's rights of way;
 - o Availability of other rights of way and transmission assets;
 - o Access to other property for siting of the transmission investment, including state-owned or controlled property;
 - o NYPA's financial resources and access to capital; and
 - o Other potential benefits flowing from NYPA's participation.
7. Whether designating the transmission investment as a Priority Project will advance other state policy goals, including those expressed in the Act and CLCPA; and
8. Such other criteria deemed by the Commission to be in the public interest.

On September 14, 2020, O&R (as part of the JU response), NYISO, New York Transco, LLC,¹²⁰ the City of New York, and other agencies provided comments to DPS Staff's petition and proposed criteria. The Company is awaiting the results of this submittal with the expectation of being part of an overall process to finalize these criteria.

Risks and Mitigation

Related to Increases in DERs

The Company continues to enhance its planning processes to support a safe and reliable electric system, ready to meet the requirements of its customers in the clean energy future.

Level of DER Adoption and Electrification

The Company is forecasting significant increases in DERs to meet the needs of the CLCPA, EMP, and planning the system to meet these needs. Should this not materialize, there could be a risk of putting in infrastructure that may not be needed. The Company's current processes help to mitigate this. The use of a ten-year planning horizon as part of the annual-planning process, combined with close coordination with Company team members managing the electrification projects, will allow the Company to see the level of DER development emerging. Making use of currently available data and "new" data as the grid modernization program is executed will help refine forecasting capabilities.

Modeling/Forecasting

The industry's understanding of potential impact from load modifiers (e.g., DG, DR, EE, DSM, EVs, and heating electrification) continues to evolve. Not only the specific impact (e.g., EV-charging profiles), but also their specific locations to allow infrastructure as needed to be built in time where needed. The development of probabilistic planning capabilities will require new and enhanced

¹²⁰ New York Transco, LLC is owned by Con Edison Transmission, LLC, Grid NY LLC, Avangrid Networks New York TransCo, LLC and Central Hudson Electric Transmission.



methodologies, tools and processes, as well as collaboration and coordination with other utilities to understand the real impact of load modifiers. In addition, forecasting process changes will be important to the development of probabilistic planning.

To mitigate these risks, the Company plans to train employees in these areas and promote understanding and adoption of the necessary changes. O&R also plans to work closely with the JU to share best practices and lessons learned throughout the process of identifying and developing the requirements and capabilities required to support probabilistic planning.

To assist with its planning, NYISO recently initiated a comprehensive data collection of DERs, to include PVs and ES connected in the distribution feeders. NYISO's intention is to have more visibility on the DERs, so it can perform its planning studies more accurately. NYISO is also slowly shifting to Dynamic Load Modeling, which will identify and separate types of loads in the distribution system, again with the intention to better model and accurately perform dynamics and stability studies.

Data and Data Management

One of the key risks to the Company's plans to advance its forecasting capabilities remains the accessibility of data and the Company's ability to collect the granular data required to support its efforts. The Company has installed, and will continue to install, intelligent distribution equipment (*e.g.*, reclosers, motor operated air break switches ["MOABS"], intelligent data collection sensors, and smart capacitors) on its electric system as part of its grid modernization efforts. The data provided by these and third-party devices used in the forecasting and planning processes will help to mitigate some of the risks identified here. Although data such as this will be available, current processes require significant effort to collect, aggregate, process, and analyze. The Company is exploring potential data historian solutions to support this initiative. However, building the processes and having the requisite skills to mine and manipulate the data may delay the Company's ability to operationalize the data. Anticipated data requirements may become burdensome and inefficient to manage without appropriate systems, tools, and people to manage "big data" requirements for engineering, planning, and real-time operational purposes.

Securing this data and the distribution automation infrastructure will be critical as well. The importance grows as access to and use of customer and system data expands. Cybersecurity and the prevention of security breaches and cyber events are priorities of the JUs. The JU Cyber and Privacy Framework provides a comprehensive approach to managing cybersecurity risks, focusing on people, processes, and technology to maintain data security. However, the cyber risks and challenges facing all industries change and evolve. The Company and the other JUs periodically assess developments, needs, and update requirements to maintain a vigilant cybersecurity posture.

Integration of Utility-Scale Renewables

Transmission Planning Process and Project Identification

The final transmission planning process for New York to support the CLCPA has not yet been defined. Even with the submittals later this year, it will take time to understand thoroughly how this will be executed and the influence it will have at the state, NYISO, and utility level. The Company will stay engaged with stakeholders and advocate for positions beneficial to its systems and customers.

It is also not clear what projects will be identified by the NYPSC in O&R's service territory and how they will impact ongoing planning and current projects in varied stages of development. The



Company will need to coordinate very closely with NYPSC, DPS Staff, neighboring utilities, and NYISO through this project identification and prioritization process.

Project Development

There are two risks associated with the development of projects that are identified as a result of the revised system planning process. They are:

- The ability to secure the appropriate siting and permitting approvals necessary to have the project online and ready when needed. This takes years in the best of circumstances and can take a decade or more.
- Clean energy goals/planning horizon misalignment. Many of the projects that will be needed to meet the needs identified in the plan can take years to design, construct, and place into service. Given the GHG reduction targets and associated infrastructure requirements, there may not be sufficient time to construct the facilities, enhancements, and upgrades needed to meet these requirements.

The Company's use of a ten-year planning horizon may help to mitigate this. There are also actions being taken by NYPSC to expedite the processes to approve and support project development (e.g., use existing rights of way and state-owned land), but how effective these will be in improving the process remains unclear. The Company will need to coordinate closely with all stakeholders (state and local officials, NYISO, developers, contractors, customers) so that plans are executed expeditiously.

FERC Order No. 1000

As transmission projects to support the CLCPA will likely be categorized as "public policy" projects under FERC Order No. 1000, the projects in O&R's service territory may be bid out through a competitive process managed by NYISO.¹²¹ How this will be coordinated and the impact to O&R's operations is unclear.

There could be added complexity should a project in the O&R service territory be awarded to a third-party developer/operator. The integration of a developer's transmission assets would add another layer of coordination and complexity to the Company operating its electric system.

¹²¹ Only projects classified as "public policy" driven would be competitively bid. Those "local" to TOs should not be subject to this process.



Role of Gas in a Clean Energy Future

Introduction and Background

O&R's natural gas business provides energy to more than 130,000 customers in the Company's New York service territory. The Company manages a large, complex, underground gas system of 1,858 miles of pipeline, to safely and reliably deliver natural gas for heating, hot water, and cooking to its residential and C&I customers. Due to its reliability, cost, and lower GHG emissions relative to other fossil fuel alternatives, O&R's customers have valued and requested natural gas to meet their energy needs. As such, natural gas is an integral part of O&R's energy system, currently meeting the heating needs of more than 60% of the residences and businesses in its service territory. As the Company looks ahead to the transitions that are taking place in the industry, the gas business will continue to be an important part of the energy future for O&R and its customers.

However, the longer-term viability of fossil-fuels in general, and natural gas specifically, needs to be considered in the context of New York's GHG emission reduction requirements. The CLCPA prescribes 40% GHG emission reduction targets (from 1990 levels) to be phased in by 2030, increasing to 85% by 2050. In addition to the CLCPA, recent actions by various New York State agencies will shape the future of O&R's gas business.

NYPSC Gas Planning Order (Case 20-G-0131)

On March 19, 2020, the NYPSC issued its Proceeding on Motion of the Commission in Regard to Gas Planning Procedures partly in response to the announcement by gas utilities in several regions of the state of new service connection moratoria due to local supply constraints.¹²² The NYPSC asserted that "these circumstances demonstrate that conventional gas planning and operational practices adopted by natural gas utilities have not kept pace with recent developments and demands on energy systems." The purpose of the Order is to have "Gas utilities... adopt improved planning and operational practices that enable them to meet current customer needs and expectations in a transparent and equitable way while minimizing infrastructure investments and maintaining safe and reliable service...planning must be conducted in a manner consistent with the recently enacted CLCPA."

The Order requires O&R and New York's other gas utilities to:

- Conduct Supply/Demand Analysis;¹²³
- Develop Transparent and Comprehensive Utility Planning Process;
- Include Analysis of Non-Pipe Alternatives;
- Develop Criteria for Use of Peaking Services;
- Codify the Process for Moratoria; and

¹²² CECONY's moratorium (Mar 2019: in Westchester) is still in place; National Grid (Nov 2018) lifted its moratorium in November 2019; NYSEG's moratorium (Feb 2015: for Town of Lansing) is still in place.

¹²³ O&R has submitted the following as of the date of this LRP: Supply/Demand Analysis-Vulnerable Areas (7/17/20); Peaking Services & Moratorium Management (7/17/20); Supply/Demand Analysis- Entire Service Territory (7/31/20); Demand Reducing Measures (8/17/20)



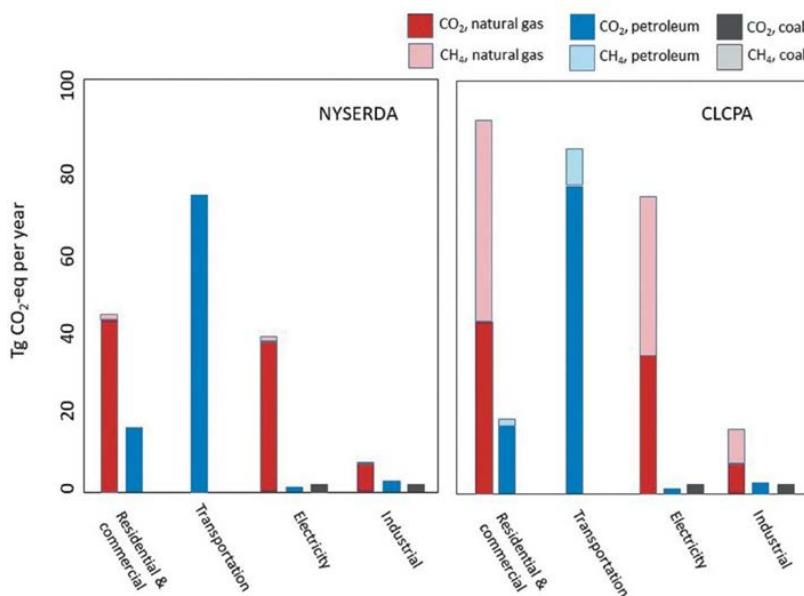
- Consider Alternative DR Methods Where Other Fossil Fuels (*i.e.*, Oil, Propane) Are Alternative Fuels.

The Company has begun to respond to some of these requirements, and they are reflected in this LRP. The Company will also incorporate the outcomes of DPS Staff's work on the modernized gas planning process once it is finalized.

New York Department of Environmental Conservation ("DEC") Part 496 Proposed Regulation

In August 2020, the New York DEC issued proposed regulation Part 496 to Title 6 of the New York Codes, Rules and Regulations ("NYCRR") governing statewide GHG limits. The proposed rule adopts limits on the emission of GHG in 2030 and 2050 pursuant to the requirements of the CLCPA. The methodology used to calculate the carbon intensity for 1990 vastly increases natural gas's carbon intensity and reduces biogas's carbon benefits. GHGs from natural gas heating and power plants approximately double with the new accounting.

Figure 36: GHG Emission Determination Comparisons¹²⁴



DEC sets the 1990 baseline and counts each year's carbon emissions. Some of the methodology is set in law, but other mechanisms are set forth in this proposed rulemaking. Two consequential methodologies are requirements of the CLCPA:

- 1) DEC must measure the climate impacts of methane and other GHGs on a 20-year scale, which differs from the New York City's and the state's prior practice of using a 100-year timeframe.
- 2) DEC includes the impact of fuels' upstream methane emissions. Out-of-state emissions associated with extraction and transmission count toward the GHGs within the state.

¹²⁴ Source: CEI assessment of DEC Part 496.



These changes significantly increase natural gas's GHG impacts. The use of a 20-year period nearly triples the GHG potency of methane versus the previously used 100-year period. The inclusion of upstream extraction and transportation emissions is new as well. With fracking shown to leak more methane than 1990-vintage extraction methodologies, DEC could further increase the GHG emission contributions of natural gas.

In addition to the time period and inclusion of upstream emissions as mandated in the CLCPA, DEC is also recommending that biofuels be treated the same as conventional fuels at the point of use with both assessed the same CO₂ emissions. This could limit the value of RNG as a carbon-friendly fuel. More discussion on this is provided below in the Risks and Mitigation section of this LRP.

O&R's Approach¹²⁵

The Company sees an important role for its natural gas business in helping realize the clean energy future. While it expects to be a provider of safe, reliable natural gas service for the duration of this LRP, the Company recognizes the need to shape its strategy to fit the clean energy future requirements. The following principles will guide the Company's plan for the gas business:

- Deliver safe and reliable service to customers at just and reasonable rates as part of our statutory obligation to provide service;
- Decarbonize by reducing the current level of emission intensity of operations and exploring new technologies;
- Increase customer awareness of, and education on, low carbon heating alternatives;
- Pursue investments that maintain the integrity and reliability of the gas system while supporting clean energy goals; and
- Advocate for rate reform and legislative changes that enable utility support of clean energy targets and help customers transition to a clean energy future.

To deliver on these principles and policy requirements, the Company is pursuing the following multi-pronged approach.

- **Decarbonizing the gas business.** Identify actions and technologies that can reduce emissions in daily operations or through transformational change, determine the path to wide-scale adoption, and then define the role of the Company in enabling the actions and technologies identified.
- **Repositioning for the future.** Identify new business opportunities, leveraging the Company's experience in natural gas distribution, while adding new skills and capabilities and expand marketing and awareness of low-carbon heating options.
- **Managing the transition of the gas business.** Optimize the Company's infrastructure and resources to meet the needs of customers in the most responsible way. Recognize that existing gas operations will need to continue to deliver the needs of customers safely and reliably for the foreseeable future.

¹²⁵ Team will adjust as necessary pending gas planning process coming out of DPS per Case 20-G-0131. Extension granted until February 12, 2021 for process proposal submittal.



Current Actions

Decarbonize the Gas Business

The Company focuses on two main areas of activity as it seeks to reduce GHG emissions from the gas business: those actions that reduce the use of gas (demand-side) and those actions that reduce the carbon in the gas supply/gas delivery system (supply-side).

Demand-Side Actions

Driven by the reliability, cost, and a lower GHG emissions profile (compared to other fossil fuels), O&R's customers have valued and requested natural gas service to meet their heating needs. To meet its statutory obligation to serve, O&R's traditional response meeting demand has been capital investment in distribution infrastructure and gas supply procurement. While this continues to remain an option to meet customers' needs, the Company first looks to its energy efficiency and demand management (EE/DM) programs as the preferred method to manage demand, reducing the overall amount of natural gas needed to meet customer needs. EE/DM programs seek to provide reliable, cost-effective service to customers, support delivering the requirements for the clean energy future, and optimize the use of the Company's resources while limiting GHG emissions.

Due to advancements in the effectiveness of these EE/DM programs, the Company is including them in its portfolio of options for NPAs to provide reliable service to its customers. Similar to the approach taken when implementing NWAs, the Company believes NPA solutions can be implemented using a targeted approach. This may include funding or increased marketing to increase adoption of measures in specific areas where infrastructure could potentially be deferred or avoided, providing additional value to vulnerable areas.

EE Gas Programs

O&R's EE gas portfolio consists of a diverse mix of programs and measures that are designed to benefit all customers. The current budget allocated to gas efficiency programs in the service territory is just over \$16.5 million to achieve a total savings of approximately 425,700 MMBtus from 2020 through 2025. Through the existing portfolio of programs, O&R has promoted the installation of EE equipment that reduces energy consumption and contributes to peak gas day demand reductions. The majority of the measures installed (*e.g.*, high efficiency furnaces and boilers, water heating equipment, low-flow devices, smart thermostats) contribute to peak demand reduction.

In 2019, O&R began implementation of a C&I gas EE program, in addition to its residential gas rebate program. This program targets prescriptive and custom gas savings measures by engaging trade allies to offer high efficiency measures eligible for customer rebates. This program is also exploring the potential to offer a mid-stream commercial package in 2021 to increase available offerings and savings opportunities.

O&R has also developed strategic energy partnerships with C&I customers to stay engaged with their capital planning and advise on high-value EE opportunities. O&R collaborates with customers to achieve long-term partnerships in segment verticals, such as hospitals, schools, and other areas, where there may be significant usage and potential for savings.

The residential segment of the gas portfolio incentivizes the installation of HVAC equipment, and it includes a free audit component on the **ORU Marketplace** for customers who would like to address whole-home upgrades. These upgrades, including building envelope improvement measures along with efficient HVAC and water heating equipment, contribute to peak gas reductions. In addition,



the **ORU Marketplace** provides one-stop-shopping with instant rebates for high efficiency equipment. Further discussion of the ORU Marketplace is provided below in the Customer Experience section of this LRP.

LMI-Focused Programs

O&R is coordinating with NYSERDA and other New York state utilities to develop a statewide portfolio of EE programs and initiatives for LMI customers and communities. O&R recently jointly filed the Statewide LMI Implementation Plan that outlines a portfolio of programs and offerings designed to establish a more holistic and coordinated approach to deliver energy efficiency to LMI customers and communities. The implementation plan outlines budgets and targets through 2025. O&R will be investing 70% of its LMI budgets in gas energy efficiency programs.

O&R will be allocating a majority of the LMI budget to serving the affordable single-family building sector by providing increased incentives to the existing Empower Program (described in the Energy Efficiency section). Measures include, but are not limited to, building envelope improvement, energy management systems, boiler pipe insulation, and water and space heating upgrades.

Demand Response

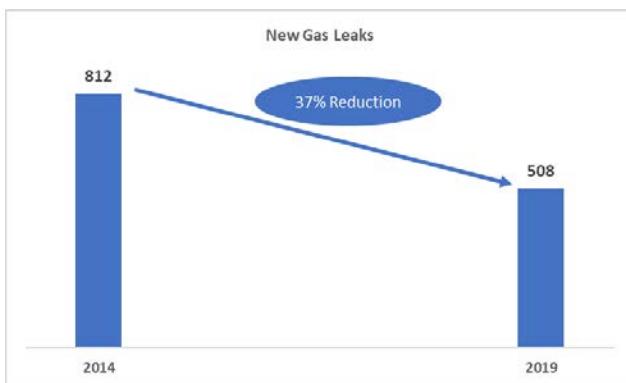
To address increased customer demand O&R proposed a Gas DR Pilot Program in March 2020 aimed at reducing peak day gas usage.

The primary objective of the Gas DR Pilot Program is to test the feasibility of incentivizing customers to provide net reductions of natural gas demand during peak gas demand days (*i.e.*, from 10:00 AM to 10:00 AM the following day) at sufficient levels, such that reductions could potentially defer or eliminate the need to pursue pipeline projects or add to peak day assets. The Gas DR Pilot Program will also explore strategies to optimize customer participation and performance.

This program offers benefits to the natural gas system through the reduction of peak day gas usage and may defer the need for additional gas infrastructure to serve peak demand. The Company submitted this pilot program to the NYPSC in March 2020 and is currently awaiting approval to move forward.

Gas Operations Improvement

O&R's Gas Operations has a well-established leak detection and repair program. The Company maintains a low backlog of leaks and short leak lifecycle, reducing the volume of methane emissions released to the atmosphere. O&R has seen a significant decrease in new incoming leaks, driven by programmatic replacement of leak prone gas pipe.

Figure 37: New Incoming Leaks (2014-2019)¹²⁶

Supply-Side Actions - Renewable Natural Gas

The Company is exploring the potential role of biomethane or RNG to aid in meeting its future gas supply needs. RNG can encompass several low-GHG substitute fuels for fossil natural gas (primarily methane). RNG has a low- to no net carbon emission advantage due to using this biomethane versus emitting, helping to meet carbon reduction goals. While there are a few technologies available for producing RNG, the immediate focus of the Company is that generated from anaerobic digestion. Anaerobic digestion is a series of biological processes through which micro-organisms decompose moist biomass in the absence of oxygen. This anaerobic digestion can occur in purpose-built facilities or within landfills as part of the natural decomposition of landfilled waste. Some typical biomass feedstocks are animal waste, wastewater treatment plant sludge, and agricultural residues/waste. The resultant biogas is typically around 60% methane. This must be upgraded to remove impurities to create pipeline quality biogas, which is referred to as biomethane.

Anaerobic digestion is a mature and commercialized technology and is being used at facilities like landfills, wastewater treatment plants, and agriculture/livestock farms. Biomethane from these sources represents the most common form of RNG available today.

In March 2020, Navigant completed the Renewable Natural Gas Analysis for the Company. The objective was to explore whether there was significant opportunity for economically feasible RNG development in O&R's gas service territory to support the needs of customers and advance clean energy objectives. This study considered the availability of feedstocks in O&R's service territory and surrounding counties, plant development and operations economics, GHG emission reductions, and possible incentives. Using this study, the Company is considering future opportunities with RNG. This is discussed below in the Future Opportunities and Focus section of this LRP.

Repositioning for the Future

As part of its strategy to reposition for the future, the gas business is taking several actions to identify new business opportunities, leveraging the Company's experience in natural gas distribution, while adding new skills and capabilities and expand marketing and awareness of low-carbon heating options.

Marketing and Awareness of Alternative Heating Options

¹²⁶ Source: O&R Gas Engineering



The Company continues to promote the value of heating alternatives to natural gas to new and existing customers and the installer/contractor community. A significant amount of this effort is directed at promoting the benefits of electric-heating technologies (*e.g.*, heat pumps). These solutions provide heating alternatives that may have otherwise required installation of new gas infrastructure to service new customers or replace assets that were at end of life or facing required replacement. Detailed discussions of the Company's efforts promoting heating alternatives is provided in the Electrification of Heating section of this LRP.

Related to this, the Company is working with state and local agencies to guide and provide input on new building codes and standards. This will also require engaging with the contractor community to ensure they have input to these standards and an understanding of the benefits associated with these changes.

[Electrification of Heating Geothermal Neighborhood Demonstration Project](#)

The Company is planning to implement an electrification of heating demonstration project, designed to test whether utility ownership of ground source heat pump technologies and/or infrastructure is beneficial to customers and a viable business model for the Company. The details of this project are provided in the Electrification of Heating section of this LRP. The Company's gas engineering and operations teams are key participants in the development and overall assessment of this demonstration project. The team is helping facilitate the selection of potential sites to deploy this project, using similar criteria and methods to those used for identifying traditional gas infrastructure investments and potential NPAs. The team will identify high-potential locations for this demonstration project, targeting those customers using non-utility provided heating sources (*i.e.*, oil, propane, wood), areas requiring significant gas infrastructure upgrades, or new development. Their experience in designing, installing, and maintaining gas infrastructure is extremely valuable as the Company explores the ownership of ground source heating loops. While the project will test the ability to deploy economically and efficiently district heating solutions to a community, it will also assess new business models for providing this service.

[Managing the Transition of the Gas Business](#)

The overarching objective of O&R's gas business is to provide safe, reliable, cost effective service to its customers. However, the Company also recognizes that in the long-term, the traditional operations of the gas business will need to evolve to help meet with the CLCPA's objectives. These changes could see both a decrease in the volume of gas delivered and a declining need for the infrastructure required to serve customers. The Company will carefully manage this transition in order to continue to provide safe, reliable gas service in the most cost-effective manner to those customers that remain on the gas system. A well-developed strategy to communicate this process and impacts to all stakeholders will be critical.

In the near-term, as part of its gas base rate case currently projected to be filed in January 2021, the Company is conducting a Depreciation Study examining the implications of a reduced natural gas footprint and customer base. The Depreciation Study will evaluate the recovery costs of existing gas infrastructure, and the rate impacts on existing customers, considering the various future-states as discussed in the Planning Scenarios section of this plan. Another input to this study will be the modernized gas planning process the DPS Staff is developing, which will be incorporated into the Company's planning processes once it is finalized.

The current gas customer base includes customers who have no alternative to natural gas today due to either the nature of their businesses or their economic status. The Company is obligated and will



continue to serve these customers but will focus on developing potential low-carbon alternatives to meeting the needs of these customers. For instance, the Company may explore alternative technologies such as collocating RNG production on site to serve these needs or potential CNG delivery. More about some of these alternatives will be discussed in the Future Opportunities section of this LRP.

Future Opportunities and Focus

As the Company looks ahead to the future, the gas business will focus on balancing the priorities of meeting state decarbonization goals with its ongoing obligation to serve customers. This will inform its actions and strategy going forward.

Decarbonize the Gas Business

Demand-Side Actions

EE, DR, and NPA

The Company will continue to provide EE and DR programs. Recognizing there will be a need for some level of natural gas service for the near- and medium-term, as a minimum, these programs should continue to be economical in reducing GHG emissions, saving the next dekatherm of gas.

Non-Pipes Alternatives

NPAs represent opportunities to defer or avoid certain traditional investments, potentially resulting in cost savings and/or environmental benefits while maintaining the highest standards for safety and reliability. An NPA is a strategy that addresses a discernable system need while deferring, reducing, or eliminating the need to construct or upgrade gas infrastructure. The Company is taking steps to integrate NPAs into the utility planning model. An important step in this process is determining if a given project is suitable for an NPA. The Company will evaluate and incorporate the process identified in the CECONY September 15, 2020 filing as appropriate.¹²⁷

Suitability criteria will be determined by the service territory features, demographics, budgeting processes, and technical system features. Criteria that are generally applicable are project type, timeline, and cost. These criteria are intended to provide transparency and to promote an efficient allocation of resources that yield the best solutions for customers. The criteria reflect the goals of: (1) identifying projects that are best suited for NPA programs; (2) providing alternative opportunities, and (3) establishing a structure that will produce successful outcomes for customers. Though criteria such as the above may be applied, safety and reliability of the system remains a primary concern when determining projects that may be appropriate for an NPA.

When opportunities for NPAs are identified, the Company will need to consider the characteristics of the project, such as the reduction needed, customer types, solution lead time and area impacted. These key characteristics will help the Company determine the ideal path for procurement, engagement, solution development, and implementation.

¹²⁷<http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=19-G-0066&submit=Search+for+Case%2FMatter+Number>. Proposal for Use of a Framework to Pursue Non-Pipeline Alternatives to Defer or Eliminate Capital Investment in Certain Traditional Natural Gas Distribution Infrastructure



The Company will continue to use NPAs, expanding their use where they make sense operationally and economically to meet the needs of its customers. With the projected ongoing obligation to serve, these will be valuable tools in advancing clean energy objectives where and when their use makes sense.

New Technology: Gas Heat Pumps

Gas heat pumps¹²⁸ (also referred to as absorption heat pumps) may be a technology that emerges to provide another heating alternative. Gas heat pumps are similar to ASHP, but rather than using electricity as the power source, natural gas is used to provide the heat needed for the system. These systems are highly efficient (up to three times more efficient than high efficiency gas furnaces¹²⁹), but most of the current applications of this technology have been confined to C&I uses. Their design complexity generally requires large units. Although some residential units have been developed, they are best suited for homes of 4,000 square feet or larger and are not widely available. It is expected that technology will continue to advance and bring more mainstream residential application opportunities. The Company will continue to monitor developments in this area and look at possibilities to develop pilots. If fueled by RNG, this would add another clean heating/cooling option to the portfolio of available products.

Supply-Side Actions

Renewable Natural Gas

The Company has been assessing the Navigant study to identify RNG opportunities. While there is limited RNG production opportunity in O&R's immediate service territory, if surrounding areas/counties are considered, there could be potential production ranging from 5–10% of current annual gas sales (2019 Forecast: 20.9 MMBTUs). The price of this RNG is currently ~3.5x the New York state city gate price for natural gas. This is before accounting for any potential operations at scale, GHG reduction benefits, and possible incentives. There is an expectation that as the scale of these RNG production facilities increases, the costs will drop. Combined with its GHG reduction benefits, this could close the gap with conventional natural gas.

The development of RNG in O&R's region is still in its very early stages. The Company will focus on developing programs to incent the development of RNG in region and take the following actions:

- Leveraging the findings of the Navigant study and working with CECONY, thoroughly assess the viability of RNG as a future customer fuel. The initial focus will include pilots and demonstration projects looking at RNG production, both within O&R's service territory and neighboring regions.
- Related, O&R will work with developers and encourage regulators to develop incentives for RNG development and adoption. This could serve as an economic bridge to increase both RNG development and adoption with the objective of ultimately reducing RNG costs. This could be structured similarly to other renewables incentive programs.

The Company's prime objective in these initial efforts will be to support RNG and close the current price gap to natural gas. Increased, scaled production should help close this gap.

¹²⁸ www.energy.gov

¹²⁹ Trane website: <https://www.trane.com/residential/en/resources/heat-pump-vs-furnace-what-heating-system-is-right-for-you/>



There are GHG reduction benefits to using RNG. Using existing gas infrastructure, RNG could be blended with natural gas, resulting in a possible 5–10% reduction in GHG emissions. This could be a way to start integrating RNG into the overall gas business. To help advance development, O&R (along with CECONY) has established standardized interconnection and purchase terms for anaerobic digestion facilities, and it has received inquiries from potential RNG project developers.

In addition to RNG efforts, O&R joined the EPRI and Gas Technology Institute (“GTI”) Low Carbon Resources Initiative (“LCRI”) in March 2020. LCRI brings together EPRI, GTI, and more than 20 utilities, technology providers, and state agencies to accelerate the development and demonstration of technologies to enable a low-carbon future. LCRI will focus on large-scale deployment to 2030 and beyond of a variety of low-carbon electric generation technologies and low-carbon chemical energy carriers (e.g., clean hydrogen, bioenergy, and renewable natural gas). The intent is to establish an accelerated pathway to enable affordable, economy-wide decarbonization technology alternatives.

The Company will use the results from currently planned initiatives and engagement with LCRI and others to guide development of RNG in the service territory. This could include working with both feedstock sources (e.g., agricultural product processing facilities, wastewater treatment facilities) and developers to coordinate RNG production facility development.

Hydrogen/Power-to Gas

In addition to RNG, interest in hydrogen as a clean alternative fuel to serve customers is growing. While used as a feedstock in a variety of industrial applications, the consideration of hydrogen as a fuel source for heating and transportation is increasing, though still in the early stages of development. While many of the projects to date have been focused on hydrogen for fuel cell vehicles, there has been growing activity to assess hydrogen as a heating fuel. Enbridge is planning its Low-Carbon Energy Project¹³⁰ with the plan to inject up to 2% hydrogen into a section of its distribution system. In partnership with Hydrogenics, a hydrogen generation company, the project was launched in 2019 and is planning to begin construction in Q2 2021. This and other pilots using hydrogen will inform O&R’s perspectives about whether to pursue hydrogen as an alternative fuel source.

Currently, there are two methods for producing hydrogen. The most common and commercially viable method is called steam methane reformation. This uses natural gas/methane as the feedstock and separates carbon and hydrogen. This process produces carbon dioxide as the by-product. For systems where this CO₂ is captured through carbon capture storage (“CCS”), the produced hydrogen is referred to as “blue hydrogen.” If the CO₂ is not captured, the hydrogen is “gray.”

The other technique is electrolysis, which involves running an electric current through water in an electrolyzer, producing hydrogen and oxygen. This is P2G. When the electricity source for this process comes from clean sources, the hydrogen produced is referred to as “green hydrogen.” There is an opportunity to pair this method with surplus renewable generation that would otherwise be curtailed. In certain cases, it has been proposed that the electrolyzer act as a DR resource to help the grid adapt to fluctuations in renewable generation.

While the environmental benefits of hydrogen are potentially significant, there are some areas of concern.

¹³⁰ Source: Enbridge website (<https://www.enbridgegas.com/About-Us#0c28fbcd-8b6f-4d39-83c2-6a078eb33a84>)



- **Cost.** The production costs for hydrogen range from \$20–30+ per MMBtu. This is driven primarily by the current scale of production operations. Forecasts indicate that this may drop significantly by 2050, to around \$5 per MMBtu, but would require significant production facility development.
- **Energy.** Hydrogen has roughly one-third the energy density of natural gas. Therefore, straight replacement of natural gas with hydrogen, from an application standpoint, would require significant changes in equipment and appliances using this fuel. Studies have shown ranges of blends up to 20% hydrogen with minor effects on the end-use equipment or appliance.¹³¹
- **Safety.** Hydrogen ignites with very low energy and has a wide flammability range relative to natural gas. The effects of hydrogen on the T&D infrastructure need to be considered as well. How this gas interacts with the varied pipe materials in systems needs to be assessed. For hydrogen to gain broad acceptance and adoption—in domestic settings and for new applications beyond current industrial uses—industry and regulators will need to establish robust safety standards for each specific use cases, just as they do for other potentially dangerous substances. Activity is underway looking at both the safety needs and detailed effects on pipelines. Initial studies have shown minimal to no effects of hydrogen on gas pipe at blending rates below 20% within the distribution system.¹³²

While there are issues and concerns with hydrogen, there is a significant amount of activity focused on development of it as a fuel for the future. The ability to move and store it in a manner similar to natural gas, combined with its clean energy properties, make this a fuel alternative the Company may want to examine as it considers alternatives to natural gas. The initial focus for the Company could be to investigate the Enbridge project described above, looking at the opportunity to blend hydrogen with natural gas and introduce it into a section of its distribution system. An analysis of this nature could enable the Company to explore the cost, how the fuel might be integrated into the distribution system, safety protocols, and the fuel's ability to meet customer needs. This may be combined with work on policy and regulations that would further the development of hydrogen as a fuel for the future and seek incentives for both development and end use.

¹³¹ Source: Hydrogen Council, Path to Hydrogen Competitiveness: A cost perspective, January 2020

¹³² Source: NREL Technical Report. Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues, March 2013

Figure 38: Example Policy Actions Directed at Hydrogen Use Development¹³³

Country	Targets
US	<p>CA:</p> <ul style="list-style-type: none"> • 1M fuel-cell vehicles by 2030 • 1,000 hydrogen fuel stations by 2030
China	<ul style="list-style-type: none"> • 1M vehicles on the road by 2030 • 1,000 hydrogen stations by 2030
UK	<ul style="list-style-type: none"> • 100 hydrogen stations by 2025
Japan	<ul style="list-style-type: none"> • Reduce cost of hydrogen to 30 yen/NM3 by 2030 and 20 yen/NM3 long term
Germany	<ul style="list-style-type: none"> • 20% of hydrogen from renewables by 2030 • Build 5GW electrolyzers
France	<ul style="list-style-type: none"> • 20-40% low-carbon hydrogen use in industrial applications • Electrolysis cost reduction to EUR 2-3/kg (\$17-25/MMBtu) by 2028

Countries in bold also offer funding / incentives

Source: "Hydrogen – a climate megatrend" by Barclays, May 2020

The Company will continue to engage with LCRI and engage in relevant research and development ("R&D") efforts related to hydrogen development and its use as a natural gas alternative.

Reposition the Gas Business

For the foreseeable future, parts of the gas business will look very similar to today, with the ongoing focus on providing safe and reliable service to customers. As the CLCPA goals are realized, the Company's conventional gas business may be decidedly smaller than it is today. The pace of this change will depend on regulation, the speed of customer adoption of alternatives, the cost evolution of natural gas replacements, and the advancements of new, low carbon, technologies. As the Company's activities discussed above are assessed for their ability to support the CLCPA's objectives and mature, new business opportunities may emerge.

New Business: Geothermal Neighborhood Demonstration Project Results

A main objective of the Geothermal Neighborhood Demonstration Project is to test whether a district thermal model may be an economically and operationally viable option for delivering heating and cooling needs for multiple customers in a given community. If this is proven to be the case, further like projects could be launched to scale up this operation to further deploy and support clean heating and CLCPA goals.

The Company believes the deployed technology for this will be a shared ground-sourced heat loop infrastructure serving all customers in a specific community. This will be composed of multiple underground loops, customer service lines, and heat pump stations depending on the size of the needed system, mirroring the traditional gas distribution system (gas mains, service lines, and compressor stations). This could be an opportunity for the Company to develop a technical workforce with the skills and knowledge to design, build, and maintain shared district heating loops.

New Business: Low Carbon Gas Alternatives

¹³³ Source: CEI CSC Presentation June 2020



Should either RNG or, longer term, hydrogen, prove to be a reliable, economical supply source for customers, it could provide a critical, long-term, carbon friendly fuel source that makes use of the existing gas infrastructure. This would enable the gas infrastructure to be a key element of delivering the CLCPA's objectives for the long-term.

Managing the Transition of the Gas Business

The Depreciation Study combined with the enhanced planning process under development by the NYPSC will serve as the foundation for developing the overall plan for O&R's future gas business. The Company's focus will continue to be on maintaining a safe and reliable system able to meet customers' needs in a cost-effective manner.

As the Company moves forward and supports the CLCPA's objectives, there is the potential for some of the gas infrastructure to last longer than needed placing the Company's existing assets at risk of becoming stranded (not fully depreciated assets which cease to be used and useful). The Company will consider ways to manage this situation prudently and proactively, such that shareholders and bondholders have an opportunity to recover their investments, while balancing affordability concerns for customers. The Company will consider ways to change its approach to asset retirement and depreciation, ensuring the interests of customers, shareholders, and regulators are considered while continuing to deliver on the CLCPA's objectives.

In meeting CLCPA's requirements and anticipated declines in gas consumption, the Company will face challenges associated with balancing the need to continue to invest in maintaining aging infrastructure while monitoring potential gas customer reductions to avoid stranded assets. Of particular concern would be LMI customers who are unable to easily switch to alternative sources. Traditional approaches to addressing these challenges (increasing sales through existing infrastructure and pipeline replacement) are not an option because these would increase gas sales and GHG emissions.

An alternate approach may entail strategic and planned retirements of portions of the gas distribution system. In this approach, rather than losing sales gradually on average across the service territory—and thus needing to maintain the network to serve each remaining customer on each street—the Company could take a geographically targeted approach to electrification switching all customers served by a particular distribution line, before retiring that line. This approach, called clustering, would be particularly favorable where the gas lines are already scheduled to be replaced.¹³⁴ This reduces net emissions, addresses actual leaks or the risk of leaks (reducing GHG emissions and increasing safety), and opens opportunities for new business models, including those built around the district-heating options discussed above.

Clustering electrification would also allow O&R's electric business to better match and pace any necessary investments in the electric system to serve new loads in the area. This would result in a more efficient system upgrade plan where the Company could adjust the distribution network for a known new long-term load in a given area, then move to the next.

The next step in this process is developing a prudent, responsible way to recover the investment made in this retired asset. In considering this option, the Company will engage with the NYPSC and DPS Staff and develop proposed methods for cost recovery for impacted assets, taking into consideration future expectations for the gas system. It also needs to be noted this is a process that will be developed,

¹³⁴ Approximately 12% of O&R's gas system (~220 miles) is defined as leak prone pipe and scheduled to be replaced over the next 10 years.



executed, and managed over the long-term allowing the Company, regulators and customers time for proper phasing to best balance the needs of all stakeholders.

While this is a strategic option, it may run counter to strategies which rely on the expansion of the use of RNG or hydrogen as a replacement fuel. Should either or both of these alternative fuels prove to be viable, clean alternatives to conventional natural gas, they would make use of the existing distribution infrastructure. The timing of these future efforts would need to be well coordinated.

Risks and Mitigation

Demand Associated Risks

The Pace of Electrification

The successful decarbonization of the gas business relies heavily on the electrification of heating. However, if the adoption of electric heating solutions is too slow and/or the electric system cannot accommodate this increased electrification in a cost-effective or timely manner, achieving the gas decarbonization objectives will be challenged. The key to mitigating this risk is well-coordinated gas and electric planning. This will help align actions and objectives resulting in mutually supportive opportunities (please see the description of targeted gas system retirement described above).

“Zero-Carbon”

While the expectation is that the gas business will decline over time, none of the envisioned future states of this plan anticipate that the gas business will completely disappear during the LRP’s 30-year planning horizon, and there will continue to be some volume of natural gas still needed by customers. Consequently, the Company will continue to maintain its statutory responsibility to deliver gas services safely and reliably to customers for the duration of this LRP.

Each of the planning scenarios presented in this LRP achieve the 85% reduction in GHG emissions targeted by 2050. However, there may be groups who find any level of fossil fuel use in the Company’s energy delivery system unacceptable. This may put pressure on lawmakers and regulators to amend current rules to be more stringent on the use of any fossil fuels.

The Company can mitigate this by optimizing decarbonization efforts, replacing conventional natural gas with RNG or hydrogen, and pursuing new technologies. They can also continue to maintain a dialogue with all key stakeholders on their efforts and keep them informed of advancements in GHG reductions.

Supply Associated Risks

Conventional Natural Gas

There have been various policies proposed and approved at the national and state-levels targeting both limiting or restricting production (primarily from hydraulic fracking) and gas transmission system expansion and development. For the near-term, this could result in a risk of sufficient supply not being available. However, to date the Company has not faced any supply constraint issues procuring and delivering natural gas to its customers. As natural gas volumes decrease due to efforts to meet the CLCPA’s goals, this risk will also decrease.

The Company will monitor regulatory, legislative, and permitting activities that may impact gas supply and will work closely with gas suppliers and its customers to manage demand as it continues to



execute its decarbonization efforts while meeting the current and future needs of customers without interruption.

Treatment of RNG

RNG could play an important role in the Company's decarbonization efforts. The Company, as described above, will be involved in exploring the opportunity to introduce RNG in the service territory. The Intergovernmental Panel on Climate Change ("IPCC") recognizes the value of RNG, treating all biofuels as emission-free at the point of use.

However, the DEC's recent recommendations could limit, if not eliminate the benefits of using RNG, and put at risk this component of the Company's LRP. The DEC's recommendation that biofuels be treated the same as conventional fuels at the point of use is contrary to the IPCC's recognition of biofuels as emission free.¹³⁵ Though not addressed in the DEC's recommendation, biogas's extraction and transmission processes leak less methane than conventional gas and could therefore be assessed fewer fugitive emissions. Even assuming that however, at best, RNG would be assessed approximately the same carbon footprint as conventional gas under the state's current methodology and RNG would not be considered carbon zero.

The Company is in the process of working on commentary to this proposal and will continue to monitor its outcome.

Technology Development Risks

Hydrogen

Hydrogen could play a significant role in realizing the clean energy future. However, the future of hydrogen as an economically viable heating fuel alternative is uncertain. Given its cost and energy properties, the most likely model would be blending hydrogen with natural gas. This would allow the use of the existing gas infrastructure and, at appropriate blending percentages, would allow the use of existing customer equipment and appliances. While Enbridge is testing this model with a 2% hydrogen blend, there would need to be significantly higher percentages in order to make a real GHG emission reduction impact. What this blend needs to be to make a difference still needs to be determined. Once the appropriate blend is determined, the long-term impact on the distribution system will need to be assessed so that the appropriate safety standards can be developed to transport, store, and properly blend hydrogen. The Company will consider pilots, leverage other utilities' experiences, and work with LCRI to determine the viability of hydrogen as soon as practical.

Should this viability as a heating alternative be validated, a significant increase in hydrogen supply will be needed to enable its contribution to GHG reductions. To provide sufficient production facility availability to meet possible growing demand, there may be a need for programs to incent production development ahead of firm demand. These programs could mirror those put in place to incent the development of renewable generation.

Gas Heat Pump Development

For gas heat pumps, the combination of extremely high efficiency and very low gas required results in significantly lower volumes of gas needed to deliver heating and cooling, while continuing to use existing infrastructure.

¹³⁵ <https://www.ipcc.ch/report/renewable-energy-sources-and-climate-change-mitigation/>



While there are proven technologies for large C&I applications, residential-focused equipment is just emerging, with current products only available for large home use (4,000 sf or greater). Therefore, it is not definitively known if this will be a viable alternative heating option.

The Company does expect new products to be made available for a broader set of home applications. It will monitor this progress and, as with current ASHP and GSHP technologies, work with customers, manufacturers, and installers to prove out this technology.

Managing the Transition

In meeting the CLCPA's goals, the Company anticipates natural gas usage will drop. This will be through a combination of EE, DR, and customer switching to cleaner energy sources (*e.g.*, heating electrification).

If this transition is not well-coordinated and managed, challenges could result for customers, the Company, and its shareholders. As discussed earlier, there is a risk for some of the current gas infrastructure to become stranded assets (not fully depreciated, no longer used and useful, no longer generating revenue). The Company will need to work with all stakeholders to address this situation to avoid economic challenges for the Company and its customers, while also treating shareholders and investors equitably.

Related, even as customers leave the gas system, there will continue to be customers that rely on gas for their energy needs, either by choice or not being able to afford to switch (*e.g.*, LMI customers). As the costs of maintaining the needed infrastructure to provide safe and reliable service is distributed among this declining customer base, rates could rise. As rates rise, those who can switch will, leaving the highest-risk customer, without the ready ability to switch, to pay for the remaining infrastructure, further putting upward pressure on rates. This could result in a downward spiral for the gas business.

Obligation to Serve

Under current New York state law and regulation, the Company has an obligation to provide gas service to any customer who requests it, with entitlements for service and main extensions (per tariff) included in the overall asset base and shared amongst all customers.¹³⁶ Barring any changes in law and regulation, these obligations could run counter to the CLCPA's goals, as well as cause costs to potentially increase to the remaining gas customers who do not choose other heating means. Until the law changes, as customers seek new energy service, the Company will need to take every opportunity to inform these customers of the value and availability of alternative-heating options, while maintaining the ability to provide safe, reliable gas service to customers it is obligated to serve.

There may be an opportunity to restructure the obligation to serve requirement. As currently structured the obligation is focused on the type of energy service (*i.e.*, gas or electric) with no consideration for how to best serve the customers' energy needs. This could instead be changed to the obligation to deliver what the customer needs. The customer requesting gas service may need this to provide heat and hot water, with that need being able to possibly be met through electric alternatives. If the obligation instead focused on satisfying the customer's need, the Company could then provide

¹³⁶ O&R approved to combine the typical 100-foot rule for both service and main extension for total of 200 feet incorporated into base rates (no individual customer contribution required).



CLCPA-aligned options. This would require statutory changes, but the environment and timing may be right for a proposal of this nature.

The Company will diligently manage the transition of the gas business as decarbonization occurs. Close coordination between the gas and electric businesses will serve to enhance this transition as well, helping to manage customer switching, so as to optimize needed investment on the electric side and manage the impact of the declining use of assets on the gas side. The Company will work closely with DPS Staff as well as it develops the new planning process to meet the needs of the customers and the requirements of CLCPA. This will also require a thoughtful way to retire assets responsibly while allowing fair recovery of the earlier investments made in these assets, as well as cost effectively maintaining the safety and reliability of those assets that remain in service. While this will be a process executed over decades, the Company needs to start developing this plan now.

Related, the successful use of RNG and/or hydrogen as economically, operationally, and environmentally viable natural gas alternatives will rely on the existing gas infrastructure for safe, reliable delivery. The provision of safe, reliable gas service will require timely answers regarding the viability of these natural gas alternatives to serve the Company's customers as the Company concurrently develops plans to transition customers away from natural gas.



Customer Experience

Introduction and Background

The Company's role is changing from one of providing customers universal access to safe and reliable energy at reasonable (prudent) cost to that of delivering clean energy solutions and universal access to safe, reliable, and resilient energy that provides societal value. Customers and communities expect the energy delivered to be increasingly clean, while maintaining reliability and enhancing resilience.

Customers want to be fully engaged in the clean energy future and the benefits it will provide them, their communities, and society as a whole. Customers are expecting the utility to make it easy for them adopt new technologies and realize the benefits of clean energy. Meeting customers' changing expectations and achieving New York's and New Jersey's clean energy goals will require a combination of solutions. Customers want solutions that make it easy for them to engage in the clean energy future, providing them with more choice, control, and convenience through seamless personalized services across all facets of their energy experience.

Choice

Customers are increasingly seeking greener options and expect their energy utilities to advise them, enabling them to choose from an increasingly wide range of energy-management and clean energy solutions. Customers do not only prioritize solutions that deliver cost savings, but some place a high value on the environmental impact of their provided energy solutions and want to be offered options that meet those needs.

To achieve both cost savings and sustainability, an increasing number of residential and business customers are seeking value-added products and services including EE and other demand management programs¹³⁷, customized offers and promotions tailored to their specific energy lifestyle needs.

Control

As customers adopt energy-management and smart customer-sited solutions, they increasingly seek control of their energy usage. Customers expect the Company, as their energy expert, to guide them in implementing and maintaining their chosen solutions¹³⁸. Enabling customers to take further control of their energy usage and costs, the Company will empower them to save energy, save money, and deliver a higher degree of satisfaction.

Convenience

Customers place high value on convenience and ease of use¹³⁹. Based on their experience with various other service providers (*e.g.*, Amazon), they expect interactions with the Company to be efficient, informative, and relevant. Smart and mobile devices are quickly becoming the preferred channel of easy two-way communications.

¹³⁷ O&R Trusted Advisors Activity 2, July 2019; O&R Trusted Advisor Activity 3, July-August 2019 presentations (KL Communications).

¹³⁸ O&R Trusted Advisors Activity 4, August 2019 presentation (KL Communications).

¹³⁹ Source: PwC Future of Customer Experience Survey 2017/18.



They also want ready access to information that is current and accurate. This includes energy usage, current bill information, outage information, and expected service restoration. The information on outages will become increasingly more important as customers' reliance on the utility for essential services grows. Today, most customers rely on the Company for power and cooling. In the clean energy future, this will expand to include heating and transportation. The customers' tolerance for interruptions will decline as their reliance on the utility increases.

Customers will benefit from the innovations and functionality offered by the growing array of smart appliances and products integrated through the internet, providing them choice, convenience, and control. Enabling this vision will deliver an exceptional customer experience and a truly satisfied customer.

Current Actions

Providing an outstanding customer experience is a priority that guides the Company in providing a sustainable and clean energy future. To meet customers' expectations and needs, the Company is investing in customer experience enhancements, technologies, and programs that meet their evolving expectations and facilitate delivering clean energy solutions while providing an enhanced customer experience.

ORU Marketplace

The ORU Marketplace (**My ORU Store**¹⁴⁰) provides an online shopping experience where customers can shop for EE products and services from the comfort of home. The EE products available for purchase include LED lamps, smart thermostats, EV chargers, smart-home products, and appliances. The platform also allows customers to receive available rebates for these items instantly at checkout. In addition to the e-commerce platform, modules are available on the Marketplace to give customers access to various energy savings programs (e.g., EV Charge Smart, Bring Your Own Thermostat) and prescreened contractors who can do installation services (e.g., weatherization, HVAC equipment, heat pumps). The ORU Marketplace also functions as an online channel through which the Company can engage with its customers and inform them about other EE programs and technologies (e.g., access information on EVs and solar solutions).

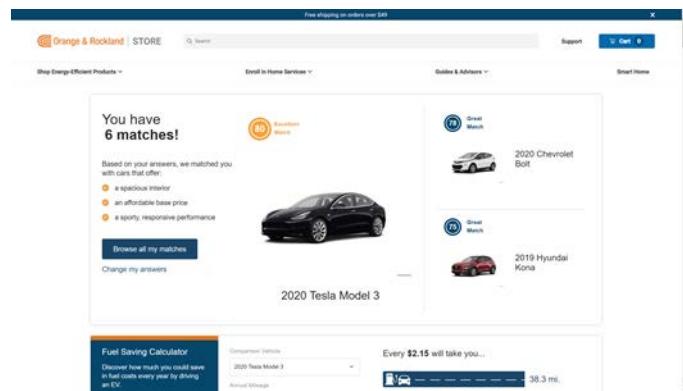
In 2019, more than 3,500 EE products were sold, saving a cumulative 295 MWh and more than 11,000 Dth (one-third of the annual gas savings goal). Through instant rebates at checkout, the Company provided \$160,000 in incentives to its customers. Through September of 2020, there have been more than 5,700 transactions selling over 7,300 EE products, resulting in cumulative savings of more than 280 MWh and 8,900 Dth.

- **Enhancing Choice.** The Company has developed "virtual" advisors to help customers find products and services to meet their needs. Accessed through the My ORU Store/ORU Marketplace, these include:
 - **EV Advisor.** Customers can find information and options available for EVs. By answering a series of questions (e.g., driving needs, target price, buying factors), they will be directed to the current EV choices that best fit their needs. The site also provides information on available incentives and rebates for EVs, as well as forecasted annualized savings and public-charging stations in the vicinity.

¹⁴⁰ <https://myorustore.com/>

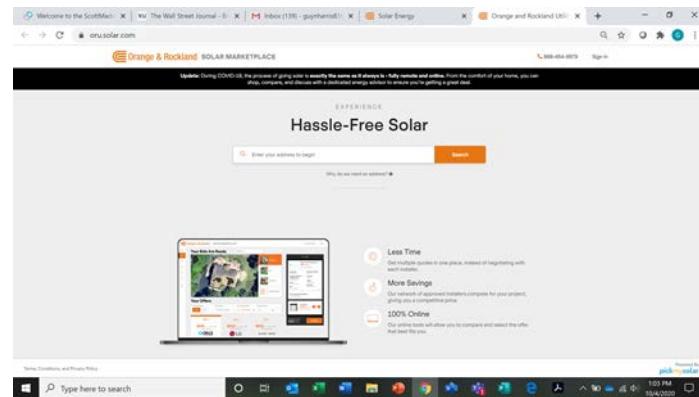


Figure 39: My ORU Store: EV Advisor



- **Go Solar.** The online site provides information and videos on solar, ES benefits, and available options. In partnership with **PickMySolar**, the site also allows customers to customize their project and compare offers from pre-approved community and rooftop solar providers and ES companies in New York and New Jersey. Using the online tool, customers input information about their residence/site and utility bill. They are assigned a personal energy advisor to guide them through the process and discuss solar and/or storage solutions that best meet their needs without having to negotiate with installers separately.

Figure 40: My ORU Store: Solar Marketplace



- **Heating Conversion Advisor.** Similar to the EV Advisor, the Company is developing a heating advisor to help guide customers to the clean heating solutions that best fit their needs. This was deployed by end of year 2020¹⁴¹.

AMI Program

As part of its commitment to enhance its customers' control over their energy use and costs, the Company has been executing its AMI program since 2017. AMI is a network of communication devices and smart meters that allow both the utility and customers to track the usage and supply of energy. Engaging customers in their energy usage can result in lowering customer bills, while providing benefits to the grid. AMI plays a critical role in providing the necessary granular data to customers needed for

¹⁴¹ Advisor deployed week of December 21, 2020.



greater control of their energy usage and bills, which can also lower customer costs through reductions in peak demand. AMI functionality enhances storm restoration, detecting customers' power status and integrating this with the outage management system, optimizing truck dispatch, and enhancing the accuracy of restoration updates.

In 2020, the Company completed the mass deployment of a total of approximately 363,000 meters in New York and 73,000 meters in New Jersey.

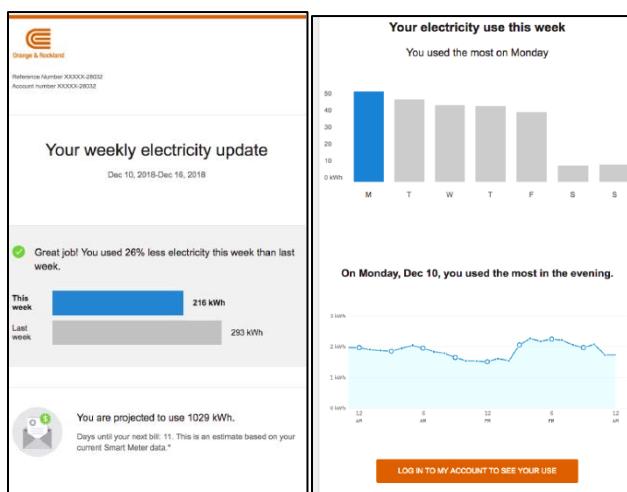
The AMI deployment also provides an opportunity to reduce carbon emissions in the following three ways.

- AMI provides data that may influence customer's behavior in a way that directly results in reduced GHG emissions through participation in EE and DR programs.
- Remote meter reading and connect/disconnect functionality has allowed the Company to take ten vehicles off the road, with a planned total of 18 by the end of 2020. This results in an annual carbon emissions reduction of 82.8 tons.¹⁴²
- AMI information provided to grid operators and planners enables the Company to control system voltage which enables a reduction in overall energy consumption.

Informed Usage

Customers can leverage the interval meter data made available by AMI to evaluate their energy consumption and make informed energy decisions. Customers can view their near-real time data, via the ORU website, in 15-minute intervals. In addition, customers can enroll in a weekly AMI ("WAMI") report, which highlights their weekly energy use and guides them to the Company's **My ORU Store**. For example, a customer's energy consumption pattern may indicate that they could benefit from replacing an aging refrigerator or installing a battery or solar array. **MY ORU Store** will list the types of products that are available to meet the customer's needs.

Figure 41: Example WAMI Report

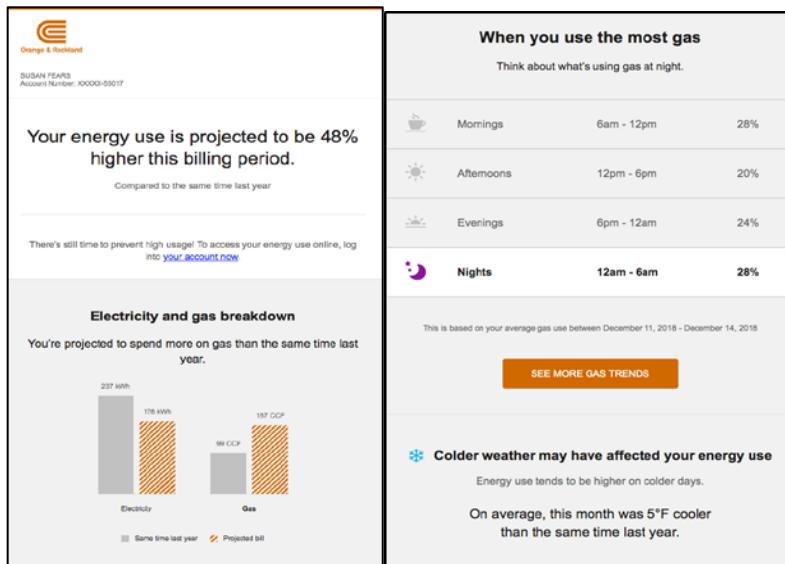


¹⁴² Based on EPA calculator estimating combustion vehicle efficiency as 22 miles/gallon, driving 11,500 miles per year.



High Bill Alert (“HBA”) emails are also an AMI-enabled tool available to customers. This is triggered when usage is a defined percent higher (currently 30%) compared to the same time of the previous year. The HBA gives customers an opportunity to avoid a higher-than-normal bill by proactively communicating the recent trend in energy use. The communication provides tips on how to better manage energy consumption and a direct link to the **My ORU Store** to view offers that may help them manage this increase.

Figure 42: Example HBA Email



Enhanced Functionality

The Company’s integrated system of AMI technology and its communications networks establishes the Company’s foundation for two-way communications between the utility and the customer, enabling new functionality, which includes the following.

- **Power Status Verification:** During outage events, the Company can “ping” AMI meters, either individually or at the circuit level to verify line and load-side voltage at the customer’s premises, reducing unnecessary truck rolls and increasing the pace of customer restoration.
- **Outage Detection:** Detecting when customers lose power and when power is restored, communicating this information back to the outage management system (“OMS”) and providing customers with accurate restoration alerts, even when they are not on the premises.
- **Events and Alarms:** Providing more visibility into the performance of the electric and gas distribution systems and enabling a safer working environment. Using the AMI communications network enables deployment of paired devices like methane sensors, that can not only detect but also report a gas leak.

The value of AMI to both customers and the Company has been demonstrated by two recent events.

- During the ongoing COVID-19 pandemic, while many New York and New Jersey customers received estimated utility bills, the Company was able to provide its AMI customers with bills based on actual energy usage. This prevented the potential “bill shock” associated with the true



up of estimated bills with actual usage. The deployment of AMI also eliminated the back-office work associated with these reconciliations. Alleviating that workload allows the Company to continue to focus on its programs to support customers during this unprecedented situation.

- Following tropical storm Isaias and associated restoration operations, the Company was able to use AMI functionality to “ping” meters and verify outage conditions. This allowed the Company to avoid almost 3,300 truck rolls. In addition to the reduction of work for Company resources, this enabled the Company to keep the customers better informed of their outage status and provide them with accurate restoration updates.

New Program Design Support

Further, leveraging AMI will support the development and design of new and enhanced EE and other programs. Data analytics using AMI data will support the design of robust and effective EE and DR programs that can better target how and when customers use energy and the real-time price impact of shifting usage. AMI provides a foundation of information and communications capabilities that will enable the Company’s customers to become informed and engaged energy consumers leading to individual customer bill savings and peak reduction that produces savings for all customers.

NYS Data Platform Pilot

As a result of O&R’s deployment of smart meters and its ability to import, validate, and process customer’s AMI data, the Company was selected to partner with NYSERDA and DPS Staff on a Data Platform pilot. This pilot allows DER developers to query anonymized system and customer data to identify potential customers. The lessons learned from this pilot will inform potential future database platforms and other mechanisms for the provision of system and customer data to third parties in support of New York’s clean energy goals.

Digital Customer Experience (“DCX”)

To carry out its commitment to a better customer experience, the Company is deploying the DCX in coordination with CECONY. This multi-year program is upgrading, redesigning, and improving the Company’s full suite of digital customer services, including websites, texting, email, apps, accessibility, and more. To do this, the Company’s DCX program uses state-of-the-art digital technologies that enhance online customer engagement and communication and provides customers with granular usage data generated by AMI. Accordingly, the Company developed six principles that continue to guide the DCX program efforts.

- **Customer First:** Through surveys, in-depth interviews, and journey mapping, the Company’s customers are guiding the Company to a best-in-class digital customer experience.
- **Simplicity:** One login is all a customer should need for access to intuitive services that minimize customer effort and have a consistent look and feel.
- **Personalization:** Data-enabled analytics and customer-driven optionality to allow customers to view highly relevant content and tailored solutions.
- **One Company:** The DCX operating model enables a collective, cross-functional approach and delivers a digital experience that is consistent across the entire website/app.
- **Agility:** Underlying solution architecture and an agile operating approach positions the Company to adapt to changes in customer preferences, markets, regulatory requirements, etc.



- **Security:** Safeguarding customer information and maintaining customers' trust, while maximizing usability is a central objective of DCX.

DCX will deliver an enhanced customer experience that meets the customer needs of today and is flexible enough to anticipate the needs of tomorrow. DCX's digital communication channels will play an increasingly important role as the Company launches new programs to engage customers. As these programs are rolled out, more customers will turn to digital channels, such as self-service options, to access and share information.

As part of the DCX initiative, the Company is redesigning its entire website. Using the DCX portal, customers will be able to gain insights about their energy use and turn those insights into action. Portal functionality is being tailored to specific customer segments, such as residential, small business, and large C&I. Results will be optimized for viewing on all devices, including mobile phones and tablets. The My Account platform is being integrated with the Company's website, providing customers with secure access using a single sign-on technology.

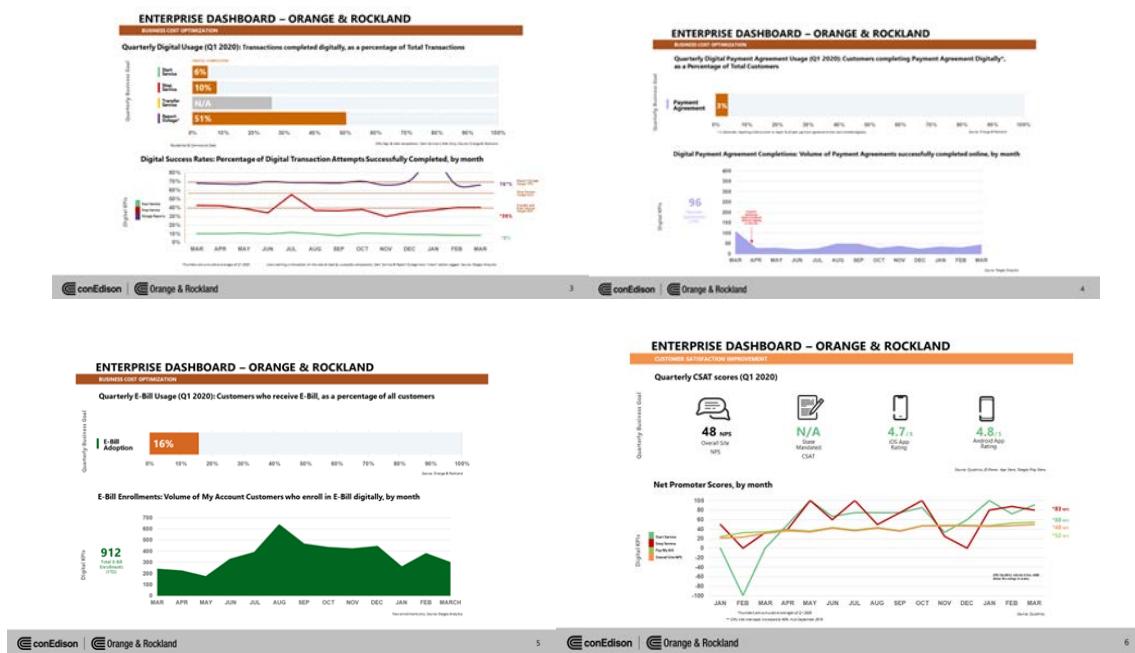
The redesigned website and other DCX channels will target not only providing an improved user experience, but also measurable business benefits, including enhanced customer satisfaction, deeper customer engagement, operational efficiency, and cost avoidance. Some specific functionalities currently enabled through the DCX platform are:

- Start/Stop/Transfer service;
- Report outage;
- E-bill;
- Payment agreement; and
- Home energy reports (electric/gas) and home energy analysis.

The Company tracks both utilization of the current functionality and customers' satisfaction/feedback. It uses this to enhance the capabilities, increase adoption, and develop new, customer-focused functions to enhance their experience with the platform and deliver what they need and value.



Figure 43: DCX Enterprise Dashboard Examples



Other Key Programs and Initiatives

- **Enhancing Convenience.** The Company is launching the Account Management Program. The program provides a dedicated Company representative who is available to qualified large power customers¹⁴³ with direct 24/7 customer access. The access allows for streamlined contact with the Company to address any need or coordination that may be required so that their operational energy needs are met to their complete satisfaction. The program is currently being evaluated and memorialized. This will also be aligned with the Company's priority critical facilities¹⁴⁴ annual outreach as required for compliance with its emergency response plans.
- **Qualtrics.** In order that the Company's actions are aligned and evolve with the needs of its customers, it is deploying Qualtrics, a robust, customizable customer survey platform. This will be used within New Business Services to obtain direct feedback from customers who have requested gas and electric services for construction. This will provide information to assess the effectiveness of current processes, as well as the opportunity for continuous improvement and so that the Company has a way to capture and act on a customer's current and evolving expectations. The plan is to deploy Qualtrics during Q4 2020 and/or Q1 2021.

¹⁴³ Large power customers are typically those in excess of 300 kW. For this program, the Company adds to this definition as those customers with plant service operations whose service reliability needs require a direct communications channel with the company.

¹⁴⁴ Critical facilities include hospitals, first responder headquarters (e.g., police and fire stations), emergency shelters, water filtration plants, sewage treatment plants, and commercial and not-for-profit organizations with a mission to assist in disaster relief and recovery.



Customer Privacy Protection¹⁴⁵

Given the amount of customer data the Company manages now or will in the future, cybersecurity and privacy are paramount. As the amount of information collected increases (e.g., AMI data, detailed usage by device, time of day detailed usage), protecting this information will become even more critical and challenging.

Recent actions by the European Union (“EU”) and California defining both requirements for protecting customer privacy and consequences for failing to do so demonstrate the importance of this. These actions could also serve as models that may be adopted by New York, New Jersey, or the federal government and may shape the requirements the Company would need to follow.

The EU put the General Data Protection Regulation (“GDPR”) into effect on May 25, 2018. The GDPR is focused on data protection and privacy in the EU and the European Economic Area (“EEA”). While protecting the data of individuals within the EU, it imposes obligations on any organization that accesses or transfers data on these individuals regardless of where the organization is located. The fundamental purpose of the GDPR is to give individuals control over their data. They have a right to know what data is being captured, what it is being used for and by whom, restrict the use of their data, and have the right to have their data removed. It also specifies penalties for violations of this regulation. These are based on the infringement and size of the company committing the violation. The most severe violation could result in a fine of up to €20 million, or 4% of the firm’s worldwide annual revenue from the preceding financial year, whichever amount is higher¹⁴⁶.

Passed in late June 2018 and effective January 1, 2020 (enforcement began July 1, 2020), the California Consumer Privacy Act (“CCPA”) has similar protections for California residents and applies to companies that serve California residents. For this to apply to a business, there is no requirement for the company to be located in California, just that it does business with California residents and has annual gross revenues greater than \$25 million or has personal information on 50,000 or more consumers/households or earns more than half of its annual revenue selling consumers’ personal information. There are also stiff penalties for violating the CCPA, including up to \$7,500 per record for a violation (e.g., data breach).¹⁴⁷

Maintaining the security and privacy of its customers’ information is a priority for the Company. The Company has robust cybersecurity protections in place and continuously monitors and responds to emerging cybersecurity risks. However, the challenge to do this properly grows as more customer systems are linked to the Company’s systems (e.g., smart appliance, EV chargers and vehicles, rooftop solar) and more data is made available. Together with the JUs, there is a common cyber and privacy framework to manage cybersecurity risks that applies to the expanded data sharing. The framework focuses on people, processes, and technology as being the foundation for a comprehensive cybersecurity and privacy governance program.

There is current legislation being proposed at both the federal and state level (both New York and New Jersey) that would provide stringent customer information protection laws similar to California’s and Europe’s. The Company has hired an outside advisor to help investigate the potential impact to current processes and how it will implement any required changes.

¹⁴⁵ O&R Privacy Statement located at oru.com/en/privacy-statement.

¹⁴⁶ Source: GDPR.EU website

¹⁴⁷ Source: ca.gov; https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB375



The Company has also undertaken a Phase Zero Privacy Readiness plan and study to determine what would be needed to provide GDPR/CCPA type choices to customers. The Company is currently reviewing the results of this study and prioritizing projects to implement to improve its governance and privacy process. The Company will continue to prioritize and review personally identifiable information (“PII”) protection requirements in this evolving area.

Future Opportunities and Focus

The Company will continue to enhance and improve its current portfolio of programs and initiatives. The ongoing focus will be to provide a truly exceptional customer experience focusing on customers’ needs for choice, control, and convenience.

Customer Care and Billing – Enterprise System¹⁴⁸

In coordination with CECONY, the Company is in the process of replacing its current legacy Customer Information Management System (“CIMS”). The identified Customer Service System (“CSS”) platform solution’s capabilities will meet the evolving business, customer, and regulatory demands. The key objectives are as follows.

- Develop a CSS solution that gives customers the ability to obtain and analyze information on their energy usage, service options, and billing options. The solution will offer simple, efficient ways for customers to enroll in programs (*e.g.*, EE). In addition, the solution will support new programs and public policy initiatives (*e.g.*, Green Button Connect¹⁴⁹ and new rate initiatives).
- Capture synergies between the Company and CECONY with a solution that implements a common CSS platform and standardized processes. The solution will be a modern and scalable platform with built-in functionality that minimizes the need for custom coding.

The Company’s modernized CSS will deliver simple and efficient solutions that address shifting customer needs and expectations. This new system will be key to the Company’s ability to adapt and thrive in the evolving and complex clean energy future as more and more customers participate in diverse energy solutions. The planning for this new system implementation has already started, with the deployment to be completed by the summer of 2023.

The Company has begun a joint project with CECONY to redesign its bill. Customers are seeking a simpler presentation of their energy usage and information. This project is led by team members from both companies. A series of focus groups were held to develop the final bill design and content. These changes are designed to improve the customer experience, providing billing information in an easy-to-understand format. The new bill design is scheduled to be completed by Q3 2021.

¹⁴⁸ This system is called **CORE** (Consolidated Edison, Orange & Rockland, and Rockland Electric) internally.

¹⁴⁹ The Green Button *Connect My Data* is the energy-industry standard for enabling easy access to, and secure sharing of utility-customer energy usage data. Utilities providing standards-based Green Button consumption and billing data can provide customers new data-driven services, programs, and platforms; digitally empowering them with the ability to securely transfer their data to third-party solution providers who can further assist them in monitoring and managing their energy.



Customer Relationship Management (“CRM”) Platform

The Company is in the process of evaluating various CRM platforms (Discovery Phase targeted for 2022). The idea is that a CRM system will be needed to optimize the technology and capabilities afforded by the new CSS.

Best-in-class CRM includes all aspects in which a company interacts with its customers. CRM also more commonly refers to the technology used to manage these relationships. This technology brings together all information and data generated by all customer interactions into one platform. This allows better management of this information and the ability to conduct analysis and recommend actions to improve the customer’s experience and satisfaction with the company. It also provides for internal efficiencies providing opportunities for streamlining current processes with inherent cost savings.

Other Initiatives

AMI: Rate Design Opportunity

The granular usage data provided by AMI can support the development of innovative rates. The ability to do this rate design effectively can be informed by the data analytics capability discussed later in this section. Effective rate designs can assist customers in making economically efficient decisions regarding their energy options, including adoption of technologies that allow them to optimize their energy consumption and energy costs.

Live Chat Agent/Virtual Agent (AI: Artificial Intelligence)

The Company is examining the opportunity to deploy virtual agent chat capabilities with the support of artificial intelligence (“AI”). This will be a “Virtual Assistant” that can help customers with routine interactions. With customers seeking more self-serve options, this virtual chat capability will provide one of those options. This functionality will allow AI chat bots to answer easier questions (e.g., balance inquiries, payments received, bill due date, and next meter reading date), freeing up customer service representatives (“CSR”) for more complex inquiries. The current plan is to deploy this capability mid-year 2024.

Risks and Mitigation

The Company is proactively looking at factors that could present risks to realizing its customer experience objectives. In addition to identifying these, the Company is also developing actions to help mitigate and minimize these risks.

Customer Experience-Enabling the Clean Energy Future

As discussed in other focus area sections, the Company is investing significant effort and resources to enable the realization of the clean energy future’s goals and objectives (e.g., EE programs, EV infrastructure development, electrification of heating readiness).

An important element of the success of these efforts is customers willingness to adopt and access these clean solutions, replacing technologies they have been using for many years. It is imperative that the Company provide the tools and guidance necessary to help customers make informed energy decisions. The Company will use technology and innovation to be proactive in providing customers with the information and means that they need to participate in a clean energy future and to facilitate customers understanding of how these technologies interrelate, can be adopted to benefit customers, and support the GHG reduction goals.



The Company must engage with customers in new ways, increasingly digitally or through mobile applications, to facilitate an environment where the customer has choice, control, and convenience. The information will need to be easily accessible with the ability to be personalized, as well as comprehensive, comprehensible, and effective.

In the upcoming rate case, the Company is proposing a multi-year program to comprehensively engage with customers and encourage adoption and enablement of clean energy technologies. Utilities serve a role to enable that adoption and participation. The objective of the Customer Enablement Initiative is to increase the adoption of emerging clean energy technologies through the enhancement of customer enrollment into a variety of existing and new programs. Given the Initiative's strong focus on customer engagement, detailed coordination will be required across the Company's Customer Energy Services, Marketing, and other organizations with customer-interfaces. The Company will need to be flexible in how it does this to allow for changes in customer preferences and available third-party offerings.

Timely and Coordinated Deployment of Customer Care and Billing – Enterprise System

The replacement of the current legacy CSS will provide benefits to the Company and assist in delivering outstanding customer service. Not only will this add a robust set of tools and capabilities for the CSRs as they engage with customers, but it will also provide a modern billing system that can meet the needs of the Company today and into the future.

However, the fact that the CSS “touches” every customer requires that the implementation and “cutover” from the old system to new be extremely well-coordinated and tested. Done well, the process will be seamless to customers, CSRs, and the business as a whole. Done poorly, this can disenfranchise customers (*e.g.*, erroneous bills received) stress CSRs handling numerous customer calls, and adversely impact customer satisfaction with the Company.

The Company will leverage its experience with the DCX deployment and use comprehensive project management in executing the CSS deployment. This will include well-coordinated phasing, testing, team training, and functionality piloting in addition to data cleansing and transfer from old system to new. This will help allow for a smooth “cutover” to the new system.

Data Management

There will be a significant amount of data that will be made available to the Company and its team members. Not only will this need to be properly captured, stored, and secured, but it will also need a capable, scalable analytics platform to turn this data into actionable information and provide increased value to the Company and to customers. If not done properly, this could overwhelm existing systems and team members, as well as result in potential security risks.

Partnering with CECONY to take advantage of the work they have done to define both business and system technical design and architectural requirements, the Company is in the process of developing a plan to implement a Data Analytics program. Required resource and system needs are being identified and incorporated into the current rate case, with a projected launch in 2022.

The Data Analytics program will be a key enabler to improving the customer experience and reducing operating costs by gaining a deeper understanding of customer needs through robust business intelligence. The Company has previously had success understanding customer needs by conducting direct customer research, such as surveys, focus groups and interaction with the Company's online Advisory



Community. However, to meet rising customer expectations, best-in-class companies across industries are employing advanced data analytics to develop a deeper understanding of customer needs.

The Company has a significant amount of data about its customers, including energy consumption, payment history, field visits, rate/program enrollment (e.g., energy efficiency programs, time of use rates, payment plans, low-income discounts), and the type and channel of historical interactions with the Company (including detailed interactive voice response ("IVR") and web logs). This valuable data currently resides in numerous internal systems and databases. Through the Data Analytics program, O&R will employ modern analytics platforms to connect these data sources and sort through the resulting data to identify patterns, trends, correlations and relationships. The Company can use this connected data to develop a better understanding of customer pain points experienced while interacting with the Company and predict current and future customer needs.

The Data Analytics program is foundational to the Company's efforts to improve the customer experience. With deep customer insights, the Company can meet rising customer expectations and engage them with new programs and services that will advance progress toward the clean energy future.



Planning Uncertainties

Achieving New York's and New Jersey's clean energy goals will require a combination of clean energy solutions. Despite knowing where carbon emissions reductions must come from—generation, transportation, buildings—there is significant uncertainty surrounding which energy sources and technologies will deliver them. Given this level of uncertainty, it is prudent that the Company advance carbon reductions, while maintaining flexibility to adopt a preferred pathway in the future. The pace and level of adoption for various clean energy solutions will be predicated on policy developments, technology performance, cost and complexity, and evolving customer preferences and expectations. In this section, the key uncertainties across these considerations that will guide adjustments to the Company's strategy are explored.

Policy

The Company expects that delivering the requirements of the clean energy future is essential to mitigating the impacts of climate change and meeting customers' needs and expectations. However, there may be new policies or changes to existing policies that expand, accelerate, limit, or eliminate the ability of utilities to provide energy solutions consistent with the goals of a clean energy future. To address this uncertainty, the Company will continue to advocate for policies that allow it to support clean energy goals. Examples include:

- Continued federal and state support of clean energy solutions (*e.g.*, EVs and renewable generation) through incentives and rebates that will increase affordability and drive adoption;
- Utility ownership of large-scale renewables (LSRs) to meet New York's Renewable Portfolio Standards ("RPS") (2030) and clean generation targets (2040) and New Jersey's RPS (2030) and clean energy targets (2050);
- Utility ownership of large-scale ES to help meet state targets (New York 3 GWs and New Jersey 2 GWs by 2030);
- Building codes and standards that will support the transition to more energy efficient structures (building envelope standards) and low-carbon alternatives for heating and cooling;
- Revisions to utilities' current obligation to serve a specific commodity to an obligation to provide energy which can encourage a more thoughtful transition of customers to low-carbon alternatives;
- Expansion and continuation of government-supported incentives and rebates for low-carbon solutions/alternatives for generation, transportation, and buildings to improve affordability; and
- Acknowledgment of clean attributes of renewable natural gas and low-carbon resources to create markets for these solutions, maintain optionality to meet emissions reductions goals, and enable utilization of gas delivery infrastructure.

CECONY's State Regulatory Affairs and Corporate Affairs organizations lead the Company's advocacy efforts through reoccurring engagement with key stakeholders (*e.g.*, DPS Staff and BPU Staff, city agencies, local municipalities) on important issues that affect the Company. The Company will continue to seek out opportunities and participate in studies that will help set policy direction (*e.g.*, CLCPA Working Group initiatives).



Technology

Both improvements in existing technologies and emergence of new technologies can fundamentally shift projected pathways to decarbonization. Technology innovation that improves efficiency, drives cost reductions, and minimizes complexity will help determine which carbon-reduction solutions and energy sources will ultimately deliver the clean energy future, but these are evolving. To address this uncertainty, the Company will continue to monitor advances in technology solutions across these three dimensions.

1) Performance

Technology is improving efficiency and increasing the potential of many clean energy solutions, including:

- Cold climate air-source heat pumps that eliminate or limit the need for supplemental heating;
- Li-ion battery cycling (charge/discharge) and density to improve EV mileage range and charging speed;
- Battery chemistry developments/breakthroughs for long duration/seasonal storage; and
- Improved panel efficiency and capacity factors for utility-scale and distributed solar PV systems.

In addition, the ability to use the existing gas system infrastructure to integrate emerging low-carbon resources (e.g., green hydrogen or methane blending, RNG) can further expand the options available to reduce carbon emissions.

2) Cost

Technology innovations are driving cost reductions in:

- Renewable generation, making it competitive with traditional generation sources for both new builds and existing facilities;
- Energy storage, expanding use cases and helping address the challenge of renewable intermittency and enhancing system resiliency;
- Li-ion batteries, improving affordability and driving adoption of EVs and expand access to energy storage solutions (front-of-the-meter, behind-the-meter);
- Air-source and ground-source heat pumps, helping to increase electric-heating market share and reduce emissions from fossil fuel alternatives;
- Capital cost for electrolyzers, driving hydrogen production costs lower and making green hydrogen a viable low-carbon solution for future use in gas delivery infrastructure;
- Capital cost for carbon-capture technologies, potentially making green methane or blue hydrogen a viable low-carbon solution for future use in gas delivery infrastructure; and
- Capital cost for gas heat pumps, potentially creating a path to lower emissions from continued use of natural gas or significant reductions when paired with RNG (assuming commercial availability of GHP technology).



3) Complexity

The ability to standardize market solutions (*e.g.*, modularized solutions that address space constraints) and establish technical expertise for support services is key to reducing complexity and facilitating customer adoption of:

- ASHP/GSHP installations in large multi-family and commercial buildings;
- ASHP/GSHP service support from HVAC providers; and
- Expanded building envelope offerings/programs.

In addition, supply chain development and scale will help to improve market maturity for emerging technologies (*e.g.*, electrolyzer manufacturing and production).

The Company will continue to develop, implement, and learn from its pilot/demonstration projects to expand and scale solutions.

Customer Preferences and Expectations

Customers' needs and expectations are continuing to evolve across all sectors. What they experience or see in one will influence what they want in another. For example, the proliferation of near on-demand service options in industries like retail and banking have increased expectations for similar near on-demand options for energy services, such as the ability to view and optimize total energy use and costs. While the Company is taking actions to meet the needs and expectations of the customer today, it must have robust and responsive processes, systems, and team members to meet the future needs and expectations. The Company will continue to monitor the evolution of customer preferences and expectations to deliver energy services customers expect.

Increased dependence on delivered energy will require the Company's energy delivery systems to be more reliable and resilient. In addition to traditional uses, such as lighting and power for their ever-expanding suite of household devices, customer's may now rely on electricity to charge their vehicles and both cool their homes in summer and heat them in winter. As customers adopt new clean energy solutions, they will increasingly rely on energy to power every aspect of their lives. This challenge is only compounded by climate change, which continues to increase the frequency and severity of weather events in the region, making resiliency of our delivery systems critical to mitigate customer disruption. The Company continues to address these issues through proactive planning, system investments that reinforce its infrastructure, and improved restoration efforts (please see the Infrastructure Planning section of this LRP for additional details).

As is the case with most service industries, customers' expectations continue to increase and evolve. They want to have positive interactions and experiences that are memorable for the right reasons. The Company must evolve as an energy service provider to meet increased customer service expectations of choice, control, and convenience.

Company Actions

Planning uncertainties will provide both opportunities and challenges for the Company to enable a clean energy future. Monitoring these emerging issues and trends and identifying strategies to mitigate or advance them will be essential as the role of the utility continues to evolve. The Company has several departments that both formally and informally ensure this happens. These include the following.



- **Sarbanes-Oxley (SOX) and Enterprise Risk Management (“ERM”) (Con Edison)** is the department that administers the ERM program for all four of Consolidated Edison Inc.’s (“Con Edison”) subsidiaries (*i.e.*, CECONY, O&R, Con Edison Transmission (“CET”), and Con Edison Clean Energy Businesses (“CEB”)) helping to protect value for its shareowners, customers, and the communities it serves. The ERM team works closely with senior management and employees across Con Edison to proactively identify emerging issues and trends, align risk exposure to organizational priorities, drive risk informed business decisions and resource allocation, and monitor and assess known risks using quantitative metrics (*i.e.*, key risk indicators). To improve Con Edison’s ability to navigate an increasingly dynamic business landscape, the ERM team recently enhanced its framework to include the identification, monitoring, and reporting of emerging issues and trends in areas impacting Con Edison and its subsidiaries. Review of emerging issues and trends stretches Con Edison’s lens of focus, identifying threats and opportunities that may develop in the next two to ten plus years. These emerging issues and trends are watched at the organization and CEI levels. Con Edison and its subsidiaries have cross-functional groups of experts examine and report on the relevant areas’ emerging issues and trends. These groups identify the implications to Con Edison and its subsidiaries (as applicable) and develop recommended actions to mitigate threats and realize benefits from opportunities.
- **Strategic Planning (Con Edison)** is a valued resource for senior leaders and their businesses that provides the leadership, insights, and counsel that enable agile and effective strategic decision making—fostering innovative, sustainable, and industry leading solutions. This department leads Con Edison’s long-range planning and business strategy development. It regularly engages internal and external stakeholders and experts to identify, monitor, and analyze implications and opportunities of emerging industry issues and trends.
- **Utility of the Future (“UotF”) (O&R)** is responsible for the governance and oversight of the Company’s efforts to implement programs and projects that support greater DERs and clean energy adoption and the clean energy goals. This includes supporting REV, CLCPA, EMP, and other decarbonization-related proceedings and representing the Company at NYPSC and NJBPU meetings, working groups, and coalitions. The UotF organization is also responsible for designing, implementing, or overseeing projects or programs resulting from these proceedings.
- **Research and Development (“R&D”) (Con Edison)** is a valued resource that facilitates innovation and the development of advanced technology solutions for the betterment of Company operations. The department collaborates with external R&D organizations, such as the EPRI, GTI, the U.S. Department of Energy National Laboratories, and academic institutions for the purpose of technology scouting and the exploration, assessment, testing, demonstration, and piloting of early-stage technologies. The department also pilots already proven technologies to test their compatibility with the utilities’ energy systems.

Beginning in 2020, these groups coordinated their efforts to understand how emerging issues and trends are discovered, analyzed, and tracked across Con Edison. The effort will seek to improve interaction on emerging issues and trends to help maximize collaboration and information sharing, reduce redundancies by developing a future state communication plan, and optimize use of resources. The major benefits of this include:

- Facilitating collaboration and idea-sharing on potential challenges and opportunities facing Con Edison and its subsidiaries;



- Incorporating multiple perspectives on how these challenges and opportunities could impact Con Edison and its subsidiaries; and
- Derive actionable knowledge that can inform efforts to anticipate and mitigate future risks while laying the groundwork for capitalizing on opportunities.

By identifying and monitoring planning uncertainties, the Company can evolve and be ready to meet the changing role of the utility, delivering the clean energy future and meeting the needs of its customers. The Company is tailoring efforts to enable adoption of clean energy solutions by continuing to scale mature markets (*e.g.*, EE), accelerating markets where performance and cost are closer to parity (*e.g.*, electrification of transportation), monitoring developing solutions (*e.g.*, low-carbon resources), and meeting the expanding needs and expectations of its customers.



Infrastructure Planning and System Resiliency

Through the period addressed in this LRP the Company will continue to expand on infrastructure improvements initiated after Superstorm Sandy, and Winter Storms Riley and Quinn that are designed to harden its infrastructure and enhance resiliency to weather events. Since 2013, the Company has leveraged lessons learned, investing a total of \$103.5 million to improve electric and gas resilience.¹⁵⁰ The Company will continue to invest to enhance the system's resilience to increasingly frequent extreme weather events driven by climate change.

New grid capabilities are also required to address changes in both the source and end use of energy. The Company will continue to invest in T&D solutions and technologies required to build upon foundational systems and infrastructure to support a smart grid. Examples include AMI, Geographic Information System ("GIS") mapping, and an ADMS system, which will better enable the Company to develop and manage the modern, two-way grid.

The Company is launching an integrated portfolio of projects and actions which are designed to:

- Deliver the modern energy grid capable of supporting the growing portfolio of renewable energy sources;
- Enable innovations in heating and transportation required to meet CLCPA and EMP goals;
- Empower its customers to have control over their energy needs, enhancing their choice and convenience;
- Provide a safe, reliable, and resilient energy delivery system that can handle customers' growing reliance on it for essential services;
- Address aging infrastructure and meet Company's design standards; and
- Mitigate the impact of increasingly frequent extreme weather events resulting from climate change.

The Company's infrastructure investment plan has three integrated components focused on making core investments, investments in clean energy technologies and investments to expand the capabilities of the Company's electric delivery system.

- **Core Investments:** Focused on maintaining and enhancing the safety and reliability of the energy delivery system, while improving its overall resiliency to meet current and future challenges.
- **"Clean" Investments:** Focused on enabling the delivery of the clean energy future. These include EV charging infrastructure, EE, and NWAs.
- **Technology Investments to Expand Grid Capabilities:** Focused on enhancing the customer experience, delivering new grid capabilities, and accommodating new business.

¹⁵⁰ Since 2013, the Company has invested \$59.2 million in New York and \$44.3 million in New Jersey.



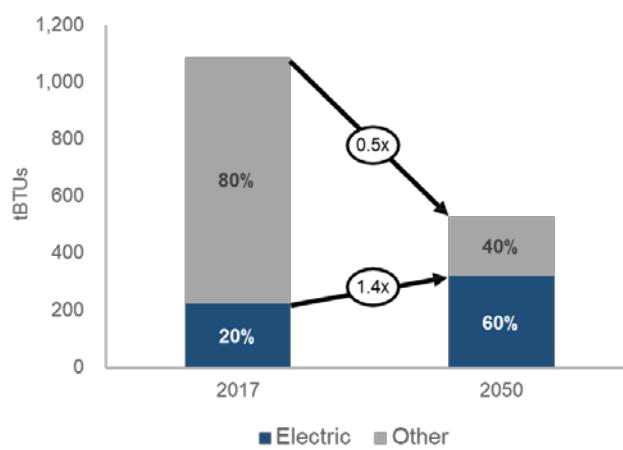
All of these investments work together enabling the Company to deliver on its clean energy future commitment. Done right, these investments and associated actions result in a “Win – Win – Win” scenario for its customers, for the Company, and for the states:

- **Win for the Customer:** Delivering enhanced customer experiences giving them choice, control, and convenience in delivering their energy requirements.
- **Win for the Company:** Providing new business opportunities, increased revenues/sales, becoming a leader in industry, and establishing a more reliable and resilient system.
- **Win for the Regulators/State:** Delivering the required policy and clean energy goals.

Improving the Core Infrastructure

As the clean energy future’s goals and objectives are realized, the Company’s customers’ reliance on safe, reliable energy service will increase as their essential needs such as heat, hot water, and transportation are electrified. While customers’ energy use is expected to decline significantly by 2050, electricity will grow from approximately 20% of all energy consumed in 2017 to approximately 60% of all energy consumed by the end of the period covered in this plan; supporting the Company’s accelerated investment in reliability and resiliency.¹⁵¹

Figure 44: Total Delivered Energy (Con Edison)



In addition to increased system reliability requirements due to this growing reliance on the Company for essential services, the increased frequency and severity of climate events produces the need for enhanced system resiliency. Since 2011, the Company has experienced six significant severe storm events.¹⁵² The 2020 Atlantic hurricane season is the most active on record,¹⁵³ potentially signaling

¹⁵¹ Source: CEI Strategic Planning analysis. CEI October 2020 Board presentation. Total energy needs include transportation, power, heating, and cooling for buildings and individuals.

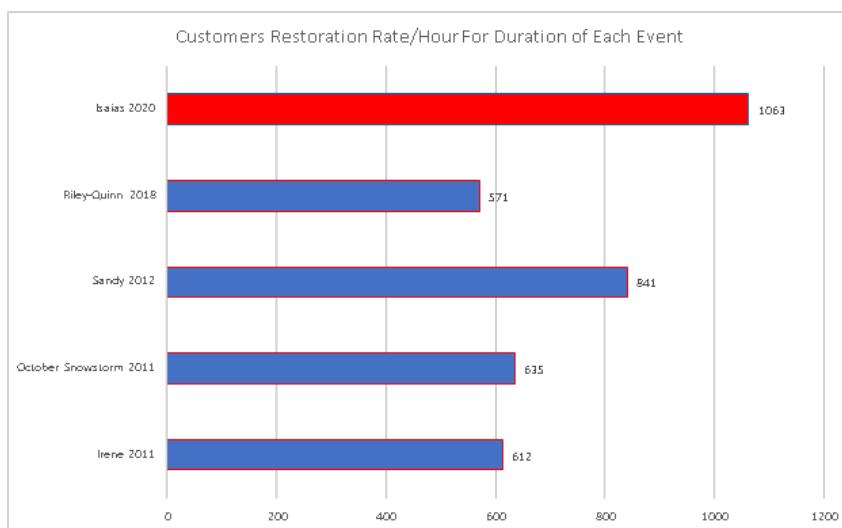
¹⁵² Hurricane Irene (August 2011); Halloween nor’easter (October 2011); Superstorm Sandy (October 2012); Winter Storm Riley (March 2018); Winter Storm Quinn (March 2018); Tropical Storm Isaias (August 2020).

¹⁵³ <https://www.nhc.noaa.gov/>. To date there have been a total of 31 tropical or subtropical cyclones, 30 named storms, 13 hurricanes, and 6 major hurricanes, including one Category 5 hurricane.



a dramatic increase in storm active for the future. The ability of the system to withstand these events and the speed at which the Company can recover and restore service are critical, as demonstrated by the August 2020 Tropical Storm Isaias. Despite the significant damage to the Company's distribution system resulting from Isaias, improvements such as ongoing infrastructure investments; distribution automation investments, the integration of AMI into the Company's OMS; lessons learned from previous major events; and organizational enhancements to its Incident Command System ("ICS") allowed the Company to avoid over 2,900 truck rolls and realize over 46,000 avoided customer outages. The 1,063 customers restored/hour for Isaias exceeded the Company's next best performance (Superstorm Sandy in 2012) by 26% and exceeded its performance during the last major event to hit the Company service territory (Winter Storms Riley and Quinn in 2018) by 86%.

Figure 45: O&R Customer Restoration Rate¹⁵⁴



Despite these efforts, the Company's overall restoration efforts fell short of the expectations of customers, municipal leaders, and regulators. This points to the fact that, despite advances made, the Company will need ongoing focus on investments in its systems and processes to continue to improve the resiliency and readiness of its systems, harden energy systems, minimize customer impact and disruptions and restore customers faster.

Storm Hardening, Resiliency Measures, and Emergency Response

The Company continues to expand on measures initiated after Superstorm Sandy designed to harden its infrastructure, enhance its resiliency, and continuously improve emergency response. Specific programs and actions are described below.

- **Tree Trimming and Vegetation Management ("VM").** Trees growing into and falling on overhead power lines are the single-largest cause of electric power outages in the Company service territory. The Company has conducted studies of vegetation risks to its system and developed an enhanced distribution system VM program. Part of this program includes hazard tree identification and removal which has resulted in removing more than 2,100 high-risk trees since the program's launch in August 2018.

¹⁵⁴ Source: O&R's "Preparation and Restoration Performance Report Tropical Storm Isaias (Matter 20-01633)"



- **Electric Distribution System Investments.** The Company has completed more than 50 storm hardening projects since Superstorm Sandy, which have eliminated or limited outages. The Company continues to identify areas that will benefit from these resiliency projects. These types of projects include:
 - Reducing circuit segment sizes through the addition of sectionalizing switches;
 - Undergrounding a substation feeder exit (and eliminating double circuit pole lines);
 - Establishing new circuit ties;
 - Upgrading an existing line to mainline construction;
 - Replacing open wire and aging poles with a new spacer cable (Hendrix) system;
 - Relocating poles to the street from off-road rights-of-way; and
 - Targeted undergrounding of distribution lines.
- **Grid Modernization:** The Company has continued to build out its distribution automation capability throughout its service territory. To date, the Company has installed more than 1,000 SCADA controlled field devices, including multiple recloser loops that allow for automatic fault isolation. These help reduce customer outages and provide the Distribution Control Center (“DCC”) with immediate notification of system issues. The ability to communicate with the field devices also gives the DCC the ability to segment damage locations and restore customers without field personnel onsite. The implementation of the ADMS will further allow the Company to realize the full value of these deployed field devices and controls. With the enhanced capability of the system to self-heal (auto loops) and the ability for the DCC to interface dynamically with and control switching devices, the reliability and storm resiliency of the Company distribution system will continue to improve as the Company continues to build out its infrastructure.
- **AMI:** The Company’s AMI system provides enhancements to service restoration activities and contributes to a reduction in outage duration and costs. Smart meters automatically transmit when power to the meter is lost as well as restored, enabling automatic outage and restoration notification. This allows the Company to manage service restoration efforts and helps to confirm partial restoration steps for larger outages. This feature enables individual meters and groups of meters to be “pinged” to confirm the power status of individual customers. This ability greatly improves the efficiency of the Company’s restoration process by eliminating unnecessary truck rolls and dispatching restoration crews only to actual outage locations.
- **Emergency Response Plan Enhancements (“ERP”):** The Company also recognizes the value of assessing its performance after each storm to identify opportunities for improvement. The Company works with regulators, customers, and municipal partners to determine ways to strengthen future storm preparation and restoration performance. The Company also seeks to continuously learn and improve its processes through interactions with industry groups (e.g., EEI, the Association of Edison Illuminating Companies (“AEIC”)) and benchmark peer utilities to evaluate and apply storm restoration best practices. The Company incorporates appropriate changes into its ERP and other policy guidelines and procedures to improve its preparation and restoration efforts, continually improving its storm response capabilities in order to better serve its customers.



In addition to these actions, the Company will be leveraging the work done by CECONY in the development of its Climate Change Implementation Plan (“CCIP”). The Company will participate in the eventual internal governance structure for the CCIP. This can serve as a reference for the Company, help shape its future actions and activities, and help inform the possible development of its own similar plan.

Through these targeted investments and actions, the Company is preparing itself and its systems to respond to current and future events. This is critical given the unprecedented frequency of significant weather events impacting the Company and its customers.

Enabling the Clean Energy Future

The Company is committed to promoting clean energy and decarbonization goals that are critical to the sustainability of its region and the planet. As discussed in the Strategy – Areas of Focus section of this LRP, the Company has launched an array of programs and projects aimed at supporting GHG reduction goals: accelerating EE investments, evaluating system and ES investments that will reduce carbon fuels from the energy supply portfolio, and planning for grid investments needed to support the electrification of heating and transportation.

Delivering New Capabilities

The Company is investing in new capabilities that will increase the delivery system’s flexibility and enable customers to manage their energy use and costs. The bulk of this investment falls within two broad areas: grid modernization and enhancing the customer experience.

Grid modernization will make the electric grid more flexible and transform it from a one-way delivery system into a two-way dynamic energy delivery system. As described in the Focus Area sections of this LRP, some of these investments include technologies such as ES, DERMS, advanced data analytics, and grid-edge sensors. These technologies will more fully integrate clean energy into the delivery system, meeting customers’ energy needs, regardless of where and how their energy is generated. The integrated delivery system will also be more reliable and resilient.

Investments enhancing customer experience will provide customers greater control and the ability to better manage their energy usage and provide a more convenient interface to the Company. More details of these programs and initiatives are described in the Customer Experience section of this LRP.

Cyber and physical security are focus areas for all of the grid capabilities that the Company is identifying and pursuing. It is critical that the Company protect people, data, and infrastructure in an ever-changing environment with increasingly diverse resources. The Company is also making investments and enhancing its processes to ensure the ever-increasing requirements of cyber and physical security are delivered.

Summary

For the 2021–2025 period, the Company is currently forecasting a total investment of approximately \$995 million, enabling the delivery of enhanced and new capabilities. Approximately 40% of this investment is expected to be in both clean energy and new capabilities investment, with the rest focused on delivering more reliable and resilient energy delivery systems.

Depending on the pathway to realizing the 2050 clean energy future goals, there will be a range of required investments to enable the clean energy future. These will be dictated by the overall pace of decarbonization efforts (primarily driven by the level of electrification of transportation and heating, as



well as the need for and type of supplemental heating), customer engagement and actions, and the Company's cost management initiatives.

All of these investments work together to enable the Company to become the energy utility of the future, empowering customers, and delivering the clean energy future, resulting in a "Win – Win – Win" scenario for all stakeholders.

To date, the Company's investments in infrastructure, programs, projects and the associated hiring have served as significant economic stimulus to the communities it serves. In this current challenged economy, the value of this investment is even more important. Executing these projects and programs puts people to work, sustains and strengthens supply chains and commodity purchases, supports logistics and back office functions, and increases the tax revenues for our government and municipal partners. In short, in times of economic stress, utilities have been and continue to be positive economic enablers.

In addition, optimizing the Company's forecasted costs and capital will be crucial. There are cost impacts to both supporting the core business and transitioning to the clean energy future. The Company will continue to focus on mitigating cost increases through frequent reviews to drive efficiency and cost optimization. Details of these programs are profiled in the Cost Management section of this LRP.

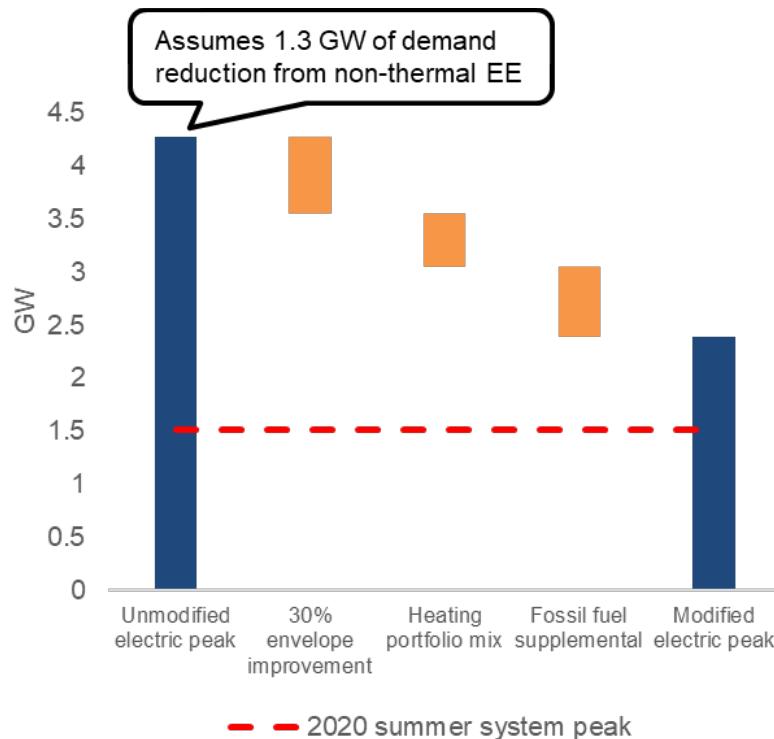


Cost Management

Introduction and Background

The next 30 years will see a new energy industry emerge, with changes in how energy is supplied, distributed, and used by customers. As the goals and objectives of the clean energy future outlined by the CLCPA and New Jersey's EMP are realized, these changes will significantly impact the Company's energy delivery systems. This is driven by many factors, including the need for the electrification of the transportation and heating sectors, the shift to a winter system peak, and forecasted growth in large-scale renewables. Even when accounting for an anticipated reduction of 1.3 GWs from EE programs, the Company forecasts this could result in a winter peak that is approximately 1.5 times greater than the 2020 winter peak.¹⁵⁵

Figure 48: O&R 2050 Peak Demand Forecast¹⁵⁶



These demand changes, combined with the deployment of large-scale renewables, will require significant investment in T&D systems. Investment levels will be further dictated by the pace of adoption and technology mix, which are also influenced by regulatory policy. Customers' increasing reliance on the electric system for a greater share of their energy needs will also amplify the need for an increasingly reliable and resilient electric system. This required investment will be at levels above what the Company has traditionally seen to deliver safe, reliable service and accommodate growth in the service territories.

¹⁵⁵ Source: O&R Engineering and CEI Strategic Planning analysis

¹⁵⁶ Source: CEI Strategic Planning & O&R Engineering Analysis; scenario assumes highest level of electrification



The required incremental investment will be primarily determined by the technologies employed to meet customer needs and clean energy requirements, mostly linked to heating. The variation in the magnitude of this incremental increase is caused by the type of supplemental/backup heating used. The greatest amount would be needed to support all electric supplemental heating, while the lowest would result from the use of all fossil fuel backup heating.

What will not change is the Company's ongoing responsibility to deliver safe, reliable, and quality service in a manner that is environmentally responsible, as well as cost-effective. The Company is keenly aware of the impact these investments will have on its customers, enabling delivery of the clean energy future but increasing costs. As more of its customer's energy costs shift toward electric, the Company will need to engage with and inform customers' clean energy actions, benefits, and impacts as this change occurs, as well as optimize its costs.

The Company is committed to taking action to mitigate the impact of these costs by the following actions.

- Identifying sustainable O&M cost improvements, including those enabled by technology and process improvements, as well as organizational redesign. The Company's Business Cost Optimization ("BCO") program coordinates the identification, development, and execution of cost savings actions and initiatives designed to deliver and sustain these savings.
- Optimizing its capital investments through a comprehensive, integrated Capital Optimization Process, designed to efficiently and cost effectively deliver the Company's operating, strategic, and regulatory requirements.
- Promoting policies that are focused on lower cost clean energy efforts.

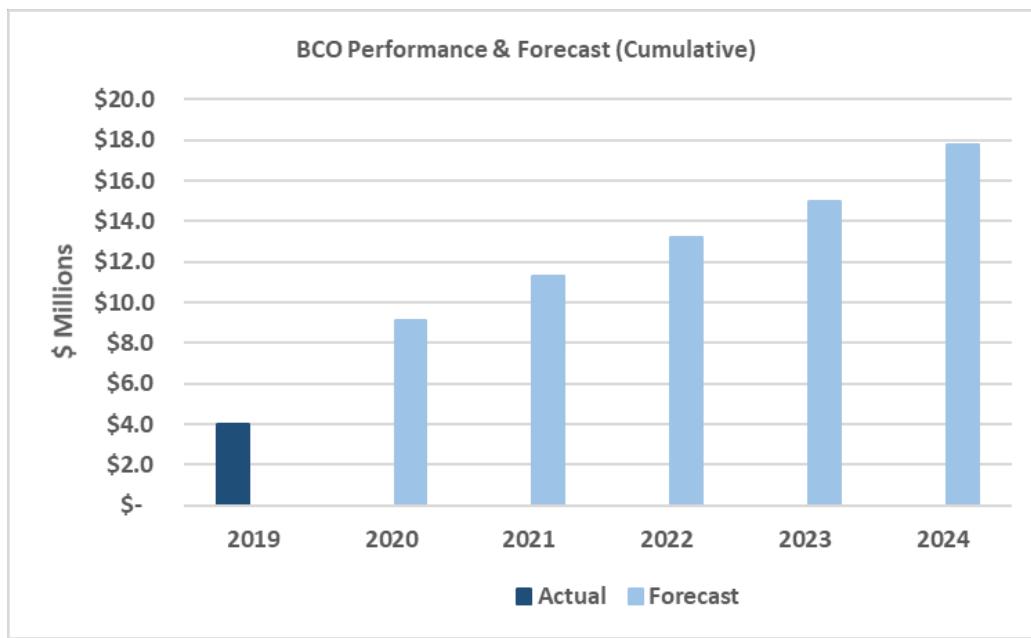
Business Cost Optimization

The Company's BCO program has three main objectives:

- Identify opportunities to reduce O&M costs;
- Develop a plan for implementing cost savings initiatives; and
- Build a long-term and sustainable process for achieving ongoing cost savings.

Launched in late 2017, the BCO program's first task was to conduct a comprehensive, enterprise-wide diagnostic to identify and prioritize savings opportunity areas, followed by initiative design and delivery. The primary categories of initiatives identified organizational design/redesign, process improvements, and new and upgraded technology deployments.

The Company launched its first set of initiatives in 2018, delivering a total of more than \$4 million in annualized savings, which was approximately 2.7% of the overall O&M budget. For 2020, the program has delivered more than \$3 million of additional savings (through Q3), with a total 2020 target of \$5.1 million.

Figure 49: O&R BCO Performance and Forecast (2019–2024)¹⁵⁷

For 2021–2024, the Company forecasts that the BCO program will deliver a total of almost \$10 million of additional savings.

The BCO program seeks to identify processes, functions, and tasks that can be performed more cost effectively, whether through technology or other changes, at the same level of service but at a lower cost to customers. At the same time, it is imperative that none of the contemplated changes compromise public or employee safety, adversely impact legal or compliance requirements (especially in the environmental area), produce negative customer experience impacts, or adversely affect the Company's record of service reliability. Given the expectation of greater severity and frequency of severe storms due to climate change, and increasing customer expectations regarding electric service, the Company is considering how to make additional selective investments that will improve resiliency, balanced against the additional costs associated with those investments.

Managing costs is key to the Company realizing its full potential as a business and providing value to its customers, especially as the business model evolves to adapt to industry and technological changes. The BCO program embodies the Company's fundamental commitment to a long-term, sustainable cost management process that will benefit its customers, its employees, and the Company as a whole.

Capital Optimization¹⁵⁸

The Company's capital budgeting process seeks to maximize the value of the Company's capital investment portfolio. The process classifies projects and program requests into tiers based on whether they are operationally required, regulatory mandated, or strategic. In addition, each capital project or program is given a value and ranked based on defined corporate strategic drivers including:

¹⁵⁷ Source: O&R BCO Team updates. O&R started tracking BCO performance in 2019

¹⁵⁸ Source: Process details from CEI **Capital Optimization Guideline(CPP-10)** and **Capital Optimization Procedure**



- Improving public and employee safety;
- Reducing costs to customers;
- Reducing and managing risk; and
- Providing reliable service.

The anticipated value delivered to the corporate strategic drivers is weighed against the estimated investment required to execute the capital project. Once potential projects and programs are assigned a strategic value, the Company develops multiple optimization scenarios, prioritizes projects and programs, and prepares a recommended portfolio. Finally, a Governance Committee performs a review and issues a recommended portfolio and budget. This process allocates funds efficiently to reduce operating risks and meet strategic objectives.

Policy Advocacy

As the overall progress toward the clean energy future evolves, the results and effectiveness of current actions and initiatives will be used to shape and inform what the Company will emphasize in the future. Policy will shape both the “what” needs to be emphasized and the “when,” as well as influence the eventual costs. The Company will advocate for those actions, initiatives, and enabling policies that meet the clean energy requirements most cost effectively.

Company Commitment

Regardless of the eventual path followed to deliver the clean energy future, there will be significant increases in investment required so that the Company can continue to provide safe, reliable, and resilient delivery of clean energy. As customers adopt clean technologies, they could see additional costs needed to meet GHG reduction targets. Managing costs will be critical for realizing the Company’s full potential as a business and providing value to its customers. The Company is committed to managing its costs diligently and to will employ sustainable cost management processes that will benefit its customers, its employees, and the Company as a whole.



Conclusion

In the coming decades, the utility industry is expecting a remarkable evolution driven by ambitious clean energy goals, improvements to clean energy technologies, and changes in customer behaviors and preferences. This will also be shaped by the impact of climate change and the resulting increase in frequency and severity of significant weather events.

This will manifest in several future state changes, including shifts in load profiles and peak demands, an increased importance placed on resiliency, a diversified variety of electrification offerings, an expectation for the Company to provide societal value in addition to safe, reliable power, and a need to adapt to changes in grid operations as well as providing enhancements to meet customers' service expectations.

As outlined in this LRP, the Company is confident it will be able to respond to these changes while delivering on its integrated vision and mission to provide value to its key stakeholders – customers, employees, regulators, policy makers, communities, and investors – through all aspects of its operations.

As described throughout this LRP, the Company will focus on numerous strategic areas to deliver on its commitment to the clean energy future, and meet the expectations of its customers, employees, and shareholders. These include executing programs and initiatives laying a foundation of EE, supporting electrification of both the heating and transportation sectors, and advocating and enabling increases in renewable generation and ES deployment throughout the Company's service territory. The Company's system planning and investments emphasize preparing its energy delivery systems to meet all clean energy needs, while enhancing their safety, reliability, and resiliency. The Company's actions will also shape the changing role of its gas business in the clean energy future, while focusing on maintaining a safe, reliable gas system. Delivering on the growing expectations of its customers, the Company's is also executing actions to make it easy and seamless for customers to benefit from the clean energy future and giving them the choice, control, and convenience they seek.

For each of these strategic focus areas the Company has identified its current actions, as well as the future opportunities that support the Company's objectives, and the communities it serves. The Company has identified risks and the mitigating factors for each, as well. This planning is critical to the future success of each focus area, but an underlying theme for each is to remain flexible throughout the LRP's duration.

The Company will need to adapt its approach to Infrastructure Planning and Cost Management to address these changes. The proposed approach outlined in this LRP addresses the increased importance placed on the electric system and, consequently, the Company. To mitigate the impact of these required investments on customer bills, the Company will be prudent in its spending, both from a business cost and a capital investment perspective.

The Company fully supports New York's and New Jersey's ambitious clean energy goals and understands the critical role it plays in delivering the clean energy future. It will pursue the envisioned clean energy future judiciously and continue to advocate for enabling policies that support progress along the way. The Company recognizes its changing role and the importance of delivering on these opportunities for its customers, its communities, its employees, and its shareholders. Along with this changing role and delivery of new opportunities presented by the clean energy future, the Company's paramount focus will continue to be creating and maintaining a safe, reliable, and resilient energy delivery system meeting the evolving needs of all stakeholders now and in the future.



Appendix A: Acronyms

<u>Acronym</u>	<u>Description</u>
ADMS	Advanced Distribution Management System
AESP	Association of Energy Services Professionals
AGA	American Gas Association
AHJ	Authority Having Jurisdiction
AI	Artificial Intelligence
AMI	Advanced Metering Infrastructure
ASHP	Air Source Heat Pump
BCA	Benefit Cost Analysis
BCO	Business Cost Optimization
BEV	Battery Electric Vehicle
BNEF	Bloomberg New Energy Finance
BPU	Board of Public Utilities (New Jersey)
BTM	Behind the Meter
BTU	British Thermal Unit
BYOT	Bring Your Own Thermostat
C&I	Commercial and Industrial
CAC	Climate Action Council
ccASHP	Cold Climate Air Source Heat Pumps
CCPA	California Consumer Privacy Act
CDG	Community Distributed Generation
CEA	Clean Energy Act (New Jersey)
CECONY	Consolidated Edison Company of New York
CEI	Consolidated Edison, Inc.
CIMS	Customer Information Management System
CLCPA	Climate Leadership and Community Protection Act
CRM	Customer Relationship Management
CSR	Customer Service Representative
CSRP	Commercial System Relief Program
CSS	Customer Service System
DA	Distribution Automation
DCC	Distribution Control Center
DCFC	Direct Current Fast Charger
DCX	Digital Customer Experience
DEC	Department of Environmental Conservation (New York)
DER	Distributed Energy Resource
DERIH	DER Interconnection Handbook
DERMS	Distributed Energy Resource Management System
DG	Distributed Generation
DLRP	Distribution Load Relief Program
DOE	Department of Energy



Acronym	Description
DPS	Department of Public Service
DR	Demand Response
DSCADA	Distribution Supervisory Control and Data Acquisition
DSIP	Distributed System Implementation Plan
DSM	Demand Side Management
DSP	Distributed System Platform
DTH	Dekatherm
EAM	Earning Adjustment Mechanism
EDC	Electric Distribution Company
EE	Energy Efficiency
EEI	Edison Electric Institute
EMP	Energy Master Plan (New Jersey)
EMS	Energy Management System
EPM	Electrification Portfolio Management
EPRI	Electric Power Research Institute
ERM	Enterprise Risk Management
ERP	Emergency Response Plan
ESR	Energy Storage Resource
ESS	Energy Storage System
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FERC	Federal Energy Regulatory Commission
FTM	Front-of-The-Meter
GBC	Green Button Connect
GDPR	General Data Protection Regulation (European Union)
GHG	Greenhouse Gas
GHP	Gas Heat Pump
GIS	Geographic Information System
GSHP	Ground Source Heat Pump
GTI	Gas Technology Institute
GW	Gigawatt
GWRA	Global Warming Response Act (New Jersey)
HBA	High Bill Alerts
HDV	Heavy Duty Vehicles
HPWH	Heat Pump Water Heater
HVAC	Heating Ventilation and Air Conditioning
ICE	Internal Combustion Engine
IEEE	Institute of Electrical and Electronics Engineers
IOAP	Interconnection Online Application Portal
IPWG	Interconnection Policy Work Group
ISBM	Innovative Storage Business Model
ISO	International Standard Organization, Independent System Operator



Acronym	Description
IT	Information Technology
ITWG	Interconnection Technical Work Group
IVR	Interactive Voice Response
JU	Joint Utilities
KV	Kilovolt
L2	Level 2 (charger)
LCRI	Low Carbon Resource Initiative
LDV	Light Duty Vehicle
LMI	Low and Moderate Income
LRP	Long Range Plan
MDV	Medium Duty Vehicles
MOABS	Motor Operated Air Break Switches
MOU	Memorandum of Understanding
MRP	Make Ready Program (New York)
MW	Megawatt
NEM	Net Energy Metering
NPA	Non-Pipes Alternatives
NWA	Non-Wires Alternative
NYISO	New York Independent System Operator
NYPA	New York Power Authority
NYSENERDA	New York State Research and Development Authority
O&R	Orange and Rockland Utilities, Inc.
OMS	Outage Management System
P2G	Power-to-Gas
PDR	Peak Demand Reduction
PEV	Plug-in Electric Vehicles
PHEV	Plug-in Hybrid Electric Vehicles
PII	Personally Identifiable Information
PON	Program Opportunity Notice
PQ	Power Quality
PSCR	Power Supply Cost Recovery
PV	Photovoltaic
R&D	Research and Development
RECO	Rockland Electric Company
REV	Reforming the Energy Vision
RFP	Request for Proposal
RNG	Renewable Natural Gas
RTO	Regional Transmission Organization
SCADA	Supervisory Control and Data Acquisition
SIR	Standardized Interconnection Requirements
SME	Subject Matter Expert
T&D	Transmission and Distribution



<u>Acronym</u>	<u>Description</u>
TOU	Time-Of-Use
TS&D	Transmission, Substation, and Distribution
TW	Terawatt
UotF	Utility of the Future
USF	Universal Service Fund
VDER	Value of DER
VM	Vegetation Management
WACC	Weighted Average Cost of Capital
WAMI	Weekly Advanced Metering Infrastructure
ZEV	Zero Emissions Vehicle