VIA ELECTRONIC MAIL (board.secretary@bpu.nj.gov)

June 12, 2024

Honorable Sherri L. Golden, RMC
Secretary of the Board
New Jersey Board of Public Utilities
44 South Clinton Avenue, 1st Floor
P.O. Box 350
Trenton, NJ 08625-0350

Re: "IN THE MATTER OF THE 2024 NEW JERSEY ENERGY MASTER PLAN"

BPU DOCKET NO. QO24020126

Dear Secretary Golden:

Thank you for the opportunity to submit comments as part of the State's effort to update the 2019 New Jersey Energy Master Plan. New Jersey Resources Corporation (NJR) is a diversified energy provider headquartered in Wall Township, serving approximately 582,000 natural gas customers through its primary subsidiary, New Jersey Natural Gas, and operating as one of the State's largest owner-operators of commercial solar through its renewable energy subsidiary NJR Clean Energy Ventures.

NJR has a strong track record and commitment to decarbonization across our subsidiaries, reflecting our approach to help reach our shared climate goals in a more efficient, reliable, and affordable manner for New Jerseyans.

Some of the meaningful progress NJR has taken to further the energy transition includes:

- Leading in New Jersey's renewable energy markets. Since 2010, NJR Clean Energy Ventures (NJRCEV), NJR's second largest subsidiary, has invested more than $1.2 billion in over 470 megawatts of solar projects across all market segments and counties in New Jersey, comprising about 10 percent of solar installed in the State.

  This investment has supported more than 1,000 local jobs constructed with union labor, helped our customers save on energy costs, and reduced 330,000 tons of GHG emissions.

- Driving long-term progress in customer-focused energy-efficiency programs. New Jersey Natural Gas (NJNG), our natural gas distribution and largest subsidiary, achieved the highest single-year investment of $60 million in our energy efficiency programs and record energy savings – helping customers reduce their energy consumption and cutting carbon emissions by over 25,000 metric tons.

- Committing to innovation, new technology and responsible investment in our infrastructure.

  - NJNG is the first utility on the East Coast to produce and distribute green hydrogen through its distribution system, reducing carbon emissions from the energy we deliver without the need to upgrade or change appliances.

- NJNG is also the first company in the State of New Jersey to deploy a novel application of distributed carbon capture technology, located at our Wall Township Headquarters. This technology integrates with our building's existing HVAC system and is in operation today, actively capturing carbon emissions without a costly or disruptive appliance conversion.

- NJNG is the first natural gas utility in New Jersey to fully replace 100% of the cast iron and unprotected steel pipe in its distribution system, drastically reducing methane leaks.

- NJR has made it a priority to engage in project and research partnerships with academic, government and industry research entities to support our emissions reduction and innovation efforts, including Stanford University, Princeton University, GTI Energy and the United States Department of Energy.

NJR recognizes the imperative of climate change and is supportive of New Jersey's emission reduction goals. As we have commented on in other forums and proceedings, these comments include recommendations and key considerations that NJR believes are critical to meeting shared carbon emission reduction goals in a way that balances reliability and affordability for New Jersey energy customers in a more realistic way.

With a continued commitment to building and investing in a cleaner energy future, NJR is supportive of public policy and an Energy Master Plan that:

- Embraces and supports innovative, cost-effective decarbonization solutions on both the gas and electric systems, including both pipeline and non-pipeline solutions, to help achieve 2050 greenhouse gas emission reduction goals;

- Prioritizes energy system and service reliability for all customers as a primary policy objective over both the near- and long-term;

- Recognizes that reducing economy-wide emissions while reliably meeting increasing energy demand will require the State to leverage its diverse, existing energy infrastructure;

- Factors in a full and robust accounting of both the cost and feasibility of large-scale electric system transmission and delivery requirements in its Integrated Energy Plan (IEP) scenarios;

- Preserves customer choice, with the recognition that navigating customer impacts and market adoption realities, minimizing ratepayer costs, and mitigating disruptions in homes and businesses are priorities that must be handled with thoroughness, broad stakeholder input, and a sophisticated and unbiased view of the facts;

- Strengthens and deepens energy efficiency measures for both gas and electric appliances to support emission reduction goals; and,

- Prioritizes development of in-state solar and renewable resources in advancing the State's renewable deployment goals, ensuring New Jersey ratepayer and taxpayer dollars are used to support green jobs and in-state emissions reductions first, rather than being sent out-of-state.

The update to the State's Energy Master Plan should prioritize these principles as it seeks to meet statutory 2050 emission reduction targets.

A new EMP should also understand and fully account for the drastic change in landscape of innovative technologies, new decarbonization solutions, and the rising demand for energy in all forms.

Since 2019, significant new renewable energy and decarbonization advances have been made, including in emissions-reducing fuels and carbon capture technology, which are being deployed with increasing speed and scale. We've witnessed historic federal funding backing these and a host of other solutions with a pragmatic focus on achieving emission reductions vs. a preferred technology pathway to long-term decarbonization.

An update of the EMP that considers the critical advancements taking place in energy innovation, technology, federal policy and amongst international renewable energy leaders and investors will have a direct, meaningful impact on the affordability, pace, energy security and reliability of New Jersey's emission reduction and energy planning efforts.

We're not alone in how we think about this.

A recent decarbonization pathway study shows that converting a gas system to deliver decarbonized fuels could reduce overall costs of economywide decarbonization by 70-85% in cold climate regions versus pure electrification. [1]

Recent decarbonization studies in Massachusetts, Illinois, and Maryland have reached similar conclusions, with savings estimated into the tens of billions of dollars from adapting a hybrid approach primarily in the building sector – recognizing a shared role in deep decarbonization for both the gas and electric systems in buildings, different fuels for different market segments, and different mixes of technologies as well. [2]

The federal government has been steadfast in its support and ambitions for the role of low- and zero-carbon – delivered through pipelines – as a cornerstone strategy in reaching emission reduction goals.

- The US Department of Energy's (USDOE) Hydrogen and Fuel Cell Technologies Office Multi-year Program Plan, released in May 2024, identifies clear research, development and demonstration objectives to establish the use of natural gas pipeline infrastructure for large-scale hydrogen distribution:
    - "Additional [research, development and demonstration] that can support large-scale distribution includes materials research to enable leveraging of natural gas infrastructure in hydrogen use (e.g., hydrogen blending in pipelines) and high-throughput compressors to enable higher volume pipelines."[3]

[1] Independent Consultant Study Performed for NJNG, June 2023
[2] The Role of Gas Distribution Companies in Achieving the Commonwealth's Climate Goals, E3, Scott Madden, March 2022; Illinois Decarbonization Study, E3, December 2022; BGE Integrated Decarbonization Strategy, E3, October 2022.
[3] Hydrogen and Fuel Cell Technologies Office Multi-Year Program Plan, U.S. Department of Energy, May 2024

- "Hydrogen may also be blended with natural gas, thus enabling a partial decarbonization of natural gas use and making use of the extensive existing national pipeline network."[4]

- The White House's November 2022 report *"U.S. Innovation to Meet 2050 Climate Goals"* called for the repurposing of existing pipelines for CO2 and clean hydrogen transport, the use of carbon-neutral fuels, and long-duration energy storage. [5]

- The U.S. Department of Energy's *"National Clean Hydrogen Strategy and Roadmap"* calls for the development of hydrogen blending standards and assessing opportunities to repurpose natural gas infrastructure for hydrogen.

    - USDOE: "identifying opportunities to use, and barriers to using, existing infrastructure, including all components of the natural gas infrastructure system, the carbon dioxide pipeline infrastructure system, end-use local distribution networks, end-use power generators, LNG terminals, industrial users of natural gas, and residential and commercial consumers of natural gas, for clean hydrogen deployment" [6]

Collaboration in Revisiting and Updating Integrated Energy Plan Scenarios

The 2019 EMP evaluated retaining gas use in buildings as part of the strategy to meeting the state's 80x50 goal in model variation 3.

The Integrated Energy Plan modeling determined that retaining gas use in buildings was similar in cost to the least cost pathway through 2045.[7] However, this option was dismissed because the model relied on biofuels to achieve emissions reductions post 2045. Biofuels were determined to be too costly.

As discussed throughout our comments, major uncertainties, challenges, and unproven assumptions exist in the 2019 EMP's reliance on maximum electrification economy-wide and in the building sector specifically.

Many of these challenges have only worsened or compounded since the publication of the 2019 EMP:

- Carbon emissions in the New Jersey power sector have increased by 6% since 2017.[8]

- Renewable additions from offshore wind have been delayed.

- The solar sector is adding capacity at about half the annual pace (350-450 megawatts) required by the Clean Energy Act of 2021 (750 megawatts), and there have been not yet been any battery storage additions pursuant to the BPU's storage incentive program.[9]

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[4] Id.
[5] Raising Ambition for a Rapid and Just Net-Zero Transition with Game-Changing Innovations, The White House, November 18, 2022
[6] U.S. National Clean Hydrogen Strategy and Roadmap, U.S. Department of Energy
[7] 2019 New Jersey Energy Master Plan: Pathway to 2050, Appendix A, January 2020
[8] New Jersey Greenhouse Gas Inventory 2022 Mid-Cycle Update Report, December 2022
[9] New Jersey Solar Installations Report through April 2024 (Annual Capacity)

- New loads added to the power system are served by fossil units 92% of the time.[10] There is no realistic, clearly defined path to change this reality in light of forecasts for data center power demand that were not contemplated in the 2019 EMP.

- There is limited evidence of whole house heat pump adoption by consumers to date in New Jersey, with no indication of how technical and economic barriers to whole house heat pump adoption can be overcome at a scale to conclude: that 3 million New Jersey buildings will be electrified by 2050; that the electric system can be cost-effectively and feasibly scaled to 2-3x its current size to meet winter heating needs; or, how those needs can be reliably met with intermittent renewables.

The necessity to decarbonize to meet climate and emissions reduction goals remains, however, requiring the State to **keep all options available to meeting its decarbonization goals, encourage new technologies and innovation, and allow cost-effective approaches to decarbonization to emerge and scale.**

NJR would welcome the opportunity to work with policymakers and stakeholders in the EMP process to refine the "Retain Gas" scenario guided by our all-of-the-above approach, which relies on both the electric and gas systems to meet our long-term decarbonization goals, involving a combination of energy efficiency, air-ground-gas heat pumps, renewable fuels, and carbon reduction projects to meet our goals.

NJR stands ready to continue playing a key role in New Jersey's energy journey and as a partner in helping reach the State's 2050 emission reduction goals. The below comments reflect our organization's positions on critical strategies of the Energy Master Plan, recommendations on how to better approach these strategies, and key data that seeks to better inform the decision-making process.

We thank you for the opportunity to comment on this important process.

[10] 2023 State of the Market Report for PJM, March 2024, Monitoring Analytics, LLC

Energy Master Plan Strategy Key Takeaways & Recommendations

Strategy 1: Reduce Energy Consumption and Emissions from the Transportation Sector

- Accounting for 40% of the state's emissions, the transportation sector is the largest contributor to greenhouse gases in New Jersey.
- There is broad recognition, with significant federal policy support, of the importance of low- and zero-carbon fuels in reducing transportation sector emissions, especially in industry segments where electrification is challenging or impractical, such as medium- and heavy-duty transport.
- Existing pipeline infrastructure in New Jersey can play a critical role in the storage, transport and delivery of renewable fuels to diverse end uses, helping bring them to scale and mitigating the costs of siting and building new infrastructure.
- The EMP should provide strong support for the development of renewable fuels across economic sectors and leverage the long-term strengths and value of the state's existing pipeline infrastructure.

Strategy 2: Accelerate Deployment of Renewable Energy and Distributed Energy Resources

- Growing New Jersey's in-state renewable energy capacity is a must-have for New Jersey to reach its 2050 goals and to reduce emissions in the power sector.
- New Jersey is not on track to meet its renewable energy and distributed energy resource deployment goals for solar, wind or battery storage.
- New Jersey's emissions from electric generation have increased by over 6% from 18.0 MMT in 2017 to 19.1 MMT in 2021, as shortfalls in in-state generation have led to increased reliance on and emissions from imported electricity from PJM, according to the latest available NJDEP data.
- To support economic development, job creation and emissions reduction *within New Jersey*, the EMP must reaffirm its commitment to and prioritization of in-state solar resources and the goal of installing 12 gigawatts of solar by 2030.
- Continued support for a robust New Jersey solar market and industry is critical to meeting renewable energy deployment goals; reforms should be made to strengthen successor incentive solar programs, address grid interconnection bottlenecks, and solidify existing installed capacity.

Strategy 5: Decarbonize and Modernize New Jersey's Energy System

- With supportive policy over the years, New Jersey has a very real advantage in comparison to other states when it comes to the energy transition and energy security: two complementary, high-quality energy delivery systems. Approximately 73% of New Jersey is connected to pipeline infrastructure, one of the highest penetrations in the United States.

- In contrast, full electrification scenarios will increase load to the electric distribution system and could create a new winter-peaking electric system 3x the size of the current summer electric peak in order to meet the state's winter heating needs.

- The State cannot effectively navigate energy policy without a complete, systemwide understanding of the impacts to cost, reliability and feasibility, as well as the major technology dependencies and gaps, of pursuing full-scale electrification.

- As such, it was encouraging to hear, in the opening of the 2024 EMP's public comment sessions, the Executive Director of the Governor's Office of Climate Action and the Green Economy discuss the intention to explore the long-term value of natural gas infrastructure to support peak demand reduction on the power system.

- Performing an appropriate, focused study to reflect additional electric generation, transmission and distribution infrastructure, and the estimated costs of a new winter peaking system will be necessary to understand the impacts of a full electrification scenario. It was therefore also encouraging to hear the intention for the State to perform a "deeper and more robust" study on the costs of climate mitigation for New Jersey residents.

  Reliability amid a rising energy demand environment is a deeply serious concern. PJM and regional grid operators around the nation are raising reliability red flags around resource adequacy primarily due to forecasted load growth from electric vehicles and data centers.

- Policy that embraces solutions across the gas and electric system to help the state reach emission reduction goals will help the state do so in a less costly manner while maintaining reliability and meeting today's growing energy needs.

Strategy 3: Maximize Energy Efficiency and Conservation and Reduce Peak Demand

- Energy efficiency remains the most cost-effective strategy for achieving emissions reductions. Customer participation and uptake continues to offer a large opportunity statewide for both gas and electric customers.

- The EMP must prioritize and bolster energy efficiency measures for both gas and electric utilities in order to meet emission reduction targets.

- Any policy that makes the decision to choose high-efficiency equipment harder at the time of a customer equipment upgrade, including disadvantaging or eliminating gas equipment incentives, risks missing an emissions reduction opportunity that only appears during a short replacement window.

- New Jersey should support an open pathways approach to decarbonization, remain open to breakthrough end-use technologies, and support innovative utility energy-efficiency programs on both the gas and electric system, especially hybrid heat, networked geothermal, and demand response.

Strategy 4: Reduce Energy Consumption and Emissions from the Building Sector

- There is no single, silver bullet solution to achieve decarbonization goals in the building sector, and New Jersey families and businesses continue to demand choice in making energy decisions for their homes and businesses. One cannot conclude it is reasonable to plan for decommissioning of the gas system.

- There is limited or no environmental benefit to adding new electric heat load to the existing electric grid until it has been further decarbonized.

- The Ratepayer Impact Study completed by the State leaves major uncertainties on cost to customers for forced electrification. We must continue to be clear on policy impacts to constituents, who continue to enjoy the benefits of a dual energy system.

- Apart from the significant systemwide costs, the absence of emissions benefits and the negative reliability impacts of electrification, the reality is that heat pumps are extremely expensive for customers and the market has not accepted them as a replacement for natural gas in cold climates.

- As such, the 2019 EMP goal to replace natural gas heat installed in over 3 million New Jersey buildings (75% of total building stock) with electric heat pumps is not reasonable.

- Innovation and technology have changed the conversation; New Jersey's gas local distribution companies have a large role to play in delivering cost-effective emissions reductions, including through energy efficiency, low- and zero-carbon fuels, hybrid heat, and the significant potential for carbon capture and other breakthroughs.

- Building sector decarbonization strategy – and state energy policy altogether – should consider varied scenarios and pathways, and leave multiple doors open to harness investment, innovation, competition, and consumer choice to lead us to better, faster, and more affordable solutions to achieve climate goals.

Strategy 6: Support Community Energy Planning and Action with an Emphasis on Encouraging and Supporting Participation by Low- and Moderate Income and Environmental Justice Communities

- Low- and moderate-income ratepayers cannot be left behind in the long-term energy transition.
- Credibility with customers is a paramount concern in driving any market transformation. If a customer is told to expect savings when replacing equipment and switching fuels for their home heating needs, they should realize those savings, especially when they come with significantly higher upfront equipment costs, as with electric heat pumps.
- At present, studies around customer electrification costs are incomplete and risk misleading the public when it comes to real world cost burdens they will incur.

Strategy 7: Expand the Clean Energy Innovation Economy

- New Jersey should benefit from new technology and innovation through an open-pathways approach to decarbonization, with cost-effective solutions available to customers across the gas and electric systems.
- Innovation is happening at a rapid pace in low- and zero-carbon fuels, renewable energy deployment and end-use appliances. Allowing space for the best, most cost-effective solutions to emerge and scale, no matter their technology, is the way to achieve 2050 goals in the least-cost and most affordable way possible.

Energy Master Plan Strategy Detailed Comments

Strategy 1: Reduce Energy Consumption and Emissions from the Transportation Sector

Key Section Takeaways

- Accounting for 40% of the state's emissions, the transportation sector is the largest contributor to greenhouse gases in New Jersey.
- There is broad recognition, with significant federal policy support, of the importance of low- and zero-carbon clean fuels in reducing transportation sector emissions.
- Existing pipeline infrastructure in New Jersey can play a critical role in the storage, transport and delivery of clean fuels to diverse end uses, helping bring them to scale and mitigating the costs of siting and building new infrastructure.
- The EMP should provide strong support for the development of renewable fuels across economic sectors and leverage the long-term strengths and value of the state's existing pipeline infrastructure.

Transportation emissions are the single largest contributor to greenhouse gas emissions in New Jersey, accounting for nearly 40% of the state's overall emissions profile. Addressing transportation is a critical priority for New Jersey to reach its climate and emissions reduction goals.

In the effort to achieve vast, economy-wide decarbonization, New Jersey's underground pipeline infrastructure can and must play a leading role to reach these emissions reduction goals as quickly and affordably as possible, and with the energy reliability that lives and livelihoods depend on. The transportation sector is no exception.

As reflected in these comments, New Jersey Resources is ready to work with New Jersey to pursue strategies and make investments to leverage our infrastructure to drive long-term emissions reductions in the transportation sector.

Low- or zero-carbon gaseous fuels can be a valuable tool in reducing transportation sector emissions alongside other decarbonization strategies for the sector that have been identified in the 2019 EMP, including efforts to promote electrification of light-duty vehicles through battery electric vehicles and hybrid electric vehicles. Such fuels may include renewable natural gas (RNG), hydrogen, biodiesel, or synthetic fuels created from renewable energy and/or recycled energy sources – all of which can be stored and delivered using pipelines.

The ability of pipeline infrastructure to distribute clean hydrogen[11] and low-carbon fuels to a variety of end uses across the economy is a key reason why multiple studies charting pathways to 2050 net-zero emissions reduction and renewable energy goals identify renewable fuels as key strategies to meet those goals in a least-

[11] The term "clean hydrogen" refers to definition under federal law of "hydrogen produced with a carbon intensity equal to or less than 2 kilograms of carbon dioxide-equivalent produced at the site of production per kilogram of hydrogen produced." 42 U.S.C. § 16166(b)(1).

cost manner. The value of New Jersey's pipeline infrastructure in limiting societal costs and ensuring energy reliability are further addressed in other sections of these comments.

This recognition has led the federal government to prioritize the development and economy-wide scaling of clean hydrogen and provide significant policy support for its use in a variety of applications across the nation's economic sectors including transportation. This support, in the form of the Bipartisan Infrastructure Law and Inflation Reduction Act, is bringing significant direct investment (hydrogen hubs program) and tax policy incentives (production and investment tax credits) to support hydrogen project development.

Importantly, New Jersey has already been the beneficiary of this federal policy support, with one of seven competitively selected hydrogen hubs located in South Jersey. Should New Jersey adopt an open pathway approach to energy policy that encourages renewable fuel production, innovation and the decarbonization of pipeline infrastructure, it can draw even more federal funding into the state that can drive tangible emissions reductions.

Low- and zero-carbon fuels offer a solution to range, load capacity and refueling challenges, especially for medium- and heavy-duty vehicles, maritime and aviation, that can significantly reduce or outright eliminate emissions for medium- and heavy-duty vehicle types, while also mitigating costs by leveraging existing pipeline infrastructure for storage, transportation and delivery to end uses.

For example, when produced at scale, hydrogen can be blended into natural gas pipelines for long-duration storage, transport, and end-use. This hydrogen can then be dispensed across a variety of applications as a blend or deblended to 100% hydrogen at the point of delivery, including medium- and heavy-duty vehicle transport, passenger vehicles, maritime and rail, industrial applications, fuel cells and more, to support economy-wide decarbonization.

For this reason, hydrogen fuel cell electric vehicles are generating significant interest as a decarbonization solution for the medium- and heavy-duty (MHD) segments:

- DOE National Clean Hydrogen Strategy and Roadmap states that medium and heavy-duty vehicles account for 20% of emissions from transportation sector nationwide [12]
- MHD vehicles in NJ account for a third of the transportation emissions (BPU MHD Straw) [13]
- Refueling times for fuel cell vehicles are comparable to a diesel vehicle and can accommodate long driving ranges above 500 miles, making fuel cells an ideal choice to reduce down time of vehicle fleets.

There are serious concerns about the adequacy, readiness and enormous long-term infrastructure costs needed to upgrade the state's electric grid to meet increased demand from the 2019 EMP's preferred strategies for vehicle and building electrification, along with the massive load growth forecasted from data centers nationwide and in the PJM grid serving New Jersey.

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[12] U.S. National Clean Hydrogen Strategy and Roadmap, U.S. Department of Energy

[13] New Jersey Electric Vehicles Infrastructure Ecosystem 2021 – Medium And Heavy Duty Straw Proposal, Docket No. QO21060946, State of New Jersey, August 12, 2021

Such structural issues call for a diversified, technology-neutral approach by New Jersey for all economic sectors, including transportation, that allows the best solutions to emerge – those which can demonstrate meaningful emissions reductions and that are cost-effective, as addressed throughout our comments.

Strategy 2: Accelerate Deployment of Renewable Energy and Distributed Energy Resources

Key Section Takeaways

- Growing New Jersey's in-state renewable energy capacity is a must-have for New Jersey to reach its 2050 goals and to reduce emissions in the power sector.
- New Jersey is not on track to meet its renewable energy and distributed energy resource deployment goals for solar, wind or battery storage.
- New Jersey's emissions from electric generation have increased by over 6% from 18.0 MMT in 2017 to 19.1 MMT in 2021, as shortfalls in in-state generation have led to increased reliance on and emissions from imported electricity from PJM, according to the latest available NJDEP data.
- To support economic development, job creation and emissions reduction *within New Jersey*, the EMP must reaffirm its commitment to and prioritization for in-state solar resources and the goal of installing 12 gigawatts of solar by 2030.
- Continued support for a robust New Jersey solar market and industry is critical to meeting renewable energy deployment goals; reforms should be made to strengthen successor incentive solar programs, address grid interconnection bottlenecks, and solidify existing installed capacity.

Growing New Jersey's in-state renewable energy capacity across technologies is a must-have for New Jersey to reach its 2050 emissions reduction goals economywide. Solar and wind deployment are critical components identified within Strategy 2, which support the EMP's subgoal of 100% clean electricity by 2050 and the 100% clean electricity by 2035 goal established by Governor Murphy's Executive Order 315.

NJR's second largest subsidiary, NJR Clean Energy Ventures (NJRCEV), is among the leaders in the New Jersey renewable energy markets. Since 2010, we have invested more than $1.2 billion in over 470 megawatts of solar projects across all market segments and counties in New Jersey, comprising about 10 percent of solar installed in the State. This investment has supported more than 1,000 local jobs constructed with union labor, helped our customers save on energy costs, and reduced 330,000 tons of GHG emissions.

As a diversified energy infrastructure company and leading investor in New Jersey's renewable energy marketplace, NJR strongly supports the prioritization of renewable energy and distributed energy resource deployment within the state to deliver greenhouse gas emissions reductions, economic growth and job creation, and equitable access to renewable energy for New Jerseyans.

NJR's comments are therefore focused on these two elements of Strategy 2:

- Key considerations and strategies as they relate to EMP strategy 2.1 "100% Clean Power by 2050" – now achieving EO 315's policy of "100 percent of the electricity sold in the State to be derived from clean sources of electricity by January 1, 2035."

- Overview, progress and recommendations for the State's policies, programs and market incentives for New Jersey's solar deployment goals, touching on EMP strategy 2.3 "Maximize solar development and distributed energy resources by 2050."

Prioritize In-state Renewable Energy Resources to Drive Emissions Reductions

Power sector emissions are rising in New Jersey, not falling. New Jersey's emissions from electric generation have increased by over 6% from 18.0 MMT in 2017 to 19.1 MMT in 2021, according to the latest available NJDEP data.[14]

New Jersey has dramatically increased its reliance on and emissions from imported electricity from within PJM, from 0 in 2017 to 4.8 million metric tons in 2021, the latest available data.[15]

To reverse this trend and realize tangible emissions reduction within the State, New Jersey must incent *new* renewable energy projects, with a priority for investments in New Jersey, as part of any regulatory construct to achieve 100% clean energy by 2035 and 2050.

The creation of a new renewable energy credit instrument or system that treats out of state resources the same as in state resources – a solution offered by some stakeholders to achieve 100% clean electricity – will not result in emissions reductions for New Jersey. This can only come from building new renewable energy projects within the state, or by ensuring credits come from out-of-state projects that are: 1) new, i.e. that add incremental renewable capacity; and 2) can demonstrate the energy produced is actually being delivered to New Jersey.

Adopting any new renewable energy credit instrument or construct to subsidize out-of-state project investment and jobs would also come with a significant cost impact for in-state ratepayers, placing New Jerseyans on the hook for new, additional costs on top of existing Class 1 Renewable Energy Credits (REC), which are purchased by electric utilities to comply with New Jersey's existing Renewable Portfolio Standard (RPS) – after the RPS increases from 21% to 35% in 2025, these purchases are projected to cost ratepayers an estimated $750 million per year.

The EMP should set firm in-state renewable targets that must be reached prior to incentivizing out-of-state renewable energy credit purchases. Any out-of-state purchases must be made with firm guardrails to achieve real electric generation sector emissions reductions – by adhering to the principles of additionality and only after giving preference to in-state renewable development to benefit New Jerseyans first.

Overview, Progress and Recommendations for the State's Policies, Programs and Market Incentives for New Jersey's Solar Deployment Goals.

Solar energy projects developed in New Jersey offer definitive and widely recognized benefits to the state, including emissions reduction, energy cost savings for customers, and robust jobs and economic development. Solar provides diversification of our renewable energy efforts, particularly given the significant delays and cost

[14] Quarterly State of the Market Report for PJM: January through March 2023, Monitoring Analytics, LLC
[15] EIA Annual Energy Outlook 2023; Table 54. Electric Power Projections by Electricity Market Module Region

increases associated with offshore wind, and the major interconnection delays beyond the State's control within PJM.

A robust New Jersey solar industry also leads to the creation of good-paying, renewable energy jobs – a fact supported by independent study. The National Renewable Energy Laboratory (NREL) has created a widely recognized model, known as Jobs and Economic Development Impact (JEDI). The JEDI model calculates the effects of renewable energy investments on the local economies that support it. According to JEDI, the 750 megawatts in annual build targeted by the SREC-II program would amount to over 13,000 full-time jobs, double the state's current level, and over $1.8 billion in direct spend on solar installation – supporting another $1.4 in indirect economic activity in the local economy.

As a developer, financier, and the largest owner-operator of commercial solar in the state of New Jersey, the following comments speak to the successes, challenges, and opportunities for improvement in New Jersey's solar industry.

Current Trends and Challenges

Today, existing Solar makes up 7-8% of New Jersey's electricity, with ambitious state targets to expand even further. The Clean Energy Act of 2021 called for 750 megawatts per year of new solar, in order to hit an overall SREC-II program goal of 3,750 megawatts by 2026. Significant capacity of in-state solar was also called for in this administration's original 2019 Energy Master Plan, under its "least cost" pathway. This amounted to 12.2 gigawatts of in-state solar by 2030, 17.2 gigawatts by 2035 and 32.2 gigawatts by 2050, equating to more than 1 gigawatt of new installation per year.

Residential solar installations account for almost 200 megawatts per year – powering approximately 25,000 homes annually with renewable energy – and other regulatory programs in various stages of development are poised to enable thousands more New Jerseyans to participate and benefit from solar energy. These programs include dual use, municipal remote net metering and community solar opt-out programs. Large-scale commercial project development, however, has been significantly lagging.

Unfortunately, New Jersey is significantly behind pace of the 750 megawatt per year target established in the Clean Energy Act of 2021. To date, the SREC-II program has only 467 megawatts installed, compared to an overall program goal of 2,250 megawatts year-to-date since the program's inception in July 2021.

This has been caused by several issues, including a PJM interconnection delay of over 260 gigawatts of capacity looking to come online, 94 percent of which are renewable energy resources[16], and delays in the rollout of individual successor incentive programs since the close of the Transitional Renewable Energy Credit (TREC) program in mid-2021. The challenges and opportunities to overcome these hurdles are further detailed below.

While the 2019 EMP states clear support and goals for in-state solar, including the installation goals of 12 gigawatts by 2030 goal and 17 gigawatts by 2035, there have also been mixed messages on the policy commitment to these goals:

[16] "The Biggest Takeaways from Our PJM and ERCOT Spring Outlook Webinars", Wood Mackenzie, March 28, 2024.

- The statutory goals for new solar end in 2026 (3,750-gigawatt goal between 2022-26).

- The BPU's Ratepayer Impact Study assumed no new solar in New Jersey after 2026.

- The Administration's support for S237/2978, which proposed a new Clean Energy Standard promoting new solar in PJM without including any firm commitments to in-state solar.

A firm commitment to the State's in-state solar goals in this interim EMP process is needed, as well as supporting policy and program adjustments as recommended below. With these, the industry can be scaled to help drive New Jersey toward these goals.

Recommendations

Adapt the Community Solar program (CSEP) to ensure more viable projects.

New Jersey's community solar program has the potential to extend the cost-saving and environmental benefits of renewable solar to low- and moderate-income households and dense, hard-to-reach multifamily buildings. As such, the program has garnered large amounts of interest.

Despite a significant show of interest in the program, only 21 projects totaling 41 megawatts were installed in the first 2 years of the program. To date, New Jersey only has 141 megawatts installed of 243 megawatts approved in the pilot program, with many completed projects struggling to subscribe customers. Multiple petitions have already reached the NJBPU for relief in subscription territory.

To strengthen the program and ensure that only viable projects are awarded, New Jersey should borrow some effective elements from the neighboring program in Connecticut:

- Allow utility management of subscription and disbursement of the customer discount, coupled with consolidated billing. This removes customer acquisition costs and ongoing subscriber management costs, reducing subsidy requirements and overall ratepayer costs.

- Establish a feed-in tariff, where solar facilities bid an all-in bundled energy and REC value, similar to New Jersey's OREC program. This ensures that project developers are adequately compensated, while reducing the overall subsidy cost to the ratepayer.

- Move to set customer discounts that are administratively determined. This would prevent projects from receiving awards based on the highest discount they could possibly support, to then be subjected to upward fluctuations in project costs leaving the project no longer financially viable. This structure would also level the playing field between vintages, with all projects offering the same or similar discounts. In a program that has no barriers to exit, customers can leave at any time with no repercussions, leaving the first slate of community solar projects at a perpetual disadvantage to new, cheaper projects entering the program in later years. It would also simplify the value proposition and program explanation for potential subscribers.

Reshape the Competitive Solicitation Incentive (CSI) program to incentivize a diversity of project types.

The CSI program is tasked with providing an adequate incentive for a diverse range of large behind-the-meter and front-of-the-meter grid supply solar projects. Its initial challenge in advancing was one of process and timing – the SREC-II program launched on August 28, 2021; however, the rules for the CSI were not finalized until December 7, 2022. The first solicitation held under the new CSI program opened later in February 2023, with bids closed for review on March 31, 2023 (19 months after SREC-II launch). At that time, the BPU was not able to award any projects, with all bids exceeding Staff's confidential price caps.

A second solicitation was opened in November 2023 and closed to new applications on February 29, 2024. On April 17, 2024, NJBPU announced the results of the second solicitation, awarding 8 projects for 310 megawatts, marking the first time in nearly 3 years that new projects over 5 megawatts had a potential programmatic home.

The program utilizes a competitive process, with an administrative ceiling capping what projects can be awarded. Two competitive processes, however, have shown that some of these project types do not belong in a competitive process.

To improve the CSI program and incentivize the greatest number of large projects possible, NJR recommends that the state:

- Remove net-metered projects 5 megawatts and over and other specialized tranches and instead incentivize them through the ADI program. On April 17, 2024, the Board approved 8 of 14 applications for projects in Solicitation 2, with winning bids ranging from $90-$125 in Tranche 3 and no bids received for Tranches 2 and 4. With bid amounts at or higher than those values available in ADI and a significant lack of interest and low application volumes, the competitive process results in only a lengthy, additional step to development of these project types. By removing these project types from the "competitive" process, developer hurdle rates will decrease given the lack of incentive risk and ratepayers will benefit due to lower costs of capital.

- The NJBPU should carry forward any shortfall to the 300-megawatt solicitation targets not awarded to future year's capacity allocations. NJBPU has established precedent in this regard with the community solar program by increasing current year targets to make up for administrative delays. The same should be done for CSI-eligible projects, which have not had an opportunity to receive an incentive award in New Jersey, due to the 2.5-year gap between TREC program closure and CSI program implementation.

Provide near-term solutions to open closed circuits, cap interconnection charges from the EDCs, and develop creative solutions to interconnect solar while circumventing the years-long PJM queue backlog.

One of the largest barriers to New Jersey attaining its clean electricity generation goals is the current state of interconnection. Across the state, but particularly in the southern regions, solar developers are repeatedly met with closed circuit after closed circuit, even on residential projects, due to antiquated, congested, and constrained electrical systems.

NJR agrees with many of the recommendations that Guidehouse made in their Grid Modernization report, and the State should support these within the 2024 Energy Master Plan:

- New Jersey should study and implement alternative cost allocation and cost recovery options for accelerated interconnection of renewables. Currently, the New Jersey interconnection process takes a

"cost causer" approach, wherein the resource looking to interconnect to a closed/constrained circuit must bear the entire cost of the upgrade. The EDCs should be made to adopt a "cost sharing" approach in which the upgrade work is done, followed by a study conducted to understand the total capacity that upgrade will allow. That cost is then disbursed appropriately to the individual resources as they come online.

- The EDCs should perform Integrated Distributed Energy Resource (DER) plans, as was called for in the 2019 EMP. Such plans are necessary for planning distribution grid expansion to interconnect renewable energy, to identify required grid investments, and establish principles for cost recovery. EDC integrated planning was recommended in the 2019 EMP but has yet to be implemented. Grid modernization investments will be best informed once these plans are advanced by the NJBPU.

- In the near-term, the State should mandate that the EDCs provide reasonable and realistic interconnection schedules and require them to meet their contractual dates. Too often, solar development has been halted by extensive interconnection timelines from the EDCs, up to and including causing projects to miss their registration deadline completely due to EDC delays in completing the required interconnection upgrade.

- The state should request EDCs to prioritize suggested near-term solutions to open the 49 closed ACE-circuits and 150 closed PSEG-circuits noted in the Draft Grid Modernization Report. Technical measures, like removing reverse current relays to allow the flow of electricity through an electrical substation from the distribution system to the transmission system, as well as the implementation of smart inverters to inject and absorb reactive power autonomously, would open up most, if not all, of the closed and/or constrained circuits in New Jersey.

- Not only is there pending legislation (S2816) calling for these exact measures statewide, but there is precedent for EDC interest in making these investments. In October 2022, ACE received approval from the NJBPU to begin such work, which will enable the opening of 61 circuits and is expected to enable more solar capacity to be interconnected and serve customers. The 2024 EMP should promote these types of solutions, given the essential nature of solar deployment to achieve the GWRA's 80% by 2050 emission reduction goals.

Secure New Jersey's existing installed solar capacity by recognizing SREC incentive end-of-life impacts and developing a program to ensure existing solar projects remain operational.

Growing new investment in in-state solar *and* securing the state's existing installed portfolio is essential for New Jersey to reach its emission reduction and clean energy goals.

Approximately 70% of New Jersey's 4.8 gigawatts of existing solar assets will reach the end of their SREC incentive eligibility over the coming years.

When projects are no longer eligible for State incentives and operating costs begin to ramp up, there are risks that these existing projects may become non-competitive and have their high-value land repurposed for another non-energy use with a greater financial value. This is a potentially significant undermining of the State's renewable energy goals. The following steps should be considered to address this risk:

- The State's solar RPS for SREC 1 should be extended in 2034 and 2035 to support projects. The BPU has statutory authority to make this change, and we suggest BPU advance this change to help ensure the market is closed with a compliance home for all SRECs and that the RPS in those years be calculated dynamically based on retail sales and the SRECs generated in those years.

- The State should explore policies and/or programs to support the "repowering" of existing solar sites. Repowering is the process of increasing an existing solar installation's capacity and performance through the installation of modern equipment.

    - During the past decade, as a result of ongoing technological innovation, the capacity, price and performance of solar panels has improved significantly.

    - Repowering existing solar projects with higher capacity, higher performance equipment represents a major opportunity for New Jersey to leverage and retain its existing solar deployment footprint, cost-effectively expand its existing installed capacity, create in-state jobs and reduce emissions.

    - Repowering capitalizes on existing permits and interconnections, avoiding the costs, complexities and delays of new project development in the most densely populated state in the U.S.

Advance other successor incentive programs to promote innovative dual-use and energy storage projects.

Other discrete programs within the successor incentive program should move forward and open for project development, including Dual-Use/Agrivoltaics and an energy storage incentive program.

- The Dual-Use Solar Act of 2021 (P.L. 2021, c. 170) was signed into law on July 9, 2021. Following its passage, no action was taken to implement this program until a straw proposal was published in November 2023 accompanied by a stakeholder meeting – 29.5 months after passage of the Dual Use Act.

    - Comments were submitted in response to the Straw Proposal, and as of April 2024, no further action has been taken.

- The Clean Energy Act of 2018 called for 2,000 megawatts of energy storage by 2030. Following its adoption into law, no progress was made in the creation of a storage incentive program until October-November 2022 when a straw proposal for behind- and front- of the meter storage was issued. This was followed by 3 stakeholder meetings to discuss the content of the straw. Comments were collected through December 12, 2022 – the industry awaits finalization.

Priority should be given to advance these programs and open new avenues for investment and renewable project deployment in line with the State's goals.

Strategy 5: Decarbonize and Modernize New Jersey's Energy System

Key Section Takeaways

- With supportive policy over the years, New Jersey has a very real advantage in comparison to other states when it comes to the energy transition and energy security: two complementary, high-quality energy delivery systems. Nearly 75% of New Jersey is connected to pipeline infrastructure, one of the highest penetrations in the United States.

- In contrast, full electrification scenarios will increase load to the electric distribution system and could create a new winter-peaking electric system 3x the size of the current summer electric peak in order to meet the state's winter heating needs.

- The State cannot effectively navigate energy policy without a complete, systemwide understanding of the impacts to cost, reliability and feasibility, as well as the major technology dependencies and gaps, of pursuing full-scale electrification.

- As such, it was encouraging to hear, in the opening of the 2024 EMP's public comment sessions, the Executive Director of the Governor's Office of Climate Action and the Green Economy discuss the intention to explore the long-term value of natural gas infrastructure to support peak demand reduction on the power system.

- Performing an appropriate, focused study to reflect additional electric generation, transmission and distribution infrastructure, and the estimated costs of a new winter peaking system will be necessary to understand the impacts of a full electrification scenario. It was therefore also encouraging to hear the intention for the State to perform a "deeper and more robust" study on the costs of climate mitigation for New Jersey residents.

- **Reliability amid a rising energy demand environment is a deeply serious concern. PJM and regional grid operators around the nation are raising reliability red flags around resource adequacy due to forecasted load growth from electric vehicles and data centers – before building electrification is even contemplated as an appropriate or practical decarbonization policy position.**

- Policy that embraces solutions across the gas and electric system to help the state reach emission reduction goals will help the state do so in a less costly manner while maintaining reliability and meeting today's growing energy needs.

Building a roadmap to the decarbonized grid of the future is going to be a massive undertaking as we think about the current state of today's grid, forecasts for a significant increase in demand on the electric grid from vehicle electrification and data center growth, the emissions associated with those increases, challenges with renewable energy deployment, and the high hurdles faced with building new infrastructure of all types when it comes to siting, cost and permitting.

To help facilitate this transition, the electric grid and existing underground pipeline distribution infrastructure must be leveraged together to more effectively decarbonize and reach our goals. New Jersey's pipeline system, which is both highly reliable and deeply embedded, can be used to avoid additional demand on the electric grid, which will have difficulty meeting increased load forecasts from electric vehicles and data center growth, while also delivering real emissions reductions in cost-effective ways.

NJR's comments are therefore focused on the following elements of Strategy 5:

- Emissions realities of increasing electric load in New Jersey as part of the PJM grid.
- Scale, cost and feasibility considerations as they relate to EMP strategy 5.1 "Upgrade the distribution system to handle increased electrification and DER."
- Discussion of policy consequences, pathway and planning considerations, and reliability and other issues implicated in EMP strategy 3.4 "Maintain existing gas pipeline system reliability and safety while planning for future reductions in natural gas consumption."

Emissions Realities of Increasing Electric Load in New Jersey as part of the PJM grid

The New Jersey 2019 EMP was premised on a view that electrification of energy end use with a massive increase of renewable electric generation will drive greenhouse gas emissions reductions. This is rooted in the assumption that a low- or carbon-free grid feeding electrified end uses will lower emissions.

Today in New Jersey, however, the PJM grid relies on significant amounts of fossil-sourced power generation. To illustrate: fossil generation currently is the marginal generator 92% of the time in PJM[17]. In practical terms, this means that at any given time to meet new electricity demand – be it a charging electric vehicle, building heat pump, or any other demand source pulling electricity from the grid – 92% of the time requires burning of a fossil fuel to meet the incremental increase in electric demand.

As detailed in comments on Strategy 2, New Jersey is significantly behind its pace of renewable energy deployment. Until the electric grid is further decarbonized, there is limited or no environmental benefits to adding new electric heat load to the existing grid.

An over-reliance on electrification will be counterproductive to achieving New Jersey's greenhouse gas reduction goals in the near-term, while imposing extreme cost burdens on customers and inviting energy reliability concerns over the long run.

Scale, cost and feasibility considerations as it relates to EMP strategy 5.1 "Upgrade the distribution system to handle increased electrification and DER."

As noted above, if New Jersey intends to dramatically increase electric load and peak demand on the electric grid through electrification, achieving 100% clean electricity by 2035 does not signal "Mission Accomplished." It is only one step in the process of serving a massively growing energy load through to 2050 and beyond. If the

[17] 2023 State of the Market Report for PJM, March 2024, Monitoring Analytics, LLC

EMP continues to focus only on electrification end-use strategies, New Jersey's electric load will not only grow, our demand profile will change to a winter-peaking electric system – requiring massive new infrastructure investments.

It is critical for the State to understand the full impacts of this increased load on the electric system. This includes the need for significant investment in the electric distribution system to meet the increased load from vehicles, building electrification and datacenters, and acknowledge the reality and consequences of creating a new winter peaking electric system.

This level of investment is much harder to model, so it is often overlooked, including its relegation in the Ratepayer Impact Study to a footnote that merely states the costs were not included (despite being in scope for the study).

But the new electric system infrastructure needs driven by electrification are of enormous scale, with costs that are substantial and highly meaningful to the conversation. Examples include:

- Con Edison recently cited a $72 billion estimate in transmission and distribution system capital expenditures needed to meet New York's electrification plan, or 8% growth per year, and more than doubling the total utility investment in the system.

- These costs have been independently estimated to be as high as $80 billion on their own in a high renewable, high electrification decarbonization pathway model. [18]

- The 2019 Energy Master Plan modeling indicated that increases in PJM to New Jersey transmission from 7 gigawatts up to 9 gigawatts – a nearly 30% increase in transmission capacity – would be needed to serve additional electric load. The 2019 EMP determined these costs were so substantial, it would be more cost-effective to add in-state solar resources than expand transmission capacity.

- Another decarbonization pathway study found that for New Jersey to rely solely on the electric grid and phase out use of the gas system could cost up to $135 billion.[19] Residents would incur the costs of new electric-only appliances, an overbuild of renewable and carbon-free power generation, as well as extensive grid expansions. The research estimates that as much as $90 billion[20] of those costs would be required to decommission and phase out use of the gas system.

Conversely, that same study showed that leveraging gas infrastructure to achieve New Jersey's decarbonization targets is a more cost-effective and feasible strategy than an all-electric alternative.

All of this has serious consequences for the long-term costs, feasibility, reliability, and customer impacts of New Jersey's energy transition. It also raises important questions that have yet to be adequately asked, let alone answered in the State's energy-making processes up to this point.

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[18] New Jersey's Pathway to a 100% Carbon-Free Electricity Supply: Policy and Technology Choices Through 2050: Summary for Decision Makers, ZERO Lab, Princeton University, March 14, 2022.
[19] Independent Consultant Study Performed for NJNG, June 2023
[20] Id.

To be clear, as raised by representatives of both New Jersey Resources and New Jersey Natural Gas during 2023's Future of Gas Technical Conference panels, our company recognizes the role that electrification can play in reducing end-use emissions under the appropriate conditions, including while preserving consumer choice and achieving real net-emissions reductions for New Jersey.

Where we continue to differ is on those questions of how electrification measures, including building electrification, should be evaluated before being selected as the preferred decarbonization solution in any part of the economy, most critically:

- In light of the power sector's reliance on fossil sources of power generation for the foreseeable future, when and by how much do electrification efforts actually reduce emissions?

- Are the costs of electrification measures to families, businesses and state/program budgets justified by the amount of emissions reduced when compared to other viable decarbonization technologies?

- What are the costs and associated rate impacts of a massive buildout of the electric system (transmission and distribution) to absorb New Jersey's transportation sector energy needs and to migrate its winter heating load from the gas system to the electric system? Is that buildout practical or cost-effective considering there are other viable alternatives using the existing underground pipeline network, when it comes to siting, permitting and construction of new infrastructure?

- What are the impacts of full electrification when it comes to system reliability and resiliency?

- What viable, long-duration backup options exist for critical facilities in the state?

- What are the fact-based, practical considerations for customer adoption and scale?

The electric system and the gas system are inextricably linked. As such, if the EMP's strategies toward 2050 emissions reduction goals are intended, as they should be, to achieve maximum cost-effectiveness and reliability in meeting New Jerseyans' energy needs, those strategies must be guided by the answers to these questions.

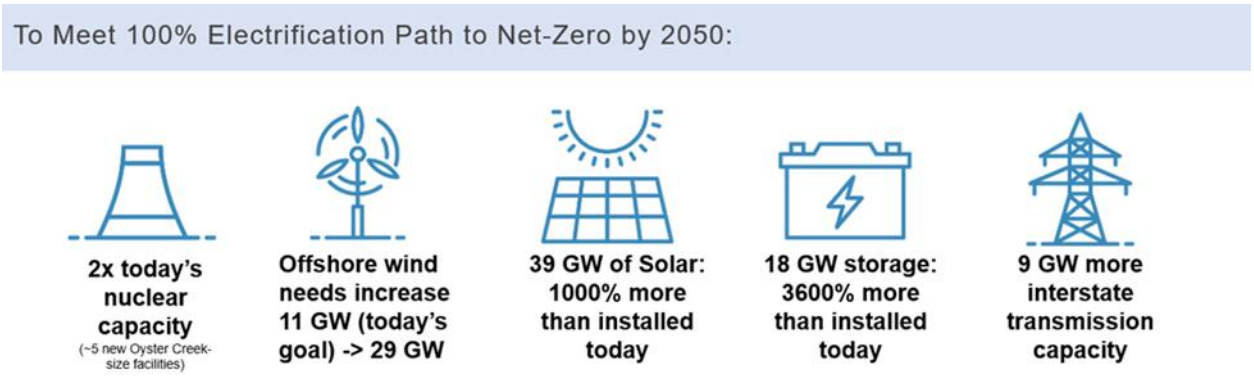
Given the potential to reach a new winter peak for electric load under electrification scenarios that would approximately triple the current winter electric peak, it is irresponsible to not have performed a more focused study reflecting the necessity of additional electric distribution system infrastructure and its estimated costs. Without trying to identify and estimate those costs, any long-term cost comparisons versus natural gas system heating costs cannot reasonably inform policy decisions.

To address these issues in a transparent, fact-based way, we respectfully request the Board to address the above questions as well as other stakeholder feedback. Additionally, should broad-based electrification of all energy end-uses remain the EMP's prevailing decarbonization approach, the EMP Ratepayer Impact Study should be updated to take an in-depth study of electric system transmission and distribution system costs resulting from increased electrification load.

Beyond cost, New Jersey must also consider the need for where such infrastructure could and would be sited and the reasonable pace at which these investments could be made alongside the State's goals for increased electric load vis-à-vis electric vehicles and electric heat pumps, coupled with forecasted demand growth from

data centers. These elements are critical to ensuring reliability and affordability, as well understanding pathway and strategy feasibility.

Our own work performed with independent consultants in this area shows just how significant these infrastructure challenges truly are to achieve a net-zero economy by 2050, without use of the gas network:



Discussion of policy consequences, pathway and planning considerations, and reliability and other issues implicated in EMP strategy 3.4 "Maintain existing gas pipeline system reliability and safety while planning for future reductions in natural gas consumption."

Reliability

Access to reliable energy is a basic need for customers and critical infrastructure across New Jersey. It is critically important to ensure energy delivery remains reliable while considering policy that transforms our energy resources.

As climate change and extreme weather pose risks to our energy infrastructure, we have an obligation to invest in more durable, resilient and reliable energy networks to protect the livelihood and well-being of our residents and businesses, and the growth and prosperity of our economy. There is no starker example of the need for – and risks of not – considering energy system reliability and stability than 2021's Winter Storm Uri in which failure to deliver energy resulted in excess of 240 lives lost and economic damage estimated as high as $130 billion.[21]

At a systemwide level, New Jersey depends on our current natural gas infrastructure to operate year-round. Resiliency is a crucial component of a dependable energy system, which is obtained through diverse and redundant energy sources. Gas system resiliency and the ability to meet seasonal and peak demands represent essential elements that must be considered when designing energy systems for a low-carbon future.

[21] Gas-Electric Harmonization Forum, North American Energy Standards Board, July 28, 2023.

As New Jersey looks to decarbonize its energy system and significantly build out renewable and low-carbon electric generation, consideration must be given to the feasibility of transitioning this energy load from the gas system to the electric system.

- The natural gas system delivers the majority of energy during New Jersey winters, with nearly 75% of households relying on natural gas for heat.

- New Jersey's gas infrastructure is designed to reliably deliver 5 billion cubic feet per day of energy on the coldest days of the year, the energy equivalent of over 60 gigawatts of electricity.

- By contrast, New Jersey's electric system is designed to deliver approximately 17 gigawatts of energy on the hottest days of the summer.

Cautious planning is required, and the costs and risks associated with building more resilient electric infrastructure transmission and distribution would become magnified without a dual-fuel energy system.

In practice, underground gas infrastructure is inherently a more reliable form of energy transportation and delivery to customers. Buried underground, it is less susceptible to weather events and physical damage.

Today, NJNG operates more than 7,700 miles of modernized underground transmission and distribution infrastructure. For longer than a decade – since Superstorm Sandy – there have been zero gas system outages due to weather conditions. Comparatively, electric system outages in the State average 104 minutes per year per customer. However, the duration and impact of significant outage events are unevenly spread, with over 35% of New Jersey households experiencing power outages lasting over 24 hours – 5th highest in the nation according to EIA data.

It's no surprise then that in NJNG's service territory alone, more than 24,000 households and businesses have installed back-up generators powered by natural gas or delivered fuels to minimize the burdens of electric outages.

From a critical infrastructure perspective, reliability is imperative in an energy transition as we see an uptick in larger outage events. In New Jersey Natural Gas' service territory, there are over 1,500 critical infrastructure facilities that rely on natural gas delivery. This includes: emergency services, healthcare facilities, sewer/water treatment plants, government operations, military bases, and telecommunications.

New Jerseyans also rely more heavily on the gas system as a backup during time of large-scale electric outages. Roughly 30-40% of residents across NJNG's service territory rely on portable backup generators during power outages,[22] with many more opting for stand-by natural gas generators for home, business and critical infrastructure back-up power.

Real-world considerations such as these need to be acknowledged and built into scenario modeling.

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[22] Health Indicator Report of Portable Generators: Self-Reported Ownership for Use during Power Outages, New Jersey Department of Health, 2020.

Grid operators including PJM sounding the alarm

As power outages become more frequent and severe due to volatile weather conditions and climate impacts, increased electrification, massive demand increases forecasted from data centers (an economic development priority of the Murphy Administration), and increasing penetration of renewables in PJM and across other regional transmission operators (RTOs), reliability challenges will grow. We are witnessing these calls from PJM and other RTOs from around the country that there are near-term threats to our grid reliability.

The North American Electric Reliability Corporation (NERC) Long-Term Reliability Assessment report released in December 2023 cited "clear evidence" of growing resource adequacy concerns in an increasing number of areas in North America that are facing capacity or energy risks over the next decade.

Within the NERC report, multiple reliability concerns are highlighted:

- NYISO released studies that identified potential resource adequacy shortfalls starting in 2025 in New York City, prompting NYISO to solicit for market-based and regulated immediate solutions.

- In New England, there are heightening concerns for potential winter supply shortfalls due to the lack of sufficient fuel availability to satisfy electrical energy and operating reserve demands during an extended cold spell.

- Consistent with the NERC report, a reliability assessment by PJM on the energy transition stated that, for the first time in recent history, it could face decreasing reserve margins due to trends in high load growth, increasing rates of generator retirements, and slower entry of new resources.

- PJM calls for continued efforts between state and federal agencies to manage reliability impacts of policies and regulations, and the urgency for coordinated actions to shape the future of resource adequacy.

As intermittent renewables and electrification increase, it will be all the more challenging to solve these existing issues on our grid.

Our power system operators need all supply and demand side options at their disposal in the event of these weather events, wildfires, and cyber-attacks – which often knock out major power plants, damage wind and solar farms, or take down major electric supply lines. Ensuring adequate reserve margins are available for our grid allows for added necessary protection under these circumstances. Developing incentive mechanisms to appropriately compensate gas generators, pipelines, and storage facilities running fewer hours and with lower volumes to prevent these assets from exiting and shutting down is imperative.

They will also need to be able to rely on demand-side measures and, as it relates to winter heating loads – which the State would like to become electrified – operators will want to have the option to shed large chunks of that load when stressed winter conditions require them to do so.

These are not hypothetical risks. On Christmas Eve 2022, temperatures plummeted to below freezing within just a few hours knocking grid generation capacity offline and resulting in widespread power outages across the east

coast. In New Jersey, PJM and NJBPU each directed both gas and electric LDCs in New Jersey to drive urgent communications to customers to reduce energy usage to avoid shortfalls and service outages.

Without the inherent flexibility and reliability advantages of a dual, gas-electric energy system serving New Jersey, the results could have been disastrous. Moving forward, maintaining New Jersey's dual energy system, with decarbonization investments made in both, should remain a core priority of policy.

Integrated Planning and Reliability

Reliability cannot be an afterthought in New Jersey's energy policy and planning. Regulators mandate and New Jersey families and businesses – our shared constituents – expect and deserve energy system reliability at all times. The frequent impacts of severe weather across the nation and in New Jersey in the form of economic loss and broad-based power outages underscore the importance of a resilient integrated energy system.

Integrated systems planning is an effective tool to ensure limited ratepayer resources are expended in a cost-effective manner to meet energy demands and decarbonization mandates, while avoiding whenever possible a backslide to the use of more carbon-intensive power sources.

Integrated systems planning forms the foundation for long-term energy resiliency, given the increasing linkage between the gas and electric systems in day-to-day operation, peak grid demand management, and back-up reliability.

As a leading renewable energy producer and natural gas utility in the state, NJR strongly urges the EMP to explicitly give weight to the mandate for energy reliability and formalize Integrated Systems Planning as a core aspect of energy master planning moving forward in the following ways:

- New Jersey should undertake a comprehensive integrated energy systems planning analysis, focusing on utilities' systems and reliability mandate and electric and natural gas distribution systems, with consideration for resource adequacy and resource mix evolution.

- This study should focus on the forecasted evolution of electric load based on the expansion of renewable and distributed energy resources, demand changes resulting from electrification of the transportation sector and secular segment growth, including but not limited to data center demand, and how that load forecasting matches with generating resources, marginal generating sources, and the adequacy of transmission and distribution systems to reliably meet this forecasted growth.

- The BPU should host a forum to solicit stakeholder feedback considering Grid Readiness and Reliability, as called for in Executive Order 317.

Non-Pipeline Solutions & Value Proposition of Existing Infrastructure

EMP Strategy 5.4.2 calls for an effort to "Instruct gas utilities to propose and adopt non-pipeline solutions when seeking expansion or upgrade of the distribution system."

NJR disagrees with the EMP's assertion that "expansion of pipeline infrastructure is inconsistent with modeling that supports pathways to New Jersey's clean energy economy." As detailed in our opening comments on EMP Strategy 5, important cost, feasibility and reliability considerations remain unaddressed in pathways that contemplate broad-based electrification across the economy, and the myriad benefits of maintaining a statewide dual, gas-electric energy system have been overlooked.

However, NJR agrees that promoting gas utility non-pipeline solutions can serve two critical functions. First, depending on the gas utility and its particular characteristics, non-pipeline solutions can be a tool to mitigate the need for additional distribution and capacity enhancements. Second, non-pipeline solutions also offer an opportunity for New Jersey, through an infrastructure agnostic approach to policy, to be an enabler of significant, cost-effective emissions reduction and contributor to the State's 2050 emission reduction goals.

This second consideration for non-pipeline solutions should carry weight equal to, if not greater than, the first.

Valuing New Jersey's in-place and paid-for underground infrastructure is a critical component in realizing the goals of the Energy Master Plan. As detailed above (see: *Scale, cost and feasibility considerations as it relates to EMP strategy 5.1*…), significant investment needs to be made in generation, distribution, and end use in a scenario that advances "maximum" electrification at all costs. There is another way. Leveraging the existing infrastructure will save rate payers money, allow for choice, provide resilience through redundancy in energy delivery and speed emission reductions through the energy transition.

Three main strategies are at the core of leveraging existing infrastructure: energy efficiency, low-carbon fuels, and innovative technology/approaches. Leveraging the systemwide and customer benefits – cost and reliability – of these strategies requires enabling energy policy that embraces an open pathway, all-of-the-above approach to innovation, technology and a transparent, fully-informed comparison of the cost-effectiveness of emissions reduction approaches. These opportunities are discussed below.

Energy efficiency is the backbone strategy across nearly all modeled pathways to 2050 – it is simply indispensable in order to reach emissions reduction targets by 2050. With about 73% of the state's residents connected to the natural gas system, it is imperative state policy continue to support robust rebates and incentives to spur customer adoption of high-efficiency gas equipment.

In the case of home heating equipment, which accounts for the lion's share of residential natural gas use statewide, equipment life and turnover occurs only approximately every 15 years. Customers continue to choose natural gas equipment on price, comfort and reliability grounds. Making the decision to choose high-efficiency equipment harder by disadvantaging or eliminating gas equipment incentives risks missing an energy-efficiency opportunity at the time of upgrade and creating an enormous opportunity cost for capturing emissions reductions.

Energy efficiency is detailed more completely in NJR's response to EMP Strategy 3.

Common to all aspects of the energy transition there needs to be a recognition that one size does not fit all and flexibility and adaptability need to be built into all emerging policies. The state of any system's infrastructure will drive strategic decarbonization decisions. NJNG's system is entirely upgraded to protected steel and high-density polyethylene, with no cast iron. This modern system which has been replaced and paid for can carry multiple sources of lower and zero carbon gas.

Low- and zero-carbon fuels: To reduce emissions across our airshed while maintaining the ability to safely and effectively deliver reliable energy, NJNG will displace the geologic derived gas, or fossil gas, with renewable sources of energy, including renewable natural gas (RNG) and clean hydrogen, while maintaining the base load gas supply demand for our service territory. These non-pipeline solutions provide sources of energy can be introduced within or in vicinity to our service territory, offsetting existing, unavoidable and naturally occurring emission sources and reducing fossil gas needs – each resulting in lower net emissions.

The state should support the production of RNG from raw biogas that is generated from essential societal services, including landfills and wastewater, which at present significantly contribute to the emissions profile across New Jersey's airshed. Supporting this approach through the EMP will facilitate reductions in net emissions across the airshed and landscape and can be readily quantified. Coupled with policy that supports holistic management of waste and energy to serve the needs of society, this would make New Jersey a leader in climate management practices in state energy policy.

The production and use of hydrogen, hydrogen blends, carbon capture and production of recycled methane also present opportunities for non-pipeline solution development that deserve support through the EMP.

NJNG has led in this space by developing and operating the first green hydrogen plant on the east coast. The system began operation in October 2021 and has since injected hydrogen into our distribution system to decarbonize the gas supply and lower emissions. This small plant produces enough hydrogen to blend at very low (1-4% volumetrically over each month) rates in a small section of the distribution system. However, even on this small scale, the project can reduce annual carbon emissions equivalent to 400,000 miles driven per year. This system was planned, installed and operated in advance of the rapidly increasing federal and global interest around green hydrogen, making NJNG – and indeed New Jersey – a leader in the clean hydrogen space.

Building off our experience, NJNG is planning additional capital investment to develop multiple clean hydrogen production plants for thoughtful deployment throughout our service territory. We also recognize the opportunities hydrogen presents to decarbonize other, potentially harder-to-decarbonize sectors including transportation (see NJR's response to EMP Strategy 1), mass transit, maritime, industrial, aviation, construction vehicle and off road uses. As these end uses develop and products become more readily available, NJNG will be able to shift and distribute hydrogen throughout our service territory for multiple end use applications. Emerging but currently available de-blending technology also exists today. NJNG will be able to produce hydrogen, inject into existing pipelines for blending to end use thermal uses, or de-blend the gases and deliver pure hydrogen, hydrogen/natural gas blends, or pure natural gas to a myriad of end uses.

Clean hydrogen scale and deployment has considerable support at the federal level, including historic legislation from Congress in the form of the Inflation Reduction Act of 2022 and the Bipartisan Infrastructure Law, each of which provides considerable funding, policy support, and momentum behind a US clean hydrogen economy. With supportive policy, New Jersey can help ensure federal dollars are captured and leveraged for projects that reduce emissions within the state.

Innovation and New Technology: Carbon capture is also closely related to both RNG and hydrogen production and is a critical area for innovation. While capturing biogas from an RNG source, CO2 and CO can also be captured and either routed for sequestration or blended with on-site hydrogen production to form recycled methane, which will greatly increase the efficiency and cost effectiveness of capture and refinement systems, while reducing emissions. Carbon capture opportunities also exist and are advancing effectiveness in a wide

range of scale, from boiler applications through industrial stack applications. The continued advancement of these technologies and space within policy to allow for that advancement is critical.

This year, NJNG installed New Jersey's first-of-its-kind distributed carbon capture system at our Wall Township headquarters. This system is operational today – actively capturing carbon emissions that would otherwise be emitted from our existing building HVAC system and proving the real-world potential for this important technological innovation.

Through a combination of RNG, green hydrogen, and carbon capture, a local distribution company such as NJNG has the ability to displace a significant portion of its fossil-derived base gas supply to reduce net emissions, all while delivering the energy to customers without a need for costly end use conversion. This approach provides a more practical, customer-centric approach that allows families and businesses to make informed decisions based on costs while maintaining the regulatory oversight by the Board of Public Utilities.

Recognizing the broader national and international landscape for renewable energy technology innovation and allowing state policy to accommodate cost-effective breakthroughs is critical to ensuring an affordable, reliable pathway to emission reductions. The value of non-pipeline solutions in delivering comparatively cost-effective emissions reductions should be recognized alongside their stated role in the 2019 EMP in potentially reducing the need for additional natural gas supply.

Strategy 3: Maximize Energy Efficiency and Conservation and Reduce Peak Demand

Key Section Takeaways

- Energy efficiency remains the most cost-effective strategy for achieving emissions reductions. Customer participation and uptake continues to offer a large opportunity statewide for both gas and electric customers.
- The EMP must prioritize and bolster energy efficiency measures for both gas and electric utilities in order to meet emission reduction targets.
- Any policy that makes the decision to choose high-efficiency equipment harder at the time of a customer equipment upgrade, including disadvantaging or eliminating gas equipment incentives, risks missing an emissions reduction opportunity that only appears during a short replacement window.
- New Jersey should support an open pathways approach to decarbonization, remain open to breakthrough end-use technologies, and support innovative utility energy-efficiency programs on both the gas and electric system, especially hybrid heat, networked geothermal, and demand response.

Maintaining and expanding energy-efficiency programs that leverage the resources and assets of all utilities and end uses is a cornerstone of decarbonization planning. The common thread across all decarbonization pathways is energy efficiency – the need to substantially reduce the amount of energy used in our homes and businesses. Energy efficiency is the fastest and most cost-effective way to reduce emissions across sectors, regardless of the type of energy delivered.

Providing customer rebates, financing options and grants for high-efficiency equipment replacement or upgrades and weatherization is an important, low-effort and cost-effective emissions-reduction strategy for New Jersey today, and an area in which NJNG has been leading for nearly 15 years.

Strengthening and scaling Energy Efficiency programs for both gas and electric use in the state is a no-lose proposition. Using less energy reduces emissions and saves money. New Jersey has taken strong action in this regard, cementing energy efficiency as a state energy policy priority, as set forth in law under the 2018 Clean Energy Act.

NJNG continues to strongly support the expansion of New Jersey's energy efficiency programs. The goals established by New Jersey's Clean Energy Act are among the most aggressive in the country as can be evidenced by a review of the American Council for an Energy Efficient Economy's ("ACEEE") Annual State Energy Efficiency Scorecard.[23] Utility efforts to achieve these goals would put New Jersey near the top of the pack in the energy-savings category. In fact, the 2022 ACEEE Scorecard indicated only one state was achieving more than the 2%

[23] The State Energy Efficiency Scorecard, American Council for an Energy Efficient Economy's ("ACEEE"), December 6, 2022

savings on annual electric retail sales and only four states are achieving more than 0.75% savings on annual natural gas sales called for in the CEA.

The EMP must build on this leadership, rather than reverse it. First, it is imperative that state policy continue, as provided for under the Clean Energy Act, to support robust rebates and incentives to spur customer adoption of high-efficiency gas equipment.

The goal of the Clean Energy Act has always been very clear – to get annual energy savings in a cost-effective manner. This includes both natural gas and electric utilities to reduce customer use over time through energy efficiency programs offered by the utilities directly to customers.

The CEA did not contemplate any potential restrictions to natural gas equipment in its directive. Rather, it established processes for utilities to make cost-effective investments that deliver measurable emissions reductions on gas and electric system.

A new Energy Master Plan must continue to align with this legislative intent and continue the progress made to date in New Jersey by both gas and electric utility energy-efficiency programs.

Moving forward, the EMP should bolster all programs that reduce energy use from all energy systems. Continued support for energy efficiency measures across both the gas and electric utilities will be critical to reaching the state's goals.

Consider the following:

- Today, approximately 73% of the state's residents are connected to the natural gas system and consuming natural gas via natural gas appliances in some form.

- In the case of home heating equipment, which accounts for the lion's share of residential natural gas use statewide, equipment life and turnover occurs only approximately every 15 years.

- Market behavior continues to show that natural gas customers continue to choose natural gas equipment on price, comfort and reliability grounds. A recent independent evaluation of NJNG's SAVEGREEN programs found that contractors indicated the absence of incentives for natural gas equipment is likely to cause customers to choose to install lower-efficiency equipment or skip the upgrade entirely.

- Getting customers into a high-efficiency appliance vs. a standard efficiency one makes a real, substantive difference on lowering emissions. Today in New Jersey, incentivizing the upgrade from a standard 80% efficiency natural gas furnace to high efficiency furnaces (95% efficiency or higher) has a greater positive impact on emissions reduction at a dramatically lower cost than both mandated or incentivized electrification for the overwhelming majority of customers.[24]

[24] Incremental cost per ton of abated CO2 vs. low efficiency furnace of $(278) for high efficiency furnace vs $513 for electric heat pump. Model assumptions: Total capital cost of $22K for whole house electric heat pump sized for 6 ton peak load; State average electric

For commercial customers, gas heat pumps, which are beginning to scale into the market, offer even greater efficiencies up to 140%.

Therefore, any policy that makes the decision to choose high-efficiency equipment harder at the time of upgrade, including disadvantaging or eliminating gas equipment incentives, risks missing an emissions reduction opportunity that only appears during a short replacement window.

This could create an enormous opportunity cost for capturing emissions reductions and an enormous step backwards in efforts to meet 2050 emissions reduction goals.

Unfortunately, New Jersey's current approach to decarbonization, highlighted most recently in its Building Decarbonization Start-Up Straw Proposal, is largely focused on electrification and alarmingly deviates from past precedent that requires programs to demonstrate cost savings for participants.

It is critical that State policy does not limit broader opportunities for cost effective decarbonization by placing an overreliance on electrification when that is just one of the available strategies capable of reducing energy usage and emissions for New Jersey's residents and businesses.

Instead, the energy efficiency policy of the state should continue to encourage customers to pursue the highest efficiency equipment for their fuel choice, just as they are today.

Second, the EMP should allow for advancements in technology, availability of end-use appliances and for consideration of net energy efficiency regardless of the delivery system.

Innovation is not limited to next-generation renewable energy and lower-carbon fuels. It's happening at a rapid pace in the energy efficiency and end-use appliance space as well, with important implications for how we think about the efficacy and affordability of energy efficiency solutions and customer choice in climate policy.

According to results from E Source's 2021 Residential Electrification Study,[25] nearly 80% of customers who own a natural gas furnace prefer to keep natural gas as their fuel source. This independent analysis supports the view that customers value energy choice, and for the customer market to realistically transform to high-efficiency, lower-carbon appliances, a menu of fuel and electricity options will be needed. That menu should evolve with the latest technologies and innovations that offer cost-effective solutions for customers and careful stewardship of public funds, as well.

Such breakthrough approaches that show promise in that regard include the development and commercial introduction of natural gas heat pumps ("GHPs"), distributed carbon capture, and hybrid home heating, among

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($.168/kwh) rates from Nov 2022-Mar 2023 from Energy Information Administration, escalated at 1.4% based on Independent Consultant Study Performed for NJNG, June 2023,estimate; Annual electric load in is 9375 kwh per year assuming 800 therm heating load per year and electric heat pump efficiency of 250%, based on actual whole house heat pump performance from Cadmus Group "Residential ccASHP Building Electrification Study", June 3, 2022 study funded by NYSERDA, US DOE, Mass Clean Energy Center; Emissions for electricity calculated from New Jersey Triennium 2 Building Decarbonization Straw Proposal, "Emissions Reductions By 2050" Table 6, page 16, June 14, 2023; EPA standard emissions rate for natural gas combustion is 117 pounds/million BTU.

[25] Results from the 2021 Residential Electrification Survey, ESource, September 27, 2021.

others, discussed in more detail below. The state should take an open approach that allows for these innovations to be advanced, piloted at the appropriate scale and studied, and then offer broader programmatic support for those that can demonstrate cost-effectiveness and real emissions reductions.

GHPs are appliances that provide building heat and water heating at extremely high efficiencies when compared with traditional gas furnaces. Similar to electric-powered, air-source heat pumps, GHPs are extremely efficient, but are driven by natural gas rather than electricity. As such, they are more efficient and effective at delivering heat in cold climates, and less costly to operate.

According to the British Columbia Institute of Technology's Zero Energy Buildings Learning Centre, GHPs have the following critical benefits:

- Have efficiencies of 140% (compared to high efficiency furnaces, which are currently capped around 99% efficiency, and standard efficiency furnaces which generally fall in the 80% efficiency range).

- Can use refrigerant with no global warming potential in contrast to electric heat pumps, which most commonly use refrigerants that carry a global warming potential thousands of times more intensive than CO2.[26]

- Are compatible with a wide range of fuel sources such as natural gas and low- and zero-carbon fuels such as renewable natural gas and hydrogen.

GHPs are a potential game-changer; a typical home with an 800 therm per year heating load could reduce emissions and operating costs by over 40%. Leveraging existing, reliable and operational infrastructure, this technology can be non-disruptive for customers and seamlessly deployed in millions of buildings that use gas furnaces today without adverse impacts on the electric system.

NJNG is already helping to drive this change. We currently have six commercial-use GHPs in operation at an existing facility, which are serving the dual purpose of providing HVAC on-site needs while providing an opportunity for real-world demonstration and education.

State policy and programs should recognize this potential and fully support efforts by gas utilities to test, commercialize and scale this technology.

NJNG also urges the EMP to incentivize a hybrid heat approach, leveraging gas and electric systems to meet its decarbonization goals in the building sector. Hybrid heat is the building equivalent of a plug-in hybrid electric vehicle, whereby the primary fuel consumed for operation is electricity (via a battery), with an integrated secondary power source that uses conventional fuel (gas). In the case of hybrid heating in a building, the primary electric source is an electric heat pump, with the secondary source being a high-efficiency gas furnace.

In a typical hybrid approach, electric heat pumps meet heating needs during milder temperatures when they can maximize their performance and efficiency benefits, with high efficiency gas heat operating in colder

[26] Impact of Refrigerants: Fact Sheet #1, ATMOsphere x Future Green Now.

temperatures when heat pump efficiency tends to degrade, from as much as a manufacturer-listed Coefficient of Performance ("COP") of between 3.5-4.0 down to 2.5 in real world conditions[27].

At the same time, by stepping in to fulfill energy demand as heating energy requirements increase, a hybrid heat system helps to intelligently manage demand by shifting energy load from the electric system to the gas system. At a systemwide level, this improves reliability while lowering costs by using existing infrastructure to meet demand, avoiding the costs of building out a winter-peaking electric system to do the same job.

The benefits of this approach are many, and can include:

- Lower customer energy costs;
- Increased comfort and a more seamless appliance transition for customers; and,
- Avoidance of the significant and challenging expense of upgrading electric system capacity to meet winter peak heating needs and improved reliability of the electric system.

Hybrid heat installations using high efficiency gas furnaces can conservatively provide a similar emissions profile to a fully electrified building over the lifecycle of conversions initiated well into the 2030s – and allow for dramatic systemwide energy transition cost savings by avoiding significant costs of building out the electric system. This is true before even considering the use of renewable fuels ramping up through the natural gas network or the use of extremely efficient natural gas heat pumps in a hybrid heat configuration, which would lower emissions even further.

It was encouraging to hear, in the opening of the 2024 EMP's public comment sessions, the Executive Director of the Governor's Office of Climate Action and the Green Economy discuss the intention to explore the long-term value of natural gas infrastructure to support peak demand reduction on the power system "for the coldest hours" of the year. However, this recognition of the value of existing pipeline infrastructure to help ensure reliability and avoid the extreme costs of an electric-only approach must be extended to a broader decarbonization role for gas infrastructure that considers customer choice and adoption hurdles to electrification in New Jersey, including but not limited to hybrid heat applications.

[27] Residential ccASHP Building Electrification Study Final Report, CADMUS, June 3, 2022; Hudson Valley Heat Pump Pilot Program: Demonstrating the Emerging Technology of Cold-Climate Air Source Heat Pumps, NYSERDA, Report Number 22-08, 2022.

Strategy 4: Reduce Energy Consumption and Emissions from the Building Sector

Key Section Takeaways

- There is no single, silver bullet solution to achieve decarbonization goals in the building sector, and New Jersey families and businesses continue to demand choice in making energy decisions for their homes and businesses. One cannot conclude it is reasonable to plan for decommissioning of the gas system.
- There is limited or no environmental benefit to adding new electric heat load to the existing electric grid until it has been further decarbonized.
- The Ratepayer Impact Study completed by the State leaves major uncertainties on cost to customers for mandated electrification. We must continue to be clear on policy impacts to constituents, who continue to enjoy the benefits of a dual energy system.
- Apart from the significant systemwide costs, the absence of emissions benefits and the negative reliability impacts of electrification, the reality is that heat pumps are extremely expensive for customers and the market has not accepted them as a replacement for natural gas in cold climates.
- As such, the 2019 EMP goal to replace natural gas heat installed in over 3 million New Jersey buildings (75% of total building stock) with electric heat pumps is not reasonable.
- Innovation and technology have changed the conversation; New Jersey's gas local distribution companies have a large role to play in delivering cost-effective emissions reductions, including through energy efficiency, low- and zero-carbon fuels, hybrid heat, and the significant potential for carbon capture and other breakthroughs.
- Building sector decarbonization strategy – and state energy policy altogether - should consider varied scenarios and pathways, and leave multiple doors open to harness investment, innovation, competition, and consumer choice to lead us to better, faster, and more affordable solutions to achieve climate goals.

As the parent company of a local distribution company and lifeline energy provider, NJR's vision for our company in the renewable energy future is to rapidly enable a renewable energy transformation for New Jersey that is affordable and reliable through the reduction of fossil gas consumption, and the storage, transport and delivery of renewable energy sources whenever and wherever they are needed to lower emissions. We can accomplish this by leveraging our upgraded energy delivery infrastructure, vast and trusted customer relationships, and our record of leadership in reducing customer natural gas usage through successful energy efficiency programs.

- New Jersey ratepayers have already invested $17 billion to build out a vast, upgraded, 35,000+ mile underground natural gas pipeline network – more coverage per square mile than any other U.S. state.

This ubiquitous network provides safe, reliable, and low-cost energy to homes and businesses, as well as the state's power generation sector.

- As detailed in these comments, this system cannot be easily or affordably replicated or replaced. Instead, it should be regarded and leveraged as an asset that can deliver and store low- and zero-carbon fuels for a variety of end uses including heating and transportation, continue to complement and balance costly demand on the state's electric system, and maintain energy reliability and resiliency for New Jerseyans. In so doing, New Jersey's existing gas network can be a powerful tool to help ensure New Jersey's 2050 emissions reduction goals become a reality as affordably and reliably as possible.

- Valuing New Jersey's in place and paid for underground infrastructure is a critical component in realizing the goals of the Energy Master Plan. As detailed above (see: *Scale, cost and feasibility considerations as it relates to EMP strategy 5.1*…), significant investment needs to be made in generation, distribution, and end use in a scenario that advances "maximum" electrification at all costs. Alternatively, leveraging the State's existing pipeline infrastructure will save ratepayers money, allow for choice, provide resilience through redundancy in energy delivery and speed emission reductions through the energy transition.

  NJR has outlined three main strategies at the core of leveraging existing infrastructure: energy efficiency, low-carbon fuels, and innovative technology/approaches. Leveraging the systemwide and customer benefits of these strategies requires enabling energy policy that embraces an open pathway, all-of-the-above approach to innovation, technology and a transparent, fully informed comparison of the cost-effectiveness of emissions reduction approaches. These opportunities were discussed in detail in Strategy 5 ("Non-Pipeline Solutions & Value Proposition of Existing Infrastructure")

As such, NJR is committed to the overarching goal of EMP Strategy 4 – reducing energy consumption and emissions from the building sector.

We look forward to working with the BPU and other stakeholders to establish and refine strategies, goals and regulatory actions in line with this vision – not simply acknowledging a role for New Jersey's natural gas infrastructure in a renewable energy future, but by recognizing and capitalizing on the *significant* role our company and assets will play in making our energy evolution more achievable, more affordable, more reliable and more resilient.

However, we have fundamental disagreements with assertions made in the EMP about the future of building decarbonization and pipeline infrastructure, most notably:

- That there is a single preferred way to meet the State's decarbonization goals with maximum electrification;

- That "modern air- and ground-sourced electric heat pumps have similar operating costs to natural gas furnaces;"

- That certain categories of ongoing investment in New Jersey's pipeline infrastructure "risks financing what will become stranded assets;"

- The flawed conclusions of the Integrated Energy Plan's least-cost scenario that offers a maximum electrification strategy as the lowest-cost pathway to 2050 goals; and,

- The resulting conclusion of some stakeholders that now is the appropriate time to start planning for decommissioning the gas system.

These inaccuracies and recommendations for addressing them are addressed fully in NJR's comments below.

At a macro level, NJR calls for a building sector decarbonization strategy – and state energy policy altogether – that considers varied scenarios and pathways, and leaves multiple doors open to harness investment, innovation, competition, and consumer choice to lead us to better, faster, and more affordable solutions to achieve climate goals.

At the core of the broad-based electrification argument is proponents' belief that modern electrified heating equipment (residential and commercial heat pumps, and other appliances) is more affordable, results in lower emissions, and will therefore be adopted widely by customers.

The reality is that these beliefs are not grounded in facts.

The EMP "least cost" scenario would require forcing 3 million residential and 150,000+ commercial accounts to convert from gas to electric heat pumps, and in the future preclude customers from deciding how they choose to heat their homes and buildings.

There is no evidence of significant whole house heat pump adoption by consumers to date in New Jersey, and no indication of how technical and economic barriers (described below) to whole house heat pump adoption can be overcome at a scale to conclude that 3 million New Jersey buildings will be electrified by 2050. Nor is there any evidence to suggest that the electric system can be cost-effectively and feasibly scaled to two to three times its current size to meet winter heating needs without the gas system, or how those needs can be reliably met with intermittent renewables.

For New Jersey, these structural issues around broad-based heat pump adoption remain challenging and deserve careful examination. These include a full and complete look at total customer costs, customer disruptions, reliability, detailed emissions impacts analysis (factoring in grid emissions and forecasts based on actual renewable energy deployment and demand trends), and quality data from New Jersey on the real world performance of whole home heat pumps in cold climates.

Customer Affordability

NJR strongly supports the preservation of customer choice in making energy decisions, with the full recognition that it cuts both ways – there may be some early adopters who are interested in installing electric heat pumps without seeing a reduction in their energy bills.

However, the average homeowner or small businessowner is interested in understanding the impacts equipment installations may have on their budgets and look to reduce costs whenever possible. In the case of electric heat pumps, as recognized by the BPU itself in its Building Decarbonization Startup Proposal May 11

draft, switching from natural gas is likely to cost consumers more based on the energy prices and system performance in our market.

This is a reality that has been undermined by stakeholder misinformation and an absence of clear, fact-based communication to the public from officials. The 2019 EMP itself was guilty of this, asserting "…efficient heat pumps would have similar or lower operational costs than natural gas furnaces (last row in Table 3), and would be much less expensive to operate than furnaces using home heating oil or propane."

The underlying cost data informing this comparison for natural gas, heating oil, baseboard electric resistance heating and propane comes from the Energy Information Administration (EIA) – a well-reputed source.

However, the data for electricity via "modern heat pump", which was estimated at a lower cost, was sourced back to an estimate based on a Rocky Mountain Institute case study which looked at a range of energy and equipment installation costs in Oakland, CA, Chicago, IL, Houston, TX, and Providence, RI. New Jersey is not referenced a single time in this report, and it remains unclear what methodology was applied to assume these costs for New Jersey, nor how those four disparate cities could inform a reasonable cost estimate for New Jersey. Nonetheless, it is plainly asserted as applicable to New Jersey.

Other studies, including the State's Ratepayer Impact Study and a pair of studies from the Acadia Center on comparative customer energy costs in New Jersey, contain many other significant flaws and omissions as to make them unactionable and misleading. NJR/NJNG has previously detailed these concerns in depth in our comments on the BPU's Future of Gas proceeding (submitted September 2023).

The reality of the costs of heat pump adoption in New Jersey do not match this rhetoric.

Real, substantial costs to families and businesses: on a total cost of ownership ("TCO") basis that includes upfront capital costs and lifetime operating costs, heat pumps cost significantly more for customers to install and operate today than high efficiency gas furnaces. Before subsidies, NJNG calculates the TCO for an electric heat pump in 2023 to be more than $54,000 per family compared to approximately $37,000 for a high-efficiency furnace – 46% higher costs.[28]

These costs reflect the reality of heat pump conversions in a market with an older housing stock without duct work, dense urban areas with multifamily buildings relying on hot water steam heat, and older commercial buildings.

As detailed earlier in these comments, these costs come with no meaningful emissions savings until the electric grid becomes significantly cleaner (See comments on Strategy 5). On any objective basis, the headlong rush to achieve outright conversions from natural gas fuel to full electrification (as opposed to high-efficiency gas

[28] Capital costs for all heating appliances based on Independent Consultant Study Performed for NJNG, June 2023,for typical 2000 sq foot single family homes sized for 6 ton peak load. Annual operating costs based on State average electric ($.168/kwh) rates from Nov 2022-Mar 2023 from Energy Information Administration, escalated at 1.4% based on Independent Consultant Study estimate. Annual electric load is 9375 kwh per year assuming 800 therm heating load per based on electric heat pump efficiency of 250% (based on actual whole house heat pump performance from Cadmus Group "Residential ccASHP Building Electrification Study", June 3, 2022 study funded by NYSERDA, US DOE, Mass Clean Energy Center.)

equipment or hybrid heat solutions) is premature when it comes to customer disruption, reliability, costs or emissions reduction benefits.

To be achievable, New Jersey's energy transition must be as affordable as possible for customers – families and businesses that pay rates and especially low- and moderate-income households who already carry a significant energy burden. As of 2021, New Jersey's cost of living for a family of four is nearly 400% higher than the federal poverty level,[29] and 2.2 million households – 39% of residents – are struggling to pay their bills.[30]

Research shows that leveraging gas infrastructure to achieve New Jersey's decarbonization targets is a more cost-effective and feasible strategy than an all-electric alternative. Decarbonization pathways that rely solely on the electric grid and phase out use of the gas system could cost up to $135 billion.[31] Residents would incur the costs of new electric-only appliances and panel upgrades to support them, an overbuild of renewable and carbon free power generation, as well as extensive grid expansions. The research estimates that as much as $90 billion[32] of those costs would be required to decommission and phase out use of the gas system (see "Grid Impacts and Costs").

Moving forward, it is essential to have full transparency regarding the expected emissions reductions based on PJM grid energy sources, as well as customer price impacts that include a full view of upfront capital costs.

Reiterating Power System Impacts

Major uncertainties remain over the impact on the power system. The State's Ratepayer Impact Study has been completed without a full assessment of the cost impacts of forced electrification for consumers and businesses to convert their buildings to all-electric. It also provided no visibility on cost per kilowatt hour for electric grid and local transmission and distribution system buildout to reliably absorb and meet the winter peak loads served by the gas system today. To illustrate:

- New Jersey has invested in a gas system to meet peak customer needs on a 0-degree day, approximately 5 BCF/day.
- Thermodynamically, that's equivalent to approximately 60 gigawatts of power or 3.5x New Jersey's peak summer day electric need today.
- Most heat pumps today switch over to electric resistance heat in the coldest temperatures – if that happens in January 2050 according to the State's plans, we will need to prepare for 64 gigawatts of power demand to meet that peak day.

With more efficient cold climate heat pumps, the additional demand might be 40 gigawatts, still 2.2x of the State's current peak electric demand.

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[29] ALICE State and County Household Budgets 2021, New Jersey State Data, Accessed 9/1/23
[30] Census Bureau Week 60 Household Pulse Survey: July 26 – August 7, Issued 8/16/23
[31] Independent Consultant Study Performed for NJNG, June 2023
[32] Id.

Some advocates suggest that we can reduce this peak demand by investing in building energy efficiency to reduce thermal heat loss, which would reduce the size and cost of the heat pump, and the peak demand on the electric system. The costs and technical feasibility of this hypothesis are not certain or proven, particularly in the Mid-Atlantic region where, according to EIA, nearly half the homes were built before 1960, and three-quarters before 1980. Because of this, we reemphasize our recommendation to obtain quality data on the real-world performance of whole home heat pumps in New Jersey.

Taken together, the reality is that building decarbonization in New Jersey is a lot more complex than a single-solution approach – "electrify everything" or otherwise.

Energy systems are complex, and gas and electric systems are increasingly interrelated when it comes to ensuring reliability, resiliency, and least cost decarbonization outcomes. For New Jersey, the fact that we have a deeply enmeshed dual gas-electric energy system, much of which has been upgraded, has significant advantages – if policy allows them to be leveraged.

The EMP should recognize and embrace the movement to value existing infrastructure and deliver cost-effective emission reduction solutions: allowing New Jersey to avoid massive electric system investments, to keep energy systems complementary and reliable, and to allow customers to make their own energy choices with a range of decarbonization options that fit their needs.

Strategy 6: Support Community Energy Planning and Action with an Emphasis on Encouraging and Supporting Participation by Low- and Moderate Income and Environmental Justice Communities

Key Section Takeaways

- Low- and moderate-income ratepayers cannot be left behind in the long-term energy transition.
- Credibility with customers is a paramount concern in driving any market transformation. If a customer is told to expect savings when replacing equipment and switching fuels for their home heating needs, they should realize those savings, especially when they come with significantly higher upfront equipment costs, as with electric heat pumps.
- At present, studies around customer electrification costs are incomplete and risk misleading the public when it comes to real world cost burdens they will incur.

To be achievable, New Jersey's energy transition must be as affordable as possible for customers – families and businesses that pay rates and especially low- and moderate-income households who already carry a significant energy burden. As of 2021, New Jersey's cost of living for a family of four is nearly 400% higher than the federal poverty level,[33] and 2.2 million households – 39% of residents – are struggling to pay their bills.[34]

NJR shares the belief that low- and moderate-income ratepayers cannot be left behind in the long-term energy transition. Putting forward policies that increase the energy burden for customers struggling to meet basic needs is antithetical to fostering a just energy transition.

Some have called for efforts to correct for the higher cost burden of electrification by adjusting bill credits or creating new rate design paradigms for heat pump customers. These suggestions are themselves an admission that electrification results in higher energy bills for customers. Trying to mask these higher costs by raising other costs makes energy more expensive across the board and the energy transition less affordable for everyone. It also risks disproportionately impacting low- and moderate-income households with higher costs – renters who have no control over the appliance in their home and homeowners whose older housing stock makes the switch to a heat pump extremely costly and more difficult.

We state again our concerns around the need for transparency and grounding in facts around the issue of costs to families and businesses. Credibility with customers is a paramount concern in driving any market transformation. If a customer is told to expect savings when replacing equipment and switching fuels for their home heating needs, they should realize those savings, especially when they come with significantly higher upfront equipment costs, as with electric heat pumps. At present, the State runs a severe risk of damaging its credibility if a flawed, incomplete and misleading study of costs becomes the prevailing pitch to customers (see NJR earlier comments "Customer Affordability" addressing Strategy 4).

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[33] ALICE State and County Household Budgets 2021, New Jersey State Data, Accessed 9/1/23

[34] Census Bureau Week 60 Household Pulse Survey: July 26 – August 7, Issued 8/16/23

This is especially glaring in two studies that continue to be referenced in the dialogue around building electrification, one commissioned by the State and one conducted by a third party, the Acadia Center. In brief:

- NJBPU's Ratepayer Impact Study only modeled consumer cost impacts out to 2030 and failed to consider upfront capital costs for either electric vehicles or electric heat pumps. Nor did it consider in any way the systemwide cost implications of massive increases in electric load driven by transportation and building end-use electrification, which ultimately end up reflected in rates and customer bills.

- The Acadia Center's "Future is Electric I & II," often cited by electrification proponents as proof of available customer savings, is flawed in its assumptions, analysis, and conclusions. Acadia's studies lack transparency into its modeling and assumptions, but clearly rely on cherry-picked high natural gas prices that do not reflect real-world customer costs, nor do the authors disclose performance assumptions of electric heat pumps used in their model.

Here, NJR also restates the opportunity before the State to continue driving equitable energy outcomes through its energy efficiency programs and Community Solar program (detailed in NJR comments on Strategy 3 and 2, respectively).

- Concerning energy efficiency, in order to reach the greatest number of customers with energy savings and emissions reductions resulting from energy efficiency program participation, including LMI households, it is imperative that state policy continue, as provided for under the Clean Energy Act, to support robust rebates and incentives to spur customer adoption of high-efficiency gas equipment.

- Concerning the Community Solar program (CSEP), the state should implement program improvements, including opt-out vs opt-in structures for customer participation, a feed-in tariff design, and streamline key administrative functions by migrating them to operator responsibility.

Strategy 7: Expand the Clean Energy Innovation Economy

Key Section Takeaways

- New Jersey energy policy should continue to benefit from an open-pathways approach to decarbonization solutions across the gas and electric systems.
- Innovation is happening at a rapid pace in low- and zero-carbon fuels, renewable energy deployment and end-use appliances; allowing space for the best, most cost-effective solutions to emerge and scale, no matter their technology, is the way to achieve 2050 goals in the least-cost and most affordable way possible.

Innovation is taking place in every facet of the energy industry, with pipeline-delivered energy no exception. We are seeing this in New Jersey today.

- New Jersey is home to the east coast's first utility hydrogen blending project, which was completed and placed into operation since October 2021 in Howell, New Jersey.
- Today, distributed carbon capture technology is also in operation in Wall Township, New Jersey – novel, breakthrough technology that integrates with existing building HVAC systems to capture carbon from natural gas-powered boilers and furnaces, with no massive retrofit or change to the building's energy use.
- Renewable natural gas projects are beginning to take shape, with ground broken on an important food waste digesting facility in Linden, New Jersey, and key, large-scale landfill RNG projects in development. Supporting a circular economy benefitting the waste industries of New Jersey strengthens our economy and reduces emissions.

These are but a few examples of where renewable fuel and pipeline energy innovation are taking place; but they are critical to understand the high concept: dual energy systems serve an essential, complementary role in New Jersey's energy landscape and offer enormous advantages on the road to 2050.

New Jersey's dual gas-electric energy network offers reliability and resiliency, cost competitiveness, and the flexibility to adopt and scale the most cost-effective innovative solutions as we drive toward 2050 emission reduction goals. Significant ratepayer investment has been made to build this system; it is an asset we should use to lower costs, preserve energy reliability and ensure a smooth, minimal-cost customer journey.

A commitment to decarbonization solutions on both the gas and electric systems is needed to capture these benefits across economic sectors – transportation, power generation, buildings, and renewable energy – and drive synergies, some of which are already in front of us when it comes to clean hydrogen, hybrid heat and carbon capture.

The 2019 EMP's view toward innovation, as enumerated in Strategy 7, must take a broader view of renewable energy technology, research and development, and not a single focus on electrified outcomes.

New Jersey should align with much of federal policy, which is aggressively pursuing growth of a clean hydrogen economy and provides unprecedented support for a diversified range of technologies – with a focus squarely on emissions reductions and not a preferred technology.

New Jersey must likewise think big and more broadly to solve its challenges – that means leaving room for innovation, engagement from all participants in the market, and an open, competitive landscape for the best solutions to emerge.

It is sincerely the hope of NJR that the forthcoming EMP embraces these principles.

We thank you for your consideration of these comments in this proceeding.

Respectfully submitted,

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