Preliminary Findings of Central Hudson's Revised Long Term Gas Plan

Prepared for New York Department of Public Service

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Version: Preliminary

Figures

Tables

Glossary

AGREE-NY - Alliance for a Green Economy-New York
ASHP - Air source heat pump
BCA - Benefit-Cost Analysis
BE - Building Electrification
C&I - Commercial & Industrial
CapEx - Capital Expenditure
CBECS - Commercial Buildings Energy Consumption Survey
CCA - Current Clean Agenda
ccASHP - cold climate air source heat pump
CH - Central Hudson
CJWG - Climate Justice Working Group
CLCPA - Climate Leadership and Community Protection Act
CLP - Communities for Local Power
Commission - New York State Public Service Commission
DIMP - Distribution Integrity Management Program
DPS - New York State Department of Public Service
DSM - Demand side management
EAP - Energy Affordability Program
EE - Energy efficiency
EIA - Energy Information Administration
EPA - Environmental Protection Agency
ESCO - Energy Service Company
FO - Fuel oil consisting of ultra-low sulfur diesel, which emits more CO2 when combusted than natural gas
GHG - Greenhouse gas
GMP - Gross Metro Product
GSHP - Ground source heat pump
GSLTP - Gas System Long-Term Plan
HDD - Heating degree day
HEAP - Home Energy Assistance Program
HH - Hopewell-Hughsonville
HM - Highland Mills
HP - Heat pump
HPWH - Heat pump water heater
HVAC - Heating, Ventilation, and Air Conditioning
IEA - International Energy Agency
ILI - In-Line Inspection
ILT Plan - Initial Long-Term Plan
Initial Report - PA's report filed on April 5, 2024
IRA - Inflation Reduction Act
LCF - Low-carbon fuel
LDC - Local distribution company
LMI - Low-moderate income
LPP - Leak-prone Pipe
MAOP - Maximum allowable operating pressure
MI - Multiple Intervenors
MMCF - Million cubic feet
NE:NY - New Efficiency New York
NFE - North Kingston Foxhall
NNI - No New Infrastructure
NPA - Non-Pipe Alternative
NPV - Net present value
NYS - New York State
NYSERDA - New York State Energy Research & Development
PA - PA Consulting Group, Inc.
PHMSA - Pipeline and Hazardous Materials Safety Administration
Planning Proceeding - Gas Planning Proceeding Case 20-G-0131
PLP - Poughkeepsie LP
PUT - Pipe Use Transformation
RFP - Request for Proposal
RIM - Ratepayer Impact Measure
RLT Plan V2 - Revised Long-Term Plan
RNG - Renewable natural gas
RSG - Responsibly sourced gas
Sales - Volumetric Gas
SCT - Societal Cost Test
SEDS - State Energy Data Systems
SME - Subject Matter Expert
T&D - Transmission & Distribution
the Company - Central Hudson
the Department - New York State Department of Public Service
the Order - Gas System Planning Order
TMA - Transportation Mode Alternatives
UCT - Utility Cost Test
UPC - Usage Per Customer
UTEN - Utility Thermal Energy Network
VRF - Variable refrigerant flow
YOU - Youth Opportunity Union

1 Executive Summary

This review is being conducted for the New York State Department of Public Service (the Department) pursuant to the requirements of the New York State Public Service Commission (Commission) in its Gas Planning Proceeding Case 20-G-0131 (Planning Proceeding). The Planning Proceeding aims to assure that the State, customers, and stakeholders have the opportunity to understand and engage in the future of New York's Natural Gas Infrastructure.

On May 12, 2022, the Commission issued an order Adopting Gas System Planning Process (the Order) requiring natural gas utilities to submit comprehensive long-term plans (Long-Term Plans), which comply with the requirements of the Climate Leadership and Community Protection Act (CLCPA) on a repeating three-year cycle.[1] PA Consulting Group, Inc. (PA) was retained by the Commission to assess Central Hudson's Long-Term Plan. On February 6, 2024, Central Hudson (The Company) filed its Initial Gas Long-Term Plan (ILT Plan) in Proceeding Case 23-G-0676. On April 5, 2024, PA filed an Initial Report (Initial Report) summarizing our initial approach, observations, and recommendations. On June 25, 2024, the Company filed its Revised Gas Long-Term Plan; on July 26th, 2024, Central Hudson filed a Revised Gas Long-Term Plan, Version 2 (RLT Plan V2), reflecting modifications to many figures, data, and accompanying narrative. In the accompanying filing letter, the Company indicates this second version is primarily the result of updated historical trend load forecasts, reflects input and feedback from stakeholders in this process and was provided to ensure stakeholders have the most up to date information for their comments. In this report (Preliminary Findings Report), we comment on PA's review of the Company's RLT Plan V2, our assessment of filed comments and the results of our latest analyses. Building upon our Initial Report's observations, in this Preliminary Findings Report we revise recommendations to reaffirm or clarify and add new or remove prior recommendations addressed by the Company.

As previously discussed within our Initial Report, a very pertinent characteristic of the Company's territory is the dominance of fuel oil as the heating fuel of choice. This is especially important given Central Hudson is a combined natural gas and electric utility and over 90% of gas customers also receive electric service[2]. Based on our analysis, PA believes three main dynamics will shape the Company's forecasted annual sales and peak demand 1) declining organic growth in customer counts driven by evolving service territory demographics (i.e., macro-economic factors), 2) appropriate level of sustained additions to customer counts due to customers switching from fuel oil, wood, etc. to natural gas as the primary heating fuel, and 3) downward pressure on customer counts, UPC and sales from electrification and EE – a combination of gas customers installing heat pumps and leaving (or reducing reliance on) the gas system and falling UPC, driven by a combination of technological change, state and federal policy evolution, and local laws.

Based upon our review of regional macroeconomic forecasts, we predict that new construction is likely to slow down. When coupled with legislation prohibiting certain new construction natural gas fueled equipment and building systems beginning December 31, 2026, as well as federal and state incentives, we expect the growth in the number of new gas heating customers will decline.[3] Customers on fuel oil present a unique challenge with respect to New York natural gas utility decarbonization goals and strategies: while macroeconomic and regulatory forces work to limit the growth of gas usage, residential and commercial gas customers could continue to grow as a share of customers switch from fuel oil to gas.

In this Preliminary Findings Report, PA furthers our assessment of this unique challenge and, also provides our assessment of the Company's RLT Plan V2 and its key metrics such as reduced peak demand and annual sales, reduced greenhouse gas (GHG) emissions, capital expenditures, benefit-cost analysis (BCA) and bill impacts presented by the Company. We also discuss the extent to which the Company has considered all stakeholder feedback and integrated improvements to the plan as appropriate and consistent with the Company's regulatory and statutory obligations. PA reaffirms several prior recommendations and identifies additional recommendations and opportunities for improvement.

[1] Source: The Order, p. 20-22.
[2] Source: RLT Plan V2, p. 19.
[3] Implementing the All-Electric Buildings Act requires the Building and Energy codes to prohibit the installation of fossil-fuel equipment and building systems (any equipment or infrastructure excluding cooking equipment used for combustion or supply of fossil fuels) beginning December 31, 2025, for new buildings of seven stories or less, and December 31, 2028, for all new buildings regardless of size or building type.

PA believes successful, cost-effective, and equitable achievement of the State's ambitious climate goals require a comprehensive assessment of the intersection of natural gas market supply and demand, technical analysis including safety and operational risks, and changing end-use patterns. PA recognizes this planning approach needs a delicate balance of meeting statutory requirements while ensuring delivery of gas services in a safe, reliable, and affordable manner.

1.1 Summary of Observations and Recommendations

A robust long-term plan recognizes the importance of balancing many topics. First and foremost, the Company must ensure that appropriate investments in the gas system are made to maintain safe, reliable, and adequate service to customers who continue to rely on gas to meet their energy needs. Second, customer behaviors have an impact on the pace of electrification, and resultingly further insight on customer willingness to switch fuels is critical. Finally, strategically reducing the need for both supply and distribution assets over time as gas demand shrinks, further reducing costs for all customers is a desired outcome of a long-term plan. Given that a gas LDC business is capital-intensive, and that gas distribution assets have long useful lives, it is important to proactively and strategically plan for what is to be a significant energy transition decades in advance.

In this section, we highlight the following key observations and recommendations necessary to understand the RLT Plan V2, which are discussed in greater detail throughout this Preliminary Findings Report.

Highly Loaded Distribution Systems

A key area of focus of the RLT Plan V2 is certain segments of the Central Hudson distribution system that have been identified by the Company as "highly loaded", meaning that they are either approaching or even exceeding their capacity to reliably serve customers on a design day. The highly loaded segments were identified using a Monte Carlo analysis to determine which parts of the system may experience drops in pressure that exceed the Company's design day criteria. All segments of the distribution system are ranked from highest loaded to least loaded. Central Hudson then conducted hydraulic modeling as a more detailed assessment to identify constraints on those segments. In PA's opinion, a Monte Carlo analysis based on distribution system pressure data is unable to convey enough information to effectively determine where reliability risks may exist. PA believes the hydraulic modeling process is the key step in determining whether these potential risks exist and lays the foundation for anticipating and addressing future design day reliability issues. Importantly, PA would expect there to be a strong correlation between the results of the Monte Carlo analyses and the results of hydraulic modeling scenarios. As is more fully explained in this report, however, it does not appear that the two modeling approaches are producing similar outcomes. We recommend that Central Hudson work to ensure that the two modeling processes complement one another, to the extent the Company believes both are useful.

Supply Stack

As peak day demand begins to decrease, a methodology to consider how to reduce the volume of contracts that are no longer needed to match changing customer usage is necessary. The Company indicated that it does not anticipate opportunities for de-contracting over the next five years given its supply portfolio was sufficient to meet expected demand under the Current Clean Agenda (CCA). However, the Company did not indicate how its supply portfolio is sufficient to meet demand under the other three scenarios, or how much excess capacity the Company may have under additional alternative scenarios. PA believes a plan for de-contracting would help provide stakeholders a longer-term view of the Company's plans to source gas supply and evaluate the affordability of service. To this end, we recommend the Company indicate how its de-contracting strategy may shift and the degree to which its supply portfolio may exceed design day demand under different scenarios.

Capital Expenditures (CapEx)

The Company provided 20-year CapEx forecasts for each planning scenario in the RLT Plan V2. PA requested detailed information supporting the forecast for each planning scenario; Central Hudson has provided those details for only the CCA scenario to date. Central Hudson also provided some information regarding the expected change in capital costs for each of the scenarios as reflected in Figure 47 of the RLT Plan, however that information was in a different format.[4]

[4] Source: Company response to PA 12-151, Attachment 1.

We have investigated the relationship between planned distribution system reinforcement investments and current and potential future operating conditions (based on hydraulic models of the highly loaded systems), as discussed in Section 4. Notably, approximately 7.2% of the CapEx forecast for 2025-29 makes up projected reinforcements of the overall gas distribution system; these are projects required to maintain design day operating standards and ensure reliability. However, it appears that only one of those reinforcements in the forecast are associated with the identified highly loaded systems. PA recommends that the Company better synchronize the results of its various models and ensure that its CapEx forecast is consistent with those results to the extent they are viewed as reliable modeling tools and explain why projected reinforcements of the distribution system are expected to focus on areas that have not been identified as highly loaded.

PA has also identified specific types of CapEx investment that the Company may have the opportunity to avoid. When taken together, more than 28% of the overall capital forecast for 2025-29 consists of investments in service line replacements (many of which are associated with the replacement of leak-prone pipe (LPP), smaller new business projects, customer conversions, and elimination of service lines that are directly connected to transmission mains (also known as farm taps). Avoidance of these investments depends (in most, if not all cases) on a single customer decision regarding their continued use of natural gas, rather than in other circumstances such as when considering whether a non-pipe alternative (NPA) is feasible to allow abandonment (rather than replacement) of LPP mains. We recommend that the Company prioritize these opportunities that can incrementally reduce CapEx requirements as well as GHG emissions.

Demand Dynamics

PA's analysis of Central Hudson's historical billing data reveals two critical residential customer dynamics: one is evolving customer counts, and the other is structural changes to gas usage patterns. PA's review of Moody's Analytics macroeconomic forecasts observes a slowdown in population growth and continued downturn in household growth. Resultingly, PA observes three main dynamics shaping the Company's forecasted annual sales and peak demand are: 1) declining organic growth in customer counts driven by evolving service territory demographics, 2) sustained additions to customer count due to customers switching to natural gas as the primary heating fuel away from fuel oil, wood, etc., and 3) downward pressure from electrification and EE due to a combination of gas customers leaving the system and falling Usage Per Customer (UPC). This trend is propelled by a combination of technological change, state and federal policy and local laws. Furthermore, the influence of warmer winters – attributable to climate change – is projected to lower sales growth but not necessarily the peak demand.

Bill Impacts

We observe low bill impacts within the Company's RLT Plan V2, especially in the residential customer class where the Company portrays a decrease in residential customer gas[5] bills from 10-30% through the forecast period. As presented, the bill impacts are calculated for an "average" bill by dividing all costs by total sales volumes in each customer class through the forecast period. PA believes the bill impacts depicted in the RLT Plan V2 may lead to incomplete conclusions about the optimal scenario with the objective of minimizing bill impacts for customers. In practice, some customers will electrify and significantly reduce their gas consumption (and gas bills) through the forecast period, while others will retain gas connections and their volumes will be reduced by only a small amount, if any at all. For customers in this latter category, gas costs would increase under all scenarios as less total volume would be available to cover the total costs of maintaining the gas distribution system. PA is concerned that the current representation of bill impacts across the four scenarios could lead stakeholders to a false understanding that all of the Company's scenarios will bring lower bills for all gas customers, which is not the case especially if the Company pursues costly measures such as blending low-carbon fuels (LCFs) and replacing leak prone pipes. PA recommends the Company to include separate bill impact analyses for gas customers who 1) electrify their space heating and 2) do not electrify their heating load (commonly referred to as non-participants).

GHG Emissions

To reduce GHG emissions associated with the gas system, the Company presents four decarbonization scenarios that offer increasing opportunity for GHG emission reduction through the incorporation of demand-side management measures (i.e., EE, weatherization, NPAs) and the blending of low-carbon fuels (i.e. RNG

[5] PA's analysis is limited to customers' gas costs and does not include any increase or decrease in electric costs.

and hydrogen) into the gas supply. The Company has evaluated the inclusion of RNG, clean hydrogen, and RSG for blending into its supply mix. The use of LCFs such as hydrogen, RNG, and RSG is an assumption applied in some combination throughout all the scenarios.

1.1.1 Summary of Scenarios

Our observations are further discussed within this section but first we summarize each of the four scenarios, Current Clean Agenda, CLCPA Approach, No New Infrastructure and Pipe Use Transformation, as presented by the Company in its RLT Plan V2.

1. **Current Clean Agenda (CCA)** reflects present day (2024) legal and policy framework at current funding levels and does not achieve state net zero GHG goals.
2. **CLCPA Approach (CLCPA)** refines the CCA to include policies and programs needed to support achievement of economy wide GHG reductions envisioned in the CLCPA.[6] To accomplish this, this scenario assumes a system-wide transition approach, as opposed to targeted regions, via 2-fold increase to heat pump conversion incentives and a cap of new connections starting in 2030. This scenario also assumes blends of hydrogen and renewable gas in the supply mix.
3. **No New Infrastructure (NNI)** reflects assumptions in which policies prevent growth-related investments, but investments for safe and reliable distribution system remain. The NNI scenario is supported by a focus on highly loaded areas and deployment of NPAs to limit capital investments. The NNI Scenario involves targeted (and five-fold higher) incentives, energy efficiency (EE) and building electrification (BE) program incentives focused on highly loaded targeted areas to promote these outcomes.
4. **Pipe Use Transformation (PUT)** builds on the NNI Scenario, in terms of continued efforts in highly loaded targeted areas and, features the increased use of LCFs, such as responsibly sourced gas (RSG), renewable natural gas (RNG), and green hydrogen.

Table 1-1 provides a high-level summary of the key assumptions of each scenario, including EE and heat pump (HP) incentives, LCF blending, and assumed restrictions on new connections.

Table 1-1: Central Hudson RLT Plan V2 Assumptions[7]

Scenario	Key Assumptions
CCA	• Reflects present day (2024) legal and policy framework at current funding levels. • Expects higher level of investment in clean heat, weatherization, not yet enacted policies such as code requirements for HPs in new buildings. • Continuation of Clean Heat & EE programs with increased emphasis on weatherization • Only scenario with budget cap at current Commission approved levels. • RNG & hydrogen integrated into the supply to the extent they are cost-effective.
CLCPA	• Assumes doubling HP incentives. • Expects technological advancements in HPs. • System-wide transition approach, rather than one targeting specific regions. • Caps new connections starting in 2030. • Finds sufficient capacity to accommodate winter peaking over 5-10 years; requires large electric transmission and distribution (T&D) investment to support incremental load.
NNI	• Assertive effort to identify highly loaded areas and use NPAs where possible.

[6] The CLCPA does not seek to achieve a specific level of emissions reductions for the gas utility sector.
[7] Source: RLT Plan V2, p. 6-8.

	• Up to a five-times increase in HP incentives and weatherization (in highly loaded areas). • Caps new connections starting 2030. • Assumes incremental electrification-oriented incentives. • Small amounts of RNG and hydrogen blending.
PUT	• Same high load growth infrastructure avoidance as NNI. • Use of existing pipeline infrastructure to decarbonize industrial facilities. • Increased use of RNG (20% by 2043) from variety of RNG feedstocks. • Green hydrogen blending.

Table 1-2 compares the key outcomes of the assumptions applied under each scenario.

Table 1-2 Scenario Key Outcomes as of 2043[8]

	CCA	CLCPA	NNI	PUT
Gas Supply Mix (2043)	5% RNG	5% RNG, 5% hydrogen	5% RNG, 5% hydrogen	20% RNG, 20% hydrogen
2043 Net Sales % change from 2024[9]	-0.5 MMCF, 4% decrease	-3.0 MMCF, 22.8% decrease	-3.8 MMCF, 28.7% decrease	-4.9 MMCF, 36.7% decrease
2043 CO_2 Metric Tons per Customer (% of 1990)	60%	50%	45%	35%
Avoided CO_2 Value from EE ($ millions)	$7.1	$14.1	$18.1	$19.1
Avoided CO_2 Value from Beneficial Electrification ($ millions)	$39.1	$90.1	$105.1	$105.1
Total Avoided CO_2 Value ($ millions)	$115.5	$183.5	$204.5	$277.5
Benefit Cost Ratio (Under SCT)	1.34	0.98	0.93	0.86
Bill Impact (% change in Gas Bill by 2043)	-15%	-25%	-30%	-30%

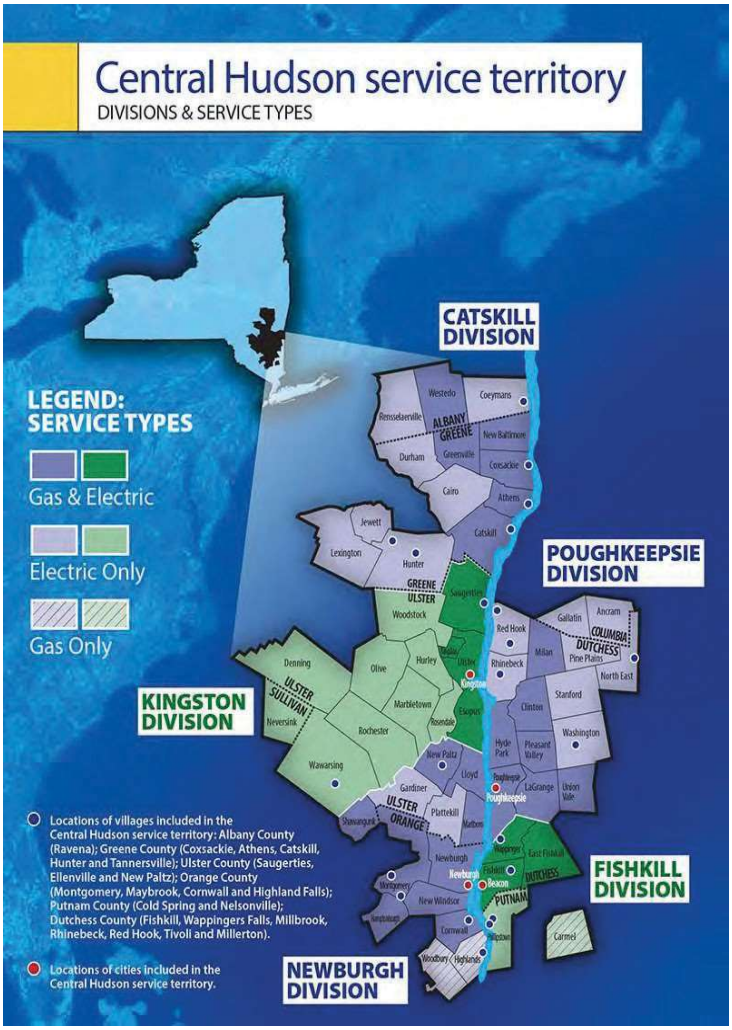
The RLT Plan V2 describes key outcomes of the scenarios, including gas supply mix, changes in net sales, avoided CO_2 emissions, and results of the Company's BCA analysis. PA summarizes our observations in more detail within the following subsections and at great length, within Sections 4 through 8.

1.1.2 Customer Base

As was previously discussed within our Initial Report, a vast majority of the Company's customers are residential customers who use gas for heating. Furthermore, the Company provides both gas and electric service; 25% of the Company's electric customers receive gas service and over 90% of customers with gas service also receive electric service, as illustrated in Figure 1-1.

[8] Source: RLT Plan V2, p. 13 and 76.
[9] Source: Company response to PA 02-37, Attachment 1. PA presents Net Sales as compared to 2024 in order to provide stakeholders with an understanding forecasted volumes the end of the forecast period, as compared to today.

Figure 1-1: Map of Central Hudson's Service Territory[10]



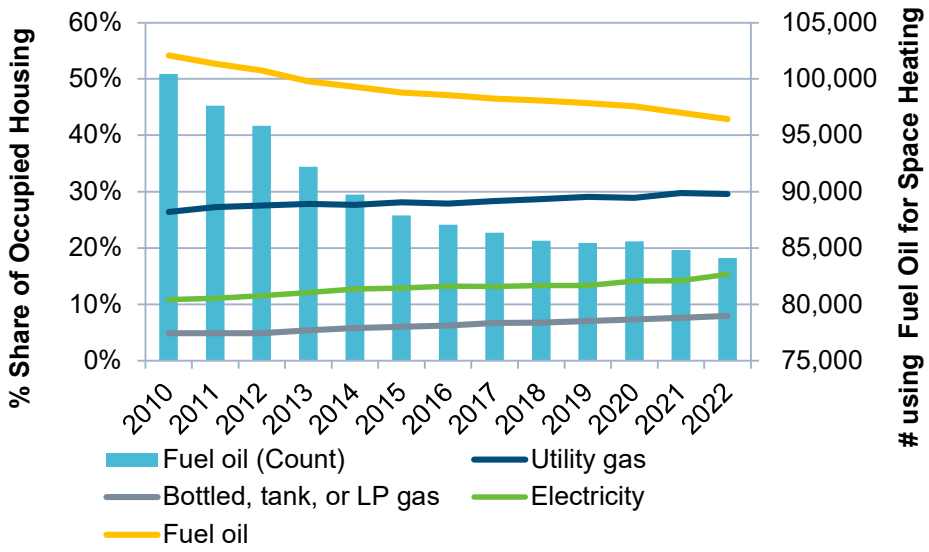
However, a small number of non-residential customers contribute a larger proportion of gas sales than residential. Over 40% of the Company's gas consumption is by non-heating customers. Fewer than 40 of the Company's approximately 87,000 customers account for over 40% of total annual gas consumption. Most of these customers are large non-firm interruptible customers and six are large transportation-only customers, some of which use natural gas to power electric generation facilities[11]. In the RLT Plan V2 the Company combines commercial and industrial customers into a non-residential category resulting in the Company's analysis and impacts now being provided on a residential and non-residential basis. Within the CLCPA, NNI, and PUT scenarios, the Company assumes a fixed residential customer growth rate of 1% over the forecast period, representing a significant change in methodology between the RLT Plan V2 and the ILT Plan. In the ILT Plan, the Company held the residential customer count constant, assuming the overall gas revenue requirement was allocated across a fixed number of customers throughout the forecast period. As discussed in this report, a 1% annual growth rate appears excessive when electrification initiatives, state and local policy objectives, demographic trends and the Company's recent experience is considered.

A review of the types of heating fuel sources within the Company's service territory finds fuel oil (FO) as the current heating fuel of choice, as illustrated by Figure 1-2, below. Although FO's share in the territory has declined since 2010, almost 43% of all occupied housing units still used FO consisting of ultra-low sulfur diesel, which emits more CO_2 when combusted than natural gas for space heating, at the end of 2022. With over 97,000 homes still using FO, there are strong implications of the potential for fuel switching to gas (or electric) – a crucial consideration for the Company as it navigates towards decarbonization. For example,

[10] Source: ILT Plan, Figure 5.
[11] The Company's electric generation transportation customers are required to decarbonize, given CLCPA requirements for statewide net zero electricity.

during the period of 2017-23, the Company has converted 3,304 customers from FO to natural gas.[12] However, given State decarbonization objectives, the past may not predict the future as some FO customers are likely going to consider heat pumps in lieu of natural gas for space heating, a trend already apparent as shown by the increasing green line in Figure 1-2.

Figure 1-2: Central Hudson Residential Space Heating Fuels[13]



Other factors are expected to impact growth in natural gas customers and sales. Based upon a review of the region's macroeconomic forecasts,[14] new construction is likely to slow down. Furthermore, legislation prohibiting fossil fueled equipment and building systems in many new buildings beginning December 31, 2026[3] will dampen the growth of gas heating customers. These trends present a unique challenge with respect to decarbonization goals and strategies and, the Company has reflected policy changes within the CCA Scenario. While macroeconomic and regulatory forces work to limit the growth of gas customers, limited growth in residential and commercial natural gas customers is expected as a portion of fuel oil customers switch to natural gas.[15]

1.1.3 Supply

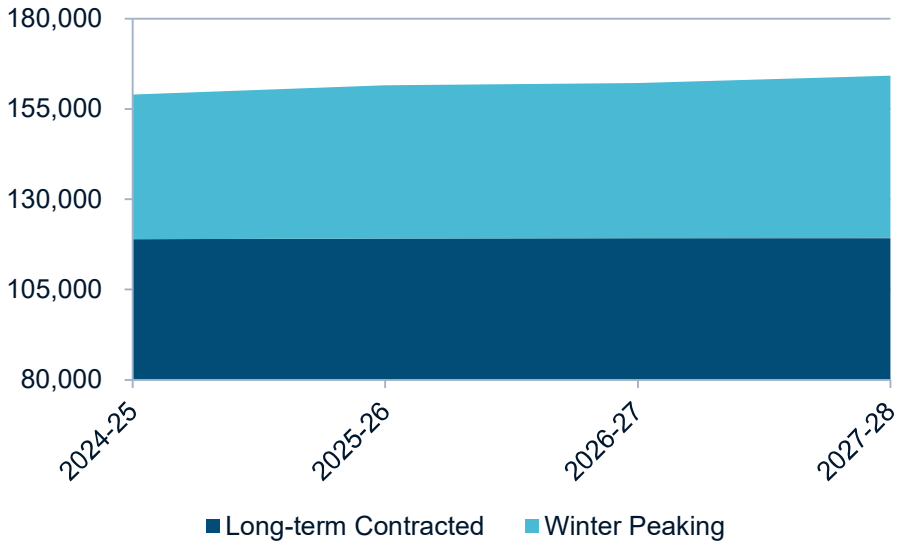
The Company's transmission system receives gas at four interstate pipeline interconnections (or citygates) and delivers that supply throughout the distribution system footprint. In aggregate, the four citygates are currently capable of flowing more gas on a design day than is presently required by the Company's customers – though the Company has noted some limitations at the Tuxedo and Cedar Hill citygates. As demand grows in the near term, even at the level of growth forecast by the Company, PA would not expect there to be a need for additional investments in those citygates to accommodate that growth.

In the RLT Plan V2, the Company explains that natural gas is procured to satisfy demand behind the citygates and that its supply stack has remained relatively static, (see Figure 1-3) with the caveat that this situation could change as the Company considers a de-contracting methodology when the current level of supply is no

[12] Source: Company response to PA 3-72.
[13] Source: https://data.census.gov/table?q=DP04. PA studied data for Dutchess, Ulster, and Orange counties in New York. The Company's gas service territory covers practically the entire Dutchess County, roughly 75% of Ulster County that includes the major population and commercial centers and the northeast region of Orange County that accounts for approximately 20% of its population. It is salient to note that while Orange County has experienced substantial growth in recent years, those population gains are almost entirely outside the Company's footprint. In fact, the population trends in the relevant Company Orange County towns/cities – Newburgh, Woodbury, New Windsor etc. – resemble those in the other two counties. For this analysis, we omitted Columbia and Greene counties as the Census does not provide data, and, therefore made assessments based on Dutchess and Ulster counties – which represent about 85% of its customer-base.
This is based on Moody's forecast that 2025 onwards both household and population growth rates are expected to turn negative.
[15] It is notable that the share of container gas (largely Propane) has been rising steadily over the past decade. Given that this data pertains to the primary heating fuel, we can surmise that customers formerly using Fuel Oil or wood that switch to, say, Propane, do so because it is either more affordable or that the Company's distribution system does not cover their territory.

longer needed to meet reduced demand over time. PA agrees the Company should be considering de-contracting. Given the likelihood that peak demand will be decreasing as discussed in Section 6.2.3, PA recommends the Company outline its approach to de-contracting, to better inform Stakeholders and the Commission how sources of gas supply will be prioritized for reduction as demand decreases. We further discuss our initial observations on the Company's Supply within Section 4.

Figure 1-3: Central Hudson Supply Stack



1.1.4 CapEx

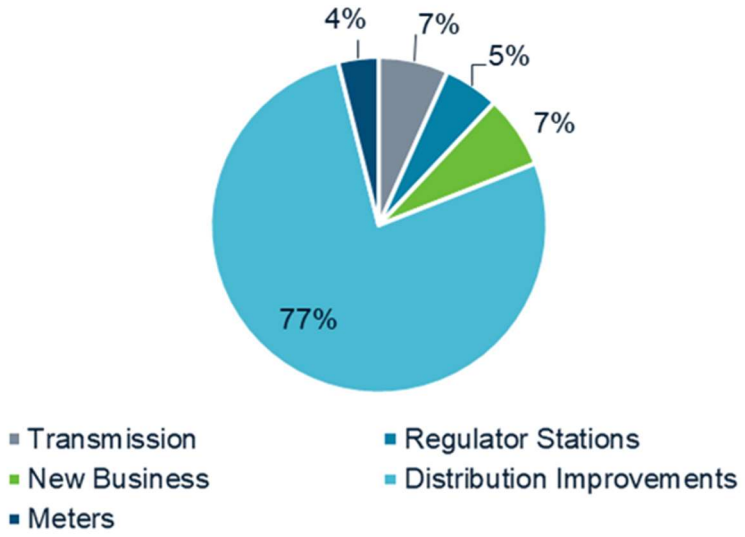
The ILT Plan discussed the Company's CapEx plan for the five-year period 2024-28. During the pendency of our review, the Company provided an updated "five-year forecast" for 2025-29. In response to PA's recommendation, in the RLT Plan V2 the Company has developed 20-year views of projected CapEx for each of the four planning scenarios. Those 20-year forecasts are quantified in total in the RLT V2 Plan. We have received detailed information about the 20-year forecast under the CCA scenario.

We discuss several aspects of the CapEx forecast in Section 5.

PA observes that any program that addresses the ongoing safety, integrity and reliability of its delivery system is appropriate. Certain transmission pipeline replacements are contemplated in the Company's five-year capital plan, driven by Federal pipeline safety requirements. Otherwise, the transmission system generally appears to be well positioned for continued reliability going forward. The Company's overall near-term capital plan is heavily weighted towards replacement of the existing distribution system. Figure 1-4 illustrates the relative size of investment types included in the Company's forecasted CapEx for the period 2025-29.[16]

[16] Source: Company's response to PA 8-118.

Figure 1-4: Makeup of Central Hudson Five-Year (2025-29) CapEx Forecast



Highly Loaded Distribution Systems

A key area of focus, on which Central Hudson's ability to continue reliable service throughout the energy transition depends, is the extent to which the Company's distribution system is capable of delivering gas to customers on a design day. The Company identified (via a Monte Carlo analysis) in the ILT Plan and RLT Plan V2 13 segments of its distribution system that are considered "highly loaded", which implies the systems are approaching or exceeding their capacity to reliably serve customers on a design day.[17] PA requested and has evaluated a variety of hydraulic modeling scenarios of these 13 segments and investigated the relationship between planned distribution system reinforcement investments and the current and potential future operating conditions (again, based on these hydraulic models). PA would expect there to be a strong correlation between the results of the Monte Carlo analyses and the results of hydraulic modeling scenarios. As is more fully explained in this report, however, it does not appear that the two modeling approaches are producing similar outcomes. We recommend that Central Hudson work to ensure that the two modeling processes complement one another, to the extent the Company believes both are useful. are approaching or exceeding their capacity to reliably serve customers on a design day.[18] PA requested and has evaluated a variety of hydraulic modeling scenarios of these 13 segments and investigated the relationship between planned distribution system reinforcement investments and the current and potential future operating conditions (again, based on these hydraulic models). PA would expect there to be a strong correlation between the results of the Monte Carlo analyses and the results of hydraulic modeling scenarios. As is more fully explained in this report, however, it does not appear that the two modeling approaches are producing similar outcomes. We recommend that Central Hudson work to ensure that the two modeling processes complement one another, to the extent the Company believes both are useful.

We assessed the relationship between planned distribution system reinforcement investments and the current and potential future operating conditions (based on these hydraulic models), and it appears that none of the reinforcements in the forecast are associated with the identified highly loaded systems. Table 1-3 summarizes Distribution Improvement investments in highly loaded systems as planned for 2024-28.[19]

[17] The Company refers to these segments as "highly loaded systems" in the RLT Plan V2. While PA understands that these are distinct systems within the overall distribution system, we refer to these as highly loaded "segments".
[18] The Company refers to these segments as "highly loaded systems" in the RLT Plan V2. While PA understands that these are distinct systems within the overall distribution system, we refer to these as highly loaded "segments".
[19]Source: Company's response to PA 8-121. Interestingly, hydraulic models of the Highland Mills (HM) system suggest that system reinforcements are contemplated; referring to Table 41, the modeled hourly gas flow in 2026 exceeds the flow in 2024, however the lowest pressure in that model is much higher (62% of MAOP in 2026-27 vs 37% in 2023-24). These results imply that a reinforcement has been assumed and built into the hydraulic model at some point in the intervening years.

Table 1-3: Distribution Improvements CapEx in Highly Loaded Segments ($000)[20]

	2024	2025	2026	2027	2028
LPP	$10,802	$2,902	$8,228	$0	$5,884
Relocation Work	$3,043	$3,577	$6,177	$1,700	$1,741
Reinforcement[21]	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0
Total	$13,845	$6,479	$14,405	$1,700	$7,625

PA has identified specific types of CapEx investment that the Company may have the opportunity to avoid. These include:

- Service line replacements (many of which are associated with the replacement of LPP mains),
- Smaller new business projects,
- Customer conversions, and
- Elimination of service lines that are directly connected to transmission mains.

Avoidance of these types of investments depends, in most cases, on a single customer decision to electrify, rather than in other circumstances such as when considering whether an NPA is feasible to allow abandonment (rather than replacement) of LPP mains. PA does not believe the Company can reduce this level of future investment in its entirety through successful NPA implementation under current policies. However, to illustrate the potential power of NPAs, even with only a 10% reduction in each of these investment types annually in 2025-28, the total CapEx forecast in those four years would be reduced by more than 3%, equating to several million dollars of avoided investment. PA further discusses potential opportunities for reducing capital investments going forward in Section 4.

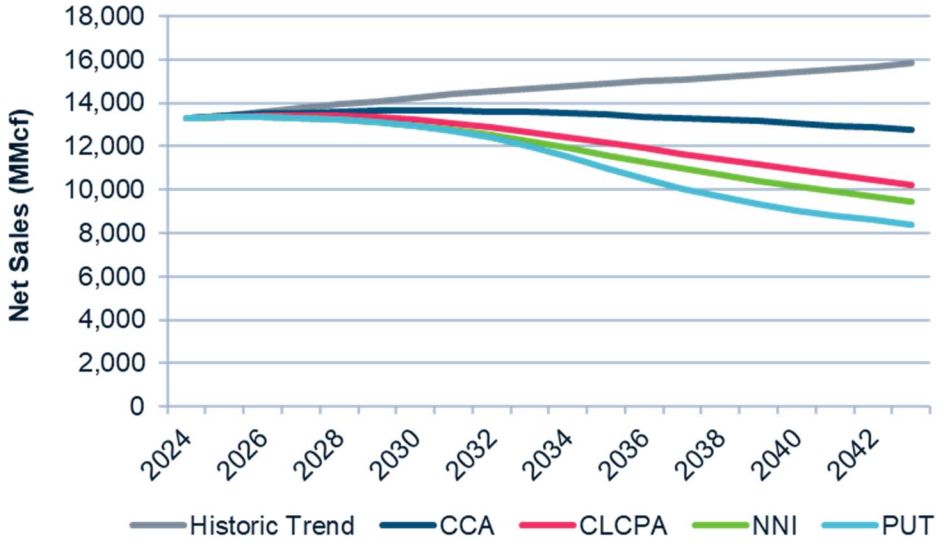
1.1.5 Demand

PA's analysis of Central Hudson's historical billing data reveals two critical residential customer dynamics: one is evolving customer counts, and the other is structural changes to gas usage patterns. Our review of Moody's Analytics macroeconomic forecasts reveals a forecasted slowdown in population growth and continued downturn in household growth. Three main dynamics will shape the Company's forecasted annual sales and peak demand: 1) additions to customer counts due to customers switching from fuel oil, wood, etc. to natural gas as the primary heating fuel, 2) declining organic growth in customer counts driven by evolving service territory demographics and, 3) downward pressure from a combination of gas customers installing heat pumps and leaving (or reducing reliance on) the gas system and the impact of demand side management measures. Furthermore, the influence of warmer winters – attributable to climate change – is projected to all else equal, lower gas volumes over the forecast period but not necessarily reduce the peak demand.

In its ILT Plan, the Company had concluded the impact of converting natural gas heating and water heating customers to electric, status-quo incentive funding and other electrification impacts were not enough to drive a decline in demand in the CCA, CLCPA and NNI scenarios. However, PA finds substantial changes within the RLT Plan V2 which now shows declines in net sales from 2024 through 2043 in all scenarios, illustrated by Figure 1-5 below.

[20] Historical CapEx values are nominal and forecasted values reflect inflation, unless otherwise specified.
[21] One project planned for 2026 was categorized by Central Hudson in its response to PA 8-121 as a Highway Relocation project but was described as a reinforcement project. The project is included as Relocation Work here.

Figure 1-5: Central Hudson Forecasted Net Sales (2024-43)[22]

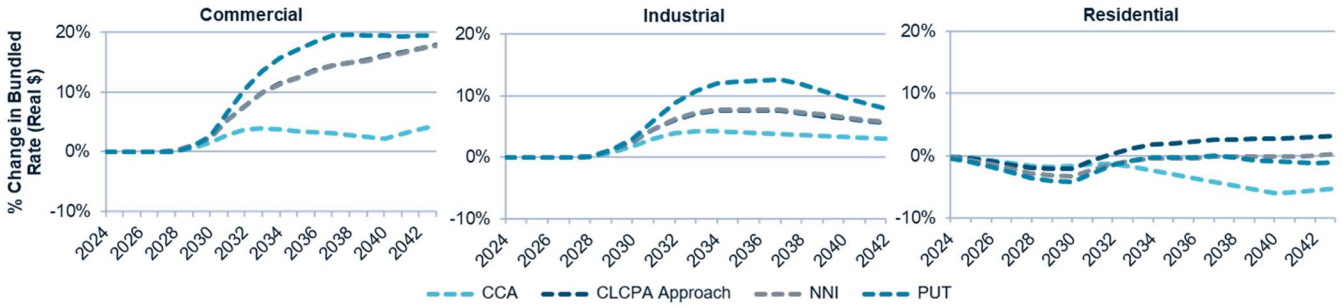


PA's observations pertaining to the customer forecast (including the implications of heat pump adoption, new buildings and other electrification policies and observations regarding UPC taken together indicate that net sales could be overstated by at least 10%. Similar trends may exist for the peak forecast. PA has recently received additional data from the Company pertaining to these aspects of its forecast which will be examined in more detail over the coming months, supportive of a detailed analysis and a more definitive assessment in our Final Report.

1.1.6 Bill Impacts

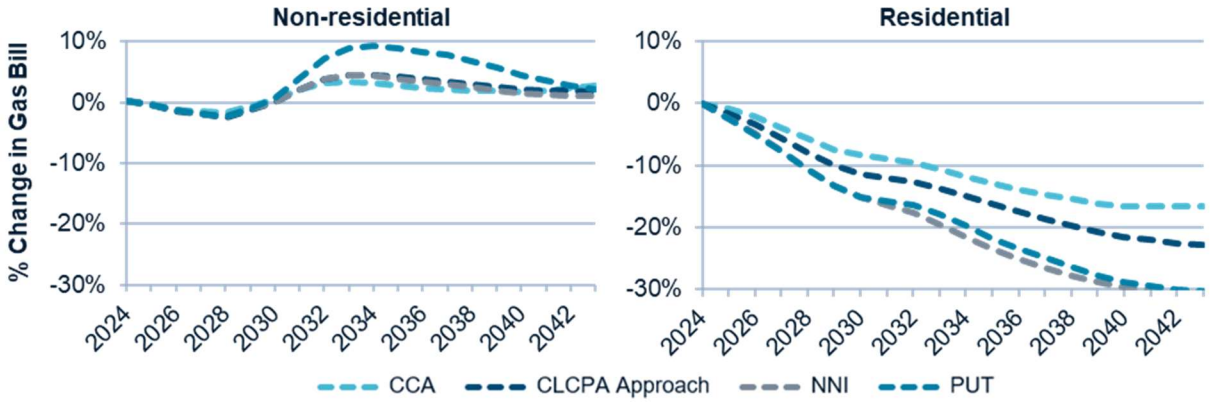
The RLT Plan V2 presents significant changes to both the assumptions and the outcomes of the Company's bill impact analysis, as compared to the ILT Plan. Most notably, the ILT Plan reflected an increase in customer bills for residential customers of 4-6% over the forecast period whereas the RLT Plan V2 now reflects a decrease in residential customer bills of between 10-30% over the forecast period across various scenarios. Similar to the residential customer class, bill impacts for the non-residential customer classes have also changed in the RLT Plan V2. The differences in reported bill impacts can be seen in Figure 1-6 from the RLT Plan V2 and Figure 1-7 from the ILT Plan.

Figure 1-6: Bill Impacts as Reported in the RLT Plan V2[23]



[22] Source: Company response to PA 10-146.
[23] Source: RLT Plan V2 Figure 50.

Figure 1-7: Bill Impacts as Reported in the ILT Plan[24]



Notable differences between the ILT Plan and the RLT Plan V2 include updated assumptions and methodology for calculating the bill impacts. The Company has revised the calculations to show the bill impact for an average residential customer with the updated volumes and costs projections and assumptions. Therefore, as reflected in the bill impact presented in the RLT Plan V2, the decline in average residential customer bills across the four scenarios is a function of the combination of two competing drivers; a lower per customer gas consumption and higher cost per unit of gas delivered.[25]

Another notable change includes assumptions made around fuel conversion customers. In the ILT Plan, the Company assumed customers switching from fuel oil or propane would more likely opt to switch to gas service. In the RLT Plan V2, the Company has changed this assumption, now reflecting the view that a greater fraction of fuel switching customers will opt to convert to electric heat pumps. This updated assumption appears to reflect the dominant role of 'full-heat' heat pumps being installed – as opposed to the ILT also including a substantial share of 'partial-heat' units. Also, the RLT Plan V2 also includes the impact of Federal IRA incentives, supportive of increased heat pump penetration levels.

PA observes development of separate bill impact analyses for gas customers who 1) electrify their space heating and 2) do not electrify their heating load, would be a valuable addition to the Company's Final Plan. This additional calculation would be beneficial for stakeholders to have a better understanding of the bill impacts across the four scenarios and would reflect more realistic impacts for customers in disadvantaged communities, who may have higher barriers to electrification (e.g., renters or low-income), and therefore have less flexibility to electrify significant portions of their existing gas demand. These customers are likely to be burdened the most from increasing gas bills over the forecast period.

As suggested by Multiple Intervenors, the Company prepared additional BCA tests in the RLT Plan V2. The Company included results for the Utility Cost Test and Ratepayer Impact Measure tests, in addition to the Societal Cost Test. The benefit-cost ratios resulting from the Utility Cost Test range from 0.65 in the PUT scenario, to 1.72 in the CCA scenario, suggesting the costs may outweigh the benefits for the NNI and PUT scenarios and the CCA and CLCPA scenarios will be more cost effective. Results for the Rate Impact Measure range from 0.49 in the PUT to 0.98 in the CCA scenario, suggesting across the four scenarios, the costs may outweigh the benefits.

1.1.7 Environmental

To reduce GHG emissions associated with the gas system, the Company presents four decarbonization scenarios that offer increasing opportunity for GHG emission reduction through the incorporation of demand-side management measures (i.e., EE, weatherization, NPAs) and the blending of low-carbon fuels (i.e. RNG and hydrogen) into the gas supply.

Notably, the Company includes the use and development of LCFs as a key decarbonizing measure across the four scenarios presented to progress toward New York's clean energy goals. The Company has evaluated the inclusion of RNG, clean hydrogen, and RSG for blending into its supply mix. The use of LCFs such as hydrogen and RNG is an assumption applied in some combination throughout all the scenarios. Regarding

[24] Source: ILT Plan Figure 4.
[25] Source: RLT Plan V2.

plans for a proposed Clean Hydrogen Feasibility Study, the Company describes this proposal with the objective of identifying portions of their distribution system where hydrogen blending could be successful and to identify end-users that could utilize hydrogen for heating and industrial process load.[26] LCFs include RNG and hydrogen and might be most impactful through targeted application for hard-to-electrify customers. The proposed statewide framework to report on GHG emissions pending before the Commission will have important implications for the GHG accounting associated with the use of LCFs in the decarbonization scenarios presented in the RLT Plan V2. If the Commission decides LCFs cannot count towards utility decarbonization goals, the Company will have to reconsider their options for decarbonization. We further discuss our initial observations on the Company's plans for LCFs in Section 8.3.

1.2 Summary of Recommendations to Improve the RLT Plan

In this section we summarize our Preliminary Findings Report Recommendations that are designed to improve the Company's RLT Plan V2. We note the Company has addressed some of the recommendations made by PA and Stakeholders throughout this process. However, PA finds the Companies have yet to adequately address several recommendations made by PA and Stakeholders To the extent these recommendations have been addressed in the RLT Plan, they have not been repeated in this report. Below PA provides the following recommendations for the Company to consider in developing its final Long-Term Plan.

1. Explain and quantify how the Company's supply stack meets demand under all four scenarios and the degree to which there is oversupply in other scenarios.
2. Quantify the expense of Winter Peaking supplies on a per Dt basis relative to other types of supply.
3. Discuss how the Company's approach to de-contracting may change under differing scenarios or if realization of an alternative scenario may require the Company to accelerate its de-contracting planning.
4. Discuss the Company's decision making in its reliance on gas from different delivery points through the lens of satisfying demand and providing least-cost service to customers. Comment explicitly on which supply sources tend to be most expensive and how the Company chooses to procure gas to reduce ultimate costs to customers.
5. While the Company may technically be able to flow enough gas to satisfy demand on a design day, please comment on potential market limitations in purchasing additional spot gas, should that become necessary, and the Company's confidence that it can purchase additional gas during design day conditions.
6. Synchronize the results of various models and ensure that the CapEx forecast is consistent with those results to the extent they are viewed as reliable modeling tools. Address potential inconsistencies and explain why projected reinforcements of the distribution system are expected to focus only on areas not identified as highly loaded.
7. Review the response to PA 8-121 to confirm that the system reinforcement investments (historical and prospective) have been accurately communicated.[27]
8. Revise the underlying assumption of a sustained 1% average annual population growth embedded in the historical trend forecast to reflect declining Population growth over the last decade or more and the forecast for negative growth rates starting 2027.
    a. Explain why the UPC trajectory implied by the CCA scenario not only does not stay consistent with the other scenarios but unexpectedly flattens after 2028.
9. Provide further analysis on the costs and benefits of customer fuel switching for each fuel option for each scenario supported by the most current data available.
10. Revise the implied historical trend based forecast for residential UPC to follow a negative trajectory to be consistent with the Company's assertion of this historical trend since 1995.

[26] Source: Case 23-G-0419, Proceeding on Motion of the Commission as to the Rates, Charges, Rules, and Regulations of Central Hudson Gas & Electric Corporation for Gas Service.
[27] Through the factual accuracy process, PA has learned the Company agrees with this recommendation and will reflect this within the Final NGLTP.

11. Model the impact of warming trend (reductions in annual and winter season HDDs in Company's service territory) on delivered gas volumes throughout the forecast period. This trend can have significant impact on delivered gas volumes in the denominator of rates formula and therefore can result in higher bills beyond what the Company has already forecasted. Then, update Residential and non-Residential customer and UPC forecasts consistent with observed trends.
12. Consider the impact of annual oil-to-gas conversion-led customer acquisitions more consistent with (a) the Company's own reporting of around 350/year in recent years and (b) to reflect a reasonable acceleration due to improving heat pump economics.
13. Provide an updated bill impact calculation to capture the bill impacts for a customer who retains full gas service throughout the forecast period and for a customer who electrifies portions of their use.
14. Develop a view on the economics of electric appliances such as heat pumps and how it may change over time as the Company pursues blending LCFs and other costly measures. The Company should consider this analysis in its long-term gas planning and bill impact calculations.
15. Properly account for rebates and subsidies provided by federal, state, and local entities and how they can improve the economics of electric appliance compared to gas appliances.
16. Further refine and explore the fuel switching assumptions for each use case (e.g., space heating, water heating, cooking, etc.). Develop a view on what share of customers who retrofit their gas appliances do or do not disconnect from the gas system, and if so why. Value exists in investigating these assumptions and explanations on what is driving this decision and how is that changing over time, if at all. Such investigation will be valuable to help stakeholders better understand the impact of fuel switching on gas volume and peak demand forecasts.
17. Develop a view on the potential feasibility of a targeted deployment for RNG and hydrogen in a limited geography for hard-to-electrify non-residential customers, rather than blending these low carbon (and more expensive) fuels with the natural gas supply across the entire system.
18. Further investigate the technical, environmental, and economic implications of hydrogen production, transport, and distribution across Company's service territory.
19. Consider prioritizing investments in electrification, NPAs, DSM measures, and EE to reduce the GHG emissions of residential customers and result in lower bill impacts by avoiding the costly blending of LCFs, as applicable.
20. Research and update the costs associated with RNG procurement and blending sourced from within and nearby geographies to their service territory and reflect this updated cost of RNG on customer bills throughout the forecast period.

Our analysis and development of this Preliminary Findings Report resulted in observations and conclusions summarized above in this Executive Summary that are discussed in greater detail within the following sections of this Preliminary Findings Report.

2 Introduction

New York State has established several of the most ambitious decarbonization goals in the United States, through a combination of both legislative and regulatory reforms that will impact the evolution of natural gas supply, planning, infrastructure, and operations. In January 2024, New York Governor Kathy Hochul unveiled the proposed Affordable Gas Transition Act, which, among many other things, would give regulators increased authority to execute certain aspects of the transition from natural gas if approved. For instance, the proposal includes adjustments and limitations to the foundational law governing natural gas utility obligation to serve, authority to limit distribution system expansions beginning in 2026, changes to line extension policies, and the authority to decommission portions of the system. This Act did not pass in the 2024 Legislative session but the continued evolution of these goals and policies will have significant implications for the Company and all other New York natural gas utilities and natural gas local distribution company (LDC) growth, in general. Additionally, some actions could have direct and profound impacts on the investment in and evolution of natural gas infrastructure and supply requirements across the State.

PA was retained to conduct an independent assessment of the Company's Long-Term Plan. This review is being conducted for the Department pursuant to requirements of the Commission in its Planning Proceeding Order. The Planning Proceeding Order specified that the independent review address specific criteria related to long-term gas plans, including but not limited to:

- Test the assumptions and check calculations and analyses used by the Company,
- Evaluate the economic and environmental tradeoffs associated with different scenarios,

Assess a reasonable number of scenarios representing hydraulic models of the Company's distribution system or segments thereof,

- Participate in stakeholder meetings and make requests of the Company and stakeholders, and
- Suggest other solutions.

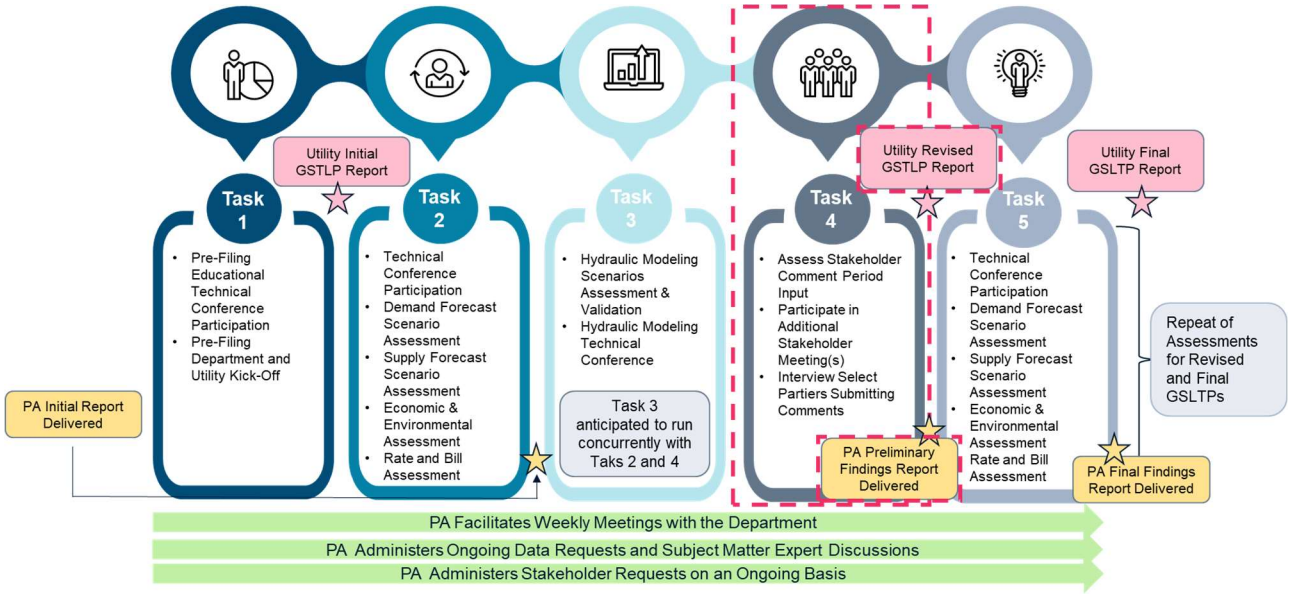
This Preliminary Findings Report summarizes our observations pertaining to the Company's RLT Plan V2, outlines suggested improvements for the Company to consider in development of its final plan and provides additional details on our continuing assessment as well as other important considerations for our subsequent Final Report.

2.1 Scope of Work

PA's review of the ILT Plan and RLT Plan V2 was conducted over approximately six months. During this time frame, PA submitted and received responses from the Company to 156 data requests, held several virtual meetings with various subject matter experts (SME) from the Company, attended the virtual pre-filing and post filing technical presentations and an on-site meeting with Central Hudson and Staff. Company personnel have provided significant amounts of requested data and have made their experts available for meetings and cooperation with PA.

Further, PA has reviewed all comments filed to date by Stakeholders and the Company. Further, several Technical Conferences were held leading up to the development of this Preliminary Findings Report, that are summarized within Section 3 and discussed in greater detail throughout this Report. Additional Technical Conferences might be scheduled to cover topics identified by New York State Energy Research & Development (NYSERDA), PA, Staff, or other stakeholders. PA will include any additional observations that might be applicable after those Technical Conferences are completed, within our Final Report. Finally, given the timeline, some of PA's comments on the Company's RLT Plan V2 are preliminary in nature and any additional observations, along with final recommendations, will be included within our Final Report. Figure 2-1 below illustrates the scope of work completed to date and, our plan for the remainder of the evaluation process.

Figure 2-1: PA Scope of Work and Schedule



We have organized our Preliminary Findings Report to first address and provide observations for the supply and demand considerations which form the basis of evaluating future investments, followed by the other aspects of the RLT Plan V2 which cumulatively provide the basis for PA's overall recommendations and reflect our comprehensive review of the RLT Plan V2. PA notes that additional analysis may be conducted as the Company provides additional data in response to data requests, completes the final version of its Long-Term Plan, and addresses stakeholder feedback over the next couple of months. This Preliminary Findings Report also outlines the key areas where additional analysis will be completed by PA over the next several months and summarized within our Final Report. Below is a list of the key topics we cover:

- Stakeholder Engagement, including:
  - Initial Stakeholder Comments
  - Company Comments
  - Technical Conferences
- Supply Assessment, including:
  - Supply Stack
  - Hydraulic Modeling
- Capex Assessment, including:
  - General Observations
  - Transmission CapEx
  - New Business CapEx
  - Distribution Improvements CapEx
- Demand Assessment, including:
  - Customer Base Growth
  - Load Forecast
- Economic Assessment, including:
  - Bill Impact
  - Disadvantaged Communities
  - Cost Benefit Analysis
- Environmental Assessment, including:
  - GHG Emissions

- DSM Programs
- Low Carbon Fuels

3 Stakeholder Engagement

The Order encourages natural gas utilities to engage in a process that is understandable to stakeholders and enables meaningful stakeholder participation. PA understands our role is not only to evaluate the plans but also to assess and help facilitate a robust stakeholder engagement process. Within this section of our Preliminary Findings Report, we discuss comments from the stakeholders engaging in the proceeding, technical conferences held to date and comments received to date, all of which we will continue to refine throughout this process. PA includes summaries of the pre-filing technical conference, facilitated by the Department, and subsequent technical conferences facilitated by the Company and PA, as well as comments filed by stakeholders and the Company.

Thus far, the stakeholders engaging in this proceeding include NYSERDA, Communities for Local Power (CLP), Multiple Intervenors (MI), and Alliance for a Green Economy-New York (AGREE-NY). In filed reply comments, Central Hudson asserts it has actively engaged with stakeholders to evaluate a range of issues addressed throughout the ILT Pan, including participation in stakeholder meetings on technical and model approaches, SME conversations with PA and Staff, and responded to data requests. Additionally, the Company comments it has closely reviewed feedback and recommendations shared during technical conferences and written comments, most of which have been addressed in the RLT Plan V2.

Several stakeholders filed comments on the Company's ILT Plan on April 29, 2024, and the Company filed revised comments in response to PA's Initial Report and Stakeholder Comments on June 11, 2024. On August 23, 2024, Communities for Local Power (CLP) filed comments on the Company's RLT Plan V2 and PA's Preliminary Findings Report. Stakeholders will be able to submit additional comments and reply to comments on the various iterations of the Long-Term Plan filed by the Company. These additional comments and discussions at any future technical conferences will be addressed in PA's Final Report.

3.1 Summary of Initial Stakeholder Comments

On April 29, 2024, a number of Stakeholders filed Initial Comments on the Company's ILT Plan. Within this section of the report, Stakeholder comments are summarized at a high-level. Stakeholder comments are then discussed in greater detail within the respective assessment sections of this report. In these sections of the report PA outlines our observations, analyses, and recommendations in each of these areas, including how Stakeholder comments have been considered in our analysis.

Stakeholders filing comments on the ILT Plan include MI, AGREE-NY, and CLP. Many of the Stakeholder comments focused on similar themes as summarized in Table 3-1. The most common themes included comments related to a preferred scenario and low carbon fuels (LCFs). All the above-mentioned Stakeholders (except for AGREE-NY) emphasized the need for Central Hudson to pick one of the four scenarios in their ILT Plan. Communities for Local Power stated, "The purpose of the long-term gas planning proceeding is to chart a course for CLCPA compliance while maintaining reliable energy services at reasonable prices. These goals cannot be achieved while attempting to follow several divergent paths at once." Most of the Stakeholders were also skeptical of the LCFs recommended by Central Hudson and indicated the need for additional analyses into each of the LCFs.

Table 3-1: Summary of Stakeholder Comments[28]

Stakeholder	GSLTP Costs, Benefits, and Bill Impacts	Forecasting Demand	Gas Supply	Electrification and Non-Pipeline Alternatives	GSLTP Scenarios
Multiple Intervenors	X	X		X	X
AGREE-NY			X	X	
Communities for Local Power	X		X	X	X

3.2 Company Comments

Central Hudson filed its response to PA's Initial Report and Stakeholder Comments on June 11, 2024, in which the Company also identifies and responds to comments made by CLP, AGREE-NY, and MI. PA finds the responses generally receptive to the feedback the Company had received on the ILT Plan. The Company's comments are organized in five parts and summarized below within Table 3-2 and described in greater detail following the table.

Table 3-2: Central Hudson's Reply Comments

Categories	Subtopic
GSLTP Costs, Benefits, and Bill Impacts	Capital Investment Forecast GSLTP Costs and Benefit Analysis Bill Impacts Assessment of Costs
Forecasting Demand	N/A
Gas Supply	Low-Carbon Fuels Bill Impacts of Blending LCF Health and Safety Impacts of LCF Responsibly Sourced Gas Gas System Current Gas Supply
Electrification and Non-Pipeline Alternatives	N/A
GSLTP Scenarios	N/A

[28] Categorized to align with Central Hudson's Reply Comments.

In general, PA finds Central Hudson appreciative of the feedback stakeholders, Staff and PA have shared in this proceeding, including in written feedback and in technical sessions. Central Hudson acknowledged the detailed and concrete recommendations and feedback, provided by PA and stakeholders. The reply comments also addressed and described plans to incorporate certain recommendations within the Central Hudson Gas System Long-Term Plan (GSLTP) or future GSLTP cycles. Additionally, to the extent that Central Hudson disagreed with a recommendation or is unable to address a recommendation in the near-term, the Company's reasoning is explained. PA further describes the reply comments within the following sub-sections and within the subsequent sections of this Report.

GSLTP Costs, Benefits and Bill Impacts

Capital Investment Forecast

The Company agreed with PA's recommendation that 20-year capital forecasts for each planning scenario presented in the ILT Plan will aid in the assessment of those scenarios, and indicated it expected to include such forecasts in its revised plan. The Company further commented that as planning scenarios continue to be optimized over time, capital spending projections may need to be adjusted and, therefore, it will likely provide additional updates to its capital expenditure forecasts in its Final GSLTP.

GSLTP Costs and BCA

The Company agreed that decarbonization efforts will entail significant costs. Central Hudson directed MI and other readers to the BCA calculation discussions in Section V and in Appendix B of the ILT Plan for more information on cost and benefit assumptions of the ILT Plan. MI asserted that the Company should submit a BCA for the UCT, and RIM test, in addition to the already provided BCAs under the SCT. MI further commented BCAs presented in the ILT Plan are not cost effective and should not be considered for implementation. The Company disagreed with MI's assertion and commented that its BCA results are reflective of a middle position. Central Hudson indicated a willingness to run additional calculations but noted that different assumptions supportive of higher BCA results would diminish the level of GHG emission reductions.

Bill Impacts

The Company endorsed PA's recommendation to conduct a comprehensive (gas and electric) share of wallet analysis to understand the bill impact of each scenario on customer affordability. This analysis shows how the potential shifting of costs for a gas to electric bill would look for each customer class under each scenario. Central Hudson indicated that its revised plan would include both gas and electricity bill impacts.

The Company disagreed with PA's conclusion that, in the ILT Plan, it had used a constant average volume of gas consumed by a representative customer over the forecast period. Rather, the Company had assumed a drop in net sales in the PUT scenario. During a SME conversation with the Company, PA alerted the Company to our observation about holding the annual average usage flat. The Company then clarified that this was a reporting mistake and the table shared in the ILT did not accurately reflect their bill impact results nor methodology. The Company revised the table and shared an updated version with PA.

The Company also emphasized that the analysis presented in the ILT Plan did not reflect abandonment of the gas system by customers adopting heat pumps, due to lack of sufficient data to make clear projections and that the focus was on gas "rates" without any assumptions about whether or not customers who install heat pumps abandon the gas system. Central Hudson indicated that going forward its analysis would include assumptions about whether such customers exit the gas system.

Assessment of Costs

The Company stated that Figure 49 of the ILT Plan contains net present value (NPV) calculations and details as to the cost and benefit components, and that this figure describes the derivation of BCA results, in response to the MI assertion that "Central Hudson should be directed to set forth, in detail, the projected costs of its [GS]LTP to customers, preferably on both a total and an NPV [i.e., net present value] basis (with an explanation as to how the NPV amount was calculated)."[29]

[29] Source: MI Comments, p. 4.

Forecasting Demand

Central Hudson agreed with PA's recommendation to quantify the impact of factors like electrification, EE, climate change, etc. over time and across all scenarios, beginning with the Historical Trend forecast, indicating it would provide further detail across the planning scenarios in its revised plan.

Gas Supply

Low-Carbon Fuels

In response to recommendations from PA related to the potential use (and/or blending) of RNG and hydrogen, the Company indicated it is open to further analysis of hydrogen and RNG through additional studies and agrees that it would be valuable to conduct a study to investigate the technical and economic implications of hydrogen and RNG production, transport, and distribution across the Company's service territory. It referenced the hydrogen study proposed in its current rate case and indicated that study could be expanded to include additional topics and suggestions from the stakeholder process. While some stakeholders expressed concerns about relying on low-carbon fuels and perhaps limiting their use, the Company stated that at this point in the long-term planning process, it is necessary and appropriate to look at every possibility, such as the ability to leverage the emission reductions that these alternative fuels could provide, so all options must remain on the table, and the Company does not support precluding hydrogen or RNG from the GSLTP at this time.

Bill Impacts of Blending LCFs

PA recommended that the Company conduct a study to show how fuel blending with RNG and hydrogen would impact a representative customer bill within Disadvantaged Communities or a low-income customer over time and the potential impact on energy assistance programs. AGREE asserted that the Company has not yet been able to purchase RNG at its target cost, and that RNG price increases are likely give the intensely competitive market for RNG. The Company commented that it expects that RNG facilities will be located in close proximity to pipeline systems with RNG supply contracted to specific gas utilities, potentially mitigating the likelihood and impact of price hikes.

While the Company agreed with PA and AGREE-NY that issues related to blending of RNG and hydrogen reflect important considerations that should be analyzed in future GSLTP cycles, it indicated that at this time there is not enough information available to calculate the proposed metrics.

Health and Safety Impacts of LCFs

AGREE stated that system-wide hydrogen blending of 20% is speculative, referring to uncertainty around the maximum level of hydrogen blending that would allow utilities to deliver hydrogen safely and reliably. CLP asserted that studies have found that, when burned, pure hydrogen produces as much as six times the nitrogen oxides as burning methane, leading to health risks for anyone who remains on the gas system. The Company reiterated the importance of its proposed hydrogen study and that it is not appropriate to remove hydrogen and other LCFs from consideration at this point in the gas planning process.

Responsibly Sourced Gas

The Company responded to CLP's recommendation that the Commission look to unbiased resources and research that accurately portrays what RSG is (as opposed to accepting the claims of utilities generally as to what it is) by pointing to Staff's support of RSG purchases up to $200,000.[30] The Company also noted that while RSG was not included in the emissions calculations presented in the ILT Plan, it would incorporate out-of-state emissions from imported fossil fuels as the CLCPA's GHG accounting methodology integrates those emissions into its process.

Gas System

The Company agreed to provide greater clarity in its revised plan as to the operational flexibility of its pipeline delivery system, as recommended by PA. Central Hudson highlighted the interconnected nature of its system behind the four citygates serving its service territory. The Company also agreed with PA's conclusion that the four citygates are currently capable of flowing more gas on a design day than is required by the Company's

[30] PA understands that $200,000 is the annual limit.

customers at this time, but clarified that while true in the aggregate, individually there is an existing constraint in the aggregate of between 30,000-35,000 Dth/day at the Tuxedo and Cedar Hill gates. The Company further indicated it would include in its revised plan a discussion of the risk associated with the reduction or loss of a citygate.

Current Gas Supply

PA recommended that Central Hudson discuss its level of confidence in being able to continue contracting the necessary Winter Peaking and Delivered Services volumes to meet winter demand, as well as the cost of those supply resources. The Company agreed to include its assessment in its revised plan, noting that any delivered services contract could, potentially, be difficult to renew.

PA also requested more information on how the Company may approach de-contracting of supply and how that may change under differing planning scenarios, including whether any one scenario might require the Company to accelerate the de-contracting process. While Central Hudson agreed that this is an important consideration in long-term planning, it opined that it is too early for this type of analysis given near-term demand projections.

Electrification, Demand Response and Non-Pipes Alternatives

PA recommended that the Company further explore customer fuel switching assumptions and explain what share of customers who retrofit their gas appliances are projected to disconnect from the gas system, and why. The Company agreed to the value of that exercise and, while noting that there is limited empirical data to rely upon, indicated it would provide as much information for these assumptions as possible in its revised plan and track the data going forward for inclusion in the next GSLTP cycle.

The Company indicated that it has limited experience implementing NPAs that would lead to decommissioning of portions of the gas network. It agreed to provide additional information as suggested by PA (e.g., the number of rebates or subsidies required to close the financial gap to incentivize electrification) as it becomes available. Central Hudson also reiterated its preference to focus on reducing demand growth in specific areas to prevent the need to invest capital in system reinforcements, rather than focus on full abandonment.

PA recommended that the Company consolidate the list of barriers that exist for deploying solutions, such as heat pumps across disadvantaged communities. The Company provided a list of those barriers, identified thus far (and invited additional stakeholder input), which included:

- Relatively high up-front costs.
- The relatively high proportion of customers residing in disadvantaged communities who live in rental housing (the customer is not the key decision maker on the investment).
- In some circumstances, switching to a heat pump may result in a net increase to the customer's bill for all utilities.
- Uncertainties around the cost of electricity for heating.
- Circumstances in which customers in multi-family housing may pay for a central heating system as part of their rent while paying for their own, separately metered electricity; an overall housing and energy cost increase would result if the rent were not adjusted downward.
- The cost of electrical panel and wiring upgrades in older buildings.
- The potential cost to modify existing, or install new, ductwork in a home or other structure.
- The cost of weatherization required to maximize the efficiency of a heat pump.
- Customer preferences to retain fossil fuel heating even when there are substantial incentives to switch technologies.
- The need for additional workforce development in Disadvantaged Communities to facilitate heat pump installations.

MI recommended that the Company be directed to evaluate one or more gas demand response programs if deemed effective. The Company indicated its willingness to explore the issue and suggested that MI identify customers who would be willing to participate in program design.

CLP suggested a more aggressive approach to NPAs, and/or a program for LPP repair, could further reduce LPP replacement costs. The Company noted its current, proactive approach to NPAs that includes potential avoidance of load growth projects. Central Hudson also noted its targeted LPP replacement program completion date of 2029.

As suggested by stakeholders, in the RLT Plan V2 Central Hudson included additional discussion on barriers to address electrification in disadvantaged communities such as high up-front costs including electrical panel and wiring updates and ductwork, large population of customers in rental housing, prices of other heating fuels, need for proper building weatherization to maintain temperatures efficiently, heat pump installation workforce development needs and overall customer preferences.

GSLTP Scenarios

The Company disagreed with the CLP assertion that the ILT Plan is unacceptable because it does not include a preferred scenario. CLP suggested the purpose of the long-term planning proceeding is to chart a course for CLCPA compliance while maintaining reliable energy services at reasonable prices and this objective cannot be achieved while attempting to follow divergent paths at once. Whereas the Company commented that the Gas Planning Order directs consideration of a range of scenarios, and it would've been counterproductive to establish a chosen scenario without informed consideration and appropriate input from Stakeholders The Company indicates an eagerness to engage with stakeholders interested in participation in the scenario development process, including an invitation to CLP to suggest modeling recommendations to PA Consulting.

PA encourages identification of the scenario that is preferred to guide the Company's plans. PA appreciates the challenges of a single point forecast when many variables are at play and finds a discussion on the range of possibilities is reasonable and useful. However, it is unclear which scenario pathway is going to inform the Company's long-term planning and investment decision that need to be made in the near-term since there are clear tradeoffs between each scenario, and it is inefficient and impossible to pursue all scenarios at the same time.

PA believes achieving desired outcomes for all Stakeholders – including the Company, customers, and the communities in which they live – requires all parties to acknowledge several key considerations, including:

- Implementing any decarbonization pathway will take time and requires cooperative efforts of customers and their representatives, the Company, and State and local legislators and regulators.
- The realities of customer needs, gas system needs, and regulatory requirements (including maintaining system safety, reliability, and affordable rates) in the short or intermediate term cannot be set aside even if they appear to be at odds with longer term objectives.
- Significant value is realized through planning for a "coordinated decarbonization" across New York to ensure safe, reliable, and affordable provision of energy services to customers. In contrast, an unplanned and uncoordinated decarbonization approach can result in stranded assets, suboptimal reliability of the gas and electric system and possibly lead to high gas and electric bills that are unaffordable to portions of the population, including disadvantaged communities.
- Identifying "no regrets" actions to be taken under any given pathway, coupled with ranges of potential outcomes, can offset the impact of many uncertainties as key assumptions including technology, policy, and customer preferences change over time.

3.3 Technical Conferences

The Department, customers and stakeholders had the opportunity to participate in a number of Technical Conferences throughout this proceeding. As we previously discussed within our Initial Report, PA was also in attendance and summarizes here the Technical Conferences held to date and further discussed in detail throughout this Report.

December 19, 2023

The Company hosted a Pre-filing Technical Conference on December 19, 2023. The session began with an overview of the natural gas industry, which provided the audience with foundational information about how

the gas utility system operates. SMEs from the Company then provided more detailed information about a variety of topics that collectively inform the ILT Plan. These topics included: customer demographics, usage trends and demand forecasting, decarbonization efforts, gas supply procurement, transportation and storage, distribution system engineering and operation, utility thermal energy networks, and utility emissions. Several stakeholders also attended, and instructions for submitting questions to PA throughout the review process were provided.

March 6, 2024

PA participated in a Technical Conference in early March, facilitated by the Company, to discuss the ILT Plan with stakeholders. In this Technical Conference, the Company reviewed assumptions and modeling methodology pertaining to the four presented scenarios. Topics covered included: gas demand modeling, demand side programs, supply planning, and results. This session provided stakeholders an opportunity to receive an overview of the ILT Plan and ask clarifying questions.

April 4, 2024

Non-Pipes Alternatives Technical Conference

In April of 2024, PA attended a Technical Conference, facilitated by Staff, in which the Company discussed NPAs. In this Technical Conference, the Company presented NPA options including transportation mode alternatives (TMA) and load growth based NPAs, NPA screening and suitability criteria, the incorporation of NPAs into LPP projects, and historical NPA implementation across their service territory. This session provided stakeholders an opportunity to ask questions regarding the Company's approach to NPA and gain understanding as to the role NPA will play in the Company's long-term approach to decarbonization.

May 8, 2024

Low-Carbon Fuels and Oil-to-Gas Conversions

PA participated in a Technical Conference, facilitated by Staff, to discuss the role of low carbon fuels and oil-to-gas conversions in the ILT plan with stakeholders. In this Technical Conference, the Company reviewed assumptions and modeling methodology pertaining to LCF feasibility and the role of oil-to-gas conversions in their customer growth forecast. The Company discussed historical oil-to-gas conversion data, notable conversions, and the assumptions associated with fuel conversions across the forecast period under the four decarbonization scenarios. Regarding LCFs, the Company provided an overview of research on RNG and hydrogen, presented the results of the third-party studies on RNG and hydrogen included in the ILT Plan, and described an overview of implementation of these LCF across the four scenarios.

May 15, 2024

Hydraulic Modeling and Vulnerable Areas Technical Conference

Central Hudson presented its methodology used to identify and analyze the segments of the distribution that are considered "highly loaded", which are identified using a Monte Carlo simulation and analysis technique. The Monte Carlo analysis uses Gas System historical trends for operating pressure along with billed volumes, considers the segment's physical characteristics, and forecasts for weather and population growth to identify areas that are approaching, or perhaps are already exceeding, their design day capacity. From the Monte Carlo analysis, 13 segments of the distribution system were identified by the Company as "highly loaded".

Once a segment of the system has been identified as highly loaded, information is provided to the Company's Gas Transformation and Planning group where a hydraulic analysis of the segment is performed using Synergi Gas. Estimates of required capital investments required to mitigate operating conditions that could negatively affect reliability are also developed by the Company for potential inclusion in future budget cycles.

4 Supply Assessment

PA has undertaken a review of several supply and supply-related aspects of the Company's system, based on information presented in the RLT Plan V2 and responses from the Company to several related data requests. Our preliminary observations are summarized within the sub-sections below. We first highlight components of the supply stack, then discuss hydraulic models of the distribution system. We conclude with comments on the Company's forecast of capital expenditures. PA will continue to explore the supply considerations of the Company's long-term gas plan, including further Company analyses, stakeholder comments, and policy considerations in preparation of our Final Report.

The Central Hudson distribution system is comprised of approximately 1,300 miles of mains and 67,000 service lines. The Company's transmission system receives gas at four interstate pipeline interconnections (or citygates) and delivers that supply throughout the distribution system footprint. In aggregate, the four interstate pipeline interconnections are currently capable of flowing more gas on a design day than is required by the Company's customers. It is important to note that this is not true at individual citygates: there are limitations at the Tuxedo gate and the Cedar Hill gate. Generally, however, if demand grows as forecast by the Company in the near term, PA would not expect there to be a need for additional investments in the citygates to accommodate growth. While certain transmission pipeline segment replacements are contemplated in the Company's capital plan, the transmission system generally appears to be well positioned for continued reliability. The Company has also indicated that there are no segments of its system that are served by a single citygate, meaning that any reduction to deliverability at a given citygate can be compensated for by procuring additional supply through other citygates.

The supply portfolio consists primarily of interstate pipeline transportation contracts and storage contracts with interstate pipeline transportation agreements. Long-term contracted capacity on interstate pipelines is held by the Company. The majority of the natural gas consumed within the Company's footprint is sourced from the Marcellus shale, including a modest volume of RSG.[31] The Company has indicated in its pending rate[32] case that it will continue to pursue the utilization of RSG (natural gas obtained from suppliers that proactively manage their methane emissions) and will seek to procure RSG up to the incremental cost threshold of $200,000, established in the previous rate case[33]. For winter peaking needs, the Company relies on Delivered Services contracts and spot purchases (which may be referred to as Winter Peaking Supplies), if necessary, to meet peak demand. The Company typically issues a request for proposal (RFP) to procure these supplies. Over time, to reduce the volume of contracts no longer needed as peak day demand decreases, a methodology for considering how to de-contract capacity to match changing customer usage is needed. While Central Hudson indicates it does not anticipate opportunities for de-contracting over the next five years, it would be valuable for the Company to identify the factors and contract features it will consider when it comes time to consider de-contracting. It would also be beneficial for the Company to indicate the degree to which demand declines associated with each planning scenario might impact how the Company considers de-contracting – especially if de-contracting considerations are accelerated in those scenarios.

A key area of focus of the RLT Plan V2 are 13 segments of the Central Hudson distribution system that have been identified by the Company as "highly loaded", meaning that they are either approaching or even exceeding their capacity to reliably serve customers on a design day. PA and Staff had the opportunity to meet with Central Hudson's SMEs at the Company's Poughkeepsie offices on June 10, 2024, to review these systems in more detail. This review included a discussion of hydraulic modeling scenarios previously requested by PA; we have investigated the relationship between planned distribution system reinforcement investments and both current and potential future operating conditions (again, based on these hydraulic modeling results).

[31] Source: Company response to PA 1-3 and PA 3-57 Attachment 1.xlsx.
[32] Source: Electric and Gas Procurement Panel Testimony, Case 24-G-0462, dated 8/1/2024.
[33] Source: Notice of Schedule for Filing Exceptions and Recommended Decisions, Case 23-G-0419, dated 5/1/2024.

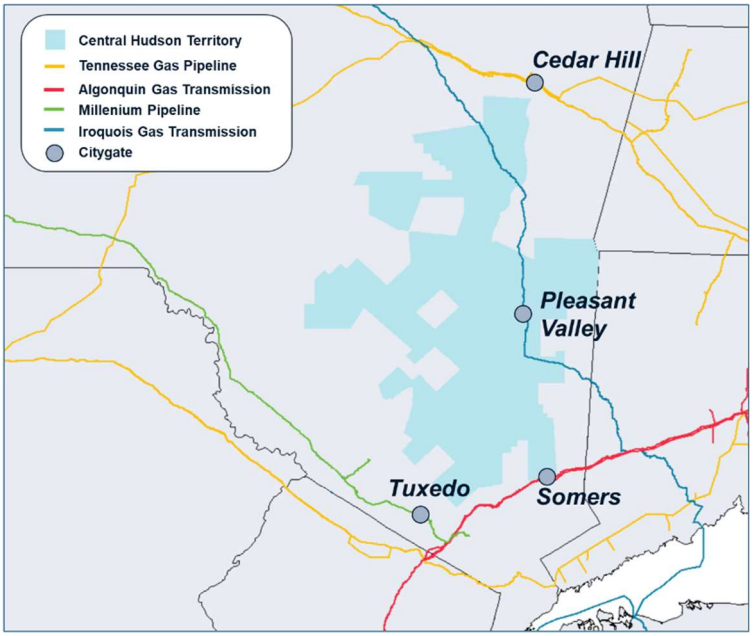
4.1 Supply Stack

As mentioned above, the system is supplied at four citygates that feed one contiguous service territory. The interstate natural gas pipelines are interconnected with the Company's network as follows:

1. the Tuxedo gate connecting to the Millenium Pipeline,
2. the Cedar Hill gate connecting to Tennessee Gas Pipeline's 200 Leg lateral,
3. the Pleasant Valley gate connecting to Iroquois Gas Transmission, and
4. the Somers gate connecting to Algonquin Gas Transmission.

Figure 4-1 illustrates these interstate natural gas pipeline interconnections.

Figure 4-1: Central Hudson Pipeline and Delivery Point Map

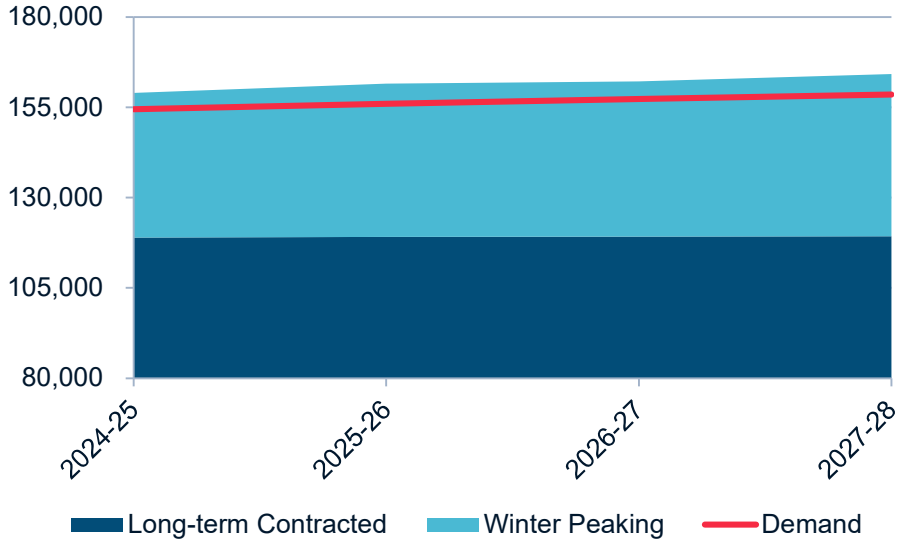


4.1.14.1 Long-Term Contracts Assessment

The majority of the Company's natural gas supply exists in the form of interstate pipeline transportation contracts. These contracts are agreements with federally regulated interstate pipeline companies to transport a specified quantity of natural gas from one region – typically a supply region such as the Marcellus shale – to a destination in proximity to load centers. These pipeline contracts do not necessarily deliver gas directly to citygates connected to the Company's local distribution system; rather, they may deliver to a point upstream of the Company's distribution system with gas then nominated through a separate contract for ultimate delivery. Similar contracts can also provide for the delivery of stored natural gas.

In its supply stack forecast, the Company has over 118 MDth/d of long-term contracted capacity on interstate pipelines held by the Company. See Figure 4-2. This volume includes storage withdrawal contracts.

Figure 4-2: Central Hudson Supply Stack[34]



In the RLT Plan V2, the Company explains that its natural gas is procured to satisfy demand behind citygates and that its supply stack has remained static in recent years, with the caveat that this could change as the Company considers a de-contracting methodology when some supply is no longer needed to meet demand.

The Company's approach to securing natural gas to satisfy its demand appears to be sound, especially given the relatively static nature of its supply stack and the lack of major projects that will alter the supply landscape. To clearly show that supply is adequate, in the Final Long-Term Plan, we recommend the Company outline and quantify how its supply stack satisfies demand under its CCA scenario as well as the alternative scenarios it identified. It is important that the Company convey the potential quantity of oversupply it may have in future years under various scenarios.

The Company further indicated in the RLT Plan V2 that none of the segments of its system are isolated or served by a single citygate. This system arrangement grants the Company a contingency in the event a citygate experiences a flow derate or outage. The Company has the ability to purchase additional natural gas on the spot market for delivery to other citygates and further has sufficient capacity within its own delivery systems to move gas to satisfy demand. In PA's view, this approach to ensuring adequate supply is reasonable however it must be noted that during design day conditions, it is entirely possible that there will not be available natural gas on the spot market due to tight market conditions across the northeast. While it may be technically possible for the Company to purchase additional gas on the spot market and move it through its system, the additional gas may not actually be available to purchase, especially during design day conditions, due to market limitations.

It would also be valuable for the Company to highlight its relative reliance on different delivery points and the "order" in which it would choose to purchase new gas to satisfy demand and provide least-cost service to customers. During its SME session, the Company indicated that procured at the Tuxedo Gate tends to be the least-cost and that it would opt to rely on Cedar Hill, followed by Mahopac, and finally Pleasant Valley which, connected to Iroquois, tends to be some of the more expensive gas in the region. The Company should comment on its decision making in procuring gas, the relative costs of gas from the different delivery points, how it is pursuing least-cost supply for its customers, and its reliance (or non-reliance) on gas indexed to Iroquois Z2.

4.1.2 Delivered Services and Winter Peaking Supplies

Delivered Services are natural gas volumes purchased from third parties that hold the rights to the underlying contracted capacity. The Company uses short-term contracted delivered supplies to meet any expected imbalances between the long-term supply portfolio and coming winter demand. Because Delivered Services can be contracted as Winter Peaking Supplies (procured immediately prior to a winter season to meet

[34] Source: Company response to PA 3-53 and PA 3-53 Attachment 1.

expected demand), the volumes fluctuate slightly in each year and the Company may not have procured all of the delivered services required for a given year until just before the winter season begins. The Company typically issues an RFP to procure these supplies. In Central Hudson's existing forecast, the volumes of Winter Peaking Supplies fluctuate between 40 and 45 MDth/d.[35]

In the RLT Plan V2, the Company explains its general methodology for seeking Winter Peaking Supplies before a winter season and indicates in broad terms that reducing reliance on delivered services would be economically beneficial for customers. The Company should go further to quantify the relative cost of these supplies when contrasted against the cost of firm capacity for the rest of its supply stack. While Winter Peaking Supplies and Delivered Services are necessary components of the supply stack to meet winter demand, these supplies tend to be more expensive due to the relatively tight natural gas market within the Northeast and seasonal deliverability constraints. After filing the ILT Plan, the Company acknowledged increased risk in its ability to renew Winter Peaking Supplies and indicated it will consider reducing its reliance on this type of supply when possible.[36] Winter Peaking Supplies remain the component of the Company's supply portfolio that has the most embedded risk, so PA believes that it was valuable for the Company to elaborate on those risks.

4.1.3 Company's De-Contracting / Re-Contracting Approach

As peak day demand begins to decrease, to reduce the volume of contracts that are no longer needed a methodology for considering how to de-contract capacity to match changing customer usage is necessary. The Company indicated that it does not anticipate opportunities for de-contracting over the next five years. However, a plan for de-contracting would help provide stakeholders a longer-term view of the Company's plans to source gas supply and evaluate the affordability of service.

In the RLT Plan V2, the Company discusses its expected methodology for de-contracting and retiring components of its supply portfolio when the supply is no longer necessary to meet demand. The Company's general approach appears to be reasonable and consistent with the general outline of de-contracting methodologies described by other New York utilities. One limitation in the Company's discussion of its de-contracting methodology is that it does not consider how de-contracting might apply in its alternative planning scenarios. While it may be relatively early to implement specific de-contracting details, it would be beneficial to consider – in broad terms – how soon de-contracting may need to be considered (and identify the applicable cost savings) under all four planning scenarios, especially those that consider more rapid declines in demand. In Sections 6.1 and 6.2.3, PA observes that the main drivers of customer growth, gas net sales and peak day demand are not likely to follow historical trends with a likely decrease in demand from levels projected by the Company. Because a decrease in peak gas demand could reduce gas supply requirements, PA will continue to analyze the Company's data in these areas in preparation for our Final Report.

The Company indicated that its supply portfolio was sufficient to meet expected demand under the CCA but did not indicate how its supply portfolio is sufficient to meet demand under the other three scenarios, or how much excess capacity the Company may have under additional alternative scenarios. To this end, we recommend the Company indicate how its de-contracting strategy may shift and the degree to which its supply portfolio may exceed design day demand under different scenarios. This information will help stakeholders and the Commission evaluate how CapEx requirements for the Company's distribution system may evolve over time as well as ongoing affordability.

4.2 Hydraulic Modeling

PA focused much of its hydraulic modeling analysis on 13 segments of the Central Hudson distribution system that have been identified by the Company as "highly loaded", meaning that they are either approaching or even exceeding their capacity to reliably serve customers on a design day. PA and Staff had the opportunity to meet with Central Hudson's SMEs at the Company's Poughkeepsie offices on June 10, 2024, to review these segments in more detail. This review included a discussion of hydraulic modeling scenarios previously requested by PA.[37] Those scenarios were based on the Company's projections of design day demand (at 73

[35] Source: Company response to PA 1-3 and PA 3-57 Attachment 1.
[36] Source: RLT Plan V2 p. 52
[37] Source: Company response to PA 6-109; confidential responses were provided at the June 10, 2024, meeting.

heating degree days (HDD)) for specific winter seasons as well as under defined operating conditions, as follows:

(a) Winter 2023-24
(b) Winter 2026-27
(c) Winter 2028-29
(d) Winter 2030-31
(e) 100% of the segment's capacity[38]
(f) 95% of the segment's capacity
(g) 80% of the segment's capacity

Key outputs of each hydraulic modeling scenario included (1) hourly demand on the highly loaded segment, (2) identification of the lowest pressure point (and the corresponding pressure) on the segment, (3) the locations at which gas velocities exceed 70 feet per second[39] (along with the corresponding velocities), (4) the system "choke point" (defined below) with corresponding pressure, and (5) identification of representative system pressures throughout the segment.

The highly loaded segments were identified using a Monte Carlo analysis to determine which parts of the system are stressed and have the potential to drop below the minimum system delivery pressure on a design day. All segments of the distribution system are ranked from highest loaded to least loaded.[40] Results are presented in the RLT Plan V2, Appendix A, Table 4 as the Company's "Weather-Normalized Loading Factor Forecast (Absent Incremental Interventions)".[41] Once a segment is identified as highly loaded, the Company's hydraulic modeling group further evaluates the segment to determine if any "choke points" exist. Choke points are restrictions to required gas flows such as sections of pipe with relatively high velocities, damaged pipe, partially open valves, undersized pipe, etc. A system segment may be removed from the highly loaded list if design day demand is projected to decrease. In fact, during the course of our assessment and as part of the Company's ongoing review, at least two such segments were removed from the highly loaded list.

It was noted during our discussions with Central Hudson's SMEs that the load forecasts for the 2028 and 2030 models did not include anticipated impacts from changes in building codes, policies, etc., that could influence design day demand. Refined load forecasts incorporating such anticipated changes could benefit these models.

In PA 6-109, PA asked Central Hudson to model the highly loaded segment scenarios listed above. As discussed previously, PA defined "100% of a segment's capacity" as the capacity of the system that would yield a pressure drop of 50% on a design day. PA would expect there to be a strong correlation between these two separate approaches (Monte Carlo analysis and hydraulic modeling) to demonstrating the relative need for reinforcement of segments of the system; that is, when Appendix A, Table 4-1 reflects that a segment of the distribution system is either approaching or exceeding its capacity (in other words, approaching or exceeding 100% loaded), the corresponding hydraulic models provided in PA 6-109 would demonstrate a pressure drop approaching (or even exceeding) 50%. However, as shown in Table 4-1 below, that does not always appear to be the case. (Data points that reflect a perceived reliability risk are shown in red; we highlight examples of the apparent inconsistencies- below the table.)

[38] For purposes of these modeling scenarios, 100% of the segment's capacity is defined as the maximum demand that can be served while maintaining minimum distribution system pressures consistent with the Company's design day criteria, which is 50% of the applicable system segment's MAOP. As further context, in the RLT Plan V2 at p. 26, the Company defines "vulnerable locations" as portions of the system where, in the next five years, pressures on a design day are anticipated to drop below 50% MAOP under planning conditions.
[39] Gas velocity of 70 feet per second is considered the limiting velocity for gas distribution system piping outside of pressure regulating stations. The Company makes the same observation in the RLT Plan V2, Appendix C, at page 12.
[40] Source: RLT Plan V2, Appendix A, Figure 14.
[41] PA interprets "absent incremental interventions" to mean that the loading factors presented do not consider any reinforcement of the distribution system.

Table 4-1: *Hydraulic Modeling Results for Highly Loaded Segments*

Source		App A, Table 4	App A, Fig 24	Derived from PA 6-109, Attachments 2-14)
Segment	**Percent Loaded 2024**	**Year at which Segment Exceeds 90% Loaded**	**Approximate % Likelihood of Triggering Upgrades by 2034**	**Percent maximum allowable operating pressure (MAOP) in 2024**
CLP	88.2	2025	60	81
CW	91.5	2023	20	69
HH	81.8	2033	30	39
HM	100.5	2023	90	37
MLP	95.9	2023	90	81
NFE	77.1	2042	Not included	64
PLP	139.2	2023	100	76
PM	92.7	2023	50	73
PN	112.9	2023	80	50
SP	77.2	NEVER	Not included	79
TVPV	84.4	2027	60	36
KS 9.5	82.3	2035	20	82
KS 40	111.2	2023	40	37

It is PA's understanding that Table 4-1 of Appendix A intends to communicate the degree to which a segment of the distribution system is "loaded", or the percentage of that system segment's maximum capacity at which it is operating under design day conditions. For example, Table 4 indicates that the Hopewell-Hughsonville (HH) system is at 81.8% of its maximum capacity in 2024. However, the 2023-24 hydraulic model of the HH system demonstrates that the lowest pressure on this segment drops to 39% of MAOP (i.e., a greater pressure drops than the 50% drop under the design hour conditions criterion) in 2024.

As also noted in Table 4-1, the HH system has been modeled at an approximate 30% likelihood of needing to be upgraded, as reflected in Appendix A, Figure 24. These three data points do not appear to support the same conclusion as to how much capacity is remaining on a design day; if indeed pressures on the HH system would fall below the Company's 50% pressure drop design day criteria, then it seems that reinforcement should be a higher priority. PA also notes that certain of the models provided in PA 6-109 also indicate gas velocities that exceed (and in some cases, far exceed) the maximum 70 feet per second gas velocity for a gas distribution system.

The Malden Low Pressure (MLP) system segment provides another example. Appendix A, Table 4 reflects that the MLP segment is nearly 96% loaded in 2024, implying that segment is 4% short of its full operating capacity on a design day. However, the hydraulic models provided in PA 6-109 suggest that the lowest pressure point on the MLP segment of the system is 81% of the segment's MAOP (well above the 50% pressure drop design day criteria). Other inconsistencies noted in Table 4-1 include the Cornwall (CW), Poughkeepsie Low Pressure (PLP), Poughkeepsie Medium Pressure (PM) and Titusville/Pleasant Valley

(TVPV) segments; in each case the output reflected in Appendix A, Table 4 is not consistent with the output of the hydraulic models provided in PA 6-109.

In PA's opinion, a Monte Carlo analysis based on distribution system pressure expectations is unable to convey enough information to effectively determine where reliability risks may exist. While the analysis may assign statistical probabilities to whether or when a distribution system (or segment thereof) may be operating at full capacity (placing reliable delivery of gas to customers at risk), hydraulic models of the same system segments better identify the nature of reinforcements that should be considered, where applicable. The hydraulic modeling process is the key step in determining whether these potential risks exist and lays the foundation for anticipating and addressing potential future design day reliability challenges. PA recommends Central Hudson re-evaluate the outputs of its various modeling exercises to ensure that the results thereof are complementary and support effective distribution system planning going forward.

We discuss the implications of the analyses of the highly loaded segments on future capital investments in Section 5.4.3.

4.3 Recommendations to Improve the RLT Plan V2

Recommendations for the Company to improve the supply components of the RLT Plan V2 are summarized below.

1. Explain and quantify how the Company's supply stack meets demand under all four scenarios and the degree to which there is oversupply in the other scenarios.
2. Quantify the expense of Winter Peaking supplies relative to other types of supply.
3. Discuss how the Company's approach to de-contracting may change under differing scenarios or if realization of an alternative scenario may require the Company to accelerate its de-contracting planning.
4. Discuss the Company's decision making in its reliance on gas from different delivery points through the lens of satisfying demand and providing least-cost service to customers. Comment explicitly on which supply sources tend to be most expensive and how the Company chooses to procure gas to reduce ultimate costs to customers.
5. While the Company may technically be able to flow enough gas to satisfy demand on a design day, please comment on potential market limitations in purchasing additional spot gas, should that become necessary, and the Company's confidence that it can purchase additional gas during design day conditions.

5 Capex Assessment

The Company provided historical nominal CapEx values, and 20-year CapEx forecasts, including inflation, for each planning scenario in the RLT Plan V2. PA requested detailed information supporting the forecast for each planning scenario; Central Hudson has provided those details for only the CCA scenario to date. However it appears that only one system reinforcement project included in the forecast is associated with an identified highly loaded system. PA recommends that the Company better synchronize the results of its various models and ensure that its CapEx forecast is consistent with those results to the extent they are viewed as reliable modeling tools and explain why projected reinforcements of the distribution system are expected to focus on areas that have not been identified as highly loaded.

The ILT Plan discussed the Company's CapEx plan for the five-year period 2024-28. During our review, PA requested and received additional details about the makeup of the investments included in the Company's forecast, including updates to the ILT Plan forecast and the addition of 2029, both of which are reflected in the RLT Plan V2. PA's observations of the Company's investment plan are discussed below, particularly as the plan relates to safe and reliable delivery of supply.

5.1 General Observations

The Company provided 20-year CapEx forecasts for each planning scenario in the RLT Plan V2. PA requested detailed information supporting those forecasts; Central Hudson has provided those details for only the CCA scenario to date.

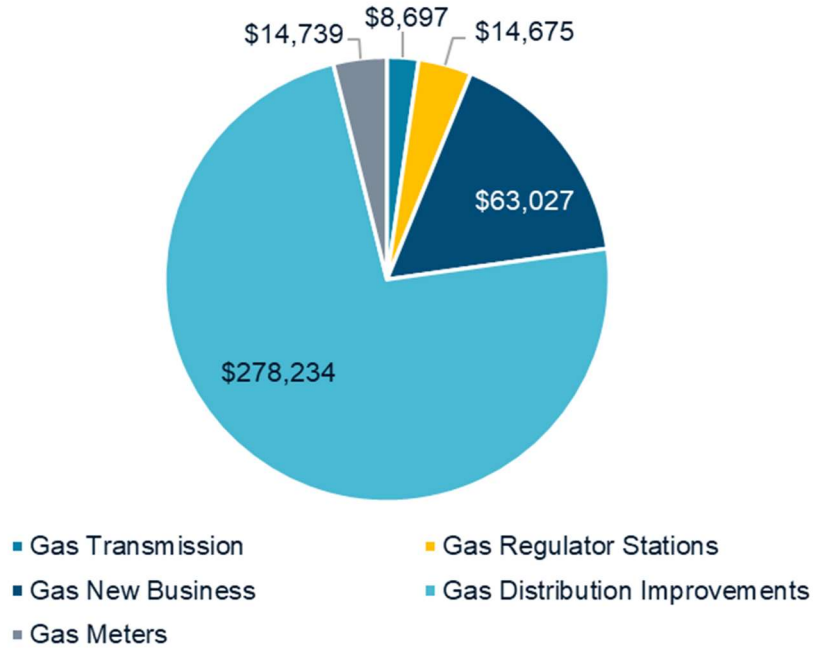
PA observes an increase in overall annual CapEx in 2024-2029 vs. actual investments in 2018-2023.[42] The average annual CapEx in the prospective six-year period is approximately 28% greater than the average annual investments in the historical six-year period.[43] More than half of that growth (nearly $9.5 million annually) can be attributed to new programs proposed in the recently completed rate case[44]. Another approximately 20% (or more than $3 million annually) of the forecasted increase is related to reinforcement of the distribution system. While increased transmission system investments also make up more than 20% of the difference (approximately $3.9 million per year), declines in new business CapEx of roughly $4 million per year in 2024-29 offset that increase overall. Annual investments to serve new customers in 2024 and 2025 are forecast to be on par with actual investments in 2018-23; beginning in 2026, annual new business CapEx is projected to be less than half of the average annual investments in 2018-25. Additional focus on a targeted distribution improvement program makes up another 11% of the difference.[45] Table 5-1 summarizes these drivers of the differences in annual CapEx investments between the historical and prospective period. It is important to note historical values are nominal whereas forecasted values are inflation adjusted, throughout this report unless otherwise specified. Figure 5-1 and Figure 5-2 summarize CapEx spending by major investment category in 2018-2023 and 2024-2029. These figures demonstrate a continued focus on Distribution Improvements, additional focus on Transmission investments, and relatively less investment in new business in the 2024-2029 period.

[42] Investments made in 2018-2022, and projected for 2024-2028, were provided in the Company's response to PA 2-39. The Company provided actual investments in 2023 in PA 4-80. An updated five-year forecast for 2025-2029 was provided in PA 8-118. As such, we have a six-year historical period (2018-2023) as well as a six-year "forecast" period (2024-2029). References to a "five-year forecast" are related to 2025-2029.
[43] For purposes of this discussion, PA considers 2024 as part of the projected period.
[44] The Commission issued an order in Case 23-G-0419 on July 18, 2024.
[45] The Company's Large Diameter Gas Welded Pipe Replacement Program is discussed in Section 5.4.4.

Table 5-1: Central Hudson CapEx by Major Investment Category ($000)[46]

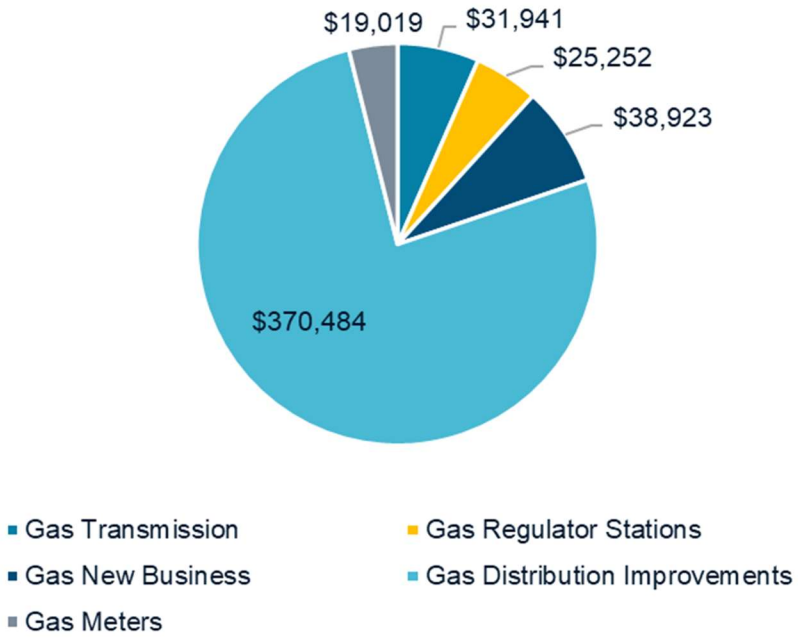
	2018-2023	2024-2029
Rate Case Programs	$0	$9,448
Distribution System Reinforcements	$2,164	$5,472
Transmission	$1,449	$5,324
New Business	$10,504	$6,487
Large Diameter Welded Pipe Program	$1,112	$3,101
Other CapEx Investments	$47,998	$51,105
Total (for Average Year)	$63,229	$80,936

Figure 5-1: Central Hudson CapEx 2018-23 ($000)



[46] Historical CapEx values are nominal unless otherwise specified.

Figure 5-2: Central Hudson CapEx 2024-28 ($000)



Finally, PA observes that in the Commission's July 18, 2024, order in the Company's most recent rate case (Case 23-G-0419), the CapEx budgets approved for 2024 and 2025 differ from the forecast Central Hudson has provided to PA. We have based our analysis here on responses to many data requests received throughout the period of our review from the Company. The majority of those were received prior to the rate case order. Central Hudson has indicated that it will prioritize projects as necessary and defer work to future years as needed to remain within the approved budget. The Company has further indicated that any projects that are postponed are still planned for completion within the 20-year forecast period as noted in its response to PA 8-118.[47] PA's analysis in this report is based on the Company's forecast in the RLT Plan V2 as presented by the Company; however, the observed discrepancy with CapEx approved in the rate case should be addressed in the Company's Final Plan.

Figure 5-3 illustrates the relative size of the investment types making up the Company's overall five-year forecast. Table 5-2 summarizes the investment amounts associated with that forecast, and also includes the 2018-24 period.[48]

[47] Source: Company response to PA 13-154.
[48] Source: Company responses to PA 2-39, PA 4-79, PA 4-80, and PA 8-118.

Figure 5-3: Makeup of Central Hudson Five-Year (2025-29) CapEx Forecast[49]

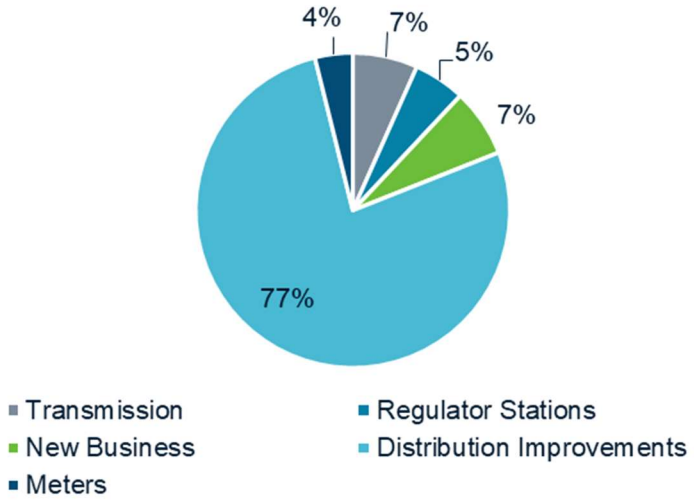


Table 5-2: Central Hudson Historical and Projected Capital Investments ($000)[50]

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Transmission	$1,016	$753	$931	$1,559	$1,112	$3,326	$4,241	$5,817	$6,684	$5,834	$4,596	$4,769
Regulator Stations	$2,070	$2,787	$1,767	$1,873	$2,581	$3,596	$3,304	$3,398	$4,161	$4,681	$5,039	$4,669
New Business	$11,451	$9,961	$9,282	$11,249	$10,506	$10,578	$9,956	$12,293	$4,489	$3,960	$3,883	$4,342
Distribution Improvements	$45,883	$49,556	$54,264	$43,246	$39,076	$46,209	$51,581	$63,775	$68,898	$66,178	$72,081	$47,972
Meters	$2,672	$2,621	$2,478	$2,180	$2,012	$2,776	$2,926	$3,126	$3,072	$3,159	$3,362	$3,374
Total	**$63,092**	**$65,678**	**$68,721**	**$60,107**	**$55,287**	**$66,485**	**$72,008**	**$88,410**	**$87,302**	**$83,812**	**$88,962**	**$65,126**

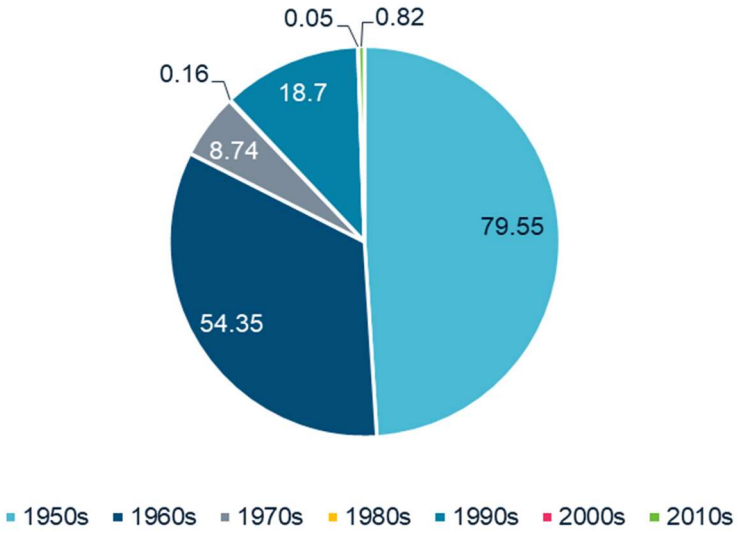
PA focused its analysis on Transmission, New Business and Distribution Improvements. Each of these three categories have implications on the reliable delivery of supply to customers, even if they are not "supply" investments in the traditional sense.[51] Where applicable, we quantify where opportunities to reduce capital investment going forward may be available to the Company.

5.2 Transmission CapEx

The Company operates over 162 miles of transmission pipelines and 100% of the transmission system is coated in cathodically-protected steel. The majority of the system (133.9 miles) was installed in the 1950s and 1960s. More than 90% of the system consists of 10- and 12-inch diameter pipelines. Figure 5-4 illustrates the age of the Company's transmission system.[52]

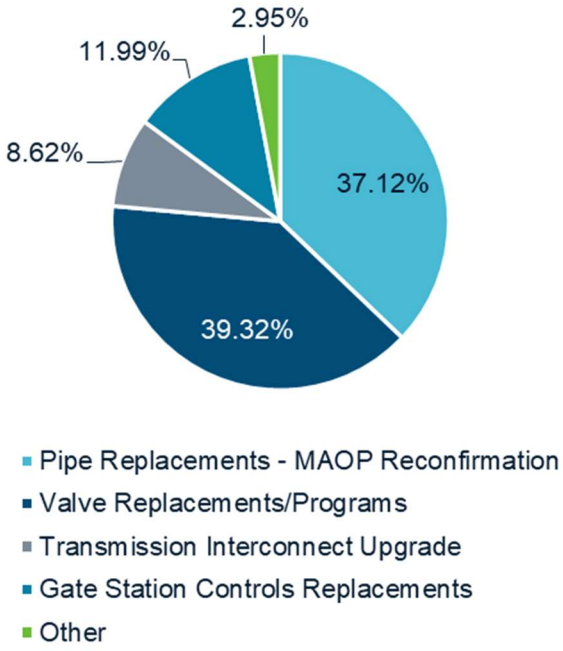
[49] Source: Company response to PA 8-118.
[50] Forecasted amounts reflected here are adjusted for inflation and consistent with the RLT Plan V2, as provided in response to PA 8-118 and PA 12-151.
[51] Arguably, Regulator Stations investments also play a role in reliable delivery of supply. PA did not review those investments due to their relatively small contribution (approximately 5%) to the overall forecast for 2025-29.
[52] Transmission system data is from the Company's Annual Gas Transmission Report submitted to PHMSA for calendar year 2023 (PA 8-125). 0.21 miles were installed in the 1980s and 2000s in total, along with 0.82 miles in the 2010s.

Figure 5-4: Transmission Miles in Service by Decade Installed



CapEx in the Company's transmission system make up nearly 7% of the Company's five-year forecast. The primary components of the transmission investments forecast are pipeline replacements and programs to install new, or upgrade existing, pipeline valves. These categories make up more than 75% of the transmission investments included in the five-year forecast, as shown in Figure 5-5.[53] PA concurs that ongoing investment in the transmission system, the backbone of the gas delivery system on which all customers depend, is appropriate. Moreover, PA does not consider the level of proposed investment for any transmission project or program to be unreasonable.

Figure 5-5: Makeup of Transmission CapEx Forecast (2025-29)



5.2.1 Transmission Pipeline Replacements

The Company's capital forecast supporting the RLT Plan V2 includes replacement of segments of its transmission system through 2030 to comply with Federal regulations. The Pipeline and Hazardous Materials Safety Administration (PHMSA) issued a final rule in October 2019[54] that requires operators of transmission

[53] Source: Company response to PA 8-118.
[54] Source: https://www.govinfo.gov/content/pkg/FR-2019-10-01/pdf/2019-20306.pdf.

lines to reconfirm the MAOP of certain of those pipelines in their systems. In the absence of traceable, verifiable, and complete records supporting the MAOP, compliance can be achieved by a number of means, including re-testing the pipeline, reducing the MAOP of the pipeline, or replacing pipeline segments for which the applicable records are not available.[55] PHMSA established an interim program milestone requiring that at least 50% of the pipelines requiring reconfirmation be completed by July 3, 2028, with 100% completion required by July 2, 2035.[56] The transmission pipelines in the Company's system ensure that required gas volumes are delivered to the various distribution regulator stations throughout the service territory at or above established minimum design pressures. PA explored each of the options for compliance as enumerated in 192.624:[57]

The regulation provides that a pressure test along with verification of the pipeline system materials' properties may be conducted to reconfirm the MAOP. The materials verification process requires the same consideration of traceable, verifiable, and complete records which, in the Company's case, are not available. Moreover, in general there is an inherent risk of failure associated with re-testing these pipelines which may have been in service for decades.[58]

The regulation would allow operators of natural gas transmission pipelines such as Central Hudson to achieve compliance by reducing the MAOP of the applicable pipeline segments; the parameters under which compliance can be achieved are prescribed accordingly. However, the Company indicated that reducing the pressure to the allowed level is not feasible, explaining that derating the pipelines requiring reconfirmation limits operational flexibility, negatively impacts system reliability and resilience, and limits the amount of gas available from a citygate with typically lower commodity costs than other supply points.

The regulation provides a separate pressure reduction methodology for pipeline segments with a small potential impact radius (defined in 192.903 as the radius of a circle within which the potential failure of a pipeline could have significant impact on people or property). Central Hudson explained that this option is infeasible since most of the Company's transmission system has a potential impact radius greater than the 150 feet applicable to this alternative.

The regulation allows operators of natural gas transmission pipelines to either follow a prescribed engineering methodology or use an alternative technical evaluation process that provides documented engineering analysis for establishing MAOP. The Company explained the perceived risk of developing or utilizing an unproven alternative technology. PA does not disagree with that conclusion; at the very least, either of these options would be burdensome.

Replacement of the applicable pipe segments is the remaining compliance alternative. PA is aware the replacement path is not uncommon as gas system operators across the United States address this requirement. The Company's replacement plan to achieve MAOP Reconfirmation compliance appears to be reasonable. As indicated in the RLT Plan V2, the Company has determined that only approximately 1.8 miles of transmission pipeline requires replacement. It is PA's understanding that plans are in place to complete replacement of nearly 90% of those segments well in advance of the 2028 deadline.[59]

5.2.2 Transmission Valve Programs

The five-year forecast for the RLT Plan V2 includes investments to modify pipeline segments in order that they can accommodate In-Line Inspection (ILI) tools. It also includes investments to replace existing valves with those that can be operated remotely, and to install new valves to address deficiencies in valve spacing that have resulted from population growth and new building construction. These investments make up only approximately 2.6% of the five-year CapEx forecast and are in large part driven by PHMSA requirements.

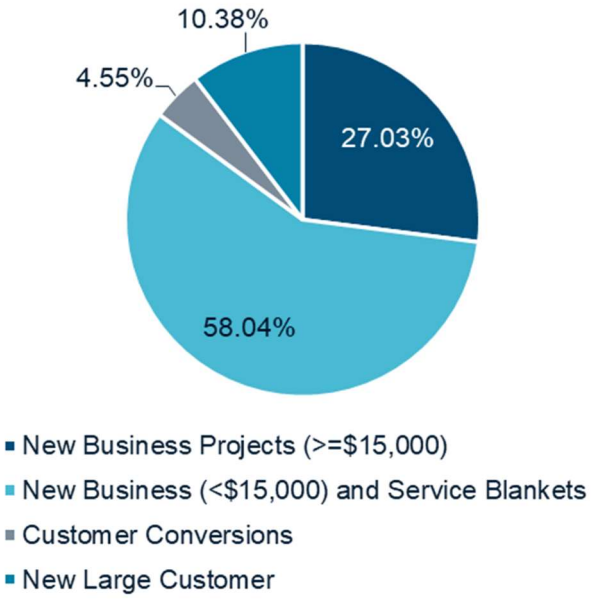
[55] Source: eCFR :: 49 CFR 192.624 – Provides the complete list of alternatives -- Maximum allowable operating pressure reconfirmation: Onshore steel transmission pipelines.
[56] Source: eCFR :: 49 CFR 192.624 -- Maximum allowable operating pressure reconfirmation: Onshore steel transmission pipelines.
[57] Source: Company response to PA 8-123 and PA 11-150.
[58] Source: Company response to PA 2-44 indicates that the majority of pipeline segments to be replaced to achieve MAOP Reconfirmation compliance were installed in the mid-1970s.
[59] Source: Company Response to PA 2-44.

5.3 New Business CapEx

New Business makes up 7% of the overall capital forecast supporting the RLT Plan V2 for 2025-29. Average annual new business investments during the forecast period are approximately 44% lower than the average investments in 2018-2024.[60] The forecast in 2025 is influenced by the second year (of two years) of a project to extend facilities to serve one large new customer[61]. Setting that investment aside, the annual New Business CapEx in 2024-29 forecast is nearly 50% lower than investments in the 2018-23 period, which is consistent with expectations for reductions in new connections pursuant to New York's All-Electric Building Act which bans natural gas connections in most new buildings (i.e., those that are less than seven stories) as of the end of 2025, and in all new buildings by the end of 2028.[62]. Declines in the annual level of new business investment can also be driven by shifts in consumer thinking; whereas in recent years natural gas may have been the more obvious preference, some consumers may now choose electricity (or in some cases, propane) as their source of heating. We discuss these issues in more detail in Section 6.

As shown in Figure 5-6, nearly 60% of the New Business five-year CapEx forecast is made up of individual projects of less than $15,000 and service line blankets.[63] It may be reasonable to assume that smaller projects are contemplated to serve fewer customers per project than larger scale projects, which may make implementation of NPAs relatively more achievable. Additionally, approximately 5% of the new business forecast is earmarked for the conversion of commercial and residential customers to natural gas service from an alternate fuel. PA encourages the Company to pursue NPAs that will allow them to avoid the installation of new mains and service lines to serve new gas customers. While we do not expect that the full 65% of the new business forecast (smaller projects/service blankets plus conversions) could be avoided in favor of successful NPAs, any avoided capital investment can serve to reduce customer bills prospectively.

Figure 5-6: Central Hudson Forecast New Business CapEx (2025-29)



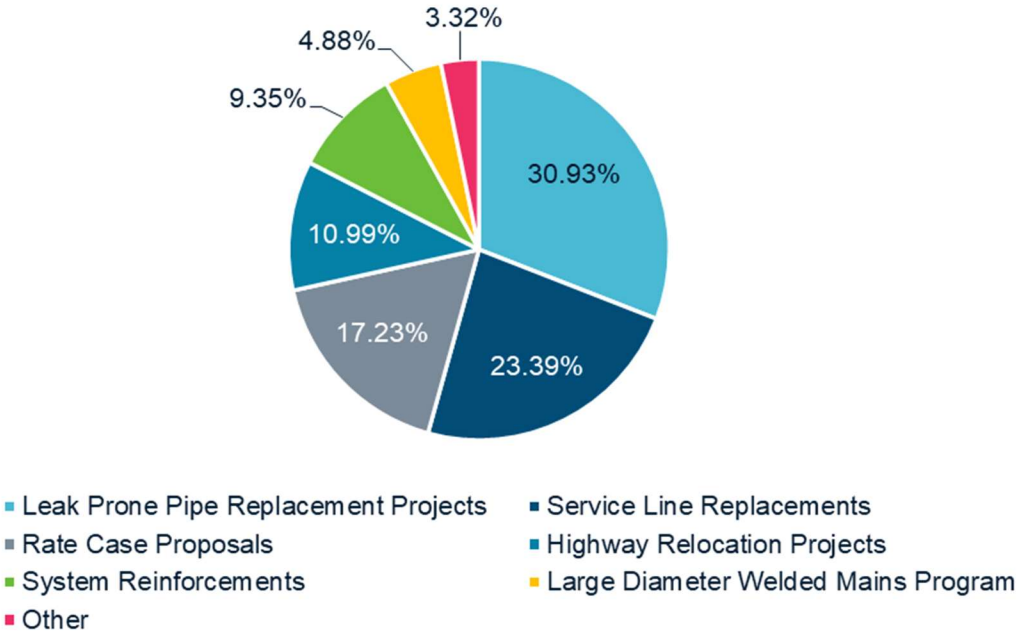
[60] Source: Company responses to PA 2-39, PA 4-79, PA 4-80, and PA 8-118.
[61] Central Hudson does not identify the customer in the RLT Plan V2.
[62] See statements/targets pertaining to building and energy codes elaborated in the New York State Budget, Fiscal Year 2023-2024.
[63] "Service line blankets" refers to the manner in which Central Hudson aggregates capital investments related to service line installations. While larger, more complex projects requiring engineering design specific to those projects are typically installed under a single, unique work order, standard service line designs are developed, approved and used for the completion of service line work. The service line "blanket" is the work order under which all service line costs are aggregated for accounting purposes.

5.4 Distribution Improvements CapEx

As noted previously, investments to replace and reinforce the distribution system drive much of the five-year forecast, making up more than 77% of the overall forecast.[64] Moreover, annual investments in 2025-29 are projected to be materially higher than for the historical period 2018-24; the average annual distribution improvement investment in the forecast period is approximately 35% higher than in the historical period.[65] Most (roughly two-thirds) of the difference is attributed to new programs the Company has proposed in its pending rate case; we discuss those programs later in this report.

Figure 5-7 summarizes the Company's forecasted Distribution Improvements by investment type. We have investigated the drivers of these investments and discuss below several of the programs and areas of investment focus identified in the RLT Plan V2 and in the Company's currently pending rate case.[66]

Figure 5-7: Central Hudson Forecast Distribution Improvement CapEx (2025-29)



5.4.1 Leak Prone Pipe (Distribution Main and Service Lines)

The Company classifies leak prone pipe as cast iron, wrought iron, and steel pipe that is either bare or ineffectively coated and not cathodically protected. The Company indicates it has approximately 67 miles of leak-prone distribution main, along with 3,517 leak-prone service lines, in service as of the end of 2023.[67] As shown in Figure 5-8 and Figure 5-9 below the Company continues to make steady progress towards eliminating this higher-risk infrastructure from its system, consistent with the forecasted CapEx supporting the RLT Plan V2.

[64] Source: Company response to PA 8-118.
[65] Source: Company responses to PA 2-39, 4-79 and 4-80.
[66] Source: Case 24-G-0462.
[67] Source: Company response to PA 1-7. The Company's response to PA 2-40 indicates that the number of LPP services reflected on p. 26 of the RLT Plan v2 is incorrect. PA also notes that the Direct Testimony of the Gas Capital and Operations Panel filed in the pending rate case reflects a different number of LPP service lines. PA has derived annual replacements from amounts included in the CapEx forecast provided in PA 8-118. PA does not expect that the differences in the data will impact the Company's plans to remove all LPP service lines by the end of 2030, which is the final year such investments are reflected in the forecast.

Figure 5-8: Central Hudson Miles of LPP Main in Service as of December 31[68]

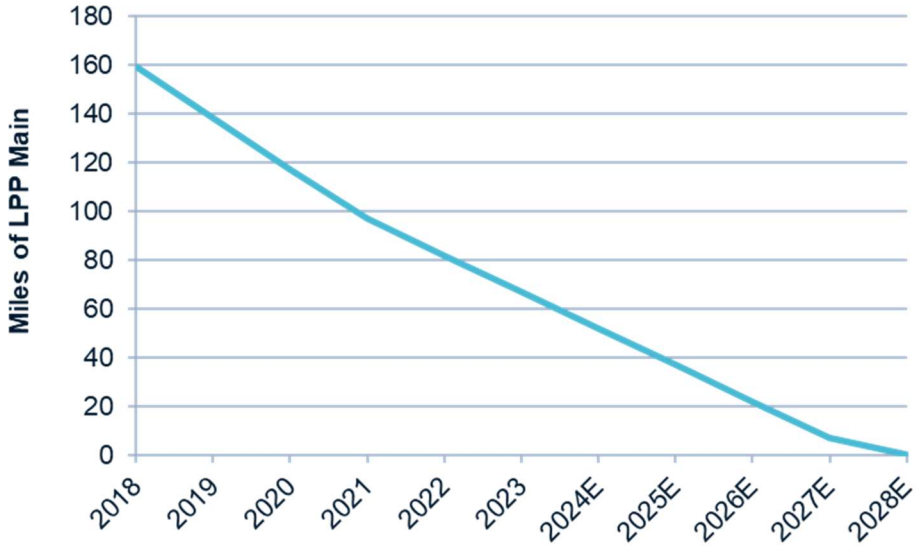
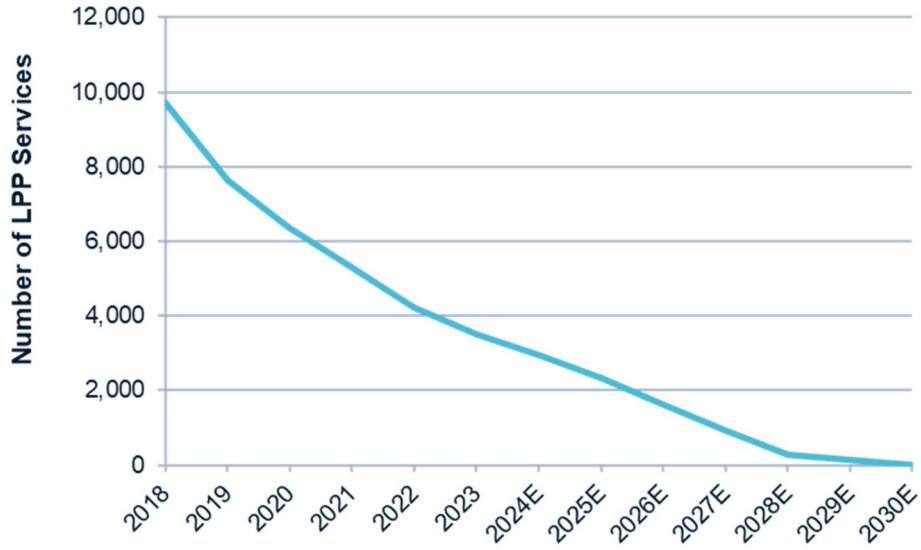


Figure 5-9: Central Hudson Number of LPP Service Lines as of December 31[69]



Under its 2021 rate plan, the Company was required to eliminate at least 15 miles of LPP main per year; that same minimum target continues in the most recent rate case.[70] In its rate case currently pending before the Commission (Case 24-G-0462), the Company has proposed to continue the 15 miles per year target which would eliminate all LPP main by the end of 2028. Under this program, leak-prone service lines associated with LPP mains are also replaced.

During the period 2018-24, approximately 32% of the Company's Total CapEx is related to its LPP replacement program, compared to approximately 28% as projected for the period 2025-28.[71] These levels of investment do not, however, reflect the total investment to eliminate LPP from the system. LPP mains are eliminated outside of the "program", per se, when completing projects to remedy undermining of cast iron mains and work required to avoid conflict with public road construction, among other types of projects.[72]

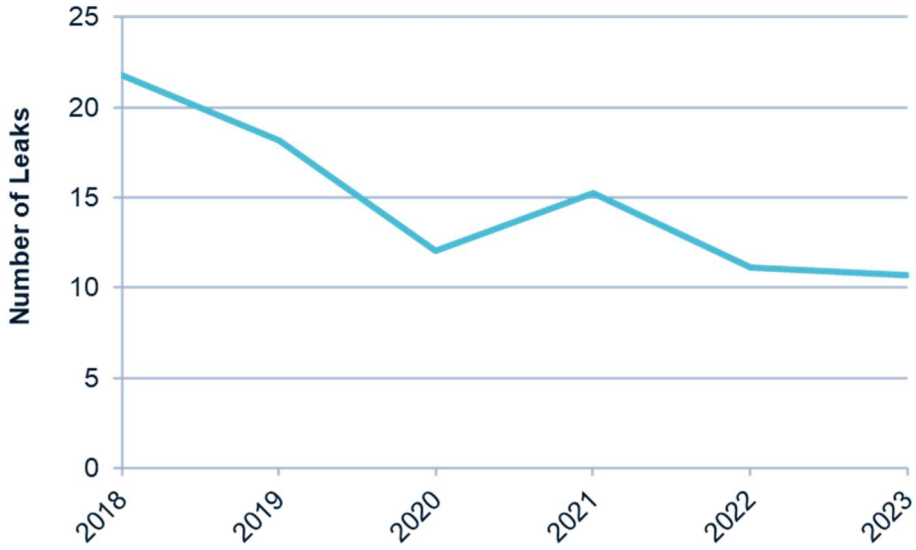
[68] Source: Annual Gas Distribution System Reports to PHMSA; 2024 and beyond reflect estimated amounts based on the CapEx forecast and the requirement to eliminate a minimum of 15 miles of LPP main annually.
[69] Source: Annual Gas Distribution System Reports to PHMSA.
[70] Source RLT Plan V2, p. 26, and the Commission's Order in Case 23-G-0419, p. 64.
[71] Source: Company responses to PA 2-39, 4-79, 4-80 and 8-118. As all LPP mains are targeted for replacement by the end of 2028, there is no associated CapEx in the Company's forecast for 2029.
[72] Source: Company response to PA 11-149.

5.4.2 Leak-Prone Service Lines Program

Central Hudson proposed a new program in its recently completed rate case to replace LPP service lines that are not associated with LPP mains being replaced. The Company proposed to continue the program in the currently pending rate case. If approved, the Company plans to complete these replacements (1,224 in total) within 7 years (or by the end of 2030).[73]

PA considers it reasonable and appropriate to continue to pursue the retirement of leak-prone infrastructure, including under a new program for leak-prone service lines that serves the same purpose as the LPP main replacement program. The figures below demonstrate the avoided leak/leak repair benefits that have been derived from removing LPP infrastructure from the system in recent years. As shown in Figure 5-10, the number of leaks repaired on mains, per 100 miles of main in service, dropped by approximately 50% between the end of 2018 and the end of 2023. Further, Figure 5-11 indicates that the number of total leaks repaired (on both mains and service lines) in 2023 were roughly 50% of the number repaired in 2018. Finally, Figure 5-12 demonstrates that the number of annual corrosion-related leak repairs (on mains and service lines) has decreased by more than 50% in the same 2018-23 period. It is reasonable to conclude that retirement of leak-prone infrastructure is directly related to the decline in leaks and leak repairs.

Figure 5-10: Central Hudson Main Leaks Repaired per 100 Miles of Main[74]



[73] Source: Company responses to PA 2-41 and 8-118. In the recent rate order, the Commission approved this and other programs for the term of that order. PA also observes that the Direct Testimony of the Gas Capital and Operations Panel in the pending rate case identifies a different number of remaining LPP services.
[74] Source: Annual Gas Distribution System Reports to PHMSA.

Figure 5-11: Central Hudson Total Leaks Repaired[75]

Figure 5-12: Central Hudson Total Corrosion Leaks Repaired[76]

We recommend the Company aggressively pursue NPAs where feasible to avoid the incremental CapEx associated with replacing leak-prone mains and service lines.

Replacement of Service Lines

The Distribution Improvements CapEx forecast includes the replacement of service lines (apart from those that are directly connected to transmission mains as discussed below) representing approximately 18% of the overall CapEx forecast for 2025-29. PA recommends the Company aggressively pursue electrification of these customers; some portion of the forecasted investments can be avoided with individual customer decisions to exit the gas system.

5.4.3 System Reinforcement

PA observes that a key area of focus of the RLT Plan V2 are segments of the distribution system which the Company has determined to be “highly loaded”, as explained previously. Approximately 7.2% of the Total CapEx forecast for 2025-29 makes up projected reinforcements of the overall gas distribution system; these

[75] *Ibid.*
[76] *Ibid.*

are projects required to maintain design day operating standards and ensure reliability.[77] However, and unexpectedly, it appears that only one of those reinforcement projects in the CapEx forecast is associated with an identified highly loaded system segment. Table 5-3 summarizes Distribution Improvement investments planned for the period 2024-28 in highly loaded segments.[78]

Table 5-3: Distribution Improvements CapEx in Highly Loaded Segments ($000)

	2024	2025	2026	2027	2028
LPP	$10,802	$2,902	$8,228	$0	$5,884
Relocation Work	$3,043	$3,577	$6,177	$1,700	$1,741
Reinforcement[79]	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0
Total	$13,845	$6,479	$14,405	$1,700	$7,625

Interestingly however, hydraulic models of the Highland Mills (HM) system suggest that system reinforcements ARE contemplated; referring again to Table 4-1, the modeled hourly gas flow in 2026 exceeds the flow in 2024, however the lowest pressure in that model is much higher (62% of MAOP in 2026-27 vs 37% in 2023-24). These results imply a reinforcement has been assumed and built into the hydraulic model in the intervening years.

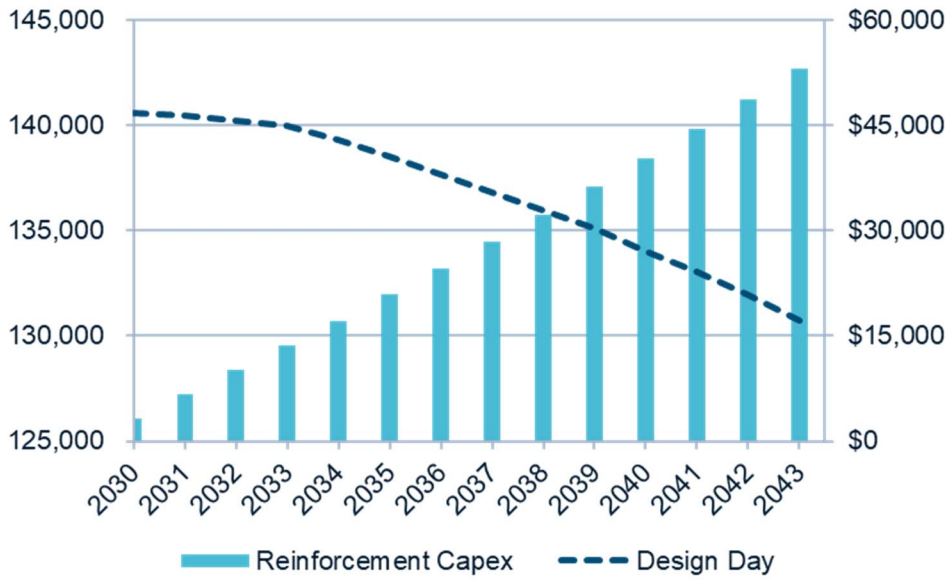
PA observes other potential inconsistences between the RLT Plan V2 and the CapEx details provided by Central Hudson:

- Alongside the lack of identified, projected reinforcement investments in the highly loaded systems, the Company appears to have invested minimal capital in recent years in those same systems; of all system reinforcement investments made from 2018-23, less than 7% of those investments were made in the highly loaded segments (equating to approximately 0.2% of total CapEx over that period).[80]
- The forecast appears to include material CapEx to reinforce the Highland Falls system, yet according to the RLT Plan V2 that system is not expected to be as much as 30% loaded throughout the forecast period, even without reinforcement.[81]
- The system reinforcement CapEx forecast is fairly constant from 2025-29 and grows with inflation thereafter. There being no identified reinforcements in the near term, PA concludes that there are also no identified reinforcements of the highly loaded systems after 2029. Further, the RLT Plan V2 identifies several distribution system segments as having a 5% or greater likelihood of triggering a growth-related infrastructure investment by 2034.[82] Once again, there appears to be no related reinforcement investment in the CapEx forecast through 2034 in these areas.
- The design day demand forecast does not appear to support the premise that continued reinforcement of the distribution system will be required, particularly after 2029. That being the case, it appears that

[77] Source: Company response to PA 8-118.
[78] Source: Company response to PA 8-121, Attachment 1.
[79] One project planned for 2026 was categorized by Central Hudson in its response to PA 8-121 as a Highway Relocation project but was described as a reinforcement project. The project is included as Relocation Work here.
[80] Source: Attachment 1 to PA 8-121.
[81] Source: RLT Plan V2, Appendix A, Table 4.
[82] Source: RLT Plan V2, p. 28 lists nine such systems; Poughkeepsie-Newburgh (PN), Highland Mills (HM), Kingston-Saugerties 40# (KS-40), Catskill Low Pressure (CLP), Poughkeepsie Medium Pressure (PM), Carmel-Mahopac, Titusville-Pleasant Valley (TVPV), Hopewell-Hughsonville (HH), and Kingston-Saugerties 9.5# (KS-9.5). Carmel-Mahopac was not included as part of the highly loaded systems in the responses to PA 5-91 and PA 6-109. Appendix A, Section 6 to the RLT Plan V2 provides discussion of seven of these systems, those not included are CLP and Carmel-Mahopac.

reductions to the later years of the 20-year CapEx forecast may be achievable. Figure 5-13 below reflects the Company's cumulative investment in distribution system reinforcements from 2030-2043, along with the Company's forecast of design day demand over time under the CCA scenario. While it is reasonable that isolated reinforcements may be needed even as overall demand drops, the declining demand day forecast does not seem to support consistent, ongoing investments to reinforce the distribution system.

Figure 5-13: Central Hudson CCA Design Day Forecast vs. Cumulative Reinforcement CapEx 2030-43 ($000)



PA recommends Central Hudson address these potential inconsistencies and explain why projected reinforcements of the distribution system are expected to focus on areas that have not been identified as highly loaded. PA further recommends that the Company review its response to PA 8-121 to confirm that the system reinforcement investments (historical and prospective) have been accurately communicated.

PA does appreciate that summary information such as the data shown in Table 4-1 cannot always tell the entire story. For example, PA understands that the Poughkeepsie LP (PLP) system is receiving the indirect benefit of reinforcing the system when mains are replaced as part of the Leak Prone Pipe Program. Still, PA recommends that the Company better synchronize the results of its various models and ensure that its CapEx forecast is consistent with those results to the extent they are viewed as reliable modeling tools.

5.4.4 Large Diameter Gas Welded Pipe Replacement Program

The Company describes in the RLT Plan V2 a replacement program targeting large diameter (defined as 6-inch and larger) welded steel pipe. The program targets risks associated with oxy-acetylene welded steel pipe installed prior to 1940. Threats associated with this asset type were first identified in 2012.[83] The program has been in place for at least five years;[84] since the end of 2017 and through 2023, the Company has reduced its targeted pipe inventory under this program by more than 25% through investments totaling nearly $44 million.[85] The Company plans to invest more than $3.0 million in the program in 2024, and the five-year forecast for 2025-29 includes another $15.6 million[86] representing approximately 3.8% of the overall CapEx forecast for 2025-29. Some, but not all, pipe to be replaced under this program is also LPP and is prioritized along with LPP generally.[87]

[83] Source: Company response to PA 4-78.
[84] Source: Company response to PA 2-42.
[85] Source: Company response to PA 2-42.
[86] Source: Company response to PA 8-118.
[87] Source: RLT Plan V2, p. 27.

Central Hudson has indicated that completion of this program is scheduled for 2045[88]; its 20-year CapEx forecast is consistent with that completion date. PA agrees that the Company should continue to replace these pipelines due to the inherent risks to safety and reliability of retaining them as part of the distribution system.

5.4.5 Distribution Improvement Programs – Rate Case Proposals

While not called out specifically in the RLT Plan V2, PA has evaluated other programs recently approved in the Company's most recent rate case (Case 23-G-0419) that will address specific safety and reliability risks. These programs were described in rate case documents and included in the forecast detail provided to PA by the Company.[89]

5.4.6 Transmission Services Elimination Program

The Company will implement a program to eliminate gas service lines that are directly connected to a transmission pipeline operating at a supply pressure greater than 125 psig. These service lines, also known as farm taps, require two stages of pressure regulation, versus traditional service lines that require one regulator (or if served by a low-pressure distribution main, no regulator). The Company no longer installs services to individual customers directly from its transmission system.

As described in the pending rate case (Case 24-G-0462) by the Company's Gas Capital and Operations Panel, "in the event of pressure regulation equipment failure or damage, there is a higher risk of a catastrophic event involving high pressure natural gas venting near a structure intended for human occupancy due to the higher potential volume of gas that could be released from a transmission service compared to a gas service supplied from a distribution system. Transmission services therefore could pose a serious risk to inhabitants and first responders."[90]

Under this program, the Transmission Service would be eliminated by installing new distribution main along with a new service line. Transmission Services can also be eliminated by implementing NPAs, negating the need for new gas infrastructure. The program represents approximately 3.3% of the overall 2025-29 forecast.

PA agrees that these safety-related investments would serve to mitigate risk. As is the case with replacement of LPP, we recommend the Company continue to test and pursue NPAs to avoid the incremental CapEx required to upgrade facilities and retain these customers.

5.4.7 Compression Coupling Neighborhoods Program

The Central Hudson distribution system includes approximately 20 miles of main installed during the 1940s through 1980s whose joints (or lengths) of pipe were connected via compression couplings rather than being welded (steel) or fused (plastic). While this asset type is not considered LPP, the Company's Distribution Integrity Management Program (DIMP) Plan has identified these facilities as a safety threat due to the potential that freeze/thaw cycles can induce new stresses on the materials. The Company proposed in the pending rate case (Case 24-G-0462) to continue a program to replace the main as well as approximately 1,800 service lines, with 4.4 miles of main targeted for the period 2025-28.[91] The program represents approximately 4.7% of the overall 2025-29 forecast. PA also observes that, based on the 20-year CapEx forecast, the Company plans to complete this program by the end of 2034. Notably, there is a significant ramp-up starting in 2029, as more than 80% of program investment occurs in 2029-34. PA agrees that addressing these risks is appropriate.

5.4.8 River/Creek Crossing Reinforcements Program

The Central Hudson pipeline system includes five (5) crossings of the Hudson River as well as more than 125 creek crossings. The Company proposed in its pending rate case a program to either re-install its pipelines beneath the bed of the river or creek, or otherwise reroute the pipeline strategically. Central Hudson proposed

[88] Source: Updated Company response to PA 4-78.
[89] Source: Company response to PA 8-118. As discussed previously, budgets approved specifically for these programs may be lower than the Company's forecast for 2024 and 2025. The Company's Gas Capital and Operations Panel once again discusses these programs in its direct testimony in Central Hudson's pending rate case, Case 24-G-0462.
[90] Source: Direct Testimony of the Gas Capital and Operations Panel, p. 38 (August 1, 2024) in Case 24-G-0462.
[91] Source: Direct Testimony of the Gas Capital and Operations Panel (August 1, 2024) in Case 24-G-0462.

to address a subset of these crossings with investments each year beginning in 2025.[92] This program represents approximately 2.5% of the overall 2025-29 forecast. PA agrees that any program that addresses the ongoing safety, integrity and reliability of its delivery system is appropriate.

5.5 CapEx Considerations Summary

PA has identified specific types of CapEx that the Company may have the opportunity to avoid. When taken together, more than 28% of the overall capital forecast for 2025-29 consists of investments in service line replacements (many of which are associated with the replacement of LPP mains), smaller new business projects, customer conversions, and elimination of transmission service lines. Avoidance of these investments depends (in most, if not all cases) on a single customer decision to either discontinue or forego the use of natural gas, rather than in other circumstances such as when considering whether an NPA is feasible to allow abandonment (rather than replacement) of LPP mains.[93] PA does not assume that the Company can reduce this level of future investment in its entirety through successful NPA implementation under current policies. Still, to illustrate the potential power of NPAs, even only a 10% reduction in each of these investment types annually in 2025-29 equates to several million dollars of avoided investment. Apart from these areas, and as noted previously, it may be possible to further reduce the 20-year CapEx forecast as potential distribution system reinforcement requirements are evaluated in the context of design day demand growth projections.

5.6 Recommendations to Improve the RLT Plan V2

Recommendations for the Company to improve the CapEx components of the RLT Plan V2 are summarized below.

1. Synchronize the results of various models and ensure that the CapEx forecast is consistent with those results to the extent they are viewed as reliable modeling tools. Address potential inconsistencies and explain why projected reinforcements of the distribution system are expected to focus only on areas not identified as highly loaded.
2. Review the response to PA 8-121 to confirm that the system reinforcement investments (historical and prospective) have been accurately communicated.[94]

[92] *Ibid*.
[93] As a point of reference, PA notes that Table 5-12 in Revised Appendix A to the RLT Plan filed on June 25, 2024, assigns a 44% probability of gas pipe abandonment when only one customer is involved in the decision. Appendix A was not updated at the time the RLT Plan v2 was filed.
[94] Through the factual accuracy process, PA has learned the Company agrees with this recommendation and will reflect this within the Final NGLTP.

6 Demand Assessment

PA has reviewed the Company's demand and load forecast as presented in the ILT Plan, RLT Plan V2 and responses from the Company to several related data requests. Based on our analysis, PA believes three main dynamics will shape the Company's forecasted annual sales and peak demand:

- Declining organic growth in customer counts driven by evolving service territory demographics (i.e., macro-economic factors),
- Some Appropriate level of sustained additions to customer counts due to customers switching from fuel oil, wood, etc. to natural gas as the primary heating fuel, and
- Downward pressure on customer counts, UPC and sales from electrification and EE – a combination of gas customers installing heat pumps and leaving (or reducing reliance on) the gas system and falling UPC - propelled by a combination of climate change, technological change, state and federal policy evolution, and local laws.

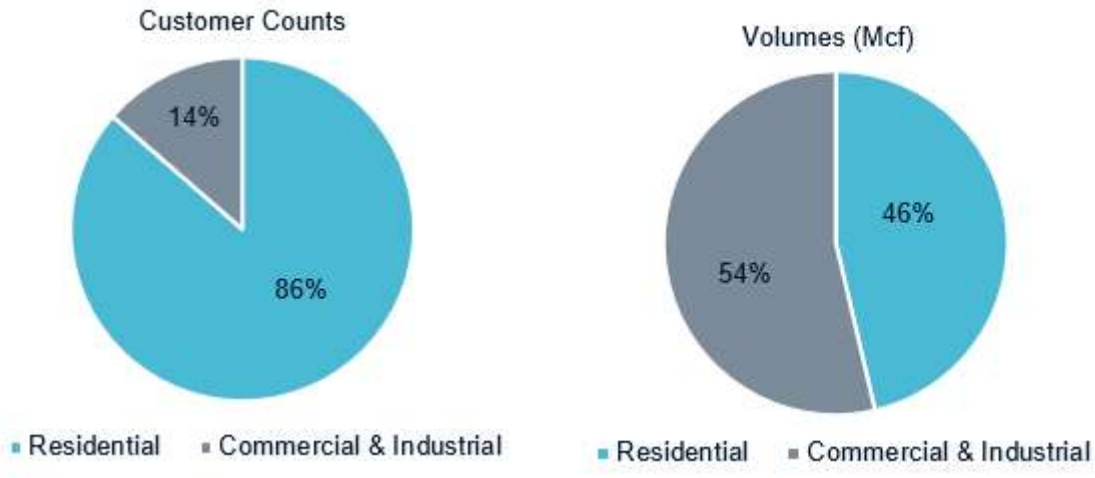
We first discuss the composition of the Company's customer base and forecasted customer counts, then we observe how these dynamics impact forecasted residential customer counts. Next, we discuss our observations on several factors influencing structural changes to usage patterns, namely residential household size and electrification of end-use trends. Lastly, we examine the implications of changes to customer counts and UPC on sales and peak day demand.

PA anticipates lower customer growth and a UPC decrease faster than projected by the Company. These factors will lead to lower annual sales and peak demand than forecast by the Company. PA will continue to explore the critical demand aspects of the Company's long-term gas plan, including further Company analyses, stakeholder comments, and policy considerations in preparation of our Final Report.

6.1 Customer Base Growth

The vast majority of the Company's customers are residential customers who use gas for heating, although a small number of non-residential customers contribute a larger proportion of gas sales than residential, as illustrated in Figure 6-1. While 86% of customers are residential, only 46% of total volumes are associated with this segment. Approximately 20% of annual gas volumes are for interruptible customers, who are required to curtail gas use in full when called upon. The Company also offers optional interruptible rate plans for large gas customers to pause service for select hours of high demand, as a part of their overall rate structure.

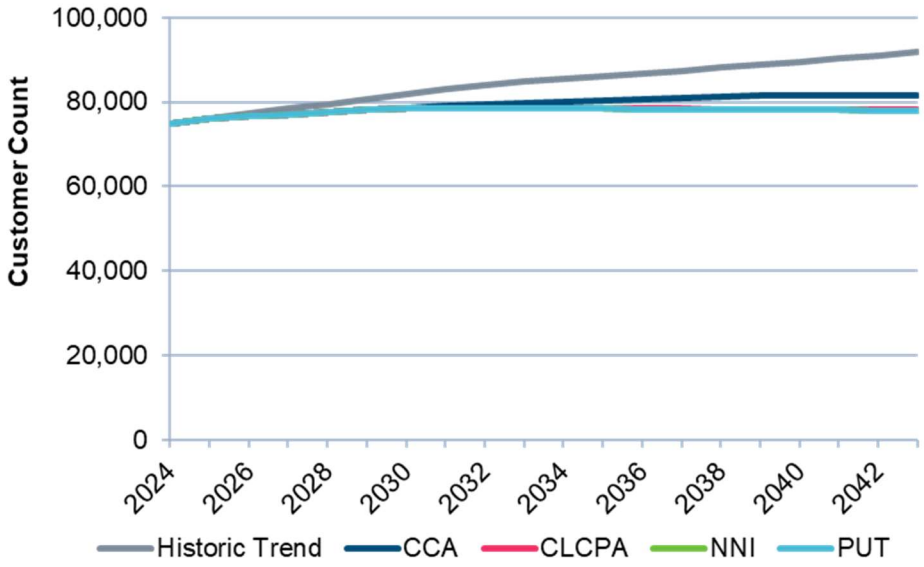
Figure 6-1: Customer Count and Sales Volume by Class (as of December 2023)



PA has reviewed several data sources to assess the Company's historical and forecasted customer counts. In Figure 6-2 below, we observe increasing residential customer counts in the historical trend and the scenarios exhibit slightly increasing to flat growth in customers. Our analysis suggests that the historical trend-based approach used by the Company to forecast future customers does not accurately capture or reflect all

the forces impacting customer growth. PA anticipates a slowdown in population growth and continued downturn in household growth will negatively impact the Company's forecasted constant customer counts after a short period of relative customer count increase for all scenarios. This is evidenced by CCA, CLCPA, NNI and PUT customer growth forecasts below the historical trend (grey) line. Our analysis is discussed in detail within the following sections below.

Figure 6-2: Company's Forecasted Residential Customer Counts Under the Four Scenarios



6.1.1 Heating Fuel Conversions

PA observes a very pertinent characteristic of the Company's territory is the dominance of FO as the heating fuel of choice. Based on data provided by the Company, the average annual pace of customers converting to natural gas from other heating fuels appears to be decreasing. A comparison of data for the 2017-23 and 2020-23 time periods suggests a decline in average annual conversions from 472 to 453.

- In a meeting on May 8, 2024, the Company reported that during 2020-23 it had 1,811 conversions from other heating fuels to natural gas – 453 per year on average over four years. (Note: If 93% of the conversions are residential as reported by the Company, the average annual conversion rate of residential customers from other heating fuels to natural gas is 421. The Company further estimated 75% of those conversions were from FO, implying the addition of roughly 315 formerly FO residential customers per annum over the most recent four years.)
- However, in response to PA-003 IR-072, the Company indicated 3,304 customers switched from other heating fuels to natural gas during the 2017-23 period, implying an average annual conversion of around 472 customers. (Note: If 93% of the conversions are assumed to residential, the average annual conversion rate of residential customers from other heating fuels to natural gas is 439.)

Based on this data, the average number of customers switching from other heating fuels to gas over the most recent four years, 453, is lower than the 472 average number of customers that switched to natural gas from other heating fuel sources over the past seven years – an apparent decrease in the average number of converting customers each year.

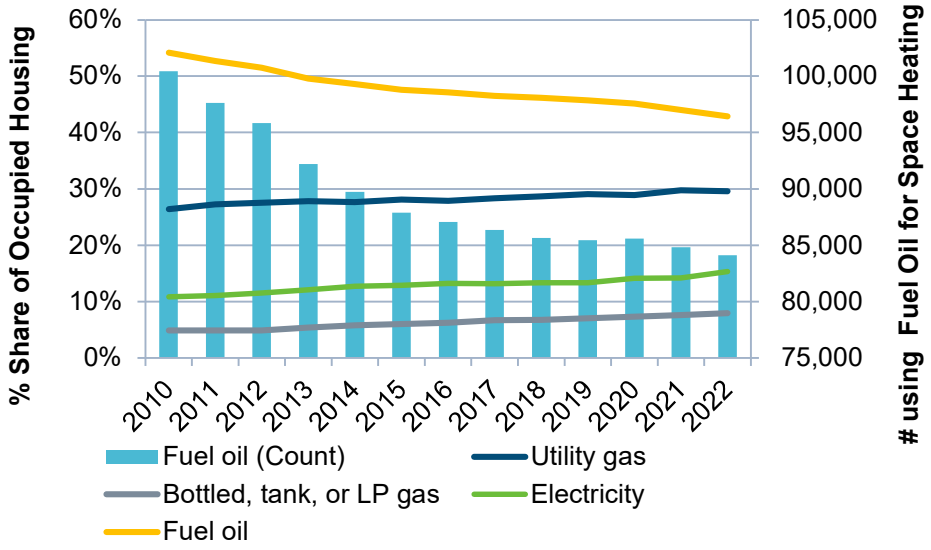
PA obtained county level data for Selected Housing Characteristics published by the American Community Survey (ACS) [95] for Dutchess, Ulster and Orange counties in order to independently gauge heating fuel

[95] Source: https://data.census.gov/table?q=DP04. PA studied data for Dutchess, Ulster, and Orange counties in New York. The Company's gas service territory covers practically the entire Dutchess County, roughly 75% of Ulster County that includes the major population and commercial centers and the northeast region of Orange County that accounts for approximately 20% of its population. It is salient to note that while Orange County has experienced substantial growth in recent years, those population gains are almost entirely outside the Company's footprint. In fact, the population trends in the relevant Company Orange County towns/cities – Newburgh, Woodbury, New Windsor etc. – resemble those in the other two counties. For this analysis, we omitted

choices in the Company's service territory. PA's analysis of ACS data suggests that the pace of conversions off other heating fuels has risen in recent years. A key characteristic of the Company's footprint is the wide diversity in space-heating fuels used by residential customers. PA's review of ACS data finds FO the dominant primary heating fuel, as of 2022. As Figure 6-3 shows, while there has been a steady decline in both the absolute number and the share of these households, FO accounts for a significant percentage of the area's housing units. The combination of improved technology, changing consumer preferences and better economics had led to a steady migration of residents switching from FO since 2010. Data shows that between 2010 and 2022, homes with FO heating dropped from over 100,000 in 2010 (accounting for a 54% share) to 84,000 in 2022 (a 43% share).[96]

PA's assessment of the Company's New York State's Clean Energy Program progress data[97] reveals, while a substantial fraction of former oil-consuming households elects to install heat-pumps for space-heating purposes, the implication is that a sizeable number of potential new customers may exist; however, natural gas is likely to absorb only a fraction.

Figure 6-3: Central Hudson Residential Space Heating Fuels[86]



6.1.2 New Construction

In a review of materials provided by the Company in response to NYSERDA 001 IR-014, PA observes data for residential heat-pump installations shows that over 40% of heat-pump installations by 2043 can be attributed to new construction (i.e. Codes & Standards) in the CCA scenario. Given that macro-economic forecasts show little growth in Population or Households, it is unclear how new construction will have much impact on future growth. Furthermore, to the extent new construction was a driver during the historical period trended by the Company, the historical trend approach will not accurately forecast future growth.

6.1.3 Service Territory Demographic Patterns

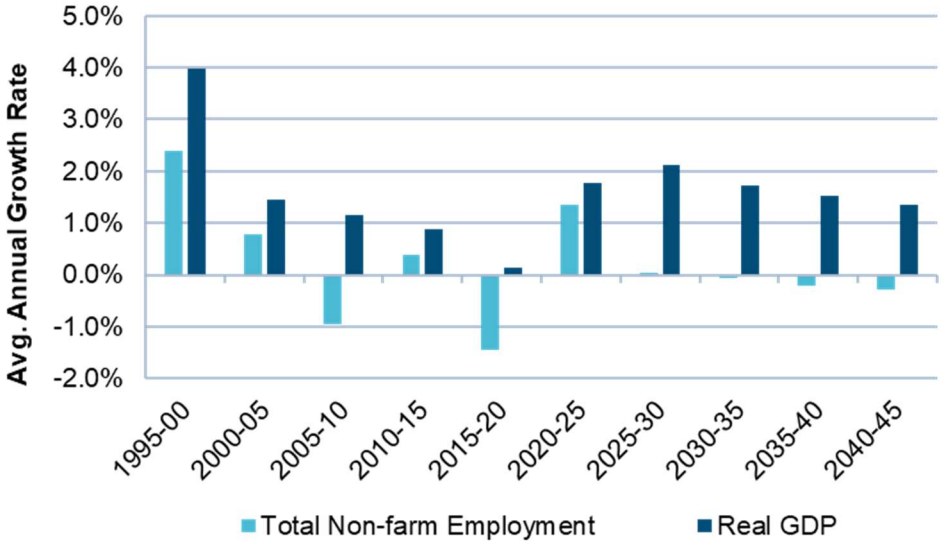
PA's analysis of data from Moody's Analytics suggests the region's economic growth had seen a decline since 2010 and underwent a noticeable setback because of Covid. However, due to the establishment of some state-owned facilities and new businesses the region's Gross Metro Product (GMP) has recovered from the previous recessionary period and is projected to show healthy growth. However, reflecting the area's overall demographic patterns, Employment is forecasted to virtually stagnate. The region's GMP is slated to grow at an average rate of 1.9% over the next decade as shown in Figure 6-4.

Columbia and Greene counties as the Census does not provide data, and, therefore made assessments based on Dutchess and Ulster counties – which represent about 85% of its customer-base.

[96] The rising share of 'container' gas (mainly propane) indicates that some homes formerly relying on Fuel Oil, wood, coal etc. are considering 'container' gas as the primary heating fuel.

[97] Source: Company response to PA 1-33 and PA 10-138.

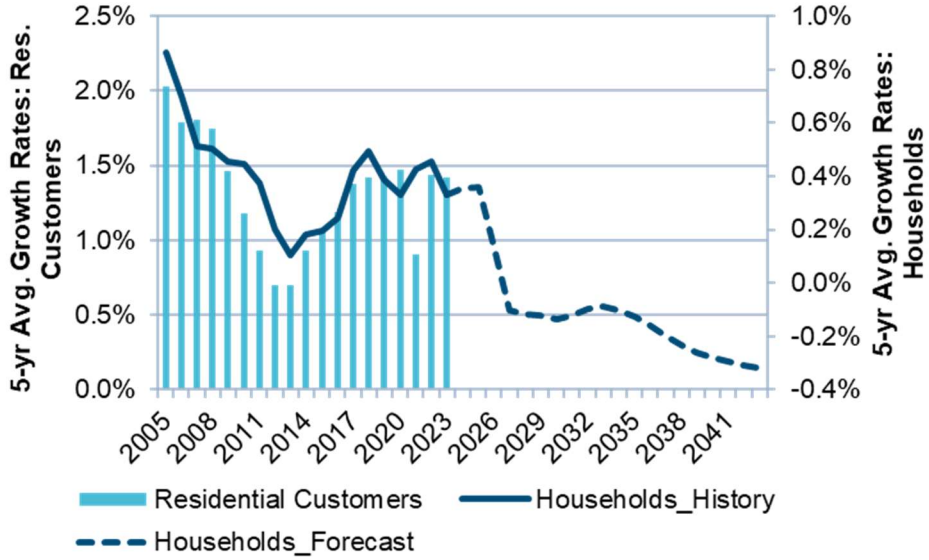
Figure 6-4: Moody's Analytics - Employments & Gross Metro Product



Population fell between 2010 and 2019, the Covid era then saw an inflow of residents – plausibly from the New York City area – adding to the customer-base. However, projections are for a resumption of a negative trend in population growth. Despite the demographic trends, household growth – the primary driver of residential and commercial customer growth – had also been fairly robust pre-Covid but the macro-economic forecast reflects a sustained decline going forward. Together, these patterns suggest headwinds with respect to future customer growth.

Figure 6-5 demonstrates the strong relationship between households and residential customers. As is the case for most gas utilities, growth of households – the chief driver of the residential customer-base – is accompanied by growth in housing and, hence, residential customers.

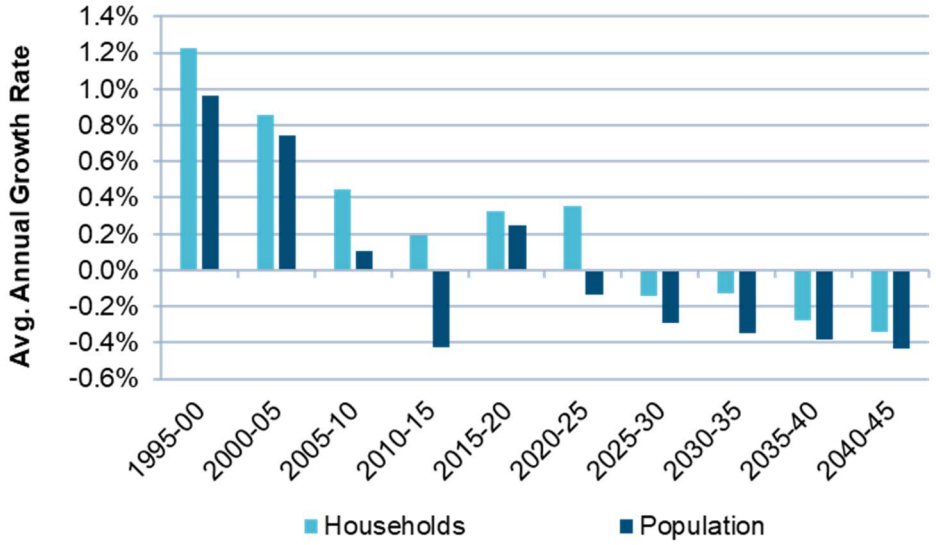
Figure 6-5: Moody's Analytics - Households vs. Residential Customers



Population trends also provide insights into gas customer growth. As shown in Figure 6-6, Moody's Analytics population data indicates that the Company's service territory[98] has seen declining population growth for over two decades, with the actual level dropping since 2010.

[98] This assessment is based on Moody's Analytics data for Dutchess and Ulster Counties.

Figure 6-6: Moody's Analytics - Annual Population Growth Rate

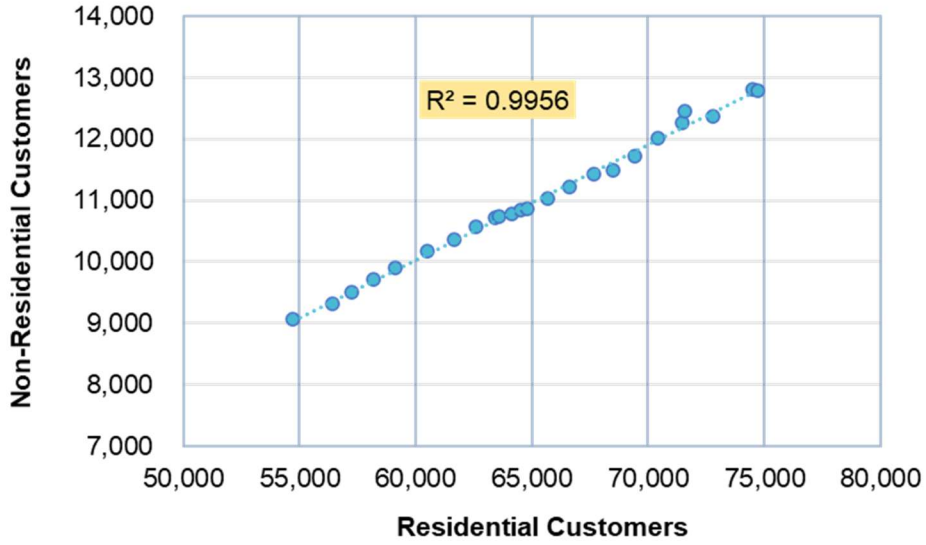


Households, on the other hand, continued to exhibit positive growth reflecting an erosion in the number of persons per household (down from 2.8 persons per household in mid-1990s to 2.75 in early 2000s and at 2.56 in 2023). While a brief spurt in residential customers occurred due to a Covid-related influx of residents from elsewhere in the state, regional trends are expected to mirror the demographic patterns in Upstate New York in general with household growth turning negative by 2026 as reflected on the right hand y-axis of Figure 6-5 above. Taken together, the data patterns signal an end to organic customer growth and, hence, the induced halt to expansion in housing stock and new construction. PA's analysis of data from the ACS[99] lends support to this notion as it shows a sharp rise in occupancy rate since 2018 even in the face of growth in the housing stock.

Similar to many natural gas utilities, non-residential customer counts trend very close to residential customers. As shown in Figure 6-7 the Company's customer counts for the 2000-23 period clearly illustrate the strong positive relationship. This relationship implies that the trajectory of residential customer count will result in a corresponding pattern for the combination of Commercial, Administrative/Government and Industrial customer counts. Therefore, as organic residential customer growth turns negative, due to demographic factors, non-residential customer growth should experience a similar impact.

[99] Source: https://data.census.gov/table?q=DP04. PA studied data for Dutchess, Ulster, and Orange counties in New York. The Company's gas service territory covers practically the entire Dutchess County, roughly 75% of Ulster County that includes the major population and commercial centers and the northeast region of Orange County that accounts for approximately 20% of its population. It is salient to note that while Orange County has experienced substantial growth in recent years, those population gains are almost entirely outside the Company's footprint. In fact, the population trends in the relevant Company Orange County towns/cities – Newburgh, Woodbury, New Windsor etc. – resemble those in the other two counties. For this analysis, we omitted Columbia and Greene counties as the Census does not provide data, and, therefore made assessments based on Dutchess and Ulster counties – which represent about 85% of its customer-base.

Figure 6-7: Company Customer Counts (2000-23) Non-Residential vs. Residential



PA anticipates a slowdown in population growth and continued downturn in household growth will negatively impact the Company's forecasted constant customer counts after a short period of relative customer count increase for all scenarios.

6.1.4 Heat Pump Adoption

Driven by policy initiatives, evolving consumer preferences and improving technology, the rising trend in Residential and, to a lesser extent, Commercial natural gas customers installing air-source heat pumps (ASHP), ground-source heat pumps (GSHP) and heat-pump water heaters (HPWH) will lead to a reduction in customer growth and ultimately an attrition from the current customer base. Both of which are assumed within the CCA Scenario.

According to the Company, since the advent of the Clean Heat Program in mid-2020 an average of 915 customers installed either an ASHP or a GSHP each year, with the rate seeing a sharp increase during the first half of 2024. In addition, the Company reports roughly 200 existing customers installed HPWH per year. While available data suggests a small fraction of such customers departing entirely from the Company's gas system entirely since 2020, PA anticipates an acceleration of this phenomenon. Additionally, even if customers switch out of gas for one or more end-uses and do not disconnect totally, their annual gas usage sees a dramatic drop, making them a fraction of the customer that they used to be in terms of sales. This impact on load is further discussed within the following section. Heat pump adoption is discussed in more detail in Section 6.2.4.

Based on the combination of these factors and analysis PA observes that future residential customer growth is not likely to follow the historical trend. In the RLT Plan V2, we understand the CCA Scenario reflects the impact of current and recently adopted policies increasing the adoption of heat pumps. PA found that in the ILT Plan, the Company did not account for how the IRA incentives can increase adoption of heat pumps in the low income and disadvantaged communities. In the RLT Plan V2, the Company made an effort to account for the IRA incentives, but given the last-minute nature of these changes, PA is not able to comment on the reasonableness of these assumptions at this point. PA will further review these changes and opine on the reasonableness of the assumptions made in the Final NGLTP.

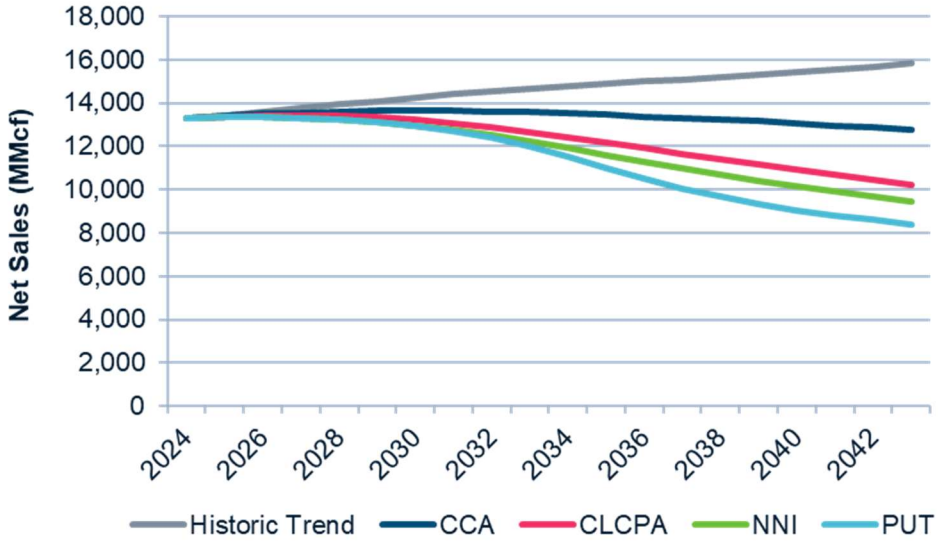
PA will continue to analyze the Company's data in this area in preparation of our Final Report. However, the combination of trends inherent in the ACS data and the decreasing annual level of conversions from other heating fuel sources to natural gas suggests an increase in conversions to heat pumps.

6.2 Load Forecast

As previously discussed, the Company's customer base is predominantly residential customers who use natural gas for heating, among other purposes. However, a smaller number of non-residential customers with

higher UPC account for a larger proportion of gas sales. The Company presents its 2024-43 forecast of total gas sales for each of the four scenarios compared to a historic trend, as illustrated in Figure 6-8.[100]

Figure 6-8: Company's Forecasted Annual Net Sales Under the Four Scenarios (2024-43)



For the residential class, PA anticipates a decrease faster than the Company, due to ongoing demographic trends as discussed above, an accelerated adoption of heat pump and electric appliances, energy efficiency, and a tendency towards warmer winters. Reductions in gas sales will be further driven by the deployment of electrification-related state policy goals, rebates and incentives, and a shift in customer preferences.

Further support for a reduction of gas load is found in an analysis of the customer base. As noted above, across the service territory, the Company reports 309,000 electric customers, 90,000 gas customers, and 235,000 electric-only customers, those who do not receive gas. Importantly, of the 90,000 gas customers, 90.4% receive electric service from the Company[101]. Due to the high overlap of gas and electric customers in the service territory improving heat pump economics, the ease and therefore likelihood for a gas customer to adopt an electric heat pump is increased. Heat pump incentive structure and adoption rates across New York are explored further in Section 6.2.4.

In summary, PA understands that the growth presented in the RLT Plan V2 relies on FO customers choosing to convert to natural gas over electric, over the next 10-15 years. However, it is likely customer preference may trend toward electric conversions over that period especially driven by strong policy goals for electrification in New York. Concerted efforts will be required to incentivize customers to "leapfrog" the FO to natural gas decarbonization pathway and to leverage beneficial electrification when converting from other fuels. However, given the large percentage of the Company's natural gas customers that also receive electric service from Central Hudson, fuel conversion customers provide a unique opportunity to incentivize electrification and avoid further investments in the expansion of the gas distribution network. These observations are further discussed within the sub-sections below.

6.2.1 Usage Per Customer

In addition to the evolving customer counts previously discussed, PA observes several factors influencing structural changes to usage patterns, namely:

- Residential household size and
- Electrification of end-uses.

As Figure 6-9 shows, based on the Company's annual billing data, the residential UPC has exhibited a pronounced negative trend since 1995. This trend has been fueled largely by climate change resulting in fewer

[100] Source: RLT Plan V2 Figure 36.
[101] Source: RLT Plan V2 p. 18.

HDDs and rising energy efficiency savings – due to a combination of increasingly efficient technology in gas furnaces, improved shell-efficiency, better temperature control mechanisms, etc.

Figure 6-9: Historical (Actual) Residential UPC (1995-23)

The historical trend reflects the sustained influence of legacy forces that have been in effect for years but may only partially capture the impact of phenomena that might have emerged recently. Therefore, merging forces and structural changes (e.g., heat pump adoption) are expected to add to this historical trend.

Household Size

Changing housing structures are likely to influence residential UPCs downward as falling household size is reflected in the rising relative share of multi-family housing units. Data from the ACS shows that in 2022, while multi-family units constituted only 20% of the housing stock, it was the only segment that saw growth in new construction, with apartment buildings comprising of 20 units or more growing 5.5% per annum since 2018. Since growth in the number of single-family units was almost stagnant over the last decade, housing trends point to smaller residential dwellings being added, which, in turn, imply declining average residential UPC.

Electrification

As previously discussed, as existing Residential gas customers electrify one or more end-uses, overall UPC is reduced. Based on end-use statistics data on regional housing structure from the ACS, the typical Residential customer uses 78% of annual gas consumption for space heating, 18% for water heating and the remainder for cooking and clothes drying.[102] Even with a conservative assumption that the typical heat-pump offsets 70% of the heating load, a customer installing a heat-pump will see gas UPC drop to 40% of what it used to be.[103]

In terms of usage patterns, in the RLT Plan V2 the Company states that there has been a concerted decline in the average weather-adjusted residential annual UPC since 1995 due to a combination of Codes & Standards and energy efficiency measures.[104] We find it reasonable to expect that with growing efficiency impacts, weatherization etc., that trend will continue. The UPC forecasts shared by the Company for the four scenarios are presented against the historical trend for the residential and non-residential customer classes in Figure 6-10 and Figure 6-11 respectively.

Based on this PA finds it surprising that the Company's Historic Trend Forecast (i.e., its baseline) for residential is ostensibly flat, as shown in Figure 6-10 below. Accordingly, a declining Historical Trend forecast will imply sharper declines in the scenario forecasts.

[102] Source: RLT Plan V2, p. 21.
[103] Correspondingly, installing a heat-pump and a heat-pump water heater reduces the customer's UPC to 23% of the pre-install level.
[104] "Overall, after controlling for weather, residential energy use declined by 7.1% on a per customer basis since 1995, an annual change in per capita use of 0.26% per year." p. 38.

Figure 6-10: UPC Forecast for Residential Customers (2024-43)[105]

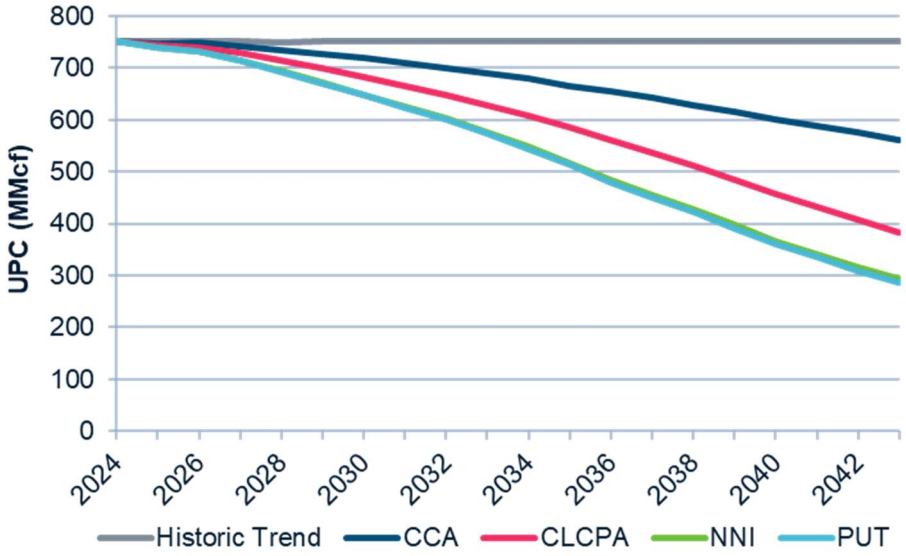
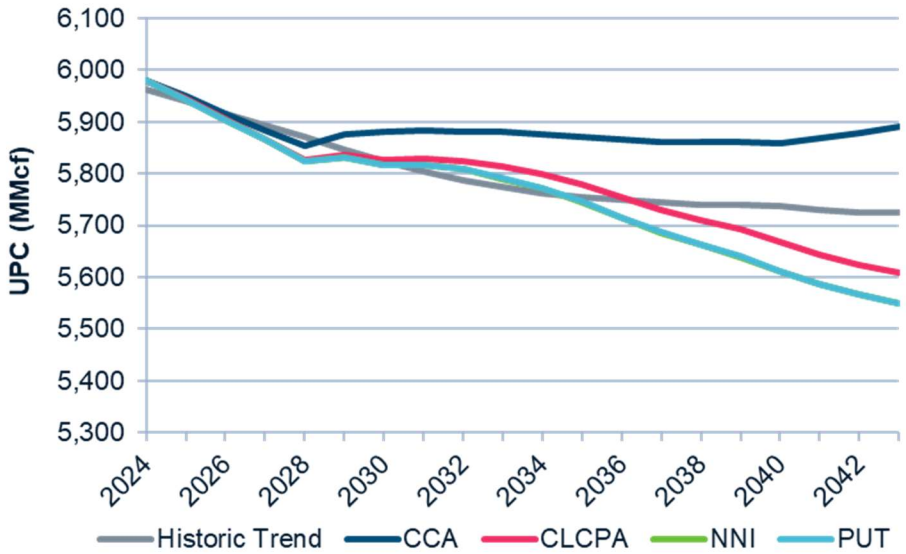


Figure 6-11: UPC Forecast for Non-Residential Customers (2024-43)[106]



The historical data for the non–residential segment indicates a declining trend as would be expected, and the historical trend forecast in Figure 6-11 above reflects the continuation of that pattern. However, it is not clear to PA why the UPC trajectory implied by the CCA scenario not only does not stay consistent with the other scenarios but unexpectedly flattens after 2028. We recommend the Company further explain this trend.

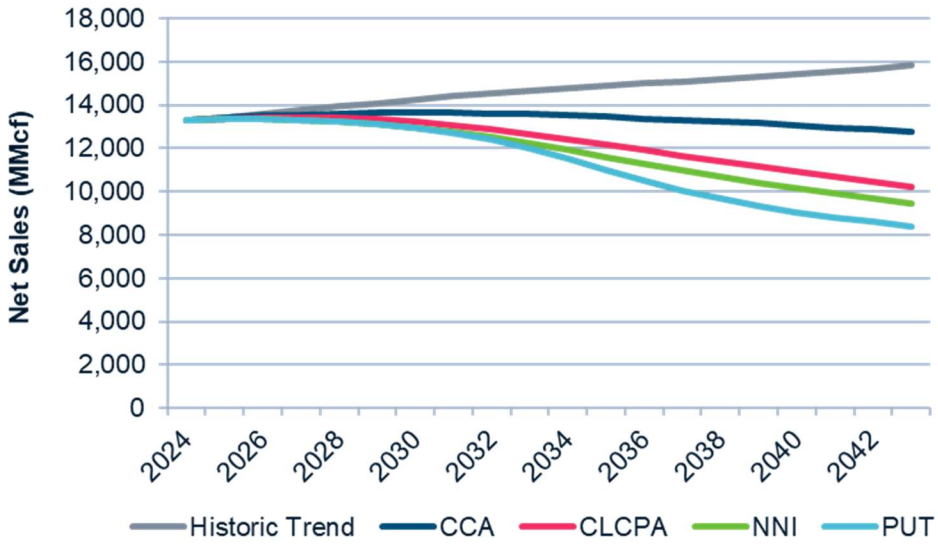
6.2.2 Net Sales

Our understanding is that the Company's peak demand forecast model incorporates weather variables and is driven by the 12-month moving average residential heating customer level (i.e., the long-term peak demand forecast is a function of the customer forecast). The Company's customer count forecast begins with a historical trend top-down forecast that reflects historical trends in customer growth and "shows a projection of that continued growth if none of the policy or decarbonization activities are implemented".[107] The Company's historical trend serves as the starting point from which the scenario forecasts are developed via modeled

[105] Source: Company response to PA-010 IR-139, Attachment 1.
[106] *Ibid.*
[107] Source: Central Hudson ILT Plan. p. 33; This approach applies to both the customer counts as well as the typical use-per-customer and, hence, the sales volumes.

customer attrition and UPC changes are layered on to yield the net sales forecasts, which then flow into Design-Day Daily Peak forecasts.

Figure 6-12: Central Hudson Forecasted Net Sales[108]



Based on our analysis of using historical trends to forecast future customers as discussed in Section 6.1 above, our analysis of UPCs and the resulting net sales, we observe the following:

Slowing population growth as forecast by Moody's Analytics and the resulting reductions in household growth imply organic customer growth (including growth from new construction) will turn negative in a few years. This trend suggests the Company's historical trend-based customer forecast is overstated.

- As shown above, growth for the non-residential customer base is very closely tied to the residential customer base. Therefore, the dynamics impacting residential customer growth will be reflected in the non-residential customer base.
- The implementation of the All-Electric Buildings Act includes a prohibition on the installation of fossil-fuel equipment and building systems beginning December 31, 2025, for new buildings of seven stories or less, and December 31, 2028, for all new buildings regardless of size or building type. Therefore, the impact of customer growth driven by new construction will diminish in the coming years and plausibly be eliminated in the next 4-5 years.
- Declining new construction growth combined with demographic projections of low population growth and basically no household growth after 2026 means practically all residential customer growth will be due to fuel conversions within 4-5 years. Given that ACS data suggests that, on average, over the last five years around 50 customers have switched from FO to other heating fuels – with natural gas, presumably absorbing a portion of that, customer growth could be much lower than the Company's 1,100 average annual forecast.[109]

The Company's ostensibly flat residential UPC is overstated considering downward pressure from policy-induced changes related to Electrification and Energy Efficiency. In PA's opinion, were the Residential UPC modeled accordingly, the forecast could be lower by around 0.5% by 2043. (This is based on the projection that the Residential UPC drops from the current level of 757 Ccf to 741 Ccf by 2043).

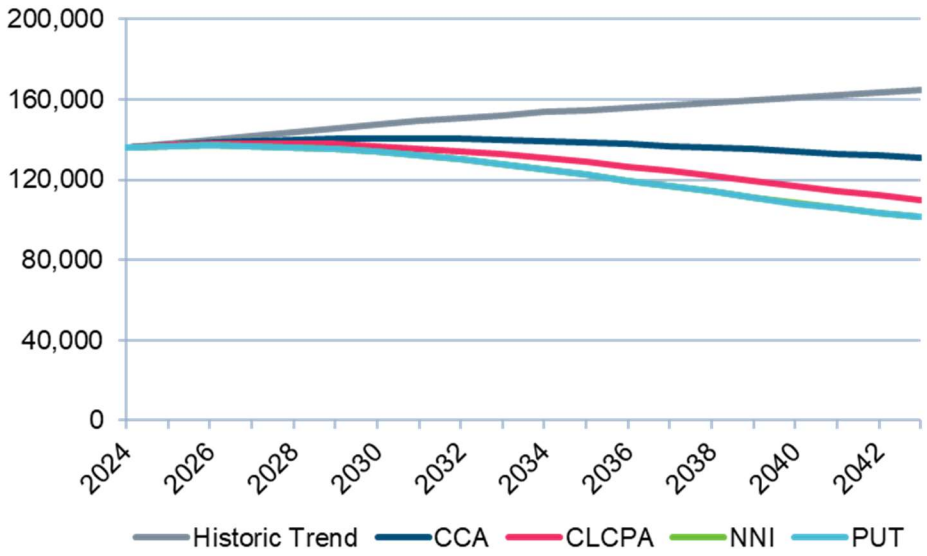
Combined these factors suggest net sales growth will be lower than forecasted by the Company across all scenarios. PA's initial estimate, which will be further developed for our Final Report is that net sales could be 10-14% lower by 2043.

[108] Source: Company response to PA 10-146.
[109] This is further supported by the observation that there has been a steady growth in households choosing container gas.

6.2.3 Peak Demand

The factors reducing customer and UPC growth discussed above could also impact peak demand. The Company plans capacity under peak day conditions where the average daily temperature reaches -8^{O}F and reinforces its distribution networks when pressure is projected to drop below 50% of normal operating pressure. As discussed in Section 4, PA understands the Company is currently capable of flowing more gas on a design day than is currently required by their customers (with the caveat that the Company may have difficulty procuring additional gas during design day conditions), so as peak demand grows in the near term, as illustrated by the Company's forecast in Figure 6-13 below, additional investments in facilities to accommodate growth should not be required.

Figure 6-13: Central Hudson Forecasted Peak Demand (2024-43)



As noted above, PA's initial estimate that the Company's historical trend approach to forecasting future customer and hence sales could overstate net sales forecast by at least 10%. If the historical trend-based forecast were adjusted downward, peak demand forecasts would also be lower. PA will continue to assess the implications for both net sales and peak demand in preparation of our Final Report.[110]

6.2.4 Heat Pump Adoption

In the ILT Plan, the Company did not account for how the IRA incentives can lead to higher adoption of heat pumps and other electric appliances. In the RLT Plan V2, the Company indicated that they have accounted for the IRA incentives.[111] However, PA is currently evaluating whether IRA incentives are fully and properly accounted for in this long-term planning and at this time does not have sufficient evidence to agree or disagree with the Company's response. The IRA offers a tax credit of up to $2,000 per year for the installation of heat pumps and heat pump water heaters. The IRA offers additional heat pump incentives for low- and moderate-income (LMI) households, providing an instant rebate at the point of sale for a heat pump of up to $8,000. This instant rebate can be sufficient in covering the entire upfront cost of the heat pump.[112]

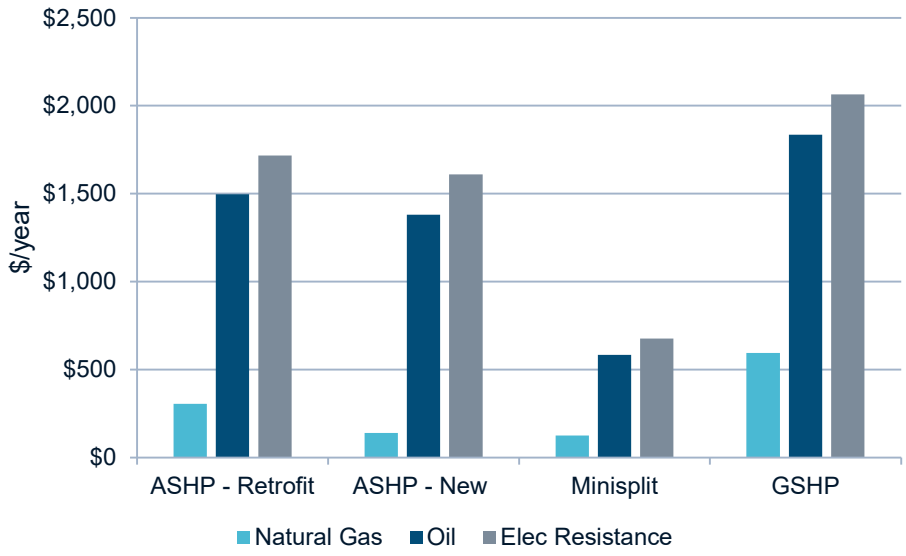
In addition to the federal program, the New York State (NYS) Clean Heat program offers rebates, financing, and tax credits for New Yorkers that install heat pumps that can combine with federal tax credits, further advancing the competitive edge for heat pump feasibility.[113] Through the NYS Clean Heat Program, contractors can gain benefits by encouraging residents, small businesses, and commercial and multifamily business owners to install cold climate heat pumps and heat pump water heaters.[114] Lastly, the Company

[110] PA notes that the Company has recently provided additional data related to the customer and UPC forecasts that time did not permit us to evaluate prior to issuing this Preliminary Report.
[111] Source: Company response to PA 14-156
[112] Source: Inflation Reduction Act of 2022 - What it Means for You | Department of Energy.
[113] Source: NYS Clean Heat.
[114] Source: Heat Pump Program (NYS Clean Heat) - NYSERDA.

offers up to a $1,000 rebate for the installation of a heat pump, given the customer abandons their previous fossil fuel heating source, and offers a $1,000 instant rebate for their customers who opt to install a heat pump water heater.[115]

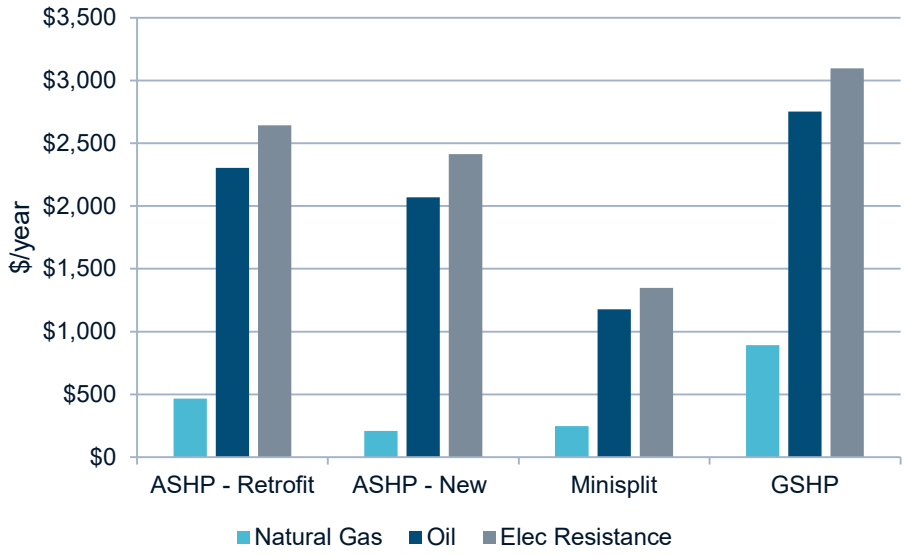
A review of a NYSERDA study on an area similar to the Company's service territory[116] suggests heat pumps are cheaper to run for residential applications than gas furnaces. As shown in Figure 6-14, in the same geographic region of the Company's service territory, an average gas customer can save on their annual energy costs if an air source heat pump is installed in a retrofit or new construction, as compared to the use of natural gas, oil, or electric resistance in the same home. Similarly, cost savings associated with the use of a Minisplit and a ground source heat pump are significant, when compared to heating the same house with natural gas, oil, and electric resistance.

Figure 6-14: Hudson Valley Annual Savings – Single Family Residential[117]



Similar cost savings for a small multifamily home are presented in Figure 6-15.

Figure 6-15: Hudson Valley Annual Savings –Multifamily Residential

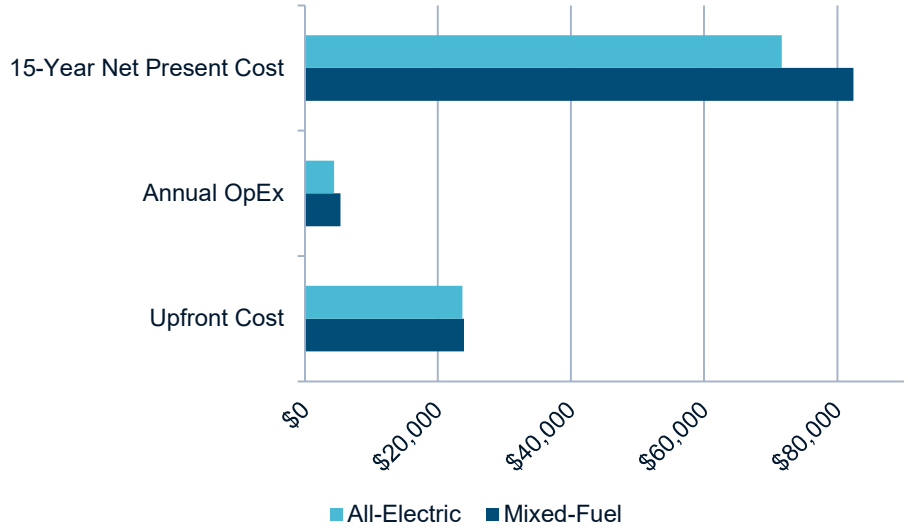


[115] Source: Residential Incentives (cenhud.com).
[116] Source: NYSERDA, "New Efficiency: New York Analysis of Residential Heat Pump Potential and Economics", 2019.
[117] *Ibid*.

Cost savings associated with the installation of a heat pump are significant, especially when compared to the alternative of oil or electric resistance heating. This competitive economical advantage in annual energy savings, paired with substantial opportunity for heat pump incentives and rebates, will drive fuel-switching customers to convert to heat pumps over natural gas furnaces.

In addition, a recent RMI study[118] found that for new construction in New York, all electric homes cost less to build and operate than a new home that uses mixed-fuel or natural gas for cooking, space and water heating. Although the upfront cost of a heat pump is nearly the same as a natural gas-powered furnace or higher for cold-climate heat pumps, incentives like the IRA, NYS Clean Heat, and the Company offered incentives, can help lower the upfront costs significantly. This study suggests that heat pumps have a lower 15-year net present cost and annual operating expenses, as compared to a natural gas-powered home in New York, as illustrated in Figure 6-16. It is important to note that Figure 6-16 does not account for heat pump incentives of any kind in the upfront cost.

Figure 6-16: New Construction Cost Comparison between an All-Electric Home and Mixed-Fuel (Natural Gas) Home in New York[118]



An acceleration of heat pump adoption can significantly impact the total volume of gas delivered to residential and small commercial customers, thus impacting the bills throughout the forecast period as discussed in detail in chapter 7 of this report. When a customer adopts a heat pump for heating, the most significant driver of that customer's gas usage is removed, greatly lowering the UPC of said customer even if they retain gas service for cooking, water heating, or back-up heat. In New York, for natural gas customers, approximately 77% of the natural gas purchased by that customer is used for space heating.[119] In their filed comments, the Company stated that bill impacts are influenced by whether a customer installing a heat pump abandons the gas system or not. Although information regarding abandonment of the gas system will be beneficial for further defining bill impacts, the most significant impact to the bill impact calculation will be the volumes of gas lost by a customer who switches from natural gas heating to a heat pump. Heating represents most of the Company's residential gas demand and were a customer to switch their heating from gas to a heat pump, the volume of gas attributed to that customer would be significantly reduced. Accelerated adoption of heat pumps, can result in a significant decline in gas sales volumes over the forecast period.

PA recommends the Company re-evaluate their heat pump adoption forecast and develop a robust view on economics of heat pumps compared to natural gas and other fuels in their service territory. Upon the failure of various appliances (gas furnace, boiler, water heater, stove, etc.), customers will face a decision to either replace the appliance with a similar technology (e.g., replace a gas furnace with another gas furnace) or switch the technology (e.g., from gas to electric or electric to gas). The current modeling approach does not account for the evolving competition between the economics of gas appliances and electric appliances (e.g., gas

[118] Source: The Economics of Electrifying Buildings: Residential New Construction - RMI.
[119] Source: Patterns and Trends - New York State Energy Profile - NYSERDA.

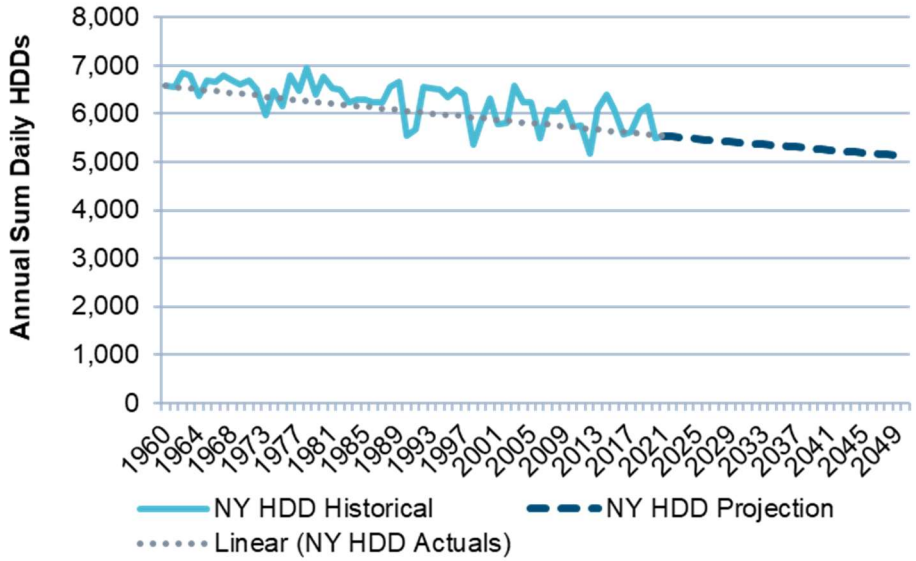
furnace and heat pump). This dynamic view is potentially a very important dynamic feedback loop as it impacts the total volumes of gas delivered to customers and thus the gas rates. Upon reduction in gas volumes, all else equal, gas rates will increase over time and alternative electric solutions will be even more cost competitive over time. PA expects significant value in providing historical adoption rate of various technologies (e.g., heat pumps) and supplementing the projections with an analysis that accounts for such evolving competition over time. By adjusting the assumptions made in their heat pump adoption forecast, the Company is likely to see higher adoption of heat pumps, even in LMI parts of their service territory, lowering net sales volumes and increasing bill impacts if not planned for in advance and managed properly. Additional information on the implications of heat pump adoption for bill impacts is provided in Section 7.2.2.

6.2.5 Warming Trends

A warming trend across the US has been documented over the past decades, and this trend is expected to continue in the future. To assess the trend of warming winters, PA has examined the warming winter trend in New York state leveraging HDDs from 1960 through 2021, published by the Energy Information Administration (EIA)[120]. Between 1960 and 2021 annual HDDs in NY have declined from 6,573 to 5,537, a 15.8% reduction. All else equal, if we extend this trend linearly into the future (assuming the warming trend will not accelerate or decelerate), annual HDDs are expected to decline by another 5.7% by 2043. PA extended the observed trend in HDDs throughout the forecast period to 2043 as depicted in Figure 6-17.

The continued decline in the annual sum of daily HDDs bolsters the assumption that gas volumes consumed for space heating in residential and commercial applications will decrease throughout the forecast period. Therefore, PA recommends that the Company should account for such reductions in its UPC and annual net sales forecasts. Correcting this assumption will likely result in additional upward pressure on gas rates and therefore the economic favorability of gas over electric appliances may further deteriorate over the forecast period. The implications of warming trends on bill impacts are discussed in more detail in Section 7.1.

Figure 6-17: Historic and Forecasted Trend of New York HDDs (1960-43)[121]



PA believes it is crucial that the Company properly forecasts and considers the possibility of significant reductions in delivered gas volumes as it can have major implications on the bill impact for most vulnerable customers. In a scenario in which rapid deployment of electrification is potentially fueled by policy goals, rebates, and/or technological advancement or customer preference, the total volumes of gas delivered to customers could decline faster than projected in the scenarios presented within the RLT Plan V2, creating even higher upward pressure on bill impact and affordability challenges for customers remaining on the gas network.

[120] Source: EIA State Energy Data Systems (SEDS) released June 23, 2023.
[121] Source: EIA- Commercial Buildings Energy Consumption Survey (CBECS) Data.

6.3 Recommendations to Improve the RLT Plan V2

Our recommendations for the Company to improve the customer and load forecast components of the RLT Plan V2 are summarized below.

1. Revise the underlying assumption of a sustained 1% average annual population growth embedded in the historical trend based forecast to reflect declining Population growth over the last decade or more and the forecast for negative growth rates starting 2027.
    a. Explain why the UPC trajectory for Non-Residential implied by the CCA scenario not only does not stay consistent with the other scenarios but unexpectedly flattens after 2028.
2. Provide further analysis on the costs and benefits of customer fuel switching for each fuel option for each scenario supported by the most current data available.
3. Revise the implied historical trend based forecast for residential UPC to follow a negative trajectory to be consistent with the Company's assertion of this historical trend since 1995.
4. Consider the impact of annual oil-to-gas conversion-led customer acquisitions more consistent with (a) the Company's own reporting of around 350/year in recent years and (b) to reflect a reasonable acceleration due to improving heat pump economics.

7 Economic Assessment

In this section, PA provides updated observations regarding bill impacts, disadvantaged communities, and cost-benefit analyses, along with recommendations to improve these aspects of the RLT Plan V2. PA will continue to explore the economic considerations of the Company's long-term gas plan, including Company analyses, stakeholder comments, and policy considerations in preparation of our Final Report.

7.1 Bill Impact

The RLT Plan V2 includes significant changes in the assumptions and results of the Company's bill impact analysis for gas customers. The Company has forecasted a bill decrease of 10-30% for the residential customer class throughout the forecast period as opposed to the 4-6% increase that was initially reported in the Company's initial filing.[122] PA has identified two main concerns with Company's updated bill impact analysis:

- Projected bill impacts for the "typical customer" do not provide a realistic picture of the bill impact for a gas customer who retains gas service throughout the forecast period, which could lead to incomplete conclusions. The Company is assuming that declines in gas consumption will outpace the increase in gas rates, and ultimately result in lower gas bills, but its analysis does not fully account for the overall increase in delivery costs being shared by a smaller number of remaining full heating gas service customers;
- Due to a combination of cost and volume assumptions, projected bill impacts are low, especially as the company intends to pursue costly upgrades such as LCFs blending and replacement of leak prone pipes. Although the bill impact calculations are inclusive of increased gas rates due to the blending of LCFs, PA assumes a more refined service territory based cost of blended LCFs may be higher than estimated by the Company.

In the RLT Plan V2, and as further elaborated by Company SMEs, the methodology for calculating the bill impacts begins with the forecasted total revenue requirement divided by total forecasted gas volumes for each customer class. This methodology fails to capture the diverging results for customers who electrify and those who do not electrify all or portions of their gas end-uses. For example, customers who electrify their space heating will be paying much less for their gas bills, as they use much less gas throughout the year. However, those who cannot electrify their appliances, will be left to pay much higher gas bills compared to their current gas bills. This divergence in bill impacts for customers who electrify and those who don't electrify their gas appliances can create major concerns about decarbonization of the gas network and implications for low and moderate income customers.

PA believes a revised methodology for bill impact calculation or at least an accurate depiction of this dynamic, that provides the bill impacts for 1) a gas customer who retains gas service throughout the forecast period and, 2) the bill impacts for a customer who electrifies heating, would be beneficial for stakeholder understanding. This would provide a more accurate reflection of the bill impacts for low-income customers and customers in Disadvantaged Communities, who may have higher barriers to electrification or control over the appliances in their homes (e.g., renters). Customers with less flexibility to electrify significant portions of their gas demand are likely to be burdened the most by increasing gas bills over the forecast period.

As discussed in PA's Initial Report, PA continues to observe low projected bill impacts, especially in the residential customer class. In the RLT Plan V2, the Company presents a large list of system upgrades focused on decarbonization initiatives, including RNG blending, hydrogen development, significant electrification programs, EE measures, and NPAs throughout the forecast period. PA recognizes that a successful completion of all these upgrades, while maintaining residential bill impacts in the 10-30% decrease from 2024 to 2043, is unlikely. This is likely due to the combination of 1) overestimated gas volumes that will be delivered throughout the forecast period (due to the impacts of under-valued heat pump adoption, conservative EE assumptions, and modest electrification assumptions made by the Company, as discussed in depth in the demand forecast section of this report), and 2) underestimated costs associated with the development of low-

[122] Source: RLT Plan V2 Figure 51.

carbon fuels and other initiatives. Discussed below are observations and recommendations for refinements to the Company's bill impact methodology.

7.1.1 Bill Impact Overview

For the purposes of this analysis, PA provides a directional view of bill impacts based on information provided in the RLT Plan V2. PA is not attempting to re-forecast bills for any customer class. Based on our review of the Company's bill impact analysis, we understand a directional view of bill impacts can be depicted using the relationship between two primary drivers for customer bills:

1. **Total cost of operating the gas system, including new investments in the gas network** (e.g., cost of LCFs fuel blending, leak prone pipe replacement, and other operational expenses.)
2. **Total gas volumes** delivered to each customer class.

Gas Rate = (**Total cost of operating the Gas Network**) / (**Total Gas Volumes Delivered**)

Bill Impact = Gas Rates x a typical customer's gas consumption

This analysis can be done on the total system or customer class levels. The relationship among the key drivers of bill impacts is demonstrated in Table 7-1 and are explored in more detail below. As you can see almost all the arrows in this table point to a future with much higher gas rates driven by either higher cost of operating the system in the numerator of gas rate formula (LCFs fuel blending, hydrogen projects, NPAs, leak prone pipe replacement, etc.), or lower gas volumes delivered in the denominator of the formula (as a result of energy efficiency, electrification, warming trend, etc.). One would need to believe the average gas use for a typical customer would need to decrease so drastically that it would counter the significant increase in gas rates to result in only a 10-30% reduction in bill impact for a customer. In addition, one would need to believe that customers are willing to pay the same amount of money or even higher per month for using a lot less amount of gas which is unrealistic. In this example, customers will likely electrify the remainder of their appliances (e.g., water heating, dryers, cooking stove, etc.) as the economics of such fuel switching decision would be favorable given the high prices of gas in this scenario. In conclusion, PA finds such a scenario far from reasonable and encourages the Company to identify and model alternative viable scenarios.

Table 7-1: Key Drivers of Bill Impacts

Drivers	Upward Pressure on Cost	Downward Pressure on Gas Volumes
Electrification		↓
Energy Efficiency		↓
Warming Trend in HDDs		↓
Hydrogen Development	↑	
Blending of LCFs	↑	
NPAs	↑	↓

ILT Plan vs. RLT Plan V2

PA observed a significant change to the bill impact results between the ILT Plan and the RLT Plan V2. In the RLT Plan V2, the Company has updated their bill impact analysis and now forecasts residential bill decreases of 10-30% across the forecast period. This result is compared to a reported bill increase of 4-6% for residential customers throughout the forecast period in the ILT, or approximate annual increase of 0.2-0.3% on average from 2024 through 2043. The bill impacts, as presented in the ILT Plan, are presented throughout the forecast

period for the various customer classes in Figure 7-1. The updated bill impact analysis in the RLT Plan V2 is shown in Figure 7-2.

Figure 7-1: ILT Plan: Percent Bill Impact for Residential, Commercial, and Industrial Customers (2024-43)[123]

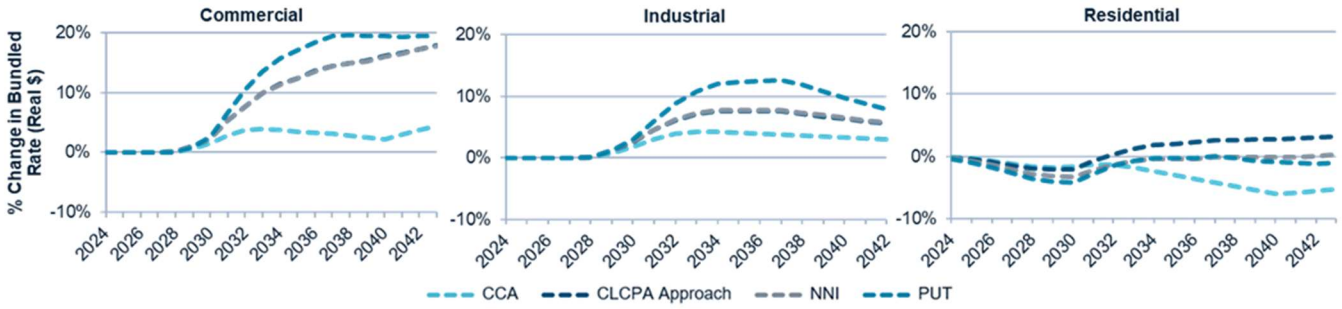
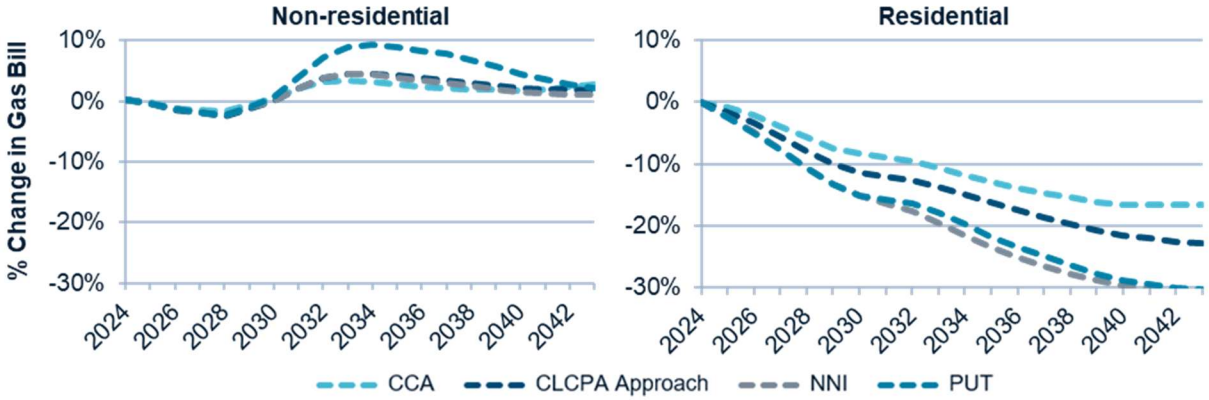


Figure 7-2: RLT Plan V2: Percent Bill Impact for Non-residential and Residential Customers (2024-43)[124]



The Company describes the bill impacts presented in the RLT Plan V2 to be driven by lower per customer gas consumption and writes that despite the lower bills per customer, the cost of gas delivery is increasing. Based on our analysis to date, PA believes the forecasted bill impact should be revised in the Final version of the plan to include a bill impact for a customer who retains full gas service heating throughout the forecast period. While gas bills for customers that install and use heat pumps for space heating could decrease, the bill impact for gas customers who retain gas heating will be much higher than the values projected in the ILT Plan, driven by two primary drivers:

1. The total volume of gas delivered will likely be lower than projected in the RLT Plan V2, especially for residential and small commercial customers. This outcome is driven by electrification of gas appliances over the forecast period, EE, the warming trend, and the resulting reduction in gas volumes. (PA is estimating that volumes will be at least 10% lower than projected in the RLT V2 Plan.)
2. The total cost of gas supply and delivery is increasing. As depicted in the RLT Plan V2, the Company plans to blend up to 20% of RNG and 5% of hydrogen in the distribution system, depending on the scenario. The Company included estimated rates for RNG and hydrogen blending, as discussed in Section 7.1.4 of this report. A conservative estimate of the impact of low-carbon fuel blending to the cost of fuel supply is approximately 3 to 10 times higher than traditional natural gas.

In assessing the changes between the bill impacts in the two Company reports, PA has examined the differences in a key bill impact figure between the two reports. In the ILT Plan, the Company presented a table highlighting the annual average usage across customer categories and the corresponding bills for 2024, 2030, and 2043. The original table from the Company's initial plan is presented in Table 7-2. In PA's Initial Report, we observed that the customer annual average usage appeared to be held relatively constant over the forecast period (e.g., in the range of 891 to 902 for the residential class).

[123] Source: ILT Plan Figure 4 and 42.
[124] Source: RLT Plan V2 Figure 50.

Table 7-2: ILT Plan Usage and Bill Impacts by Customer Class (Original Figure 44)

Customer Category	Scenario	Annual Average Usage (CCf)	2024	2030	2043
Residential	CCA	902	$1,453	$1,420	$1,334
	CLCPA Approach	900	$1,462	$1,413	$1,452
	NNI	896	$1,460	$1,394	$1,411
	PUT	891	$1,458	$1,382	$1,360
Commercial	CCA	6,325	$6,023	$5,944	$5,870
	CLCPA Approach	6,325	$6,023	$5,991	$6,622
	NNI	6,325	$6,023	$5,988	$6,614
	PUT	6,325	$6,022	$6,006	$6,140
Industrial	CCA	316,641	$301,508	$298,844	$289,922
	CLCPA Approach	316,641	$301,508	$301,513	$296,450
	NNI	316,641	$301,508	$301,609	$296,979
	PUT	316,641	$301,508	$302,703	$275,560

PA alerted the Company to our observation about holding the annual average usage flat over time, and the Company clarified that the usage column reflected 2024 values and the table shared in the ILT Plan did not portray the projected reductions in usage. The Company revised the table and shared an updated version with PA[125], as presented in Table 7-3, which was also included in the RLT Plan V2. Gas use for a typical residential customer is assumed to decrease from 908 to 405 CCF in 2043 under the Reference and PUT scenarios.

Table 7-3: RLT Plan V2 Usage and Bill Impacts by Customer Class (Revised Figure 44)[126]

		Typical Customer Annual Usage (CCf)			Typical Customer Annual Gas Bill		
Customer Category	Scenario	2024	2030	2043	2024	2030	2043
Residential	Reference	908	908	908	$1,466	$1,443	$1,409
	CCA	902	819	580	$1,463	$1,420	$1,334
	CLCPA Approach	900	787	563	$1,462	$1,413	$1,454
	NNI	896	744	464	$1,460	$1,395	$1,413
	PUT	891	711	405	$1,458	$1,382	$1,394
Commercial	Reference	6,326	6,308	6,325	$6,024	$5,853	$5,627
	CCA	6,325	6,286	6.295	$6,023	$5,944	$5,874
	CLCPA Approach	6,325	6,274	6,922	$6,023	$5,992	$6,628
	NNI	6,324	6,265	6,879	$6,023	$5,990	$6,621

[125] Source: Company response to PA 6-106.
[126] *Ibid*.

	PUT	6,324	6,265	6,879	$6,023	$6,011	$6,716
Industrial	Reference	316,641	316,641	316,641	$301,508	$293,807	$281,683
	CCA	316,641	316,641	316,641	$301,508	$298,843	$289,915
	CLCPA Approach	316,641	316,641	316,641	$301,508	$301,511	$296,416
	NNI	316,641	316,641	316,641	$301,508	$301,607	$296,936
	PUT	316,641	316,641	316,641	$301,508	$302,695	$301,364

Based on the updated table in the RLT Plan V2, PA acknowledges that the Company accounted for reductions in typical customer annual gas usage for the bill impact assessment. PA agrees that volumes per customer will decline over the forecast period and believes the revised table will better inform stakeholders of the Company's bill impact methodology, however, the pace and extent of this reduction is still in question and PA will continue working with the Company to assess the reasonableness of assumptions made.

PA believes the bill impacts depicted in the RLT Plan V2 may lead to wrong conclusions about the optimal scenario with the objective of minimizing bill impacts for customers. For example, an audience of this report could review table above (Table 7-3) and make the conclusion that PUT scenario is the most cost-effective scenario and brings the lowest bills for residential customers ($1,394 on average in 2043 compared to other forecasted bills). The audience may not realize that the PUT scenario requires costly upgrades to the gas supply and delivery systems that need to be paid for by customers and this bill impact forecast relies on the assumption that there will be significant reductions in gas volumes that would outpace the increase in gas rates. At the moment, PA does not have sufficient evidence to confidently support the reasonableness of this assumption.

Customers who electrify their space heating will be paying much less for their gas bills, as they use much less gas throughout the year. However, those who do not electrify their appliances, will pay higher gas bills compared to current gas bills. PA believes a more useful depiction is to calculate bill impacts for 1) a gas customer who retains gas service throughout the forecast period and, 2) the bill impacts for a customer who electrifies heating, would be beneficial for stakeholder understanding. As reported within the RLT Plan V2, typical gas customer pays $1,466 per year. By 2043 a "typical customer" is expected to pay on average $1,409 under the reference case, $1,334 under the CLCPA, $1,454 under the NNI, and $1,394 under the PUT scenario. PA is concerned these average amounts might lead to the conclusion that pursuing PUT or NNI are the most cost-effective scenarios and bring the lowest cost bills to customers, which may not be the case. Based on PA's analysis to date, this is not the case as these scenarios rely on costly upgrades to the gas supply and delivery systems that need to be paid for by customers. The Company provides an outlook on the changes to gas rates throughout the forecast period in Table 7-4.[127] The combination of higher overall delivery system costs and lower amount of gas consumed will result in higher average unit costs and ultimately higher bills for customers that do not electrify.

[127] Source: RLT Plan V2 Figure 6.

Table 7-4: Percent Impact on Bundled Gas Rates for Non-Residential and Residential Customers (2024 – 2043)

	Residential				Non-Residential			
	2025	**2030**	**2035**	**2043**	**2025**	**2030**	**2035**	**2043**
CCA	0%	-1%	0%	15%	0%	0%	0%	0%
CLCPA Approach	0%	0%	10%	60%	0%	0%	5%	5%
NNI	0%	0%	15%	90%	0%	0%	5%	5%
PUT	0%	0%	20%	100%	0%	0%	10%	7%

As discussed above the Company's bill impact calculations represent a hypothetical average bill calculated by dividing the projected cost of running the gas system (revenue requirement) by forecasted volumes delivered to a customer class and does not account for the fact that some customers will reduce their gas use substantially throughout the forecast period under all scenarios, while others will not. This diverging dynamic can result in some customers who will electrify their appliances paying much less than projected values, and some customers who cannot electrify their appliances paying significantly higher bills. Customers who are less likely to electrify can include low-income customers, renters, or customers residing in a Disadvantaged Community that may have less control over energy sources for their homes or less resources at their disposal to pursue these solutions. PA believes it is important to properly forecast and clearly communicate this divergence in customer bills to stakeholders.

In the following sections, PA presents observations and suggestions for refining the residential volume assumptions based on heat pump adoption and electrification and observations regarding the development and integration of low-carbon fuels and the impact this will have on customer bills.

7.1.2 Annual Gas Volumes

For the residential class, PA anticipates gas volumes will likely decrease at a faster rate than forecasted by the Company. Reductions in gas volume could be driven by a combination of factors including heat pump adoption and a rapid deployment of electrification accelerated by policy goals, rebates, and incentives, and a shift in fuel-switching customer preference. Across the service territory, the Company reports 309,000 electric customers, 90,000 gas customers, and 235,000 electric-only customers, those who do not receive gas. Of the 90,000 gas customers, 90.4% receive electric service from the Company.[128] Since more than 90% of gas customers are also electric customers, given improving heat pump economics, the ease and therefore likelihood for a gas customer to adopt an electric heat pump is potentially increased. Recommended changes to the annual gas volumes forecast are described in further detail in Section 6 of this report. PA expects to see a decline in gas volumes and customer UPC throughout the forecast period due to fuel switching customers leaving the gas system or significantly reducing their gas usage by maintaining only some of their gas appliances (e.g., gas stove), or advancements in EE efforts, and/or electrification.

In addition to EE and electrification reducing anticipated gas volumes, volumes are impacted by the average decrease in annual HDDs across New York state. A warming trend across the US, including New York, has been documented over the past decades and this trend is projected to continue in the future. To assess the trend of warming winters, PA examined the warming winter trend in New York state leveraging HDDs from 1960 through 2021, published by the EIA[129]. Between 1960 and 2021 HDDs in NY have declined from 6,573 to 5,537, a 15.8% reduction. All else equal, if we extend this trend into the future (assuming the warming trend will not accelerate or decelerate), annual HDDs are expected to decline by another 5.7% by 2043. PA extended the observed trend in HDDs throughout the forecast period to 2043.

The continued decline in the annual sum of daily HDDs bolsters the assumption that gas volumes consumed for space heating in residential and non-residential applications will decrease through the projected period.

[128] Source: RLT Plan V2, p. 14.
[129] Source: EIA SEDS released June 23, 2023.

This trend will further improve the economic favorability of electric appliances over gas, potentially accelerating the pace of heat pump adoption and other electric appliances over the projected period, beyond what the Company has forecasted. Therefore, PA recommends the Company account for such reduction in annual sales which will result in additional upward pressure on gas bills.

7.1.3 Electrification & Energy Efficiency

Electrification across the Company's service territory could accelerate at a rate faster than anticipated by the Company, lowering the volumes of gas sold, lowering the number of gas customers, and raising the bill impacts to customers remaining on the system to cover required gas system investments. This rate of accelerated electrification is likely to be driven by policy, federal / state / utility-led rebate and incentive programs, advances in technology, and, in some cases, customer preference.

Beyond heat pump incentives and rebate programs discussed in Section 6.1.4, several initiatives are in place in New York to support the electrification of the transport and buildings sectors. NYS Clean Heat is a prime example of a public-private partnership supporting the deployment of low-carbon solutions. Launched on April 1, 2020, this program provides customers and contractors electrification and EE incentives, along with heat pump rebates, to advance the adoption of efficient electric systems for homes and businesses throughout the State. Electric utilities provide incentives to encourage adoption of certain eligible heat pump technologies, including cold climate air source heat pump (ccASHP) systems, GSHP systems, variable refrigerant flow (VRF) systems, commercial and multifamily heat pump systems, and heat pump water heaters (HPWHs).

The NYS Clean Heat Program is implemented in coordination with a portfolio of NYSERDA-led market development initiatives, which aim to build market capacity to deliver building electrification solutions. Federally, the IRA has specific provisions for adoption of more efficient appliances and electrification of various applications (e.g., heat pump, heat pump water heater, electric stoves, heat pump clothes dryer). NYS Clean Heat rebates can be combined with IRA federal and state tax credits, making electric appliances even more affordable than ever before. While the Order does not require the Company to discuss the impact of building electrification on the electric grid, the Company proactively discusses the potential impact of building electrification on the electric grid in terms of system peak demand and the size of electric load in the RLT Plan V2, which is helpful.

In addition to the heat pump and heat pump water heater incentives discussed above, the Company offers incentives to customers for EE, including natural gas heating equipment incentives. Customers are eligible for up to $1,800 for appliance upgrades to energy efficient natural gas heating equipment.[130] The Company, as described in their Annual System Energy Efficiency Plan for 2020-2025, offers gas heating, ventilation, and air conditioning (HVAC) incentives, including "Smart Wi-Fi and Learning thermostats, boiler reset controls on existing boilers, furnaces, hydronic boilers, steam boilers, combination boilers/water heaters, combination furnace/water heater, and indirect water heaters."[131] Additionally, the Company anticipates increased weatherization across the service territory to improve efficiency.

Lastly, Central Hudson is pursuing NPA opportunities across the service territory. The Company has achieved some success with TMA, a category of NPAs that targets areas along the gas system with low customer saturation and aging pipe infrastructure. Customers along these sections of pipe, if willing, are removed from the gas system, entirely converting the building off natural gas and electrifying. The Company offers electric service upgrades and bonuses to willing customers, ensuring their standard NPA conversion package can be offered to participants at no net cost.[132] The Company has also shared plans to advance load growth based NPA options to gas customers to manage locational constraints associated with peak demand, including EE, weatherization, demand response, and smart thermostats.[133]

PA predicts the initiatives, rebates, and programs offered at the federal, state, and utility level will spark an acceleration of electrification across the Company's service territory. This potential is further ignited by the fact that more than 90% of the Company's gas customers are also electric customers, easing the electrification process. By increasing the EE of gas customers, accelerating electrification through incentive programs, and entirely removing gas customers through NPAs, the Company's service territory is likely to see natural gas

[130] Source: Natural Gas Heating Equipment Incentives (cenhud.com).
[131] Source: Central Hudson Annual System Energy Efficiency Plan 2019-2025. Case 15-M-0252 and Case 18-M-0084. April 1, 2022.
[132] *Ibid*.
[133] Source: RLT Plan V2.

service volumes reduce further than forecast by the Company, thus limiting the potential to decrease gas customer bills and potentially increasing bill levels.

7.1.4 Low-Carbon Fuels

In addition to gas volumes, the Company has considered an integral investment in the Company's plan to decarbonize - the development and deployment of low-carbon fuels. Across all scenarios, the Company has assumed RNG is introduced into the system in 2028. The Company has worked with a third-party consultant to determine RNG potential in the service territory. The report was made available in an appendix to the ILT Plan, and the Company has not provided updated appendices in the RLT Plan V2. Results of the RNG report suggest the most available RNG feedstock in the Company's service territory is agricultural residue, which NYSERDA estimates to cost between $19.87 and $39.78/MMBtu.[134] Even though the Company emphasized that they would not be the owners or developers of an RNG production facility, the costs of RNG make it considerably higher than traditional natural gas for gas customers.

In the CCA, NNI, and CLCPA approach, the Company assumes RNG is blended into the gas supply at a level at which RNG remains cost-competitive with conventional natural gas. The Company has provided an RNG price assumption starting at $2.74/Ccf ($2023).[135] For these three scenarios, the Company increases the blend of RNG to a maximum of 25% of the assessed Company RNG potential level by 2034. The total potential RNG in the Company's service territory is approximately 5.9 million Ccf/year. The PUT scenario relies more heavily on RNG, reaching a maximum of 75% of the assessed Company RNG potential level by 2036, approximately 17.9 million Ccf/year.

PA believes the costs associated with agricultural residue fed RNG could be higher than anticipated by the Company when the time to blend RNG in the gas supply arrives. Agricultural residue fed RNG is costly and less commercially viable in large quantities within the Company's service territory. However, the Company hopes to procure their RNG from within their service territory, meaning the RNG production facilities will be smaller than other potential locations with larger concentrations of agricultural residues. On a per unit produced basis, smaller RNG production facilities can be less economically viable to construct and run because of the expense associated with production infrastructure and lower volume output. Smaller RNG production facilities can result in producers charging a higher rate for the RNG produced. By looking to source all RNG locally, the Company runs the risk of higher-than-average production costs.

Additional cost considerations for RNG from agricultural residue is the production pathway in which RNG is produced from this feedstock, referred to as thermal gasification. Thermal gasification is a relatively complex process for RNG production, as compared to the more common anerobic digestion process utilizing animal waste, municipal solid waste, or landfill gas.[136] Thermal gasification is a proven and operational technology; however, the commercial application of this production process can make it more costly. To date, the gasification of agricultural residues and other biomass for producing RNG remains a relatively niche industry.[137]

PA recommends the Company consider a targeted deployment of RNG further into the forecast period for industrial and commercial customers with hard-to-electrify end-uses. PA believes a targeted deployment of RNG to customers left on the gas system, after electrification and heat pump adoption mature in the residential customer class, will alleviate the potential cost burden of RNG development for the entirety of the Company's customer base.

In addition to RNG, the Company presents decarbonization scenarios with the potential for a maximum 20% blend of hydrogen in the PUT scenario into the gas supply. The Company identifies the blending of green hydrogen in the PUT scenario to begin as early as 2028, representing a significant cost to gas customers by the time of implementation. Green hydrogen is produced via electrolysis using only renewable power.[138] Green hydrogen is the costliest to produce, and to date, less than 1% of global hydrogen production is green.[139] PA recognizes the Company is in an early stage of hydrogen research and development and details around how

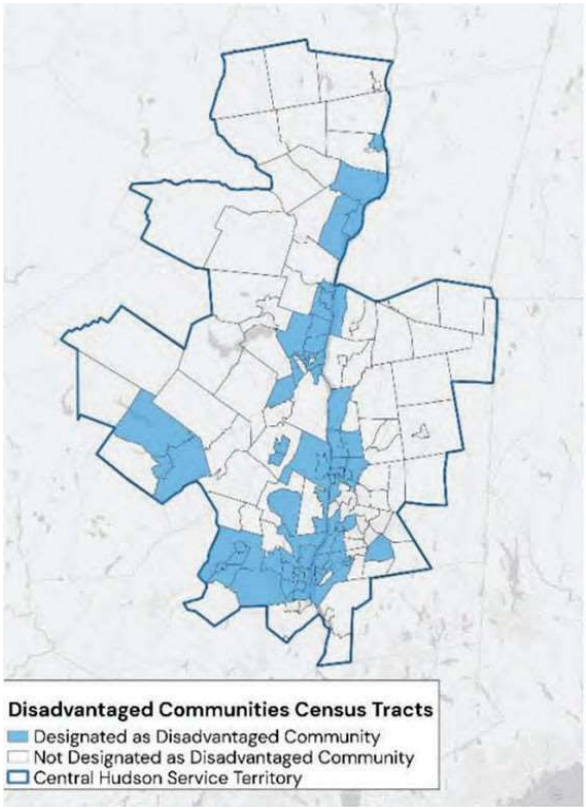
[134] Source: Potential of Renewable Natural Gas in New York State, NYSERDA, 2022.
[135] Source: ILT Plan, Appendix B, Table 15
[136] Source: bc-renewable-and-low-carbon-gas-supply-potential-study-2022-03-11.pdf (fortisbc.com).
[137] Source: Emerging-Gasification-Technologies_final-1.pdf (ieabioenergy.com).
[138] Source: World Economic Forum, 2021.
[139] Source: The Future of Hydrogen – Analysis - IEA.

the Company plans to acquire and produce hydrogen are still in the early stages. However, it is possible the cost of green hydrogen in 2028 will be higher perhaps than anticipated by the Company.[140] PA recommends the Company continue their efforts to research hydrogen opportunities and continue pursuing the deployment of hydrogen for hard-to-electrify industrial end-users. A targeted hydrogen deployment will limit the impact of this costly fuel to the Company's entire customer base and utilize hydrogen for a hard-to-electrify end-user.

7.2 Disadvantaged Communities

PA commends the Company for working alongside the Commission to support the Commission's directive of enhanced reporting for Disadvantaged Communities. The Company has made affordability and energy equity an important component of the RLT Plan V2 and continues to evolve their support for Disadvantaged Communities. Figure 7-3 outlines the Disadvantaged Communities with the Company's market area.[141]

Figure 7-3: Disadvantaged Community Census Tracts in the Central Hudson Service Territory



Electrification and adoption of heat pumps, especially in Disadvantaged Communities, could be higher than forecasted in the RLT Plan V2. High adoption can be fueled by incentives, at the federal, state, and utility levels that can make the economics of heat pumps and electrification more favorable for some customers in Disadvantaged Communities. This potential outlook is explored further in Section 6. PA encourages the Company to revisit the adoption curve of heat pumps across their territory to include incentives, such as those made available by the IRA and the NYS Clean Heat program.

7.2.1 Disadvantaged Communities and the RLT Plan V2

The RLT Plan V2 describes continued efforts to advance the Company's support of Disadvantaged Communities in the energy transition, including research and programs with targeted support and investment in Disadvantaged Communities. New York's CLCPA established a Climate Justice Working Group (CJWG) that developed criteria to identify Disadvantaged Communities across the state using socioeconomic data, including energy burden and poverty rate. In addition to Disadvantaged Communities, New York state also classifies low-income customers as households with annual income at or below 60% of state median income.

[140] Source: IRENA Hydrogen Report, 2019.
[141] Source: RLT Plan V2 Figure 11.

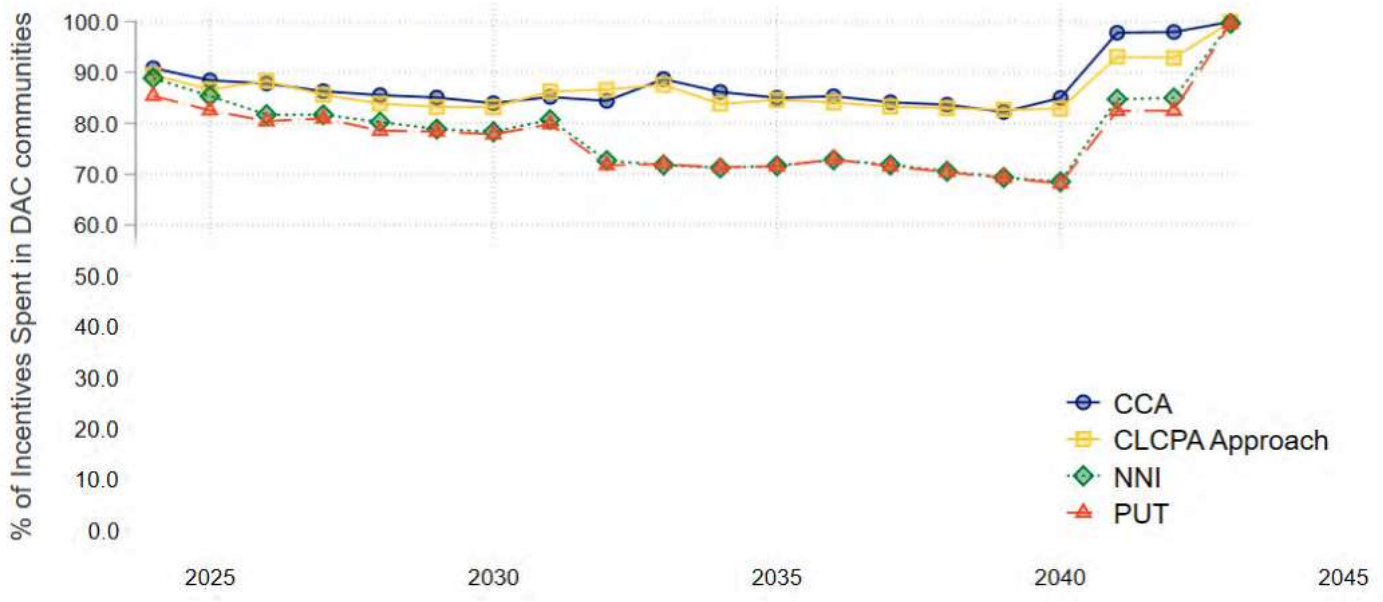
The New York Energy Affordability Program (EAP)[142] aids income-eligible customers with a discount on their monthly heating and cooling bills. PA understands that the EAP program is funded through base rates charged to both electric and gas customers. Additionally, the Home Energy Assistance Program (HEAP) uses federal funding to help income-eligible residents pay their fuel bills.

In 2022 and 2023, the Company received and passed on approximately $4.7 million of HEAP regular and emergency benefits to assist qualified customers with their heating costs.[143] In the RLT Plan V2, the Company states that 23 out of 34 of the Company's NPA approval cases (since 2019) were in Disadvantaged Communities and four out of five of the NPA cases that reached completion were Disadvantaged Communities.[144] Given that 71% of the Company's gas meters are located within a disadvantaged community,[145] we encourage the Company to continue maintaining a strong focus on the bill impact implications on these customers. All these options have their own limitations and if not managed well, could result in unintended consequences.

7.2.2 Heat Pump Adoption in Disadvantaged Communities

In the RLT Plan V2, the Company outlines a shift in current practices to include larger incentives for customers in Disadvantaged Communities in the Company's scenario modeling. In all scenarios presented, heat pump incentives for customers in Disadvantaged Communities are 1.5x to 1.67x larger than for customers outside of Disadvantaged Communities.[146] The Company's forecast percentages of incentives to be spent in Disadvantaged Communities are illustrated below in Figure 7-4.[147]

Figure 7-4: Heat Pump Incentives Spent in Disadvantaged Communities



In the RLT Plan V2, the Company describes a strategy of prioritizing incentives for Disadvantaged Communities at the onset of an incentive program, with approximately 90% of heat pump incentives allocated for customers in Disadvantaged Communities. However, the Company anticipates adoption rates to be low early in the forecast period. Based on these market assumptions, the Company plans to lower and progressively phase out heat pump incentives over time. PA believes the Company's approach to heat pump adoption in Disadvantaged Communities is under-valued specifically due to the Company's omission of heat pump incentives in the adoption modeling.

[142] Source: https://dps.ny.gov/energy-affordability-program.
[143] Source: RLT Plan V2.
[144] Source: RLT Plan V2, p. 22.
[145] Source: RLT Plan V2.
[146] Source: RLT Plan V1.
[147] Source: RLT Plan V2 Figure 53.

PA found that in the ILT Plan, the Company did not account for how the IRA incentives can increase adoption of heat pumps in the low income and disadvantaged communities. In the RLT Plan V2, the Company made an effort to account for the IRA incentives, but given the last-minute nature of these changes, PA is not able to comment on the reasonableness of these assumptions at this point. PA will further review these changes and opine on the reasonableness of the assumptions made in the Final NGLTP.

By including incentives targeted at Disadvantaged Communities, PA believes the Company will see the economic competitiveness of heat pumps in Disadvantaged Communities, ultimately increasing the adoption of heat pumps across the service territory. The IRA alone has the potential to lower the cost of electrification in LMI households by up to 70% for low-income and 40% for moderate income households.[148] With instant rebates, in some cases enough to pay for the entire upfront cost of new equipment, heat pump adoption in Disadvantaged Communities is likely to be higher than anticipated by the Company.[149]

PA plans to continue working with the Company to evaluate the reasonableness of the impact of IRA incentives on adoptions of heat pumps, especially as they apply to Disadvantaged Communities. In the ILT Plan, the company did not account for the impact of IRA incentives on electrification. In the RLT Plan V2, the Company indicated that they have accounted for the IRA incentives, but at this time, PA does not have sufficient evidence to agree that the IRA incentives are fully and properly accounted for in this long-term planning.

7.3 Cost-Benefit Analysis

In response to stakeholder feedback, the Company expanded their BCA calculation in the RLT Plan V2 to include three beneficial cost tests - SCT, UCT, and Ratepayer Impact Test.[150] The benefit cost ratios can be seen in Figure 7-5.

Figure 7-5: BCA – Comparison of Scenarios ($ Million)

Benefit Cost Test	CCA	CLCPA Approach	NNI	PUT
Societal Cost Test:				
Benefits	$744.7	$992.7	$1,126.5	$1,205.7
Costs	$553.9	$1,013.8	$1,209.6	$1,397.2
Net Benefits	$190.8	-$21.1	-$83.2	$191.5
Benefit Cost Ratio	1.34	0.98	0.93	0.86
Utility Cost Test:				
Benefits	$629.7	$809.4	$922.8	$927.6
Costs	$367.2	$801.5	$1,192.7	$1,433.5
Net Benefits	$262.5	$7.9	-$269.9	-$505.9
Benefit Cost Ratio	1.72	1.01	0.77	0.65
Ratepayer Impact Test:				
Benefits	$629.7	$809.4	$922.8	$927.6
Costs	$639.8	$1,209.1	$1,657.5	$1,907.3
Net Benefits	-$10.1	-$399.8	-$734.7	-$979.7
Benefit Cost Ratio	0.98	0.67	0.56	0.49

As discussed in the sections above, PA questions some of the assumptions and conclusions underlying the Company's bill impact and volumes outcomes. PA recommends the Company refine these calculations, as

[148] Source: Rocky Mountain Institute, Home Building Electrification.
[149] Source: Inflation Reduction Act of 2022 - What it Means for You | Department of Energy.
[150] Source: RLT Plan V2, p.13.

described in this report. The results from the BCA tests will ultimately be affected by changes to the volumes forecast and bill impacts, and it is imperative to align those results prior to making decisions based on the BCA ratios provided. PA encourages stakeholders to hold judgement on the BCA ratios of the proposed scenarios until critical refinements are completed by the Company. We expect to provide further analysis of the BCA tests in our Final Report.

7.4 Recommendations to Improve the RLT Plan V2

Based upon our work to date, our recommendations for the Company to improve the bill impact analysis and refine the assumptions in the RLT Plan V2 are summarized below.

1. Provide an updated bill impact calculation to capture the bill impacts for a customer who retains full gas service throughout the forecast period and for a customer who electrifies portions of their use.
2. Model the impact of warming trend (reductions in annual and winter season HDDs in Company's service territory) on delivered gas volumes throughout the forecast period. This trend can have significant impact on delivered gas volumes in the denominator of rates formula and therefore can result in higher bills beyond what the Company has already forecasted. Then, update Residential and non-Residential customer and UPC forecasts consistent with observed trends.
3. Develop a view on the economics of electric appliances such as heat pumps and how it may change over time as the Company pursues blending LCFs and other costly measures. The Company should consider this analysis in its long-term gas planning and bill impact calculations.
4. Properly account for rebates and subsidies provided by federal, state, and local entities and how they can improve the economics of electric appliances compared to gas appliances.
5. Further refine and explore the fuel switching assumptions for each use case (e.g., space heating, water heating, cooking, etc.). Develop a view on what share of customers who retrofit their gas appliances do or do not disconnect from the gas system, and if so why. Value exists in investigating these assumptions and explanations on what is driving this decision and how that changing over time, if at all. Such investigation will be valuable to help stakeholders better understand the impact of fuel switching on gas volume and peak demand forecasts.

8 Environmental Assessment

In this section, PA provides updated observations on the environmental-related aspects of the Company system, along with recommendations to improve these aspects of the RLT Plan V2. We first highlight the GHG emissions, as reported by the Company, then discuss the role of demand side management (DSM) programs and the Company's efforts to reduce emissions, concluding with a discussion of low-carbon fuel options, including RNG and hydrogen. PA will continue to explore the environmental considerations of the Company's long-term gas plan, including further Company analyses, stakeholder comments, and policy considerations in preparation of our Final Report.

8.1 GHG Emissions

To reduce GHG emissions associated with the gas system, the Company presents four decarbonization scenarios that offer increasing opportunity for GHG emission reduction through the incorporation of demand-side management measures (i.e., EE, weatherization, NPAs) and the blending of low-carbon fuels (i.e. RNG and hydrogen) into the gas supply. DSM measures can actively reduce the amount of gas delivered to customers and have demonstrated success in reducing emissions across the Company's service territory. The effectiveness of low-carbon fuels in reducing GHG emissions will depend on state policy decisions on how utilities account for emissions across the natural gas lifecycle.[151]

In the RLT Plan, the Company reports GHG emissions under the EPA's Mandatory GHG Reporting Program.[152] Under this program, natural gas distribution companies are required to report GHG emissions annually from mains, services, metering stations, and certain types of combustion units. The Environmental Protection Agency (EPA) sets a 25,000 MT CO_2e/year reporting threshold. The Company has presented a Proposal for an Annual Greenhouse Gas Emissions Inventory Report[153] and a Joint Utilities' May 31, 2023, Supplement to Proposal for an Annual Greenhouse Gas Emissions Inventory Report[154] for Commission approval. If the Joint Utilities Proposal is approved, each New York investor-owned gas utility could use a statewide framework to report on its GHG emissions. These emissions would be estimated for the entire supply and delivery chain from gas production through consumption. This Commission decision will impact the calculation of the emissions reduction associated with low-carbon fuels, such as RNG and hydrogen.

Across the four proposed decarbonization scenarios, the use of low-carbon fuels (e.g., RNG, hydrogen) is integral in reducing the GHG emissions throughout the Company's gas system. The Commission's decision on the GHG emission impact of low-carbon fuels will have important implications for the GHG accounting methodology in the decarbonization scenarios presented in the RLT Plan.

In the RLT Plan, the four scenarios describe various levels of emission reductions by displacing conventional natural gas in the supply mix with a blend of RNG and/or hydrogen. Across the four scenarios, the Company presents increasing blends of RNG and hydrogen, as illustrated in Table 8-1.

[151] Source: Case 22-M-0149, Proceeding on Motion of the Commission Assessing Implementation of and Compliance with the Requirements and Targets of the Climate Leadership and Community Protection Act ("CLCPA Implementation Proceeding"}, Joint Utilities' Proposal for an Annual Greenhouse Gas Inventory Report (December 1, 2022} ("GHG Inventory Proposal"}.
[152] Source: Greenhouse Gas Reporting Program (GHGRP) | US EPA.
[153] Source: Case 22-M-0149, Proceeding on Motion of the Commission Assessing Implementation of and Compliance with the Requirements and Targets of the Climate Leadership and Community Protection Act ("CLCPA Implementation Proceeding"}, Joint Utilities' Proposal for an Annual Greenhouse Gas Inventory Report (December 1, 2022} ("GHG Inventory Proposal"}.
[154] Source: CLCPA Implementation Proceeding, Joint Utilities' Supplement to Proposal for an Annual Greenhouse Gas Emissions Inventory Report (May 31, 2023} ("Supplemental GHG Inventory Proposal"}.

Table 8-1: Low-carbon Fuel Blends by Scenario as of 2043[155]

Scenario	Blend RNG by 2043 (%)	Blend Hydrogen by 2043 (%)
CCA	5%	0%
CLCPA	5%	5%
NNI	5%	5%
PUT	20%	20%

Based on a combination of blending low-carbon fuels and continuing efforts on DSM measures, the Company presents their estimates for CO_2e reductions, from 1990 levels, by 2043. The resulting emissions reduction for each scenario range from 200,000 metric tons under the CCA scenario to nearly 600,000 metric tons under the PUT scenario by 2043, as outlined in Table 8-2. The emission reductions associated with each scenario, as presently calculated by the Company, represent a decrease in CO_2e emissions per customer ranging from 35%-60% of 1990 emission levels by 2043.

Table 8-2: CO_2e Emission Reductions, by Scenario, in Metric Tons and Percent of Total Emissions per Customer [156]

Scenario	Estimated CO_2e Reduction (MT)	2043 CO_2 Metric Tons per Customer (% of 1990)
CCA	200,000	60%
CLCPA	310,000	50%
NNI	350,000	45%
PUT	550,000	35%

[155] Source: Source RLT Plan V2.
[156] Source: RLT Plan V2 Figure 3 and 40.

Further detail of the emissions reductions for each scenario were presented in the RLT Plan V2 Figures 3 and 40. The ranges of projected CO_2e emission reductions and percent of CO_2e emissions per customer, per year, for each scenario are outlined below in Figure 8-1 and Figure 8-2.

Figure 8-1: Calendar Year CO_2e Emissions Reductions (2024 Baseline)[157]

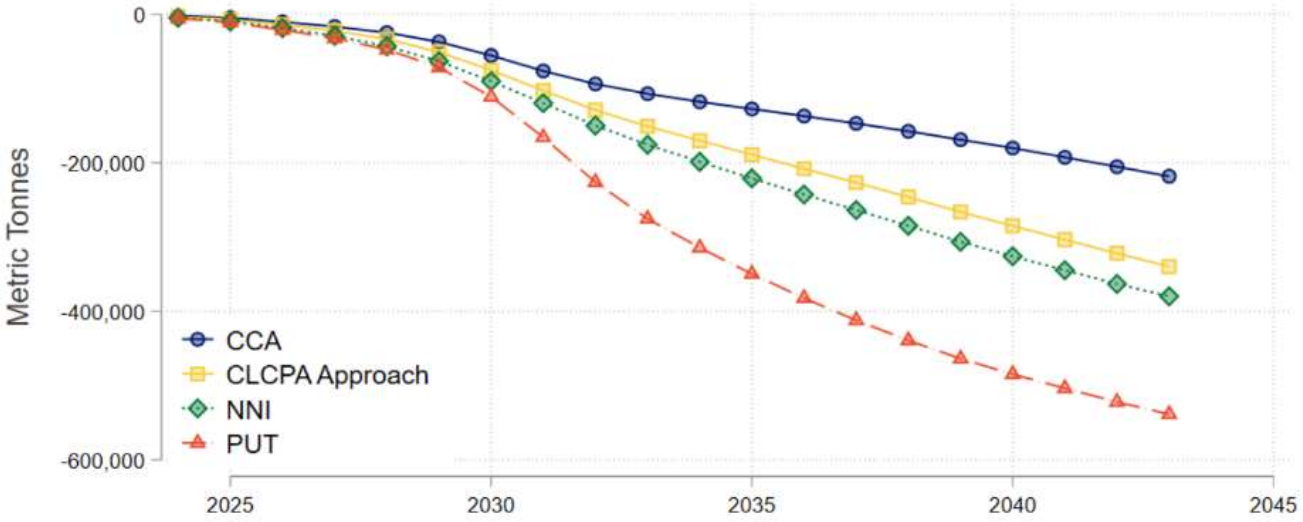
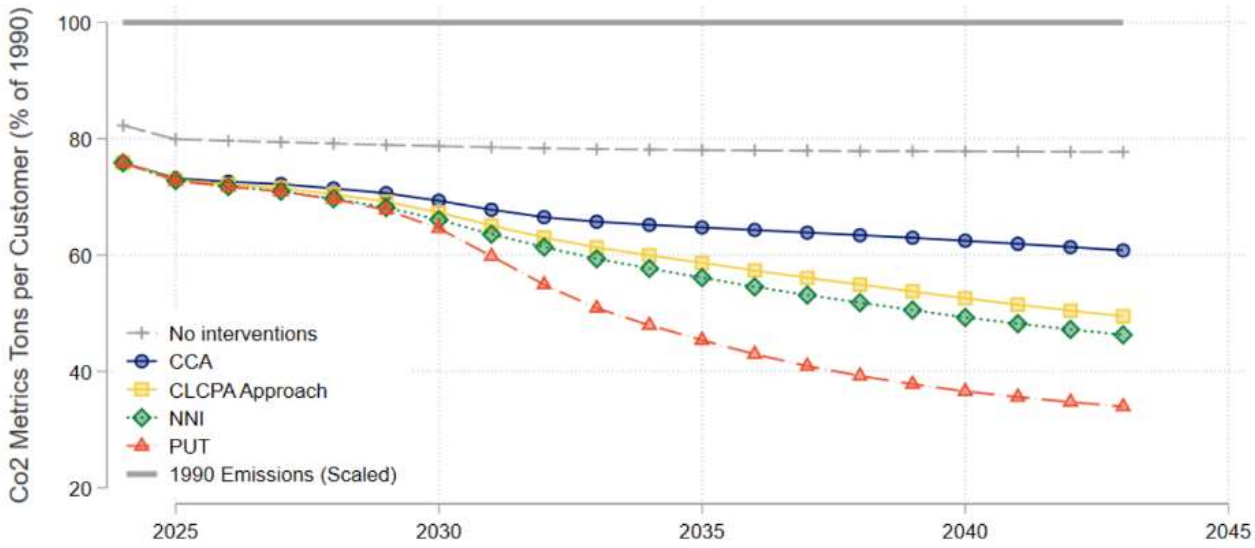


Figure 8-2: Annual CO_2e Emissions as Percentage of 1990 Levels[158]



The PUT scenario, given the relatively large blend of hydrogen and RNG by 2043, shows the highest CO_2e reductions of the four scenarios. Across the four decarbonization scenarios, the Company anticipates continued reduction in annual CO_2e per customer. It is important to note that the decision on the role of LCFs and their life-cycle emissions reduction is far from being settled and policy makers and regulators are actively discussing to what extent these emissions reduction can be accounted for in a gas utility emissions accounting. This decision will be integral to the successful GHG emission reduction potential achieved under the PUT scenario.

In addition to emission reduction efforts described in more detail in the following sections, the Company reports on its involvement as a cosponsor of NYSEARCH, a coalition of utilities across New York, the United States, and Canada.[159] The coalition focuses on research and development in decarbonizing the gas sector

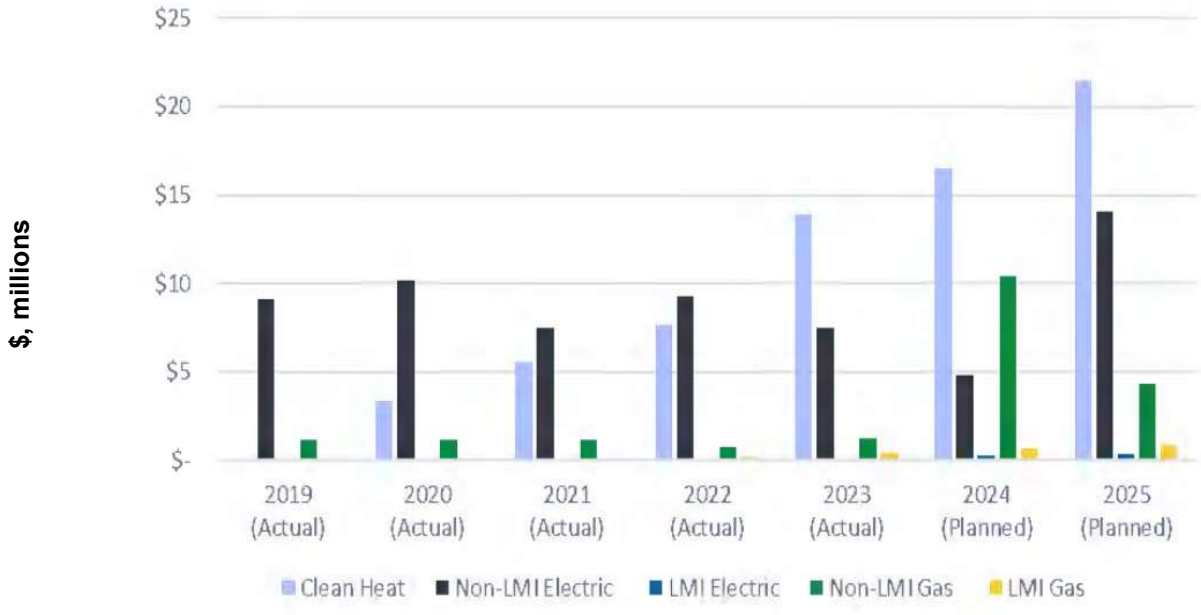
[157] Source: RLT Plan V2 Figure 43.
[158] Source: RLT Plan V2 Figure 42.
[159] Source: RLT Plan V2 Figure 25.

through enhanced leak detection and measure assessment. As part of the Company's involvement with NYSEARCH, the Company has sponsored projects to help the industry move towards the adoption of low-carbon fuels, such as RNG and hydrogen, and to learn how these low-carbon fuels can be leveraged across the gas sector. These projects include the development of small unmanned aerial systems, development of robotic systems for leak detection, methane emission reduction studies, and an odor detection study, among others.

8.2 DSM Programs

The Company has established EE and clean heat programs targeted at reducing CO_2 emissions. The Company offers several gas (and electric) EE solutions across its customer base and partners with NYSERDA and other New York utilities to develop statewide EE programs, targeted towards LMI customers. In the RLT Plan V2, the Company indicated a recent rate case approval that enabled them to scale up their EE portfolio on an annual basis from years prior.[160] The expanded Company portfolios are shown in Figure 8-3.[161] The Company has demonstrated success and plans to further advance EE and building electrification measures for their gas and electric customers into the years ahead, with significant planned portfolios for clean heat, non-LMI electric and non-LMI gas customers.

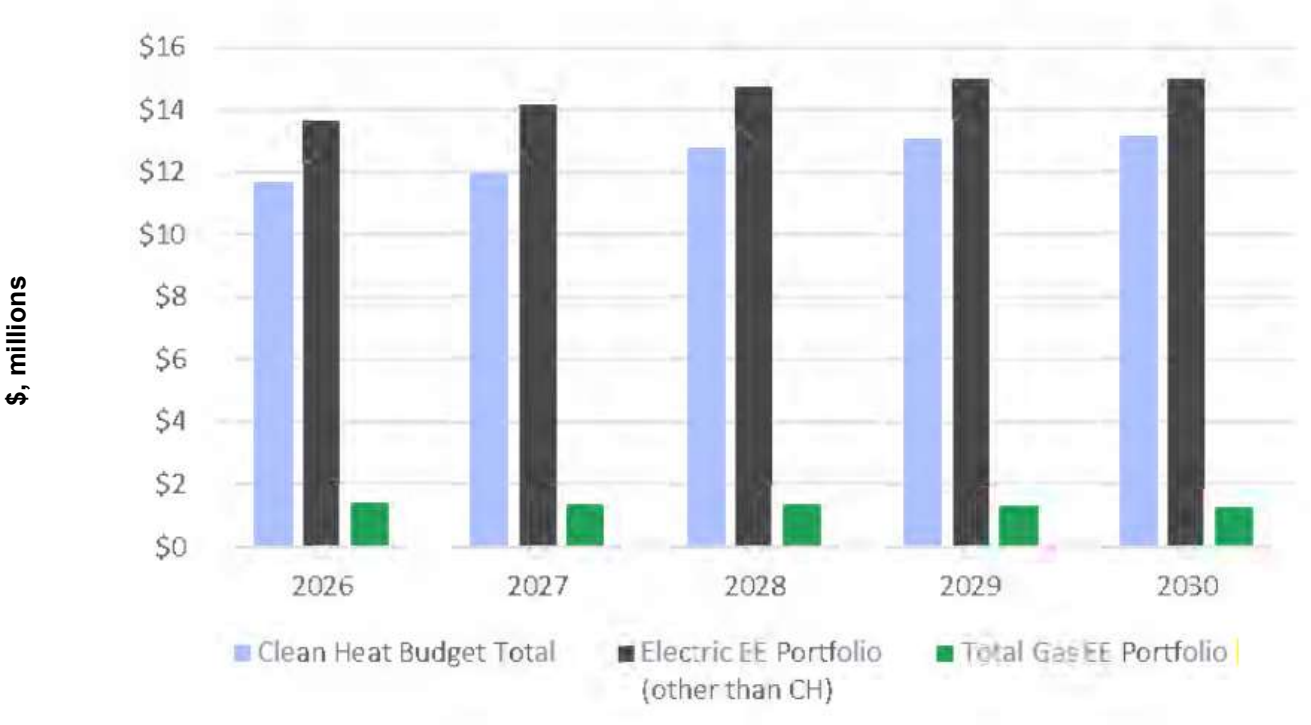
Figure 8-3: 2019-2025 Central Hudson Gas and Electric EE Portfolios ($ million)



Beyond 2025, the Company has filed its EE/BE Proposal[162], outlining applicable targets and budgets for these programs for 2026-30. In this proposal, the Company has allocated 92% of this budget to strategic EE/BE measures, with an emphasis on weatherization and building electrification measures in their Clean Heat programs. The budget for 2026-30 is presented in Figure 8-4.[163]

[160] Source: Case 20-E-0428, Proceeding on Motion of the Commission as to the Rates, Charges, Rules, and Regulations of Central Hudson Gas & Electric Corporation for Electric Service et al, Order Adopting Terms of Joint Proposal and Establishing Electric and Gas Rate Plan (issued November 18, 2021).
[161] Source: RLT Plan V2 Figure 24.
[162] Source: Case 18-M-0084, In the Matter of a Comprehensive Energy Efficiency Initiative ("NE: NY Proceeding").
[163] Source: RLT Plan V2 Figure 26.

Figure 8-4: Central Hudson Electric and Gas Portfolio Budgets 2026-30 ($ million)



As presented in the EE/BE Proposal, the Company's EE/BE budget significantly favors electric programs over gas programs. This focus on electric programs is reflective of state level policy decisions that have begun to reduce reliance on gas, especially in new construction, beginning in 2026.

In addition to EE and BE programs, the Company has been proactive in electrification of customers' heating and appliances. As noted above, the Company offers incentives to their customers who opt to install heat pumps and heat pump water heaters. By continuing electrification efforts, the Company has successfully retired LPP in strategic locations using NPAs. Not only does electrification along LPP reduce emissions, but electrification can also save customers the cost of LPP replacement CapEx. However, to be an effective NPA, all the natural gas customers served by the designated infrastructure must agree to retire and replace their gas service in a timely fashion. The Company calls this type of NPA the TMA and TMA are designed for strategic abandonment of leak prone pipe through electrification where it is more cost effective than replacement and system reliability is not negatively impacted. TMA are most impactful in areas with high LPP replacement requirements and low customer saturation. To date, the Company has identified over 40 separate TMA projects, representing approximately 100 customers in total and has eliminated 2,139 feet of leak prone pipe.[164]

In addition to TMA, the Company is exploring load-growth based NPAs and is looking to leverage DSM and EE to manage load growth and forego further infrastructure investments, where possible. In addition, the Company conducted a geothermal potential study. The Company's proposed utility thermal energy network (UTEN) Thermal Pilot site is the Project Youth Opportunity Union (YOU) and an adjoining neighborhood in Poughkeepsie, NY. The site features 17 non-residential and 38 residential buildings in a densely populated area, which provide diversification of thermal loading and value, and is in a Disadvantaged Community.[165]

8.3 Low-Carbon Fuels

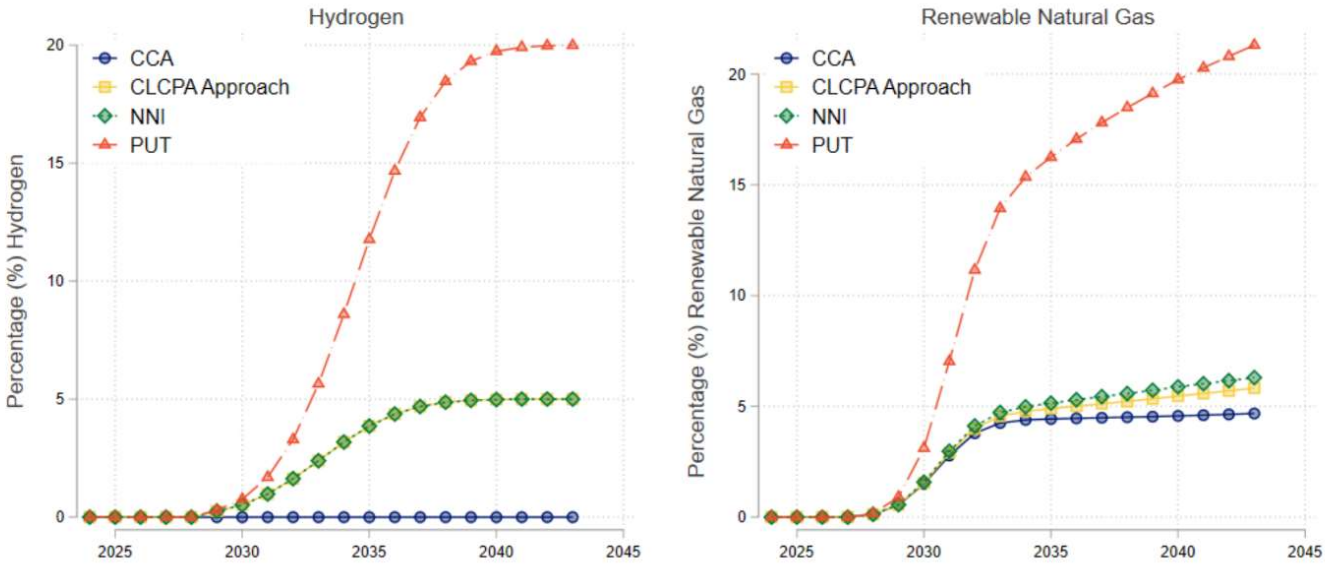
The Company's reliance on the blending of low-carbon fuels to achieve emissions reduction may be unsustainable as supply, costs, and feasibility of blending low-carbon fuels into the gas supply can prevent implementation as planned. As discussed below, the sustainability of RNG feedstocks in the state, the competitive landscape for a limited RNG supply in New York, and lack of technological readiness for green hydrogen deployment at a utility scale present challenges to deployment at affordable levels. PA recommends

[164] Source: Company response to PA 1-7.
[165] Source: RLT Plan V2, p. 47.

the Company consider limiting the deployment of low-carbon fuels to hard-to-electrify customers who may remain as large customers on the gas system after alternative decarbonization measures for residential end-users (ex. DSM measures, electrification, EE, weatherization, etc.) are exhausted.

The Company assumed that both RNG and hydrogen will be available at a competitive price for blending into the distribution system beginning in 2028. The bill impacts and costs associated with blending RNG, and hydrogen are discussed above in Section 7.1.4. As illustrated in Figure 8-5, the four decarbonization scenarios assume different blends of hydrogen and RNG as a percent of total gas supply across the forecast period.

Figure 8-5: Percentage of Hydrogen and RNG in the Gas System (2024-43) [166]



The differences pertaining to low carbon-fuels among the four scenarios are described here in further detail.

1. ***CCA*** – in the CCA scenario, the Company plans to incorporate RNG and hydrogen into the supply portfolio as these low-carbon fuels become cost competitive with conventional natural gas. RNG is expected to sustain a 5% blend of gas supply by 2034, in this scenario.
2. ***CLCPA***– in the CLCPA scenario, the Company plans to incorporate both RNG and hydrogen into the supply mix in 2028, with a sustained 5% blend of RNG and a sustained 5% blend of hydrogen by 2043.
3. ***NNI*** – the NNI scenario presents a strong focus on NPAs and represents a gas system under policies that prevent growth-related investments in the gas system. The scenario therefore focuses on increasing EE, weatherization, and robust heat pump incentives. Therefore, this scenario includes a 5% blend of hydrogen and a 5% blend of RNG of the gas stream by 2040.
4. ***PUT*** – in the PUT scenario, the Company features a transition of gas supply resources that will displace conventional natural gas with low-carbon fuels. Under this scenario, the Company anticipates hydrogen to reach a peak level of 20% of the gas stream by 2040 and a blend of up to 20% RNG by 2043.

In the ILT Plan, the Company included two appendices, one of which was a third-party report, that provided an overview of RNG and hydrogen potential. The appendices assessed RNG supply and feedstock availability in the service territory and system readiness for blending of hydrogen into the supply mix in the coming years. Updates to these appendices were not made available in the RLT Plan V2, so our analysis is based on the appendices to the ILT Plan.

In addition to RNG and hydrogen, the Company has proposed enhancing their utilization of responsibly sourced gas (natural gas obtained from suppliers that proactively mitigate their methane emissions), after determining from a recent pilot project that use of RSG can have a significant impact on reducing GHG emissions, as compared to traditional natural gas.

[166] Source: RLT Plan V2 Figure 36, p. 61.

8.3.1 Renewable Natural Gas

Upon further review of the Company's plans for incorporating RNG into their system, PA notes that RNG supply across the state of New York will be limited, and the Company may find difficulty in procuring adequate volumes of RNG to meet their GHG emission reduction targets. The bill impacts of low-carbon fuel blending are discussed in detail in Section 7.1.4.

The third-party study, provided in the ILT Plan, assessed the RNG potential in the Company's service area from various feedstocks. Results found that RNG sourced from agricultural residues had the highest potential for development within the Company's service territory, followed by RNG from animal wastes, food wastes, and lastly landfills and wastewater treatment facilities. The estimated RNG potential across the service area was reported 3.3M Dth/year. The potential RNG available is broken down by feedstock in Table 8-3.

Table 8-3: RNG Potential by Feedstock[167]

Feedstock	RNG Potential (%)
Agricultural Residues (predominantly corn stover)	69%
Animal Wastes	10%
Food Wastes	13%
Landfills, Wastewater Treatment	~8%

Additionally, the third-party study provided estimates of the GHG emission reduction potential from RNG development. Estimated carbon intensity and emission reductions are presented in Table 8-4 and found in the ILT Plan Appendix D.

Table 8-4: Estimated Carbon Intensity and Emissions Reductions for RNG Feedstocks[168]

Fuel	Carbon Intensity (kgCO2e/Dth)	Carbon Intensity (kgCO2e/Dth)	% of Potential for CH	Emissions Reductions (metric ton CO2e)
Natural Gas	52.9	NA	NA	NA
Landfill RNG	36.8	16.1	0%	0
Corn Stover RNG	23.1	29.8	73%	70,570
WWT RNG	8.2	44.7	3%	4,949
Food Waste RNG	-24.2	77.1	13%	33,683
Animal Waste RNG	-288.2	341.1	10%	116,402
Weighted Average for Central Hudson Service Territory[169]	**-16.3**	**NA**	**100%**	**255,604**

As presented in Appendix D to the ILT Plan, the Company's consultant estimated RNG could offset 218,152 metric tons of CO_2e per year, if RNG were fully developed and blended into the Company's gas system. This

[167] Source: ILT Plan Appendix D.
[168] *Ibid*.
[169] This table presents values before taking into consideration the emission from feedstock transportation, which are discussed later in this section. These values represent GHG emissions on a 100-year GWP basis. Natural carbon intensity is based on end-use combustion. Carbon intensity for RNG vehicle use based on CARB estimates in 2018 UC Riverside study, except for corn stover which is based on 2012 ANL study, corn stover represents all agricultural residues.

estimated value of 218,152 reduces the 225,604 metric tons CO_2e presented in Table 8-4 to account for emissions associated with the transportation of feedstocks. Based off the limited availability of RNG feedstocks in the Company's territory, the Company cannot utilize the most carbon intensive RNG feedstocks to develop more than 10% of their RNG. Rather, the Company will be sourcing approximately 73% of their RNG from agricultural residue, predominantly corn stover which includes the leaves, stalks, and cobs that remain after a corn harvest. The third-party report expresses concern for the sustainability of New York state agricultural residue as an RNG feedstock due to the trend in converting farmland to solar PV developments to achieve the state's clean electricity targets.[170] In addition, cost considerations to produce RNG sourced from agricultural residue must be considered. According to a recent report from the International Energy Agency (IEA), landfill gas is the lowest cost feedstock for RNG.[171]

Although the Company has identified a cost threshold for RNG production and distribution for limiting the bill impacts of RNG blending on their customers, PA observed the third-party study did not address the bill impacts of RNG production and blending. PA would recommend the Company work with the third-party to develop a fulsome bill impact report based upon the results from the RNG potential study to include in its Final NGLTP. The Company reported, to date, it has been unable to secure RNG production at its target cost. In a prior rate case, the Company proposed a "Green Premium" that would provide customers the option to purchase natural gas blended with RNG at an incremental cost. The Green Premium did not come to fruition.

The third-party RNG study in Appendix D of the ILT Plan expressed uncertainty around RNG feedstock availability. PA agrees with this uncertainty, considering the limited supply of the RNG market, considering that other gas utilities across the state are also forecasting to use the limited RNG supply within the state.[172] In addition to demand from other gas utilities, anticipated state policy for RNG application in the transportation market and RNG utilization for electric generation present additional demand on a potentially limited supply of RNG.

Additional concerns with the environmental impact of RNG blending is at the potential environmental or health concerns at the site of combustion. Some research indicated that RNG can produce hazardous emissions when blended and burned with natural gas for residential appliance end use. Studies have suggested that when the composition of natural gas is changed, for example RNG is blended with traditional natural gas, the change in gas composition can lead to incomplete combustion[173] and release harmful pollutants into the air, including carbon monoxide.[174]

For the reasons discussed above, PA would recommend the Company re-examine their reliance on RNG gas for emissions reduction. PA believes RNG has potential use in future gas planning as a targeted decarbonization measure for hard-to-electrify customers who remain on the gas system after other decarbonization measures are deployed for residential uses.

8.3.2 Hydrogen

In the RLT Plan V2, the Company presents decarbonization scenarios with the potential for a maximum 5% blend of hydrogen into the gas supply. Hydrogen emits only water when burned, therefore the most important component for assessing the environmental impact of hydrogen blending is the process by which the hydrogen is produced. The most common types of hydrogen are grey hydrogen, blue hydrogen, and green hydrogen. Grey hydrogen is produced using steam methane reforming powered by a fossil fuel, typically natural gas. Blue hydrogen is produced via steam methane reforming or gasification using fossil fuels accompanied by carbon capture and sequestration technology. Green hydrogen is produced via electrolysis using only renewable power.[175] Green hydrogen is the only hydrogen considered *clean*, is the costliest to produce, and to date, less than 1% of global hydrogen production is green.[176] The Company identifies the blending of green hydrogen in the PUT scenario to begin as early as 2028, representing a significant cost to gas customers by the time of implementation. PA recognizes that the Company is in an early stage of hydrogen research and

[170] Source: NYSERDA, 2023.
[171] Source: Sustainable supply potential and costs – Outlook for biogas and biomethane: Prospects for organic growth – Analysis - IEA.
[172] Source: NYSERDA, 2022.
[173] Source: Lebel et al. 2022.
[174] Source: Lebel et al. 2022.
[175] Source: World Economic Forum, 2021.
[176] Source: The Future of Hydrogen – Analysis - IEA.

development and details around how the Company plans to acquire and produce hydrogen are still in the early stages.

To bolster the understanding of hydrogen, the RLT Plan V2 was guided by a study that assessed the Company's system for hydrogen blending potential. To assess the potential for hydrogen blending, the Company completed a preliminary "Potential Hydrogen Blending Study" which covered a statistical sample of its distribution system (25 out of 94 system segments were studied) to estimate the amount of hydrogen the Company could blend without any pipeline modifications or reductions in load. Results from this study found that, of the distribution system segments studied, 72% of the system could support a hydrogen blend of up to 20% on a typical winter day without any need for modification of flow or pressure.[177] The study concluded that specific opportunities for hydrogen use above 20% may exist at targeted commercial and industrial (C&I) customers, whose operations could potentially accommodate higher levels of blended hydrogen.[178] The Company plans to follow this study with a proposed clean hydrogen feasibility study, to include identifying portions of the distribution system with the potential for successful hydrogen blending and use of hydrogen for gas heating and industrial process load.

PA concurs with the preliminary hydrogen study that further investigation into the adaptability of the Company's entire distribution system is necessary to better understand both the opportunities and implications of planning for hydrogen's role in the future. Additionally, PA commends the Company's approach to understand hydrogen and the impact on the gas system and encourages the Company to continue exploring a targeted hydrogen deployment, rather than blending hydrogen across the entire gas network. Hydrogen may have promising application for hard to electrify applications and industries, some of which are present in the Company's service territory.

8.4 Recommendations to Improve the RLT Plan

Recommendations for the Company to improve the environmental assessment components of the RLT Plan are summarized below.

1. Develop a view on the potential feasibility of a targeted deployment for RNG and hydrogen in a limited geography for hard-to-electrify non-residential customers, rather than blending these low carbon (and more expensive) fuels with the natural gas supply across the entire system.
2. Further investigate the technical, environmental, and economic implications of hydrogen production, transport, and distribution across Company's service territory.
3. Consider prioritizing investments in electrification, NPAs, DSM measures, and EE to reduce the GHG emissions of residential customers and result in lower bill impacts by avoiding the costly blending of LCFs, as applicable.
4. Research and update the costs associated with RNG procurement and blending sourced from within and nearby geographies to their service territory and reflect this updated cost of RNG on customer bills throughout the forecast period.

[177] Source: RLT Plan V2, p.4.
[178] Source: ILT Plan Appendix C.