Initial Report of Central Hudson's Initial Long Term Gas Plan

Prepared for New York Department of Public Service

April 5, 2024

New York Office

PA Consulting Group Inc.
45th Floor
The Chrysler Building
405 Lexington Avenue
New York
NY 10174
USA
+1 212 973 5900

paconsulting.com

Prepared by: PA Consulting Group, Inc.

Version: Initial

Glossary 6

1 Executive Summary 7

1.1 Summary of Initial Observations 7
1.1.1 Customer Base 9
1.1.2 Supply 11
1.1.3 Demand 12
1.1.4 Bill Impact 13
1.2 Summary of Key Observations 13
1.3 Summary of Recommendations to Improve the ILT Plan 14

2 Introduction 16

2.1 Scope of Work 16

3 Stakeholder Engagement 18

3.1 Technical Conferences 18

4 Supply Assessment 19

4.1 Supply Stack 19
4.1.1 Long-term Contracts Assessment 20
4.1.2 Delivered Services and Winter Peaking Supplies 20
4.1.3 Company's De-Contracting / Re-Contracting Approach 21
4.2 Hydraulic Modeling 21
4.3 Capex Considerations Related to Supply Matters 22
4.3.1 General Observations 22
4.3.2 Transmission Investments 23
4.3.3 Distribution Investments 25
4.4 Recommendations to Improve the ILT Plan 26

5 Demand Assessment 27

5.1 Introduction 27
5.2 Load Forecast Observations 28
5.2.1 Customer Base 29
5.2.2 Electrification 30
5.3 Recommendations to Improve the ILT Plan 32

6 Economic Assessment 33

6.1 Bill Impact 33
6.2 Electrification 34
6.3 Disadvantaged Communities 36
6.4 Recommendations to Improve the ILT Plan 38

7 Environmental Assessment 39

7.1 GHG Emissions 39
7.1.1 DSM Programs 41
7.2 Low-Carbon Fuels 42
7.2.1 Renewable Natural Gas 43
7.2.2 Hydrogen 45
7.3 Recommendations to Improve the ILT Plan 46

Figures

Figure 1-1 Central Hudson 2023 Service Class Sales and Customer Counts 10
Figure 1-2 Central Hudson Housing Fuels 10
Figure 1-3: Makeup of Central Hudson Five-Year CapEx Forecast 11
Figure 1-4 Central Hudson Forecasted Net Sales 12
Figure 2-1: PA Scope of Work and Schedule 17
Figure 4-1: Central Hudson Pipeline and Delivery Point Map 20
Figure 4-2: Makeup of Central Hudson Five-Year CapEx Forecast 23
Figure 4-3: Transmission Miles in Service by Decade Installed 24
Figure 4-4: Makeup of Transmission CapEx Forecast 24
Figure 5-1: Map of Central Hudson's Service Territory 27
Figure 5-2 Central Hudson Forecasted Net Sales 28
Figure 5-3 Central Hudson Forecasted Peak Demand 29
Figure 5-4: Customer Count and Sales Volume by Class (as of December 2023) 30
Figure 5-5 Central Hudson Housing Characteristics 31
Figure 6-1: Forecasted Annual Sales Under the Four Decarbonization Scenarios 33
Figure 6-2: Percent Bill Impact for Residential, Commercial, and Industrial Customers (2024-2043) 34
Figure 6-3: Disadvantaged Community Census Tracts in the Central Hudson Service Territory 37
Figure 6-4: Heat Pump Incentives Spent in Disadvantaged Communities 37
Figure 7-1: Calendar Year CO_2e Emissions Reductions {2024 Baseline} 40
Figure 7-2: Annual CO_2e Emissions as Percentage of 1990 Levels 40
Figure 7-3: 2019-2025 Gas and Electric EE Portfolios ($, millions) 41
Figure 7-4: Central Hudson Electric and Gas Portfolio Budgets 2026-2030 {$, millions} 42
Figure 7-5: Percentage of Hydrogen and RNG in the Gas System (2024-2043) 43

Tables

Table 1-1 Scenario Key Outcomes as of 2043 8
Table 1-2: Central Hudson ILT Plan Scenarios 9
Table 4-1: Central Hudson Historical and Projected Capital Investments ($000) 23
Table 5-1 Scenario Demand Forecast Key Outcomes 29
Table 7-1: CO_2e Emission Reductions, by Scenario, in Metric Tonnes and 39
Table 7-2: Estimated Carbon Intensity and Emissions Reductions for RNG Feedstocks 44
Table 7-3: RNG Potential by Feedstock 44

Glossary

BCA - Benefit-Cost Analysis
BE - Building Electrification
C&I - Commercial & Industrial
CAC - Climate Action Council
CCA - Current Clean Agenda
ccASHP - cold climate air source heat pump
CHP - Clean Heat Program
CJWG - Climate Justice Working Group
CLCPA - Climate Leadership and Community Protection Act
Commission - New York State Public Service Commission
DOB - Department of Buildings
DPS - New York State Department of Public Service
DSA - Demand Side Analytics
DSIP - Distribution System Implementation Plan
DSM - Demand side management
EE - Energy efficiency
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
HP - Heat pump
HPWH - Heat pump water heater
ILI - In-Line Inspection
ILT Plan - Initial Long-Term Plan
Initial Report - PA's report filed on March 22, 2024
LCF - Low-carbon fuel
LMI - Low-moderate income
LPP - Leak-prone Pipe
MAOP - Maximum allowable operating pressure
NE:NY - New Efficiency New York
NNI - No New Infrastructure
NPA - Non-Pipe Alternative
NREL - National Renewable Energy Laboratory
NYC - New York City
NYFS - New York Facilities System
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 Gas Number 20-G-0131
PUT - Pipe Use Transformation
RNG - Renewable natural gas
RSG - Responsibly sourced gas
Sales - Volumetric Gas
SME - Subject Matter Expert
TGP - Tennessee Gas Pipeline
the Company - Central Hudson
the Department - New York State Department of Public Service
the Order - Gas System Planning Order
TMA - Transportation Mode Alternatives
UPC - Usage Per Customer
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 Number 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, 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 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 Number 13-G-0676.

As a combined natural gas and electric utility, 25% of the Company's electric customers receive gas service and over 90% of gas customers also receive electric service from the Company. In our initial review, PA finds the Company's service territory presents opportunities for decarbonization, especially given the combined gas and electric offerings, despite the sizable non-heating end uses. Additionally, PA observes a very pertinent characteristic of the Company's territory is the dominance of fuel oil as the heating fuel of choice. In its ILT Plan, the Company identifies four decarbonization scenarios with descriptions of what those scenarios offer in terms of key metrics, such as reduced peak demand and annual sales, reduced greenhouse gas (GHG) emissions, and increased annual and peak electric demand. PA commends the level of detail and transparency presented in the ILT Plan, especially the Company's efforts to develop a flexible and adaptable approach which considers a gas planning approach similar to the electric Distribution System Implementation Plan (DSIP) and the development of a modeling approach that is expected to flexibly account for numerous assumptions and inputs.

PA believes successful, cost-effective, and equitable achievement of the State's ambitious climate goals requires 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. This report (Initial Report) summarizes PA's initial approach, observations, and recommendations.

1.1 Summary of Initial Observations

Within this section, we discuss our understanding and initial observations of the four scenarios, Current Clean Agenda, CLCPA Approach, No New Infrastructure and Pipe Use Transformation, as presented by the Company in its ILT Plan.

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 reduction objectives.
3. **No New Infrastructure (NNI)** reflects assumptions in which policies prevent growth-related investments, focusing investment on safe and reliable distribution remain. The NNI Scenario involves targeted (and higher) incentives to promote these outcomes.
4. **Pipe Use Transformation (PUT)** builds on the NNI Scenario. It features the increased use of low-carbon fuels (LCF), such as responsibly sourced gas (RSG), renewable natural gas (RNG), and green hydrogen.

Table 1-1 compares the key outcomes of the assumptions applied under each scenario through the forecast period to 2043.

[1] The Order, pp. 20-22.

Table 1-1 Scenario Key Outcomes as of 2043

	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[2]	2.1 MMCF, 18% increase	1.0 MMCF, 9% increase	0.2 MMCF, 2% increase	-1.7 MMCF, 15% decrease
2043 CO_2e Emissions Reductions per Customer (% of 1990)	38.9%	44.3%	48.1%	64.9%
Avoided CO_2 Value from Energy Efficiency ($ millions)	$35.4	$43.0	$54.0	$67.3
Avoided CO_2 Value ($ millions)	$112.2	$166.3	$143.2	$252.2
Benefit Cost Ratio	0.81	0.81	0.82	0.83

The ILT Plan discusses several key outcomes of the decarbonization scenarios, including gas supply mix, changes in net sales, avoid CO_2 emissions, and results of the Company's benefit-cost ratio analysis. At the end of the forecast period (2043), PA finds the following:

- Across the Company's scenarios, various levels of emission reductions are achieved by displacing conventional natural gas in the supply mix with increasing blends of RNG and hydrogen. Gas supply mix assumes a minimum of 5% RNG blend in all scenarios and varying hydrogen supply in three scenarios (CLCPA, NNI and PUT).
- Across the four decarbonization scenarios, the Company achieves considerable CO_2e emissions reductions, especially in the PUT scenario, which relies heavily on the introduction of LCFs to the supply mix. Resulting emission reductions range from 250,000 metric tons under the CCA scenario to nearly 600,000 metric tons under the PUT scenario by 2043. The projected emission reductions across all four scenarios are in the range of 40%-70%, compared to a baseline level from 1990.
- The status-quo space and water heating electrification conversion trend is not enough to elicit a decline in demand. Under the CLCPA scenario, 2043 sales grow by 18%, over 2024. Under the NNI scenario, annual 2043 net sales grow by 2%, over 2024. The PUT scenario is the only forecast in which net sales decrease, with a decline of 15% anticipated from 2024 to 2043.
- The Benefit Cost Ratios (BCA) for all four scenarios are nearly identical. Although the results are quite positive, PA is contemplating if these results may indicate the scenarios do not adequately test the trade-offs between emissions reduction and affordability but rather optimize for favorable BCA results.
- PA encourages the Company to work with the Department and Stakeholders to further revise scenario assumptions to optimize for certain outcomes, such as emission or CapEx reductions. This collaborative effort could support a more concentrated approach to maximize a number New York's climate goals and plan for impacts on the Company's electric system.

Table 1-2 provides a high-level summary of the key differentiators of each scenario, including energy efficiency (EE) and heat pump (HP) incentives, LCF blending, and assumed restrictions on new connections.

[2] Source: Company's response to PA 02-37 Attachment 1

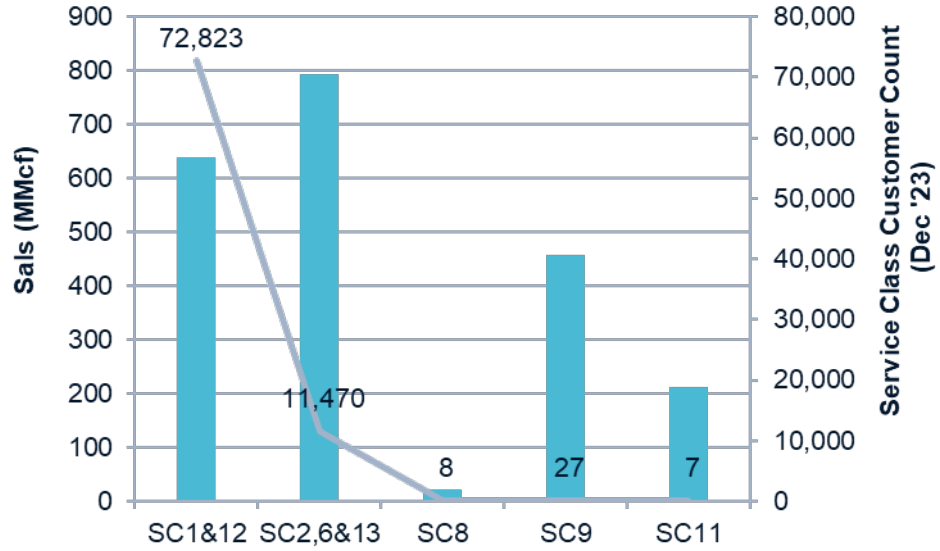
Table 1-2: Central Hudson ILT Plan Scenarios

Scenario	Key Assumptions
CCA	• Reflects present day (2024) legal and policy framework at current funding levels and does not achieve state net zero GHG goals. • 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 T&D investment to support incremental load.
NNI	• Assertive effort to identify highly loaded areas and use NPAs where possible. • Up to five-time 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. • Utilization of RSG. • Green hydrogen blending.

1.1.1 Customer Base

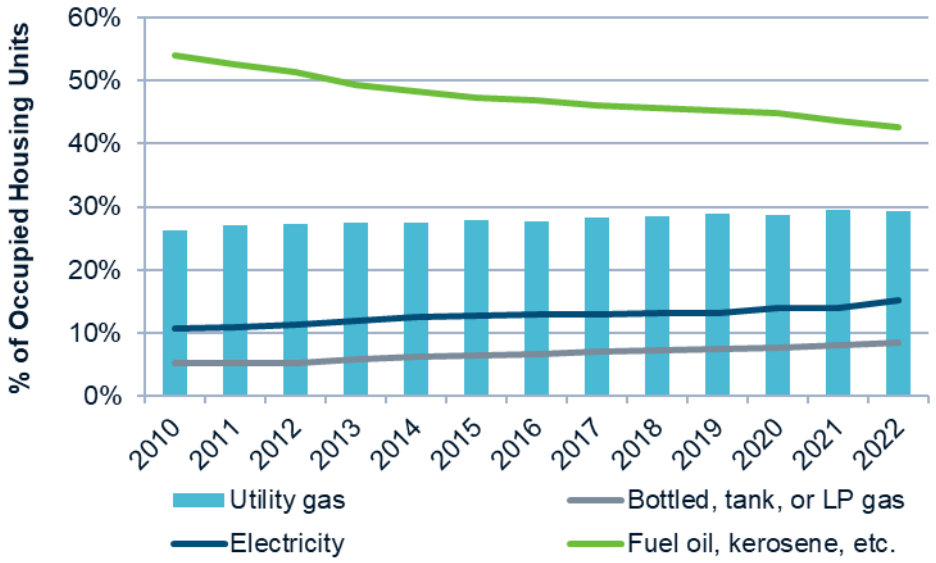
A vast majority of the Company's customers are residential customers who use gas for heating. However, a small number of non-residential customers contribute a larger proportion of gas sales than residential. As illustrated below in Figure 1-1, over 40% of the Company's gas consumption is non-heating. Less than 40 of Company's approximately 87,000 customers account for over 40% of total annual gas consumption. Most of these are large non-firm interruptible customers and six are large transportation-only customers, some of which use natural gas to power electric generation facilities. The Company's electric generation transportation customers are required to decarbonize, given CLCPA requirements for statewide net zero electricity. Therefore, the Company recognizes that to achieve material reductions in gas sales, measures must either significantly address transitions of commercial and industrial loads or a significant population of residential customers.

Figure 1-1 Central Hudson 2023 Service Class Sales and Customer Counts



Central Hudson serves several customers with energy intensive, high temperature industrial processing (steel and concrete manufacturing) and its proposed hydrogen study, included within the rate case proposal, intends to assess the potential for targeted use of hydrogen to serve certain industrial customers. At this time, the Company has yet to establish which customers would be classified as hard to electrify.[3] The Company says it will develop a list of potential customers where the nature of its operations and equipment will be considered as part of recommending potential pilot projects. PA recognizes further advances in technology are needed to improve the economics of commercial and industrial decarbonization and encourages the Company to continue efforts to define its hard to electrify customers and tailor effective decarbonization offerings.

Figure 1-2 Central Hudson Housing Fuels



A review of the types of heating fuel sources within the Company's service territory finds the dominance of fuel oil (FO) as the heating fuel of choice, as illustrated within Figure 1-2, above. Although FO's share in the territory has declined since 2010, almost 43% of all occupied housing units still use FO for space heating. Given the region's socioeconomic landscape, with over 97,000 homes still using FO, there are strong implications for the potential for fuel switching in favor of gas – a crucial consideration for the Company as it navigates its course as the agent of transformation toward decarbonization. During the period of 2017 to 2023,

[3] Source: Company's response to PA 1-30.

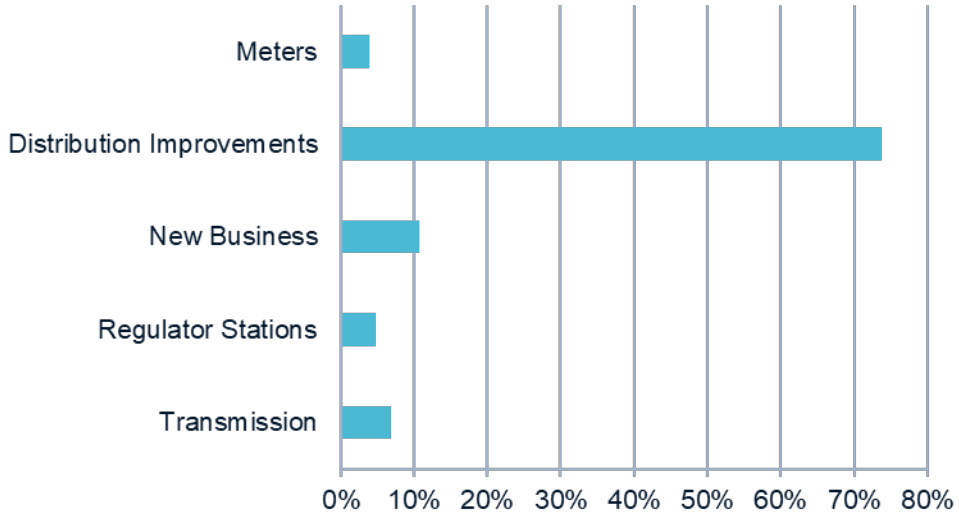
the Company has converted 3,304 customers to natural gas.[4] Based upon our review of the region's macroeconomic forecasts, we predict that new construction is likely to slow down. Furthermore, legislation prohibiting new natural gas fueled equipment and building systems beginning December 31, 2026[5] will retard the growth of gas heating customers. This presents a unique challenge with respect to 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 FO to gas.

1.1.2 Supply

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

Although certain transmission system replacements are contemplated in the Company's five-year capital plan, the transmission system generally appears to be well positioned for continued reliability. The Company's overall capital plan is heavily weighted towards replacement and reinforcement of the existing distribution system. Figure 1-3 illustrates the relative size of investment types included in the Company's forecasted CapEx for the period 2024-2028.[6]

Figure 1-3: Makeup of Central Hudson Five-Year CapEx Forecast



In the ILT Plan, the Company explains that natural gas is procured to satisfy demand behind the citygates and that its supply stack has remained relatively static, 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. We further discuss our initial observations on the Company's Supply within Section 4. 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. We further discuss our initial observations on the Company's plans for LCFs in Section 7.2. Additionally, we plan to better understand the

[4] Source: Company's response to PA 33-72.
[5] 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.
[6] Source: Company's Confidential response to PA 2-39.

Company's thinking on next steps to evaluate the potential for hydrogen blending on its system and the ultimate path to implementation, through additional conversations with the Company.

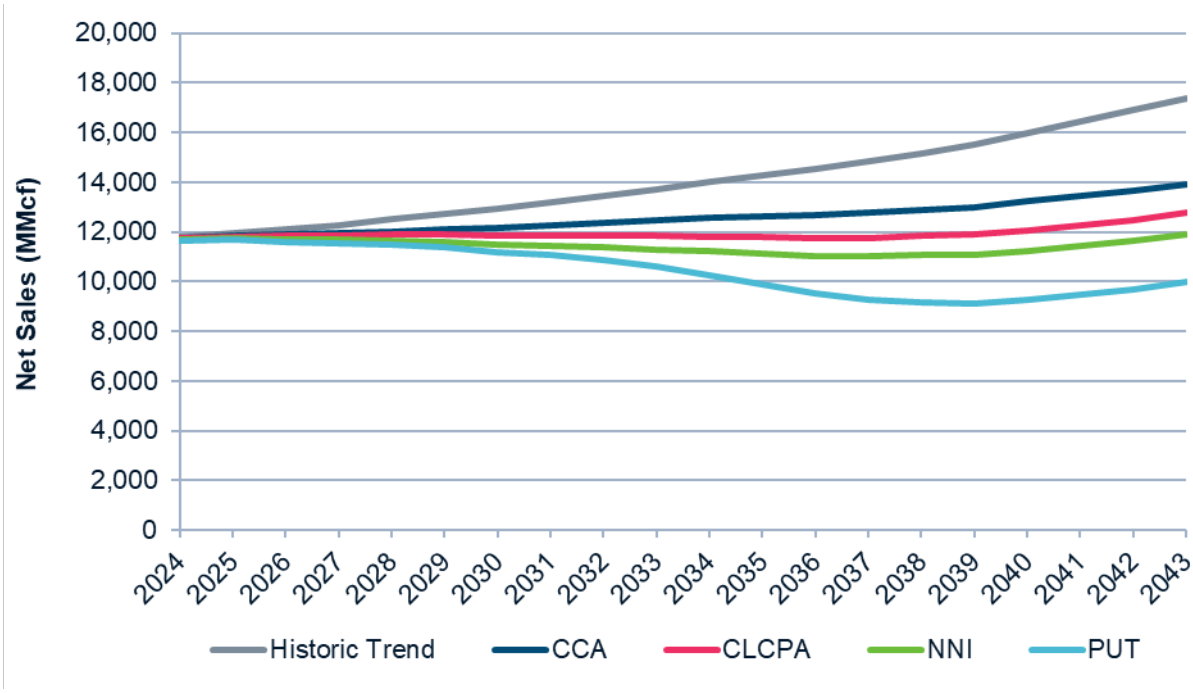
The ILT Plan discusses the Company's CapEx plan for the five-year period 2024-2028. Although the ILT Plan describes four future scenarios, only a single CapEx plan is included. PA plans to explore with the Company if it is reasonable to consider whether some investments may not be needed in the planning scenarios, as well as what the CapEx plan is expected to be for the 15 years beyond 2028 under each scenario.

The Company explained in the ILT Plan that several segments of its distribution system are "highly loaded", meaning the systems are approaching or exceeding their capacity to reliably serve customers on a design day. PA will conduct a more detailed review in the coming weeks, which will include identifying the relationship between distribution improvement investments included in the Company's five-year capital plan.

1.1.3 Demand

Based on our analysis to date, we observe the customer count forecast begins with a "Historical Trend" top-down forecast that reflects historical trends in customer growth, absent policy, legislation or other decarbonization activities. Under the Historical Trend, net sales volume is projected to grow from the 2024 level of 12.9 MMcf to around 17.7 MMcf, all else equal. This Historical Trend forecast reflects the natural gas usage and connections absent incremental interventions discussed within the ILT Plan.[7] At this time, we understand the Historical Trend forecast forms the top-line basis for developing the four scenario forecasts discussed throughout the ILT Plan by subtracting impacts of electrification, efficiency gains, fuel-switching etc. The CCA begins with the Historical Trend and includes incremental effects from NY legislation and policies, including increased budgets as compared to the Historical Trend. However, despite the adoption of current legislation and policies and assuming no change in funding levels of Clean Heat and EE programs, the CCA Scenario predicts a growth in annual net sales (18% growth from 2024 through 2043), given projected increases in connections to the gas systems and continued FO conversions to natural gas. While the Company has successfully converted natural gas heating and water heating customers to electric, the status-quo funding and electrification conversion trend is not enough to elicit a decline in demand in the CCA, CLCPA and NNI scenarios. The PUT scenario is the only forecast in which sales decrease – a decline of 15% from 2024 to 2043. See Figure 1-4 below.

Figure 1-4 Central Hudson Forecasted Net Sales



[7] See, ILT Plan, p. 33.

We appreciate the Company's analysis and efforts to assess the overlap of highly loaded gas systems and the corresponding electric grid to understand the available capacity for electrification of heating. In the ILT Plan, the Company discusses this assessment and the resulting areas where beneficial electrification (and non-pipeline alternatives) could provide relief to segments of its gas distribution system that are currently or anticipated to be constrained. In support, the Company has built a modeling approach, using county level load shapes from the National Renewable Energy Laboratory (NREL) to estimate localized peak demand by scenario, under the assumption this tool will help identify portions of the system requiring further traditional CapEx to maintain safety and reliability, in addition to other portions of the system that would benefit from targeted efforts to mitigate growing demand and the resulting incremental CapEx. PA will conduct a more detailed review of the Historical Trend, the four scenarios and the highly loaded gas system assessment in the coming weeks, as we as we discuss this further with the Company.

1.1.4 Bill Impact

In its ILT Plan, the Company reports that only the PUT scenario will result in a reduction of total gas sales. However, even this scenario assumes some continuation of growth of peak demand around 2039 through 2043. A vast majority of the Company's customers are residential customers who use gas for heating, although, a smaller number of non-residential customers contribute a larger proportion of gas sales. We observe the Company assumes constant customer count after a short period of relative customer count increase for all scenarios, except the CLCPA scenario. This assumption is important for considering bill impacts, as the overall gas revenue requirement continues to be allocated across a fixed number of customers over a majority of the forecast period.

To specifically test this dynamic, the Company presents the NNI Scenario in which growth-related gas investments are mitigated where possible through targeted incentives and restrictions on new residential and commercial connections by 2030. We understand that while the Company's modeled and quantified the savings associated with restricting new connections, the Company cannot impose caps on new connections absent legislative action. We plan to further understand the new gas customer connection assumptions employed and state requirements, such as the All-Electric Buildings Act which enacts new natural gas connection restrictions in certain buildings beginning in 2026.[8] Additionally, we believe more insight is needed to better understand customers switching from FO to gas heating, instead of electric heat pumps, something the Company does not track. This is a notable nuance within the Company's ILT Plan, especially considering sizable non-gas and electric heating sources, like FO, within the Company's service territory.

The ILT Plan presents bill impacts for residential customers to be the most modest across all scenarios, at approximately 0.2-0.3% per year through the entirety of the forecast period to 2043. For commercial and industrial customers, the Company anticipates higher bill impacts in the early forecast period, as high as 18% depending on the scenario, due to the less elastic nature of commercial customer demand, with bill impacts declining in the early 2030s for these customer classes driven by declines in DSM and clean heat funding mechanisms. Under a scenario in which rapid deployment of electrification is potentially fueled by policy mandates, rebates, and/or technological advancement or customer preference, the total volumes of gas delivered to customers could decline much faster than projected in the scenarios presented within the ILT Plan. This could create higher upward pressure on bill impact and affordability challenges for customers remaining on the gas network.

1.2 Summary of Key Observations

In summary, we highlight the following key observations below:

- Only one of the four scenarios (PUT) results in a decline in 2043 net sales vs 2024. This is largely due to the dominance of FO for space heating throughout the territory and assumptions for conversions and new connections. It is important to note that over 40% of the Company's gas consumption is from large non-firm, interruptible customers and six are large transportation-only customers, mostly power plants.

[8] Affordability, Progress, and Prosperity: Senate Passes FY 2023-24 Budget | NYSenate.gov

- Given constant customer counts after a short period of relative customer count increase for all scenarios (except CLCPA), the bill impact reflects that the overall gas revenue requirement continues to be allocated across a fixed number of customers over a majority of the forecast period.
- The existing citygates and transmission system appear to be well positioned to accommodate projected near-term growth. The ILT Plan discusses the Company's CapEx plan for the five-year period 2024-2028. While the ILT Plan describes four scenarios, only a single CapEx plan was included. Scenario-specific CapEx plans, as well as forecasts for the fifteen years beyond 2028, will assist our evaluation. We believe CapEx forecasts for each planning scenario for a 20-year period will better inform decisions to be made regarding service reliability, customer affordability, and reducing reliance on fossil fuels.
- We commend the Company for recognizing the importance of planning and investing for a "single energy delivery paradigm" that emphasizes the linked use of all energy carriers, including gas and electric, throughout their modeling and analysis. By combining gas and electric planning, along with other fuels given their widespread use case in the Company's service territory (e.g., FO), the Company can measure benefits and costs of the proposed scenarios for both its gas and electric customers. In addition, the Company can continue its effort to optimize investments, using granular gas and electric data, to mitigate bill impacts from unnecessary CapEx. Given the small portion of the territory that overlaps both gas and electric services, PA will continue to assess the relative decarbonization potential within these areas.
- By combining gas and electric planning, along with other fuels, the Company has successfully measured the benefits and costs of the scenarios for both their gas and electric customers, using a BCA ratio. The decarbonization scenarios result in similar ratios, at approximately 0.8.[9] This ratio indicates that, in some cases, the costs may outweigh the benefits, meaning higher potential infrastructure and commodity costs will be needed to achieve reductions in GHG emissions. The Company reports that there were some benefit cost categories omitted from the BCA calculations because of challenges to quantify these variables.
- The bill impact calculations seem modest, especially for the residential customer class. If rapid deployment of electrification is fueled by potential policy mandates, rebates, and/or technological advancement or customer preference, the total volumes of gas delivered to customers could decline much faster than projected in the scenarios presented within the ILT Plan, creating even higher upward pressure on bill impact and affordability challenges for customers remaining on the gas network.
- The Company assumes that new construction customers in the service territory who opt to install heat pumps would not connect to the gas system, and based on empirical data, customers who retrofit their heating system to heat pumps do not disconnect from the gas system.
- The use of LCFs through targeted and / or system-wide blending applications is based on critical assumptions for GHG emission reductions in all scenarios. 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 ILT Plan.

1.3 Summary of Recommendations to Improve the ILT Plan

Based upon our work to date, our recommendations for the Company to strengthen the ILT Plan are summarized below:

1. CapEx forecasts for each planning scenario for a 20-year period will better inform decisions to be made regarding service reliability, customer affordability, and reducing reliance on fossil fuels.
2. Explain and quantify how the Company's supply stack meets demand under all four scenarios.
3. Expand on the operational flexibility of the Company's pipeline delivery system; for example, is the entire system interconnected downstream of the four citygates or are there segments of the system

[9] Source: Central Hudson's ILT Plan.

that are isolated and specifically served by one citygate. To this end, discuss risks in satisfying design day demand if deliverability at one citygate is reduced.

4. As it relates to Winter Peaking and Delivered Services supply, discuss the Company's confidence in its ability to continue contracting the necessary volumes of Winter Peaking or Delivered Services volumes to meet winter demand. Expand on the level of risk associated with relying on these supply sources to meet winter demand and discuss the costs associated with procuring these supplies.
5. 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.
6. Explain and quantify the impact of factors like electrification, EE, climate change, etc. over time and across all scenarios, beginning with the Historical Trend forecast.
7. Develop a more robust view on the role of targeted electrification that could lead to the abandonment/retirement of the gas network in certain geographies. Quantifying the number of rebates or subsidies required to close the financial gap to incentivize electrification in certain regions and among certain customer types will emerge from this analysis would be a valuable exercise.
8. Further explore the fuel switching assumptions and explain what share of customers who retrofit their gas appliances do or do not disconnect from the gas system, and why. Value exists in investigating these assumptions and explanations on what is preventing customers from disconnecting from the gas network. Such investigation will be valuable in next steps helping stakeholders better understand the impact of fuel switching on gas volume and peak demand forecasts.
9. Conduct a comprehensive (gas and electric) share of wallet analysis to understand the bill impact of each scenario on customers' affordability and how potential shifting costs from a gas to electric bill would look for each customer class.
10. Conduct a study to show how fuel blending with RNG and hydrogen would impact a representative customer bill within a Disadvantaged Community or a low-income customer over time and the potential impact on energy assistance programs.
11. Further investigate and consolidate the list of barriers that exist for deploying electrification solutions (e.g., heat pumps) across the Disadvantaged Communities.
12. Develop a view on the potential feasibility of a targeted use of RNG and hydrogen in a limited geography for hard to electrify commercial and industrial customers rather than blending these low carbon (and more expensive) fuels with the natural gas supply across the entire system.
13. Further investigate the technical and economic implications of hydrogen production, transport, and distribution across Company's service territory.
14. Further investigate and present the cost of blending hydrogen and RNG into the gas supply compared to the alternative decarbonization solutions (e.g., electrification of residential and small commercial applications, energy efficiency, demand response) to further discuss the bill impact implication of fuel blending.

PA looks forward to gaining better insight into the customer base, demand and supply forecasts, bill impact calculations and results, as well as working with the Company to understand how the addition of LCFs into the supply mix will impact rate payers and GHG emission reductions. PA expects to work with the Company, the Department and Stakeholders to better understand the assumptions and related impacts going-forward, in addition to highlighting areas for further refinement within future scenarios.

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

2 Introduction

New York State has established several of the most progressive and ambitious decarbonization mandates 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, may give regulators increased authority to execute certain aspects of the transition from natural gas. For instance, the proposal includes a repeal of 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. The continued evolution of these mandates and policies will have significant implications for the Company and all other New York natural gas utilities. 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 ILT 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.

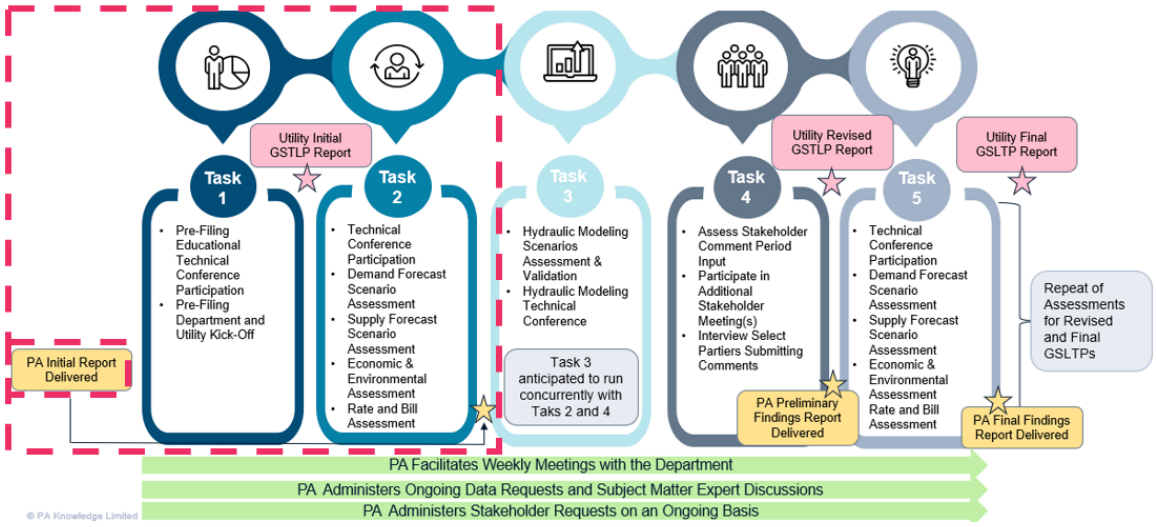
This Initial Report summarizes our initial findings and observations pertaining to the ILT Plan outlines suggested improvements for the Company to consider and provides additional details on our planned assessment as well as other important considerations for PA as we develop our subsequent Preliminary Findings and Final Findings Reports.

2.1 Scope of Work

PA's initial review of the ILT Plan was conducted over approximately one month. During this time frame, PA submitted and received responses from the Company to over 70 data requests, held several virtual meetings with various subject matter experts from the Company, and attended the virtual pre-filing and post filing technical presentations. Company personnel have provided significant amounts of requested data and have made their experts available for meetings and cooperation with PA.

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 Initial Report to first address the supply and demand considerations which form the basis of evaluating future investments, followed by the other aspects of the ILT Plan which cumulatively provide the basis for PA's overall initial recommendations. PA notes that additional analysis will be conducted as the Company provides additional data in response to data requests, modifies the ILT Plan, and addresses stakeholder feedback over the next several months. This Initial Report outlines the key areas where additional analysis will be completed by PA over the next several months. Below is a list of the key topics we will cover:

- Stakeholder Engagement
- Supply Assessment, including:
  - Supply Stack
  - Hydraulic Modeling
  - Capex Considerations
- Demand Assessment, including:
  - Load Forecast Observations
- Economic Assessment, including:
  - Bill Impact
  - Electrification
  - Disadvantaged Communities
- Environmental Assessment, including:
  - GHG Emissions
  - Low Carbon Fuels

3 Stakeholder Engagement

The Order encourages 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 facilitate a robust stakeholder engagement process. Within this section of our Initial Report, we discuss the stakeholders engaging in the proceeding and technical conferences held 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.

Thus far, the stakeholders engaging in this proceeding include NYSERDA and Citizens for Local Power. Stakeholders have and will continue to have the opportunity to attend various Technical Conferences. Stakeholders will be able to submit comments and reply to comments on the various iterations of the long-term plans put forth by the Company.

3.1 Technical Conferences

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. Subject matter experts 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, administered 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. Further Technical Conferences will be requested by PA (and potentially other stakeholders) to continue discussing specific aspects of the ILT Plan.

4 Supply Assessment

PA has undertaken its review of several supply and supply-related aspects of the Company's system, based on information presented in the ILT Plan and responses from the Company to a number of related data requests. Our initial observations are summarized within the sub-sections below. We first highlight components of the supply stack, then discuss hydraulic models of the systems. We conclude with comments on supply-related aspects of the capital forecast.

The majority of the natural gas consumed within the Company's footprint is sourced from the Marcellus shale, including a modest volume of RSG.[10] The Company has proposed enhancing its utilization of RSG (natural gas obtained from suppliers that proactively manage their methane emissions) and is seeking to expand purchasing of RSG in the current rate case. The Company's transmission system receives gas at the four interstate pipeline interconnections (or citygates) and delivers that supply throughout the distribution system footprint. Collectively, the four interstate pipeline interconnections are currently capable of flowing more gas on a design day than is required by the Company's customers at this time, so as demand grows 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 five-year capital plan, the transmission system generally appears to be well positioned for continued reliability.

For winter peaking needs, the Company relies on delivered services contracts and spot purchases, if necessary, to meet peak demand. The Company typically issues an 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. However, the Company indicates it does not anticipate opportunities for de-contracting over the next five years. Therefore, in the near term, it is reasonable to expect a rather static supply stack. As PA further analyzes the peak day demand forecast, we will assess the feasibility of de-contracting pipeline capacity.

Given the importance of reliable supply for meeting customer demand, PA will continue to explore these and other issues in the coming weeks and will include our findings in our Preliminary Report.

4.1 Supply Stack

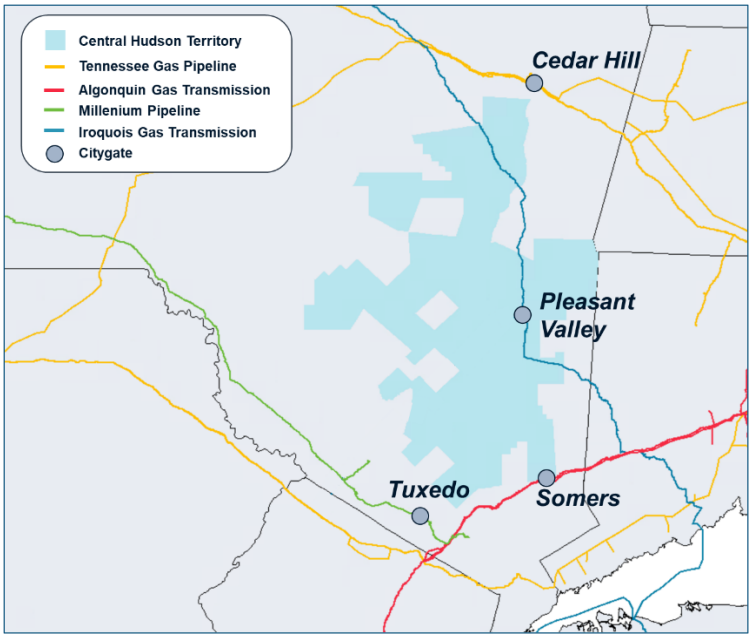
As mentioned above, the system is supplied at four citygates that feed one contiguous service territory. The interstate natural gas pipelines are interconnected with the Company's network as follows:

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.

[10] Source: Company's responses to PA 1-3 and 3-57 Attachment 1.xlsx

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



4.1.1 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 directly to citygates connected to the Company's local distribution system but may be delivered to a point upstream of the Company. 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 supply comprised of natural gas supplied by a mix of the Company and Energy Service Companies (ESCO). This volume includes storage withdrawal contracts. In this context, ESCOs are companies that can sell natural gas directly to customers via interstate pipeline capacity released by the Company, as well as the utility's distribution system.

In the ILT Plan, the Company explains that its natural gas is procured to satisfy demand behind citygates and that its supply stack has remained relatively static, 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. By indicating that natural gas is procured to satisfy demand behind citygates, the Company raises the question of how flexible it is to move natural gas across its service territory from an area served by one citygate to an area served by a different citygate. Understanding this question is key to understanding if the Company can serve demand across the entire territory if deliverability at a given citygate is reduced.

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. In the Revised Long-Term Plan, we recommend that 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. To better understand deliverability risks, PA recommends that the Company expound on the degree to which it has flexibility to move supply across its territory to serve demand in different regions, or if individual regions are fully reliant on natural gas sourced at a given citygate.

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 and Winter Peaking Supplies are often procured in response to upcoming winter demand, the volumes

fluctuate slightly for 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 its existing forecast, the volumes of Winter Peaking Supplies fluctuate between 40 and 45 MDth/d.[11]

In the ILT Plan, the Company explains its general methodology for seeking Winter Peaking Supplies before a winter season but does not indicate the relative expense of these supplies when contrasted against 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. In the ILT Plan, the Company did not discuss the level of risk associated with contracting Winter Peaking Supplies and Delivered Services.

While the Company's supply portfolio is relatively straightforward and un-complicated by major supply related projects, it is still important that the Company communicate how it perceives risk in securing incremental supply to serve demand during winter seasons. It is especially important for the Company to provide additional detail insofar as the risks inherent in procuring winter supply could result in increased costs for customers. It may be beneficial for the Company to indicate if and how its RFP process for securing Winter Peaking Supplies results in least-cost outcomes for consumers – and if or how the Company expects that to change going forward.

Because these types of supply are important to balance supply and demand during the winter season, PA recommends that the Company relay its level of confidence related to securing sufficient supplies to meet demand prior to the winter season and identify any general risks related to the availability and cost of these types of supply. PA also recommends that the Company quantify the potential cost of these types of supply.

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 ILT Plan, 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 of the Company's discussion of its de-contracting methodology is that it does not consider how de-contracting might apply in its alternative scenarios. While it may be relatively early to implement specific de-contracting details, it may be beneficial to consider – in broad terms – how soon de-contracting may need to be considered under all four planning scenarios, especially those that consider more rapid declines in demand.

The Company indicated that its supply portfolio was sufficient to meet expected demand under the CCA but did not go so far as to 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, it would be valuable for the Company to 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 both system CapEx requirements and ongoing affordability.

4.2 Hydraulic Modeling

The Company explained in the ILT Plan that several segments of its distribution system are "highly loaded", meaning that they are either approaching or even exceeding their capacity to reliably serve customers on a design day. PA has reviewed hydraulic modeling results for 11 "highly loaded" segments of the distribution system as provided by the Company[12]. We will conduct a more detailed review in the coming weeks which

[11] Source: Company's response to PA 1-3 and 3-57 Attachment 1.xlsx
[12] Source: Company's response to PA 1-2.

will include identifying the relationship between distribution improvement investments (comprising nearly 74% of the overall forecast) included in the Company's five-year capital plan (discussed below in Section 4.3) and may also request discussions with the Company's subject matter experts.

4.3 Capex Considerations Related to Supply Matters

The ILT Plan discusses the Company's CapEx plan for the five-year period 2024-2028 (the five-year forecast). PA's initial observations of the investment plan are discussed below, particularly as the plan relates to safe and reliable delivery of supply. We will work to better understand the various categories of investment in the coming weeks.

4.3.1 General Observations

While the ILT Plan describes four future scenarios, only a single CapEx plan is included. It is PA's assumption that the Company is taking a position that CapEx will be the same in the near term in each scenario. PA plans to explore with the Company whether it is reasonable to consider whether some investments may not be needed in certain of the planning scenarios, as well as what the CapEx plan is expected to be for the 15 years beyond 2028 under each scenario.

PA also observes an increase in overall annual CapEx in 2024-2028 vs. actual investments in 2018-2023.[13] The average annual CapEx in the projected five-year period is approximately 31% greater than the average annual investments in the historical six-year period. The primary drivers appear to be investments in (1) the transmission system, and (2) improvements (such as replacements or reinforcements) to the distribution system. Annual investments to serve new customers are forecast to be on par with actual investments in 2018-23 for the first two years of the projected period; the Company's investment plan reflects an approximate 25% decline in those investments from 2025 to 2026, with modest annual increases thereafter (for 2026-2028).

Figure 4-2 illustrates the relative size of the investment types making up the Company's overall five-year forecast.[14] Table 4-1 summarizes the investment amounts associated with that forecast, as well as for the 2018-23 period.[15]

[13] Investments made in 2018-2022, and projected for 2024-2028, were provided in the Company's confidential response to PA 2-39. The Company provided actual investments in 2023 in a supplemental response.
[14] Percentages are from confidential response to PA 2-39.
[15] Information provided in response to PA 2-39.

Figure 4-2: Makeup of Central Hudson Five-Year CapEx Forecast

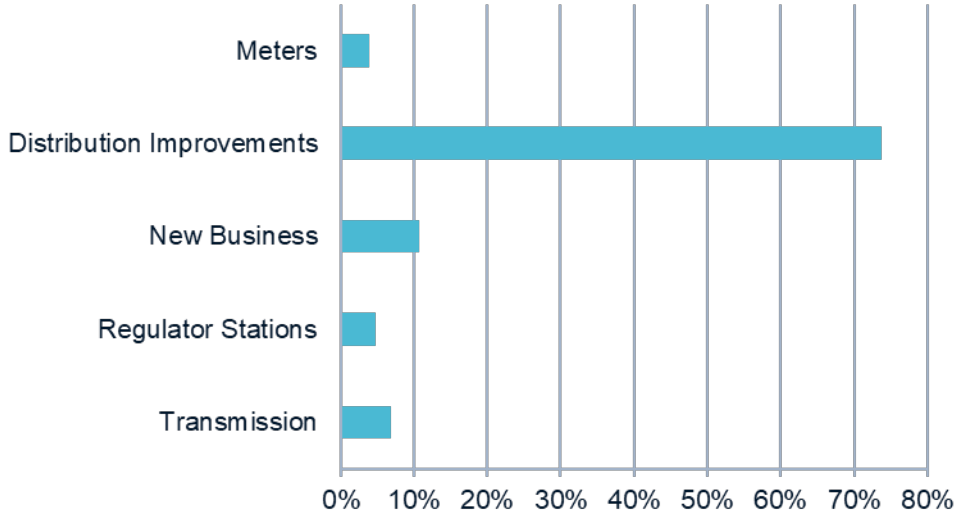


Table 4-1: Central Hudson Historical and Projected Capital Investments ($000)

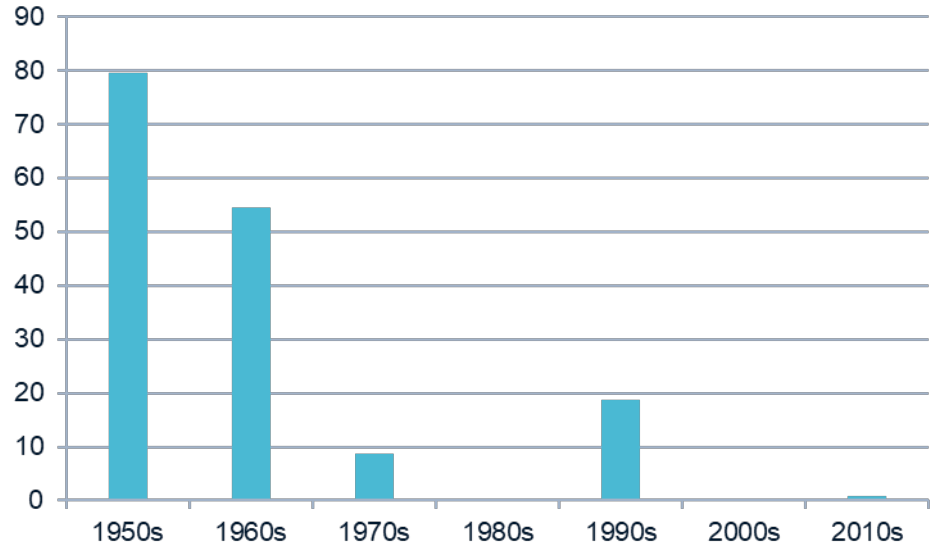
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Transmission	$1,016	$753	$931	$1,559	$1,112	$3,326	$4,240	$6,647	$6,818	$4,493	$5,672
Regulator Stations	$2,070	$2,787	$1,767	$1,873	$2,581	$3,596	$3,304	$3,592	$3,820	$4,376	$4,337
New Business	$11,451	$9,961	$9,282	$11,249	$10,506	$10,578	$9,955	$10,373	$7,738	$7,908	$8,313
Distribution Improvements	$45,883	$49,556	$54,264	$43,246	$39,076	$46,209	$51,581	$56,374	$60,382	$63,691	$69,912
Meters	$2,672	$2,621	$2,478	$2,180	$2,012	$2,776	$2,926	$3,028	$3,213	$3,405	$3,611
Total	**$63,092**	**$65,678**	**$68,721**	**$60,108**	**$55,287**	**$66,484**	**$72,006**	**$80,014**	**$81,971**	**$83,873**	**$91,845**

4.3.2 Transmission Investments

The Company operates 162.37 miles of transmission pipelines. 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 4-3 illustrates the age of the Company's transmission system.[16]

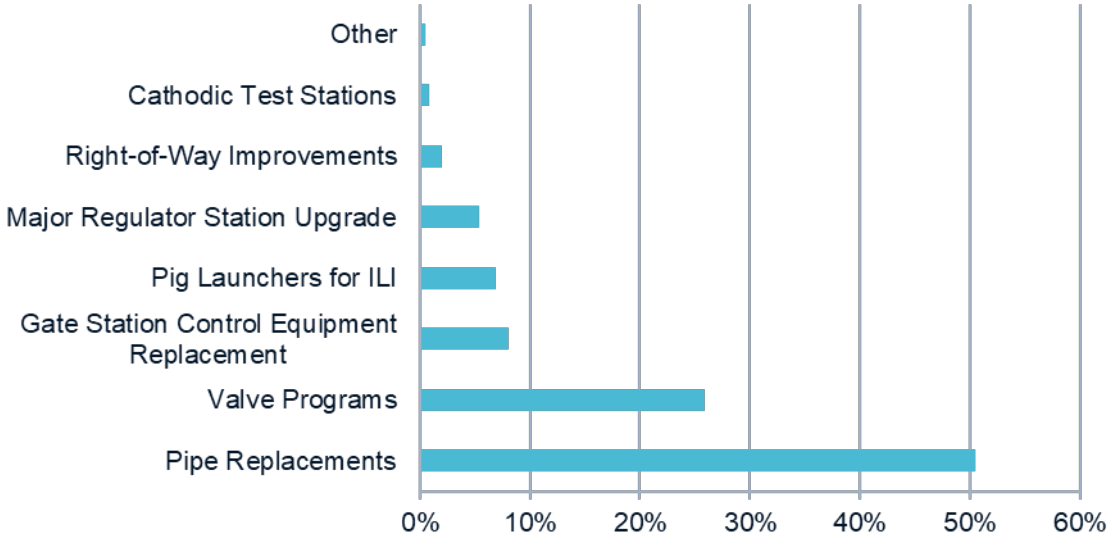
[16] Transmission system data included here is from the Company's Annual Gas Transmission Report submitted to PHMSA for calendar year 2022 (PA 1-6). Information will be updated as data for 2023 becomes available. 0.21 miles were installed in the 1980s and 2000s in total, along with 0.82 miles in the 2010s.

Figure 4-3: Transmission Miles in Service by Decade Installed



Investments 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 of investment make up approximately 75% of the transmission investments included in the five-year forecast. Figure 4-4 reflects the makeup of the transmission system portion of the Company's five-year forecast.

Figure 4-4: Makeup of Transmission CapEx Forecast



Transmission Pipeline Replacements

The Company's capital forecast includes replacement of segments of its transmission system through 2035 to comply with Federal regulations. The Pipeline and Hazardous Materials Safety Administration (PHMSA) issued a final rule in October 2019 that requires operators of transmission lines to reconfirm the maximum allowable operating pressure (MAOP) of certain of those pipelines in their systems. In the absence of traceable, verifiable, and complete records[17] 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. 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

[17] 49 CFR Part 192.624 Maximum allowable operating pressure reconfirmation: Onshore steel transmission pipelines. (July 1, 2020).

required by July 2, 2035. 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. Based on a preliminary assessment, reducing the pressure on the existing transmission system is not feasible from a reliability perspective, and in general there is an inherent risk of failure associated with re-testing these pipelines which may have been in service for decades.[18] PA is aware the replacement path is not uncommon as operators across the United States address this type of compliance issue.

As indicated in the ILT Plan, 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. Upon an initial review of project plans and cost estimates, alongside a review of the five-year forecast, it appears there may be transmission replacements contemplated that are not required by the PHMSA MAOP Reconfirmation requirements. PA will work to validate our understanding of what may be driving other transmission replacement requirements and determine whether modifications by the Company might be appropriate.

Transmission Valve Programs

The five-year forecast includes investments to replace existing valves with those that can accommodate remote operators as well as In-Line Inspection (ILI) tools. It also includes investments to install new valves to address deficiencies in valve spacing that have resulted from population growth and new building construction. These investments are in large part driven by PHMSA requirements. Our preliminary observation is that ongoing investment in the transmission system – the backbone of the gas delivery system on which all customers depend – is reasonable and appropriate.

4.3.3 Distribution Investments

As noted previously, investments to replace and reinforce the distribution system drive much of the five-year forecast, making up nearly 74% of the overall forecast.[19] Moreover, annual investments in 2024-2028 are projected to be materially higher than for the historical period 2018-2022; the average annual distribution improvement investment in the forecast period is approximately 30% higher than in the historical period.[20] Distribution investment types include (among other things) replacement of Leak Prone Pipe (LPP), relocation of facilities due to state or local highway or municipal improvement projects, major leak repairs, and remediation of exposed or undermined pipelines. PA will request additional details from the Company on the makeup of the five-year forecast, particularly as it relates to distribution investments.

We discuss some of the programs identified in the ILT Plan and will further investigate the nature of distribution improvement investments in general to better understand the drivers, including (as discussed previously) investments to improve design day reliability on highly loaded systems.

Leak Prone Pipe (Distribution)

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 66.8 miles of leak-prone distribution main, along with 3,517 leak-prone service lines, in service as of the end of 2023.[21]

Under its 2021 rate plan, the Company is required to eliminate at least 15 miles of LPP main per year.[22] Based on this requirement, all LPP main will have been eliminated by the end of 2028.

[18] Central Hudson's confidential 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.
[19] Source: Company's Confidential response to PA 2-39.
[20] Ibid.
[21] Source: Company's response to PA 1-7.
[22] Source: ILT Plan, page 22.

Proposed Leak-Prone Service Lines Program

In its pending rate case (Case No. 23-G-0419), the Company has proposed a program to replace LPP service lines that are not associated with LPP main to be replaced. Based on information provided in response to data requests, it appears that investments under this program (if approved) would extend beyond the forecast period.

PA considers it reasonable to propose a program for leak-prone service lines that serves the same purpose as the LPP main replacement program. We will continue to explore the interface(s) between the replacement programs and NPA opportunities.

Large Diameter Gas Welded Pipe Replacement Program

The Company describes in the ILT Plan a replacement program targeting large diameter welded steel pipe. The program has been in place for at least five years;[23] since the end of 2017 and through 2023, the Company has reduced its targeted pipe inventory by more than 25% through investments totaling nearly $44 million. The five-year forecast includes another $13.3 million, which will target an additional 10% of the targeted large diameter welded pipe inventory in service as of January 1, 2018. PA notes that there appears to be some level of overlap between this program and the LPP replacement program and will continue to explore the drivers of these investments.

4.4 Recommendations to Improve the ILT Plan

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

1. CapEx forecasts for each planning scenario for a 20-year period will better inform decisions to be made regarding service reliability, customer affordability, and reducing reliance on fossil fuels.
2. Explain and quantify how the Company's supply stack meets demand under all four scenarios.
3. Expand on the operational flexibility of the Company's pipeline delivery system; for example, is the entire system interconnected downstream of the four citygates or are there segments of the system that are isolated and specifically served by one citygate. To this end, discuss risks in satisfying design day demand if deliverability at one citygate is reduced.
4. As it relates to Winter Peaking and Delivered Services supply, discuss the Company's confidence in its ability to continue contracting the necessary volumes of Winter Peaking or Delivered Services volumes to meet winter demand. Expand on the level of risk associated with relying on these supply sources to meet winter demand and discuss the costs associated with procuring these supplies.
5. 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.

[23] Source: Company's response to PA 2-42.

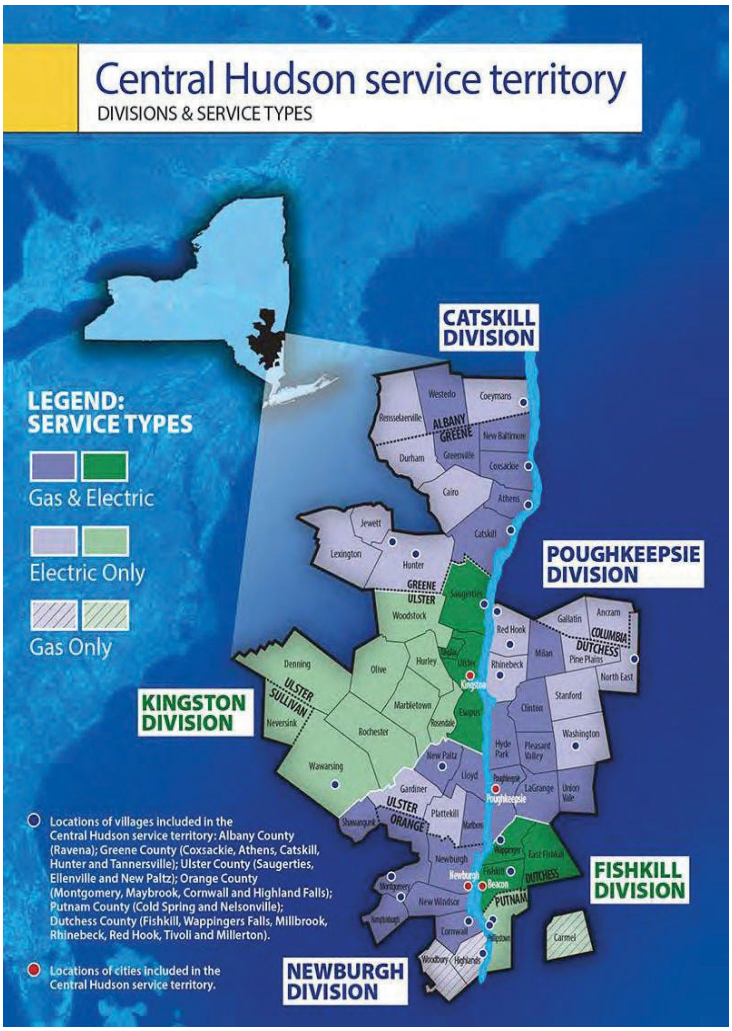
5 Demand Assessment

PA has reviewed the Company's demand and load forecast as presented in the ILT Plan and responses from the Company to a number of related data requests. Our initial observations are summarized within the sub-sections below. We highlight the components of the load forecast, including customer counts, sales volume, demand side management (electrification, energy efficiency and demand response).

5.1 Introduction

PA has begun its review of the forecast components, based on information presented in the ILT Plan and responses from the Companies to initial data requests. Our initial observations are discussed in this section. As described in the ILT Plan, 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 5-1:

Figure 5-1: Map of Central Hudson's Service Territory[24]



PA finds the two main dynamics shaping the Company's gas peak demand are:

- Declining growth in customer counts driven by evolving demographics, and
- The downward pressure of electrification and energy efficiency on delivered gas volumes propelled by a combination of technological change, state and federal policy and local laws.

[24] Source: Figure 5 in Central Hudson's ILT Plan.

5.2 Load Forecast Observations

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 forecast is a function of the customer forecast). The 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".[25] Based on the trend, as shown in Figure 5-2 as the Historical Trend," the net sales volume is projected to grow from the 2024 level of 12.9 million Mcf to around 17.7 million Mcf, an increase of 47%, all else equal. That outcome rests on a statistical model driven by a time-trend variable – in other words this forecast implies the continuation of historical patterns well into the future.

Our understanding is that this Historical Trend forecast forms the top-line basis for developing the four scenario forecasts by subtracting impacts of electrification, efficiency gains, fuel-switching, etc. PA considers it critical to conduct a detailed analysis to study the manner in which this forecast was constructed to fully assess the Company's scenario volumetric and Peak forecasts. We will work with the Company, Department and Stakeholders over the coming weeks to complete this assessment.

Figure 5-2 Central Hudson Forecasted Net Sales

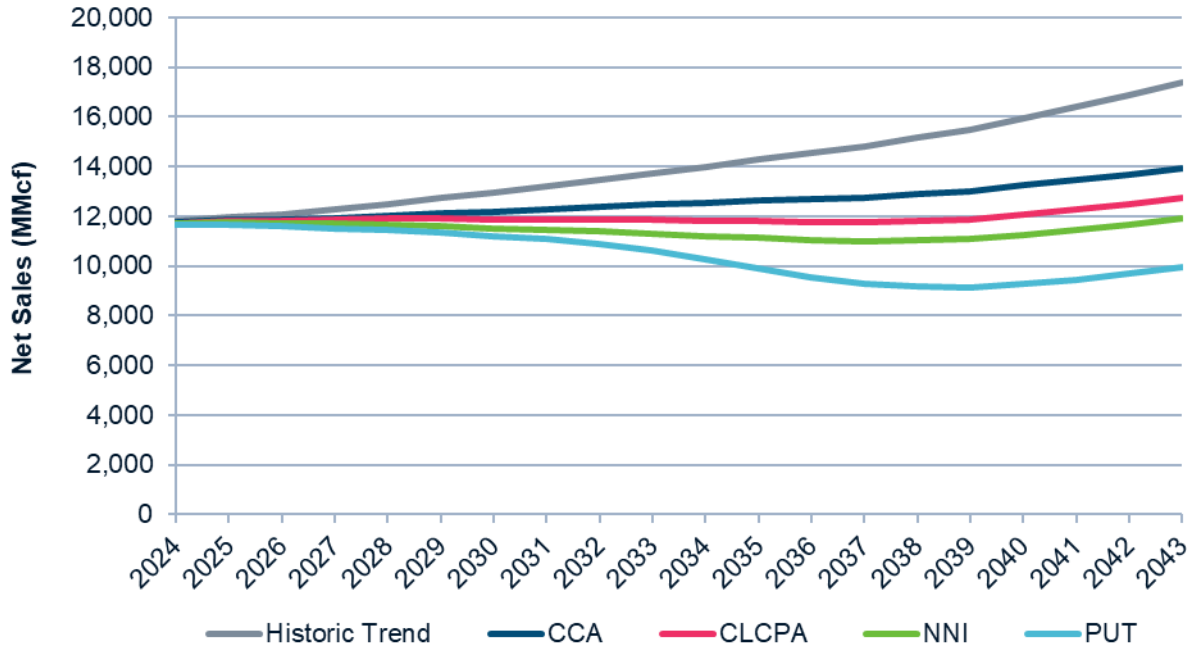


Figure 5-2 above also exhibits that the sales forecast under the CCA scenario (reference forecast), is projected to grow from the current weather-normalized level of around 11.7 million Mcf to 13.9 million Mcf by 2043 – a rise of 18%. Associated with the CCA scenario is the assertion that "(o)bserved residential customer growth trends are generally assumed to continue through 2043 under the CCA Scenario, in which residential accounts will increase by approximately 17% over the evaluation period,"[26] implying a growth from the current level of around 74,700 customers to over 87,400 by 2043. As shown within the table below, the CLCPA scenario sales grow by 9% by 2024 as advancements in heat pumps, system-wide transition approach and caps on new connections starting 2030 take effect. Under the NNI scenario, 2043 sales increase by 2% as the Company anticipates an assertive effort to identify highly loaded areas and use NPAs where possible. This scenario assumes up to a five-time increase in heat pump incentives and weatherization (in highly loaded

[25] 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.

[26] The NNI, CLCPA Approach, and PUT Scenarios restrict the deployment of growth-related capital, meaning that new customer accounts are restricted in highly loaded regions of the Central Hudson system. Residential customer growth under these scenarios is held to approximately 6% over the 20-year planning period. Commercial accounts growth figures are assumed to mirror residential account growth." Refer to page 56 of Central Hudson's ILT Plan.

areas), and caps new connections starting 2030. Finally, the PUT scenario is the only forecast in which sales decrease – a decline of 15% by 2043.

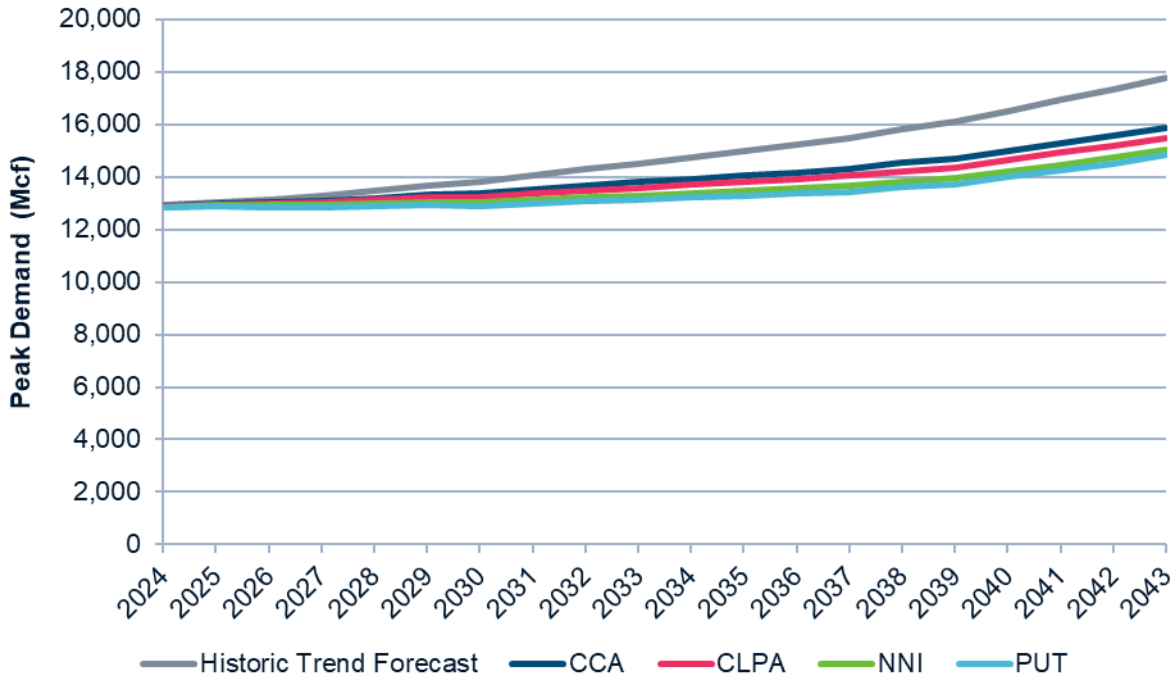
Table 5-1 Scenario Demand Forecast Key Outcomes

	CCA	CLCPA	NNI	PUT
2043 Net Sales % change from 2024	2 MMCF, 18% increase	1 MMCF, 9% increase	0.2 MMCF, 2% increase	-2 MMCF, 15% decrease

In terms of usage patterns, the ILT Plan states that there has been a concerted decline in the average residential annual use-per-customer (UPC). It is reasonable to expect that with growing efficiency impacts, weatherization etc., that trend will continue. However, the trend in the Company's forecast suggests that the CCA forecast reflects a growing UPC and/or number of customers. PA thinks it important to analyze further this aspect of the forecast to determine the general reasonability of the load forecast. This analysis will involve analyzing the underlying assumptions, modeling approach, etc.

We observe that 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 earlier, PA understands the Company is currently capable of flowing more gas on a design day than is currently required by their customers, so as demand grows in the near term, as illustrated in Figure 5-3 below, PA would not expect there to be a need for additional investments in those city gates to accommodate that growth.

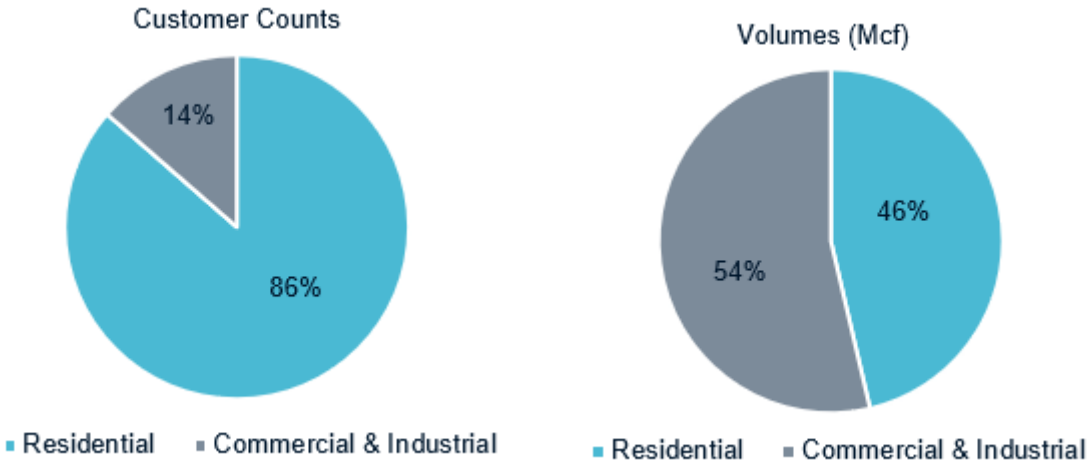
Figure 5-3 Central Hudson Forecasted Peak Demand



5.2.1 Customer Base

A vast majority of the Company's customers are residential customers who use gas for heating, although, a smaller number of non-residential customers contribute a larger proportion of gas sales than residential, as illustrated in Figure 5-4. While 86% of customers are residential, only 46% of total volumes are associated with this segment. We observe the Company assumes constant customer counts after a short period of relative customer count increase for all scenarios, except CLCPA.

Figure 5-4: Customer Count and Sales Volume by Class (as of December 2023)



Approximately 20% of annual gas sales are for interruptible customers, who are required to curtail gas use in full when called upon. The Company also offers interruptible rate options for large gas customers to pause service for select hours of high demand, as a part of their overall rate structure. This will be an important factor as we continue assessing the implications for decarbonization of these harder to decarbonize customers.

The Company's territory is characterized by a challenging macroeconomic environment that exhibits a duality:

- A relatively affluent and vibrant core with steady/growing incomes and new construction (situated in the metro areas proximate to the New York State Thruway), and
- A periphery with modest living standards and an aging housing stock.

Furthermore, the commercial sector in these sub-categories reflects the residential patterns.

Based on analysis of data from Moody's Analytics, the region's economy has undergone a noticeable setback since the advent of Covid. While the region's Gross Metro Product (GMP) had recovered from the previous recessionary period and showed healthy growth, the economy at large has shown an average annual growth rate of 0.85% over the 2004-2023 period. The GMP forecast projects the economy will recover but not to the level that existed pre-Covid; GMP is slated to grow at an average rate of 1.77% over the next decade. As far as Employment is concerned, the area suffered a net job loss over the last two decades and the job market is projected to grow at a modest rate of 0.17% over the coming decade.

A central feature of the Company's market is a dramatic slowdown in Population growth. Population fell between 2010 and 2019, the Covid era 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 prime driver of Residential and Commercial customer growth – had also been fairly robust pre-Covid but the forecast reflects a sustained decline going forward. Together, these patterns suggest a challenge with respect to future customer growth.

5.2.2 Electrification

While there are different ways to project how electrification could unfold in the building sector across various timelines and various regions, two primary pillars must be addressed to properly incorporate electrification and its impact on gas utilities.

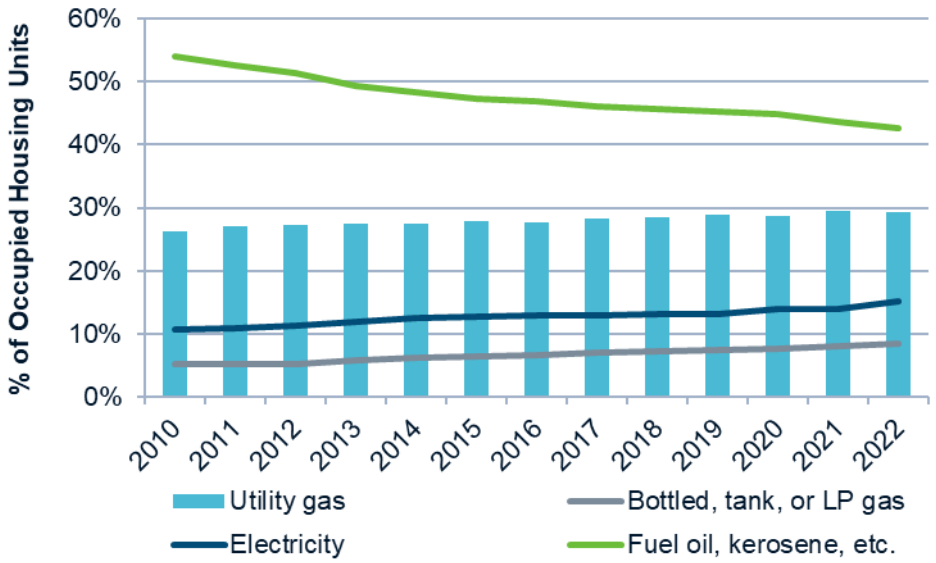
- First, the time when a new building is built, and
- Second, conversions from gas to electric appliances.

When a new building is built, it could be built with or without a gas hook-up depending on a variety of factors, including residents' preference, home developers' familiarity and experience with heat pump technology, local building codes, state and local policies, economics of each technology, proximity to existing natural gas mains, cost, etc.

The second path to account for electrification is conversion from gas to electric. 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). Since not all appliances fail at the same time, the switching decision for all appliances is typically not made in the same timeframe. Given the Company's sizeable addressable market of oil-heating homes the Company does have the potential to keep adding to its gas customers despite the overall economic conditions. This reality presents a scenario whereby gas customers and sales could continue to increase, at least in the near term.

PA obtained county level data for Selected Housing Characteristics published by the American Community Survey (ACS)[27] for Dutchess, Ulster and Orange counties in order to gauge heating fuel choices in the Company's service territory. Since the market covers just the northeastern portion of Orange County, we thought it appropriate to apply a weight of 31%[28] to the data from that county to aggregate the ACS data.

Figure 5-5 Central Hudson Housing Characteristics



As illustrated within Figure 5-5 above, a very pertinent characteristic of the Company's territory is the dominance of FO as the heating fuel of choice. While its share in the territory has been declining since 2010, almost 43% of all occupied housing units still use fuel-oil for space heating. Given the region's socioeconomic landscape, with over 97,000homes still on oil, there are strong implications for the potential for fuel switching in favor of gas – a crucial consideration for the Company as it navigates its course as the agent of transformation toward decarbonization. While the share of utility gas as a heating fuel has a modest growth over the past decade – from 27.6% of occupied homes in 2013 to 29.4% in 2022 – the share of container gas (propane, tank etc.) has also grown from 5.8% to 8.4% correspondingly. This suggests that a slice of the region's population is gradually moving off legacy heating fuels and upgrading but not entirely to utility gas.

[27] Source: https://data.census.gov/table?q=DP04

[28] Assuming the footprint covers the Orange County towns of Cornwall, Highlands, Montgomery, Newburgh and Woodbury, we arrived at the weight based on the latest population figures - relative to the county as a whole.

5.3 Recommendations to Improve the ILT Plan

Recommendations for the Company to improve the customer and load forecast components of the ILT Plan are summarized below.

1. Explain and quantify the impact of factors like electrification, EE, climate change, etc. over time and across all scenarios, beginning with the Historical Trend forecast.

6 Economic Assessment

PA has begun a review of the economic and environmental aspects of the ILT Plan based on information presented in the ILT Plan and responses from the Company to several related data requests. Our initial observations are summarized within the following sub-sections. We first highlight the bill impacts related to the Company's rate forecast, followed by the impacts to disadvantaged communities within the Company's territory. Given the importance of these topics, PA will continue to explore economic and environmental considerations, including Company analyses, stakeholder comments and policy considerations. Our evaluation will be both qualitative and quantitative.

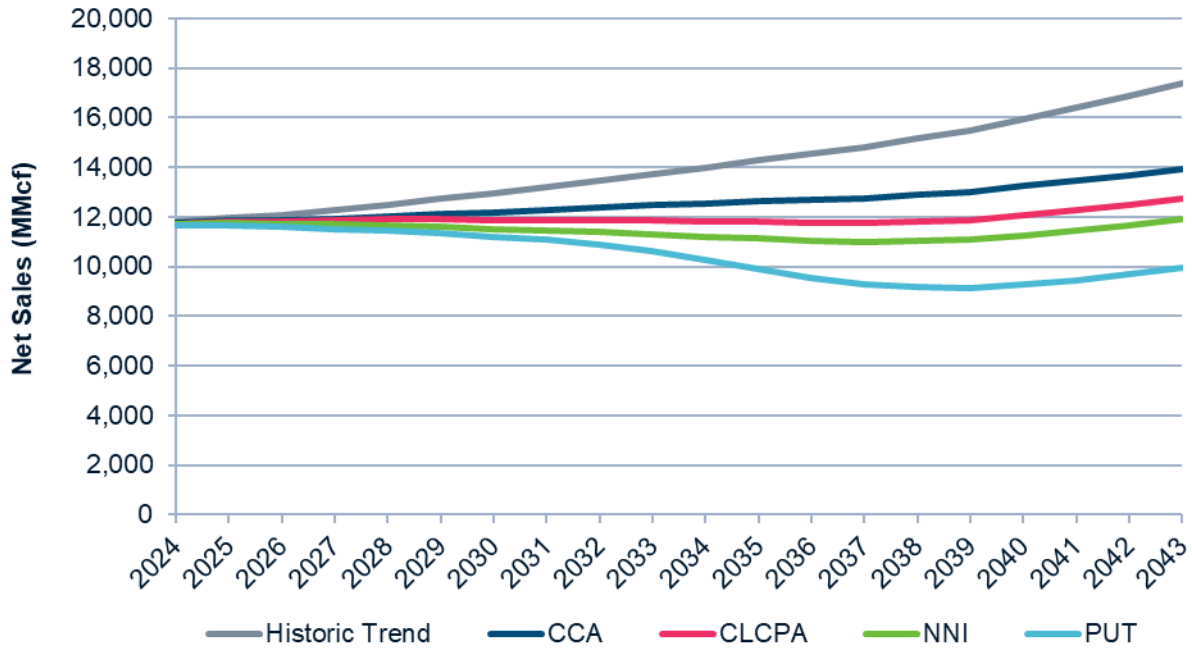
6.1 Bill Impact

The Order requires the Company to provide clear quantitative and qualitative explanations for their proposed capital projects and an estimated bill impact and net present value of estimated costs. In the ILT Plan, the Company stresses the importance of maintaining affordability for all customers and emphasizes efforts to ensure that their customers continue to have safe, reliable, and equitable access to energy throughout the clean energy transition. The Company focuses on preserving safety, resiliency, and affordability across the four decarbonization scenarios in the ILT Plan.

As discussed earlier, we commend the Company for recognizing the importance of planning and investing for a "single energy delivery paradigm" that emphasizes the linked use of all energy carriers including gas and electric planning throughout their modeling and analysis. By combining gas and electric planning, along with other fuels given their widespread use case in the Company's service territory, the Company can measure benefits and costs of the scenarios for both their gas and electric customers. In addition, the Company can continue its effort to optimize investments, using granular gas and electric data, to mitigate bill impacts from potential unnecessary CapEx deployments. The Company identifies its ILT Plan as only one component of a broader process to advance electric and gas integration and planning work moving into the future.

The Company indicated that they used a dynamic, bottom-up model for each of the decarbonization scenarios to assess a variety of factors, including bill impacts to their customers. The Company reports that only the PUT scenario will result in a reduction in total gas sales as illustrated in Figure 6-1.

Figure 6-1: Forecasted Annual Sales Under the Four Decarbonization Scenarios



However, even the PUT scenario assumes a continuation of growth of peak demand. A vast majority of the Company's customers are residential customers who use gas for heating, although, a smaller number of non-residential customers contribute a larger proportion of gas sales. We observe that the scenarios anticipate the

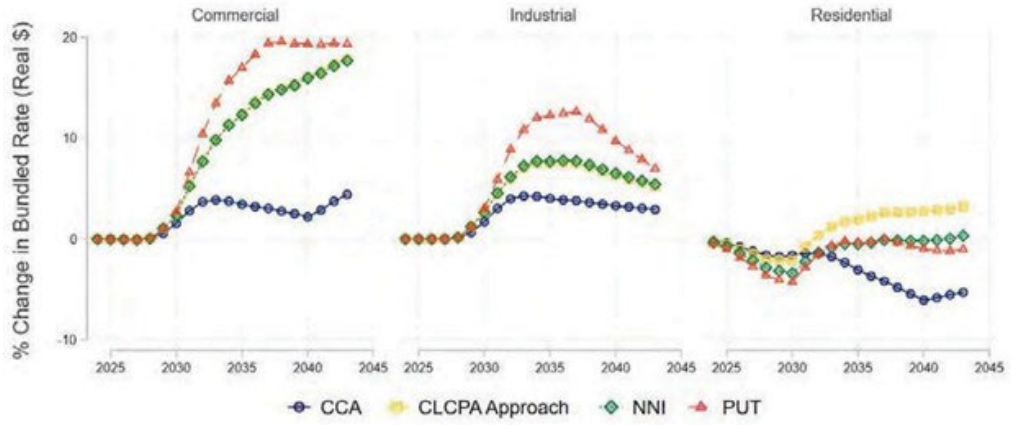
most significant decline in sales to be in the residential customer class. The Company reports that their modeling assumes a constant customer count, or a period of no change, following a short period of relative increase in customer counts for all scenarios, except CLCPA. This assumption impacts the bill impact analysis as the overall gas revenue requirement continues to be allocated across a fixed number of customers over a majority of the forecast period.

In its ILT Plan, residential customers bill impacts are reported to be modest, at between 4-6% through the entirety of the forecast period to 2043, or approximately 0.2-0.3% per year. For commercial and industrial customers, Company anticipates higher bill impacts in the mid to late forecast period, as high as 10-18%, or approximately 0.47-0.83% per year, based on the scenario, due to the less elastic nature of commercial customer demand, with bill impacts declining in the early 2030s for the industrial customers but keeps increasing for commercial customers because of assumed declines in DSM and clean heat funding mechanisms. The primary drivers for these rate increases are the:

1. Assumed reduction in total volumes of gas delivered in the denominator of the bill impact calculation, and
2. Investments in the gas network, cost of LCFs fuel blending, and other operational expenses that will be increasing in the nominator of the rate impact calculation.

The change to gas bills for the Company's various customer classes are illustrated in Figure 6-2.[29]

Figure 6-2: Percent Bill Impact for Residential, Commercial, and Industrial Customers (2024-2043)



6.2 Electrification

Plenty of initiatives and programs exist in New York to support the electrification of the transport and buildings sectors. New York State (NYS) Clean Heat[30] is a prime example of a public-private partnership supporting the deployment of low carbon solutions. NYS Clean Heat launched April 1, 2020, provides customers, contractors, and other heat pump solution providers with a consistent experience and business environment, and includes initiatives to advance the adoption of efficient electric heat pump systems for space and water heating applications 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, ground source heat pump (GSHP) systems, variable refrigerant flow (VRF) systems, commercial and multifamily heat pump systems and heat pump water heaters (HPWHs). NYS CHP 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 Inflation Reduction Act (IRA) bill 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 heat pumps more affordable than before. While the Order does not

[29] Source: Figure 4 and Figure 42 in Central Hudson's ILT Plan.
[30] https://cleanheat.ny.gov/

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 ILT Plan, which is very helpful.

As discussed earlier within Section 5, in order to achieve material reductions in gas sales, measures must either significantly address transitions of industrial loads or fuel switching for a significant number of residential customers. The Company provides gas but not electric to customers in Carmel, Highland Falls, and Woodbury service districts. 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. And the Company acknowledges the impact of gas planning beyond the gas utility and has developed BCA ratios to quantify the benefits and costs across the decarbonization scenarios. However, in its ILT Plan, the Company also highlights some challenges in quantifying certain impacts in a benefit cost analysis calculation. Further understanding from the Company on assumptions underpinning the four scenarios including the customer count and sales, gas supply and CapEx will inform our observations of the scenario BCA results. scenario. We will continue our assessment of the BCA results presented within the ILT Plan.

The Company has indicated a potential future where the gas distribution network extends to most of these non-gas or electric heating customers who rely on other fuels (e.g., FO, propane). Concerted efforts are required to incentivize customers to “leapfrog” the decarbonization pathway and leverage beneficial electrification for these customers that rely on other fuels to use electric heat pumps. This situation presents a unique opportunity for the Company and would help to avoid further invests to expand the gas distribution network and potentially avoiding upgrades upstream across the whole system. Further analysis on cost and benefits of customer fuel switching through each fuel option is required for further commentary and, we recommend the Company provide an analysis on this subject. There will be significant value on providing a view on number of non-gas customers that are within the 100 feet distance from the existing gas distribution network.

The Company assumes that new construction customers in the service territory who opt to install heat pumps would not connect to the gas system, and based on empirical data, customers who retrofit their heating system to heat pumps do not disconnect from the gas system. We will further investigate this assumption to better understand the impact of fuel switching on gas volume and peak demand forecasts.

The Company expects continued declines in UPC, as energy efficiency advances and electrification technologies continue to become more affordable. On the other hand, the costs per units of gas delivery and supply are increasing. However, in the current version of the bill impact calculation, the Company used the *average* volume of gas consumed by a representative customer constant over the forecast period. While this analysis is beneficial in helping stakeholders better understand the implications of the long-term investments and average operational costs on customer bills and the potential affordability issues (especially for the disadvantaged community and low-to-moderate income (LMI) customers), we recommend the Company also provide an analysis of declining sales in the bill impact calculations.

In a scenario in which rapid deployment of electrification is potentially fueled by policy mandates, rebates, and/or technological advancement or customer preference, the total volumes of gas delivered to customers could decline much faster than projected in the scenarios presented within the ILT Plan, creating even higher upward pressure on bill impact and affordability challenges for customers remaining on the gas network. PA expects significant value in developing a more robust view on the projected volumes of gas to help develop a more accurate view on the bill impact over the forecast period.

From our preliminary analysis and understanding of projected bill impacts, it seems that the company is making conservative assumptions on reductions in gas volumes and bill impacts, especially in the residential class. As discussed earlier, the highest forecasted bill impact on residential customers across the 4 scenarios is projected to be 4% over 20 years, which translates to 0.2% per year. At the same time, while most scenarios project volumes to decline slightly the highest projected reduction in gas sales in these scenarios is projected to be ~16% which is much lower than similar studies conducted by other gas LDC companies across the US and in NY. PA will continue to understand the implications of the proposed plan and benchmark the implications against peer utilities across the US and in NY.

PA will continue to develop further analysis and insight on the bill impacts of each customer class across the four scenarios. Further understanding from the Company on bill impact calculations and results will assist PA

in developing our view of the economic impact of each decarbonization scenario. PA recommends the Company develop a prioritization framework for identifying potential investments under each scenario that could be reduced or eliminated if certain assumptions pertaining to the pace of electrification or other factors, are met, with the goal of reducing the revenue requirement and ultimately lowering the bill impact on customers.

PA plans to investigate further the Company's assumptions surrounding heat pump adoption, cost of installation for various customer classes, and potential barriers for heat pump adoptions. To further develop our understanding of the Company's bill impact analysis, PA will benefit from additional information on the fuel switching decision process and the dynamic decision process of comparing upfront cost and total lifecycle cost for various fuels.

PA also recommends the Company consider developing a high-level view of the impact on the electric grid for each scenario and conduct a total energy "Share of Wallet" type of analysis to inform the bill impact because of investments made across both gas and electric networks to provide a better view on energy affordability and energy burden across various scenarios.

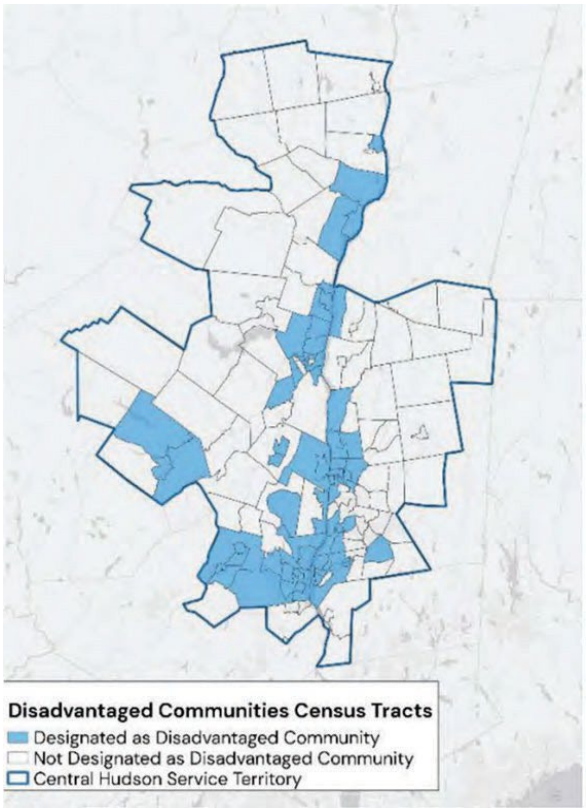
6.3 Disadvantaged Communities

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. The ILT Plan describes continued efforts to advance its support of Disadvantaged Communities in the energy transition, including research and programs with targeted support and investment in Disadvantaged Communities. PA has reviewed the Company's plans for an equitable energy transition within the Disadvantaged Communities across its service territory, and we recognize the plans will evolve overtime. An overview of the Disadvantaged Communities served, historical NPA cases and plans for increased incentives below.

Figure 6-3[31] outlines the Disadvantaged Communities with the Company's market area. Though Disadvantaged Communities cover under 50% of the Company's market, the Company estimates that 71% of its natural gas meters are located within a Disadvantaged Community.

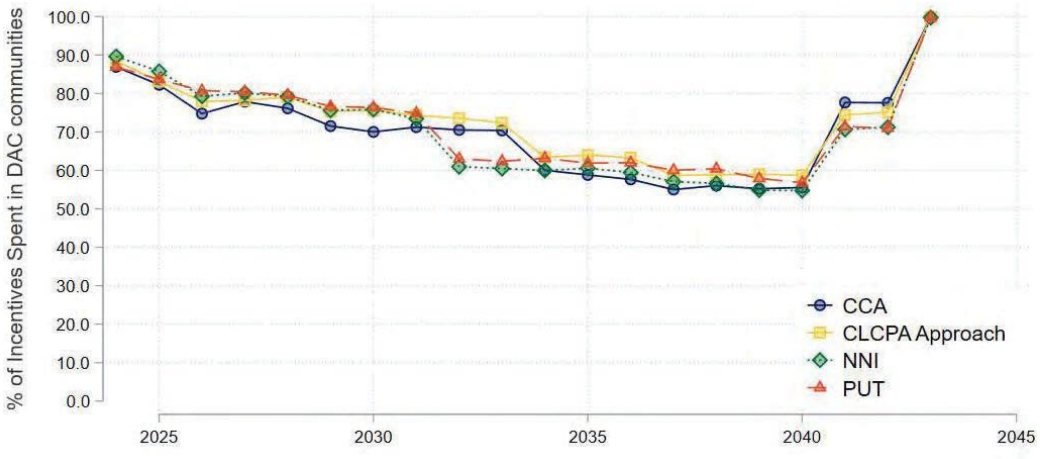
[31] Source: Figure 9 in Central Hudson's ILT Plan.

Figure 6-3: Disadvantaged Community Census Tracts in the Central Hudson Service Territory



The Company plans to continue working alongside the Commission to support the Commission's directive of enhanced reporting for Disadvantaged Communities. In the ILT Plan, the Company details that 23 out of 34 of the Company's NPA approval cases (since 2019) were in Disadvantaged Communities and 4 out of 5 of the NPA cases that reached completion were within a Disadvantaged Communities. Additionally, the Company outlines a shift in current practices to include larger incentives for customers in Disadvantaged Communities in the Company's scenario modeling in the ILT Plan. In all scenarios presented, heat pump incentives for customers in Disadvantaged Communities s are 1.5x to 1.67x larger than for customers outside of Disadvantaged Communities.[32] The forecast percentage of incentives to be spent in Disadvantaged Communities are illustrated below in Figure 6-4.[33]

Figure 6-4: Heat Pump Incentives Spent in Disadvantaged Communities



[32] Source: Central Hudson's ILT Plan.
[33] Source: Figure 45 in Central Hudson's ILT Plan.

In the ILT Plan, 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. We encourage the Company to further investigate this assumption and document various barriers to adoption of heat pumps in Disadvantaged Communities and proactively present these barriers to the stakeholder community in future iterations of the long-term gas plan. PA plans to further explore the assumptions made around heat pump incentives, heat pump adoption rates, and the cost of heat pumps and installation across the Company's service territory, with a focus on Disadvantaged Communities. PA will also submit a data request to the Company inquiring as to the reason for the changes in heat pump incentives depicted on Figure 6-4, especially the jump to 100% incentive in 2043 for Disadvantaged Communities.

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. The New York Energy Affordability Program (EAP)[34] 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 all customers. Additionally, the Home Energy Assistance Program (HEAP) uses federal funding to help income-eligible residents pay their fuel bills. From 2022-2023, the Company has distributed approximately $4.7 million HEAP regular and emergency benefits to assist qualified customers with their heating costs.[35] Given that 71% of the Company's gas meters are located within a disadvantaged community,[36] 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.

6.4 Recommendations to Improve the ILT Plan

Based upon our work to date, our recommendations for the Company to improve the economic impact components of the ILT Plan are summarized below.

1. Develop a more robust view on the role of targeted electrification that could lead to abandonment/retirement of the gas network in certain geographies. Quantifying the number of rebates or subsidies required to close the financial gap to incentivize electrification in certain regions and among certain customer types will emerge from this analysis would be a valuable exercise.
2. Further explore the fuel switching assumptions and explain 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 preventing customers from disconnecting from the gas network. Such investigation will be valuable in next steps helping stakeholders better understand the impact of fuel switching on gas volume and peak demand forecasts.
3. Conduct a comprehensive (gas and electric) share of wallet analysis to understand the bill impact of each Scenario on customers' affordability and how potential shifting costs from gas to electric bill would look for each customer class.
4. Conduct a study to show how fuel blending with RNG and hydrogen would impact a representative customer bill within a Disadvantaged Community or a low-income customer over time and the potential impact on energy assistance programs.
5. Further investigate and consolidate the list of barriers that exist for deploying electrification solutions (e.g., heat pumps) across the Disadvantaged Communities.

[34] https://dps.ny.gov/energy-affordability-program
[35] Source: Central Hudson's ILT Plan.
[36] Source: Central Hudson's ILT Plan.

7 Environmental Assessment

PA has evaluated environmental-related aspects of the Company system, based on information presented in the ILT Plan and responses from the Company to several related data requests. Our initial observations are summarized within the sub-sections below. We first highlight the GHG emissions as reported by the Company and then discuss low-carbon fuel options such as RNG and hydrogen and conclude with a discussion of DSM Programs and NPAs.

7.1 GHG Emissions

The Company reports GHG emissions under the EPA's Mandatory GHG Reporting Program[37]. Under this program, gas distribution companies are required to report GHG emissions annually from mains, services, metering stations, and certain types of combustion units. The 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[38] and a Joint Utilities' May 31, 2023, Supplement to Proposal for an Annual Greenhouse Gas Emissions Inventory Report[39] for the Commission approval. If 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 all the Company's proposed decarbonization scenarios, the use of low-carbon fuels is significant. Low-carbon fuels include both RNG and hydrogen, intended for blending into the gas distribution system and/or targeted application for hard-to-electrify customers. The Commission's decision will have important implications for the GHG accounting associated with the use of these low-carbon fuels in the decarbonization scenarios presented in the ILT Plan.

In its ILT Plan, the scenarios depict various levels of emission reductions are achieved by displacing conventional natural gas in the supply mix. The Company anticipates increasing blends of RNG and hydrogen and the resulting emissions would range from 250,000 metric tons under the CCA scenario to nearly 600,000 metric tons under the PUT scenario by 2043, outlined by scenario in Table 7-1 below.

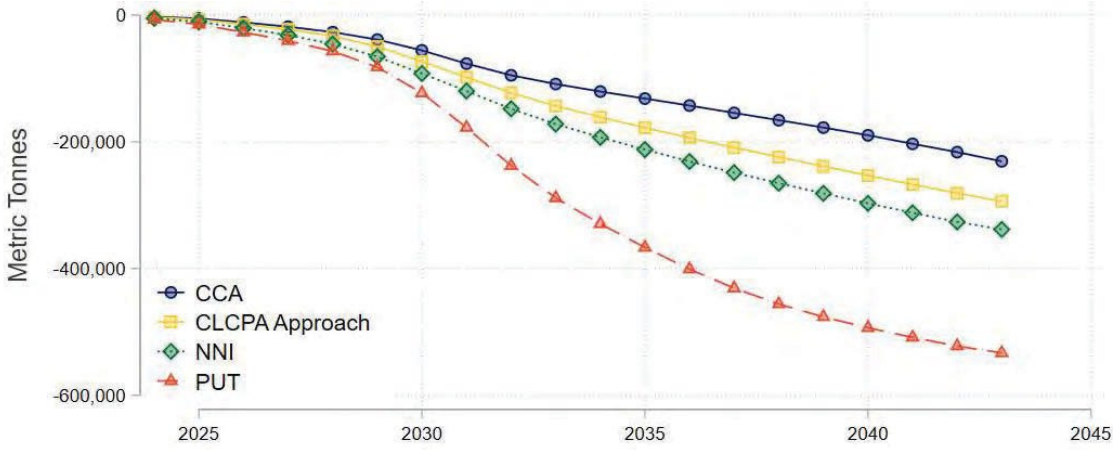
Table 7-1: CO_2e Emission Reductions, by Scenario, in Metric Tonnes and Percent of Total Emissions per Customer [40]

Scenario	Estimated CO_2e Reduction (MT)	2043 CO_2e Reduction per Customer (%)
CCA	215,000	38.9%
CLCPA	300,000	44.3%
NNI	350,000	48.1%
PUT	550,000	64.9%

[37] Greenhouse Gas Reporting Program (GHGRP) | US EPA
[38] 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"}.
[39] CLCPA Implementation Proceeding, Joint Utilities' Supplement to Proposal for an Annual Greenhouse Gas Emissions Inventory Report (May 31, 2023} ("Supplemental GHG Inventory Proposal"}.
[40] Source: Figures 3 and 37 of the ILT Plan and Central Hudson fact-checking review.

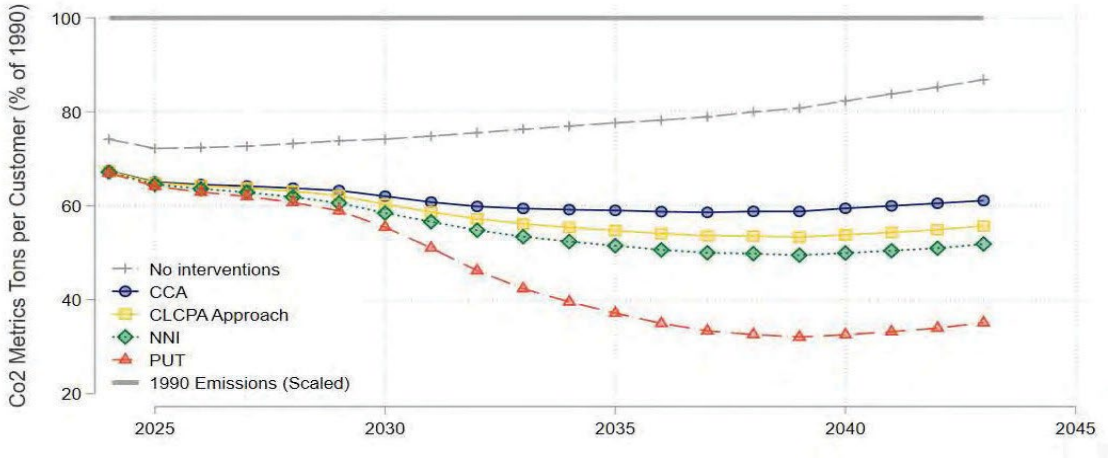
The ranges of projected CO_2e emission reductions under each scenario are outlined below in Figure 7-1.[41]

Figure 7-1: Calendar Year CO_2e Emissions Reductions {2024 Baseline}



The annual CO_2e emissions as a percentage of 1990 levels for the four scenarios are demonstrated in Figure 7-2.[42] The Company includes a "No interventions" projection of annual CO_2e per customer to demonstrate the effectiveness of the four decarbonization scenarios. Under the no interventions trend, annual CO_2e as a percentage of 1990 levels are expected to increase from approximately 75% to nearly 90% by 2045. Across the four decarbonization scenarios, the Company anticipates increasing reduction in annual CO_2e per customer.

Figure 7-2: Annual CO_2e Emissions as Percentage of 1990 Levels



Under the CLCPA, New York has set a goal of reducing statewide GHG emissions 40% by 2030, 85% by 2050, and a target of net zero emissions across the economy by 2050.[43] Across the four decarbonization scenarios, the Company achieves considerable CO_2e emissions reductions, especially in the PUT scenario that relies heavily on low-carbon fuel introduction to the supply mix. The projected emissions reduction across all four scenarios are in the range of 40%-70% compared to 1990. Further research and forecasting will be completed by PA, with support from the Company, to confirm which of the decarbonization scenarios have the potential to achieve the CLCPA goal of 85% by 2050 or gets closest to this goal, as these scenarios only forecast emissions to 2043.

[41] Source: Figure 38 in Central Hudson's ILT Plan.
[42] Source: Figure 37 in Central Hudson's ILT Plan.
[43] NY State Senate Bill 2019-S6599 (nysenate.gov)

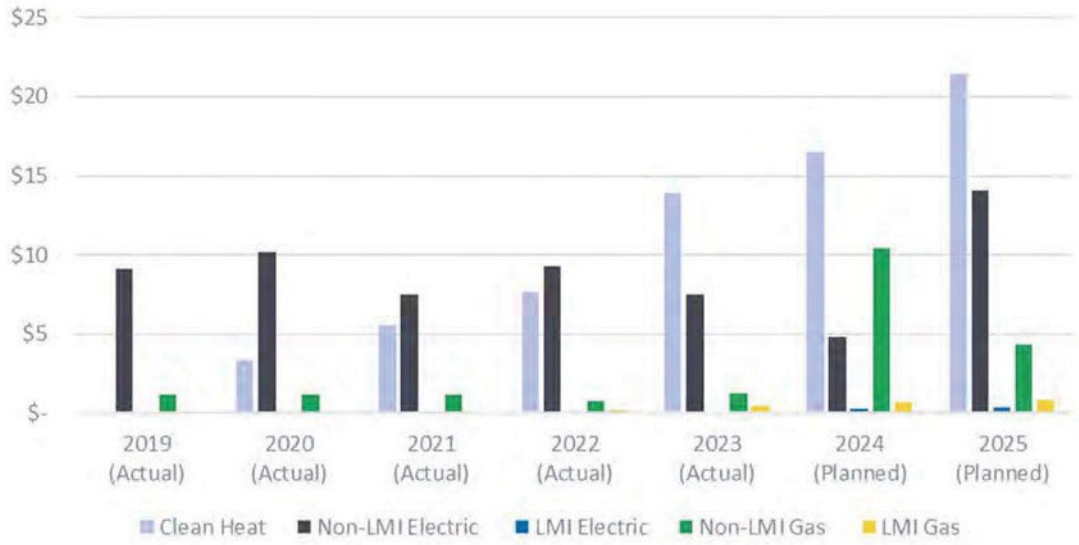
In addition to emission reductions across the four scenarios outlined in the ILT Plan, the Company describes its involvement as a cosponsor of NYSEARCH, a coalition of utilities across New York, the United States, and Canada. The coalition focuses on research and development in decarbonizing the gas sector through enhanced leak detection and measure assessment. As part of the Company's involvement with NYSEARCH, they have 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.

PA anticipates completing a more fulsome analysis of emissions as more information becomes available and as we further refine our understanding of the emissions implications of changes to gas supply and demand and potential policy decisions in the State of New York.

7.1.1 DSM Programs

The Company has established energy efficiency and clean heat programs targeted at achieving CO_2 emission reductions. The Company offers several gas (and electricity) EE solutions across its customer base and partners with NYSERDA and other New York utilities to develop statewide EE programs, targeted towards LMI customers. An important element throughout the Company's ILT Plan is continuing GHG emission reduction utilizing low-carbon fuels, continued energy efficiency, and clean heat planning. The Company's 2019-2025 gas and electric EE portfolios are illustrated in Figure 7-3.[44]

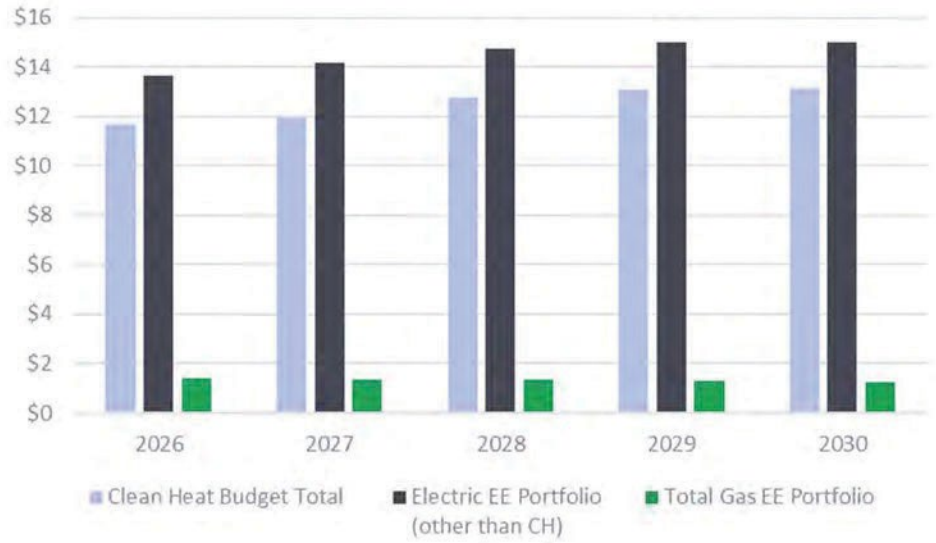
Figure 7-3: 2019-2025 Gas and Electric EE Portfolios ($, millions)



Beyond 2025, the Company has filed its Energy Efficiency/Building Electrification (BE) Proposal[45], outlining applicable targets and budgets for these programs for 2026-2030. 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. As presented in the EE/BE Proposal, the Company's EE/BE budget significantly favors electric programs over gas programs. The budget for 2026-2030 is presented in Figure 7-4.[46]

[44] Source: Figure 22 in Central Hudson's ILT Plan.
[45] Under Case 18-M-0084, In the Matter of a Comprehensive Energy Efficiency Initiative ("NE: NY Proceeding")
[46] Source: Figure 24 in Central Hudson's ILT Plan.

Figure 7-4: Central Hudson Electric and Gas Portfolio Budgets 2026-2030 {$, millions}



In addition to programs and measures for its service territory and customers, the Company plans to continue its active participation in state and federal GHG accounting efforts to estimate GHG emissions for the entirety of its supply and delivery chain.

Through electrification of customers' heating and appliances, LPP can be retired permanently in strategic locations. The approach is ideal for areas with high LPP replacement costs. However, 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 offers the Transportation Mode Alternatives (TMA) non-pipeline alternatives program 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 is 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.[47] We observe that the Company is looking to leverage DSM and EE to manage load growth and forego further infrastructure through consideration of a load-growth based NPA program. The Company conducted a geothermal potential study underpinning the selection of a site for the Company's proposed UTEN Thermal Pilot site designated as the Project Youth Opportunity Union and an adjoining neighborhood in Poughkeepsie, NY. The site features 17 non-residential and 38 residential buildings in a densely populated area, which provide great diversification of thermal loading and value, and is in a Disadvantaged Community. PA will continue to further assess the Company's NPA assumptions across all four scenarios through additional conversations with Company SMES and the upcoming Technical Conference on April 4th.

Given the importance of reliable supply to meeting customer demand, PA will continue to further explore the above mentioned and other similar issues in the coming weeks.

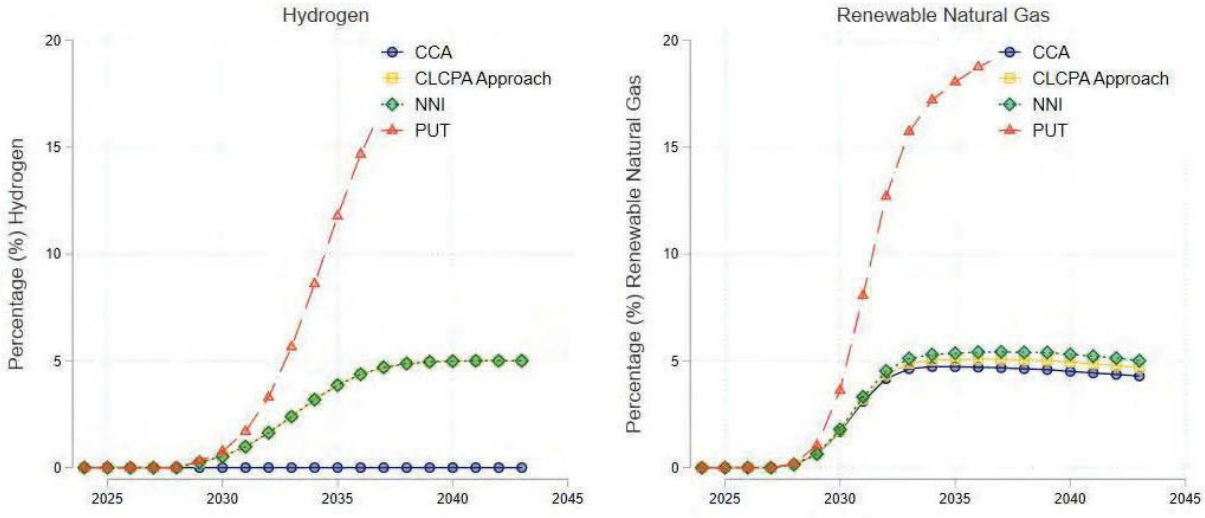
7.2 Low-Carbon Fuels

The Company includes the use and development of low-carbon fuels as key decarbonizing measures across the four scenarios presented in the ILT Plan to progress toward New York's clean energy goals. The Company has evaluated the inclusion of RNG, clean hydrogen, RSG, and potentially synthetic natural gas, for blending into their supply mix. The Company has proposed enhancing their utilization of RSG (natural gas obtained from suppliers that proactively manage 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. The Company is seeking to expand purchasing of RSG in its current rate case.

[47] Response to PA 1-7.

Further detail around the Company's approach and study of RNG and hydrogen blending was presented in the Company's ILT Plan. Blending of RNG and hydrogen are presented in various percentages across the four decarbonization scenarios, as illustrated in Figure 7-5[48] which assumes that both RNG and hydrogen will be available at competitive price for blending into the distribution system beginning in 2028.

Figure 7-5: Percentage of Hydrogen and RNG in the Gas System (2024-2043)



As illustrated in Figure 7-5 the four decarbonization scenarios assume different blends of hydrogen and RNG as a percent of total gas supply across the forecast period. The differences among the four scenarios are described 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 energy efficiency, 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.

The Company included two reports, one of which was provided by a third-party entity on RNG and hydrogen potential as appendices of the ILT Plan. These two studies 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.

7.2.1 Renewable Natural Gas

In preparation for blending RNG into its gas system, the Company hired a third-party consultant to conduct a study of RNG potential and feedstock availability within the counties of the Company's service territory. The study assessed RNG from various feedstocks and estimated the GHG emission reduction potential from RNG

[48] Figure 33 in Central Hudson's ILT Plan.

development. Estimated carbon intensity and emission reductions are presented in Table 7-2 found in the ILT Plan Appendix D.

Table 7-2: Estimated Carbon Intensity and Emissions Reductions for RNG Feedstocks[49]

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[50]	**-16.3**	**NA**	**100%**	**255,604**

As presented in 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 estimated value of 218,152 accounts for emissions associated with the transportation of feedstocks, reducing the 225,604 metric tons CO_2e presented in Table 7-2. The third-party report found RNG potential across a variety of feedstocks within the Company's service territory, resulting in 3.3M Dth/year of RNG potential. The potential RNG available is broken down by feedstock are presented in *Table 7-3* below.

Table 7-3: RNG Potential by Feedstock

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

The Company plans to work with a third-party RNG producer from whom it will purchase RNG to blend into the system. The RNG study recommends the Company work with a developer to site one or more RNG production facilities near the border of Orange and Dutchess Counties to minimize transportation costs and maximize emission reduction potential. Additionally, the Company has expressed support for the Northeast Gas Association's interconnect guidelines for managing work between an RNG supplier and an LDC.

We observe the study did not assess the bill impacts of RNG production and blending. The Company has identified a cost threshold for RNG production and distribution to limit the impact of RNG blending on their

[49] Source: Appendix D – Central Hudson ILT Plan.

[50] 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.

customers. However, 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.

PA plans to further develop our understanding of the third-party study, the assumptions used to develop the GHG emission reduction estimates, and potential bill impacts of blending RNG. To improve our assessment of blending RNG in the Company’s service territory, PA plans to further develop understanding around feedstock availability and anticipated bill impacts to rate payers. The RNG study in the ILT Plan expressed some uncertainty around RNG feedstock availability. PA agrees with this uncertainty, especially considering the limited supply of RNG market, considering that other gas utilities across the state are also forecasting to use the limited RNG supply within the state. In addition to other 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. PA plans to refine our view of RNG potential, feedstock availability, customer bill impacts, and associated GHG emission reductions after further SME conversations with the Company and stakeholders.

7.2.2 Hydrogen

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% can support a hydrogen blend of up to 20% on a typical winter day without any need for modification of flow or pressure. We recommend further analysis of the remaining distribution system segments to ensure that hydrogen can be safely blended into those distribution networks, as this statistical analysis is insufficient in ensuring that the remaining 69 distribution networks have the same characteristics as the 25 studied to date.

The study further identified that gas velocity was the major limiting factor to hydrogen blending and suggested that improvements to the velocity of a system are more economical that improvements to the system pressure. Lastly, the study concluded that some specific opportunities for hydrogen use above 20% may exist at targeted locations, focused on C&I customers with operations that could accommodate higher levels of blended hydrogen.[51] The approach of developing a targeted hydrogen hub rather than blending hydrogen across the entire gas network is gaining momentum in the energy industry, especially for hard to electrify applications and industries, some of which are present in the Company’s service territory. We encourage the Company to further study the potential feasibility, costs, and benefits of such hydrogen hubs in its territory.

In addition to the Potential Hydrogen Blending Study, the Company’s study proposed the development of a clean hydrogen feasibility study. This study includes several goals aimed at 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 plans to further develop our understanding of the Company’s plan to blend hydrogen into their distribution system and hold SME discussions with key Company staff. PA also plans to explore the bill impacts of hydrogen blending, associated GHG emission reductions, and refine our understanding of the Company’s position of targeting hydrogen use for hard-to-electrify customers. 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.

[51] Source: Appendix C – Central Hudson ILT Plan.

7.3 Recommendations to Improve the ILT Plan

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

1. Develop a view on the potential feasibility of a targeted use of RNG and hydrogen in a limited geography for hard to electrify commercial and industrial 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 and economic implications of hydrogen production, transport, and distribution across Company's service territory.
3. Further investigate and present the cost of blending hydrogen and RNG into the gas supply compared to the alternative decarbonization solutions (e.g., electrification of residential and small commercial applications, energy efficiency, demand response) to further discuss the bill impact implication of fuel blending.