PA CONSULTING'S REVIEW OF NATIONAL GRID'S GREENPOINT VAPORIZER 13 & 14 REPORT

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1 Executive Summary

PA Consulting Group, Inc. ("PA") conducted an independent assessment of The Brooklyn Union Gas Company d/b/a National Grid NY ("KEDNY") proposed Greenpoint Vaporizer 13 and 14 Long Term Capacity Project ("Greenpoint Project" or "Project"). This review was conducted for the New York State Department of Public Service (the "Department") pursuant to terms of the Joint Proposal in the recent proceedings regarding the KEDNY and KeySpan Gas East Corporation d/b/a National Grid ("KEDLI") (collectively, "National Grid" or the "Companies") that was modified and adopted by the New York State Public Service Commission ("Commission").[1] The Joint Proposal outlined a mechanism for an independent assessment of certain on-system projects as a condition of cost recovery over the term of the rate plan.[2] That mechanism specified that the independent review address specific criteria related to long-term capital capacity projects, including:

- Need for the project to meet a reasonable forecast of customers' peak demand, based on the most recent forecast available,
- Any safety and/or reliability benefits from the project,
- Viable alternatives to the project that would ensure reliable service,
- All-In Cost of the project and a comparison of the All-In Cost of viable alternatives,
- Greenhouse gas ("GHG") emissions attributable to the project and any viable alternatives, and
- Any comments and analysis submitted by intervening parties and the public.[3]

PA was selected by the Department to be the independent consultant.

This report summarizes the basis for our findings and conclusions and provides additional details on our assessment as well as important caveats.

On August 29, 2022, National Grid submitted its Greenpoint Vaporizers 13 and 14 Long Term Capacity Project Report ("National Grid Greenpoint Report" or "Greenpoint Report") seeking independent review and cost recovery for the Greenpoint Project which consists of two vaporizers – vaporizers 13 and 14 ("Vaporizers 13 / 14"). As noted by National Grid, the Greenpoint Project is one of two on-system infrastructure enhancements included in the Distributed Infrastructure Solution ("DIS").[4]

As noted in the National Grid Greenpoint Report, in February 2020, National Grid published its "Natural Gas Long Term Capacity Report for Brooklyn, Queens, Staten Island and Long Island" (the "Long-Term Capacity Report")[5] that assessed the gas supply constraints in downstate New York and identified potential options for meeting future

[1] Case No. 19-G-0309 and 19-G-0310, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of The Brooklyn Union Gas Company d/b/a National Grid NY and KeySpan Gas East Corporation's d/b/a National Grid for Gas Service, Order Approving Joint Proposal, as Modified, and Imposing Additional Requirements (issued and effective August 12, 2021) ("Order"), adopting with modifications the terms of the Joint Proposal, dated May 14, 2021.
[2] Joint Proposal, Section IV.5.3.
[3] Joint Proposal, at 45.
[4] Greenpoint Vaporizers 13&14 Long Term Capacity Project Report, August 29, 2022.
[5] Case 19-G-0678, National Grid Natural Gas Long-Term Capacity Report, filed February 25, 2020.

customer demand. The report analyzed the relative risks and benefits of the identified options (which included interstate pipelines, liquified natural gas and compressed natural gas facilities, on-system transmission projects, and demand-side solutions) in terms of reliability, deliverability, cost, and environmental impacts, among other considerations.[6]

As further noted in the Greenpoint Report, in May 2020, the Company published the Long-Term Capacity Supplemental Report ("Supplemental Report") that recommended a portfolio of non-infrastructure (e.g., energy efficiency, demand response, weatherization) and targeted infrastructure enhancements, referred to as the "Distributed Infrastructure Solution," ("DIS").[7] This report was informed by stakeholder comments and reviewed by the Commission. It is currently used as a roadmap for addressing supply constraints in Downstate New York ("Downstate").[8]

More recently, in June 2021, National Grid published its Natural Gas Long Term Capacity – Second Supplemental Report ("Second Supplemental Report")[9], which provided an updated assessment of the Company's Downstate New York customer gas demand forecast and a further evaluation of potential supply resources to meet that demand, including the DIS. In this report, National Grid confirmed its recommended need for the DIS, including the Greenpoint Project.

The proposed Greenpoint Vaporizers 13/14 remain a major component in the Company's proposed supply resource mix ("National Grid Supply Stack"). As described by National Grid, the Project consists of two new vaporizer units that will "allow for more efficient extraction of liquified natural gas ("LNG") from the existing Greenpoint LNG facility during periods of peak demand. The two new vaporizers add a maximum of 58.8 MDth per day of vaporization capacity to the Greenpoint facility and also provide one back up vaporizer for the Greenpoint facility."[10]

1.1 Summary of Conclusions

Development of PA's independent report considered in detail all of the criteria outlined in the Joint Proposal. Our analysis resulted in the conclusions that fall into two main areas:

Supply-Demand Alternatives and Costs

- Existing supply resources presented by National Grid ("Existing Supply Stack") are reasonable through at least the 2023-24 winter season, but several low-risk opportunities exist to expand the supply stack for subsequent years.
  - The addition (in the 2024-25 winter season) of a fifth compressed natural gas ("CNG") site ("Farmingdale CNG" or "CNG-5") that would provide 17.6 MDth per day of peaking capacity currently under construction with estimated completion in Q1 2023.[11]
  - Renewal of two existing co-generation contracts - 9.5 MDth per day peaking capacity contract with Nissequogue Cogen Partners ("NCP") and two contracts for a total of 55.6 MDth per day of capacity with the Brooklyn Naval Yard Cogen Partners ("BNY"), which PA believes are realistic – would increase available supply with little risk. The National Grid Existing Supply Stack assumes 30.6 MDth per day of this peaking capacity from the BNY facilities become firm supply; however, 25.3 MDth per day of peaking capacity would be incremental supply above the amounts in the Company's Existing Supply Stack.
  - Adjustments to add CNG-5 and the renewal of the NCP and two BNY contracts result in an addition of 52.3 MDth per day of peaking capacity in the 2026-27 winter season which increases over time ("PA Supply Stack").
- The National Grid Existing Supply Stack adjusted for the addition of CNG-5 and the continuation of these cogeneration contracts is reflected in the "PA Supply Stack."
- Additional sources of supply from the Iroquois Expansion ("ExC") project and renewal of city gate peaking supply could add an incremental 121 Dth per day to the PA Supply Stack but carry significant risks.
- National Grid's most recent natural gas customer demand forecast ("2022 Forecast") reflects significant reductions in Design Day demand from the demand forecast presented in the Second Supplemental Report ("2021 Forecast"), but additional reductions in demand are likely.
  - Adjustments to reflect PA's baseline analysis of meter counts and usage per customer would reduce Design Day demand in the 2026-27 winter season (the first winter National Grid's own forecasts suggest additional supply is required to meet Design Day demand) by 65 Dth per day – from 2,962 Dth per day to 2,897 Dth per

[6] National Grid Greenpoint Report, at 1.
[7] Case 19-G-0678, National Grid Natural Gas Long-Term Capacity Supplemental Report (filed May 8, 2020).
[8] National Grid Greenpoint Report, at 2.
[9] Case 19-G-0678, National Grid Natural Gas Long-Term Capacity Second Supplemental Report (filed July 8, 2021).
[10] National Grid Greenpoint Report, at 6.
[11] No CNG-5 supply contract for the 2022-23 winter season has been executed to date.

day; by the 2034-35 winter season the decrease would be 122 Dth per day – from 3,230 Dth per day in the Company's 2022 Forecast to 3,108 Dth per day ("PA Baseline Forecast").

  - Additional reductions in demand beyond those reflected in the PA Baseline Forecast could reduce demand further to 2,718 Dth per day by the 2034-35 winter but carry significant risks.

- Based on National Grid's Existing Supply Stack and the Company's 2022 Forecast, adequate supply exists to meet Design Day demand until at least the 2026-27 winter season without Vaporizers 13 / 14.

  National Grid's demand forecast has decreased significantly since the forecast in place when the Greenpoint project was initially proposed, and planning began. As recently as 2021, analysis of National Grid's demand forecast suggested a supply-demand gap might occur as soon as the 2023-24 or 2024-25 winter season and the need for multiple new supply sources, including Vaporizers 13/14, might be required to meet Design Day demand. Analysis of the National Grid Second Supplemental Report in 2021 noted the DIS programs, including the new vaporizers, might be a reasonable approach to meet forecasted Design Day demand at that point in time, especially given uncertainty about load growth and the ability of DSM programs to meet the level of anticipated savings. However, based on the new 2022 National Grid demand forecast, the time period by which Vaporizers 13/14 may be needed to meet forecasted Design Day demand has been extended.

- However, a more reasonable estimate based on the PA Supply Stack and PA Baseline Forecast is that adequate supply to meet Design Day demand would be available until at least the 2028-29 winter season without Vaporizers 13 / 14. Based on the PA analysis and assuming 18 months of lead time[12], construction for Vaporizers 13 / 14 would need to begin by May 2027 to meet the need date.

  - Other more-risky supply resources and/or demand reduction programs might extend the necessary in-service date beyond the 10-year forecast window used in PA's analysis. However, PA is not recommending those more risky supply and demand adjustments be used to determine the supply and demand balance at this time.

- PA made adjustments to the Company's presented All-in Cost for the Greenpoint Project which resulted in design day costs roughly 7.5% higher.

  - The estimated costs of Clove Lakes and additional demand side programs currently remain orders of magnitude greater than PA's adjusted All-in Cost of the Greenpoint Project at $1,750/Dth on a design day basis. Per the Company's Report the All-in Cost per Design Day dekatherm of the Clove Lakes Uprate project is estimated to be $9,552 while DR program costs are estimated to be $6,432.

  - For reasons stated later in this report, PA does not believe it is constructive to the evaluation process to compare the All-in Costs of the Project and alternatives on an annual basis. Due to the significant assumptions and dramatically different potential use cases of the alternatives, PA believes that such comparison is limited in value. For example, while comparing two pipeline alternatives to one another may be useful, comparing a pipeline option having committed, firm, year-round capacity to an LNG peak shaving facility which operates a few times per year naturally results in significant and non-comparable differences.

From a supply and demand standpoint, based on the recommended PA Supply Stack and PA Baseline 2022 Forecast for Design Day Demand, the soonest another new source of supply, such as the Greenpoint Project, would be required is the 2028-29 winter season, six seasons from now. This extended period of time would provide significant opportunities to determine whether supply sources such as the ExC project come online and the degree to which additional demand reduction opportunities from the non-infrastructure solutions in the Distributed Infrastructure Solution ("DIS") program materialize as these programs mature.

Greenpoint Energy Center Reliability

- Vaporizers 13 / 14 would increase the reliability of the Greenpoint facility by providing a backup vaporizer for the low-pressure system[13] that does not currently exist.

- Vaporizers 13 / 14 provide minimal emissions benefit compared to the existing vaporizer fleet from an operational standpoint within the Greenpoint facility.

- By increasing the vaporization capacity overall and the ability to meet Design Day demand, Vaporizers 13 / 14 also provide National Grid the ability to serve more natural gas customers overall, which increases gas use throughout the year and reduces the potential for a future moratorium on new customer connections.

Vaporizers 13 / 14 would provide the benefit of added reliability to the Greenpoint facility and overall natural gas supply stack on a Design Day. While it does not appear the increased capacity would be required to meet Design Day

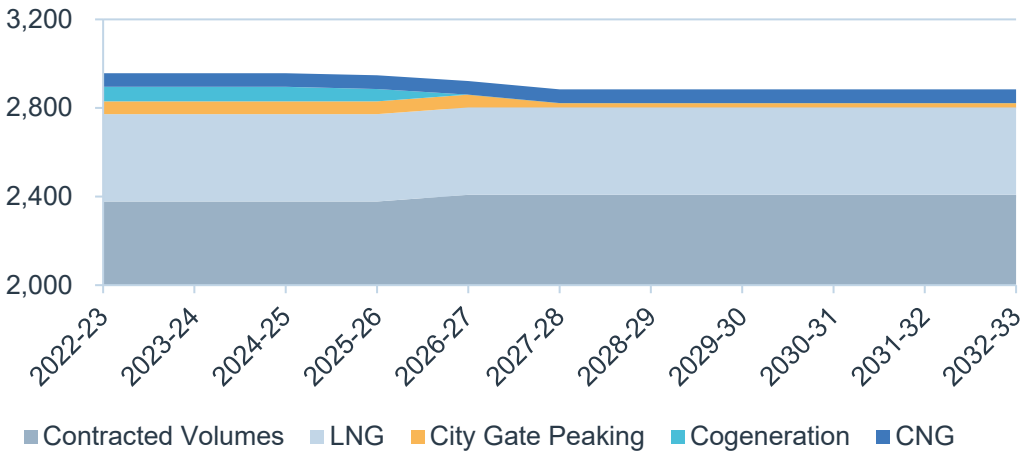
[12] In documents provided in response to PA 1-6, the Company indicated an approximate 18-month construction schedule for the Greenpoint Project.
[13] Two of the three low-pressure vaporizers at Greenpoint were installed in 1986. The third low-pressure vaporizer was installed in 2022.

demand (based on the PA baseline supply and demand forecasts) until at least the 2028-29 winter season, having backup vaporizer capacity would be beneficial to operations at Greenpoint.

1.2 Supply Stack

Available sources of natural gas supply (often known as the Supply Stack) is one of two key components for determining whether adequate resources exist to meet forecasted demand – for purposes of our analysis, Design Day demand. Based on existing standards for the Downstate New York Region, Design Day demand is defined based on the coldest experienced temperature - a day with 65 Heating Degree Days ("HDDs"). The demand forecast is the other component. PA evaluated the various supply categories contributing to National Grid's existing supply stack and the extent to which supply stack components may be relied upon for the next 10 years, our selected study period. According to National Grid, the total contracted supply stack to meet Design Day demand for the upcoming 2022-23 winter season is 2,957 MDth per day. The Existing Supply Stack provided by National Grid is shown in Figure 1-1.

Figure 1-1: Current National Grid Contracted Supply Stack[14]



National Grid notes an expected reduction in supply starting around the 2026-27 winter season; however, PA's analysis suggests some of the reduction can be avoided.

For purposes of this supply assessment, PA selected a 10-year evaluation period which adequately covers the current and likely two more rate case cycles and provides adequate time to consider the potential for several major changes to the supply stack, including, but not limited to:

- Additional CNG sites,
- Renewal of cogeneration contracts,
- The Iroquois ExC project, and
- Future sources of city gate peaking supplies.

In addition, this time period provides an opportunity to determine the maturity of non-infrastructure solutions in the DIS program and complete a more robust analysis of customer adoption and behaviors, impact of electrification and any lingering implications of Covid-19 on Design Day demand.

Across the 10-year forecast period, there are several potential notable changes to the contracted supply stack. These changes include, but may not be limited to:

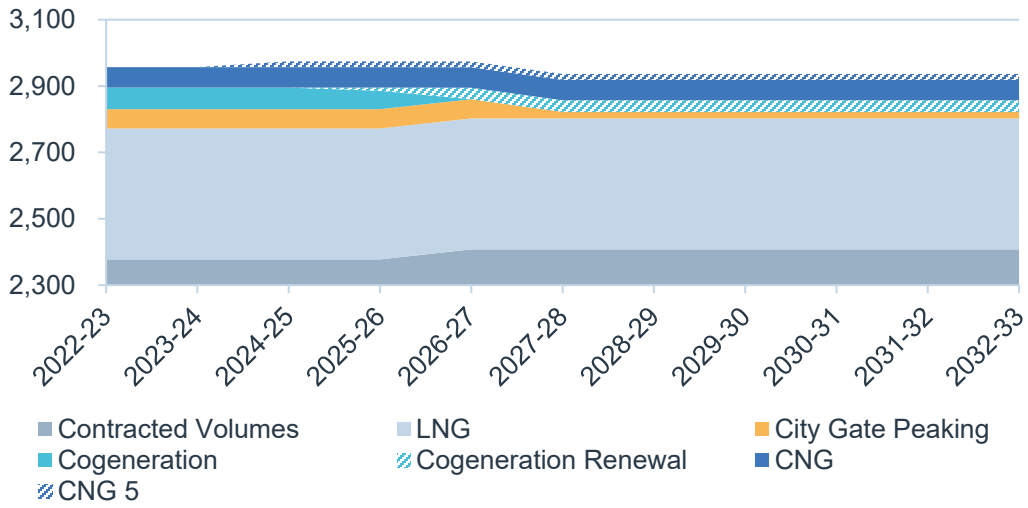
- Addition of a fifth CNG site at Farmingdale in the first quarter of 2023 providing up to 17.6 MDth per day of peaking capacity by the 2024-25 (or potentially 2023-24) winter season,
- The expiration of cogeneration peaking supply contacts - 9.5 MDth per day NCP peaking capacity contract in 2025-26 and two contracts representing 25.3 and separately 30.3 MDth per day of peaking capacity with the BNY in 2026-27,

[14] Source: Documents provided in response to PA 3-1.

- The reversion of the second BNY cogeneration peaking contract to long-term contracted supply – adding 30.3 MDth per day to permanent supply,
- Addition of the ExC project providing 62.5 MDth per day of additional peaking capacity,
- The expiration of city gate peaking volumes totalling up to 38 MDth per day of capacity, and
- Potential incremental city gate peaking capacity of 20 MDth per day.

In evaluating these potential supply stack options against the Existing Supply Stack used by National Grid, PA found that adding the Farmingdale CNG beginning no later than the 2024-25 winter season and the renewal of the expiring cogeneration peaking contracts no later than the current noted expiration dates provides a reasonable minimal supply stack to meet Design Day demand. This supply stack, the PA Baseline Supply, is shown in Figure 1-2.

Figure 1-2: PA Supply Stack (Includes CNG 5 & Renewed Cogeneration)[15]



The PA Supply Stack reflects a decrease in supply after the 2026-27 winter season, but the supply level remains higher than the National Grid Existing Supply Stack[16].

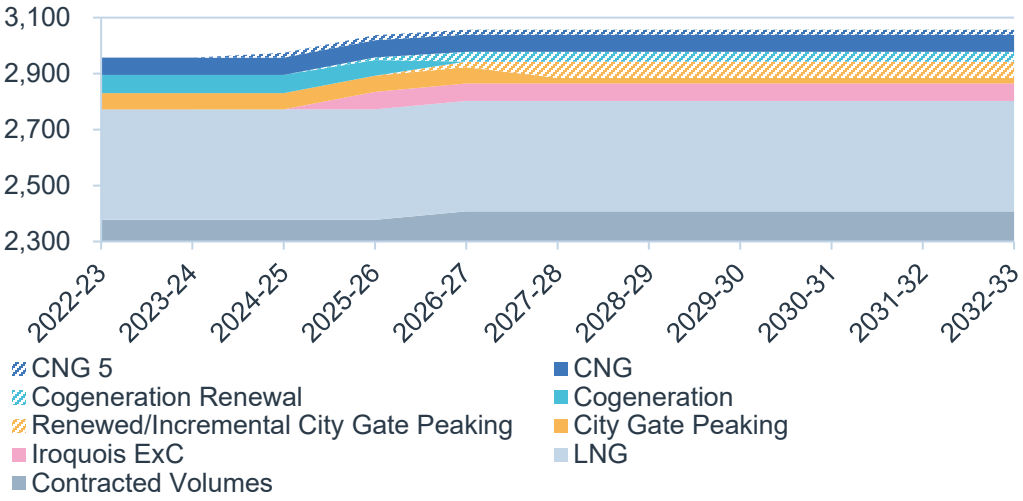
At least three other potential supply options, not including Vaporizers 13 / 14, exist to meet Design Day demand:

- Addition of the ExC project providing 62.5 MDth per day of additional capacity,
- Renewal of the expiring city gate peaking volumes totalling up to 38 MDth per day of capacity, and
- Potential incremental city gate peaking capacity of 20 MDth per day.

While adding these three sources of supply capacity could add several more years to the time frame before the Greenpoint Project would be required, regulatory approval or contracting uncertainty exists. Therefore, these sources are not included in the PA Baseline Supply Stack. However, as shown in Figure 1-3 these supply sources could add up to an additional 120.5 MDth per day of peaking supply, which as discussed below could extend the required in-service date for the Greenpoint Project by several years.

[15] Source: Documents provided in response to PA 3-1.
[16] Grid employs a single portfolio of assets to meet the needs of both service territories.

Figure 1-3: PA Supply Stack with ExC and Renewed and Incremental City Gate Peaking[17]



In summary, PA recommends a supply stack (i.e., the PA Supply Stack) that includes the Farmingdale CNG site beginning in the 2024-25 winter season as well as the renewal of the co-generation contracts beginning in the 2025-26 winter season as outlined in Figure 1-2.

1.3 Demand Forecast

National Grid developed its 2022 Adjusted Baseline Demand Forecast to provide Design Day MDth demand based on its 2022 annual retail sales forecast. The process begins with developing a retail sales forecast using a bottom-up approach that starts with annual forecasts of Meter Counts ("MC") and Use-Per-Customer ("UPC") for each customer segment in KEDNY and KEDLI which are then combined to yield a base level retail sales forecast. The base level forecast is subsequently adjusted for a variety of factors, including Demand Side Management ("DSM"), electrification and line losses, to derive a total annual retail sales forecast. This retail sales forecast is then translated into Design Day demand by adding an adjustment for losses and unaccounted-for gas to arrive at the annual wholesale equivalent which is subsequently shared out to a daily level based on climatic conditions matching the Design Day criteria to produce the National Grid "2022 Forecast."

The assumptions used by the Company to develop the 2022 Forecast have been modified from the previous 2021 Forecast used for the Second Supplemental Report resulting in Design Day (or peak) demand decreasing from 2,966 MDth per day to 2,812 MDth per day in the 2022-23 winter season – reduction of 154 MDth per day or 5.2%. By the 2034-35 winter season, Design Day demand would be reduced from 3,430 MDth per day to 3,230 MDth per day – a reduction of 210 MDth per day or 6% under the Company's approach.[18] The reduction can be attributed to several reasons, including lower Commercial ("COM") customer demand due to COVID-related factors, the anticipated impacts of New York City's Local Law 154 that prohibits may types of new gas connections and several customer class specific adjustments to MC and UPC forecasts.

PA's analysis supported the types of adjustments proposed by National Grid in developing its 2022 total annual sales and Design Day demand forecasts but concluded several additional modifications would be reasonable based on an analysis of the factors underlying the Company's total annual retail sales forecast. Based on an assessment of the August 2022 Moody's econometric forecasts for the counties in the National Grid Downstate territory[19] and an analysis of weather-normalized usage patterns for the Company's customer classes, two potential discrepancies that could significantly change the Company's forecast were identified by PA.

- MC forecast for KEDLI's Residential Heating ("RH") customer segment: Based on a statistical analysis of MCs for each major customer class and the Moody's forecast trends for 2021 and 2022, PA developed a revised MC forecast for each major customer class. Our analysis for most customer classes produced results similar to the

[17] Source: Documents provided in response to PA 3-1. Note that the y-axis scale of this figure (and several other figures showing the supply stack) is adjusted to maintain a reasonable size for the figure.
[18] National Grid determines its *Design Day* forecast in the aggregate for KEDNY and KEDLI, so PA's analysis followed this same approach.
[19] The August Moody's forecasts were the most recent version available at the time of the PA analysis.

Company's figures underlying its 2022 Forecast (i.e., deviations in the range of only +/- 1.5% to 2.5% by 2034-35). However, the MC forecast for the KEDLI RH customer class was an outlier at 9% lower than the Company's forecast for the 2034-35 year. In addition, the MC used to support the Company's 2022 forecast was 7% higher than the corresponding level provided to support the 2021 Forecast in the Second Supplemental Report.

- UPC forecast for KEDNY's Multi-Family ("MF") customer segment: Based on a trend-based projection of weather-normalized annual UPCs, PA developed a revised UPC forecast for each major customer class. The resulting analysis showed UPC results consistent with the amounts underlying the Company's 2022 Forecast with one major exception. By 2034-35 the forecasted UPC for the KEDNY MF class was 14% below the Company's projected level.

The PA Baseline Forecast updated the Company's 2022 Forecast to reflect the impact of our analysis for MCs and UPCs across the major customer classes with the majority of the adjustment for the KEDLI RH and KEDNY MC customer classes. As shown in Table 1-1, adjusting for these factors reduces aggregate retail sales by 2034-35 by 13,709 MDth with the KEDLI RH MC adjustment and KEDNY MF UPC adjustment contributing 65% of the difference in the retail sales forecast in 2024-23 and up to 94% of the difference by 2034-35.

Table 1-1: Comparison of National Grid and PA Annual Retail Sales Forecasts

Difference between PA's Forecast and NG_2022: DSNY (MDTh)					
	Aggregate	KEDNY: MF		KEDLI: RH	
	(a)	(b)	(b)÷(a)	(d)	(d)÷(a)
2024-25	(6,928)	(3,236)	47%	(1,215)	18%
2029-30	(8,913)	(3,775)	42%	(3,787)	42%
2034-35	(13,709)	(5,021)	37%	(7,833)	57%

Building on the difference in the annual retail sales forecasts, PA developed its PA Baseline Forecast for Design Day to reflect the reduced total annual retail sales for each customer class noted above and applying the National Grid implied load factor - the ratio of its forecasted Design Day demand levels to the corresponding retail sales forecast. This analysis produced a PA Baseline Forecast 27 MDth per day lower than the Company's 2022 Forecast for the 2022-23 winter season with the difference increasing steadily to 122 MDth per day lower by the 2034-35 winter season. A comparison of the resulting PA Baseline Forecast and National Grid forecasts for Design Day demand by year are shown in Table 1-2 below.

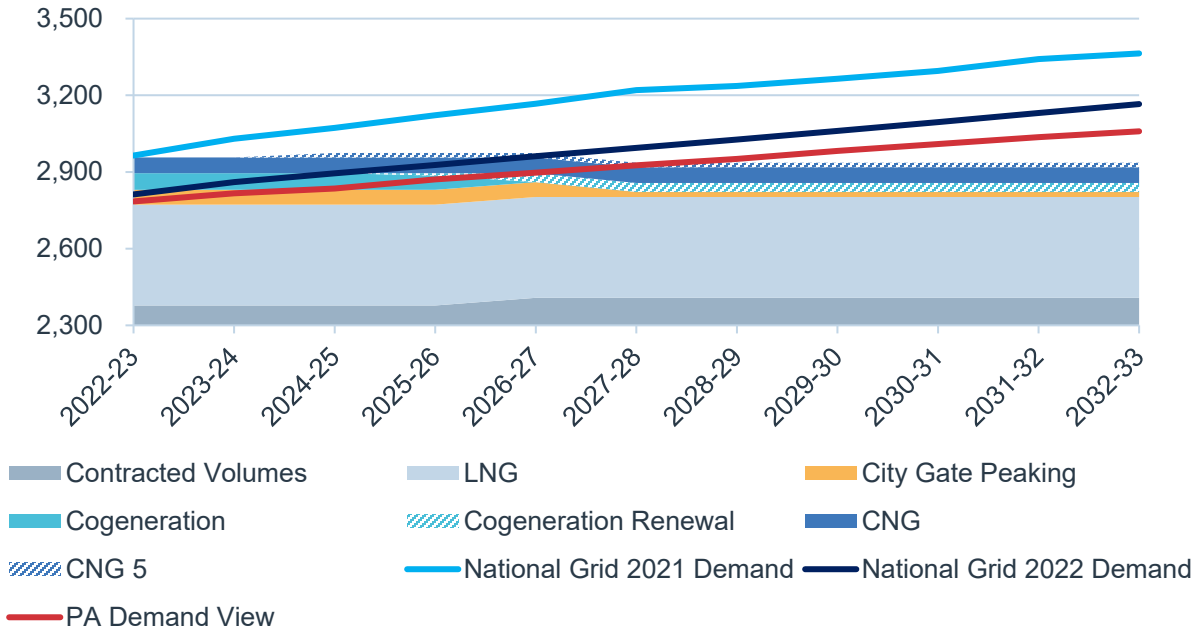
Table 1-2: Comparison of PA Baseline and National Grid Design Day Demand Forecast Comparison (MDth/day)

Year	Company Adjusted Baseline: 2021	Company Adjusted Baseline: 2022	PA Baseline
2022-23	2,966	2,812	2,785
2023-24	3,031	2,861	2,816
2024-25	3,074	2,895	2,835
2025-26	3,123	2,927	2,871
2026-27	3,168	2,962	2,897
2027-28	3,221	2,994	2,926
2028-29	3,238	3,027	2,951
2029-30	3,265	3,061	2,983
2030-31	3,296	3,095	3,010
2031-32	3,343	3,131	3,036
2032-33	3,365	3,166	3,059
2033-34	3,399	3,199	3,086
2034-35	3,430	3,230	3,108

The PA Baseline Forecast for Design Day demand shown in Table 1-2 is then compared to the PA Supply Stack shown in Figure 1-2 above to determine whether adequate supply exists to meet customer demand on a Design Day.

As shown in Figure 1-4, this analysis determines that additional sources of firm supply, including the Greenpoint Project, would not be required until the 2028-29 winter season. Over the next several years, National Grid (and the Commission) will know whether the Iroquois ExC has been permitted and implemented and will also have several additional years to refine the demand forecasts to reflect evolving economic conditions in Downstate New York, additional post-Covid trends and the level of customer acceptance of the DIS non-infrastructure programs.

Figure 1-4: Comparison of PA Supply Stack to PA Baseline and National Grid 2022 Demand Forecasts

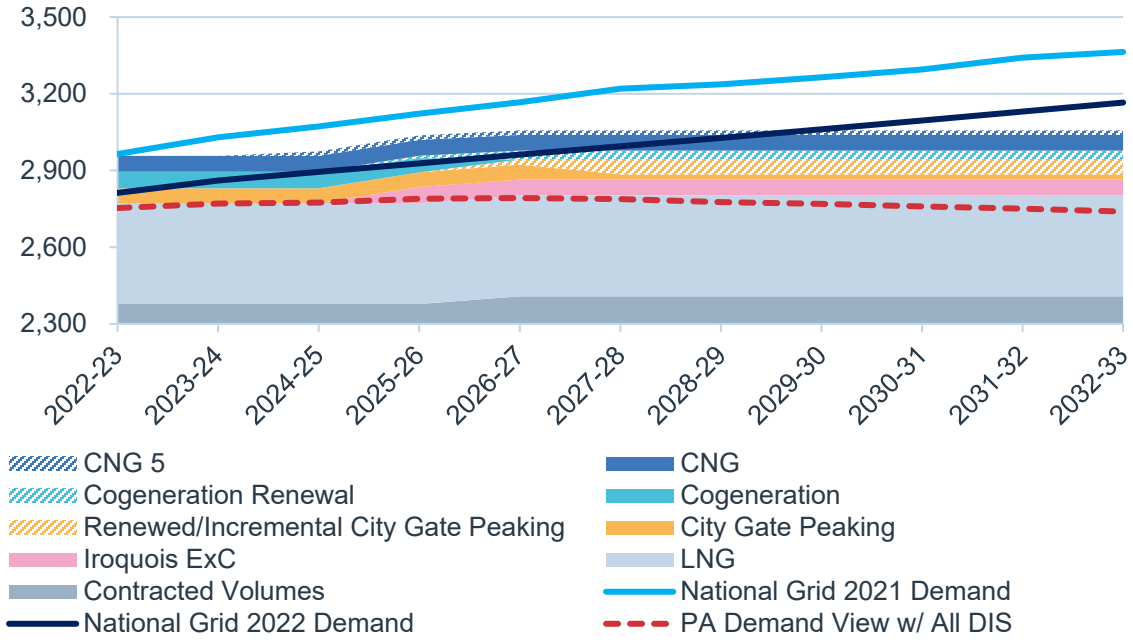


In the interim, several potential developments could extend the need for additional supply sources, including the Greenpoint Project, beyond the 10-year evaluation period, including, but not limited to:

- Addition of the ExC project providing 62.5 MDth per day of additional peaking capacity,
- Renewal of the expiring city gate peaking volumes totalling up to 38 MDth per day of capacity,
- Potential incremental city gate peaking capacity of 20 MDth per day, and
- Full demand reduction potential of the non-infrastructure components of the DIS program, including energy efficiency, demand response, and electrification programs.

These potential sources of supply are subject to material contingencies outside of National Grid's control (e.g. permit approvals, market mechanisms and responses) and, therefore, have not been included in the PA Supply Stack. However, if all of these efforts were realized, the need for additional supply sources to meet Design Day demand, including the Greenpoint Project, would extend beyond the 10-year study period as shown in Figure 1-5.

Figure 1-5: Supply-Demand Comparison Reflecting All Potential Future Supply Sources and Demand Reduction Opportunities



As noted above, based on the PA Supply Stack and PA Baseline 2022 Design Day demand forecast, the Greenpoint Project would not be required until the 2028-29 winter season. Additional adjustments to the supply stack and demand forecast could extend this time period; however, those additional modifications are too risky to include in an analysis of the supply and demand balance for a Design Day at this time.

The Company has indicated that approximately 18 months is required for construction of the Greenpoint Project after all regulatory and permitting decisions are completed, so construction would need to start by May 2027, if needed at that point. This timeline provides significant time to evaluate the alternatives in the supply stack and demand forecast deemed too risky to incorporate at this time.

1.4 Safe and Reliable Service

The new vaporizers proposed by the Company represent commercially proven technology that is currently in use at Greenpoint. While the necessary in-service date for the vaporizers project to meet forecasted Design Day demand is several years into the future, the Greenpoint Project does provide a number of more immediate reliability benefits including:

- The ability to deliver reliable, incremental supply on a Design Day to the distribution system to the extent required to meet peak demand,
- The opportunity to utilize newer, more efficient vaporization units even when the full capability of the facility is not required to serve demand, in place of existing vaporizers installed in the 1980s,
- Backup capability in the event one of the existing vaporizers feeding the low pressure (60-psig) distribution system were to fail on a Design Day or during an upstream supply interruption,
- Increased ability to support system supply maintenance or unplanned outages, and
- An alternate source of supply in the event other on-system assets are unavailable (e.g., CNG or city-gate pipeline supply)

Our review was informed by an assessment of the results of different hydraulic modeling scenarios provided by National Grid for the 2022-23 winter season through the 2027-28 winter season. That review supports PA's conclusion that the Project will not be required to serve National Grid's forecast of Design Day demand (based on the National Grid 2022 Forecast) until at least the 2027-28 winter season. Furthermore, based on the models reviewed, that date would be extended if either the Iroquois ExC project or the Tennessee Gas Pipeline expansion serving Consolidated Edison Company of New York, Inc. ("Con Edison") is in service.

While our hydraulic analysis confirms the conclusion that based on the Company's 2022 Forecast, capacity exists to meet Design Day demand until the 2027-28 winter season (or longer based on the PA Baseline Forecast for demand), the Greenpoint Project does provide several more immediate reliability benefits as noted above. The hourly capacity of the proposed Vaporizer 13 / 14 Project is relatively small when compared to even the average actual demand during the last three winter seasons at the largest of the supply nodes on the National Grid distribution system. However, any supply resource that offers redundancy and reliability in the event of an outage is preferable to no alternatives. In addition, the operational efficiencies of newer, more efficient vaporization units even when the full capability of the facility is not required to serve demand, should be considered.

1.5 Alternatives

Our analysis of the need for the Greenpoint Project includes an assessment of infrastructure and non-infrastructure alternatives to the project that would ensure reliable service within the timeframes necessary. The following alternatives that might be implemented to address Design Day supply or reliability concerns were evaluated.

- Infrastructure: Clove Lakes Uprate Project
- Demand Side Program Non-Infrastructure Alternatives:
  - Energy Efficiency ("EE")
  - Demand Response ("DR")
  - Electrification ("ELEC")
- Other Non-Infrastructure Alternatives:
  - Non-Pipes Alternatives
  - Commercial Building Management Systems
  - Alternatives to Company Deployed Metering Infrastructure
  - Modifications to Rate Design
  - Energy Efficient Connections
  - Targeted Electrification/ Entire Gas System Dis-connections
  - Networked Geothermal

Infrastructure

PA assessed the Company's plans and progress advancing Clove Lakes since the Long-Term Capacity Report was developed. Grid reported minimal progress has been made towards planning for Clove Lakes. To make Clove Lakes a viable alternative the Company would need to significantly accelerate project development efforts and the project schedule would need to proceed without any material permitting or construction delays. In addition, even if design, construction and permitting could be accelerated, initial cost analysis of the Clove Lakes project suggests this project would cost at least twice the cost of the Greenpoint Project. Therefore, no other infrastructure alternatives to Vaporizers 13/14 were identified.

Non-Infrastructure

As noted above, in addition to the PA Baseline Forecast three additional demand reduction opportunities from non-infrastructure components of the DIS were assessed and compared to the PA Baseline Forecast to determine the potential impact from additional demand reduction. However, at this point, the available data suggests that these scenarios might be too aggressive to incorporate into a firm demand forecast.

PA has previously assessed potential incremental demand side savings options and determined that they are in the early stage of testing and roll-out, which has not changed. Both customer uptake and the savings per participating customer are still fairly unproven and it is unclear whether customers will enroll at a rapid enough pace to meet existing targets for at least some of the programs, even if budgets were expanded. Currently, such non-infrastructure solutions are maturing at varying paces but will require additional time to be proven reliable alternatives.

Recent results for the EE program serve as a good example for the pace of development of non-infrastructure solutions. PA's analysis of achieved gross annual savings for the period January 1, 2022 to June 30, 2022, seasonally adjusted and extrapolated for a full calendar year 2022 finds underachievement of 2022 EE Capacity Demand Metrics ("CDM") targets to be a likely outcome as shown in Table 1-3.[20]

[20] This analysis is based on the CDM targets, including an incremental increase in EE targets included in the Commission's May 2022 EE CDM Target decision.

Table 1-3: National Grid Energy Efficiency CDM Program Results

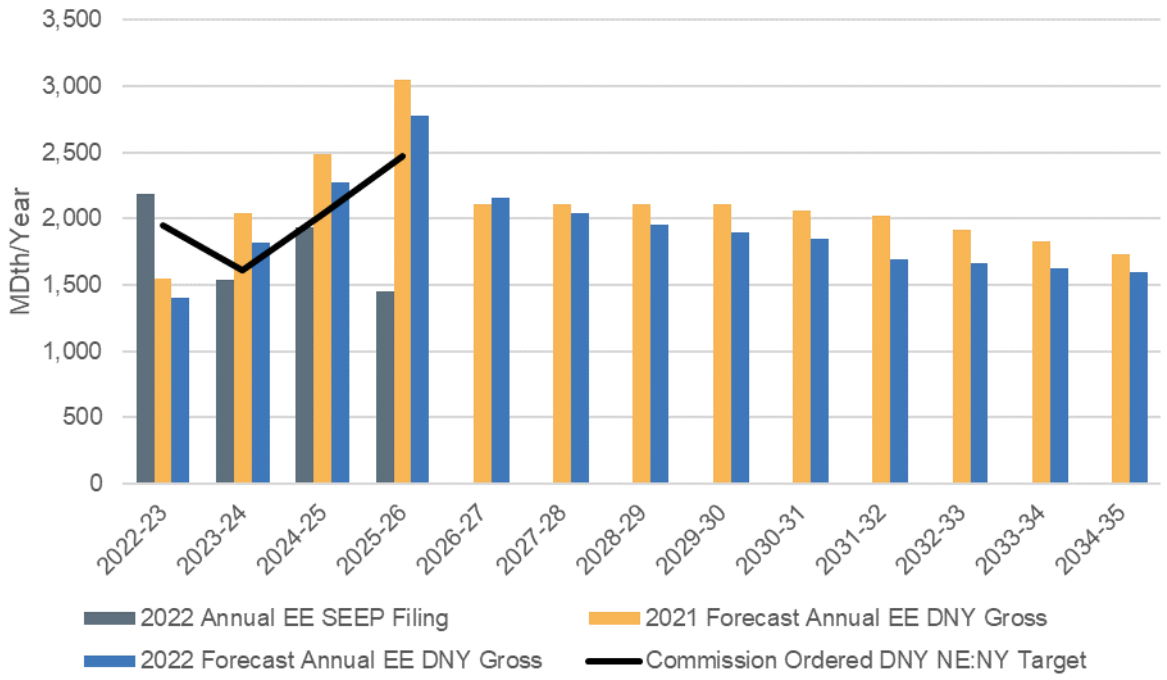
	KEDNY	KEDLI	Total
2021 NE:NY	510,740	433,821	944,561
2022 NE:NY	674,740	601,821	1,276,561
2022 Incremental	458,329	431,562	889,891
Cumulative	**1,643,809**	**1,467,204**	**3,111,013**
2021 Achievement (Gross)*	614,480	550,171	1,164,651
2022 CDM Target	**1,029,329**	**917,033**	**1,946,362**

**2021 Achievement (Gross) Savings represents actual validated 2021 savings.*

EE CDM target underachievement does carry capital cost recovery ramifications as underachieving the EE CDM results in a 25% penalty for the revenue requirement associated with EE CDM programs. If the total for all five CDMs are not met (which would be the case if EE underachieves), an additional 15% revenue requirement penalty applies. Missing EE (and resultingly the total of all five CDMs) could result in a total 40% CapEx recovery penalty, estimated by the Company at $3M KEDNY $1.5M KEDLI. Our analysis suggests underachievement of 2022 EE CDM target is likely.

Interestingly, the National Grid 2022 Forecast for 2023 through 2025 includes an over-achievement of annual gross NE:NY savings targets, so the pace of program expansion may accelerate as shown in Figure 1-6. However, based on our analysis, underachievement of EE CDMs over the mandated duration may continue to be a possible outcome.

Figure 1-6: Annual Forecast Energy Efficiency Savings Comparison (as of June 30, 2022)[21]



Our analysis of Design Day electrification savings found the Company's 2022 Forecast anticipates a higher level of Design Day relief as compared to the 2021 Forecast, due to the anticipated impact of Local Law 97 and Local Law 154. Therefore, progress is being made. PA observed a slight increase in demand response Design Day relief, as compared to the 2021 Forecast; we also observed the Company conservatively estimated the level of DR relief, considering the amount of savings presented within the Annual Demand-Side Management Report is not 100% reflected within the 2022 Forecast. We find this approach to be reasonable, given increasing reliable relief from DR programs is unproven.

[21] "To NE:NY / CDM Targets" represents CDM targets for 2022 and, NE:NY targets for years 2023 – 2025.

However, we also believe additional efforts to incentivize customer engagement in energy efficiency, demand response, electrification and other non-infrastructure alternatives, beyond what is presently approved, enhances the Company's ability to reduce demand over the long-term, providing additional headroom within the supply and demand gap. We encourage increased consideration of additional non-pipe alternatives, as well as incentives for entire gas system dis-connections and targeted transitions to geothermal.

1.6 Cost Comparison

Our analysis of the costs of the Greenpoint project and alternatives considered both the limited infrastructure and identified non-infrastructure programs,

As noted earlier, technically Clove Lakes is an alternative; however, after assessing permitting, construction and cost challenges, our analysis concluded this project would not really be viable. Even in the pre-development stage, the in-service date is not until the end of 2029. It is unclear at what pace the Clove Lakes progress would progress through the required approval process but meeting a 2029 in-service date is unlikely. More importantly, Clove Lakes is significantly more capital intensive than the Greenpoint Project at an estimated capital cost of over $320M, compared to approximately $70M for the Greenpoint Project.

Demand side management solutions are maturing at varying paces but will require additional time to be proven reliable alternatives at a magnitude such as Vaporizers 13/14. However, considering New York State's environmental goals and the potential for expanded relief from incremental measures, we find demand side measures and other non-infrastructure solutions should continue to be evaluated.

In our analysis, we evaluated the cost of the Greenpoint project in detail as well as compare that project's cost with other alternatives.

PA understands that approximately 65% of the capital budget of Greenpoint Project has been spent through June 30, 2022. As noted earlier, it is PA's understanding National Grid began acquiring equipment for the Greenpoint Project in early 2020 based on the projected need to have adequate supply resources to meet the demand forecast in place. At that point in time National Grid had developed its Long-Term Capacity Plan, which showed the potential for a supply-demand gap as early as the 2023-24 winter season unless additional sources of supply were obtained. Based on an evaluation of alternatives at that time, National Grid included Vaporizers 13/14 as part of a planned multi-source strategy, along with the ExC project and demand side management programs, to meet the demand forecast in place in 2020.[22]

National Grid's Second Supplemental Report in 2021, which was based on an earlier demand forecast, also indicated the potential need for this type of multi-source solution. However, as noted elsewhere throughout this report, National Grid's most recent demand forecast, showed a significant decline in forecasted demand, calling into question the need for Vaporizers 13/14 at this time.

Responses to PA's requests for up to the date capital budget indicate that the continued delays of the project have resulted in cost escalation of $5.1M resulting in a current capital budget of $69.7M as opposed to the $64.6M budget reflected in the Greenpoint Report as shown in Table 1-4 below.

Table 1-4: Vaporizers 13 / 14 - Actuals and Remaining Spend (as of June 30, 2022)

Spend Category	Actuals to 6/30/2022	Forecast to Complete	Final Estimated Cost[23]	% Complete
Construction and Procurement	$20,335,850	$13,000,000	$33,335,850	61.0%
Engineering	3,160,670	100,000	3,260,670	96.9%
Vaporizer Equipment	5,987,182	100,000	6,087,182	98.4%
Other Contractor Support	4,214,059	2,430,000	6,644,059	63.4%
Overheads	7,385,964	2,479,588	9,865,552	74.9%
Capitalized Interest	2,763,487	5,500,000	8,263,487	33.4%
Labor + Benefits	1,525,638	750,000	2,275,638	67.0%
Fleet	6,656	3,000	9,656	68.9%
Total	**$45,379,507**	**$24,362,588**	**$69,742,095**	**65.1%**

In keeping with our assessment of alternatives on a Design Day basis, our analysis looked at the cost per Design Day for several alternatives. Our analysis concluded the All-in Cost for the Greenpoint Project would be $1,750 per Design

[22] National Grid's Supplemental Report provided similar findings on the need for additional supply.
[23] Source: Documents provided in response to PA 3-9.

Day Dth. As a point of reference National Grid's proposal noted an All-in Cost of the Project of $1,628 per Design Day Dth. The difference is in part due to the increased total cost of the Vaporizer 13/14 Project.

PA's review of the Clove Lakes Uprate project indicated that it remains in very early stages of development with minimal data to analyze. As such, PA is unable to determine whether such costs presented by the Company are reasonable, however PA does expect it is reasonable to expect that due to the nature of the project, that it will be significantly more expensive with a higher risk profile of completion than the Greenpoint project.

PA evaluated the DSM programs in comparison to the Company's recent and projected performance related to its ongoing programs. Similarly, there is limited data to evaluate the costs, scale potential, and demand destruction benefit. PA has estimated the all-in cost for demand response under a scenario representing a deferred operational date for the Greenpoint Project which reduces the All-in Cost, but still meaningfully greater than the Greenpoint Project.

A comparison of the All-in Costs for the Greenpoint Project and other major alternatives is shown in Table 1-5 below. As indicated in this table, the new vaporizers are currently the most economical alternative.

Table 1-5: Comparison of All-in Costs of Alternatives

Project / Program	All-in Cost per Design Day Dth
Greenpoint 13/14	$1,628 (per the Company); $1,750 (per PA)
Clove Lakes Uprate	$9,552 (per the Company)
Demand Response	$6,432 (per the Company); $4,025 (per PA)
Energy Efficiency	$21,000 (Per PA)
Electrification	$12,500 (Per PA)

As discussed previously, Clove Lakes is not viewed as a viable alternative nor is there a detailed budget to evaluate for comparison purposes. However, DSM, and DR in particular, can and should be developed more aggressively. Key assumptions in the cost and value of DR include the total number of addressable customers that could feasibly participate in a DR program, the amount of demand reduction which could be relied upon if customers are called to do so, and the economic incentive needed to achieve both of the previous factors. In addition, societal costs that might increase the cost for the Greenpoint Project have not been considered. While these costs would likely close the gap today, that situation is likely to change over time.

Whether comparing the All-in Cost of DR to the All-in Cost of the Greenpoint Project, the attractiveness of the Project cost versus DIS non-infrastructure programs is highly dependent upon the assumed usage of the vaporizers and the number of the customers who are both signed up and respond when demand response events are called. While the Greenpoint Project is a long-lived fixed asset wholly within the control of the Company, non-infrastructure solutions often require annual renewal by customers as well as unknown levels of customer participation and as such represent different risk profiles. To further complicate the comparison is the challenge related to the frequency of Design Day events. It is possible that 18,500 Dth of DR may be sufficient on a Design Day in 2027 (as a hypothetical) and that a Design Day does not occur in 2028 but that DR customers still must be paid, resulting in effectively zero direct financial value for the program cost. Conversely, if demand in Downstate New York flattens or gradually declines over the next decade, one would logically expect to see greater value in flexible resources such as demand response or other non-infrastructure solutions compared to fixed resources such as Vaporizers 13 / 14.

1.7 Emissions Considerations

National Grid presented an emissions analysis for the Greenpoint facility conducted by AKRF, Inc. as a "worst-case" evaluation of GHG to comply with the Climate Leadership and Community Protection Act ("CLCPA"), under the guidance of the New York State Department of Environmental Conservation ("NYSDEC"). This worst-case basis approach evaluated the maximum potential annual emissions from the Greenpoint facility after the installation of Vaporizers 13/14 and was based on a scenario in which the LNG storage tank inventory would be emptied once in a year.[24] Based on that limitation, the AKRF analysis concluded that the addition of Vaporizers 13/14 would reduce total carbon dioxide equivalent ("CO2e") emissions because those vaporizers are more efficient and would be operated in favor of existing, older vaporizers that are less efficient.

[24] The analysis was based on using 90% of the tank capacity. This level of LNG approaches the limit of pumping operations and leaves sufficient LNG in the storage tank to keep the system cold until liquefaction resumes.

While the worst-case LNG usage (90% of Greenpoint capacity) introduced above may have been necessary for NYSDEC and CLCPA compliance, the focus of PA's review under the Joint Proposal is on the Design Day requirements. Therefore, our analysis evaluated a comparison of CO2e emissions associated with all vaporizers at Greenpoint, both before and after the addition of Vaporizers 13 & 14 based on design hour output, for both the least efficient and most efficient sets of vaporizers. Due to the addition of Vaporizers 13 & 14, Design Day capacity increases from 291.2 MDth per day (12.1 MDth per hour) to 350 MDth per day (14.6 MDth per hour) with the increase in capacity entirely on the low-pressure system. The results of the emissions calculations based on different vaporizer operations scenarios are presented in Table 1-6.

Table 1-6: Design Hour Emissions for Various Vaporizer Combinations

Vaporizers In Use	Total Heating Gas Use (mmBtu/hr)	Design Hour Throughput Supplied Gas, (Dth/hr)	Vaporizer Heating Gas Design Hour Emissions (metric tons CO2e)
Current Scenarios			
HP: 7+8 LP: 9+10+11	216	12,133	20.6
HP: 8+12 LP: 9+10+11	215		20.5
Future Scenarios (After addition of V13/14)			
HP: 7+8 LP: 9+10+11+13	259	14,583	24.7
HP: 8+12 LP: 10+11+13+14	256		24.4

PA notes that the new vaporizers may also impact emissions upstream and downstream of the Greenpoint facility but has not included those impacts in its analysis reflected in Table 1-6 above.

The differences in vaporizer efficiency make only a slight positive difference in the total hourly CO2e emissions from the vaporizers at the design hour conditions – 24.4 MT vs. 24.7 MT as shown in Table 1-6 above. While the addition of Vaporizers 13 and 14 does increase the potential to add to overall site emissions, it is only because of the added throughput that may be needed to serve Design Day needs as the vaporizers tend not to run frequently other than on Design Days or when other sources of gas are curtailed. As Design Day events are not frequent, the potential for significant increased emissions from adding Vaporizers 13 and 14 on a Design Day is minimal.

1.8 Public Comment Highlights

Over the course of the comment period related to the Greenpoint Project beginning from the date of the Company's report filing through October 7, 2022, over 300 comments were received in addition to the approximately 10 hours of public discourse over the span of four public meetings in September 2022. Those submitting comments largely represented residents in neighborhoods of North Brooklyn and Queens, relatively near the Greenpoint facility. However, given that the KEDNY service area includes nearly 2 million customers the input received represented a comparatively small and localized sample of the Company's customer base.

Broadly, public input received was in opposition to the Project with only one statement submitted in support. The primary themes of opposition observed from public input are as follows:

- The negative impact on human health the project represents to an already heavily burdened area of industrial pollution, and the fact that the project is in an environmental justice zone
- The risk that the Project becomes a stranded asset
- The need for the Project
- The Project as adverse to CLCPA
- The Project as adverse to NY State law prohibiting LNG infrastructure
- The lack of alternatives presented (including renewable resources and a decommissioning plan)
- The relationship of the Project to MRI Phase 5
- The Design Day criteria and associated demand forecast being unrealistic

Each of these themes is discussed later in the report. However, our analysis does provide several modifications National Grid could consider improving public communication and the meeting process in the future.

- Given particular concerns related to safety, environmental and socio-economic justice, and rate impacts, investigate alternative, more frequent two-way channels of communication with all stakeholder groups.
- Evaluate additional methods of gathering input and seeking community engagement, whether via focus groups, surveys, visiting door to door, or more frequent "town-hall" type of meetings in order to increase the breadth and diversity of input and allow for real time process improvement in gathering and acting on feedback. Relatedly, conduct an evaluation of the effectiveness of the outreach campaign the Company undertook related to the Project.
- Ensure that the NGridSolutions website is kept up to date (e.g., the current links to transcripts are either unavailable or link to irrelevant meetings).
- Develop and publish follow up reporting to address the primary questions raised and offer additional sessions for specific topics (e.g., the relationship or lack thereof between Greenpoint and MRI).

1.9 Conclusions

National Grid's analysis projects that adequate supply is available to meet Design Day demand until the 2026-27 winter season. Based upon PA's review of the proposed Greenpoint Project per the considerations outlined in the Joint Proposal and application of the requisite criteria, the Project is not required to meet forecasted Design Day demand until the 2028-29 winter period which would be beyond the rate period in the current rate plan. PA's conclusions related to when the Project is needed under different scenarios are shown in Table 1-7.

Table 1-7: Greenpoint Project In-Service Need Dates Summary

Supply Stack	Demand Forecast	Earliest Need Date (winter)
Existing Supply Stack	National Grid 2022	2026-27
PA Supply Stack	National Grid 2022	2027-28
PA Supply Stack	PA Baseline Forecast	2028-29

Assuming 18 months of lead time, construction of Vaporizers 13 / 14 would need to begin by May 2027 to meet the date required for additional supply to meet forecast demand. However, Vaporizers 13 / 14 would provide the benefit of added reliability to the Greenpoint facility and overall natural gas supply stack on a Design Day. PA's conclusions related to each of the two governing criteria under the Joint Proposal are shown in Table 1-8.

Table 1-8: Joint Proposal Governing Criteria Conclusions

Criteria #	Criteria	Conclusion
1	Reasonably forecast peak customer demand requires the implementation of the projects to meet that demand	The Company's most recent forecast of peak demand does not indicate a need for the Project until the 2026-27 winter season. Based on PA's analysis reasonable extensions of current firm supply contracts will further reduce the need for the project as it relates to peak day demand further extending the need-by date until the 2028-29 winter season.
2	Alternatives that could meet that demand (or reduce or eliminate it) cannot reasonably be expected to be available and operational in the timeframes necessary for a lower "All-In Cost."	The Company has not presented evidence of alternative supply side, demand reduction, or non-pipe alternatives which could provide or reduce equivalent gas volume before the 2024-25 winter season it proposed for the Greenpoint Project to be in service. Based on PA's review of the potential alternatives and the Company's historical performance related to demand reduction programs, there are no lower cost alternatives which could be implemented within the time period for the Greenpoint Project proposed by National Grid. However, based on the PA Supply Stack and Baseline Forecast, adequate supply is available to meet Design Day demand until the 2028-29 winter season. Under this scenario it is possible, though not confirmed, that non-infrastructure DIS alternatives could mature and have the potential to provide equivalent savings at a lower All in Cost.

2 Introduction

PA Consulting Group, Inc. ("PA") conducted an independent assessment of The Brooklyn Union Gas Company's d/b/a National Grid NY ("KEDNY") proposed Greenpoint Vaporizer 13 and 14 Long Term Capacity Project ("Greenpoint Project" or the "Project"). This review was conducted for the New York State Department of Public Service (the "Department") pursuant to terms of the Joint Proposal in the recent rate settlement for KEDNY and KeySpan Gas East Corporation d/b/a National Grid ("KEDLI") (collectively, "National Grid" or the "Companies") that was modified and adopted by the New York State Public Service Commission ("Commission").[25] The Joint Proposal outlined a mechanism for an independent assessment of certain on-system projects as a condition of cost recovery over the term of the rate plan.[26] That mechanism specified that the independent review address specific criteria related to long-term capital capacity projects, including:

- The need for the project to meet a reasonable forecast of customers' peak demand, based on the most recent forecast available,
- Any safety and/or reliability benefits from the project,
- Viable alternatives to the project that would ensure reliable service,
- The All-In Cost of the project and a comparison of the All-In Cost of viable alternatives,
- Greenhouse gas ("GHG") emissions attributable to the project and any viable alternatives, and
- Any comments and analysis submitted by intervening parties and the public.[27]

PA was selected by the Department to be the independent consultant. This report summarizes the basis for our findings and conclusions as it relates to the Greenpoint Project and provides additional details on our assessment as well as important caveats. As prescribed in the Joint Proposal, the following are the components for PA's consideration in its review of the Company's proposal:

Category	Consideration Definition[28]
Supply & Demand	The Company's need for the project to meet a reasonable forecast of customers' peak demand, based on the Company's most recent forecast available
Safe & Reliable Service	Any safety and/or reliability benefits from the project
Alternatives - Reliability	Viable alternatives to the project that would ensure reliable service
Alternatives - Cost	The All-in Cost of the project and a comparison of the All-In Cost of viable alternatives
Alternatives - Emissions	The GHG emissions attributable to the project and any viable alternatives
Public Input	Any comments and analysis submitted by intervening parties and the public.

Further, as defined by the Joint Proposal, PA is tasked to apply the following standards to establish need for a given project[29]:

(i) Reasonably forecast peak customer demand requires the implementation of the projects to meet that demand; and

(ii) Alternatives that could meet that demand (or reduce or eliminate it) cannot reasonably be expected to be available and operational in the timeframes necessary for a lower "All-In Cost."

[25] Case No. 19-G-0309 and 19-G-0310, Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of The Brooklyn Union Gas Company d/b/a National Grid NY and KeySpan Gas East Corporation's d/b/a National Grid for Gas Service, Order Approving Joint Proposal, as Modified, and Imposing Additional Requirements (issued and effective August 12, 2021) ("Order"), adopting with modifications the terms of the Joint Proposal, dated May 14, 2021.
[26] Joint Proposal, Section IV.5.3.
[27] Joint Proposal, at 45.
[28] Joint Proposal, at 45.
[29] Ibid.

2.1 Overview of the Greenpoint Project

Borrowing language from the Company's proposal, the Greenpoint Project is one of two on-system infrastructure enhancements included in the Company's Distributed Infrastructure Solution introduced as part of the broader Distributed Infrastructure Solution. The Project consists of two new vaporizer units that will allow for more efficient extraction of liquified natural gas ("LNG") from the existing Greenpoint LNG facility during periods of peak demand. The Greenpoint LNG plant has been in service since 1968 to supplement the gas supply on the coldest days of the winter serves as a "peak shaving" facility with the primary purpose of meeting short periods of infrequent but significant peaks of demand.

Located at the Greenpoint Energy Center, the LNG plant occupies 50 acres including approximately 1/4 mile of waterfront along the Newtown Creek. The plant has two single containment LNG storage tanks with a total storage capacity of 1.6 billion standard cubic feet ("BCF").

Figure 2-1: Aerial view of the Greenpoint Energy Center

The proposed Project reflects the installation of two low-pressure LNG vaporizers at the Greenpoint LNG facility to expand the plant's overall output capacity. The two additional vaporizers, designated as "Vaporizers 13 and 14", would bring the total number of vaporizers at the facility to eight increasing the capacity at the facility to 350 MDth per day

There is no trucking of LNG associated with this Project nor does the proposed Project increase storage capacity.

2.2 Scope of Work

PA's review of the Project was conducted over the months of August to mid-October 2022. During this time frame, PA submitted, and the Company provided in depth responses to over 200 data requests, held over a dozen virtual meetings with various subject matter experts from the Company, conducted a site walk of the Greenpoint Energy Center, and attended the virtual and in-person public meetings related to the Company's Proposal. National Grid personnel have provided significant amounts of requested data, making its experts available for meetings and cooperating fully with PA.

Our report addresses each of the criteria listed in the Joint Proposal. We have organized the report to address first the supply and demand considerations which form the basis of evaluating the Project need, followed by the other aspects of the Project which cumulatively provide the basis for PA's overall recommendation.

3 Supply & Demand Assessment

In this section natural gas supply resources and the demand forecast are evaluated. Given the obvious inter-relationship of supply and demand for assessing the requirement, timing and costs for the Greenpoint Project, these two items have been assessed together.

Based upon the most recent demand forecast provided by National Grid, available sources of supply and PA's evaluation of the primary assumptions and drivers therein, the Greenpoint Project is not needed in order to meet Design Day demand for at least six years. National Grid's analysis projected a Need for the Project in the 2026-27 winter season. Our analysis has determined that based on low-risk adjustments to the National Grid existing supply stack ("PA Supply Stack") and following National Grid's most recent demand forecast ("2022 Forecast") the soonest the Greenpoint Project would be required to meet Design Day demand is the 2027-28 winter season. However, based on adjustments to the demand forecast proposed by PA ("PA Baseline Forecast"), the Greenpoint Project would not be required to meet Design Day demand until the 2028-29 winter season.

Purely from the standpoint of having adequate supply to meet demand, several years remain before construction would need to begin.

Furthermore, with additional non-infrastructure programs, this requirement could be extended further. However, while we outline several additional scenarios for the expansion of demand reduction programs in his report, reliance on incremental demand reduction from these programs carries significant risk and should not be incorporated into the supply-demand analysis until more experience with these programs is obtained.

For purposes of this assessment, we have selected a 10-year evaluation period. Ten years adequately covers the current and probably two more rate case cycles. In addition, this time period provides adequate time for additional learnings around a number of key areas, including, but not limited to:

- The Iroquois ExC project,
- Maturity of non-infrastructure programs in the DIS programs to allow more robust analysis of customer adoption and behaviors,
- Electrification impact on Design Day demand,
- Lingering Covid-19 implications on demand and economic development, and
- The implementation and effect of CLCPA and other city and state climate law.

The National Grid 2022 Forecast reflects slowing demand growth over time. The PA Baseline Forecast confirms this trend. Therefore, both National Grid and PA analysis suggest significant changes in demand are likely over the next 10 years. As discussed in this section, significant time still exists to evaluate the Greenpoint Project which could allow more time to evaluate non-infrastructure DIS components and other solutions as alternatives to meet forecasted Design Day demand.

3.1 Assessment of National Grid's Existing Supply

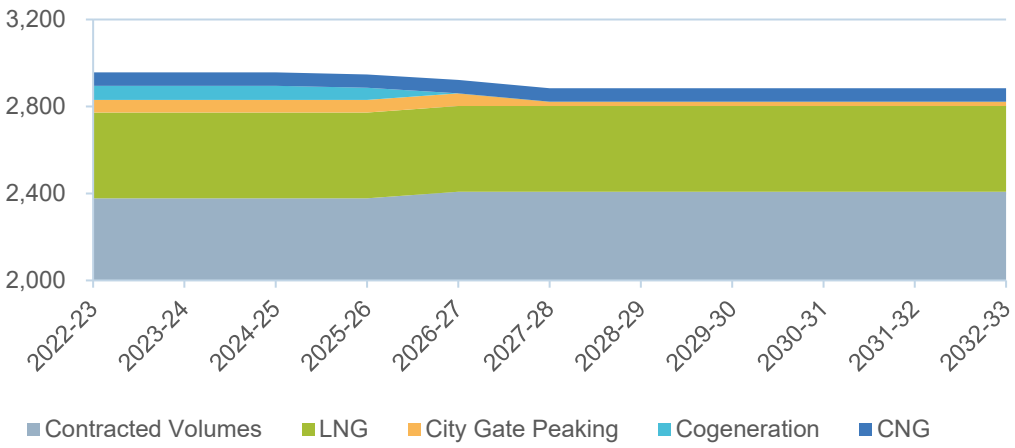
PA evaluated the various supply categories contributing to National Grid's existing supply stack. PA first verified the supply stack as it currently exists, and the extent to which supply stack components may be relied upon in the next 10-year study period, before including any incremental components of the Distributed Infrastructure Solution. The total contracted supply stack for the upcoming 2022-23 winter season stands at nearly 2,957 MDth per day of Design Day capacity. This volume includes all existing long-term contracted capacity, storage, existing Liquified Natural Gas ("LNG") capacity at Greenpoint and Holtsville, peaking capacity from contracts with cogeneration entities, city gate peaking contracts, four existing Compressed Natural Gas ("CNG") facilities[30], and Renewable Natural Gas ("RNG")[31]. See Figure 3-1 for the existing supply stack reported by National Grid.

Across the 10-year forecast period, there are a few notable changes to the contracted supply stack. These changes include:

- The expiration of cogeneration peaking supply contacts,
- The reversion of cogeneration peaking contracts to long-term contracted volumes, and
- The expiration of city gate peaking volumes.

[30] The fifth CNG facility, which is currently under construction at Farmingdale, is not included for the 2022-23 winter as it is scheduled for completion in Q1 2023. Moreover, supply has not yet been contracted for that facility in the 2023-24 winter. However, this facility should be completed and could be ready to provide injection of CNG in 2024-25 winter season, assuming National Grid pursues a supply contract for the facility.
[31] RNG volumes within the supply stack are likely to remain negligible in the foreseeable future.

Figure 3-1: Current National Grid Contracted Supply Stack[32]



In the above Figure 3-1, key shifts reported by National Grid result in a lower overall contracted supply stack across the 10-years - eventually reducing the contracted total to approximately 2,884 MDth per day by the 2027-28 winter season.

The first reduction could occur in the 2025-26 winter season with the expiration of a 9.5 MDth per day peaking capacity contract with Nissequogue Cogen Partners ("NCP"). The next major reduction could occur in the 2026-27 winter season with the expiration of two contracts with another cogeneration entity—Brooklyn Naval Yard Cogen Partners (BNY). The first contract, representing 25.3 MDth per day of cogeneration peaking capacity, expires outright. The second BNY volume to expire represents an additional 30.3 MDth per day of cogeneration peaking capacity. This second contract is unique because the 30.3 MDth per day volume is owned by KEDLI and released to BNY. When this cogeneration peaking contract expires, the volume returns to National Grid and is reflected within the total fixed pipeline and storage category in the supply stack. Said differently, this 30.3 MDth per day of capacity remains in the supply stack beyond the BNY contract expiration.

The final known reduction in the contracted city gate supply stack occurs upon the expiration of 38 MDth per day of city gate peaking capacity on Iroquois in the 2027-28 winter season. After these supply changes, the contracted supply stack decreases by approximately 73 MDth per day over the course of the 10-years: from nearly 2,957 MDth per day in for the 2022-23 winter season to approximately 2,884 MDth per day at the end of the 10-year period as shown in Table 3-1 below.

Table 3-1: National Grid Reported Contracted Supply Change Summary

Supply Type	Season	MDth/d[33]
Existing	2022-23	2,956.9
NCP	2025-26	(9.5)
BNY - KEDLI	2026-27	(25.3)
BNY - KEDNY	2026-27	(30.3)
BNY- KEDNY Reclassified	2026-27	30.3
Iroquois City Gate Peaking	2027-28	(38.0)
Total		2,884.2

[32] Source: Documents provided in response to PA 3-1.

[33] Capacities are rounded.

3.2 Incremental Supply Options and Associated Risks

3.2.1 CNG

CNG capacity is contracted capacity to transport CNG on specialized trailers to injection sites across National Grid's territory. The contracts allow National Grid to call on vendors to truck CNG into the downstate New York area and inject CNG into the distribution system at specific sites to support demand on a Design Day. Without sufficient contracted supply, CNG sites cannot provide support on a Design Day. Currently, four CNG injection facilities[34] exist with contracts that can support up to 61.6 MDth per day, with a fifth site—the Farmingdale site—under construction and expected to be finished in Q1, 2023. The Farmingdale site will provide up to 17.6 MDth per day of peaking capacity. As of the publication of this report, National Grid has not contracted for Farmingdale supply with a CNG vendor and plans to use an existing CNG peaking contract for a different site to test the Farmingdale CNG site. National Grid noted that it would require approximately one year of lead time to acquire a contract to support the Farmingdale CNG site due to the limited number of vendors and constraints on vendors' compression capacity.

From an implementation standpoint, the fifth CNG facility is considered the least risky incremental component of the supply stack given it will be completed in early 2023, National Grid's familiarity with building and operating these facilities, and the degree to which contracted supply can be used at different facilities, depending on where the need is. PA has assumed that CNG 5 can be online for the 2024-25 winter season at the earliest to account for the necessary planning to contract for additional CNG volumes to supply the injection site. The addition of this new CNG is reflected in the PA Supply Stack in Figure 3-4 below.

While the completion and implementation of the Farmingdale facility as a component of the supply stack is relatively low risk, it is important to note that there is a considerable degree of execution risk for Design Day in trucking CNG to injection sites. Execution risks exist in the potential that CNG trucks themselves could be unable to quickly deliver CNG volumes during adverse weather that might accompany a Design Day or that the CNG equipment does not function correctly when needed. Since 2018, National Grid has called on CNG for demand purposes on three separate days but has called on CNG for testing on 22 days, indicating that there has been historical precedent for relying on CNG to support demand needs and system reliability and that National Grid has experience in utilizing CNG.

3.2.2 Renewed Cogeneration Supply

The cogeneration peaking volumes are contracted volumes with cogeneration counterparties. During a Design Day, these contracts allow National Grid to call on volumes that would otherwise be bound to power cogeneration facilities during a Design Day event. There are two potential sources of cogeneration supply - both of which are re-contracting opportunities rather than new contracts. The first opportunity is the renewal of the KEDNY NCP cogeneration peaking contract, representing a Design Day volume of 9.5 MDth per day, starting in the 2025-26 winter season. The second possible cogeneration peaking contract is that between KEDNY and BNY[35]. This contract represents 25.253 MDth per day of Design Day volume that can be re-contracted starting in the 2026-27 winter season. In each of these cases, the contracts are with counterparties with whom National Grid has had relationships for several years. National Grid has noted that it will endeavor to re-contract for both agreements. Given the bilateral nature of the contracts, National Grid's historical relationship with the counterparties, the fact that National Grid has renewed these contracts previously, and the 3-4 years of lead time with which National Grid can consider negotiations, PA's view is that these volumes have relatively low risk to being re-contracted. There is some risk that the cogeneration counterparties could choose to sell to other parties, but there are relatively few large entities that would compete against National Grid for access to the gas volumes. The continuation of this cogeneration supply is also reflected in the PA Supply Stack in Figure 3-4 below.

Since 2017, National Grid has called upon one or more cogeneration peaking contracts on 32 days. Of those 32 days, 18 were between 2017 and 2018, the remaining 14 are from 2019 through the present.

3.2.3 Iroquois Enhancement by Compression

The Iroquois Enhancement by Compression ("ExC") project is being undertaken by Iroquois Gas Transmission, LP to enable 125 MDth per day of additional natural gas capacity to be split between the Hunts Point and South Commack delivery areas. Iroquois ExC requires only the construction of additional compression capability along the transmission line; there is no new pipeline construction. The project provides both Consolidated Edison Company of New York, Inc. ("Con Edison") and National Grid each 62.5 MDth per day of additional Design Day capacity and has received a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission ("FERC") which

[34] These include the Riverhead, Glenwood, Inwood, and Barrett CNG facilities. Riverhead has a peaking capacity of 8.8 MDth per day. The capacity of each of the remaining three CNG facilities is 17.6 Dth per day. All of National Grid's CNG facilities are designed to operate for up to 8 hours per day – 4 hours during both the morning and evening periods of peak demand.

[35] When the gas contract is called, BNY reverts to an alternate fuel in lieu of natural gas.

grants Iroquois three years to place the project in service[36]. While Iroquois has proposed an in-service date of November 1st, 2023, the project still requires approvals from the New York Department of Environmental Conservation ("DEC") and from the Connecticut Department of Energy and Environmental Protection ("DEEP") as well as a FERC Notice to Proceed. It is important to note that this project is entirely independent of National Grid and Con Edison. Neither company has any control over the project timeline, permitting or construction. Approximately eight months will be required for construction, so all approvals would need to be in place by March 2023 to meet Iroquois's planned November 1, 2023 in-service date.

The Iroquois ExC project is considered to be of moderate risk because of its outstanding state and federal approvals National Grid's lack of control over this project heightens its risk of reliance on the project. In its evaluation, PA has assumed that if the permits have been approved for ExC, it will come online for the 2025-26 winter season, opting for a conservative view of the timing for the project to be fully approved. If this resource does become available, it would be added to the supply stack as shown in Figure 3-5 below.

3.2.4 Renewed and Incremental City Gate Peaking Supply

City gate peaking contracts represent pipeline volumes that can be called upon during the winter months to support natural gas demand during peaking demand or a Design Day. After the 2026-27 winter season, 38 MDth per day of city gate peaking capacity contracts are currently scheduled to expire. National Grid has noted that it would attempt to re-contract for this expiring capacity but re-contracting those volumes is not certain, given that other parties in the natural gas market may attempt to acquire those volumes. This risk exists within the natural gas markets in general. Because city gate peaking contracts lack a Right of First Refusal (ROFR), other parties have the opportunity to acquire the underlying volumes.

National Grid has concluded that it may need to acquire between 5 and 20 MDth per day[37] of additional supply beginning in the 2024-25 winter season depending on which components of the DIS are successful. The Company has also asserted that, while it believes between 5-20 MDth per day of city gate peaking capacity may exist on the market, it is not possible to know what volume is attainable until an RFP is issued[38]. Uncertainty in future availability makes these volumes inherently riskier than sources of supply discussed above. When seeking incremental city gate peaking volumes, National Grid will likely be competing against other market participants that would require natural gas peaking capacity. These parties would include power generators and other nearby utilities. National Grid has successfully acquired city gate peaking capacity in the past and is familiar with the participants and counterparties that own the capacity. If National Grid is able to obtain the 38 MDth per day of incremental city gate peaking supply as it has in recent years and up to an additional approximately 20 MDth per day it has identified as possibly attainable, the supply stack would be increased as shown in Figure 3-6.

3.2.5 Delivered Services

Delivered services are those volumes that are contracted for the upcoming heating season only. The availability of these volumes tends to be both uncertain, especially in future years, and expensive. For these reasons, PA is not considering the impact or availability of delivered services in the supply stack. However, this source of incremental supply remains an alternative for National Grid.

3.2.6 Total Supply in the Distributed Infrastructure Solution

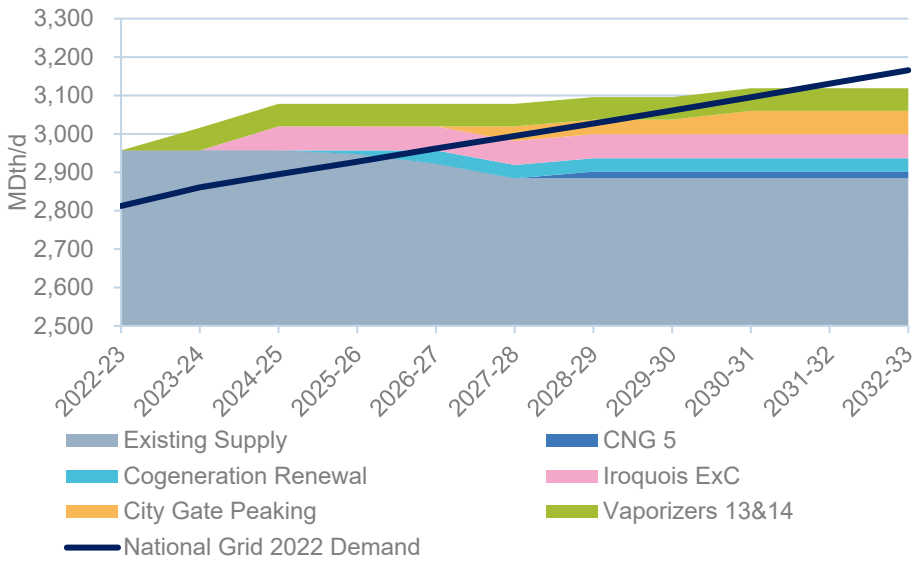
The supply stack provided by National Grid detailing the "Potential DIS Program Supply Options", shown in Figure 3-2 assumes the continuation or addition of the following resources. Please note that, for some components, the initial year of availability differs from the years assumed in PA's analysis.

- The NCP and BNY cogeneration peaking contracts are renewed in 2025-26 and 2026-27, respectively,
- CNG 5 becomes available in 2028-29,
- A 38 MDth per day city gate peaking contract that expires in 2026-27 is renewed in 2027-28,
- Iroquois ExC comes online in 2024-25, and
- Greenpoint Vaporizers 13 & 14 come online in 2023-24.[39]

It is key to note that, going forward this supply stack is distinct from Grid's Existing Supply stack, which outlines only those sources of supply that exist without the renewal or addition of any component. The below supply scenario only indicates a view of the supply options available and is not necessarily National Grid's chosen supply forecast.

[36] Pursuant to the FERC order, ExC must be in service by March 25, 2025.
[37] Source: Documents provided in response to PA 3-1.
[38] Source: Documents provided in response to PA 6-1.
[39] The Greenpoint Report indicates that Vaporizers 13 and 14 will be online in 2024-25. The DIS in Full Scenario in documents provided in response to PA 3-1 indicates a start date of 2023-24, which is reflected in the below graphic.

Figure 3-2: National Grid's Suggested Distributed Infrastructure Supply Stack



3.3 Assessment of Available Supply to Meet National Grid's Forecast Demand

To evaluate the ability for supply to meet Design Day demand, PA reviewed the available contracted supply stack and all potential incremental components to the supply stack and compared those options against the Adjusted Baseline Demand Forecast in the Company's 2022 Forecast.

Figure 3-3 represents National Grid's Existing Supply Stack (including infrastructure and non-infrastructure components) compared to the Company's 2022 Adjusted Baseline Forecast (i.e., the 2022 Forecast).

When evaluating potential incremental components of the supply stack beyond the elements included by National Grid, PA considered:

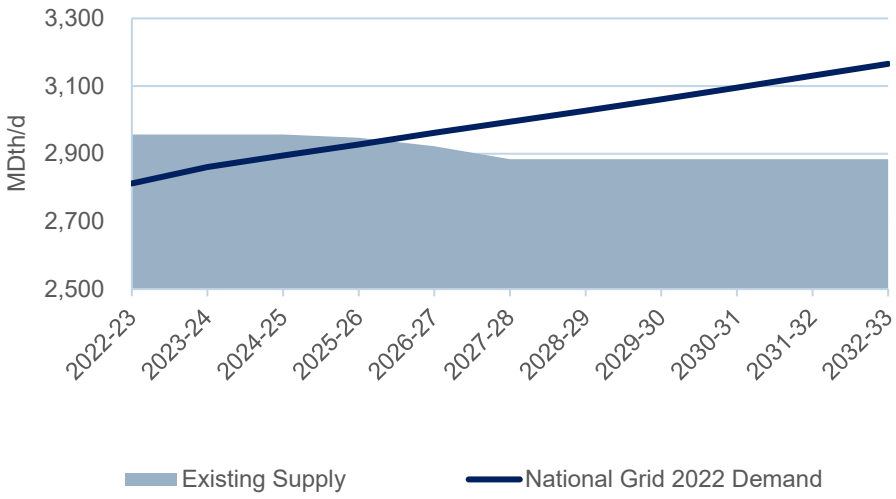
- The risk associated with securing the given supply component,
- The capability of Grid's distribution system to redeliver the supply, as evidenced by hydraulic modeling scenarios of the system under a variety of conditions, and
- Any regulatory and permitting hurdles associated with a given supply component.

Considering the above, PA analyzed supply stack components that first incorporate the least risky components to meet forecast demand. By incorporating incremental changes to the supply stack on least-to-greatest risk basis, PA has built a view on when the Greenpoint Project may be needed to provide reliable service on a Design Day – the PA Supply Stack.

Existing Supply Only

Figure 3-3 details National Grid's existing supply stack (an aggregation of the categories shown in Figure 3-1, above) compared to its 2022 forecast. Considering only the existing supply and the National Grid 2022 Forecast, the need date for Greenpoint Vaporizers 13 & 14 is the 2026-27 winter season.

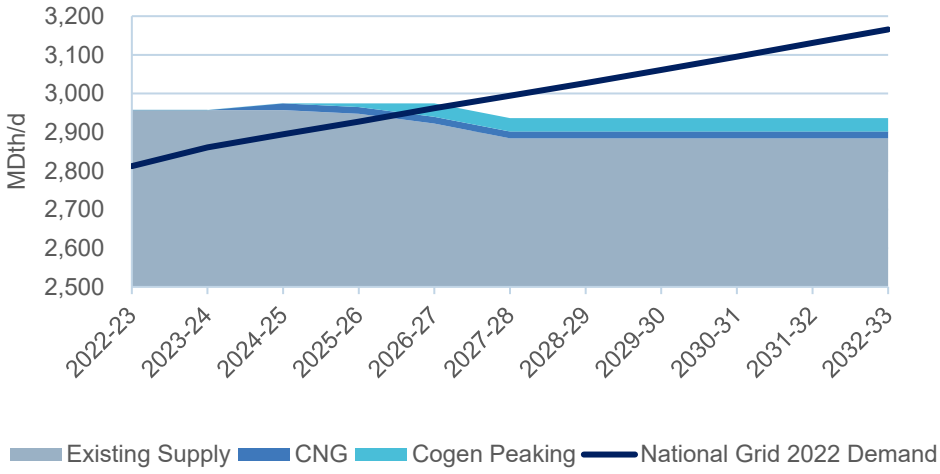
Figure 3-3: National Grid Demand – With Only Existing Supply



Fifth CNG Site / Cogeneration Renewals – PA Baseline Supply Stack

In evaluating the supply stack options against National Grid's 2022 Forecast, PA found that by adding the lowest-risk components (Farmingdale CNG beginning in 2024-25 and the renewal of both expiring cogeneration peaking contracts), the date by which the Greenpoint Project may be needed extends to the 2027-28 winter season as shown in Figure 3-4. Before that time, National Grid will know whether Iroquois ExC has been successful and should be able to develop a refined demand forecast reflecting more recent economic conditions in Downstate New York, and additional post-Covid trends.

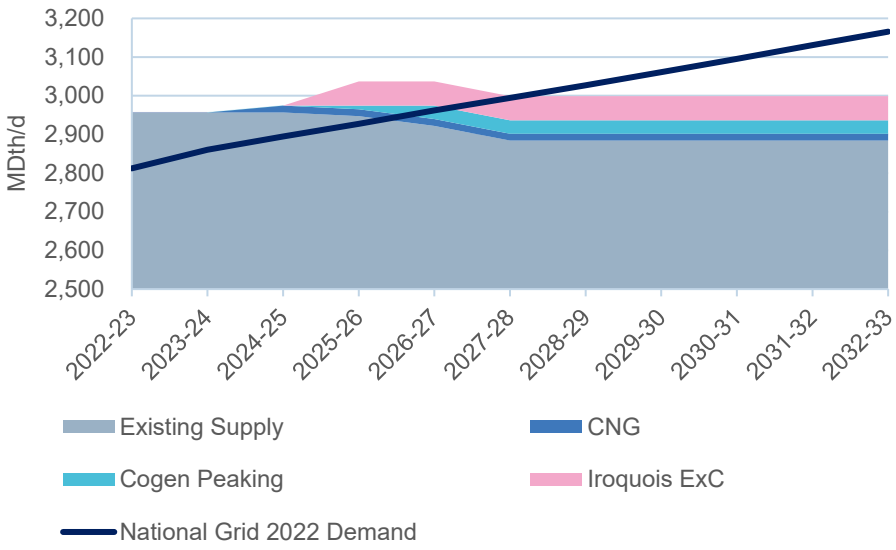
Figure 3-4: National Grid Demand – With CNG 5 & Renewed Cogeneration (PA Supply Stack)



Iroquois ExC

If – in addition to National Grid opting to pursue the lower-risk components noted above – the Iroquois ExC project is also approved and completed, it would extend the need for the Greenpoint Project out one more year to the 2028-29 winter season as shown in Figure 3-5, at which point National Grid would presumably have an even more refined demand forecast and additional information on the progress of its DIS programs.

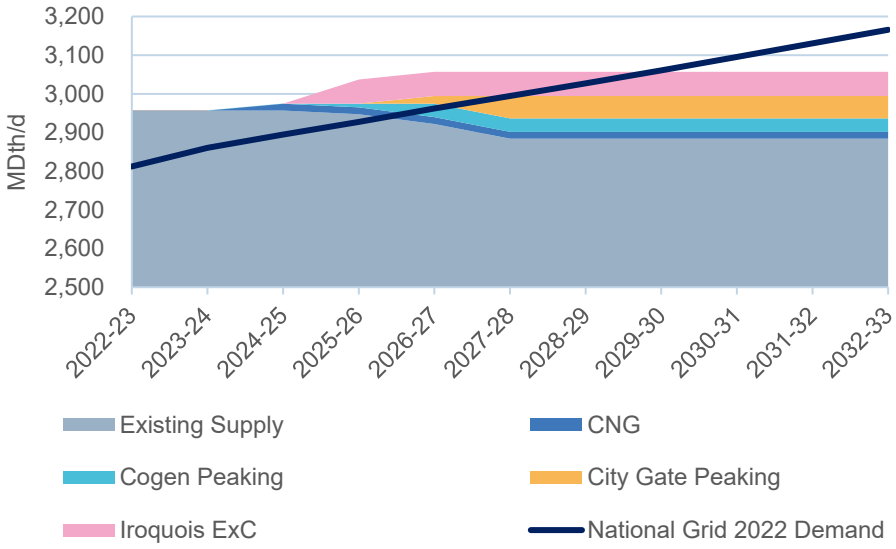
Figure 3-5: National Grid Demand – PA Supply Stack with Iroquois ExC



City Gate Peaking

Evaluating the highest-risk components last; if National Grid is also able to re-contract the 38 MDth per day of city gate peaking volume that expires prior to the 2027-28 winter season and is able to purchase an incremental 20 MDth per day – the upper end of the volume National Grid indicated it may be able to purchase – before its currently estimated 2028-29 winter season need date, it would push the date Vaporizers 13 / 14 would be required out another year, to the 2029-30 winter season as shown in Figure 3-6.

Figure 3-6: National Grid Demand – PA Supply Stack with ExC and Renewed & Incremental City Gate Peaking



These various options to increase Design Day supply are summarized in Table 3-2. Please note that the supply additions in Table 3-2 are not ordered sequentially by year of availability, but instead in order of perceived increasing risk. At a minimum, to meet Design Day demand under normal operating conditions based on Design Day demand in the 2022 Forecast, National Grid will not require the additional supply capacity from the Greenpoint Project until the 2026-27 winter season. Furthermore, if the ExC project is approved and National Grid is successful in securing the current level of peaking supply, this date could be extended to the 2029-30 winter season.

Table 3-2: Summary of Design Day Supply Options

Supply Source	Year Added (PA View)	Incremental Design Day Capacity	Cumulative Design Day Capacity	Year Vaporizers 13 & 14 Would be Required
Existing Supply Stack[40]	-	-	2,922.2[41]	2026-27
Incremental Additions				
CNG 5	2024-25	17.6	2,939.8	2026-27
Re-contracted Cogeneration Peaking – NCP	2025-26	9.5	2,949.3	2026-27
Re-contracted Cogeneration Peaking – BNY	2026-27	25.3	2,936.5[42]	2027-28
Iroquois ExC	2025-26	62.5	2,999.0	2028-29
Re-contracted city gate peaking	2027-28	38	3,037.0	2029-30
Incremental city gate peaking	2026-27	20	3,057.0	2029-30

The PA Supply Stack view incorporates all of the existing supply - supply that National Grid has noted could be contracted through the next ten years - and layers on capacity from the CNG 5 facility beginning in 2024-25 and re-contracted cogeneration capacity in 2025-26 and 2026-27. This scenario extends the need date for additional supply to the 2027-28 winter season.

An extension of the PA Baseline view incorporates capacity from the Iroquois ExC project beginning in 2025-26. This view places the need date for additional supply in the 2028-29 winter season. A further extension incorporates first a re-contracted city gate peaking capacity, followed by an incremental city gate peaking capacity in 2027-28 and 2026-27, respectively, extending the need date to the 2029-30 winter season.

3.4 Assessment of National Grid's Demand Forecast

3.4.1 Overview of National Grid's Demand Forecast

The Company's Adjusted Baseline Demand Forecast provides Demand Day MDth levels based on its annual Retail Sales forecast. The latter is developed using a bottom-up approach that starts with annual forecasts of Meter Counts ("MC"), customers, and annual Use-Per-Customer ("UPC") for each customer segment in KEDNY and KEDLI which, in turn, are combined to yield the retail sales forecast. The rolled-up retail forecast is subsequently adjusted for DSM factors, line losses etc. to arrive at the annual gross/wholesale figure which is then translated into Design Day demand (given the relatively minor magnitudes of the adjustments, there is a high correlation between the annual Retail Sales and the Adjusted Baseline for the Design Day and, hence, this report's analysis works with the assumption that a given percentage change in the former leads to approximately the same percentage change in the latter).

The Company arrived at its 2022 Adjusted Baseline (also referred to as the "2022 Baseline") by modifying the underlying elements of the (previous) 2021 Adjusted Baseline forecast (also known as the "2021 Baseline"). Whereas the 2021 forecast had a peak-day load of 3,340 MDth per day for the 2034-35 winter, the latest forecast projects demand to be 3,230 MDth per day – 200 MDth or 6% lower. While the Greenpoint Report characterizes this downward shift in the forecast as being driven by an expected decrease in commercial load and reduced new construction load due to NYC Int. 2317 ("Use of substances with certain emissions profiles"), which will accelerate electrification in new construction within the City of New York"[43], discussions with the Company revealed that their latest forecast modelling

[40] Capacity currently in place and not expiring in the next 10 years
[41] In the 2026-27 winter season, when additional supply is required.
[42] This value decreases versus the previous line item despite the addition of the BNY cogeneration contract because of 38 MDth/d of expiring city gate peaking volume in the 2026-27 winter season. The net impact of this expiration and the renewal of the BNY cogeneration contract is a decrease of 12.747 MDth per day.
[43] See Greenpoint Report, p. 20

also incorporated market information that became available since the 2021 forecast to revise the underlying MC and UPC forecasts across several customer classes.

In assessing the Company's 2022 Baseline PA's objective was not to develop an independent load forecast based on a technically rigorous methodology akin to National Grid's forecast development process but rather to analyze the market data and environment to identify aspects beyond those already reflected in the Company's revision of the 2021 Forecast. Our approach focused on examining the implications of the changing socio-economic backdrop for the Downstate gas market and a detailed analysis of the MC and UPC data for the individual customer classes. What follows is a discussion of how we perceive there to be additional reasons why the Design Day forecast could be even lower than what the Company represents in its 2022 Baseline. In our assessment, the trends in the economy, population and household formation discerned from the latest forecast provided by Moody's Analytics and some forecasting discrepancies provide a reasonable case for a forecast lower than what the Company's presented in its Report.

3.4.2 Discussion of Regional Economic and Population/Households Trends

PA finds it informative to examine the evolving macroeconomic forecasts pertaining to National Grid's Downstate service territory to provide context for an assessment of its changing market conditions – especially as they relate to gas demand in general and to the need for the Greenpoint Project. PA conducted a comparative analysis of three sets of Moody's forecasts of key economic and population-related variables for the 2021-35 period:

- Spring 2020 delivery – used by the Company for development of the load forecast originally used to frame the rationale for the Greenpoint Project in the last rate case,
- Spring 2021 delivery – which formed the basis for the load forecast (2021 Forecast) in the Second Supplemental Report in June 2021, and
- August 2022 delivery – obtained independently by PA to support the Greenpoint Project (2022 Forecast).

Since early 2020, COVID-19 resulted in a series of shocks to the Downstate New York ("DSNY") economy that has led to a profound transformation in consumer behavior and gas demand patterns. While some effects were relatively transient, the unprecedented nature of the pandemic has engendered apparent structural changes (e.g., work from home, commercial bankruptcies, population outflows from the state etc.). Uncertainty around the path of economic recovery necessarily introduced some volatility in economic forecasts as is reflected in the frequent revisions of near-term trajectories of some key economic variables. The specific variables critical to the Company's forecast of gas demand are population, the number of households, regional GDP and employment.

PA deployed the latest Moody's data with data as of August 2022 and analyzed weather-normalized usage patterns to identify any meaningful divergences from indicated trends in the Company's forecast. Specifically, PA found two potential discrepancies:

- Meter Count forecast for KEDLI's Residential Heating ("RH") segment, and
- Usage per customer forecast for KEDNY's Multi-Family ("MF") segment.

Our analysis suggests that forecasts of these two variables are trending on the high side in the 2022 forecast. Revision of these two factors as discussed below results in the PA Retail Sales forecast being 2.5% and 3.8%, respectively, below the Company's 2022 Downstate New York annual Retail Sales forecast in 2028-29 and 2034-35 winter season. Correspondingly, PA's Design Day forecast ("PA Baseline Forecast") is lower than the Company's 2022 Adjusted Baseline to a similar degree.

The following discussion and associated tables provide a comparison of the data provided by National Grid in support of the Company's demand forecast noted above from the referenced three Moody's forecasts over the last 18 months.

3.4.3 Population and Households

Forecasts of the number of Households and Population are key drivers of gas customer and gas meter growth. Table 3-3 and Table 3-4 compare the compound annual growth rates ("CAGR") for KEDNY and KEDLI calculated using data from the three editions of Moody's forecasts.

Table 3-3: Regional Population Growth: KEDNY and KEDLI[44]

	KEDNY			KEDLI		
	2020 Forecast	2021 Forecast	2022 Forecast	2020 Forecast	2021 Forecast	2022 Forecast
2021-28	0.11%	(0.05%)	(0.00%)	(0.05%)	(0.18%)	(0.16%)
2028-35	(0.01%)	(0.19%)	(0.09%)	(0.18%)	(0.28%)	(0.23%)
2035-42		(0.26%)	(0.19%)		(0.34%)	(0.31%)

The August 2022 forecast from Moody's supports the Population decline trends in KEDNY and KEDLI exhibited by the data used in the Company's forecasts albeit with a slight revision - presumably reflecting a less pessimistic post-COVID projection in the short term but suggesting a sharper drop in growth rates in the latter part of the forecast horizon. A key observation is that Population decline is a long-term phenomenon that accelerates over time.

Table 3-4: Regional Household Growth: KEDNY and KEDLI[45]

	KEDNY			KEDLI		
	2020 Forecast	2021 Forecast	2022 Forecast	2020 Forecast	2021 Forecast	2022 Forecast
2021-28	0.30%	0.15%	0.00%	0.23%	0.12%	(0.05%)
2028-35	0.17%	0.02%	0.03%	0.08%	(0.01%)	(0.03%)
2035-42		(0.20%)	(0.21%)		(0.21%)	(0.26%)

Beyond the post-COVID adjustment, the progression of Household forecasts also points to an acceleration in the decline in new household formation implying a faster shrinkage in the Company's potential customer base. Particularly striking is the forecast for KEDLI – with household growth already negative and projected to fall faster after the mid-2030s, the implications for reduced Residential customer growth seem significant.

3.4.4 Gross Regional Product and Employment

Table 3-5 and Table 3-6 show the CAGRs based on the three editions of Moody's Analytics forecasts for Real Gross Regional Product and Total Employment. It is useful to note that given the structure of the regional economy and the relative dominance of Residential usage, macroeconomic variables have a lower bearing on gas usage as compared to other parts of the country.

Table 3-5: Gross Regional Product Profile: KEDNY and KEDLI[46]

	KEDNY			KEDLI		
	2020 Forecast	2021 Forecast	2022 Forecast	2020 Forecast	2021 Forecast	2022 Forecast
2021-28	2.05%	2.29%	2.42%	1.88%	2.18%	2.33%
2028-35	1.53%	1.60%	1.98%	1.24%	1.43%	1.73%
2035-42		1.43%	1.59%		1.33%	1.38%

The higher figures in the August 2022 forecast for the 2021-28 period in both KEDNY and KEDLI hint at a post-COVID revision of the GDP forecast. However, common to both the 2021 and August 2022 forecasts is the notion of a decelerating trend in the local economy – possibly implying a slowdown in the overall gas market in the long run.

[44] CAGRs are based on data from Moody's Analytics.
[45] Ibid.
[46] Ibid.

Table 3-6: Regional Employment Profile: KEDNY and KEDLI[47]

	KEDNY			KEDLI		
	2020 Forecast	2021 Forecast	2022 Forecast	2020 Forecast	2021 Forecast	2022 Forecast
2021-28	0.60%	0.84%	1.17%	0.47%	0.81%	0.96%
2028-35	0.20%	0.02%	(0.10%)	0.22%	0.12%	(0.03%)
2035-42		(0.03%)	(0.21%)		0.08%	(0.12%)

It is clear that in all three referenced Moody's forecasts there is a marked slowdown in Total Employment growth during the 2028-35 period as compared to the 2021-28 period across both KEDNY and KEDLI. Not only is that trend consistent with the shrinking Population across National Grid's Downstate New York territory as shown in Table 3-3 but it also suggests a potential slowing of Commercial ("COM") customer growth and plausibly UPCs as it plausibly mirrors a slowdown in new business growth and reduced business activity.

Moody's forecasts exhibit similar trends well past the 2035 horizon further suggesting that it is appropriate for National Grid's gas demand forecasts in total and for a Design Day to look less optimistic in 2022 than they did in 2020, which is the case. This continued trend would support the need for less supply than currently forecasted to be needed to meet future Design Day loads.

3.4.5 Meter Count Forecasts

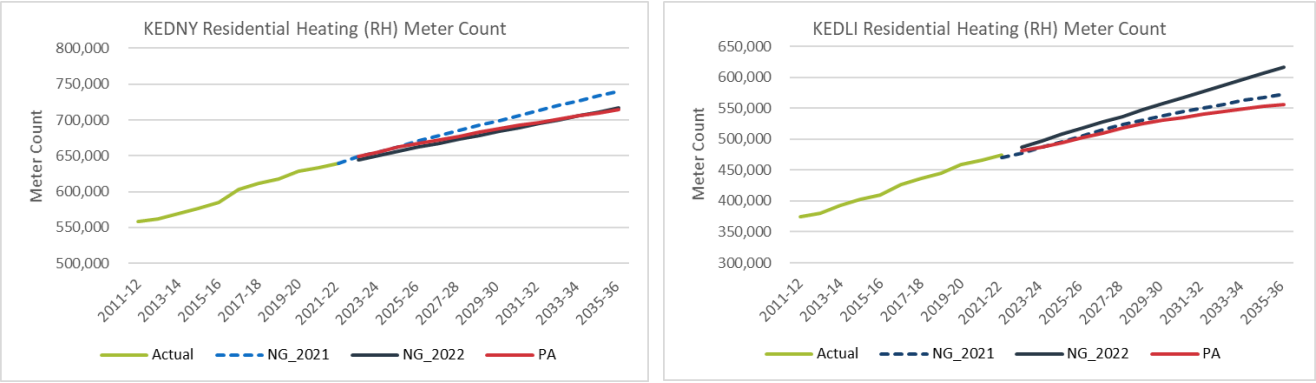
In order to quantify the implications of weakening economic and demographic forecasts, PA developed statistical models for Meter Counts (MC) for the RH, COM and MF customer classes based on the 2021 and 2022 Moody's forecasts and leveraged the implied differentials to scale the 2021 Retail Sales forecasts. The scaling factor for each customer class was calculated as the ratio of the estimated MC forecast based on Moody's 2022 data to the corresponding estimates based on Moody's 2021 data. In all cases the resulting ratios were less than one which suggests diminished growth trajectories based on the economic and demographic variables and implied MC levels lower than the original 2021 forecasts.

PA developed a revised MC forecast for the RN customer class based on the trends exhibited by this historical data.

While for most customer classes across KEDNY and KEDLI the revised forecasts were ostensibly similar to the Company's figures underlying its most recent 2022 retail forecast (i.e., with the 2034-35 levels deviating by +/- 1.5% to 2.5%), one key exception emerged - the MC forecast for the KEDLI RH customer class. As illustrated in Figure 3-7 below, not only is PA's forecast for the 2034-35 year 9% lower the Company's forecast, but the Company's most recent forecast is 7% higher than the corresponding level originally provided in the Second Supplemental Report in June 2021. PA's adjustment to the Company's forecast relied on the most recent version of the Moody's economic forecast (August 2022) available at the time of our analysis and its trajectory is consistent with projected electrification pathways and the forecasted decline in Population and Household growth in the KEDLI territory.

Figure 3-7: Meter Count Forecasts for Residential Heating (RH) Class: KEDNY and KEDLI

(a) (b)



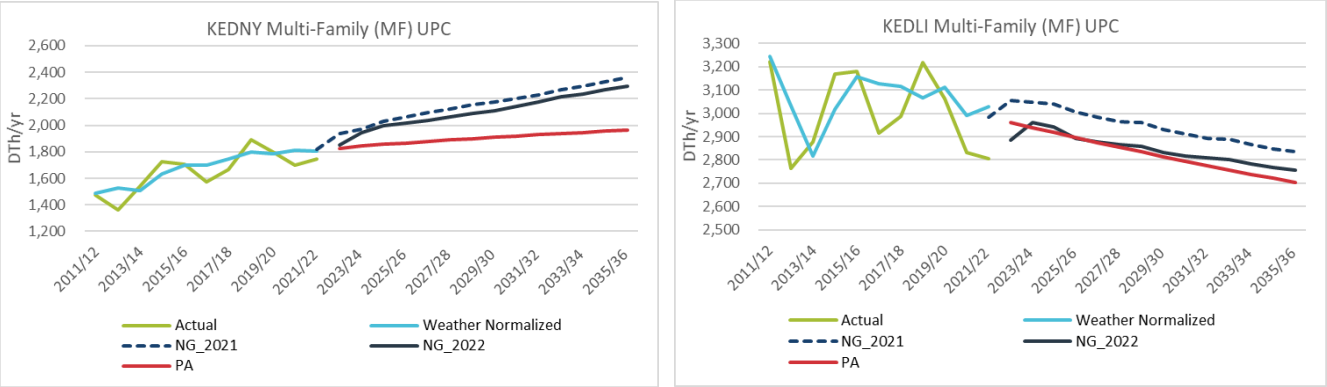
[47] Ibid.

3.4.6 Usage per Customer (UPC) Forecasts

PA also assessed the National Grid UPC data by developing trend-based projections of weather-normalized annual UPCs for the RN, RH, COM and MF customer classes for the NEDNY and KEDLI territories. The resulting PA forecast levels were consistent with the Company's magnitudes underlying the 2022 Forecast with one major exception – the 2034-35 forecasted UPC for the MF class in KEDNY was 14% below the Company's level for the same year. Figure 3-8 illustrates these observations. PA's adjustment to the Company's 2021 forecast is consistent with the stabilization exhibited in the weather-normalized trend during the last five years. Note that the bulk of fluctuation in annual UPCs from year to year is weather-related and the smoother trajectories of the weather-normalized estimates are due to statistically removing that factor. Also note that the noticeable drop in KEDLI's levels during 2012-14 can be attributed to the effect of Super-storm Sandy.

Figure 3-8: UPC Forecasts for Multi-Family (MF) Class: KEDNY and KEDLI

(a) (b)



Appendix E contains a detailed assessment of the MC and UPC forecasts for each customer class across KEDNY and KEDLI.

3.4.7 Assessment of Design Day Demand Forecast

Using the revised MC and UPC forecasts described above and leveraging the National Grid implied load factor - the ratio of its forecasted Design Day demand levels (i.e., the National Grid Adjusted Baseline) to the corresponding retail sales forecast - an alternative total annual retail sales (i.e., annual demand) forecast[48] was developed as the PA Baseline Forecast[49]

The following steps describe how PA arrived at its Baseline demand forecast.

Step 1. Develop Meter Count (MC) forecasts for each of the 4 customer-classes - Residential Non-eating (RN), Residential Heating (RH), Commercial (COM) and Multi-Family (MF) - in KEDNY and KEDLI.

- KEDNY: For the RH, COM and MF segments PA estimated two separate models using the same statistical specifications but one using the 2021 Moody's economic forecast (used by the Company to develop its 2021 Forecast) and the other using the August 2022 Moody's economic forecast. This step was done to quantify the impact of the changed economic and/or Population/Household forecasts. Treating the ratios of the estimates from the two models, PA scaled the Company's corresponding 2021 MC forecasts to arrive at PA's MC forecasts. For the RN class, PA's forecast is trend based. PA adopted the Company's forecast for the NFDR and Other customer classes.
- KEDLI: For the RH and MF segments PA followed the same approach as for KEDNY's counterparts. PA adopted the Company's MC forecast for the COM customer class. For the RN class, PA's forecast is trend based. PA adopted the Company's forecast for the NFDR and Other customer classes.

[48]As communicated by the Company, there was a change in its billing regimen as the Temperature Controlled (TC) and interruptible (IT) rate codes were reclassified as Non-Firm Demand Response (NFDR) Tier 1 and Tier 2 rate codes. Acknowledging the ensuing disconnect between the legacy and current historical and forecasted MC and UPC levels, PA chose to adopt the Company's 2022 figures for the NFDR and 'Other' customer classes.

[49]National Grid's forecasting methodology involves the step of 'grossing up' the Retail Sales to arrive at the annual wholesale 'sendout 'equivalent and subsequently to apportion it to daily loads based on a normative 365-day temperature profile thereby arriving at the Design Day load attributed to the coldest day exhibiting an average daily temperature of zero degrees Fahrenheit – i.e., 65 Heating Degree Days.

Step 2. Develop Use-Per-Customer (UPC) forecasts based on trends of weather-normalized historical values for all four customer segments in KEDNY and KEDLI.

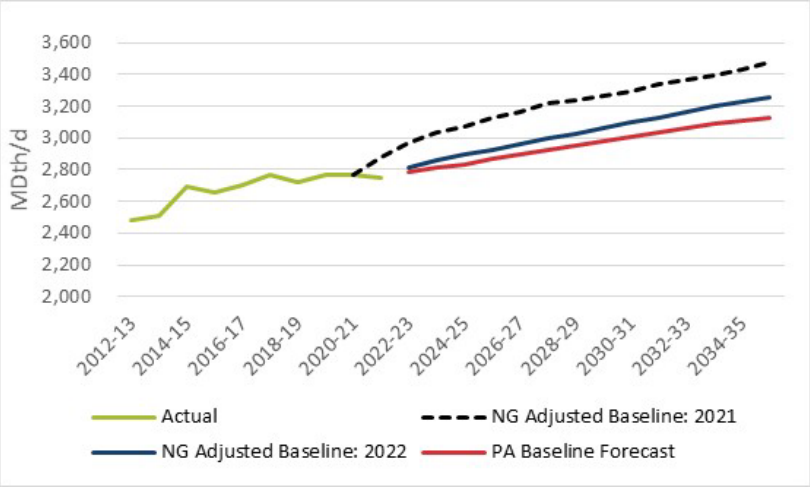
Step 3. Calculate the forecasted annual sales volumes for each customer class in KEDNY and KEDLI by multiplying the forecasted MC and UPC values for each year. Aggregate the sales across all customer classes in the Company's Downstate New York territory to obtain PA's annual Retail Sales forecast.

Step 4. Calculate the implied Load Factor (ratio of Peak Load to Annual Retail Sales) in the Company's 2022 Forecast.

Step 5. Multiply the figures obtained in Step 3 with the Load Factor from Step 4 to arrive at PA's estimated Design Day demand forecast (i.e., PA Baseline Forecast).

A comparison of the PA Baseline Forecast and two Company forecasts are shown in Figure 3-9 below[50].

Figure 3-9: Historical Peak Load and Design Day Demand Forecasts



The annual winter forecasted Design Day demand levels for the two most recent National Grid peak forecasts noted above and the PA Baseline Forecast are provided in Table 3-7 below.

Table 3-7: Design Day Demand Forecast Comparisons (MDth/day)

Year	Company Adjusted Baseline: 2021	Company Adjusted Baseline: 2022	PA Baseline
2022-23	2,966	2,812	2,785
2023-24	3,031	2,861	2,816
2024-25	3,074	2,895	2,835
2025-26	3,123	2,927	2,871
2026-27	3,168	2,962	2,897
2027-28	3,221	2,994	2,926
2028-29	3,238	3,027	2,951
2029-30	3,265	3,061	2,983
2030-31	3,296	3,095	3,010
2031-32	3,343	3,131	3,036
2032-33	3,365	3,166	3,059
2033-34	3,399	3,199	3,086
2034-35	3,430	3,230	3,108

[50]The historical data depicted in Figure 3-9 was provided in response to Data Request PA 8-3.

Figure 3-9 and Table 3-7 contrast the PA Baseline Forecast with the 2022 Forecast and 2021 Forecast for a Design Day. The two key observations from this data are:

- Changes by the Company in the MC and UPC forecasts across various customer classes for KEDNY and KEDLI led to a significant downward shift in its Design Day forecast, and
- PA's independent analysis suggests a forecast that is lower than the Company's current Design Day forecast.

In characterizing its latest Design Day forecast, the Company states that "National Grid's latest adjusted baseline demand forecast[51] is lower than its 2021 adjusted baseline forecast, and the forecast provided in the Supplemental Report. The decrease is driven by an expected decrease in commercial load and reduced new construction load due to NYC Int. 2317 ("Use of substances with certain emissions profiles"), which will accelerate electrification in new construction within the City of New York."[52]

In summary, while PA agrees with the Company's rationale for the projected long-term shift in gas demand in Downstate New York, it does not fully agree with how the Company represented those changes in the underlying data for the 2022 adjusted baseline forecast – especially in the context of the evolving macroeconomic and demographic backdrop discussed earlier. With respect to the Commercial sector, the COVID-19 pandemic engendered structural impacts on the local economy – shutdowns and bankruptcies in restaurants and hospitality, protracted and possibly long-term switch to hybrid working arrangements etc. - and it is reasonable to expect that these changes will lead to a combination of reductions in new commercial customer growth and commercial-sector UPCs. We interpret New York City's mandates (embodied in Local Law 154[53]) aimed at electrifying most newly constructed and substantially retrofitted buildings as potentially consequential moves that will impact gas demand by dramatically limiting new customer growth in the RH, COM and MF customer classes in KEDNY and part of the KEDLI territory[54]. Furthermore, we find (a) that the latest economic and demographic forecasts imply a future market landscape that suggests a less optimistic environment for customer growth and (b) that there are sound arguments for lowering the UPC forecast for the MF customer class in the KEDNY area and the MC forecast for the RH customer class in the KEDLI area – together implying a forecast lower than the Company's 2022 Forecast.

Therefore, a strong case can be made for a further decline in Design Day demand based on the evolving economic and demographic profile, the long-term effect of COVID-19 on gas-usage patterns and the potential electrification impact of the New York City's Local Law 154. Based on the annual forecasts in Table 3-7, PA's Baseline Forecast results in a Design Day demand forecast that implies a CAGR of 0.92% over the 2022-2035 period as compared to a 1.16% CAGR implied by the Company's 2022 Forecast. This lower demand growth could help increase the time period until incremental supply resources would be required to meet demand. In the following section we address the available supply to meet demand based on the PA Baseline Forecast.

3.5 Assessment of Available Supply to Meet PA's Baseline Forecast

Using the same approach as utilized in Section 3.3 above, PA evaluated the supply resources available to meet Design Day demand in the PA Baseline Forecast. Furthermore, we evaluated several potential adjustments to the PA Baseline Forecast that would provide additional headroom to utilize available supply resources. These adjustments include:

- Incremental energy efficiency,
- Incremental demand response, and
- Incremental electrification.

3.5.1 PA Baseline Forecast

Scenario 1: PA Baseline Forecast - National Grid Existing Supply Stack

Figure 3-10 compared National Grid's Existing Supply Stack to the PA Baseline Forecast of Design Day demand, with no incremental components of the supply stack included. In this scenario, demand will outpace supply beginning in 2027-28.

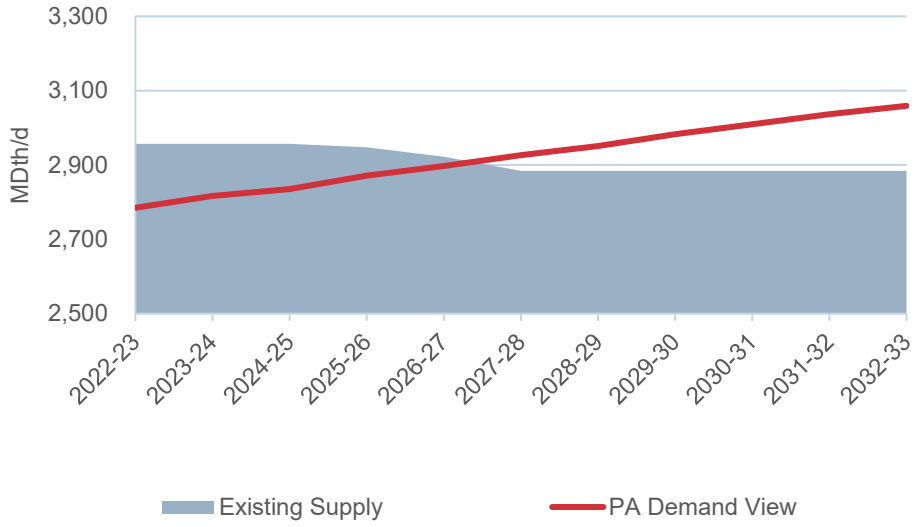
[51] The latest National Grid adjusted baseline demand forecast was developed in March-April 2022.

[52] See Greenpoint Report, p. 20.

[53] The Law amends the administrative code of the city of New York, in relation to the use of substances with certain emissions profiles and directs the Commissioner of Buildings to deny construction documents and permits in connection with a building that would require the combustion of these substances, with some exceptions (See https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=4966519&GUID=714F1B3D-876F-4C4F-A1BC-A2849D60D55A&Options=ID%7CText%7C&Search=combustion).

[54] KEDLI's territory includes portions of Queens County that fall in New York City limits and are therefore affected by the impacts due to Local Law 154.

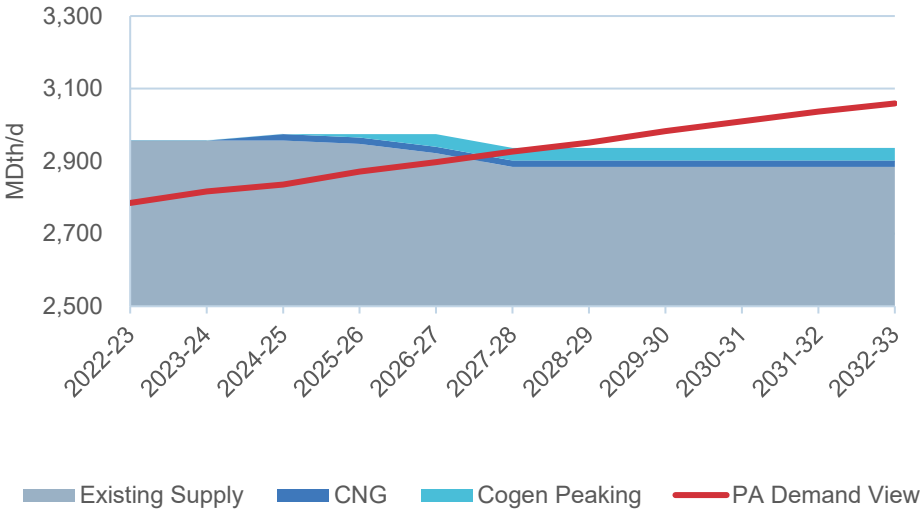
Figure 3-10: PA Baseline Forecast (Design Day Demand) – National Grid Existing Supply Stack



Scenario 2: PA Baseline Forecast - National Grid Existing Supply Stack Plus CNG 5 and Cogeneration

When considering only the lowest-risk incremental supply components to meet Design Day demand – CNG 5 plus renewal of the cogeneration peaking contracts (PA Supply Stack) – based on the PA Baseline Forecast additional supply from the Greenpoint Project (or any other new sources) may not be required until at least the 2028-29 winter season, as is shown in Figure 3-11 below.

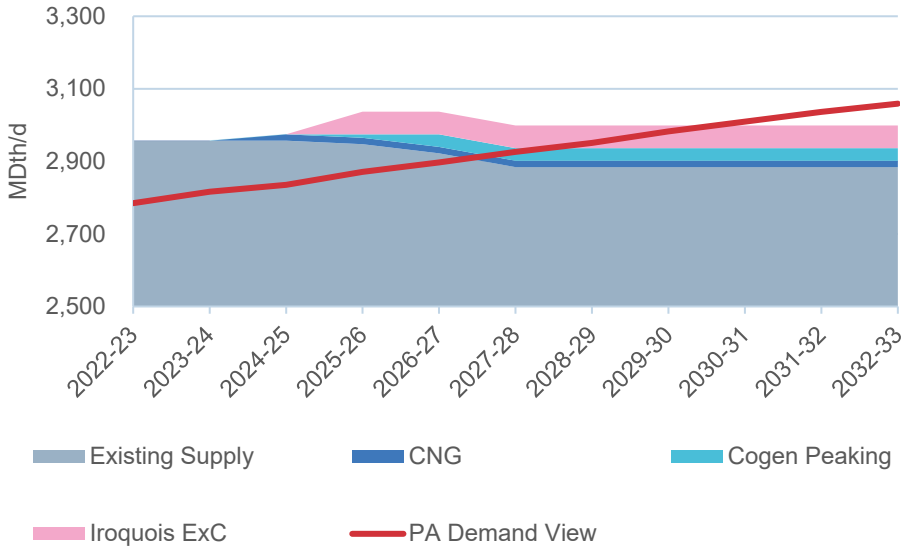
Figure 3-11: PA Baseline Demand - National Grid Existing Supply Plus CNG 5 and Cogeneration (PA Supply Stack)



Scenario 3: PA Baseline Demand – PA Supply Stack Plus Iroquois ExC

If Iroquois ExC is approved, the need for additional supply could be further extended to the 2030-31 winter season as shown in Figure 3-12.

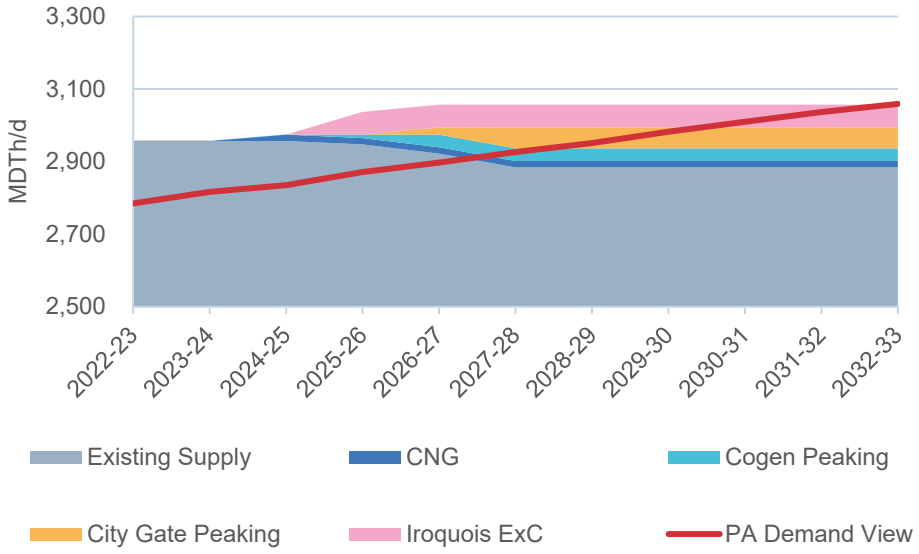
Figure 3-12: PA Baseline Demand – PA Supply Stack Plus Iroquois ExC



Scenario 4: PA Baseline Demand – PA Supply Stack Plus Iroquois ExC and Renewed and Incremental City Gate Peaking

If National Grid were successful in reacquiring the 38 MDth per day city gate peaking contract that expires in 2026-27, the need for additional supply could be pushed to 2032-33 as shown in Figure 3-13. If National Grid were successful in contracting for the approximately 20 MDth per day of additional city gate peaking capacity that is said might be available, the same outcome could be reached.

Figure 3-13: PA Baseline Demand – PA Supply Stack Plus Iroquois ExC and Renewed & Incremental City Gate Peaking



3.5.2 Incremental Demand Reduction Opportunities

As noted above, in addition to the PA Baseline Forecast three additional demand reduction opportunities based on the non-infrastructure alternatives included in the DIS were assessed and compared to the PA Baseline Forecast. These scenarios are presented to highlight the potential for additional demand reduction. At this point, the available data suggests that these scenarios might be too aggressive to incorporate into a firm demand forecast. However, National Grid is encouraged to aggressively pursue these types of programs.

Incremental Energy Efficiency: PA determined the additional energy efficiency impact by incorporating the incremental savings anticipated from the non-infrastructure components of the DIS as compared to the savings reflected in the

Company's 2022 Forecast. The DIS anticipated incremental relief from weatherization programs, above what is reflected in the Company's 2022 Forecast, given the 2022 Forecast weatherization amounts were substantially reduced due to the challenges experienced in scaling those programs. The DIS also anticipated relief from the proposed requirement that new gas customers, including those converting from other heating technologies, must adopt advanced energy efficiency measures prior to connection to the natural gas system. This was not reflected in the Company's 2022 Forecast, given approval, implementation, and overall relief potential uncertainties. Our full analysis of such measures and challenges is described in greater detail within Section 5.2.2 of this report

Incremental Demand Response: PA determined the additional demand response savings by incorporating the incremental savings anticipated from the non-infrastructure components of the DIS as compared to the savings reflected in the Company's 2022 Forecast. The Company's 2022 Forecast reflects a conservative approach in estimating the relief. Whereas the DIS reflects an aspirational level of customer participation and relief reliability. For example, the DIS anticipated approximately 690 more customers participating in the Daily DR and Peak Period DR programs by the winter 2025-26 season, a difference of 155%. See Section 5.2.2 of this report for additional discussion on this topic.

Incremental Electrification: PA determined the additional electrification savings by incorporating the incremental savings anticipated from the non-infrastructure components of the DIS as compared to the savings reflected in the Company's 2022 Forecast. While incentivizing electrification is not normally the responsibility of a gas utility, the DIS assumed that the Company would need to provide a separate incentive to encourage an incremental number of customer adoptions to electric heating. This was not included within the Company's 2022 Forecast since such incentives are not approved, as described in greater detail within Section 5.2.2 of this report.

The impact of each of these three incremental demand reduction opportunities is then compared to the National Grid Proposed Supply Stack as well as the National Grid supply stack adjusted for each of the incremental supply sources identified by PA and discussed earlier in Section 3.2 of this report.

All DIS: The total DSM impact was developed by incorporating the incremental savings from the relief of all demand side programs originally forecast in the 2021 Forecast from the non-infrastructure components of the DIS as compared to all of the demand side program savings reflected in the Company's 2022 Forecast.

As discussed below, each of the incremental demand reduction opportunities (added to the PA Baseline Forecast) could increase the amount of time until National Grid would require incremental supply from the Greenpoint Project or other new sources of supply to meet Design Day demand.

Scenario 1. National Grid Existing Supply Stack

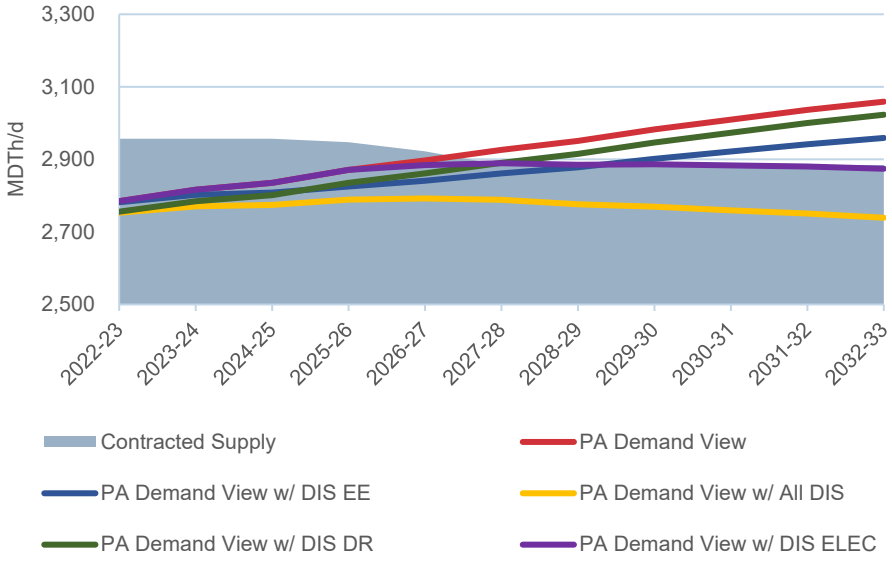
A comparison of the PA Baseline Forecast adjusted for these incremental non-infrastructure components of the DIS opportunities to National Grid's Existing Supply Stack Grid might increase the time period additional supply from the Greenpoint Project (or any other sources) would be required to meet Design Day demand until at least the 2027-28 winter season and possibly until the 2029-30 winter season as shown in Table 3-8. In each scenario, by incorporating Demand Response, Electrification, and Energy Efficiency in tandem, the need for more supply could be pushed beyond the 10-year study period.

Table 3-8: Meeting Design Day Demand with Incremental DIS - National Grid Existing Supply

PA Baseline	Demand Response	Electrification	Energy Efficiency	All
2027-28	2027-28	2027-28	2029-30	Beyond the 10-Year Forecast Period

Figure 3-14 provides a graphical comparison of the PA Baseline Forecast with each incremental demand reduction opportunity compared to the National Grid Proposed Supply Stack on a Design Day.

Figure 3-14: PA Baseline Forecast and Incremental Demand Reduction – National Grid Existing Supply Stack



Scenario 2. PA Supply Stack - National Grid Existing Supply Stack Plus CNG 5 and Cogeneration

When considering only the lowest-risk incremental supply components to meet Design Day demand – CNG site 5 plus renewal of the cogeneration peaking contracts – based on the PA Baseline Forecast adjusted for the three incremental demand reduction opportunities, additional supply from the Greenpoint Project (or any other new sources) may not be required until at least the 2028-29 winter season and possibly until the 2031-32 winter season as shown in Table 3-9

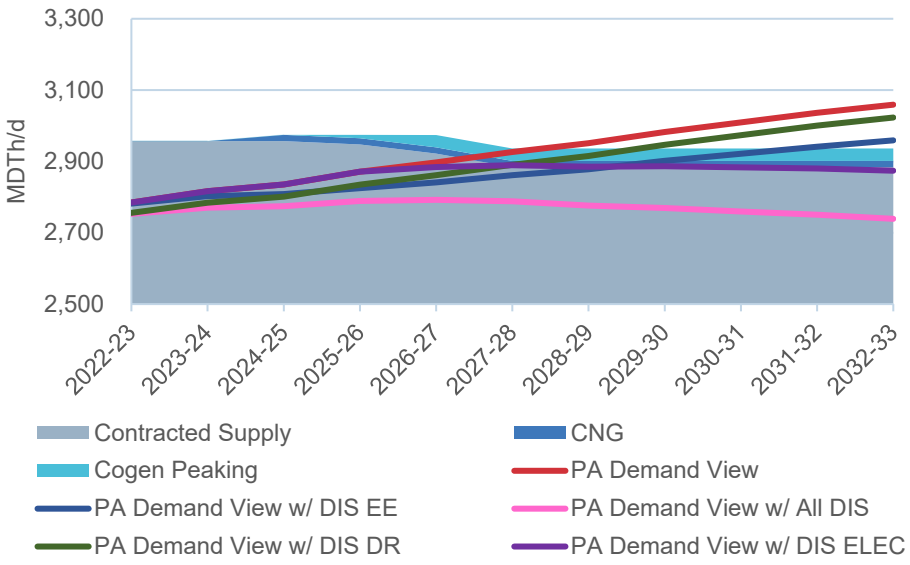
Table 3-9: Meeting Design Day Demand with Incremental DIS – PA Supply Stack

PA Baseline	Demand Response	Electrification	Energy Efficiency	All
2028-29	2029-30	Beyond the 10-Year Forecast Period	2031-32	Beyond the 10-Year Forecast Period

If incremental demand reduction from the DIS electrification program is added to the PA Baseline Forecast, Design Day demand might not surpass available supply with the addition of CNG site 5 and the cogeneration contract renewal (or in any other following increased supply stack scenarios) during the 10-year forecast period. The same could be said for the scenario that incorporates all three DIS programs – incremental DR, EE and electrification.

Figure 3-15 provides a graphical comparison of the PA Baseline Forecast with each incremental demand reduction opportunity compared to the National Grid Proposed Supply Stack with CNG site 5 and renewal of the cogeneration contracts on a Design Day.

Figure 3-15: PA Baseline Forecast and Incremental Demand Reduction – PA Supply Stack



With the addition of CNG 5 and the renewal of cogeneration contracts, under Scenario 2, available supply might cover Design Day demand until at least the 2028-29 winter season under the PA Baseline Forecast, might be delayed until as far as 2031-32 or further if the incremental DIS programs were implemented.

Scenario 3. PA Supply Stack Plus Iroquois ExC

If the Iroquois ExC project is also approved, based on the PA Baseline Forecast adjusted for the three incremental demand reduction opportunities, additional supply from the Greenpoint Project (or any other new sources) may not be required until at least the 2030-31 winter season and possibly until beyond the 10-year forecast period as shown in Table 3-10.

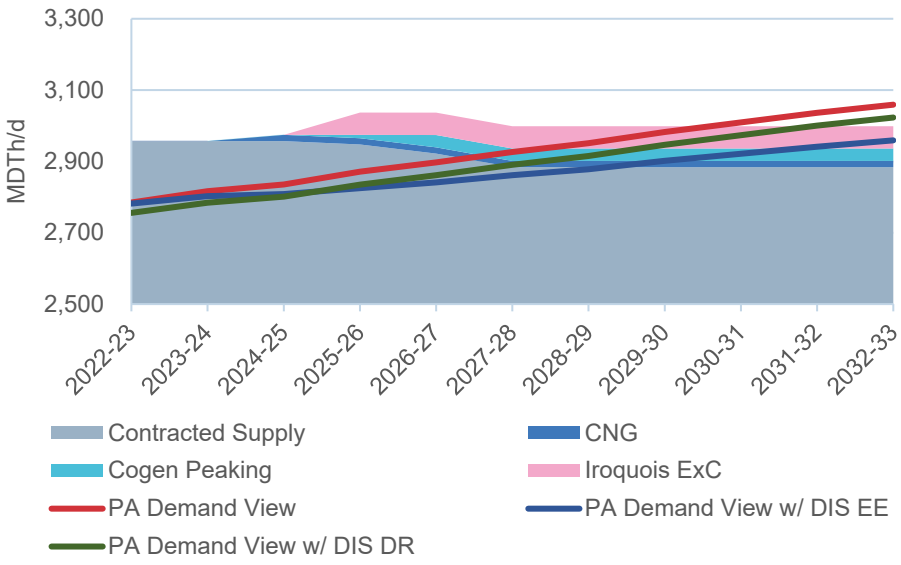
Table 3-10: Meeting Design Day Demand with Incremental DIS – PA Supply Stack Plus ExC

PA Baseline	Demand Response	Electrification	Energy Efficiency	All
2030-31	2031-32	Beyond the 10-Year Forecast Period	Beyond the 10-Year Forecast Period	Beyond the 10-Year Forecast Period

As outlined in Table 3-10, when incorporating just the incremental DIS DR program, demand is expected to surpass supply in the 2031-32 winter season. However, when incorporating incremental energy efficiency and/or electrification, the PA Baseline Forecasts of demand may not surpass supply within the 10-year forecast period.

Figure 3-16 provides a graphical comparison of the PA Baseline Forecast with each potential incremental demand reduction opportunity compared to the National Grid proposed supply stack with CNG 5, renewal of the cogeneration contracts and the ExC project in place on a Design Day.

Figure 3-16: PA Baseline Forecast and Incremental Demand Reduction – PA Supply Stack Plus Iroquois ExC



Under Scenario 3, the ExC project along with the addition of CNG site 5 and the renewal of cogeneration contracts, available supply would cover Design Day demand until at least the 2030-31 winter season under the PA Baseline Forecast and might be delayed beyond the 10-year forecast period if the incremental DIS programs were implemented.

Scenario 4. PA Supply Stack Plus Iroquois ExC and Renewed and Incremental City Gate Peaking

As noted earlier, re-contracting for 38 MDth per day city gate peaking contract that expires in the 2027-28 winter season (or other peaking contracts) is the riskiest of the supply alternatives evaluated. However, if National Grid successfully re-contracted for this peaking supply, additional supply from the Greenpoint Project (or any other new sources) would not be required until the 2032-33 winter season under the PA Baseline Forecast. Accounting for the expected impact of just the DIS DR program might extend the date for additional incremental supply beyond the 10-year forecast period. The same result might occur if any of the other incremental non-infrastructure DIS solutions were added. These results are outlined in Table 3-11.

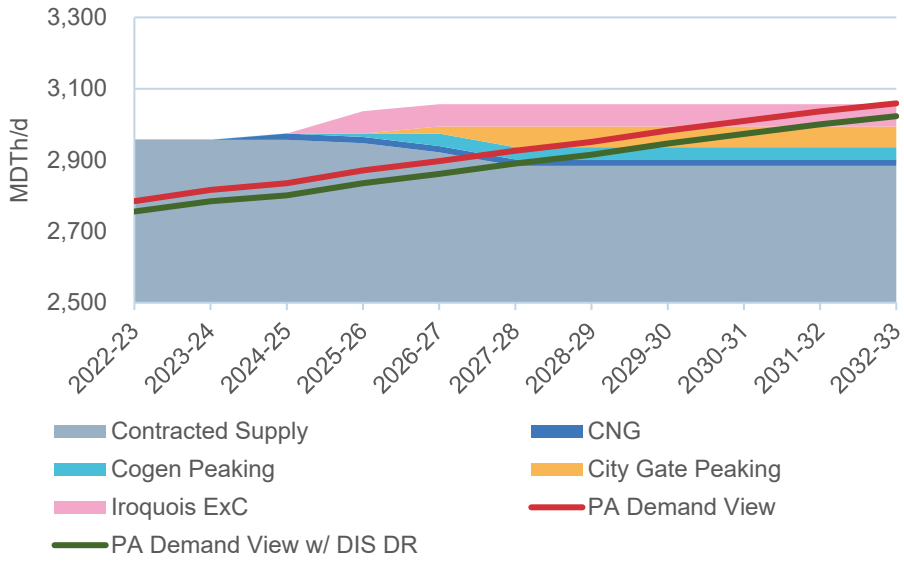
Table 3-11: PA Baseline Forecast and Incremental DIS – PA Supply Stack Plus ExC and Incremental City Gate Peaking

PA Baseline	Demand Response	Electrification	Energy Efficiency	All
2032-33	Beyond the 10-Year Forecast Period	Beyond the 10-Year Forecast Period	Beyond the 10-Year Forecast Period	Beyond the 10-Year Forecast Period

If National Grid were also successful in contracting for an incremental 20 MDth per day of city gate peaking capacity that it indicated may be available, these dates would not change under the PA Baseline Forecast. However, when also accounting for the impact of any of the incremental non-infrastructure DIS programs, new supply might not be required until after the 10-year forecast period.

Figure 3-17 provides a graphical comparison of the PA Baseline Forecast with each incremental demand reduction opportunity compared to the National Grid proposed supply stack with CNG 5 and renewal of the cogeneration contracts (PA Supply Stack) and the ExC project and incremental city gate peaking in place on a Design Day.

Figure 3-17: PA Baseline Forecast Plus Incremental Demand Reduction PA Supply Stack Plus Iroquois ExC and Renewed & Incremental City Gate Peaking



Under Scenario 4, adding incremental city gate peaking and the ExC project to the PA Supply Stack (which includes CNG 5 and renewal of cogeneration contracts) would provide adequate supply to cover Design Day demand until at least the 2032-33 winter season under the PA Baseline Forecast and might be delayed beyond the 10-year forecast period if the incremental non-infrastructure DIS programs were implemented.

3.5.3 Summary Conclusions – Timing of Incremental Design Day Capacity Requirements

Our conclusions regarding when incremental Design Day capacity may be needed is summarized in Table 3-12, which demonstrates that a decision on whether the Greenpoint Project (or other incremental supply) is needed to support Design Day demand can be delayed.

Table 3-12: Incremental Design Day Capacity Need Date Under Various Supply/Demand Scenarios

Supply Stack	Demand Forecast	Earliest Need Date
Existing Supply Stack	National Grid 2022	2026-27
PA Baseline Supply	National Grid 2022	2027-28
PA Baseline Supply	PA Baseline Forecast	2028-29

3.5.4 Additional Considerations for Demand Side Program Contributions

PA evaluated various supply stack solutions against the PA Baseline Forecast of Design Day demand as well as the additional impacts from three non-infrastructure components of the DIS programs – incremental DR, energy efficiency and electrification. In the Greenpoint Project report, the Company asserts the DIS programs remain the best available solution and, while the timing and magnitude of the demand-supply gap has changed since the Second Supplemental Report, the need for non-infrastructure components of the DIS solutions remains.

PA agrees that DIS non-infrastructure programs continue to reflect an ambitious scaling of demand-side programs and, believes risks and headwinds to achieving such ambitious relief exist, as described in greater detail in Section 5.2 of this report. In presenting a scenario reflecting the full relief of the non-infrastructure DIS programs, PA does not intend to imply that for present supply and reliability planning purposes the amount of demand savings included within the Company's 2022 adjusted baseline forecast is unreasonable. Instead, PA provides additional scenarios as useful examples of the potential for additional supply headroom to meet demand over-time. Even without the incremental DIS non-infrastructure programs, based on the National Grid Existing Supply Stack and National Grid 2022 Forecast for demand the Greenpoint Project would not be required to be in service until the 2026-27 winter season to meet Design Day demand. If the incremental supply sources discussed in Section 3.2 are available (i.e., the PA Supply Stack) and

the PA Baseline Forecasts for demand is realized, the in-service date could be extended to at least the 2028-29 winter season.

Therefore, even if incremental supply such as the Greenpoint Project is approved, the Company should continue to aggressively pursue the DSM programs. Consideration of demand side measures or other non-infrastructure solutions for future supply and reliability planning is critical and may provide expanded demand savings to avoid future supply expansion, especially considering New York State's aggressive environmental goals.

4 Safe & Reliable Service

The new vaporizers proposed by the Company represent commercially proven technology that is currently in use at Greenpoint. While the necessary in-service date for the vaporizers project to meet forecasted Design Day demand is several years into the future, the Greenpoint Project does provide a number of reliability benefits including:

- The ability to deliver reliable, incremental supply on a Design Day to the distribution system to the extent required to meet customers' needs up to a peak demand scenario,
- The opportunity to utilize newer, more efficient vaporization units even when the full capability of the facility is not required to serve demand, in place of existing vaporizers installed in the 1980s,
- Backup capability in the event one of the existing vaporizers feeding the low pressure (60-psig) distribution system were to fail on a Design Day or during an upstream supply interruption,
- Increased ability to support system supply maintenance or unplanned outages, and
- An alternate source of supply in the event other on-system assets are unavailable (e.g., CNG or city-gate pipeline supply)

PA's assessment of Project need on a Design Day, as well as system reliability benefits, included a comprehensive review of hydraulic modeling scenarios of the New York Facilities System (NYFS) prepared by National Grid and Con Edison[55] These scenarios make assumptions about the supply stack, the Design Day demand to be served, and the distribution system infrastructure in place. The models simulate the way the system is expected to operate under a given set of conditions and are periodically updated to reflect changing assumptions about demand, infrastructure, and supply to ensure minimum design standards are met. As is normal practice in the gas industry, the models are typically prepared with a five-year planning horizon, which provides the opportunity to anticipate and identify potential supply, reliability, or other operating issues and time to consider alternatives to reinforce the system to mitigate that risk. PA's primary focus was to determine which incremental infrastructure and/or supply assets will be reasonably required to reliably serve Design Day demand in any given year, based on the applicable demand forecast.

PA assessed the results of more than 30 different hydraulic modeling scenarios provided and prepared by National Grid for its forecast Design Day in winter 2022-23 through winter 2027-28[56]. Based on that review, the Project will not be required to serve National Grid's forecast of Design Day demand (based on the National Grid 2022 Forecast) until at least the 2026-27 winter season, as is discussed below in more detail and summarized in Table 4-1:

- Specifically, National Grid provided hydraulic modeling scenarios that demonstrate the following characteristics.
  - Existing infrastructure is adequate through the 2023-24 winter season[57];
  - Existing infrastructure, along with completion of a multi-year system integrity project known as Northwest Nassau Phase 2 (NWN-2)[58] on National Grid's system in calendar year 2024, is adequate through the 2026-27 winter season assuming adequate supply is available.[59] (Of note, the 2025-26 winter season is the first period for which its fifth CNG facility is included in any of the models the Company provided to PA. Construction of the fifth CNG facility is underway and is expected to be completed by early 2023. PA considers the fifth CNG facility as "existing infrastructure" beginning in winter 2024-25 since it will be in service prior to that time. The Company would need to secure a corresponding supply contract as required thereafter.) As discussed previously in Section 3 of this report, the Company may need to recontract some expired capacity in winter 2026-27 but no additional infrastructure would be required.
  - For the 2027-28 winter season, the Greenpoint Project will not be required if either the Iroquois ExC project or the Tennessee Gas Pipeline expansion serving Con Edison[60] is in service.[61] If neither of those projects are completed, the models provided indicate that the new Vaporizers 13/14 are required to meet National

[55] Refer to Appendix A for a description of the New York Facilities System.
[56] PA considers the hydraulic modelling scenarios provided by the Company to fairly represent a comprehensive set of infrastructure scenarios which appropriately ascertain the capability of the distribution system with and without certain assets in service over time.
[57] Source: Documents provided in response to PA 2-14 Supplemental.
[58] Northwest Nassau Project Phase 2 (NWN-2), is not on the list of Long-Term Capital Capacity Projects identified in the Joint Proposal approved in Case No. 19-G-0309; it is not subject to independent review.
[59] Source: Documents provided in response to PA 2-14 Supplemental.
[60] FERC approved Tennessee Gas Pipeline's East 300 Upgrade Project on April 21, 2022. The project brings an additional 115,000 Dth/day of capacity to meet the needs of Con Edison in downstate New York. While FERC provided a "notice to proceed with construction" for two of three project components on October 6, 2022, it is PA's understanding that state level permits in New Jersey remain outstanding for the third component. In its Second Supplemental response to PA-14, National Grid provided reliable hydraulic models for winter 2027-28 that assume only those two components which have been approved for construction are completed.
[61] As noted above, the fifth CNG facility is assumed to be available if needed.

Grid's forecast of Design Day demand in the 2027-28 winter season. Three different hydraulic modeling scenarios were provided by the Company that reflect reliable Design Day operating conditions assuming the National Grid 2022 Forecast as long as Vaporizers 13/14, or ExC, or the Tennessee Gas Pipeline ("TGP") expansion are in service. While TGP does not provide incremental capacity to National Grid, it does improve the likelihood that transfers from Con Edison can be relied upon on the coldest of days.[62] [OBJ].

- As discussed elsewhere in this report, the PA Baseline Forecast of Design Day demand is lower than the most recent forecast prepared by National Grid. Under PA's Design Day demand forecast, the Company's hydraulic modeling scenarios demonstrate slightly different results.
  - Existing infrastructure is adequate through the 2024-25 winter season[63];
  - Existing infrastructure, along with completion of NWN-2 in calendar year 2024, is adequate through the 2027-28 winter season.[64]
- In summary, whether considering either the National Grid 2022 Forecast or the PA Baseline Forecast for Design Day demand, there is (or will be) sufficient infrastructure in service to allow a decision on the Project to be delayed. These conclusions are consistent with the summary provided in Table 4-1.[65] PA is not aware of any particular challenges to completion of NWN-2 as expected in 2024; National Grid has substantial, if not full, control over the schedule. Even under National Grid's higher (more conservative) 2022 Forecast for Design Day demand, the distribution system is capable of delivering Design Day supply through the 2026-27 winter season, as demonstrated by National Grid's own hydraulic modeling scenarios.
- PA notes that under the approval granted by FERC, ExC must be completed by March 25, 2025. It is reasonable to assume that the Company, as well as all stakeholders, will learn at least months in advance of that date whether the project is proceeding to construction. In any event, facilities would be in place to serve Design Day demand through the 2026-27 winter season.
- Based on the need to meet Design Day demand, time exists to determine whether the paths forward for ExC and TGP become clearer in the next year or so. If not, sufficient time remains to assess the need for the Greenpoint Project as more certainty is known about additional supply sources and demand reduction opportunities noted in this report without risking service reliability on a Design Day.

Table 4-1: Modelling Scenarios and Required Infrastructure

(MDth/day)	2022-23	2023-24	2024-25	2024-25	2025-26	2026-27	2027-28	2027-28	2027-28	2027-28
Grid 2022 Adj. Baseline	2,812	2,861	2,895	2,895	2,927	2,962	2,994	2,994	2,994	2,994
PA Forecast	2,785	2,816	2,835	2,835	2,871	2,897	2,926	2,926	2,926	2,926
Hydraulic Modeling Assessment										
Minimum Infrastructure per Grid Fcst	Existing	Existing	Note (1)	+NWN-2	+NWN-2	+NWN-2	Note (2)	+13/14	+ExC	+TGP
Minimum Infrastructure per PA Fcst	Existing	Existing	Existing	+NWN-2	+NWN-2	+NWN-2	+NWN-2	N/A	N/A	N/A
Modeled Demand	**2,861**	**2,861**	**2,861**	**2,962**	**2,962**	**2,962**	**2,962**	**2,994**	**2,994**	**2,994**
Headroom vs Grid Fcst	48	0	(34)	67	35	0	(32)	(0)	(0)	(0)
Headroom vs PA Fcst	76	44	25	127	91	65	36	68	68	68

For purposes of this table, "Existing" Infrastructure includes the fifth CNG site

Notes:

1	The model provided by Grid utilized 4 CNG facilities. The fifth site would add 17.6 MDth/day; still insufficient
2	Grid provided models that demonstrate that its forecasted demand for winter 2027-28 can be met if only one of three projects are in service: Greenpoint 13/14, ExC, or TGP

[62] Source: Documents provided in response to PA 2-14 Supplemental.
[63] Source: Documents provided in response to PA 2-14 Supplemental.
[64] Source: Documents provided in response to PA 2-14 Supplemental.
[65] The "Modeled Demand" in Table 4-1 reflects the modeled Design Day capability of a set of infrastructure assets, as reflected in hydraulic modeling scenarios provided by National Grid. When the "Modeled Demand" exceeds the forecast in a given year, the table reflects additional infrastructure for that same year which changes (increases) the capability of the system (for example, adding NWN-2 to existing infrastructure results in the system's capability exceeding the Company's corresponding demand forecast for 2024-25).

4.1.1 Holtsville LNG Facility Risk

A potential risk to meeting Design Day demand is related to National Grid's LNG facility at Holtsville (Long Island). The storage tank at that facility is scheduled to undergo maintenance in 2025 which presents some risk that supply may be unavailable if the tank refill process is delayed. PA expects the Company to mitigate that risk in its project planning and requested a project timeline. The Company's response indicates that preliminary work would begin in 2024 with construction (or maintenance work) completed by the end of September 2025. The schedule further reflects the tank is to be refilled to 50% of its capacity by the end of November 2025.[66] Assuming work is completed as scheduled, the full 4,300 Dth/hr of Design Day supply from Holtsville would be available during the 2025-26 winter season - albeit for a fewer number of days (or hours). In any scenario, the loss of 4,300 Dth/hr (or 103.2 MDth/day) of Design Day supply would be difficult to replace; neither the Greenpoint Project nor ExC would on their own make up for that level of lost supply. PA anticipates that National Grid is well positioned to complete the tank maintenance project on schedule, however with any maintenance project of this magnitude, unexpected findings that extend the project's duration is always a possibility. In the event Holtsville LNG supply is not available, the Company would likely need to curtail customers on a Design Day (and even on a near-Design Day).

4.1.2 Upstream Supply Risk

In the Greenpoint Project Report, the Company discusses the reliability benefits associated with Vaporizers 13/14 on numerous instances. For example, on page 3 of the Report, National Grid makes the following statement:

> "These vaporizer units are the final infrastructure component of the Distributed Infrastructure Solution and the only option capable of enhancing near-term system reliability in the event of a pipeline failure or other supply interruption."

And on page 7 of the Report, the Company states

> "... the Commission, noting operational issues on interstate pipelines, has found that "National Grid and all gas utilities should consider single points of failure on the interstate gas system and have contingency plans in place to ensure such changes do not negatively impact the reliability of its system."

PA agrees that having Vaporizers 13/14 in place provides an alternative supply resource should there be a disruption at another supply node. Given these statements, PA further explored the extent to which the incremental capacity provided by Vaporizers 13/14 can be relied upon to replace, or displace, other sources of supply.

While the natural gas transmission and distribution system in the United States continues to be very reliable, disruptions based on unanticipated compressor outages, wellhead supply failures, and even third-party damage to a pipeline can occur. PA evaluated the degree to which the Project can serve as a backup to a supply disruption at any given supply node on the system from two perspectives by evaluating the relative size of the Project's hourly supply capacity to meet:

1. The average actual hourly flows during the months of December through March for the 2019-20, 2020-21 and 2021-22 winter seasons, and
2. The highest actual hourly flows during those same months.

As reflected in Table 4-2, no single day in the most recent three winter seasons approached the Design Day (65 HDD). The coldest single day occurred in January 2022 (51 HDD), and HDDs averaged approximately 24 in December, 30 in January, 28 in February, and 19 in March.

[66] Source: Documents provided in response to PA 11-5.

Table 4-2: Heating Degree Day Summary

Summary - Actual Weather - Winter 2019/20, 2020/21 and 2021/22				
HDD Summary	**Dec 2019**	**Jan 2020**	**Feb 2020**	**Mar 2020**
Average	26.3	25.4	24.9	17.9
High	42.0	41.0	43.0	36.0
HDD Summary	**Dec 2020**	**Jan 2021**	**Feb 2021**	**Mar 2021**
Average	25.8	30.5	30.6	19.2
High	39.0	45.0	39.0	34.0
HDD Summary	**Dec 2021**	**Jan 2022**	**Feb 2022**	**Mar 2022**
Average	21.0	34.8	27.8	19.5
High	34.0	51.0	45.0	39.0
Average Monthly HDD	**24.4**	**30.3**	**27.7**	**18.9**

As shown in Figure 4-1 and Figure 4-2, the hourly capacity of the Vaporizer 13 / 14 Project is relatively small when compared to even the average actual demand during those last three winter seasons at the largest of the supply nodes on the National Grid distribution system.[67] However, any supply resource that offers redundancy and reliability in the event of an outage is preferable to no alternatives. These figures are intended to illustrate that the Project by itself would not be capable of replacing supply at any one of the primary nodes on the system; for example, a pipeline rupture in Kentucky on a Texas Eastern Transmission Company (TETCO) pipeline in summer 2019 resulted in forced pressure reductions that reduced capacity to KEDNY and KEDLI collectively by approximately 106,000 Dth/day (5,300 Dth/hr), or more than twice the hourly capacity of Vaporizers 13/14. Moreover, LNG supply at Greenpoint in a winter season is limited to the capacity of the two storage tanks, so the Project (or even the Greenpoint facility as a whole) would not be capable of supporting a supply disruption for more than a few days.[68] While the Project would offer some support to the system in the event of a supply disruption at any supply point, its hourly capacity is still smaller (and in most cases much smaller) than the hourly capability of any other supply node except for the Company‘s CNG sites.

PA also understands that National Grid relies on LNG as part of its supply portfolio at temperatures of 15 degrees and colder. That being the case, the spare capacity to offset a supply disruption can become even more limited as LNG inventory is exhausted. More broadly, the use of LNG inventory for any single reason (backup supply, pressure support, or Design Day reliability) makes that inventory unavailable for other purposes during a given winter season.

[67] More detailed charts illustrating the Project’s capacity relative to both actual average hourly and actual maximum hourly flows during the most recent three winter seasons are included in Appendix D. Note that PA has not identified the supply nodes by name or location but has designated them “A” through ”D” here.

[68] Without regard to whether ”moving” 106,000 Dth/d of supply from TETCO to Greenpoint would result in reliable distribution service, if Greenpoint LNG were required to provide that level of supply the existing tank capacity would limit the use of LNG for that purpose to 14 days (or 280 hours assuming 20 hours per day, which is the assumption when converting daily capacity to design hour capacity at pipeline city gates) -- Vaporizers 13/14 would not be needed since the existing Greenpoint LNG capacity is 12,133 Dth/hr currently, and LNG inventory would be exhausted at that point for the remainder of the winter season. Mathematically: Capacity of Tanks 1 and 2 = 1.6 BCF; multiplying by 1.03 yields 1,648 MDth. Then multiplying by the assumed usable tank inventory of 90% results in 1.483.2 MDth of LNG inventory. Finally dividing 1483.2 MDth by 106 MDth/day yields 14 days.

Figure 4-1: Primary Supply Nodes - Average Hourly Flow

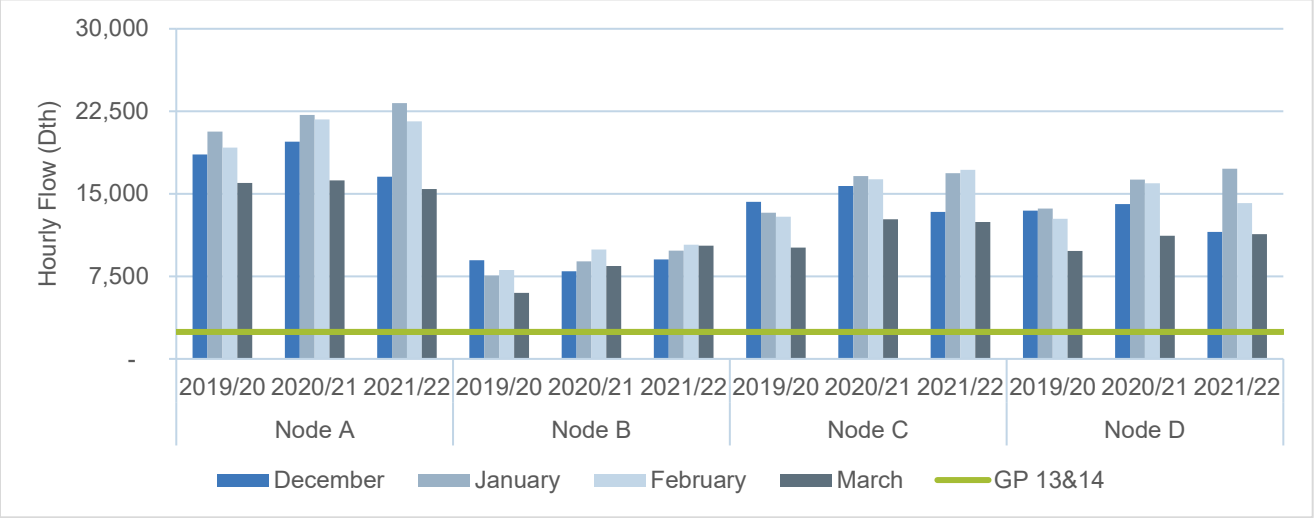
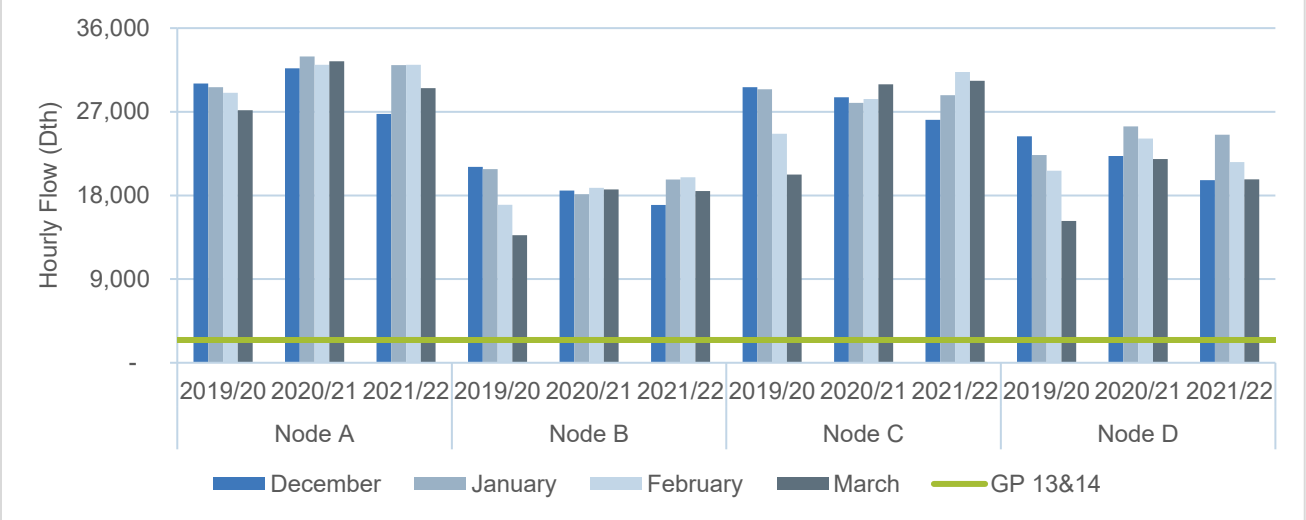


Figure 4-2: Primary Supply Nodes - Maximum Hourly Flow



PA also considered the incremental coverage the Project could provide against a significant upstream supply disruption. As shown below in Table 4-3, this indicates that two additional units increasing send out by 58.8 MDth would equate to coverage of an incremental 2% of contracted supply while doing so would decrease the duration such outage could be covered by approximately 20 hours.

Table 4-3: Evaluation of Incremental Coverage

Assessment of GP 13 / 14 Impact on Outages	*Units*	
Contracted Supply	MDth per day	2,957
2023/24 Demand per Company Forecast	MDth per day	2,812
Unit 13/14 supply	MDth per day	58.8
Contribution of Unit 13 / 14 to Supply at full capacity	% of Supply	2.0%
Tank Capacity	MSCF	1,600
Usable Capacity @ 90%	MSCF	1,440
Tank Capacity @ 1.030 DTH / SCF	MDTH	1,483
Plant Capacity with 13/14	MDth per day	350
Max Operating Days with 13 / 14	Days	4.2
Plant Capacity without 13 / 14	MDth per day	291

Assessment of GP 13 / 14 Impact on Outages	*Units*	
Max Operating Days without 13 / 14	Days	5.1
Reduced Outage Duration Coverage Inclusive of 13 / 14	**Hours**	**(20.5)**
Major Outage to Contracted Supply	% of Supply	10.0%
Reduction in Contracted Supply	MDth per day	296
Supply Shortfall	MDth per hour	12.3
Vaporizer Unit Capacity	MDth per hour	2.5
Implied Vaporization Units Required for 1 hour Disruption	**Units**	**5.0**
Major Outage to Contracted Supply	% of Supply	12.0%
Reduction in Contracted Supply	MDth per day	355
Supply Shortfall	MDth per hour	14.8
Vaporizer Unit Capacity	MDth per hour	2.5
Implied Vaporization Units Required for 1 hour Disruption	**Units**	**6.0**

4.1.3 Spare Vaporizer Capacity

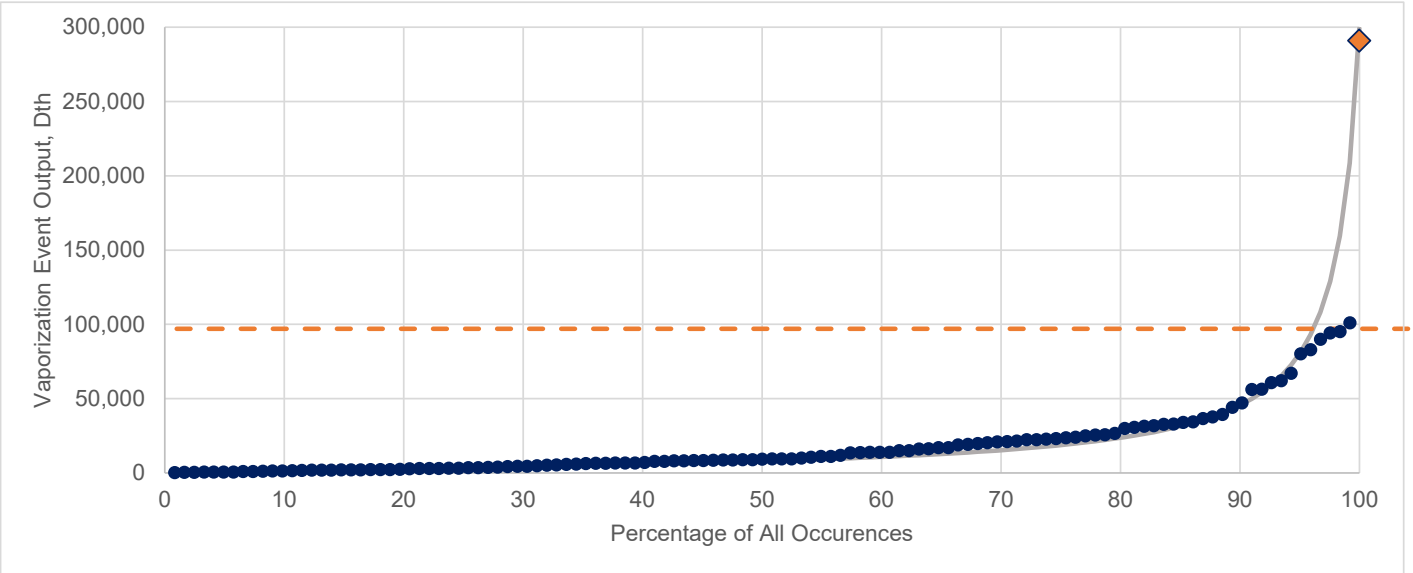
National Grid makes clear in the Greenpoint Report that, if completed, the Project results in a "spare" low-pressure vaporizer at Greenpoint. At present, based on its Design Day forecast, a spare vaporizer exists on the high-pressure side of the system (the vaporizers delivering gas to the 350-psig distribution system) while all three existing low-pressure vaporizers are required on a Design Day, leaving no spare in the event of an equipment malfunction. PA certainly expects that National Grid's newer vaporizers, including 13 and 14, will be the first called upon when LNG vaporization is required to support demand on the system.[69] With the addition of two new vaporizers, one low pressure vaporizer would function as a "spare" at any given time. Providing the Company this backup capability would be reasonable in a scenario where four low-pressure vaporizers are required. Notably, the oldest low-pressure vaporizers at Greenpoint were installed in 1986. However, PA has not identified any reliability concerns with these units, which indicates that National Grid has maintained them appropriately over time. PA's observations on the Design Day forecast, and when and the extent to which a fourth vaporizer may be needed, are discussed elsewhere in this report.

In most years, the use of the LNG facility does not approach Design Day or design hour outputs. Based on data gathered from National Grid for the last 13 winter seasons, a graphical representation of the Greenpoint output was developed. Figure 4-3 shows the historical daily output for approximately 120 recent vaporization events, with a single Design Day represented at the end of the data set by the orange marker.

This graph can be interpreted as follows: If a Design Day occurs in the 2022-23 winter season, then the cumulative distribution of vaporization events can be represented by Figure 4-3 The blue points are the actual output data (with the Design Day data point shown as the orange marker at the top of the curve), the grey curve is an approximate fit of this data, and the orange dashed line represents one-third of Greenpoint's total current send out capacity (or 97 MDth). The data demonstrate that, for the last 13 winters, most vaporization events do not approach the Design Day output. Approximately 99% of all occurrences are less than one-third of the current Design Day capacity.

[69] With the addition of Vaporizers 13 / 14, National Grid would have five low-pressure vaporizers in total, however pump capacity at Greenpoint would limit operation to no more than four low-pressure vaporizers operating at the same time.

Figure 4-3: Distribution of Daily Vaporization Output at the Greenpoint Facility (2009-10 through 2021-22 Winters)



4.1.4 CNG Facilities

National Grid also states, at page 8 of its Report, that "...the new vaporizers will reduce reliance on CNG solutions." Once again, PA does not disagree with this statement. Utilizing LNG, in favor of CNG, offers a number of benefits including:

- Increased reliability since the risk of adverse weather disrupting supply deliveries on a Design Day is eliminated, and
- Avoidance of emissions associated with the delivery (via trucking) of CNG supply.

The Company previously considered CNG at Greenpoint but ultimately decided to abandon that strategy and pursue new vaporizers. Acknowledging the risks and challenges associated with CNG as noted above, PA agrees, in and of itself, that electing to pursue the Project rather than a CNG facility at Greenpoint was a reasonable decision.

However, comparing the proposed Project to existing CNG facilities in this setting is in some respects an apples-to-oranges proposition since four CNG sites are already in service, and a fifth site is expected to be completed in early 2023. Those five CNG sites represent capital investments that have already been made.

Notably, the (soon-to-be) five CNG facilities are located in the KEDLI footprint. It is PA's understanding that at least a subset of those facilities was designed to support the KEDNY system. It is reasonable that areas at risk for low pressure events in the KEDNY footprint would benefit more from peaking supply at Greenpoint than from Long Island (given Greenpoint's proximity to those areas).

PA also explored the relative reliability benefits associated with the Company's CNG facilities. National Grid has explained to PA that deployment of the CNG sites requires as much as three days advance notice that they will be needed. This limitation appears to be driven by the existing CNG supply contracts Grid has executed with its vendors. It is reasonable that National Grid is not the only customer served by these CNG vendors and that those vendors' resources are allocated based on the terms of the contracts.

The Company describes LNG supply as being much more flexible than CNG, as it can be dispatched fairly quickly when needed (in other words, the LNG supply is already on hand at Greenpoint, whereas CNG supply must be transported across long distances). While PA agrees with that assessment, we also observe that the Company could investigate ways to restructure its contracts and its processes such that the CNG facilities in which it has invested – four of which have been approved for rate recovery – are more readily available when needed. More fully utilizing existing investment, already approved by the Commission and being recovered in customer rates, would be a reasonable approach to consider.

4.1.5 Vaporizer Safety

The existing vaporization units at the Greenpoint facility have performed well over time. Based on PA's review of the proposed design and operating plan for the new units, we would expect there to be a negligible incremental safety risk, if any, associated with the new vaporizers. The vaporizer units are proven technology which has been in use at Greenpoint since the facility began operation. The expected preferred use of the newer vaporizers will likely result in fewer problems that could develop into hazardous conditions. New equipment, as well as modern control systems, process communications, and emergency shut down systems will all contribute to fewer incidents with the newer vaporizers. Given the reliability record of the vaporizer technology at the Greenpoint site, the addition of Vaporizers 13/14 presents virtually no incremental safety risk to the public, and minimal additional risk to plant personnel.

The emissions impact is discussed further in Section 7 of this report. However, as shown in Table 7-1 in that Section, from a Design Day perspective the new vaporizers would result in only a modest decrease in total Greenpoint emissions. On days where less than the full capacity of the facility is required, the emissions reduction would be greater (on a relative basis) – particularly when comparing scenarios where two or more low-pressure vaporizers are operating. The improved efficiency of Vaporizers 13 / 14, when compared to the older units installed in 1986, would drive that reduction. The possible operating scenarios are almost infinite (number of vaporizers, % of full output, and number of operating hours required). As such, PA did not attempt to quantify improvements in non-Design Day emissions.

4.1.6 Vaporizer Equipment Reliability

The Greenpoint facility currently utilizes six vaporizer units, designated as Vaporizers 7, 8, 9, 10, 11, and 12. Vaporizers 1 through 6, which were commissioned between 1968 and 1970, have now been decommissioned. This points to the reality of any kind of mechanical system: equipment has a finite (but not necessarily defined) lifespan. At the end of its useful life, a system (or piece of equipment) must be refurbished or retired from service. While good maintenance and forethought in the original design can result in extended lifetimes, most hydrocarbon processing equipment has a lifetime of 40 to 50 years. The most recent decommissioning involved Vaporizers 3 & 4, which were in service for 52 years.

The vaporizers currently in service at Greenpoint were commissioned in 1980 (Vaporizers 7 & 8), 1986 (Vaporizers 9 & 10), and 2022 (Vaporizers 11 & 12). The addition of Vaporizers 13/14 would add to the supply capacity for National Grid's 60-psig distribution system, which is currently supported by Vaporizers 9, 10, and 11. PA did review the Company's vaporizer maintenance procedures which appear to be adequate; additionally, Federal regulations require that emergency shut down and control systems be tested at the beginning of each season. Reliability is further ensured by operating each vaporizer at least once annually, even for a short duration, increasing the likelihood that each unit stands ready to serve demand when called upon, including as a backup to another vaporizer.

Vaporizers 9 and 10, at 36 years into their service life, are likely not as reliable as new vaporizers would be. A list of vaporizer maintenance events obtained from National Grid included about two events per year. Most of these events involved inoperable valves or malfunctioning control systems. From the short descriptions provided, it appears that most events were, or could be, corrected quickly or, presumably, could be resolved by the use of alternate vaporizers. While no downtime data was available for review, the historical record shows that 30+ year old technology, while still viable and useful, is not without its problems. As vaporizers 9 & 10 approach 40 years of service, the presence of Vaporizers 13 / 14 would certainly be a preferred choice for the Company's operators, as the reliability and usability of new systems would be superior to the older units.

4.1.7 Reliability Summary

Having a spare vaporizer on hand is an appropriate mitigation of risk at such time as Vaporizers 13 / 14 are required to serve Design Day demand. As we have stated throughout this report, that Design Day need is at least a few years away. The vaporizer technology is sound and expected to be reliable, and there are minimal (if any) incremental safety risks associated with new vaporizers. The Project does not provide enough backup capacity in the event of a significant disruption to upstream supply; its relative size to the city gates delivering gas to the National Grid distribution system is too small. However, the additional capacity from Vaporizers 13/14 could mitigate the risk that system pressures fall below their design minimums in circumstances where supply disruptions are of short duration. The most significant risk to Design Day supply in the coming years arises in the 2025-26 winter season. If the Holtsville LNG facility cannot be brought back online after the tank maintenance project and LNG supply is not available at that location, the additional capacity from the Greenpoint Project would be capable of offsetting approximately 57% of the lost peaking supply at Holtsville (Vaporizers 13/14 with a capacity of 2,450 Dth per hour, divided by the 4,300 Dth per hour, which is the hourly capacity of Holtsville).

5 Alternatives

Our analysis of the need for the Greenpoint Project includes an assessment of infrastructure and non-infrastructure alternatives to the project that would ensure reliable service within the timeframes necessary. The following solutions that might be implemented to address Design Day reliability concerns have been evaluated.

- Infrastructure: Clove Lakes Transmission Loop
- Demand Side Program Non-Infrastructure Alternatives:
  - Energy Efficiency
  - Demand Response
  - Electrification
- Other Non-Infrastructure Alternatives:
  - Non-Pipes Alternatives
  - Commercial Building Management Systems
  - Alternatives to Company Deployed Metering Infrastructure
  - Modifications to Rate Design
  - Energy Efficient Connections
  - Targeted Electrification/ Entire Gas System Dis-connections
  - Networked Geothermal

5.1 Infrastructure Alternatives

The following other potential infrastructure solutions that might be implemented to address Design Day reliability concerns have been evaluated. We comment on those alternatives within this section of our report.

5.1.1 Clove Lakes Uprate Project

In its Long-Term Capacity Report prepared in February 2020, National Grid included the "Clove Lakes Transmission Loop" (hereinafter "Clove Lakes") as one of the DIS options under consideration to close the gap between forecast demand and available supply. As described in that report, this project would entail construction of approximately 8 miles of new 30-inch steel transmission main across the borough of Staten Island to facilitate the Company's ability to take more gas through the TETCO Goethals Take Station and ultimately move this gas across Grid's system to supply constrained areas. The Company further explained that this project would "essentially remove a "bottleneck" and enable more gas to flow to the National Grid system, without requiring an upstream pipeline", and was likened "to adding an additional lane to a roadway - it adds additional capacity to move gas." The Clove Lakes Uprate Project discussed in the Company's Greenpoint Report is that same project.

As part of its review, PA explored whether the Clove Lakes project should be considered a viable alternative to Vaporizers 13/14. An initial, and rather obvious, observation is the relative cost of Clove Lakes – estimated at approximately $320 million, or more than four times the estimated cost of Vaporizers 13/14[70]. Even in the absence of a near-term need for incremental Design Day capacity, the incremental cost of Clove Lakes (as compared to Vaporizers 13 / 14) is significant.

Beyond the relative cost, PA also investigated the level of progress the Company has made in advancing Clove Lakes since the Long-Term Capacity Report was filed. National Grid reported that minimal progress towards planning for Clove Lakes had been made and indicated, in a response to a request from PA, that for it to be a viable alternative to Vaporizers 13/14:

> "(a) the Company would need to significantly accelerate project development efforts, (b) the project schedule would need to proceed without any material permitting or construction delays, and (c) the demand forecast would need to stay at or below current levels. If those conditions are not met, the risk associated with the peak hour demand of a Design Day may exceed acceptable reliability criteria before the Clove Lakes project can be completed."[71]

[70] The estimated cost of Clove Lakes is approximately 4.6 times that of the Project ($320 million vs. $70 million). The estimated cost of Clove Lakes is provided in the Company's Report. PA discusses its perspective on the estimated cost of the Project later in this report.
[71] Source: Documents provided in response to PA 3-3.

National Grid based these statements on its own forecast of Design Day demand. However, even when considering PA's (lower) demand forecast and the additional time that forecast allows until additional supply is needed, the difference in costs alone makes Clove Lakes a non-viable alternative to Vaporizers 13/14.

The Clove Lakes project is also discussed in the Cost Comparison section of this report. No other infrastructure alternatives to Vaporizers 13/14 were identified.

5.2 Non-Infrastructure Alternatives

We evaluated the demand side alternative non-infrastructure solutions anticipated within the Greenpoint Report, the 2022 Forecast, program documentation requested by PA and provided by the Company, Company Subject Matter Expert ("SME") discussion sessions and information found within recent applicable Commission filings noted in Table 5-1. We comment on those alternatives within this section of our report.

Table 5-1: Recent Demand-Side Management Filings

Filing	Date	Filing Party
Supplemental Filing for Approval of Incremental Demand-Side Management Programs (Incremental Filing)[72]	March 25, 2022	Company
Order Regarding Incremental Demand-Side Management Programs (Commission Order)[73]	May 13, 2022	Commission
CY 2021 Annual Earnings Adjustment Mechanisms ("EAM") Report[72]	April 15, 2022	Company
Demand Response Annual Report[73]	June 15, 2022	
2019-2025 System Energy Efficiency Plan ("SEEP") Record of Revision[74]	July 15, 2022	
Annual Demand-Side Management Report[72]		
Second Quarter 2022 Capacity Demand Metric Report[72]	July 29, 2022	

While it is known DSM programs reduce more than just Design Day demand and provide broader benefits, annual demand relief is less relevant in the context of this Project assessment. In this assessment, the primary focus is on reliability driven need on a Design Day. We approached our assessment with an emphasis on the extent to which DSM savings are included within the 2022 Forecast and reflected within recent filings. We comment on those alternatives within this section of our report.

Next, we compared the Company's anticipated level of relief from program savings to the 2021 Forecast and non-infrastructure components of the DIS non-infrastructure components as well as key performance and recovery targets. To the extent key performance and recovery targets are set on an annual relief basis, we reviewed program forecasts in this context. Finally, we evaluated potential alternatives that would provide incremental demand reduction beyond amounts already built into 2022 Forecast demand side program forecasts, such as the relief anticipated by the non-infrastructure components of the DIS.

[72] Cases 19-G-0309 and 19-G-0310.
[73] Cases 20-G-0086 and 20-G-0087.
[74] Case 15-M-0252.

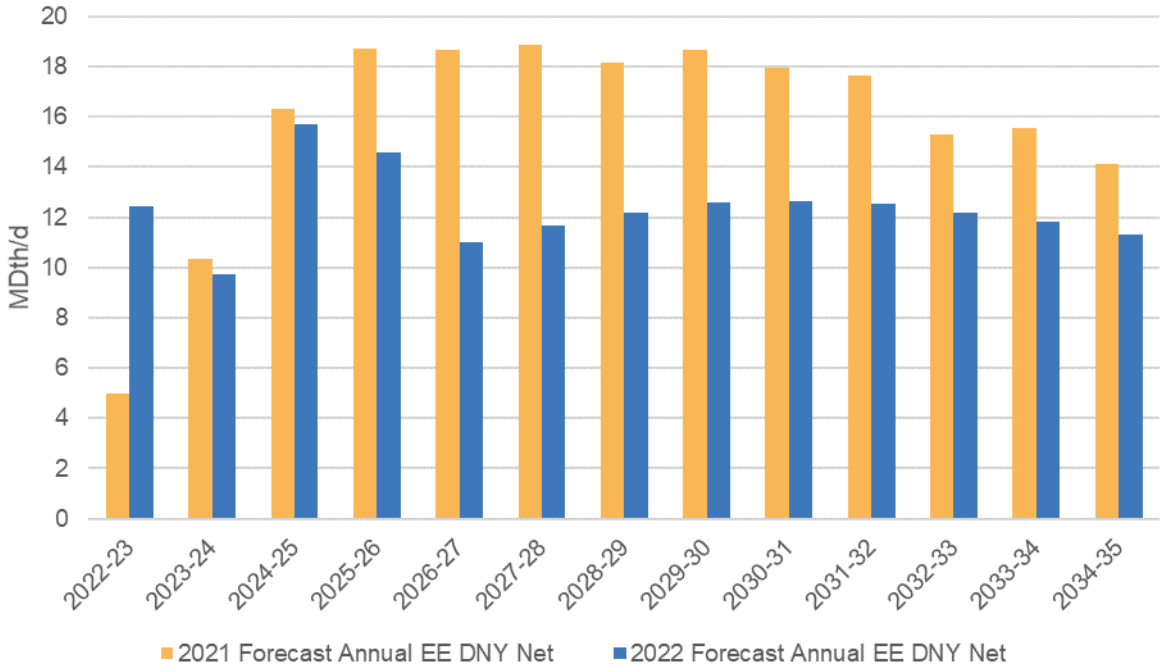
5.2.1 2022 Forecast Demand-Side Program Savings

Within this section, we discuss our findings related to the extent to which DSM savings are included within the 2022 Forecast, reflected within recent filings, and compare with the 2021 Forecast, non-infrastructure components of the DIS and key performance and recovery targets.

Energy Efficiency

Our evaluation of Design Day energy efficiency savings assumed within the 2022 Forecast finds that the Company anticipates a lower level of Design Day relief, as compared to the 2021 Forecast. Below, Figure 5-1[75] presents annual incremental accelerated 2021 Forecast EE relief (net of embedded historical savings) in orange while the respective 2022 Forecast relief is presented in blue, including some incremental weatherization relief. The difference between the two is primarily due to the lower extent of NE:NY savings achievement and a low level of incremental weatherization, due to several program challenges which are described in greater detail within Section 5.2.2.

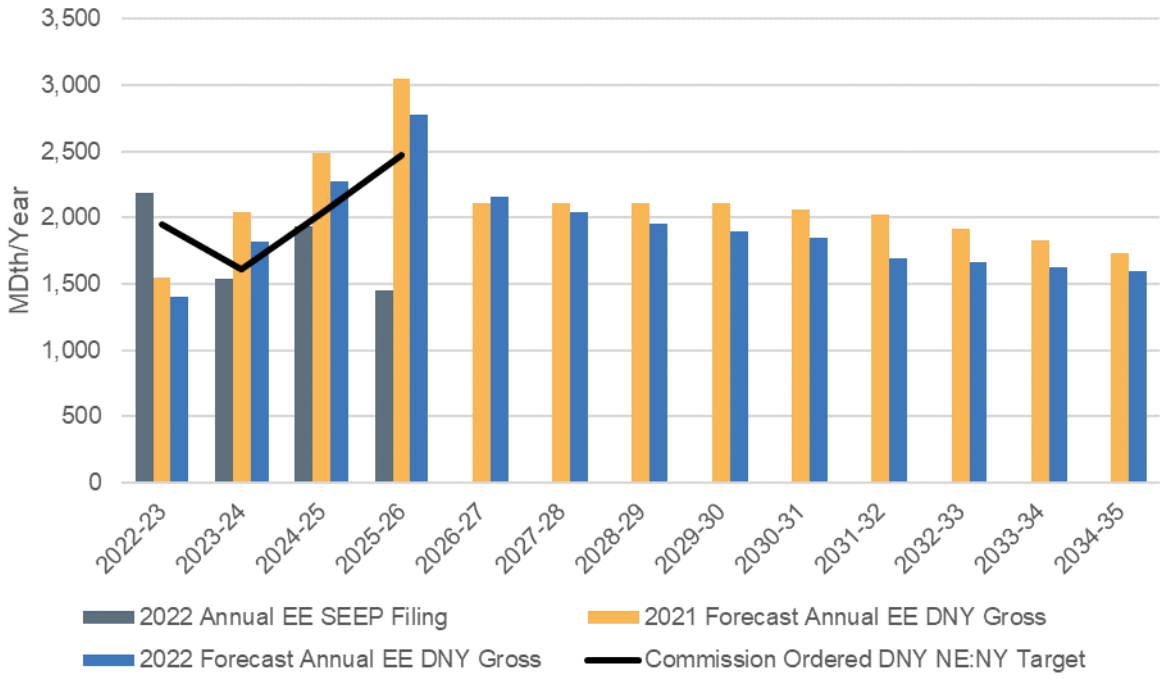
Figure 5-1: Annual Incremental Accelerated EE Design Day Forecast Comparison



The Company's SEEP Filing anticipates EE program performance on an annual relief basis and key performance metrics are also set on this basis. Therefore, we also examined the Company's expectations for annual relief. Our evaluation of the annual EE savings underpinning the 2022 Forecast EE Design Day results in a finding consistent with the Design Day assessment - the Company anticipates lower near-term annual savings, as compared to the 2021 Forecast. In terms of key performance targets, via discussions with Company SMEs, we learned the 2021 Forecast anticipated 100% achievement of gross annual NE:NY EE savings targets[76] while, the 2022 Forecast assumes 65-80% achievement of NE:NY EE targets plus a portion of recently approved weatherization program savings[77]. This is illustrated by the difference between the black trendline, and light blue bar presented within Figure 5-2.

[75] Figure 5-1 and other EE figures and tables within Section 5.2.1 present relief on an annual incremental basis for ease of viewing program growth, rather than on a cumulative basis.
[76] Case 18-M-0084, In the Matter of a Comprehensive Energy Efficiency Initiative, Order Authorizing Utility Energy Efficiency And Building Electrification Portfolios Through 2025 (issued January 16, 2020) (establishing utility energy efficiency program parameters, budgets and targets for the period 2019-2025).
[77] Order Regarding Incremental Demand-Side Management Programs Cases 20-G-0086 and 20-G-0087.

Figure 5-2 Annual Forecast Energy Efficiency Savings Comparison (as of June 2022)[78]



The Company's efforts related to EE, demand response, electrification, non-pipe third party solutions and leak-prone pipe NPAs are guided by the Capacity Demand Metrics in the Joint Proposal. The Joint Proposal initially set the EE CDM target at the levels identified in the 2020 NE:NY order. Simultaneously with approval of the Company's proposed incremental weatherization programs, the Commission set 2022 CDM EE targets ("Commission 2022 CDM EE Order") equal to the Company's proposed budgets multiplied by the run rates approved in the 2020 NE:NY Order, as illustrated within Table 5-3, below. PA evaluated 2022 Forecast relief relative to these current Commission ordered CDM targets.

Table 5-2: National Grid March 2022 Filing EE CDM Target

	KEDNY	KEDLI	Total
2021 NE:NY	510,740	433,821	944,561
2022 NE:NY	674,740	601,821	1,276,561
2022 Incremental	110,550	90,450	201,000
Cumulative	**1,296,030**	**1,126,092**	**2,422,122**
2021 Achievement (Gross)*	614,480	550,171	1,164,651
2022 CDM Target	**681,550**	**575,921**	**1,257,471**

**2021 Achievement (Gross) Savings represents actual validated 2021 savings.*

Table 5-3: Commission Ordered May 2022 EE CDM Target

	KEDNY	KEDLI	Total
2021 NE:NY	510,740	433,821	944,561
2022 NE:NY	674,740	601,821	1,276,561
2022 Incremental	458,329	431,562	889,891
Cumulative	**1,643,809**	**1,467,204**	**3,111,013**
2021 Achievement (Gross)*	614,480	550,171	1,164,651
2022 CDM Target	**1,029,329**	**917,033**	**1,946,362**

**2021 Achievement (Gross) Savings represents actual validated 2021 savings.*

[78] "Commission Ordered DNY NE:NY Targets" represents CDM targets for 2022 and, NE:NY targets for years 2023 – 2025.

Our comparison of Commission Order EE 2022 CDM targets against the amounts in the Company's 2022 Forecast finds underachievement. This result is driven in part by the older vintage of the 2022 Forecast, as well as Company views of what demand savings is currently achievable. Through our analysis and conversations with Company SMEs, we confirmed the 2022 Forecast is a March 2022 vintage, validated by our observation that 2022 Forecast EE savings are consistent with the savings anticipated within the Company's March 2022 SEEP Filing. Vintage is noteworthy because in the month of May, as noted above, the Commission Order 2022 EE CDM targets were set higher than the achievement anticipated by the Company. Said differently, at the time of the 2022 Forecast, the higher EE CDM target was not known.

According to PA's recent discussions with Company SMEs, underachievement of 2022 EE CDM target is still anticipated. PA's analysis of achieved gross annual savings for the period January 1, 2022, to June 30, 2022,[79] seasonally adjusted and extrapolated for a full calendar year 2022 finds underachievement of 2022 EE CDM targets to be a likely outcome. We believe it is important to note EE CDM target underachievement carries capital cost recovery ramifications. Underachieving the EE CDM results in a 25% penalty for the revenue requirement associated with EE CDM programs and, if all five CDMs are not met (which would be the case if EE underachieves), an additional 15% revenue requirement penalty applies. Therefore, missing EE (and resultingly five CDMs) results in a 40% CapEx recovery penalty, estimated by the Company at $3M KEDNY $1.5M KEDLI[80].

In the 2022 Forecast, years 2023 through 2025, over-achievement of annual gross annual NE:NY savings targets appears possible with the inclusion of forecasted weatherization savings, as evidenced by the light blue bars exceeding the black trendline which represent the NE:NY targets, above in Figure 5-2. An evaluation of 2022 Forecast over these years, requires a view of both NE:NY and CDM targets, assuming the Commission sets subsequent year CDM targets at NE:NY levels plus incremental savings at or exceeding Company's approved incremental weatherization program. When PA employs this approach, we find underachievement of CDMs over the mandated duration may continue to be a possible outcome.

Demand Response

National Grid offers DR programs aiming to reduce peak demand during system emergencies, while also improving system reliability. Programs include:

- Load Shedding Demand Response (formerly known as "Daily Demand Response"),
- Load Shifting Demand Response (formally known as "Hourly Demand Response") programs for Commercial, Industrial and Multifamily customers,
- Bring Your Own Thermostat ("BYOT"), and
- Behavioral Demand Response Programs for Residential Customers.

As discussed in previous assessments, programs are advancing towards maturity, but fulsome assessment of program potential continues to be hampered by mild weather. As a result, the Company continues to use test events to inform future views on program performance. 2022 Forecast relief was estimated by scaling recent test event performance within each service territory into Design Day conditions. Next, these base year Design Day savings were grown for each future year based on expected growth rates from approved programs and pilots by the Company, taking into consideration historical enrollment, past performance, and available market.

PA assessed the reasonableness of relief assumed within the 2022 Forecast and found the slight, 2.5%-2.6% increase in peak day DR savings, as compared to the 2021 Forecast to be reasonable. DR relief continues to be driven by C&I Daily Load Shedding Program participation. The 2022 Forecast reflects an increase in program relief due to the inclusion of additional savings from approved incremental weatherization programs, partially offset by a decreased reliability percentage for the Load Shifting Demand Response program (based on winter 2021-22 program performance), and the addition of a snapback factor[81]. PA believes it is important to note that forecasted DR relief is net of reliability and snapback factors and therefore forecasts anticipate relief at a level less than the enrolled (gross) savings; the Company roughly estimates that 60% of the Load Shedding Demand Response Program gross enrollments will respond when an event is called under Design Day conditions (also referred to as the reliability factor). This assumption appears to be reasonable, when compared to test event performance. This difference is illustrated by the blue-grey and light grey bars within Figure 5-3.[82]

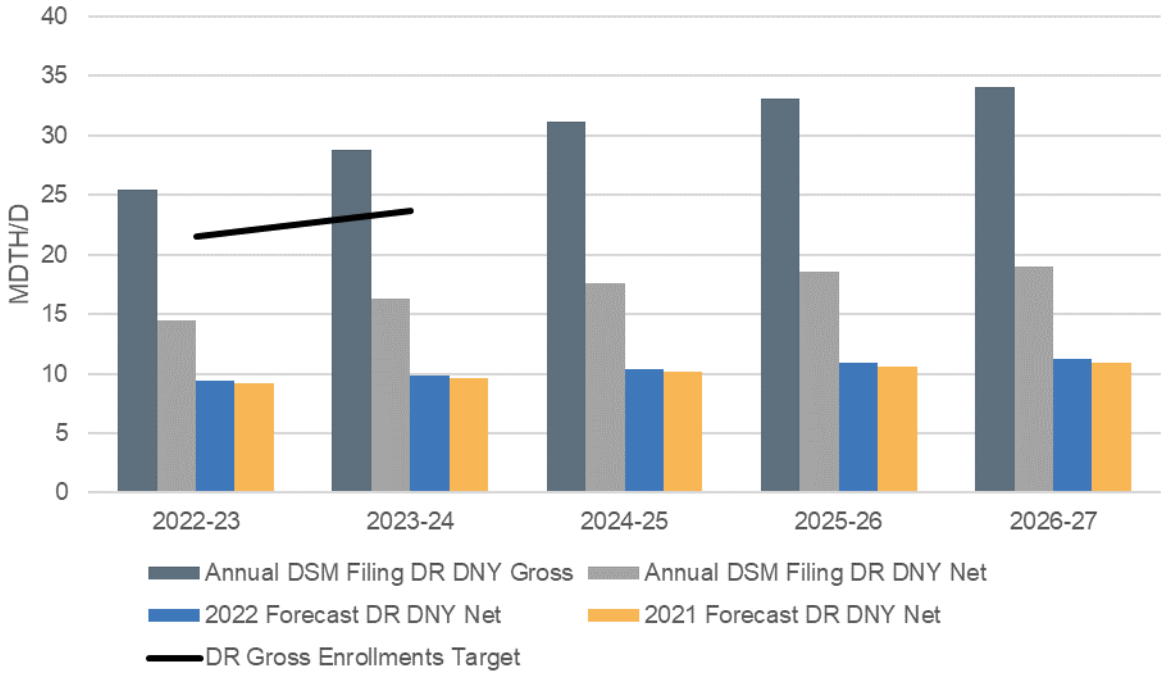
PA also compared 2022 Forecast to the amount of relief anticipated within the Company's Annual Demand-Side Management Report, finding again that the 2022 Forecast anticipates a lower level of relief, illustrated by the difference between the light grey and blue bars within Figure 5-3. Via discussions with Company SMEs, PA confirmed this observation and found the level of relief anticipated within the Annual Demand-Side Management Report is not 100%

[79] Source: Documents provided in response to PA 7-1.
[80] Per PA discussion with Company SMEs Friday, September 16th, 2022.
[81] Source: Documents provided in response to PA 3-24.
[82] Figures and tables within Section 5 and 6 present relief on a cumulative basis, considering program design in which customers sign-up annually.

reflected within the 2022 Forecast. Company SMEs describe a conservative approach was utilized for the 2022 Forecast, accounting for concerns participants may be less reliable under Design Day conditions (as opposed to test events), coupled with questions as to how participants will respond during consecutive Design Day conditions resulting in a risk of setting too high of an expectation of unproven DR achievement within the 2022 Forecast.

We believe it is reasonable to take a conservative approach in estimating the extent to which DR reductions can be relied upon, particularly considering the lack of Design Day weather events needed to validate reliability of these measures. However, we also find DR reductions beyond those anticipated within the 2022 Forecast, up to or beyond the levels proposed within the Annual Demand-Side Management Report might be achieved via temperature threshold refinements and other efforts to encourage increased participation and performance; as such, these incremental reductions might provide additional headroom within the supply and demand gap, which we discuss further within Section 5.2.2.

Figure 5-3 Cumulative Demand Response Design Day Reductions Comparison



According to the most recent CDM Report,[83] the Company anticipates meeting the 2022-23 winter gross Load Shedding DR Program enrollment target of 21,526 Dth. PA utilized a 60% reliability factor to gross-up Design Day savings for the enrollment equivalent, which resulted in under-achievement of this CDM target. Using a qualitative approach, we referenced prior winter year enrollments of 21,115 Dth (exceeding enrollment target of 19,569 Dth per day) coupled with the recent Company statements of achievement, to find CDM target achievement to be likely. This discrepancy further indicates the 2022 Forecast embodies a rather conservative view of Design Day relief, consistent with comments from Company SMEs. Above, Figure 5-3 includes a black trendline representing the 2022-23 and 2023-24 DR gross enrollments targets.

Electrification

Electrification programs aim to reduce supply side constraints and support decarbonization goals by encouraging customers to substitute electricity for natural gas for space and water heating and/or other appliances. PA assessed the reasonableness of the electrification reductions assumed within the 2022 Forecast. Unlike the 2021 Forecast, which only assumed electrification through heat pump installations as driven by electric distribution company efforts, the 2022 Forecast assumes several sub-components driving electrification savings[81]. The National Grid Greenpoint Report indicates the higher 2022 Forecast is largely driven by inclusion of additional electrification assumptions described within this section, mainly the impact of Local Law 154 and Local Law 97. Our analysis confirms that the 2022 Forecast includes a higher level of Design Day relief from electrification.

[83] Second Quarter 2022 Capacity Demand Metric Report filed July 29, 2022, Cases 19-G-0309 and 19-G-0310

Consistent with the 2021 Forecast, the first sub-component is electrification savings assumed by the electric distribution companies (e.g., Con Edison clean heat targets and PSE&G Long Island and LIPA (collectively "PSEG-LI/LIPA") targets) and considers two kinds of heat pump installations, full and partial.

- Full heat pumps are assumed to be sized to meet the customer's full heating requirements and the existing gas system is decommissioned when a full heat pump is installed. Therefore, the 2022 Forecast treats each full heat pump installation as a meter loss, including all associated load. As compared to the previous forecast, the 2022 Forecast now reflects a lower impact of full heat pump electrification in KEDLI, driven by PSEG-LI/LIPA's more recent outlook.
- Partial heat pumps are assumed to be installed with integrated controls connected to the existing gas furnace, which remains in service. It is assumed that the controls run the heat pump when outside temperatures are above 30 degrees and switch to the gas system when temperatures are 30 degrees or lower. Partial heat pumps are not treated as a meter loss in the 2022 Forecast. Instead, they are reclassified as partial heating customers and their gas usage is reduced by the amount normally used when temperatures are above 30 degrees. Therefore, the 2022 Forecast is unaffected by partial heat pumps.

Albeit minimal, new to the 2022 Forecast for KEDLI is the impact of planned water heater heat pump ("WHHP") installations. No change was made to the KEDLI meter count forecast to account for WHHPs, the Company's adjusted volumes to reflect water heating savings, depending on the type of WHHP, at an average Dth/WHHP of 8.2 Dth per year.

The 2022 Forecast also now expects meter losses due to Local Law 154, also known as NYC Int. 2317, anticipated to accelerate electrification of new construction within the City of New York. Forecasted savings are derived by a Company estimated percentage of new construction customers impacted by Local Law 154, over the 2022 to 2050 horizon. It is estimated that by 2030 50% of the forecasted annual meter growth in KEDNY residential, commercial, and multi-family rate groups will be affected by Local Law154; the majority of KEDLI is not impacted by this legislation. An adjustment was made to the 2022 Forecast only if the meter loss from electric distribution company heat pump electrification programs were greater than meter loss from Local Law 154. If the latter was the case, then only the difference between electrification program and the Local Law 154 meter-loss was subtracted from the forecast. The National Grid Greenpoint Report cites inclusion of this expected decrease in load as one of the contributors to the lower 2022 Forecast.

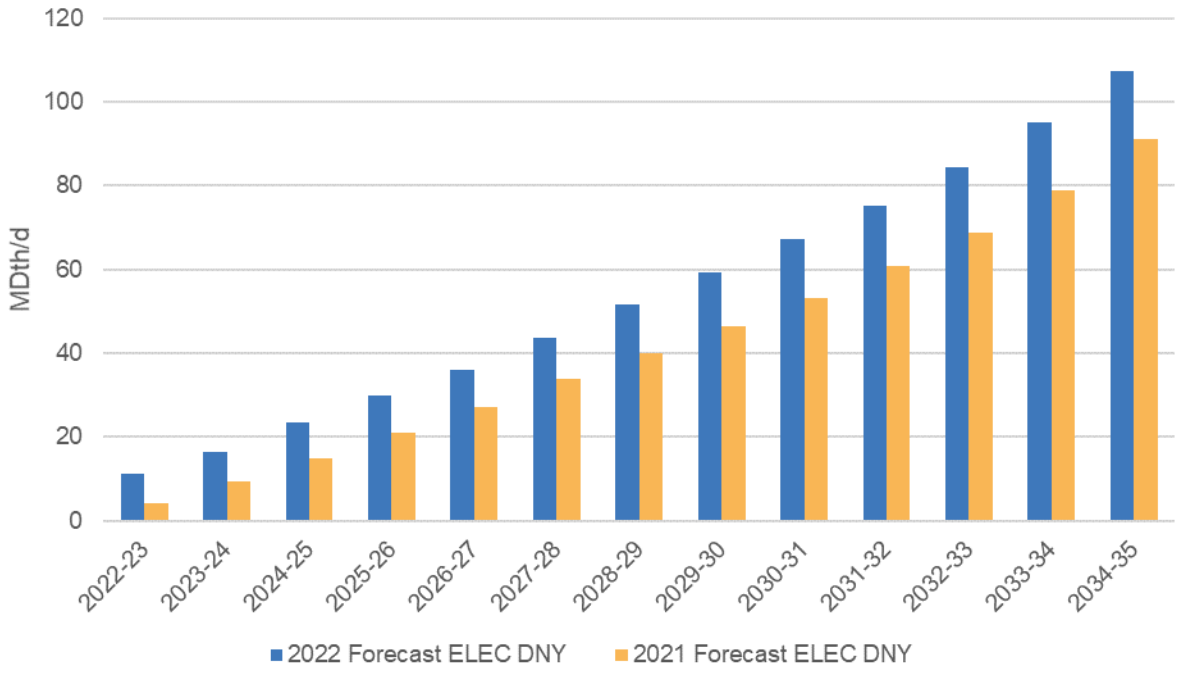
The 2022 Forecast also includes Local Law 97 driven reductions in gas load representing emissions reductions needed to meet compliance of GHG emission limits on buildings in New York City over 25,000 sq. ft, beginning in 2024. Within the 2022 Forecast, Local Law 97 limits are fixed from 2024 to 2029; tightened considerably in 2030; and held constant at those levels through 2034. GHG limits are scheduled to change in 2035 and later years, but New York City has not yet released those limits. To estimate the impact of Local Law 97, the Company utilized building emission rates calculated by multiplying the fuel use by their GHG emission factors and dividing by building square footage. If the result is greater than the Local Law 97 emissions limits per square foot, building owners must reduce emissions through EE, fuel switching, decarbonization of fuels, or any combination of the three, or pay a penalty. The forecast assumes the reductions over the time period 2024 through 2030 and the same emission limits from 2030 onward.

According to Company SMEs, Multifamily and Commercial building types, accounting for 93% of total building gas use, are on average already well below the 2024-2029 limits and, must reduce emissions moderately by 2030 for compliance. As a result, the 2022 Forecast assumes the required reductions in gas use are covered by the energy efficiency and electrification projections in the forecast, so no further adjustment was made to account for Local Law 97 impact of these customers.

On the other hand, Company SMEs indicate Industrial/Manufacturing building types are more than two times over 2024 limits and eight times over 2030 limits. Given these are very large non-firm gas customers who do not participate in Company EE programs, the Company anticipates these customers must make a fast ramp up in the use of renewable gas, green hydrogen or take other steps to cut existing gas use 80% by 2030. The 2022 Forecast assumes required reductions all come from cutbacks in production and gas use in these buildings. Despite the agnostic view that relief may come from a variety of programs and reductions, we have included the impact of Local Law 97 within our analysis of Electrification program relief.

Therefore, our evaluation of Design Day electrification savings assumed within the 2022 Forecast observes that the Company anticipates a higher level of Design Day relief, as compared to the 2021 Forecast, as illustrated by Figure 5-4. This is due to the anticipated impact of Local Law 97 and Local Law 154.

Figure 5-4 Incremental Electrification Design Day Reductions Comparison



The electrification CDM target requires the Company to collaborate with Con Edison and PSEG-LI/LIPA regarding prospective customers who are potential candidates for electrification, and to refer a minimum number of customers annually to Con Edison and PSEGLI/LIPA to determine if the customers are interested in electrification. As of June 30, 2022, the company has exceeded this CDM target.

In summary, we observe that the 2022 Forecast reflects lower Design Day relief from energy efficiency programs, a slightly higher level of relief from demand response programs and a more significant increase from electrification, as compared to the 2021 Forecast. As compared to recent filings, both energy efficiency and demand response savings assumed within the 2022 Forecast are lower than the reported relief within the SEEP and Annual Demand Side Management Report. In terms of CDM achievement, we expect achievement in all program metrics except for energy efficiency.

5.2.2 Incremental Non-Infrastructure Alternatives

We evaluated incremental non-infrastructure solutions, beyond what is anticipated within the 2022 Forecast, that might be implemented to further address Design Day reliability concerns. The Company indicates

> "because the need for the Greenpoint Vaporizer 13/14 Project was determined using the adjusted baseline gas demand forecast as a baseline, and because that baseline incorporates significant amounts of anticipated demand reductions from DSM programs (energy efficiency, weatherization, gas demand response, and electrification implemented by PSEG-LI and Con Edison), only the amounts of DSM incremental to that forecast could feasibly serve as an alternative to the Project"[84]

In addition to the PA Baseline Forecast three additional demand reduction opportunities from the non-infrastructure components of the DIS were assessed and compared to the PA Baseline Forecast. These scenarios are intended to highlight the potential for additional demand reduction. At this point, the available data suggests that these scenarios might be too aggressive to incorporate into a firm demand forecast. We comment on the incremental alternatives within this section of our report, beginning with DSM programs and ending with other alternatives not considered for adjustments.

Energy Efficiency

The Company acknowledges both advances and challenges in scaling the EE programs such as serious supply chain issues and perceived value of incentives to customers (due to increased cost of materials)[85] for example:

- Residential Weatherization customer participation (project) rates below expectations, however average savings per project is trending higher than anticipated

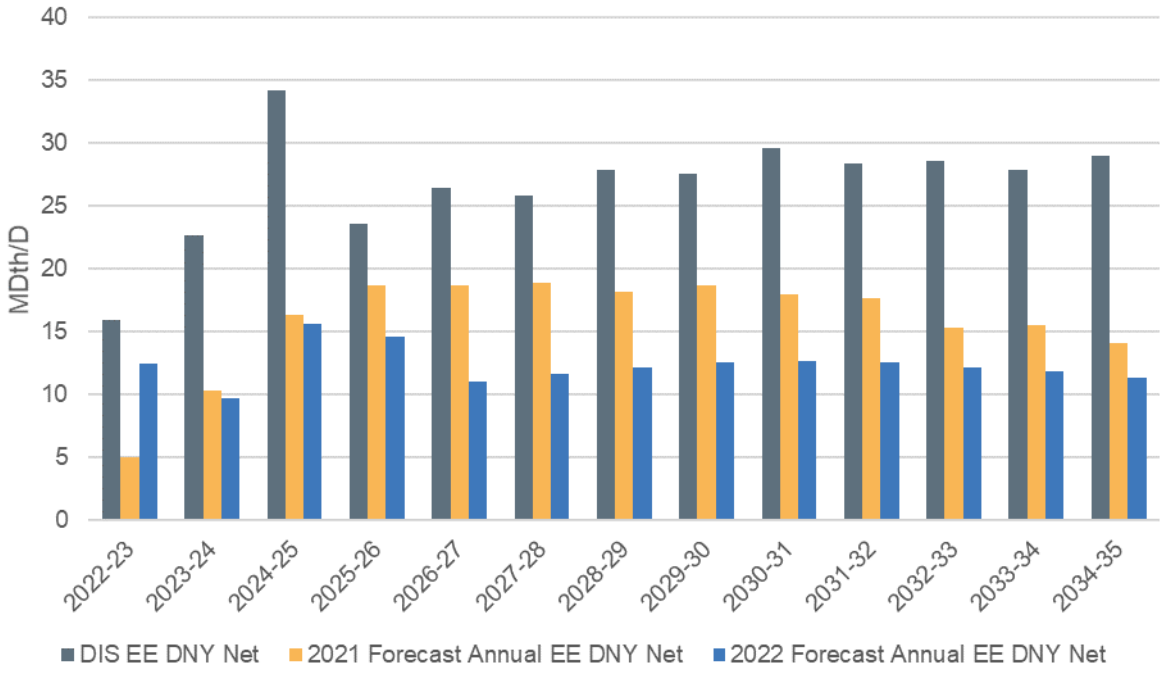
[84] Greenpoint Report, Page 33.
[85] According to statements made within the July 15, 2022 Annual Demand-Side Management Report.

- Non-Residential Weatherization savings limitations due to labor and materials shortages as well as the complexity of the application process which limited the number of projects that were able to be completed.

The Company must overcome such barriers in order to meet the level of incremental EE savings anticipated within the SEEP Filing and non-infrastructure components of the DIS. Both the SEEP Filing and non-infrastructure components of the DIS anticipated relief from weatherization programs, above what is reflected in the Company's 2022 Forecast. The 2022 Forecast weatherization amounts were substantially reduced due to the challenges experienced in scaling those programs. The non-infrastructure components of the DIS also anticipated relief from the proposed requirement that new gas customers, including those converting from other heating technologies and must adopt advanced energy efficiency measures prior to connection to the natural gas system. This was not reflected in the Company's 2022 Forecast, given approval, implementation, and overall relief potential uncertainties. In an effort to mitigate, the Company is recruiting potential contractors but efforts to expand the contractor network have yet to yield the progress needed to make market penetration. Additionally, continued ongoing collaboration with NYSERDA to develop a workforce capable of delivering the necessary services at scale may prove to be impactful.

The Company indicates incremental amounts of EE savings cannot feasibly serve as an alternative to the Greenpoint Project. In prior assessments, PA has described the challenges of cost-effectively scaling EE and we acknowledge the Company's challenges impacting EE serving as a viable alternative. However, we find it valuable to illustrate the potential for EE savings incremental to the amounts included within the 2022 Forecast, especially given our finding that the 2022 Forecast anticipates 65-80% achievement of NE:NY EE targets, plus a portion of recently approved weatherization program savings. Figure 5-5 illustrates the level of EE anticipated by the 2021 Forecast in orange, the 2022 Forecast in light blue and the aspirational non-infrastructure components of the DIS in dark blue-grey.

Figure 5-5 Annual Net Energy Efficiency Relief Comparisons



PA agrees there are headwinds to scaling EE programs. Once barriers such as supply chain constraints, cost to incentive ratios and contractor availability impacting customer participation are overcome, we find the potential relief anticipated by the Company's non-infrastructure components of the DIS will become less aspirational and more achievable. As such, this incremental relief might provide additional headroom within the supply and demand gap. It will take time to overcome such headwinds, and this may come at a higher than currently expected cost; nonetheless we believe that National Grid should aggressively pursue incremental EE relief, considering the overall benefits of EE programs, such as sustained relief on both an annual and Design Day basis, which translate into an effective tool for ensuring the reliability of the system, especially considering New York State's environmental goals.

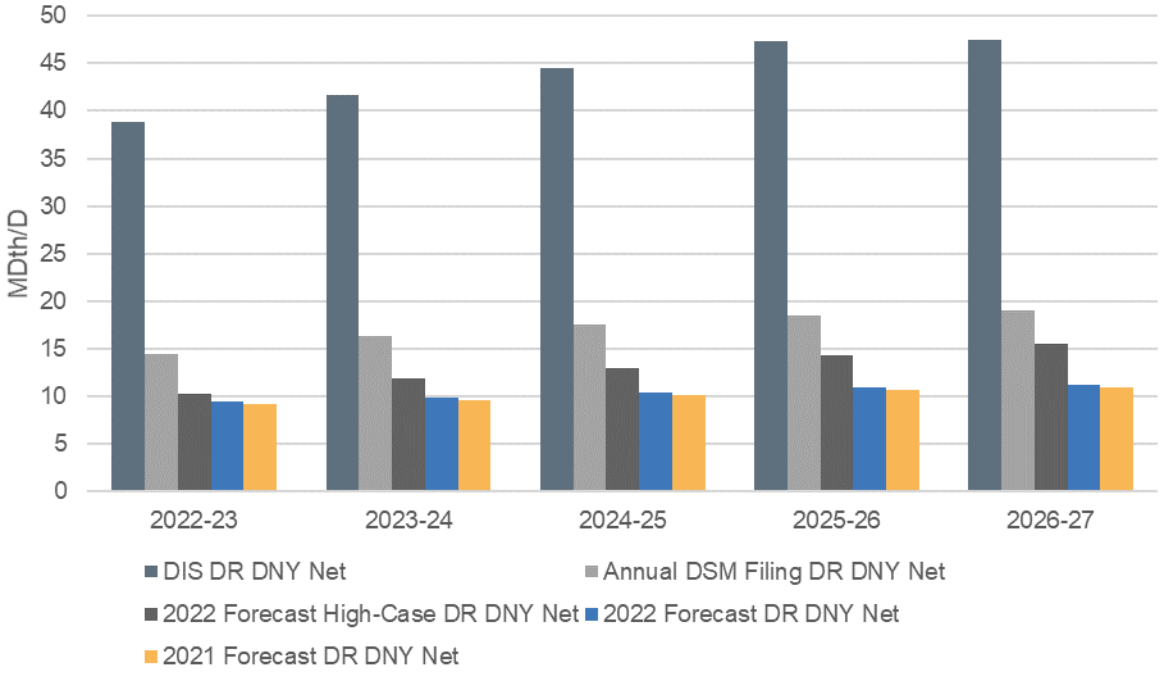
Demand Response

The Company acknowledges both successes and challenges experienced in scaling the DR programs, with key findings from the 2021-22 winter season test events including, but not limited to:

- Daily DR program commitments of reducing Design Day gas consumption by 21,115 Dth per day (overachievement of enrollment target of 19,569 Dth per day). This program is a direct load control ("DLC") program, and these types of savings are considered to be the most reliable of all DR.
- While DLC programs only represent 1/5th of overall enrolled load, they bring a higher reliability than non-DLC accounts and, are key to increasing firm DR performance in the future. A higher incentive is offered for DLC accounts, given higher reliability. The Company recently increased the incentive in an effort to further test the effectiveness of this incentive.
- Hourly DR program commitments of reducing load by 184 Dth/hour or 736 Dth/day (over a 4-hour event window). Test event results indicate that approximately half of enrolled customers did not attempt to reduce load, highlighting the reliability challenges of reductions from this program.

In the National Grid Greenpoint Report, the Company indicates that only DR could provide demand reductions incremental to 2022 Forecast load forecast and, there is an upper limit to the amount of demand reductions that can be provided by gas demand response customer participation. Given the primary program intent is to reduce peak demand during system emergencies, DR can be considered as the closest alternative to the Project. While PA has previously described the challenges of scaling DR and agrees all DSM programs are currently limited by respective technical market potential, we find it useful to illustrate the potential for relief incremental to the amounts assumed within the 2022 Forecast. This is particularly valuable, given our previously described findings that the 2022 Forecast includes only a portion of program achievements anticipated within the Annual Demand-Side Management Report, illustrated by the Figure 5-6 below.

Figure 5-6: Cumulative Net Demand Response Relief Comparisons



As discussed earlier, PA confirmed the level of DR relief anticipated within the Annual Demand-Side Management Report is not 100% reflected within the 2022 Forecast. Company SMEs describe a conservative approach utilized for the 2022 Forecast. Therefore, we find it reasonable to expect that further reductions, up to the levels proposed within the Annual Demand-Side Management Report as illustrated by the light grey bar within Figure 5-6 at a cost already approved by the Commission. Also presented within Figure 5-6 are High-Case DR relief illustrated by the dark grey bar, assuming participation escalations are higher in the mid-long term as well as a higher reliability factor than the 2022 Forecast, and aspirational non-infrastructure components of the DIS reductions illustrated by the blue-grey bar and would come at an incremental cost.

PA agrees with the Company that increasing reliable relief from DR programs is unproven at this time. DR programs require customer participation in order to result in relief and, while some DLC programs have higher reliability factors other DR programs are dependent upon customer participation yet to be tested on a Design Day. Additionally, as it becomes more difficult to reach incremental customers, the marginal costs for an incremental customer could increase as compared to the average costs for existing enrollees. Plus, there also is likely to be a limit to the Load Shedding DR Program (which offers the highest contribution of relief) addressable market because the program relies upon customers use of backup fuels during events and, there is a limited population of such customers. We believe it is reasonable to take a conservative approach in estimating relief from DR programs particularly considering the lack of Design Day conditions needed to validate reliability of relief. However, we also find DR reductions beyond those anticipated within the 2022 Forecast, might provide additional headroom within the supply and demand gap in the future. As a result, the Company should continue to aggressively pursue incremental customer participation, especially within the Daily Demand Response program.

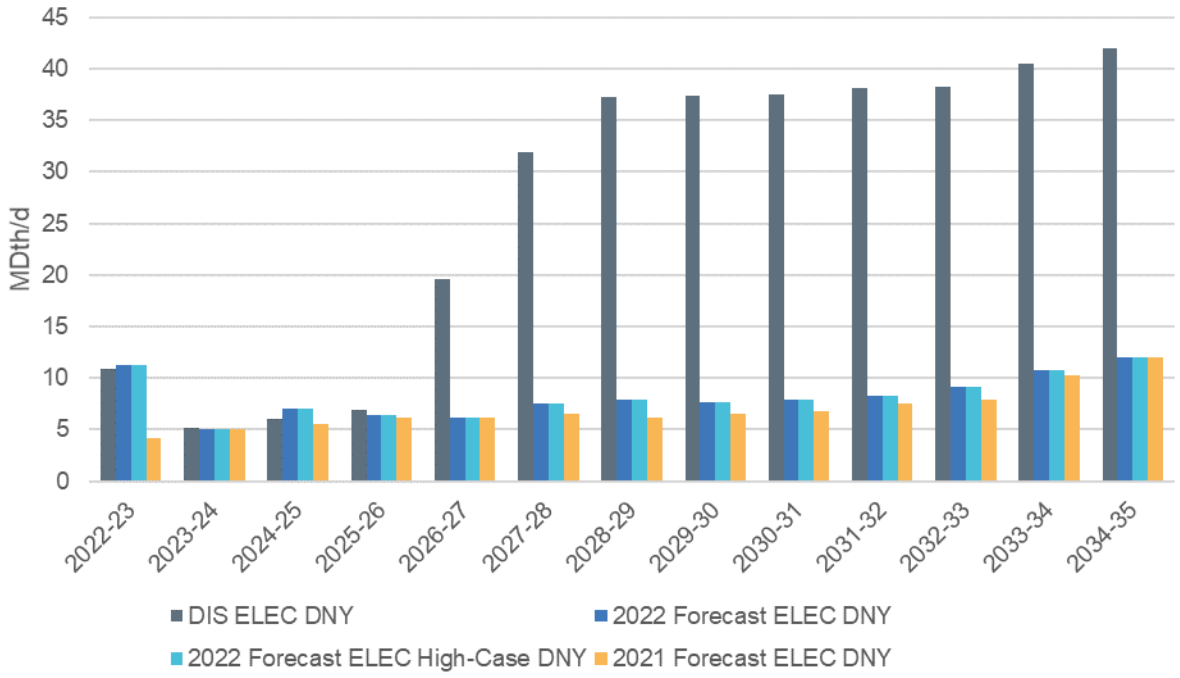
Electrification

The Company expresses challenges in furthering electrification driven reductions including, but not limited to:

- Full-load heat pump installations also retain previous/backup gas systems, mentioned within the draft Greenpoint Report; this could be mitigated via offering current customers a bonus or incentive to disconnect entirely from the gas system. We find this challenge to be reasonable and worthy of continued investigation as more customers transition to heat-pumps.
- Because the Company is not authorized to use gas ratepayer funds to incentivize installation of equipment such as electric heat pumps, it is dependent on the success of Con Edison and PSEG-LI's electrification incentive programs.

PA has described the challenges of scaling this program in previous assessments. While we acknowledge the Company's present challenges and also find that Con Edison and PSEG-LI's electrification incentives alone are unlikely to serve as a near-term viable alternative, we find it useful to illustrate the potential for incremental reductions beyond the amounts included within the 2022 Forecast.

Figure 5-7 Electrification Relief Comparisons



The amounts embedded within the electrification adjustments only reflect the savings assumed by the electric distribution companies' targets (clean heat targets for Con Edison + PSEG LI's targets) plus Local Law 154 and Local Law 97, as illustrated within the above Figure 5-7 blue bars. The Company also provided a 2022 Forecast High-Case, illustrated by the teal bar. Non-infrastructure components of the DIS incremental relief, illustrated by the dark blue-grey bars, were not included within the 2022 Forecast due to the Company's limited ability to put the incremental savings into effect and the lack of authorized funds needed to run its own heat pump programs. Previously assessed non-infrastructure components of the DIS relief assumed the Company would run heat pump programs at an approximate

total incentive cost of over $2B. The Company states incremental amounts of electrification cannot feasibly serve as an alternative to the Vaporizers 13 / 14. While this may be the case based solely on Con Edison and PSEG LI targets, we observe that increased incentives are available via the Inflation Reduction Act, and if National Grid's programs were to be expanded with additional funds authorized and/or other sources, there is potential for electrification to provide additional load reductions. Further, if the estimated percentage of the forecasted annual meter growth in KEDNY residential, commercial, and multi-family rate groups affected by Local Law 154 and/or if Industrial/Manufacturing emission reductions materialize greater and/or earlier than the 2022 Forecast estimates, we find potential for additional relief.

Therefore, we believe there is headroom within the suite of electrification program offerings and the non-infrastructure components of the DIS serve as a helpful benchmark for this incremental electrification relief; however, such relief should not be included within the Company's 2022 Forecast since the Company is not authorized to use gas ratepayer funds to incentivize installation of equipment such as electric heat pumps. Additionally, the Company may see additional relief from the impacts of Local Law 154 and Local Law 97 and other governmental programs, however, it is too early to determine the timing and extent of such incremental savings.

Combined Incremental Impact

As mentioned earlier, we included scenarios representing the additional opportunities from the non-infrastructure components of the DIS, to highlight the potential for additional DSM relief overtime. The total DSM impact was developed by incorporating the incremental savings from the relief of all demand side programs originally forecast in the 2021 Forecast from the non-infrastructure components of the DIS as compared to all of the demand side program savings reflected in the Company's 2022 Forecast.

As discussed within this section, the available data suggests that these scenarios might be too aggressive to incorporate into a firm demand forecast, at this time. However, this illustrates how the incremental demand reduction opportunities could increase the amount of time until National Grid would require incremental supply from the Greenpoint Project or other new sources of supply to meet Design Day demand. Therefore, National Grid is encouraged to aggressively pursue these types of incremental program savings.

Other Alternatives

The Company is required annually to issue at least one request for proposal seeking non-traditional, cost-effective peak supply alternatives, also referred to as a non-pipeline alternative ("NPA") solution. The Company issued a NPA request for proposal ("RFP") on July 29, 2022, therefore meeting this CDM target. Additionally, the Company has issued three requests for information ("RFI") to gain preliminary market insight.

Additionally, in terms of incremental opportunities relative to NPA RFPs, we recognize the following realities.

- Cost-effectiveness challenges exist within dense territories, such as the KEDNY territory; therefore, to date when alternatives are compared to the relative amount of existing infrastructure, resulting NPAs are less effective and higher cost largely because of the significant amount of energy carried by current infrastructure and useful life of existing pipelines.
- The Company closely tracks the efforts by other New York utilities and, the experiences of Con Edison and New York State Electric & Gas Corporation/Rochester Gas and Electric Corporation have been informative. The Company holds monthly check-in meetings with various New York peer utilities to discuss NPA best practices as well as participate in conferences to share their experience with NPAs and to learn from the success of others. Continuation of such collaboration may result in identification of presently unidentified cost-effective NPAs.

We evaluated potential non-infrastructure alternatives that would provide relief beyond programs envisioned by the Company. Consideration of other non-infrastructure solutions for future capital planning is critical and may provide expanded demand savings to avoid future infrastructure expansion, especially considering New York State's environmental goals. For example, we find there might be potential relief via use of alternatives to Company deployed metering infrastructure and/or direct load control devices. Additionally, there is potential relief via alternatives to current Company deployed metering devices when coupled with modifications to rate design such as hourly peak pricing. Below is a summary of the potential other alternatives we considered and reviewed with Company SMEs.

- Commercial customer building management systems in which the Company can send a signal to trigger existing commercial building system responses.
- Exploring additional metering solutions such as the potential of piloting the installation of pole-mounted devices that could collect hourly meter reads from a cluster of nearby customers, both small and medium commercial and residential. This pilot may result in lower metering costs for smaller customers and might allow the Company to better assess the reliable peak demand reduction capability of small and medium commercial customers. Such efforts might also support changes in rate design including Time Of Use / peak pricing / seasonal rates which currently are not feasible due to lack of advanced metering/hourly estimations.

- Use of shadow meters, which essentially count the pulses to estimate and provide customers and the Company with load visibility. The Company has considered utilizing this technology however, there are limitations such as regulatory approval beyond the existing metering providers and how the Company integrates load data provided via varying sources.

Furthermore, we considered National Grid's overall Clean Energy Vision plan which anticipates "supporting cost-effective, targeted electrification on our gas network, including piloting networked geothermal solutions, to electrify as much as 50% of the heating load by 2050; in areas where full electrification may not be practical or cost-effective, providing customers with the tools to pair electric heat pumps with their gas appliances; and, finally, eliminating fossil fuels from our existing gas network no later than 2050 by delivering renewable natural gas and green hydrogen to customers." While the Company is already progressing electrification efforts and we have discussed potential incremental relief from such efforts, implementing other solutions such as geothermal, RNG, and green hydrogen will take time and, were not considered by the Company as viable alternatives at the time the Project was anticipated. Given the recently approved NY Senate Bill S9422 which promotes development of thermal energy networks throughout the State of New York, PA observes that partnerships with NYSERDA and the geothermal industry could bring appropriate cost-effective solutions to market within the KEDNY and KEDLI service territories. For example, under the recently opened proceeding to implement the Utility Thermal Energy Network and Jobs Act[86], the Company anticipates its recently filed pilot proposal may result in one fully developed pilot within KEDNY being submitted for Commission approval on January 9, 2023.

As part of the Leak-Prone Pipe ("LPP") NPAs CDM target, the Company is required to annually identify at least five segments of LPP that could be abandoned if all customer loads were met with cost-effective alternatives. We expect areas in which LPP segments are identified bring increased potential for some combination of non-infrastructure alternatives such as targeted electrification and/or geothermal. As of June 30, 2022, the Company has identified five segments of such LPP, meeting the target within each service territory.

Our evaluation of the other non-infrastructure alternatives noted above results in several potential options for exploration. As such, we encourage consideration of additional alternatives including but not limited to installation of pole-mounted devices collecting hourly meter reads from a cluster of nearby customers and other advanced metering coupled with time of use / peak pricing rate design as well as energy efficient connections, incentives for entire gas system dis-connections and targeted transitions to geothermal.

5.2.3 Key Conclusions

- In previous assessments, we concluded that proposed incremental demand side options are in the early stage of testing and roll-out. As a result, both customer uptake and the savings per participating customer are unproven - since participation in the programs is voluntary, it is unclear whether customers will enroll at a rapid enough pace to avoid the need for near-term infrastructure enhancements even if budgets were expanded. In this assessment, we used 2021 and 2022 YTD program performance results and recent forecasts to inform our present view of program readiness. Following an additional year of program performance, we find non-infrastructure solutions are maturing at varying paces and, require additional time to be proven reliable alternatives at a magnitude such as Vaporizers 13 and 14.
- The available data suggests that incremental DSM relief scenarios might be too aggressive to incorporate into a firm demand forecast. However, we observe incremental DSM relief could increase the amount of time until National Grid would require incremental supply from the Greenpoint Project or other new sources of supply to meet Design Day demand.
- We still believe that additional efforts to incentivize customer engagement in DSM and other non-infrastructure alternatives, beyond what is presently approved, enhances the Company's ability to reduce demand over the long-term, providing additional headroom within the supply and demand gap. We encourage consideration of additional NPAs, as well as incentives for customers to entirely disconnect and targeted transitions to geothermal.
- Consideration of incremental demand side measures or other non-infrastructure solutions for future capital planning is critical and will likely provide expanded demand savings to avoid future infrastructure expansion as programs mature, especially considering New York State's environmental goals.

[86] Case 22-M-0429.

6 Cost Comparison

Pursuant to the Joint Proposal, the cost of the Greenpoint Project is to be evaluated using two calculations of "All-in Cost", the intent of which are to allow for an apples-to-apples comparison of the cost of identified viable alternatives to the proposed project. Per the Joint Proposal, the two methods for this calculation are (underscored to highlight the differences in the calculations):[87]

1. The sum of the fixed cost per year of the project plus the fixed O&M cost of the project divided by the projected Design Day Dth of use of project plus the variable commodity cost per Dth of the project plus the variable O&M cost per Dth (if any), and,
2. The sum of the fixed cost per year of the project plus the fixed O&M cost of the project divided by the projected annual use of project plus the variable commodity cost per Dth of the project plus the variable O&M cost per Dth (if any).

According to the Joint Proposal's description of alternatives against which the proposed project should be compared, the alternative must be able to meet or reduce demand in the same or shorter timeframe and for a lower all-in cost than the proposed project. In the case of the Greenpoint Project specifically, the Company has not identified any alternatives which meet the criteria to be deemed as "viable" under the guidelines of the Joint Proposal. The Company identified two specific options in its proposal which were the basis of cost comparison: the Clove Lakes Uprate Project and incremental DSM.

Clove Lakes is not a viable alternative on the basis that it:

- Is in pre-development phases with a project in-service date of the end of 2029, which is later than the need-by date identified by the Company;
- Is significantly more capital intensive than the Greenpoint Project at an estimated capital cost of over $320M;
- Is significantly more operationally expensive than the Greenpoint Project as it is projected to require an annual pipeline capacity charge of $274/Dth (or approximately $16.5M[88] per year of capacity charges) in order to maintain the rights to the equivalent 60 MDth of capacity provided by the Greenpoint Project; and
- Further, and while not a consideration of viability under the Joint Proposal, PA does not expect that a project such as Clove Lakes would expediently progress through the necessary environmental and permitting stages of development without significant if not permanent delays.

DSM solutions are maturing at varying paces and require additional time to be proven reliable alternatives at a magnitude such as Vaporizers 13 and 14. Considering New York State's environmental goals and the potential for expanded relief from incremental measures, we find that DSM is a viable alternative, but additional time is required to prove out the efficacy and adoption of demand response specifically during cold weather conditions.

6.1 Evaluation of All-in Costs

PA's analysis of the primary components of the All-in Cost for the Project is shown in Table 6-2. With the caveat that, as stated elsewhere in this report, there is no Design Day need for the Project in the near future, in keeping with the review criteria in the Joint Proposal PA is presenting its All-in Cost perspective on a Design Day. For reference, Appendix C of the Company's Proposal provides an All-in Cost of the Project of $1,628 per Design Day dekatherm. PA understands that approximately 65% of the capital budget of the Project has been spent through 6/30/2022. As previously noted, it is PA's understanding National Grid began acquiring equipment for the Greenpoint Project in early 2020 based on the projected need to have adequate supply resources to meet the demand forecast in place. At that point in time National Grid had developed its Long-Term Capacity Plan, which showed the potential for a supply-demand gap as early as the 2023-24 winter season unless additional sources of supply were obtained. Based on an evaluation of alternatives at that time, National Grid included Vaporizers 13/14 as part of a planned multi-source strategy, along with the ExC project and demand side management programs, to meet the demand forecast in place in 2020.[89]

National Grid's Second Supplemental Report in 2021, which was based on an earlier demand forecast, also indicated the potential need for this type of multi-source solution. However, as noted elsewhere throughout this report, National

[87] Joint Proposal, pages 45-46.
[88] Pro-rated the pipeline demand charges to reflect an assumed 60 MDth of capacity vs. the proposed project's capacity of 80 MDth; per the Company's response to PA 6-39, the assumed capacity charge is approximately $0.75/Dth (approximately $22.86/Dth/month, divided by 30.4 (the average number of days in a month) yields $0.75/Dth.
[89] National Grid's Supplemental Report provided similar findings on the need for additional supply.

Grid's most recent demand forecast, showed a significant decline in forecasted demand, calling into question the need for Vaporizers 13/14 at this time.

Responses to PA's requests for the up-to-date capital budget indicates that the continued delays of the Project have resulted in cost escalation of approximately $5.1M resulting in a current capital budget of $69.7M as opposed to the $64.6M budget reflected in the Company's Report[90] as shown in Table 6-1 below.

Table 6-1: Actuals and Remaining Spend through June 30, 2022

Spend Category	Actuals to 6/30/2022	Forecast to Complete	Final Estimated Cost[91]	% Complete
Construction and Procurement	$20,335,850	$13,000,000	$33,335,850	61.0%
Engineering	3,160,670	100,000	3,260,670	96.9%
Vaporizer Equipment	5,987,182	100,000	6,087,182	98.4%
Other Contractor Support	4,214,059	2,430,000	6,644,059	63.4%
Overheads	7,385,964	2,479,588	9,865,552	74.9%
Capitalized Interest	2,763,487	5,500,000	8,263,487	33.4%
Labor + Benefits	1,525,638	750,000	2,275,638	67.0%
Fleet	6,656	3,000	9,656	68.9%
Total	**$45,379,507**	**$24,362,588**	**$69,742,095**	**65.1%**

In review of the All-in Costs of the Project, PA has identified two revisions to the values provided by the Company.

- First, as a result of cost escalation, PA has increased the numerator of the equation to reflect the current budget of $69.7M. In order to also incorporate the return of capital and tax implications on a like-for-like basis as shown in Appendix C of the Company's Report, PA has recalculated the net present value of capital spend which assumes the difference in the budgets is allocated on a proportional basis according to the Company's projected 2023 and 2024 capital spend of $11.2M and $2.5M respectively.[92] The attribution of the incremental budget of $5.1M therefore results in adjusted 2023 and 2024 spend of $15.4M and $3.4M respectively. See Appendix C for additional detail comparing the Company presentation of costs vs. PA's adjustments.
- Second, PA has revised the denominator to better reflect historical vaporization volumes for the purpose of calculating the All-in Cost per annual dekatherm. Specifically, since 2009, the greatest single day sendout was approximately 100 Mdth as shown in Figure 4-3, implying approximately 29% of the total Greenpoint facility's total 350 MDth capacity with Vaporizers 13 / 14 in place. Therefore, PA believes that applying a similar 29% of annual sendout from the Project is a conservative (i.e., at the high end of historical actual usage) estimate of annual use for the purpose of determining the All-in Cost on an annual basis. In combination with an expectation of five events per year and approximately 16.8 MDth per event (or approximately 29% * 58.8Mdth), this approach indicates estimated annual use of 84 MDth with an All-in Cost of $1,225/MDth.

For the purpose of calculating the All-in Cost per Design Day Dth, PA assumes that the full capacity of the Project (58.8Mdth) will be deployed on a hypothetical Design Day in which the entire capacity of the Project is needed, resulting in an All-in Cost per Design Day DTh of $1,750/Dth shown in Table 6-2 below.

Table 6-2: PA's Estimate of All-in Costs of the Greenpoint Project

	Value ($) or Use (Dth)	Input / Source
Cumulative Capital Cost - per Company	$64,629,502	Company Report Appendix C
Cumulative Capital Cost - PA Adj.	$69,742,095	Table 6-1
PV of Cumulative Capital Cost - PA Adj.	$68,152,243	PA Report Appendix C
NPV of Fixed Costs - PA Adjusted	**$102,564,770**	**PA Report Appendix C**
Useful Life	39	Based on actual and assumed useful lives[93]
Annual Fixed O&M Cost	$25,350	Company Report Appendix C
PV of Cumulative Fixed O&M Cost	$306,640	Fixed O&M for 39 years at 7.83% pre-tax WACC
Variable O&M / Dth	$0.310	Company Report Appendix C
Design Day Capacity (Nameplate, Dth)	58,800	Company Report Appendix C
All-in Cost / Design Day Dth	**$1,750**	

[90] Greenpoint Report, Appendix C.
[91] Source: Documents provided in response to PA 3-9.
[92] Greenpoint Report, Appendix C.
[93] Based upon the actual retirement age of vaporizers 1-6, assumed retirement of vaporizers 7-8 in 2025 and 9-10 in 2031.

	Value ($) or Use (Dth)	Input / Source
Instances of annual operation	5	Based on historical average
Sendout per instance (Dth)	16,800	Based on high end of historical sendout
Estimated annual use	84,000	Based on annual instance and average sendout
All-in Cost / Annual Dth	**$1,225**	
All-in Cost / Design Day Dth (w/Pump)	*$1,877*	*Assumes $5M capital cost of pump project in 2023*
All-in Cost / Annual Dth (w/Pump)	*$1,314*	*Assumes $5M capital cost of pump project in 2023*

Note that the above costs do not include the estimated cost ($5-6 million) of a pump rebuild project[94] at Greenpoint which was not included in the Company's total budget for the Vaporizers 13/14 Project, but PA understands is necessary to achieve the full 58.8 MDth per day capacity of the Project. PA has not considered the pump project in our analysis as that project is not included in the list of Long-Term Capital Capacity Projects subject to independent review per the Joint Proposal. However, given the relationship of the pump project to the overall Greenpoint Project, inclusion of the cost for comparison purposes may be reasonable which would result in All-in Costs roughly 7% higher than shown above in Table 6-2.

Even with PA's adjustments to the All-in Cost for the Greenpoint Project, the estimated costs of Clove Lakes and additional demand side programs currently remain orders of magnitude greater. Per the Company's Report the All-in Cost per Design Day dekatherm of the Clove Lakes Uprate project is estimated to be $9,552 while DR program costs are estimated to be $6,432. See Table 6-3 below.

Table 6-3: Comparison of All-in Costs of Alternatives

Project / Program	All-in Cost per Design Day Dekatherm
Greenpoint 13/14[95]	$1,628 (per the Company); $1,750 (per PA)
Clove Lakes Uprate	$ 9,552 (per the Company)
Demand Response	$6,432 (per the Company); $4,025 (per PA)
Energy Efficiency	$21,000 (Per PA)
Electrification	$12,500 (Per PA)

As discussed previously, Clove Lakes is not viewed as a viable alternative nor is there a detailed budget to evaluate for comparison purposes. However, DSM, and DR in particular, can and should be developed more aggressively. Key assumptions in the cost and value of DR include the total number of addressable customers that could feasibly and reliably participate in a DR program, the amount of demand reduction which could be relied upon if customers are called to do so, and the economic incentive needed to achieve both of the previous factors.

The All-in Cost per annual Dth of the Project is estimated to be $1,225 per Dth based on an assumption that the Project will be called upon to contribute proportionally to the overall Greenpoint facility output as discussed previously (29% of the total output). In that scenario, the Project would provide approximately 16.8 MDth (approximately 29% times 58.8 MDth) on five occasions per year, or a total annual volume of 84 MDth. Note that this per Dth cost is likely to be a high estimate given that it assumes vaporizers 13/14 provide a proportional contribution to total sendout (in other words, if maximum daily send-out is 100 MDth, this represents approximately 29% of the total Greenpoint capacity of 350 MDth and implies that the new vaporizers would not be used more frequently than the existing vaporizers). In reality, PA would expect that Vaporizers 13/14 would be favored to operate over older units thereby increasing the denominator (and reducing the per Dth cost) in this calculation. However, in the absence of a decommissioning plan or

[94] Source: Documents provided in response to PA 4-3. The Company is planning to upgrade the existing low-pressure pumps at Greenpoint. Currently, the three low-pressure pumps can collectively supply up to 156 MDth/hr. If the Project is constructed, the required low-pressure pumping capacity is 9,600 Dth/hr or 230.4 MDth/day -- the equivalent of more than four pumps (230.4 MDth/day / 52 MDth/day per pump = 4.43 pumps, assuming equivalent capacity of the existing pumps). In other words, the Design Day capacity of the Greenpoint facility with Vaporizers 13/14 (350 Mdth/day) cannot be achieved without an upgrade to the low-pressure pumps. (Note – the remaining 120 MDth (350 in total, minus 230 for the low-pressure system) of Greenpoint capacity is currently (and prospectively) supplied to the high-pressure system.)

[95] PA's understands that the Company's All-in Cost includes variable commodity costs.

parameters which would otherwise set operating constraints, PA calculated the cost on the basis of proportional weighting across the entire facility.

Unlike the Greenpoint Project, the Clove Lakes Uprate project would operate continuously throughout the year. According to the Company's Report, the levelized cost of Clove Lakes is approximately $700/MDth per day. However, the All-in Cost of the Clove Lakes project is highly sensitive to the assumed send-out from the project. For the purpose of illustrating the boundaries, PA calculated two book-end examples:

- If the project is assumed to provide 80 MDth on five occasions per year (as is the case for Vaporizers 13/14), or 400 MDth as the denominator with an all-in cost of approximately $764M (per the Company's Report) as an analogue to the frequency of sendout of the Greenpoint project, the resulting cost per annual Dth is $1,910
- If the project is assumed to reflect, for example, a 25% load factor over 365 days per year the resulting cost per annual Dth is $105

The Clove Lakes project also provides more capacity than is needed by the system on normal weather days – a nuance that PA believes over-represents the benefit attributed to that project. Due to the significant assumptions and the dramatically different potential use cases of the two projects, PA believes that such comparison is limited in value. While comparing two pipeline alternatives to one another may be useful, comparing a pipeline option with committed, firm capacity to an LNG peak shaving facility which operates a few times per year naturally results in significant and non-comparable differences.

Demand Response Program Costs

Currently, the Company estimates a cost of $474 / Dth per season[96] which is largely related to the incentive payment to large customers to curtail demand when called upon. As a point of reference, the Company's latest Incremental Downstate DSM filing includes an enrollment target of 375 customers by the 2026-27 winter season with each customer representing savings of approximately 9 Dth/hour or approximately 70 Dth over an eight-hour peak period. Assuming reliability of 60%, Design Day demand reduction in the 2027-28 winter season of approximately 18,500 Dth (375 customers * 70Dth * 60%) would result in nearly one third of the equivalent supply the Greenpoint Project could provide. At a cost of $474 / Dth, this savings would cost roughly $1.5M in incremental total spend for one year.

Whether comparing the All-in Cost of DR to the Company's estimated All-in Cost of the Greenpoint Project or to PA's adjusted value for this Project, the attractiveness of the Project cost versus DR is highly dependent upon the assumed usage of the vaporizers and the number of the customers who are both signed up and respond when demand response events are called. Additionally, challenges exist in comparing the Company's DR costs with costs of other gas utilities given costs per Dth are dependent on customer participation, reliability and overall program maturity. The challenge with comparing the costs of the Greenpoint Project to DR solutions is that the former is a long-lived fixed asset wholly within the control of the Company while DR requires annual renewal by customers as well as unknown levels of customer participation and as such represent different risk profiles.

To set DR on an equivalent basis to PA's supply and demand outlook, in which the Project's need date is 2028/29, PA projected the cost of DR at $472[97] per Dth per season averaging 6,243 Dth per year and a cumulative cost of $36.9M over the 2029-2038 timeframe. On an NPV basis, this equates to $4,025 / Dth – lower than the Company's forecast but still nearly 2.5x more expensive than the Project.

Energy Efficiency Program Costs

We requested estimated incremental energy efficiency costs however, the response received is that budgets and savings achievement are decided in Commission orders, Company has only estimated annual costs through 2025 and, do not have authorization for energy efficiency funding past what is outlined in the January 2020 NE:NY Order through 2025. Therefore, we sought an alternative approach to estimating program costs and assessed the total downstate New York residential and C&I weatherization 2023 Annual Program Budgets with FTEs for 2023 incremental Design Day Savings, resulting in a cost of approximately $21,000/Dth[98]. We then compared this to weatherization program estimated budgets on a design day for three years, as provided for our prior assessment of Southeast Suffolk Phase 1 project of $20,000/Dth. Thus, we found the $21,000/Dth cost to be reasonable and the most current estimate available. Similar to DR, one of the challenges in comparing the cost of EE to the Greenpoint Project is unknown levels of customer participation and as such different risk profiles.

Electrification Program Costs

We requested estimated incremental electrification costs however, the response received is that the Company has not estimated the costs for implementing the levels of electrification because the KEDNY and KEDLI territory programs are

[96] Greenpoint Report, Appendix C.
[97] Case 19-G-0309 and 19-G-0310 Annual Demand-Side Management Filing of the Brooklyn Union Gas Company d/b/a National Grid NY and Keyspan Gas East Corporation d/b/a National Grid.
[98] Source: Documents provided in response to PA 3-24.

administered by Con Edison and PSEG LI. Therefore, we sought an alternative approach to estimating program costs. We reviewed the accelerated electrification incentive cost assumptions from the Second Supplemental Report of approximately $12,500/Dth. We then compared this to the costs provided for our prior assessment of Southeast Suffolk Phase 1 of approximately $15,000/Dth. Given the challenge of unknown levels of customer participation and the level of incentives needed to encourage participation, we find the comparison of the cost of electrification to the Greenpoint Project to be challenging.

6.1.1 Key Conclusions

In PA's view, the All-in Cost of the Project is likely modestly higher than presented in the Company's Report, however due to the combination of a lack of alternatives which meet the definition of "viable" per the Joint Proposal, PA notes that comparing the Project Cost to Clove Lakes or DSM options is not an altogether constructive exercise for the purpose of decision-making. The Clove Lakes project has not been developed by the Company with sufficient detail to evaluate the costs while the maturity of the DSM programs and application of those programs on design day conditions have yet to be proven out. Further, in the absence of a decommissioning plan for either the existing units at Greenpoint or the proposed new units, is it difficult to address the fixed cost nature of the Project as compared to the variable costs associated with demand response.

PA finds that the costs as presented by the Company are reasonable, however notes that the costs are not altogether helpful for the purpose of benchmarking options due to the reasons stated above.

7 Emissions Comparison

An analysis of the emissions associated with the Greenpoint Project must be grounded in the proper context and time frame. An emissions analysis for the Greenpoint facility has been conducted by AKRF, Inc ("AKRF"). That analysis, published in October 2021 and updated in March 2022, sought to define the Greenpoint site emissions before and after the Project is placed in service. The basis of that study was a "worst-case" evaluation of GHG to comply with the Climate Leadership and Community Protection Act ("CLCPA"), under the guidance of the New York State Department of Environmental Conservation ("NYSDEC"). This worst-case basis approach evaluated the maximum potential annual emissions from the Greenpoint facility after the installation of Vaporizers 13 / 14 and was based on a scenario in which the LNG storage tank inventory would be emptied[99] once in a year. Based on that limitation, the AKRF analysis concluded that the addition of Vaporizers 13 / 14 would reduce total carbon dioxide equivalent (CO2e) emissions because those vaporizers are more efficient and would be operated in favor of existing, older vaporizers that are less efficient should the 90% LNG use scenario occur. In other words, the basis of the evaluation was that, in a single winter season, 90% depletion of the on-site LNG inventory would result in lower overall emissions. This finding was primarily based on the higher efficiency of the new vaporizers.

Further evaluation was done in the March 2022 update of the AKRF report to account for actual gas usage by new customers in the future. Future natural gas demand and its growth are addressed in other parts of this report, so are not discussed quantitatively within this emissions discussion. The finding of the additional AKRF analysis was that the total CO2e emissions associated with downstream usage (in the future) would decrease primarily due to fuel oil conversions to natural gas. Said differently, while gross emissions related to natural gas use by new gas customers would increase, there would be a net decrease in total emissions due to the avoidance of emissions associated with the use of fuel oil. This finding is not directly related to Vaporizers 13 / 14, except in the sense that their addition to the Greenpoint facility may facilitate the addition of new natural gas customers in new construction as well as where conversion from fuel oil to natural gas take place. So, while the Vaporizers 13 / 14 Project could enable more natural gas end use, and the associated higher total CO2e emissions, the expected conversion from fuel oil would be an offset to the extent that total CO2e emissions would actually be lower for natural gas compared to fuel oil. The degree to which additional customer connections would consist of oil to gas conversions (or other fuel switching), which could partially offset the emissions associated with new customers on the natural gas distribution system, is dependent upon the actual mix of new customer types.

Design Day Emissions Analysis

While the worst-case LNG usage (90% of Greenpoint capacity) introduced above may have been necessary for NYSDEC and CLCPA compliance, the focus of PA's review under the Joint Proposal is on the Design Day requirements. Consequently, an emissions analysis which focuses on Design Day LNG output was undertaken and simplified further to the maximum design hour output. The premise of this emissions analysis was a comparison of CO2e emissions associated with all vaporizers at Greenpoint, both before and after the addition of Vaporizers 13 and 14. In each current and future case, CO2e emissions were calculated at design hour output, for both the least efficient and most efficient sets of vaporizers. These calculations involved vaporizers that serve both the high pressure (HP), or 350 psig system, and the low pressure (LP), or 60-psig system. Due to the addition of Vaporizers 13/14, Design Day capacity increases from 291.2 MDth per day (12.13 MDth per hour) to 350 MDth (14.6 MDth per hour) with the increase in capacity entirely on the low-pressure system. The results of the direct use CO2e emissions calculations are presented in Table 7-1.

[99] Source: Documents provided in response to PA 5-2. The AKRF analysis assumed that only 90% of the LNG tank inventory can be withdrawn and vaporized. This assumption appears to be reasonable. The 90% limitation leaves 10% of the tank's volume intact. This level of LNG approaches the limit of pumping operations and leaves sufficient LNG in the storage tank to keep the system cold until liquefaction resumes.

Table 7-1: Design Hour Emissions for Various Vaporizer Combinations

Vaporizers In Use	Total Heating Gas Use (mmBtu/hr)	Design Hour Throughput Supplied Gas, (Dth/hr)	Vaporizer Heating Gas Design Hour Emissions (metric tons CO2e)
Current Scenarios			
HP: 7+8 LP: 9+10+11	216	12,133	20.6
HP: 8+12 LP: 9+10+11	215		20.5
Future Scenarios (After addition of V13/14)			
HP: 7+8 LP: 9+10+11+13	259	14,583	24.7
HP: 8+12 LP: 10+11+13+14	256		24.4

As seen in Table 7-1, the differences in vaporizer efficiency make only a slight positive difference in the total hourly CO2e emissions at the design hour conditions – 24.4 vs. 24.7 MT. The values in Table 7-1, much like the AKRF scenarios, represent the full (or exaggerated) daily capability of the Greenpoint site which would only be realized in rare (Design Day) situations.[100]

The use of fuel gas at any of the Greenpoint vaporizers (as shown in Figure 4-3) contributes only a small fraction of the overall CO2e emissions associated with natural gas usage. While the addition of Vaporizers 13 and 14 increases the potential to add to overall site emissions, it is only because of the added throughput that may be needed to serve Design Day needs as the vaporizers tend not to run frequently other than on Design Days or when other sources of gas are curtailed. As Design Day events are not frequent, the potential for significant increased emissions from adding Vaporizers 13 and 14 on a Design Day is minimal.

[100] There is an assumption that the Greenpoint facility is operating at full capacity on a Design Day. It is therefore reasonable to multiply the design hour emissions by 24 to arrive at Design Day emissions.

8 Public Input

Over the course of the comment period related to the Greenpoint Project beginning from the date of the Company's report filing through October 12, 2022, over 300 comments were received in addition to the approximately 10 hours of public discourse over the span of four public meetings in September 2022. These comments and feedback do not include the public input provided prior to the filing of the Company's Greenpoint Report which span several years and fall beyond the scope of PA's assessment related to this specific Project. In addition to individual input from members of the public, letters were submitted from numerous public officials from the NY Assembly, City Council, State Senate, and State House of Representatives.

While the project did elicit a significant volume of input, many written comments appeared to be effectively the same templates being used by multiple commenters. Similarly, many instances of comments delivered at the public meetings appeared to be repetitive based on similar talking points. Further, the input was largely received from residents in neighborhoods of North Brooklyn and Queens. In relation to the broader KEDNY service area and nearly 2 million downstate New York customers who would receive potential Design Day benefits from the Project across KEDNY and KEDLI service territories, the input received represented a comparatively small and localized sample of the Company's customer base.

Such sample sizes are not atypical for such public solicitations and, in the case of this project specifically, should reflect an overweighting towards the opinion of residents who bear a larger than proportional share of potential indirect project costs – whether social, economic, environmental, or otherwise. The fact that the two in-person public meetings conducted were in neighborhoods adjacent to the Project underscore the relative impact of the Project on nearby residents even as the Company suggested reduced emissions, modest rate increases, and meaningful reliability improvements – all of which incur proportional cost and benefit regardless of the physical location of the KEDNY customer.

Broadly, public input received was in opposition to the Project with only one statement submitted in support. The statement of support was presented by a trade union which made the case that in the absence of alternative plans, the vaporizers are the only solution to meet demand while the energy sector continues to decarbonize.

8.1 Primary Public Input Themes

The primary themes of opposition observed from public input, based on the commenters' understanding of facts and context are as follows:

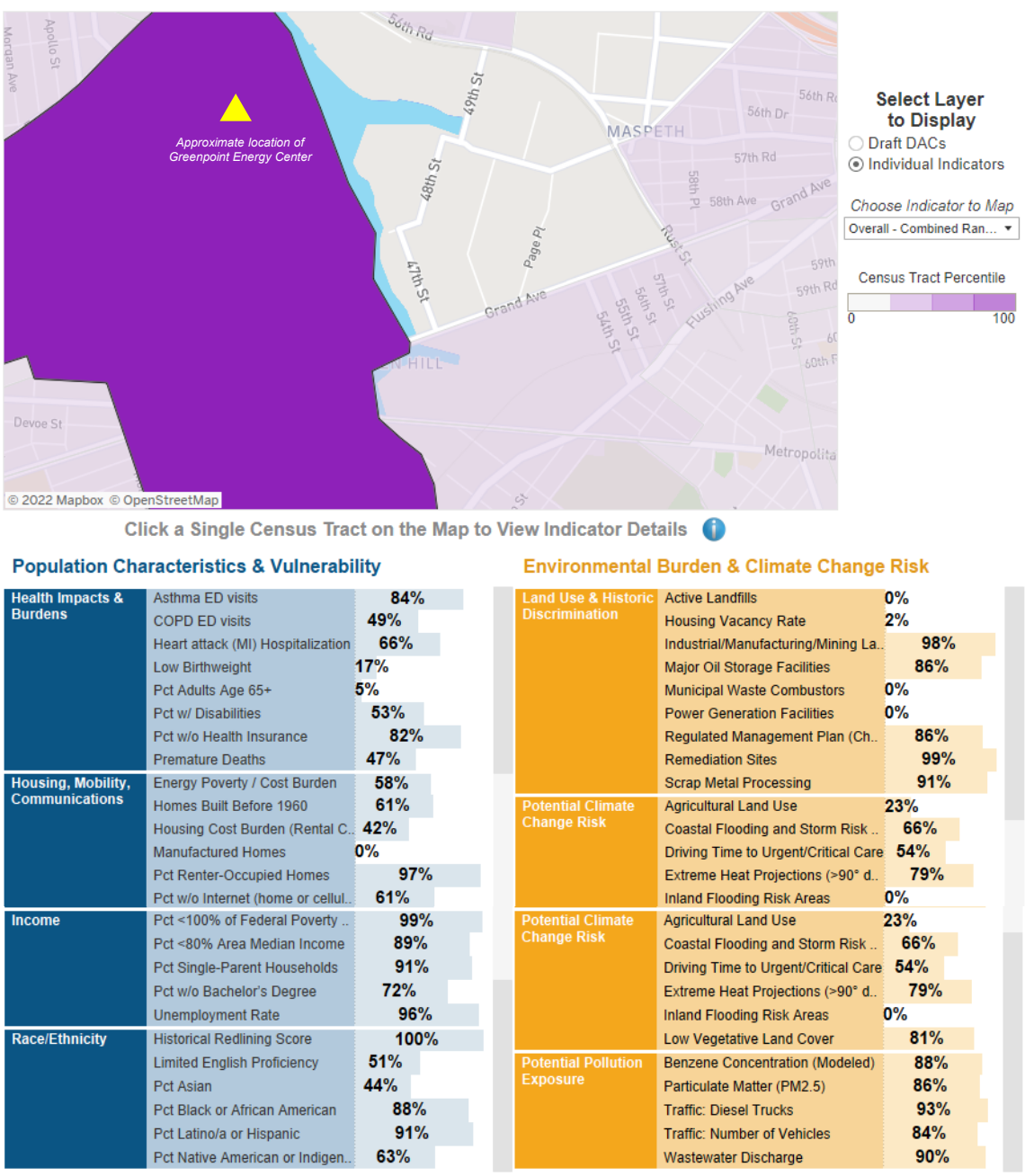
- The negative impact on human health the addition the project represents to an already heavily burdened area of industrial pollution, and the fact that the project is in an environmental justice zone
- The risk that the Project becomes a stranded asset
- The need for the Project
- The Project as adverse to CLCPA
- The Project as adverse to NY State law prohibiting LNG infrastructure
- The lack of alternatives presented (including renewable resources and a decommissioning plan)
- The relationship of the Project to MRI Phase 5
- The Design Day criteria and associated demand forecast being unrealistic

Below we provide PA's summary observations and potential implications for these themes.

Health and Social Impacts

- The neighborhoods adjacent to the Project location represent Disadvantaged Communities as defined by New York State's draft criteria and as shown in Figure 8-1. While the Company stressed that the more efficient vaporization units (i.e., Vaporizers 13 / 14) would result in lower direct per Dth emissions, plans to permanently reduce the carbon footprint of the facility in terms of both direct and indirect emissions was not provided.

Figure 8-1: Disadvantaged Communities Metrics of Nearest Census Tract to Greenpoint Energy Center



101

- More specifically, for the purpose of transparency, PA observes the Company could have acknowledged that emissions are reduced when fewer than four vaporizers are required to run, however, to the extent the Project allows the Company to avoid a moratorium on new customer connections, it could contribute to a gross annual increase in emissions from those new customers' use of natural gas. A net decrease may be possible to the extent fuel oil conversions to gas are a significant portion of new customer additions. A longer-term outlook of total emissions indirectly attributable to the Project commensurate with the long-term lifespan of the capital investment may have provided residents with more complete information to evaluate the potential long term health impacts associated with the Project.
- The Company noted as part of its response to such questions that an Environmental Impact Study was not necessary given that the Project was within the footprint of the existing operating facility.

[101] Source: https://climate.ny.gov/Our-Climate-Act/Disadvantaged-Communities-Criteria/Disadvantaged-Communities-Map

- The environmental burden that the project would place on disadvantaged communities was a prevalent concern raised by commenters. However further written comments were submitted which PA believes are important to clarify. Per the letter submitted by the New York Law School:

> "In approving the rate hike, PSC recognized that the CLCPA applied and analyzed the environmental impact of the Greenpoint expansion, located in a primarily white community. However, it declined to review the environmental impacts of the pipeline. DPS never analyzed whether its actions in approving the pipeline construction and associated rate hikes disproportionately harm Black and Latinx individuals… By applying the mandated environmental impact analysis only to the predominantly white area surrounding the Greenpoint facility and failing to examine the impact on communities of color, DPS violated the CLCPA by using criteria and methods that had a disproportionate impact on the safety of Black and Latinx individuals."[102]

- Such statement appears to conflict with the majority of public input as well as census data indicating that the areas surrounding the Greenpoint facility are not predominantly white. PA has separately evaluated the conflation of the Vaporizer 13 / 14 Project and the Metropolitan Reliability Infrastructure ("MRI") project below.

Stranded Asset Risks

- Numerous concerns were raised regarding the future of the broader Greenpoint facility and the risk that the proposed new vaporizers become stranded assets such as in a scenario in which winter temperatures increase and peak gas demand declines leading to a write down of the asset. A reasonable evaluation of this risk requires an assessment of the total Greenpoint facility and scenarios in which assets at or near end of life are retired and support the utilization of new resources. While the Company implied that the new vaporizers may allow for the eventual decommissioning of the oldest and least efficient vaporization units, a plan describing how such decisions would be evaluated and what the future carbon footprint of the site may be was not provided.

The Project's Conflict with the CLCPA

- A consistent theme raised in both written and public comments made related to the Project is that the Project is in conflict with the State's CLCPA emissions reduction goals and prohibition on new fossil infrastructure. Such questions were answered by the Company from the context of the AKRF CLCPA emissions study (discussed above in Section 8) indicating that the Project would reduce total emissions due to the improved efficiency of the proposed units and therefore is not out of step with the CLCPA. The Company's position on this topic can and should be further clarified based upon the simple calculation of the change in emissions produced by the entire Greenpoint facility inclusive of an additional 60 MDth of vaporization possible from Vaporizers 13 / 14. As discussed in Section 8 and shown in Table 7-1 above, the new vaporizers will add additional capacity that could increase emissions on a Design Day and potentially throughout the year.
- If the Company needs the additional capacity to provide reliable service and is not decommissioning existing units, then the total potential capacity of the Facility could implicitly be utilized on a Design Day, which would lead to an increase in total Design Day emissions.
- Based on PA's own analysis of the Project's emissions as noted in Section 7 above, it is obvious that there are many ways to alter operating scenarios and attribute emissions to certain sources. PA understands that Vaporizers 13 and 14 are subject to a permit decision by NYDEC that would address potential increases in emissions.

The Need for the Project

- Many stakeholders voiced questions as to why the Project is needed given the expectation that the existing vaporizers are not at the end of their useful lives and the two proposed vaporizers will be used in place of, rather than in addition to, existing vaporizers. As discussed by the Company at the public meetings and paraphrased here from a response provided to PA on a related question, "…Most of the vaporization that takes place at Greenpoint only requires a fraction of the total vaporization capability of the plant. Since the newer, more efficient units would be the first on and run the longest, the fuel gas utilized to produce the same volume of LNG vapor would decrease by not requiring the older, less efficient units to operate...". The Company's proposal however highlighted the forecast demand curve and reliability as the primary rationale, not the value attributable to increment efficiency or opportunity to decommission inefficient infrastructure.
- It is reasonable to expect the Company to clearly justify the need for the Project in the context of both historical and projected circumstances. Such presentation of the circumstances triggering a call on vaporization capacity as well as the duration of the instances in which the full capacity of the Greenpoint facility has been required due to either

[102] Anjana Malhotra, NYLS Comment in Case 19-G-0309 and 19-G-0310, September 28, 2022.

Design Day conditions or upstream supply disruptions would have helped frame the Project as a reliability project which provides relatively low cost, flexible supply as an option of last resort in adverse circumstances.

- It is PA's understanding that under emergency conditions, whether triggered by severe cold weather, other unexpected demand spikes, service outages, upstream flow reductions or likely some combination of each, the Project represents the source of last resort. The fact that Greenpoint has seen limited historical usage underscores the fact that the Company employs vaporization only after alternative measures have proven insufficient (e.g., calling on reductions from temperature-controlled customers or other non-firm customers). The Company did not describe the need and the use case for the project in such context, instead exhibiting it in the context of Design Day demand (which not only indicates the Project may not be imminently necessary, but also that it will deliver greater quantities of gas into the system on both Design Days and other times of the year).

The Lack of Proposed Alternatives

- Given the cost and long lifespan of the Greenpoint Project, numerous questions were asked related to why renewable resources or alternative projects such as RNG production or local biomass processing facilities were not under consideration. The Company's response that its goal is to "bend the demand curve down" and that it wished it could solve the challenge with RNG resources in alignment with recent materials presented to its shareholders regarding long term decarbonization goals. The steps to achieve those goals and develop viable alternatives however was not discussed or outlined by the Company. A number of evolving opportunities are likely being investigated, including the sourcing of landfill or other renewable gas, investigation of hydrogen production for certain types of customers, among other upstream technologies which can and should be a focal point for future development under timelines sufficient to act as viable alternatives to future conventional natural gas supply projects. Given our analysis of available supply to meet demand in Section 3 above, adequate time to investigate more thoroughly some of these alternatives likely exists.
- As discussed in Section 5 of this report, the Company did not propose any viable alternatives[103] as part of its proposal for the Project. As such, without a basis of comparison, it is challenging for any stakeholder to benchmark or otherwise evaluate the costs and benefits of the proposed project.

The Relationship of the Project to MRI Phase 5[104]

The perceived relationship between the Metropolitan Reliability Infrastructure ("MRI") project and the Greenpoint facility represented a significant point of contention highlighted in both public meetings and written comments. The Company responded to such comments by clearly stating there is no such relationship. Because there has been and continues to be a perceived relationship between the two projects, PA further explored the issue -- despite National Grid's statement during at least one public meeting that the Company is not planning to pursue Phase 5 of the MRI Project.

MRI Phase 5 has in fact previously been described as being required in order for the Company to realize the full benefits of the Project. Over time, National Grid has either directly stated, or at a minimum implied, a relationship between the two projects. PA has summarized below a few examples of instances in which the Company has made such statements, and notes that those made in publicly available documents would naturally cause stakeholders to question the two projects' relationship. Specific instances indicating such relationship are listed below:

1. National Grid's "Natural Gas Long-Term Capacity Supplemental Report" filed in Case No. 19-G-0678 on May 8, 2020
    - Section 3.2 of this report describes permitting, policy and regulatory requirements for different options to close the gap between downstate NY gas demand and supply. The first option listed is

        "LNG Vaporization and Iroquois Gas Compression enhancements...combined with incremental Energy Efficiency and Demand Response." The list of requirements for this option includes "permitting approvals and funding for CNG sites, **along with NYC and funding approvals for Metropolitan Reliability Infrastructure (MRI) Phase 4 and 5".** (Emphasis added)
2. Section 5.4 of this report, at page 48, states that "Additionally, under the LNG Vaporization opportunity that is described in Section 7 below, MRI Phase 5 is an important requirement to enable this incremental capacity, as it completes the reliability looping to our Greenpoint LNG facility." Section 7 goes on to describe in detail the option

[103] As per page 45 of the Joint Proposal, a "viable" alternative must be able to ensure reliable service in the same time frame as the proposed project. Clove Lakes fails the test as it is not feasible to reach operational readiness by the Winter of 2024/25 (the winter by which the Company states the Project will be operational in its Proposal). Similarly, DSM fails the test as the programs are highly unlikely to achieve sufficient scale by 2024/25.

[104] MRI Phase 5 is not included in the list of potential Long-Term Capital Capacity Projects in the Joint Proposal approved in Case No. 19-G-0309. It is however described in the Joint Proposal as an additional project requiring the same type of independent review as the Long-Term Capital Capacity Projects before its costs can be included in the Company's rates. To date, National Grid has not requested such review of MRI Phase 5.

to install two LNG Vaporizers at Greenpoint. The Company's internal capital project authorization records requested by PA include the following statements:

- "To make full use of the MRI Phase V interconnection at Greenpoint, two new LNG vaporization systems (Vaporizers 13 and 14) will be constructed at the LNG Facility on Maspeth Avenue." (December 9, 2019)
- "This project will introduce two new vaporizers, #13 and 14, to the Greenpoint LNG facility to increase the vaporization capacity of the plant... This project, **along with MRI Phases 1-5** (emphasis added), allows the expanded Greenpoint LNG supply to flow to customers in Brooklyn..." (May 26, 2020)

3. The Company's response to DPS request number 1091[105] in Case No. 19-G-0309 dated April 17, 2020
   - Question: "Is Phase 5 of the MRI project necessary for KEDNY's plans to utilize compressed natural gas[106] at Greenpoint? Explain."
   - Response: "Yes...to support growth in NYC using CNG injected at Greenpoint, MRI Phase 5 is needed..."

More recently, the Company has clarified that the new vaporizers which would be installed under the proposed Greenpoint Project are not connected to MRI Phase 5.

- In its response to PA's request for internal capital project authorization records related to the Project, the Company stated:

  "... The Companies have subsequently clarified that the vaporizers are not dependent upon...completion of MRI Phase 5 to achieve the desired vaporization capability, and the need for MRI Phase 5 is not based on the increased vaporization capability provided by Vaporizers 13/14, which will be connected into the 60 psig system, not the 350 psig system[107]."

- In the response to another recent request from PA, the Company states that it has:

  "clarified that the vaporizers are not dependent upon…completion of MRI Phase 5 to achieve the desired vaporization capability…" since they are connected to the 60-psig system[108] rather than the 350-psig system.

  However, the sanctioning papers (which are referenced above) for the project provided as Attachment 2 to that response include statements that indicate Vaporizers 13 and 14 will:

  "make full use of the MRI Phase V interconnection at Greenpoint and that the "(Vaporizers 13 and 14) project, along with MRI Phases 1-5, allows the expanded Greenpoint LNG Supply to flow to customers in Brooklyn without stranding needed Newtown Creek supplies…".

- PA asked a follow-up question to the Company: At the time these statements were made, were Vaporizers 13 and 14 designed to flow into the 350-psig system? Response: "No, Vaporizers 13 and 14 were never designed to flow into the 350-psig system."
  - In response to an additional follow up question, "please provide additional context for the statements from the sanctioning papers", the Company responded:

    "The referenced language in the sanctioning papers was intended to capture the options under consideration at the time. The vaporizer additions were not initially assigned to either the 350-psig or 60-psig system. It was eventually determined that pump capacity into the 350-psig system was constrained, but the 60-psig pump constraint could be addressed with pump modifications. Therefore, the vaporizers were designed for 60-psig system conditions."

PA has had the opportunity to assess the relationship between the Vaporizer 13/14 Project and MRI Phase 5 and, despite certain Company statements as summarized above, can confirm that the Project is not dependent upon the completion MRI Phase 5.

It would not be possible for gas delivered at 60 psig from any supply source, including Vaporizers 13/14, to be injected into a distribution system operating at 350 psig, unless compression facilities were installed to increase the supply pressure. If that approach were the objective, National Grid would simply have proposed to connect Vaporizers 13 / 14 directly to the 350-psig system (assuming there were no other constraints on doing so).

[105] DPS-1091 was referenced in the letter filed in Case No. 19-G-0309 on September 28, 2022 by New York Law School.
[106] National Grid previously considered both CNG and LNG vaporization options at Greenpoint. The Company ultimately decided to pursue only LNG vaporization. Each of those options would have been designed to provide similar hourly capacity (CNG – 2,200 Dth; LNG – 2,450 Dth). It is reasonable to assume that the response to the question as posed, related to CNG, would be the same for LNG vaporization.
[107] Source: Documents provided in response to PA 1-2. Based on National Grid's response, PA can infer that MRI Phase 5, if completed, would be part of the 350-psig system.
[108] Greenpoint Report, page 27: the Company states that "the output from the new vaporizers will be delivered directly into the Brooklyn 60 psig distribution system..."

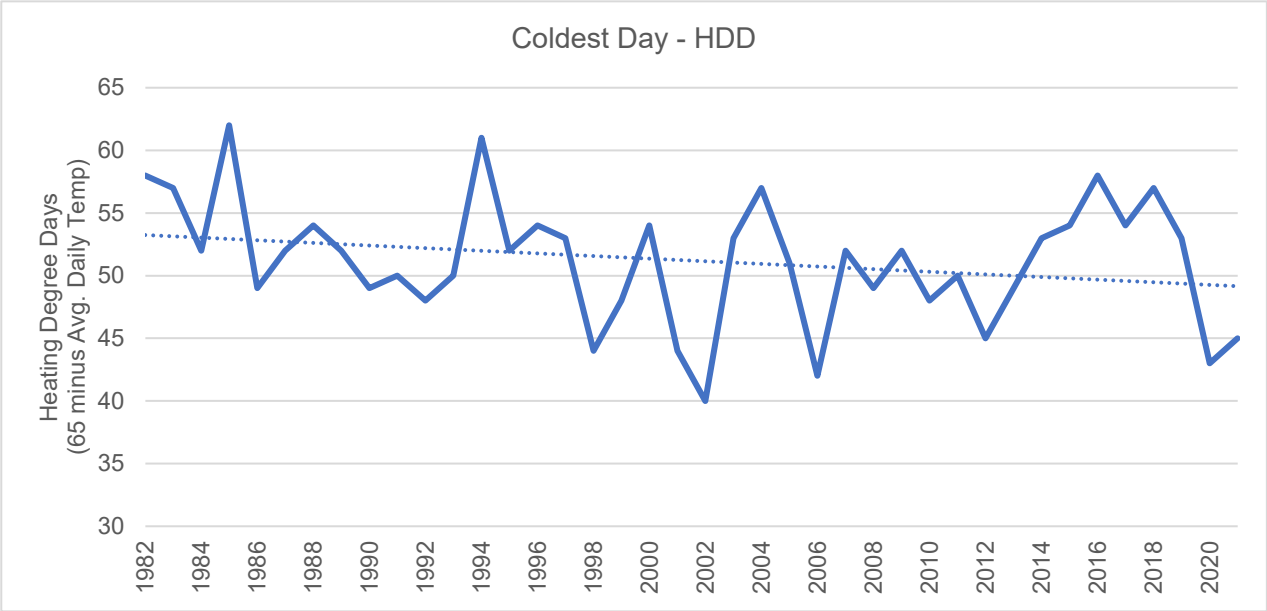
PA also requested drawings that clearly show how the outlet piping from each vaporizer at Greenpoint (both existing vaporizers and proposed Vaporizers 13/14) is connected to the corresponding downstream pressure system.[109] National Grid provided a drawing indicating that gas from existing vaporizers 7, 8 and 12 flows into the 350-psig distribution system. The same drawing indicates that existing vaporizers 9, 10 and 11, along with proposed Vaporizers 13 and 14, flow into the 60-psig system. While the drawings provided did not explicitly show the connections to the 60-psig system, PA can conclude that gas delivered by the Project (if constructed) cannot find its way to the 350-psig system, of which MRI Phase 5 would be a part.

The Design Day Criteria and Associated Demand Forecast

Numerous comments were made regarding whether the Company's demand forecast is based on a requirement to meet 65 heating degree days (or in other words, defining the Design Day demand as a 24-hour period in which the temperature is 0 degrees Fahrenheit). As noted at the public meetings, such a Design Day has not been observed in over 30 years. Several attendees who attended the public meetings organized by the Company raised the issue of the Company electing to develop its Design Day load forecast using the 65 HDD criterion. Consistent with a recent assessment of the Company's Long-term Capacity Report[110], the commentary highlighted the fact that conditions equivalent to the Design Day had not been observed in over 30 years and that given the long-term warming trend for New York winters the likelihood experiencing it were diminishing over time.

PA analyzed HDD data based on NOAA's daily average temperature readings for Central Park, NY over the 1982-2021 period and found that the coldest day during that 40-year period was in January 1985 recording an average daily temperature of 3 degrees Fahrenheit or 62 HDD. As Figure 8-2 shows, there was one day with 61 HDD in 1994 and since then New York has not had a day colder than 58 HDD. In line with the *Synapse* study[111], PA's analysis of the Company's data suggests that were the Design Day based on a 62 HDD criterion, the implied forecasted peak load would be lower by around 95 MDth. However, while changing the Design Day criterion may offer cost savings without impacting reliability, unexpected weather can also result in risks to service reliability. Furthermore, matters pertaining to revising reliability criteria are more appropriately considered in coordination with other regional gas utilities.

Figure 8-2: Central Park, NY Heating Degree Days (1982-2021)



[109] Source: Documents provided in response to PA 12-2.
[110] Assessment of National Grid's Long-Term Capacity Report: Natural Gas Capacity Needs and Alternatives – prepared for the Eastern Environmental Law Center, Synapse Energy Economics, April 2020, p. 15.
[111] Ibid., p. 15.

8.2 Conclusions Related to Public Input

The Company hosted multiple virtual and in person public meetings which were well-attended with a diversity of rationale presented. While the Company did point to various public resources such as the Greenpoint Energy Center website, the NGridSolutions website, as well as the Commission docket management portal, it was unclear how stakeholders could seek to have further questions be addressed or receive the information requested of the Company related to a number of the questions raised at the meetings.

To improve the public meeting process in the future, National Grid should consider several modifications.

- Given the particular concerns related to safety, environmental and socio-economic justice, and rate impacts, investigate alternative, two-way channels of communication with stakeholders which may or may not need to be "on the record".
- Evaluate additional methods of gathering input and seeking community engagement, whether via focus groups, surveys, visiting door to door, or more frequent "town-hall" type of meetings in order to increase the breadth and diversity of input and allow for real time process improvement in gathering and acting on feedback. Relatedly, conduct an evaluation of the effectiveness of the outreach campaign the Company undertook related to the Project.
- Ensure that the NGridSolutions website is kept up to date (e.g. the current links to transcripts are either unavailable or link to irrelevant meetings).
- Develop and publish follow up reporting to address the primary questions raised and offer additional sessions for specific topics (e.g., the relationship or lack thereof between Greenpoint and MRI).

9 APPENDIX A. New York Facilities System

National Grid and Con Edison jointly own and operate the New York Facilities System, an intra-city transmission pipeline system which is connected to and receives natural gas supply from multiple interstate pipelines.

The New York Facilities Agreement governs how the jointly owned pipeline system will operate and, among other things, specifies each utility's allocated share of interstate pipeline capacity entitlements at each city gate (e.g., each interconnection with an upstream transmission pipeline) as well as maximum hourly volumes of gas that are permitted to flow from one utility to the other. While gas flow is bidirectional at the pipeline interconnections known as Lake Success and Newtown Creek, on a Design Day gas flows from Con Edison to National Grid.

10 APPENDIX B. Incremental Demand Side Management

For ease of comparison, PA developed Table 10-1 and Table 10-2 illustrating the Company's respective annual baseline demand forecast and demand-side management cumulative Design Day adjustments for both the 2022 and 2021 Forecasts. Since the 2022 Forecast does not include the full impact of incremental DSM relief from the Company's DIS (as was the case in the Second and Third Supplemental Reports where the 2021 Forecast was further adjusted for incremental non-infrastructure components of the DIS relief), PA includes adjustments within Table 10-1. The resulting annual cumulative program relief is equivalent to anticipated program relief within the 2021 Forecast with non-infrastructure components of the DIS, absent variation in the unadjusted baseline demand. The program adjustments presented also are consistent with the adjustments represented within the trendlines included within figures found in Section 3.3. However, the unadjusted and adjusted baseline demand is the Company's forecast, rather than PA's forecast. For comparison purposes, Table 10-2 illustrates the incremental DSM reductions anticipated by the Company's DIS, coupled with the 2021 Gas Load Forecast as presented in the Second and Third Supplemental Reports.

Table 10-1: 2022 Forecast with Incremental DSM Relief Equivalent to DIS

2022 June GLF Demand & DSM

Cumulative Design Day (Mdth/d)	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
Unadjusted Baseline Demand	2,845	2,909	2,966	3,021	3,073	3,125	3,178	3,232	3,287	3,344	3,400	3,456	3,511
Less: Energy Efficiency	(12.5)	(22.2)	(37.9)	(52.5)	(63.5)	(75.2)	(87.3)	(99.9)	(112.5)	(125.1)	(137.3)	(149.1)	(160.4)
Less: Demand Response	(9.4)	(9.9)	(10.4)	(10.9)	(11.2)	(11.5)	(11.7)	(11.9)	(12.2)	(12.4)	(12.7)	(12.9)	(13.2)
Less: Electrification	(11.2)	(16.3)	(23.4)	(29.8)	(36.0)	(43.6)	(51.4)	(59.1)	(67.0)	(75.3)	(84.4)	(95.2)	(107.2)
Subtotal: Cumulative DSM	(33.1)	(48.4)	(71.6)	(93.2)	(110.7)	(130.2)	(150.5)	(171.0)	(191.8)	(212.8)	(234.4)	(257.2)	(280.8)
DSM % of Baseline Demand	*1.2%*	*1.7%*	*2.4%*	*3.1%*	*3.6%*	*4.2%*	*4.7%*	*5.3%*	*5.8%*	*6.4%*	*6.9%*	*7.4%*	*8.0%*
DSM YoY % Change	*187.9%*	*46.2%*	*48.1%*	*30.1%*	*18.8%*	*17.6%*	*15.6%*	*13.6%*	*12.2%*	*11.0%*	*10.1%*	*9.7%*	*9.2%*
Adjusted Baseline Demand	**2,812**	**2,861**	**2,895**	**2,927**	**2,962**	**2,994**	**3,027**	**3,061**	**3,095**	**3,131**	**3,166**	**3,199**	**3,230**
Less: Incremental Energy Efficiency	(3.1)	(14.1)	(27.1)	(46.1)	(56.0)	(65.3)	(73.3)	(81.3)	(88.5)	(95.5)	(100.3)	(105.6)	(109.9)
Less: Incremental Demand Response	(29.4)	(31.8)	(34.1)	(36.5)	(36.3)	(36.1)	(35.9)	(35.7)	(35.5)	(35.5)	(35.5)	(35.5)	(35.5)
Less: Programmatic Electrification	–	–	–	–	(12.6)	(37.0)	(66.4)	(96.0)	(125.6)	(155.5)	(184.7)	(214.4)	(244.3)
Subtotal: Incremental DSM (DIS)	(32.4)	(45.9)	(61.2)	(82.5)	(104.9)	(138.4)	(175.6)	(213.1)	(249.7)	(286.5)	(320.5)	(355.5)	(389.8)
DSM % of Adj. Baseline Demand	*1.2%*	*1.6%*	*2.1%*	*2.8%*	*3.5%*	*4.6%*	*5.8%*	*7.0%*	*8.1%*	*9.2%*	*10.1%*	*11.1%*	*12.1%*
DSM YoY % Change	*#DIV/0!*	*41.4%*	*33.5%*	*34.8%*	*27.1%*	*32.0%*	*26.8%*	*21.4%*	*17.2%*	*14.8%*	*11.9%*	*10.9%*	*9.6%*
Adj. Demand w/Incremental DSM	**2,780**	**2,815**	**2,834**	**2,845**	**2,857**	**2,856**	**2,852**	**2,848**	**2,846**	**2,844**	**2,845**	**2,843**	**2,840**

Table 10-2: 2021 Forecast with Incremental DSM Relief from DIS

2nd Supplemental Grid Demand (June 2021 GLF) & DSM

Cumulative Design Day (Mdth/d)	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
Unadjusted Baseline Demand	2,993	3,074	3,139	3,214	3,284	3,363	3,404	3,457	3,513	3,585	3,630	3,691	3,748
Less: Energy Efficiency	(7.1)	(17.4)	(33.7)	(52.4)	(71.1)	(90.0)	(108.1)	(126.8)	(144.8)	(162.4)	(177.7)	(193.3)	(207.4)
Less: Demand Response	(9.2)	(9.6)	(10.1)	(10.6)	(11.0)	(11.2)	(11.4)	(11.6)	(11.9)	(12.1)	(12.4)	(12.6)	(12.9)
Less: Electrification	(10.9)	(16.0)	(21.5)	(27.7)	(33.9)	(40.4)	(46.6)	(53.2)	(59.9)	(67.5)	(75.4)	(85.7)	(97.7)
Subtotal: Cumulative DSM	(27.2)	(43.0)	(65.4)	(90.7)	(116.0)	(141.6)	(166.2)	(191.6)	(216.6)	(242.1)	(265.5)	(291.6)	(318.0)
DSM % of Baseline Demand	*0.9%*	*1.4%*	*2.1%*	*2.8%*	*3.5%*	*4.2%*	*4.9%*	*5.5%*	*6.2%*	*6.8%*	*7.3%*	*7.9%*	*8.5%*
DSM YoY % Change	*54.8%*	*58.2%*	*52.0%*	*38.8%*	*27.8%*	*22.1%*	*17.3%*	*15.3%*	*13.0%*	*11.8%*	*9.7%*	*9.8%*	*9.1%*
Adjusted Baseline Demand	**2,966**	**3,031**	**3,074**	**3,123**	**3,168**	**3,221**	**3,238**	**3,265**	**3,296**	**3,343**	**3,365**	**3,399**	**3,430**
Less: Incremental Energy Efficiency	(5.4)	(13.4)	(23.3)	(35.7)	(35.7)	(35.7)	(35.7)	(35.7)	(35.7)	(35.7)	(35.7)	(35.7)	(35.7)
Less: Incremental Demand Response	(29.6)	(32.0)	(34.4)	(36.7)	(36.6)	(36.4)	(36.2)	(36.0)	(35.9)	(35.9)	(35.9)	(35.9)	(35.9)
Less: Energy Efficient Connections	(3.0)	(5.5)	(8.0)	(10.4)	(12.6)	(14.7)	(16.7)	(18.7)	(20.5)	(22.4)	(24.1)	(25.7)	(27.2)
Less: Programmatic Electrification	–	(0.1)	(0.6)	(1.4)	(14.8)	(40.2)	(71.3)	(102.0)	(132.7)	(163.3)	(193.7)	(223.9)	(253.8)
Subtotal: Incremental DSM (DIS)	(38.1)	(51.0)	(66.2)	(84.2)	(99.7)	(127.0)	(159.9)	(192.4)	(224.8)	(257.2)	(289.3)	(321.1)	(352.5)
DSM % of Adj. Baseline Demand	*1.3%*	*1.7%*	*2.2%*	*2.7%*	*3.1%*	*3.9%*	*4.9%*	*5.9%*	*6.8%*	*7.7%*	*8.6%*	*9.4%*	*10.3%*
DSM YoY % Change	*296.7%*	*34.1%*	*29.8%*	*27.1%*	*18.4%*	*27.4%*	*25.9%*	*20.3%*	*16.8%*	*14.4%*	*12.5%*	*11.0%*	*9.8%*
Adj. Demand w/Incremental DSM	**2,928**	**2,980**	**3,008**	**3,039**	**3,068**	**3,094**	**3,078**	**3,073**	**3,071**	**3,085**	**3,075**	**3,078**	**3,078**

11 APPENDIX C. Vaporizers 13 / 14 NPV Analysis

Greenpoint Vaporization Expansion (13 and 14) - PA Adjustments in yellow											
Estimated In Service	Incremental Allocation	5/31/2024									
Capex Cost Estimate through 2021		32,352,340	10/1/2022								
Capex Estimate CY 2022		18,602,166	12/31/2022								
Capex Estimate CY 2023	4,180,270	15,361,520	6/30/2023								
Capex Estimate CY 2024	932,323	3,426,069	5/31/2024								
Annual O&M Estimate		43,600	68,152,243								
Inflation		2%									
Property Tax Rate		5.43%									
Period		25 years									
Discount rates:	RY3 WACC	6.22%									
	RY3 Pre-Tax WACC	7.83%									
			May-24	2024	2025	2026	2027	2028	2029	2030	2031
			69,742,095	43,600	44,472	3,646,322	3,647,229	3,648,154	3,649,098	3,650,061	3,651,043
										16,800	16,800
			2032	2033	2034	2035	2036	2037	2038	2039	2040
			3,652,045	3,653,066	3,654,108	3,655,171	3,656,256	3,657,361	3,658,490	3,659,640	3,660,814
			2041	2042	2043	2044	2045	2046	2047	2048	
			3,662,011	3,663,232	3,664,477	3,665,748	3,667,043	3,668,365	3,669,713	3,671,088	
Net Present Value		$102,871,410									
Estimated incremental vaporization capability (peak-day dekatherms)		58,800									
NPV cost per design day dekatherm		$1,750									
Assumptions:											
Annual O&M estimate includes:											
Operation of the vaporizers		18,250									
Maintenance of the vaporizers		25,350									
		43,600									
Estimated 2,450 dekatherms on design day peak hour. Design hour flow is 1/24th of design day flow.											
Property tax rate is an average tax rate for the assessment year roll for years 2016-2021.											

Greenpoint Vaporization Expansion (13 and 14)											
Estimated In Service		5/31/2024									
Capex Cost Estimate through 2021		32,352,340	10/1/2022								
Capex Estimate CY 2022	0.21	18,602,166	12/31/2022								
Capex Estimate CY 2023		11,181,250	6/30/2023								
Capex Estimate CY 2024		2,493,746	5/31/2024								
Annual O&M Estimate		43,600	63,378,037								
Inflation		2%									
Property Tax Rate		5.43%									
Period		25 years									
Discount rates:	RY3 WACC	6.22%									
	RY3 Pre-Tax WACC	7.83%									
			May-24	2024	2025	2026	2027	2028	2029	2030	2031
			64,629,502	43,600	44,472	3,419,333	3,420,240	3,421,166	3,422,109	3,423,072	3,424,054
										16,800	16,800
			2032	2033	2034	2035	2036	2037	2038	2039	2040
			3,425,056	3,426,078	3,427,120	3,428,183	3,429,267	3,430,373	3,431,501	3,432,651	3,433,825
			2041	2042	2043	2044	2045	2046	2047	2048	
			3,435,022	3,436,243	3,437,489	3,438,759	3,440,055	3,441,376	3,442,724	3,444,099	
Net Present Value		$95,705,886									
Estimated incremental vaporization capability (peak-day dekatherms)		58,800									
NPV cost per design day dekatherm		$1,628									
Assumptions:											
Annual O&M estimate includes:											
Operation of the vaporizers		18,250									
Maintenance of the vaporizers		25,350									
		43,600									

12 APPENDIX D. Hourly Average and Max Supply Flow

Figure: 12-1: Supply Node A Average Flow

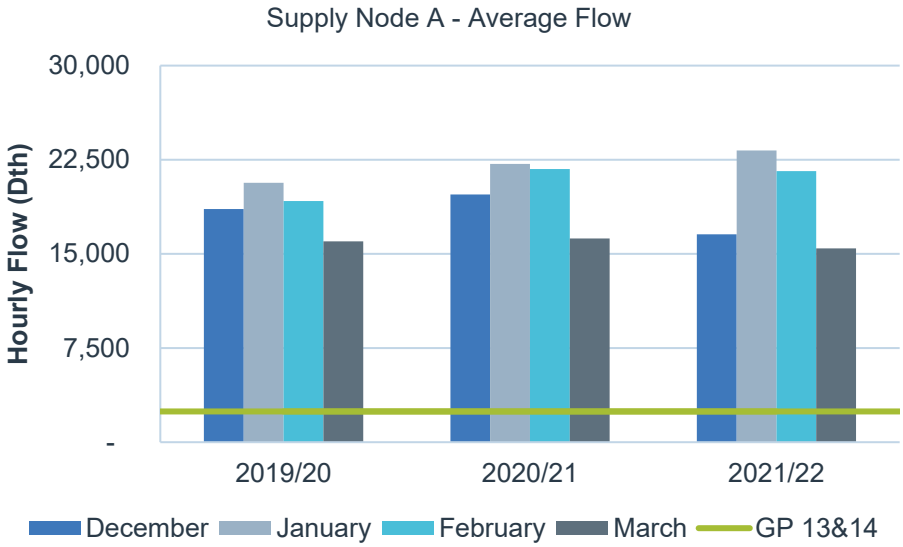


Figure 12-2: Supply Node B Average Flow

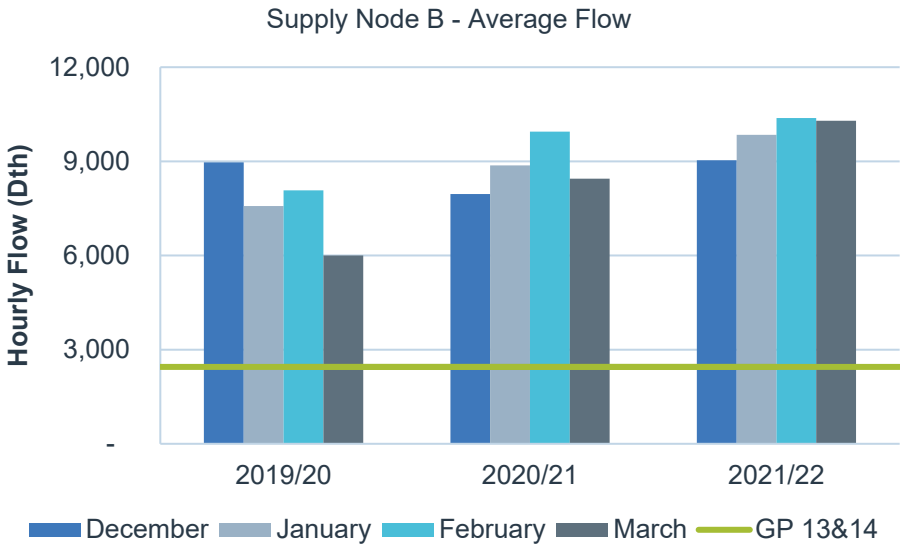


Figure 12-3: Supply Node C Average Flow

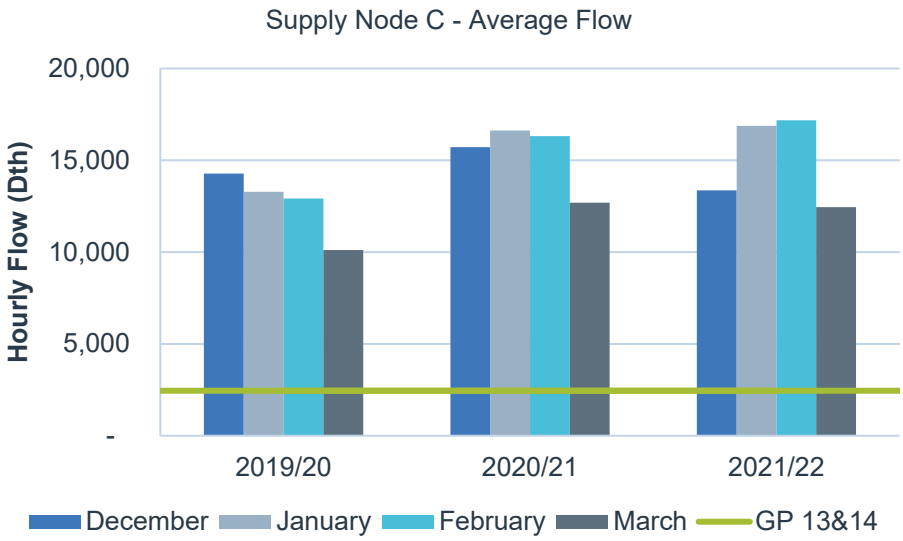


Figure 12-4: Supply Node D Average Flow

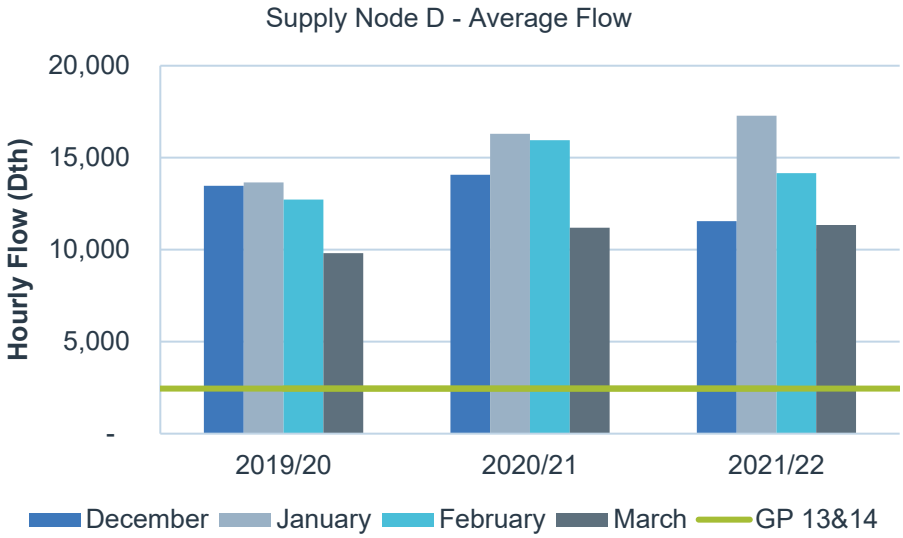


Figure 12-5: Supply Node A Maximum Flow

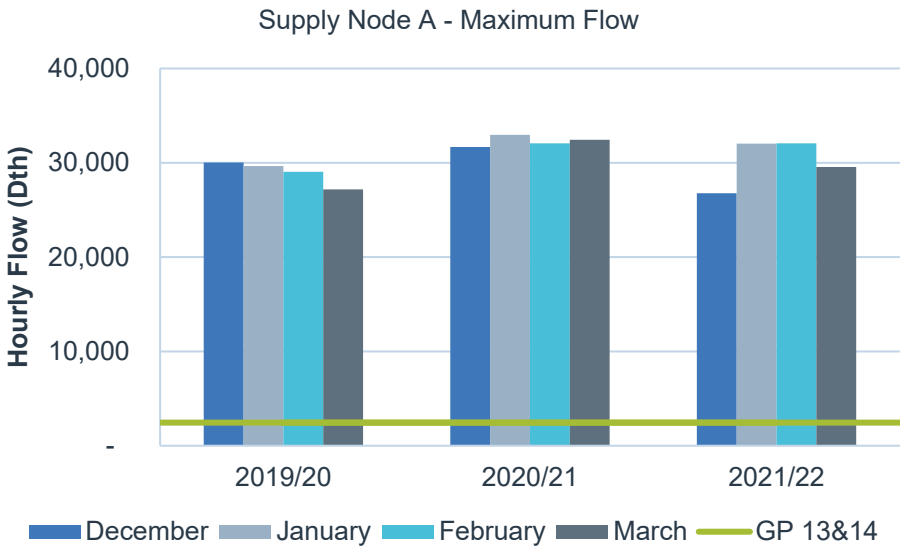


Figure 12-6: Supply Node B Maximum Flow

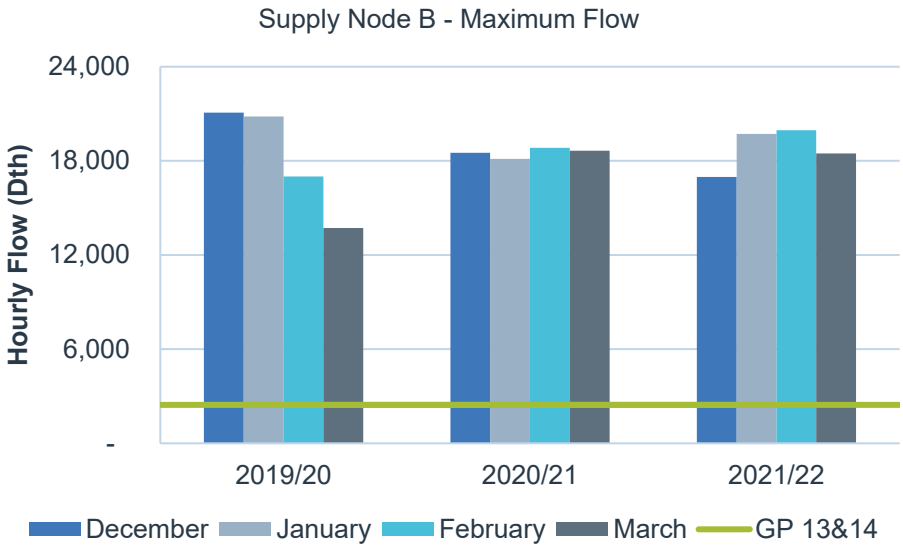


Figure 12-7: Supply Node C Maximum Flow

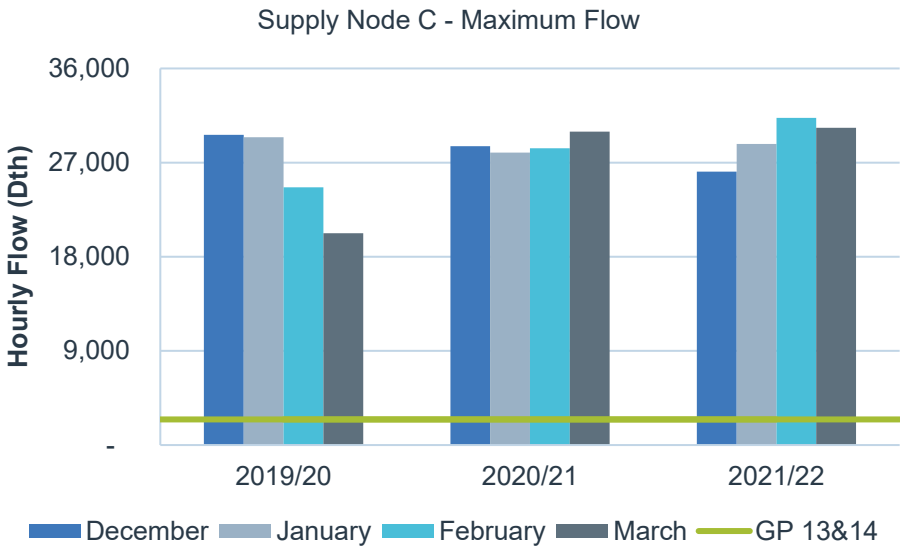
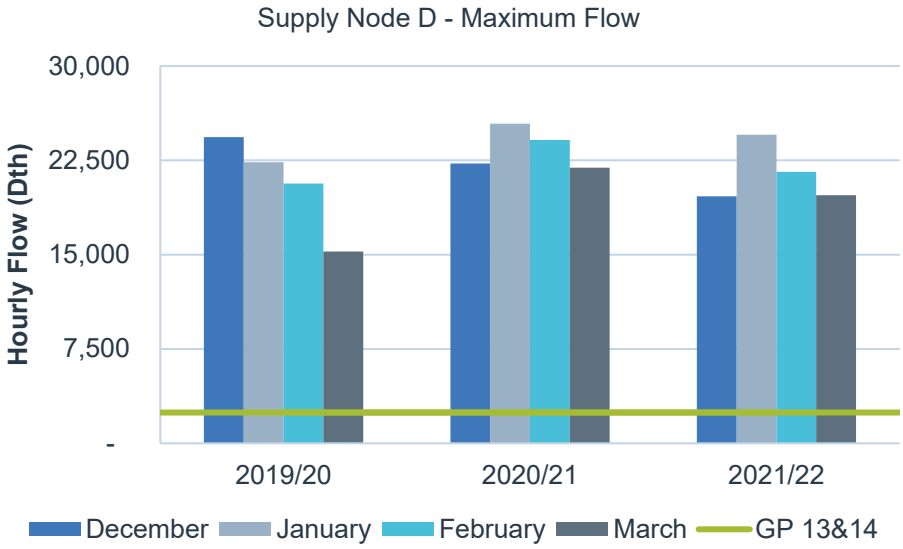


Figure 12-8: Supply Node D Maximum Flow



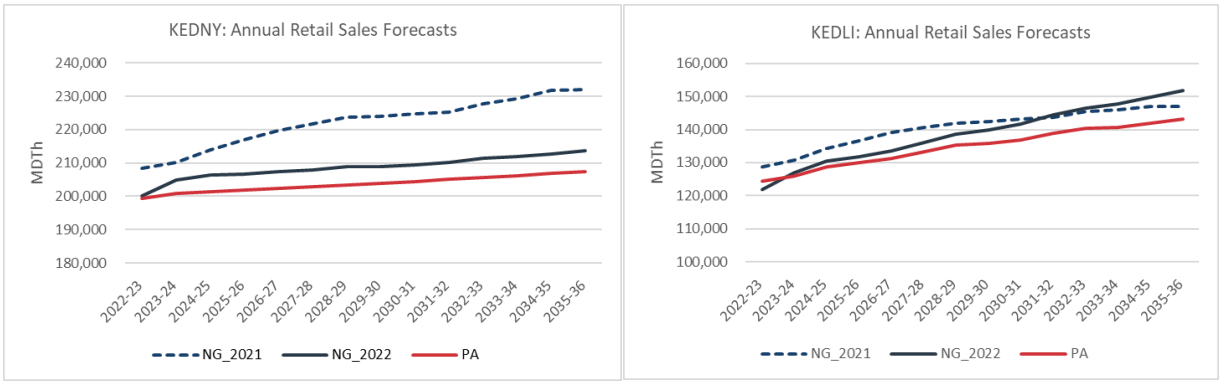
13 APPENDIX E. Total Retail Sale Forecast Assessment

This Appendix provides a detailed analysis of the Company's MC and UPC data underlying its total annual retail sales forecast. As mentioned in this report, retail sales volumes are the basis for developing the Design Day demand forecast and, consequently, a rise/fall in the former necessarily lead to corresponding rise/fall in the latter.

As discussed in this report, the Company's Design Day demand forecast represented by the Adjusted Baseline in its 2022 Forecast is derived from its forecast of total annual retail sales. Therefore, the dynamics embedded in retail sales are fundamental to understanding the trajectory of the 2022 Forecasts for Design Day demand. Assessing the above MC and UPC trends in conjunction with the Company's total annual retail sales forecast data suggests trends of declining population, slowing/falling household formation and negative employment growth – firm indications of a long-term slowdown in growth of demand for natural gas in Downstate New York.

However, a disaggregated analysis of the MC and UPC data underlying annual retail sales in the Company's 2022 Forecast reveals disparate and sometimes contradictory dynamics across both customer classes as well as the two service territories. Figure 13-1 below compares the aggregate volumetric patterns implied by the 2021 Forecast and the 2022 Forecast as well as the PA Baseline Forecast for KEDNY and KEDLI. As illustrated, the Company's most current (2022 Forecast) total annual retail sales forecast[112] for the KEDNY territory is noticeably lower than in the 2021 Forecast, the corresponding revision to KEDLI's forecast points to gas usage above levels projected in 2021.

Figure 13-1 Total Annual Retail Sales Forecasts: KEDNY and KEDLI

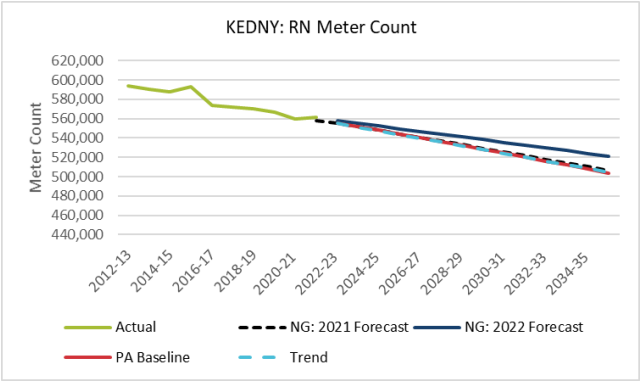


KEDNY Sales Forecasts by Segment

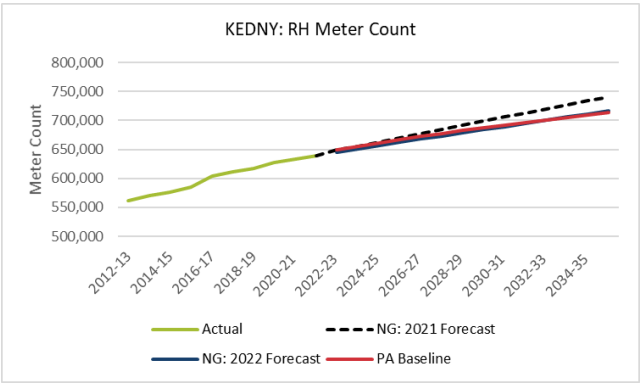
The following sub-section offers a comparative overview of the MC and UPC forecasts for the RN, RH, COM and MF customer segments in KEDNY. (This omits discussion of the NFDR and Other customer classes because (a) the Company's billing system re-classified some associated sub-classes thereby introducing incongruity between legacy and new data and (b) sales attributed to these segments are relatively stable and do not contribute to significant changes in the forecasts.)

[112] For a given customer class, Annual Retail Sales = Meter Count (MC) x Annual Use Per Customer (UPC). By definition, higher total annual sales implies a higher Design Day demand level.

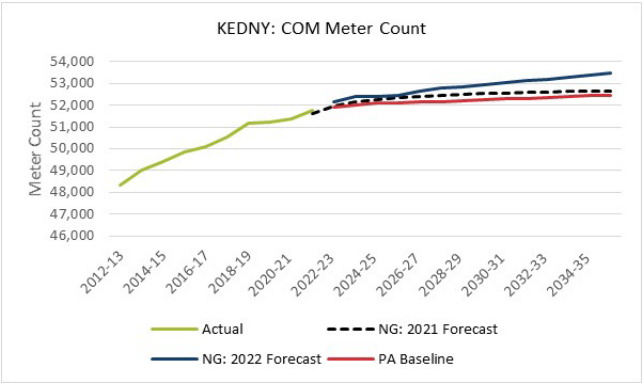
Figure 13-2 KEDNY: Meter Count (MC) Forecasts



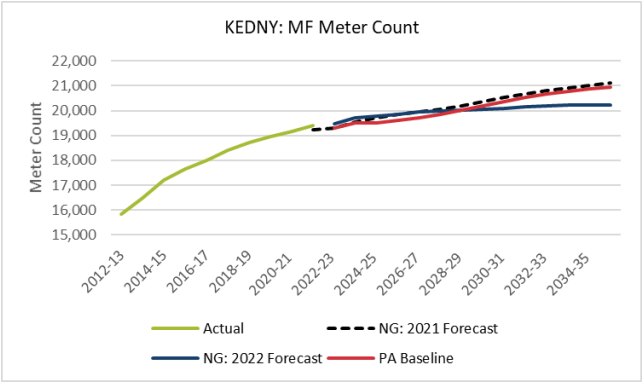
- According to the Company, its higher 2022 Forecast is due to inclusion of recent historical data in the modeling and supply-chain issues slowing the process of fuel conversions.
- PA's Baseline Forecast that is in line with the Company's 2021 Forecast. While we included the latest MC data in our trend-based forecast, we did not model incremental supply-chain related impacts because of lack of data/insights to form a basis.



- The Company's lower 2022 Forecast seems consistent with the projected impact of Local Law 154.
- Based on the latest Moody's macroeconomic forecasts, PA's Baseline Forecast almost matches the Company's latest forecast.

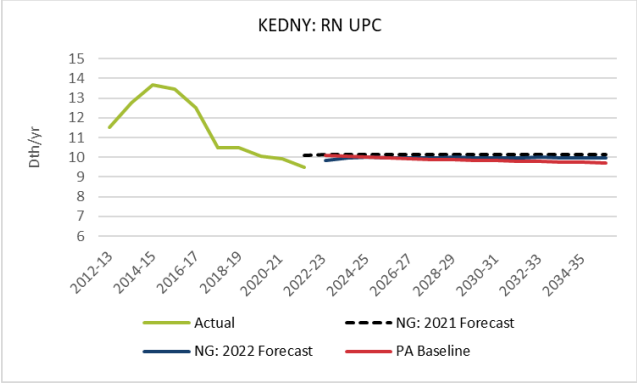


- The Company's revision for its 2022 Forecast is inconsistent with its cited negative impacts on COM load due to COVID-related effects and NYC's Local Law 154.
- PA's Baseline Forecast reflects the diminished long-term macroeconomic projections as per Moody's latest forecasts.

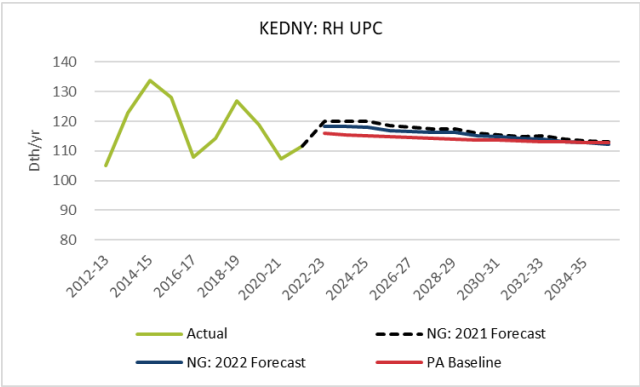


- The Company's 2022 Forecast captures the projected impact of Local Law 154 as it diverges lower from the 2021 Forecast.
- PA's Baseline Forecast aligns with the Company's 2021 Forecast as it only reflects the effect of a newer Moody's macroeconomic forecast. We did not model the projected impact of Local Law 154 given lack of data, targets, and implementation details. However, if adopted the Company's adjustments for Local Law 154 could reduce demand below the PA Baseline view.

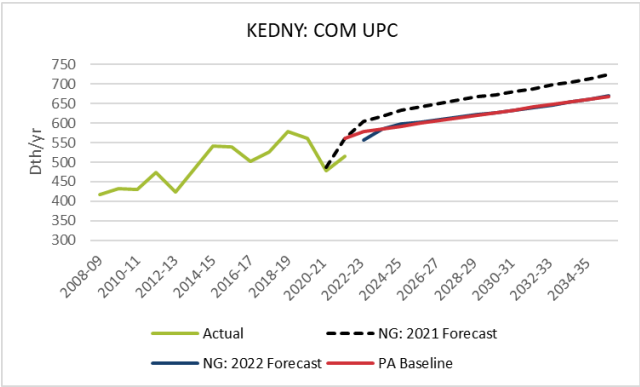
Figure 13-3 KEDNY: Annual Use-Per-Customer (UPC) Forecasts



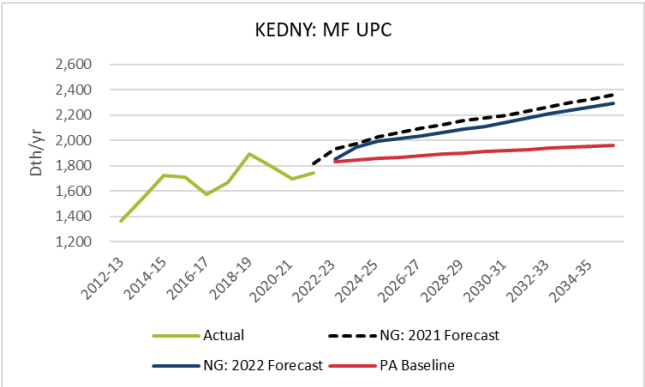
- No substantial differences are found between the Company 2021/2022 and PA Baseline Forecasts.



- Except for minor differences in the early years, general agreement exists across the trends in the Company 2021/2022 and PA Baseline Forecasts.



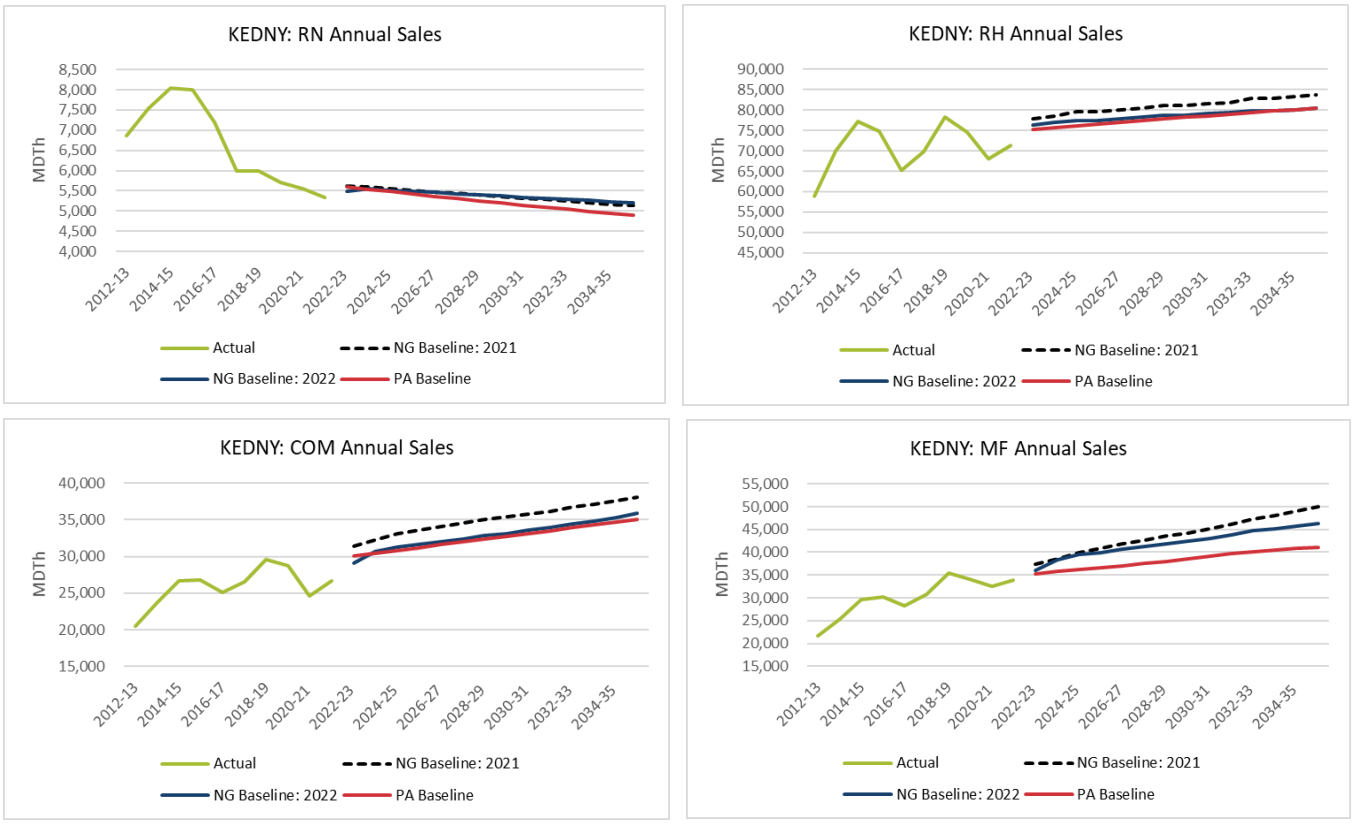
- While the Company's lower 2022 Forecast is consistent with its citation of negative impacts due to COVID-related factors and NYC's Local Law 154 on COM load, the methodology for quantifying the impacts is unclear.
- PA's forecast aligns with the Company's 2022 trajectory and reflects the diminished long-term macroeconomic projections in Moody's latest macroeconomic forecasts.



- The Company's 2022 Forecast resembles its 2021 Forecast and reflects only nominal revisions.
- PA's forecast reflects a decade-long trend in weather-normalized levels (as discussed in Sec. 3.4.5) and exhibits a substantially lower and flatter trend as compared to the Company's 2022 Forecast.

Figure 13-4 shows that as compared to the Company's 2021 total annual sales forecast for KEDNY, its 2022 Forecast has a relatively flat trajectory with a slightly widening gap over time that amounts to an 8% reduction in total annual usage by 2034-35. Based on the individual segmented forecasts in Figure 13-4 below, the Company's lower overall 2022 sales forecast is the combined result of diminished gas usage forecasts for the RH, COM and MF customer classes.

Figure 13-4: KEDNY Customer Class Usage Forecasts

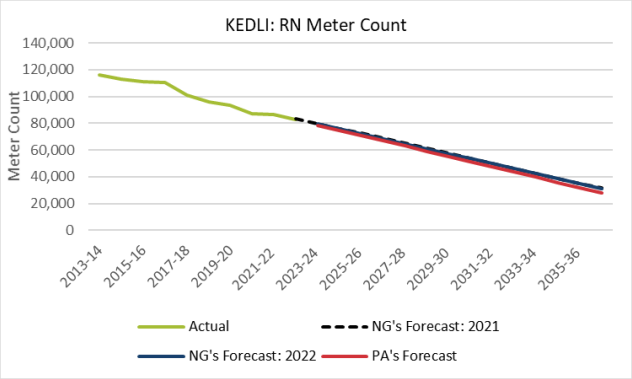


Relative to segment sales in the Company's 2021 Forecast for KEDNY, PA's volumetric forecasts are lower for all four classes. While PA's forecast is ostensibly in line with the Company's 2022 forecast for the other segments, there is considerable divergence in the MF sales forecast. PA's MF sales forecast is lower ostensibly due to a lower UPC forecast. As shown Figure 13-4 above PA's projection of KEDNY's *weather-normalized* UPC (in red) is considerably below the level in the Company's 2022 Forecast (in solid blue). By 2034-35, PA's adjustment to the MF UPC accounts for around 85% of the difference between the Company's and PA's total KEDNY annual sales forecasts.

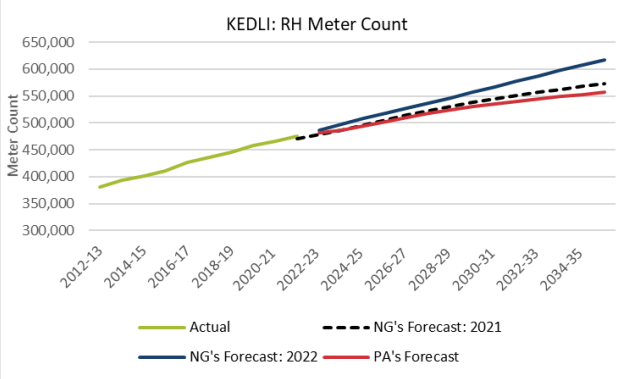
KEDLI Sales Forecast by Segment

The following sub-section offers a comparative overview of the MC and UPC forecasts for the RN, RH, COM and MF customer segments in KEDLI. (This omits discussion of the NFDR and Other customer classes because (a) the Company's billing system re-classified some associated sub-classes thereby introducing incongruity between legacy and new data and (b) sales attributed to these segments are relatively stable and do not contribute to significant changes in the forecasts.)

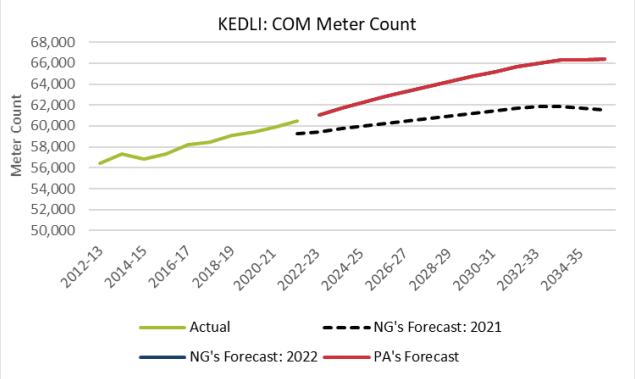
Figure 13-5 KEDLI: Meter Count (MC) Forecasts



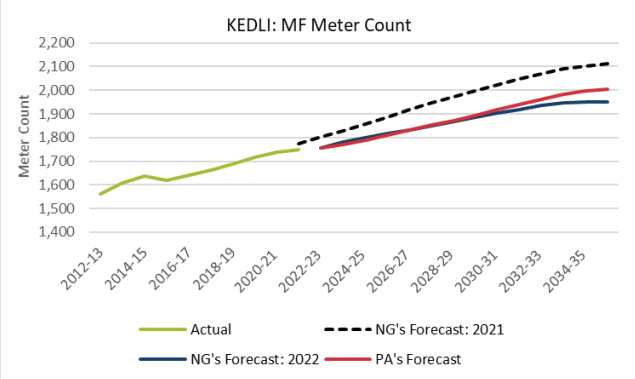
- No substantial differences exists between the Company's 2021 and 2022 Forecasts and the PA Baseline view



- The Company attributed its considerably higher 2002 forecast (7% higher than its 2021 forecast by 2034/35) to the inclusion of the latest 12 months of MC data in its modeling – despite that data showing no deviation in the long-term trend.
- PA's Baseline Forecast is slightly below the Company's 2021 forecast reflecting the impact of the latest Moody's macroeconomic forecasts showing decreased growth of Population and Households in the region

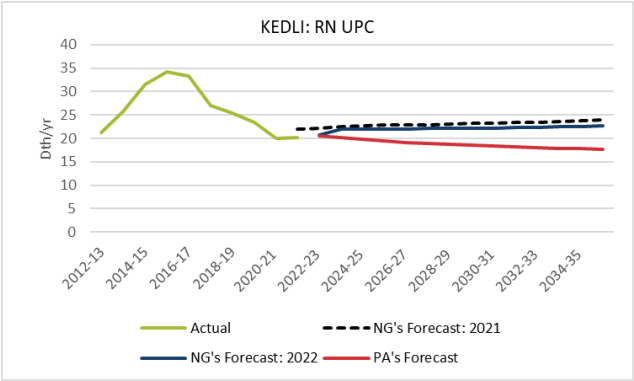


- For the 2022 Forecast, the Company made a substantial upward revision to its 2021 Forecast with its latest forecast being consistent with the long-term trend – implying a recast modeling approach, which PA finds reasonable.
- Based on analysis of macroeconomic data. PA finds the Company's latest COM MC forecast reasonable and adopted it in its analysis of KEDLI's Retail Sales.

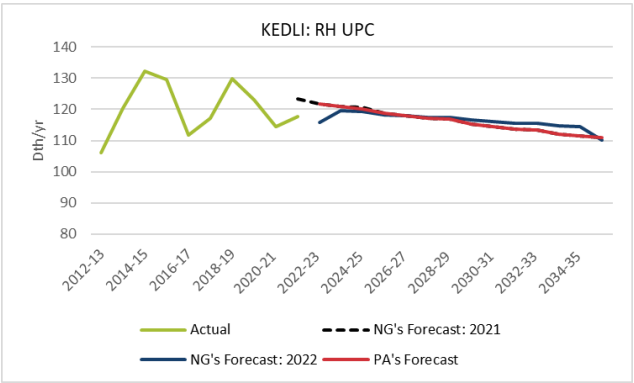


- The Company's 2022 Forecast reflects a substantial downward adjustment from its 2021 Forecast – one that is in line with the long-term trend.
- PA's Baseline Forecast aligns with the Company's latest forecast initially but then diverges slightly higher – reflecting an adjustment based on expected macroeconomic trends in the latest Moody's forecasts.

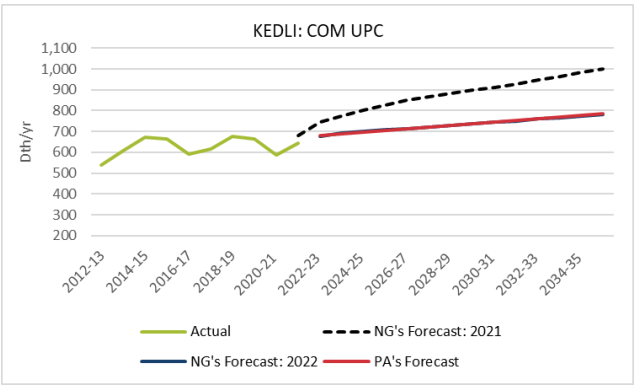
Figure 13-6 KEDLI: Annual Use-Per-Customer (UPC) Forecasts



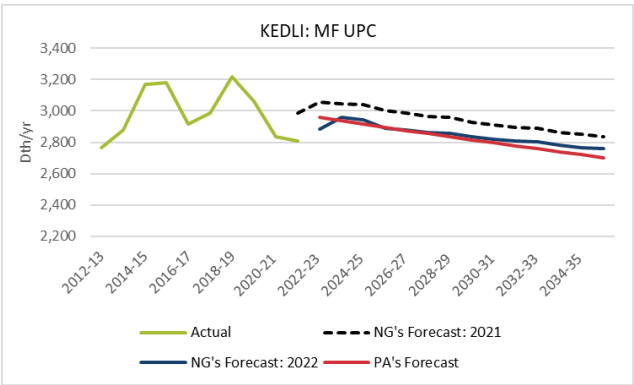
- The Company's 2022 Forecast is ostensibly similar to its 2021 Forecast and maintains a slightly positive trend.
- PA's forecast based on weather-normalized historical levels tracks noticeably lower with a declining trajectory consistent with the trend.



- The 3 forecasts are more or less aligned with the Company's 2002 Forecast drifting slightly higher in the out years but then converging with its 2021 Forecast by 2034/35.
- The uptick in the Company's 2022 Forecast does not appear to follow any trends.



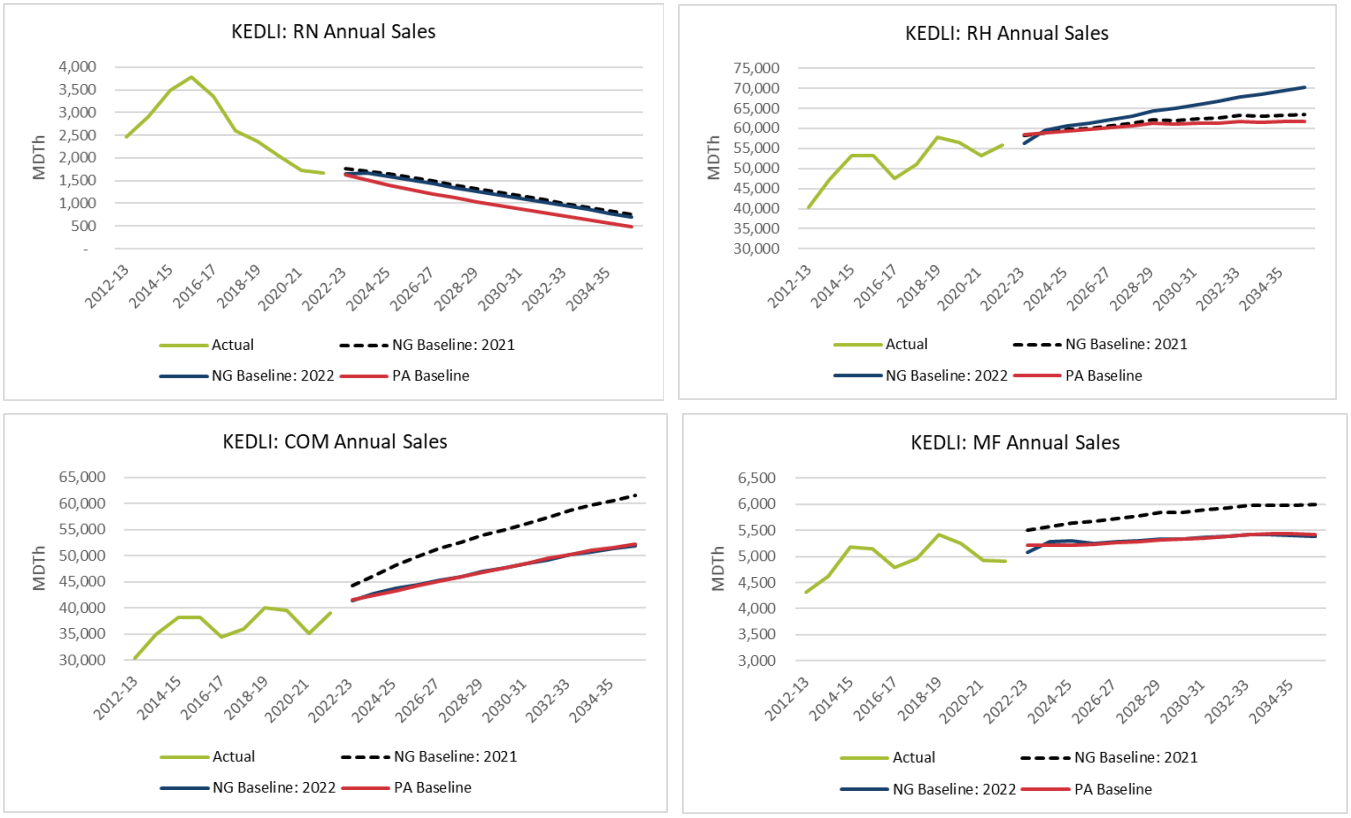
- The Company made a substantial downward revision from its 2021 Forecast making the 2022 Forecast consistent with the long-term trend – implying a recast modeling approach.
- PA's trend-based Baseline Forecast reflects the influence of Moody's most recent changed macroeconomic forecasts and aligns with the Company's 2022 Forecast



- The Company's 2022 Forecast reflects a substantial downward adjustment from its 2021 Forecast – one that aligns with the long-term trend.
- PA's Baseline Forecast aligns with the Company's 2022 Forecast initially but then diverges slightly lower – reflecting an adjustment based on the influence of the latest Moody's macroeconomic forecasts.

PA's KEDLI retail sales forecast as shown in Figure 13-6 reflects independent MC and UPC forecasts for the RN, RH, COM and MF customer classes. As shown, total annual retail sales for KEDLI in the Company's 2022 Forecast are initially below its 2021 Forecast but with a trajectory steeper than the latter. Total annual retail sales in the 2022 Forecast attain a level 2% higher than the level for KEDLI in the 2021 Forecast by 2034-35. As Figure 13-7 below shows, this implies that the aggressive 2022 RH sales forecast more than offsets the effect of the noticeably lower sales forecasts for the COM and MF segments on the aggregate KEDLI sales.

Figure 13-7: KEDLI Customer Class Usage Forecasts



A more detailed examination based on Figure 13-7 indicates that the Company's 2022 MC forecast for the KEDLI COM class underwent a substantial revision. PA finds this change reasonable and incorporated the updated figures into its analysis. Given the relative share of the COM class load in KEDLI this revision had a marked downward impact on the overall sales forecast. However, PA finds it difficult to reconcile the upward revision to KEDLI RH MCs in the 2022 Forecast (see 13-5 above) in light of the economic and Population/Household forecasts discussed earlier. The declining population, the near absence of new household formation and the forecasted negative growth in employment all suggest a more pessimistic environment for the residential customer base.

Despite incorporating the Company's substantial revision to its MC forecast for the COM segment in our modeling, PA's KEDLI sales forecast attain levels that are not only consistently lower than levels in the Company's 2022 Forecast but also follow a flatter trajectory similar to annual retail sales level for KEDLI in the 2021 Forecast. This deviation is largely due to PA's MC forecast for the RH segment being lower than levels in the Company's 2022 Forecast.

At the overall Downstate New York level (KEDNY and KEDLI in the aggregate), the trajectories and relative levels of total annual retail sales forecasts mirror the Design Day forecasts shown in Figure 3-9 (in the main body of this report). However, it is informative to examine the sources of the differences between the Company's 2022 Forecast and PA's Baseline Forecast. Figure 13-8 provides a comparison of the customer class components of total annual retail sales in the Company's 2022 Forecast to the PA Baseline Case. The detail in the figure illustrates that while there is relatively minor disparity between the annual retail sales for eight of the 10 customer segments,[113] MF sales in KEDNY and RH sales in KEDLI are the two segments that explain most of the difference between the two forecasts as shown at the top of the graphs in Figure 13-8. In addition, the disparity increases over time.

[113] Load accounted for by the other 8 customer classes are clubbed together as the 'DSNY_All_Other' category.

Figure 13-8 demonstrates how the KEDNY:MF and KEDLI:RH segments are responsible for most of the deviation between the Company's 2022 forecast and PA's version – with near alignment between the PA and Company amounts for the other eight customer classes.

Figure 13-8: Customer Class Components of Total Annual Retail Sales Forecasts

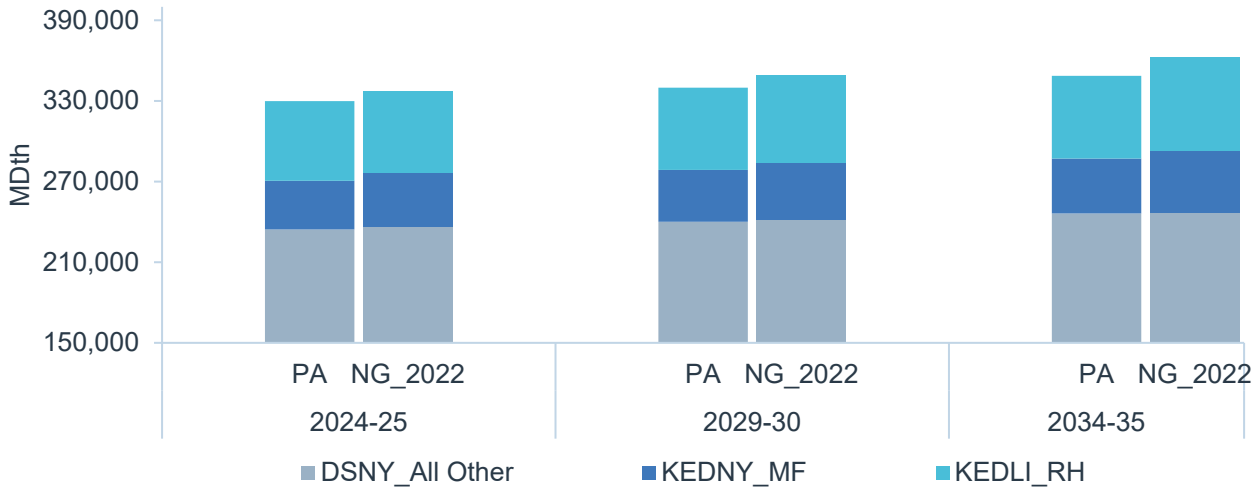


Table 13-1 below provides insight into the sources of differences between the Company's 2022 Retail Sales forecast and PA's version. For the 2034-35 year, the table shows that at the Downstate New York level PA's aggregate retail sales are 13,709 MDth below the Company's 2022 Forecast.

- PA's lower UPC forecast implied that its KEDNY MF sales were 5,021 MDth below the Company's forecast in 2034/35, accounting for 37% of the difference in DSNY sales forecast (5,021 / 13,709 = 37%).
- For the same year, aggressive growth in the underlying MC forecast for the KEDLI RH customer class was responsible for PA's sales forecast for that segment being lower by 7,833 MDth as compared to the Company's forecast – accounting for 57% of the difference in the DSNY sales.

By 2034-35, the combined impact of these two differences accounts for 94% of the difference between total annual retail sales in the PA Baseline Case the Company's 2022 Forecast.

Table 13-1: Differences in Total Annual Retail Sales between the Company's 2022 and PA Baseline Forecasts

	Aggregate Annual Sales			KEDNY: MF Sales			KEDLI: RH Sales		
	PA	Company	Difference	Company	PA	Difference	Company	PA	Difference
	(a)	(b)	(a) - (b)	(d)	(e)	(d) - (e)	(g)	(h)	(g) - (h)
2024/25	329,815	336,984	(7,169)	36,204	39,439	(3,236)	59,188	60,644	(1,455)
2029/30	339,811	348,724	(8,913)	38,586	42,361	(3,775)	61,149	64,937	(3,787)
2034/35	348,687	362,396	(13,709)	40,794	45,815	(5,021)	61,623	69,456	(7,833)

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