Assessment of Economic Benefits in NYISO's Wholesale Electricity Market Attributable to Transco's Northeast Supply Enhancement Project

prepared for

National Grid

June 27, 2025

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Disclosure

This report has been commissioned by National Grid Company. Levitan & Associates, Inc. has performed an independent assessment of the Northeast Supply Enhancement (“NESE”) project, how gas transported by NESE will be used, and the net impacts of NESE on New York State’s natural gas and electric prices, ratepayer costs and reasonably foreseeable electric sector GHG emissions. The methods, findings and recommendations set forth in this report are strictly those of LAI. The findings and conclusions reached in this report are independent of any other work undertaken for other clients.

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Glossary

AEO	Annual Energy Outlook
BTM PV	Behind-the-Meter Solar
BOEM	United States Bureau of Energy Management
CCR	Cost Containment Curve
CES	Clean Energy Standard
CHPE	Champlain Hudson Power Express
CLCPA	Climate Leadership and Community Protection
CNG	Compressed Natural Gas
CH_4,	Methane
CO_2	Carbon Dioxide
CO_2e	CO_2-equivalent
ConEd	Consolidated Edison
CPCN	Certificate of Public Convenience and Necessity
CT	Combustion Turbine
DEFR	Dispatchable Emission-free Resources
Dth	Dekatherm
EA	Environmental Assessment
EBB	Electronic Bulletin Board
EE	Energy efficiency
EIA	United States Energy Information Administration
ELCC	Effective Load Carrying Capability
ETNG	East Tennessee Natural Gas
ExC	Iroquois Enhancement by Compression Project
FES Study	Fuel and Energy Study
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas Emissions
GPCM	Gas Pipeline Competition Model
GW	Gigawatt
GWh	Gigawatt-hour
HDD	Heating Degree Days
HQ	Hydro-Québec
IESO	Independent Electric System Operator of Ontario
IRPs	Integrated Resource Plans
KEDLI	KeySpan Energy Delivery Long Island
KEDNY	KeySpan Energy Delivery New York
LAI	Levitan & Associates
LDC	Local Distribution Company
LIPA	Long Island Power Authority
LMP	Locational Marginal Price
LTP	NGrid 2025 Long-Term Plan
LNG	Liquified Natural Gas
MDth	Thousand Dekatherms
MMcf	Million Cubic Feet
MW	Megawatt
MWh	Megawatt-hour
NERC	North American Electric Reliability Corporation
NGrid	National Grid
NOx	Nitrogen Oxides
NYDEC	New York State Department of Environmental Conservation
NYDPS	New York Department of Public Service
NYFS	New York Facilities System
NYISO	New York Independent System Operator
NYPA	New York Power Authority
NYPSC	New York Public Service Commission
NYSRC	New York State Reliability Council
OFO	Operational Flow Order
OSW	Offshore Wind
PV	Present Value
RCI	Residential, Commercial, and Industrial
RGGI	Regional Greenhouse Gas Emission
RNA	Reliability Needs Assessment
SCC	Social Cost of Carbon
SO_2	Sulfur Dioxide

T&D	Transmission and Distribution
TETCO M3	Texas Eastern M-3
Transco	Transcontinental Gas Pipe Line Company, LLC
TWh	Terawatt Hours
Transco Z6-NY	Transco Zone 6-New York
WSE	Winter Storm Elliott

Executive Summary

Levitan & Associates, Inc. ("LAI") has quantified the benefits ascribable to the Transco Northeast Supply Enhancement Project ("NESE"), a 400 MDth/d project that will expand the existing linkage between the low-cost Marcellus producing area in Pennsylvania to New York City and Long Island. Since 2020, National Grid Company's ("NGrid") response to local constraints in New York City and Long Island has included the development of additional compressed natural gas ("CNG") facilities at strategic locations that are vulnerable to minimum pressure constraints during cold snaps. NGrid's firm entitlement on NESE will provide their NYC and Long Island LDCs (KEDNY and KEDLI, respectively) with the ability to meet core sendout obligations going forward while reducing reliance on CNG.

LAI's recent gas/electric interdependency assessment performed for the Northeast Power Coordinating Council ("NPCC") and the New York Independent System Operator ("NYISO"), *et al*, helps set the stage for gas-grid reliability in New York City and Long Island when cold snaps happen or outage contingencies occur. LAI recognizes that the principal justification for NGrid's evaluation of NESE is the need for new pipeline capacity to mitigate the risk of supply shortages during the peak heating season when gas demand surges. The addition of NESE will provide improved reliability in New York City and Long Island by supporting NGrid's ability to meet peak-day sendout requirements during cold snaps. It will also provide additional protection at the local level in the event of a supply chain failure. While not the primary rationale, there are substantial economic benefits to New York state attributable to NESE. The main economic benefit is the reduction in wholesale electric energy prices over the study period as a result of the significant increase in pipeline deliverability into the heart of the market. The focus of this study is the assessment of the anticipated value of these economic benefits.

The addition of 400 MDth/d from Marcellus to New York represents a major expansion between Transco's mainline Station 195 in Pennsylvania and Station 210 in New Jersey, as well as a parallel path connecting Transco's new Station 206 in New Jersey and the New York Lower Bay Loop. This segment across Transco's mainline represents the central artery for energy supply into New York City and Long Island. Transco's improvements along this segment lessen congestion along major gas supply aggregation points, where utilities and marketers, often acting on behalf of gas-fired generators, schedule gas each day to meet their core send-out obligations as well as to enable generators' bids in NYISO's Day Ahead and Real Time Markets. The leading price indices include Transco Zone 6-New York ("Transco Zone 6-NY"), Iroquois Zone 2 and Texas Eastern M-3 ("TETCO M3"). These gas price indices drive wholesale electric energy prices throughout the year, especially during the peak heating season. They are also strongly correlated with changes in other delivered natural gas prices of relevance throughout New York State.

LAI has quantified the anticipated reduction in these leading price indices in order to derive Mark-to-Market ("MtM") savings in wholesale electric energy costs over a 15-year horizon, 2028 through 2042. To quantify the MtM benefits in the wholesale electric energy market, LAI has derived the average monthly change in the leading price indices with and without NESE using RBAC's Gas Price Competition Model ("GPCM"), a standard modeling system that industry uses to forecast price. Electric production cost modeling simulations have been performed in Aurora, an industry standard modeling system licensed by Energy Exemplar. Both GPCM and Aurora were customized by LAI to incorporate changes reflecting market, environmental, operational and regulatory policy dynamics. The “but-for test” formulated in GPCM and Aurora comprises the analytic foundation supporting the MtM financial results. The economic benefits are synonymous with lower wholesale electric energy prices in downstate New York (Zones J-K), the Capital District and Lower Hudson Valley (Zones F/G-H-I), and upstate New York (Zones A-E). We report the annual year-over-year benefits, the present value of the wholesale benefits, and the levelized price impact for each of the three aggregated zones.

Key findings are these:

- The reduction of congestion at key aggregation points in New Jersey puts sustained downward pressure on delivered natural gas prices in the heart of the market, in particular, Transco Zone 6-NY and TETCO M3. For the month of January when the price impact is largest, the reduction in Transco Z6-NY and TETCO M3 prices ranges from $0.76 to $1.00 per MMBtu in the first five years through the last five years. All price impacts explained by the addition of NESE happen during periods when the absence of NESE would result in pipeline congestion. The period of congestion without NESE are the three peak heating season months, December through February.

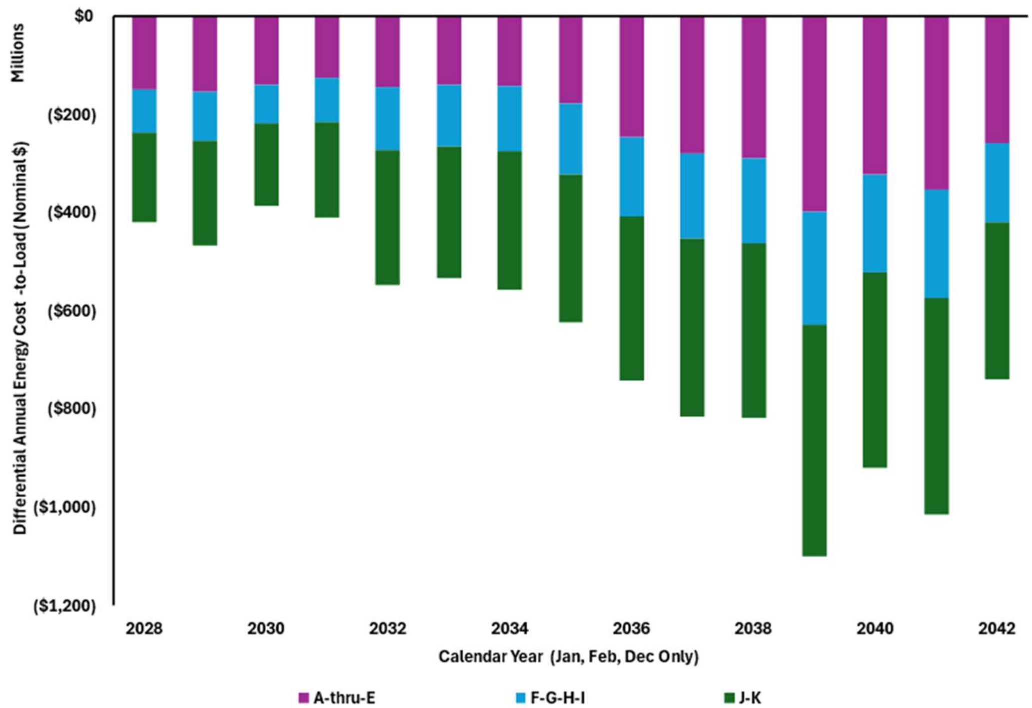
Table 1: Reduction in Gas Price from NESE (January)

Years	Iroquois Z2	Transco Z6 NY	TETCO M3
2028-2032	$0.62	$0.76	$0.76
2033-2037	$0.73	$0.90	$0.90
2038-2042	$0.81	$1.00	$1.00

- There is no reportable difference in either delivered natural gas prices or wholesale electric energy prices with or without NESE outside the three peak heating season months, December through February. Hence, there are no economic benefits observed during the summer or shoulder season attributable to NESE.
- Wholesale energy prices across NYISO stay level on average as renewable and clean energy reduce the use of gas-fired generation, but prices during winter and summer peak months increase. The addition of NESE reduces the impact of the gas constraint, thereby reducing the number of hours when scheduled generation runs on distillate fuel or residual oil. From 2028 to 2042, the average January price reduction is $35.53/MWh. The average price reduction in December and February is much lower, but still significant.
- The MtM benefits associated with the change in wholesale electric energy prices during winter months for Zones J-K, F/G-H-I and A-E are shown in nominal dollars year-over-year in Figure 1. The average savings in New York City and Long Island in the first five years is $207 million per year. The average savings in downstate New York over the 15-year period is $305 million. The average savings in Capital District and Lower Hudson Valley in the first five years is $97 million per year. The average savings in these zones the Capital District and Lower Hudson Valley over the 15-year period is $147 million. The average savings

across NYISO in the first five years is $446 million per year. The average statewide savings region wise is $673 million over the 15-year period.

Figure 1: NESE MtM Winter Benefits



- The MtM benefit of NESE in the wholesale electric market is steady through the mid-2030's due to a general balance between winter demand growth and onshore renewable across NYISO. From 2035-2040, additional offshore wind generation contemplated to achieve the 9 GW target is not enough to reduce the number of gas constrained days in the *Without NESE* case, but it does reduce the total gas burn enough to unlock additional days in the *With NESE* case. This observation underscores the importance of the thermal fleet for NYISO Resource Adequacy objectives associated with winter season demand growth.
- The annual MtM results can be expressed in present value (PV) terms in 2028 using a 7% nominal discount rate. The PV benefit in downstate New York is $2.8 billion. The PV benefit in the Capital District and Lower Hudson Valley is $1.3 billion. The benefit in upstate New York is about $1.9 billion, reflecting the correlation of upstate wholesale power prices with downstate prices absent transmission congestion. These results are expressed in PV nominal dollars.

Table 2: PV of Differential Cost-to-Load in Winter

Zone	PV of Differential Cost-to-Load (2028 Base PV$) in Winter in Million
A through E	-$1,946
F-G-H-I	-$1,318
J-K	-$2,750
All Zones	-$6,013

- Another key MtM price metric is the cost-to-load effect of NESE, which is expressed on an equivalent level annual basis over the 15-year period. The Zone J-K levelized annual benefit equivalent is $302 million over the 15-year period. The cost-to-load effect in the Capital District and Lower Hudson Valley is $145 million. The upstate benefit is $221 million. For New York State, the levelized unit price equivalent is $660 million.

Table 3: Levelized Nominal Differential Cost-to-Load Impact in Winter

Zone	Levelized Differential Cost-to-Load (Nominal $/yr, 15 years) in Winter in Million
A through E	-$214
F-G-H-I	-$145
J-K	-$302
All Zones	-$660

- In addition to the wholesale electric energy price benefits across New York State, there are other gas resiliency and environmental benefits that count. Parenthetically, we note that LAI has not sought to monetize gas resilience benefits in this study, but we nevertheless flag them as valuable due to the favorable hydraulic benefits related to increased pressure and flow into the New York Facilities System. Likewise, we have not quantified the anticipated reduction on NGrid's weighted average cost of gas associated with the expansion of the low cost Transco pathway into New York City and Long Island.
- However, we have quantified other secondary benefits that include avoided CNG and avoided emissions. NESE will allow NGrid to reduce reliance on three CNG facilities in New York City and Long Island. The resultant avoided supply cost for the three sites would amount to roughly $55 million per year. In addition, there would be avoided truck-related tailpipe emissions associated with the avoidance of 48 daily truck round-trips. This amounts to about 36 short tons of CO2 emissions per day per site. The avoided emissions would be about $6,200 per site per day, albeit a relatively small, but nevertheless noteworthy secondary benefit. On the power sector avoided emissions, the NESE addition results in GHG emission reduction from approximately 23,200 to 88,800 short tons of CO_2e, depending on the level of oil displacement in each year. Based on Social Cost of

Carbon values, the avoided climate damages average $9.1 million annually in nominal terms between 2028 to 2042.

- The addition of NESE strengthens NGrid's ability to add a large electric load to accommodate data center / AI power demand.

This report is organized in five sections.

In Section 1, LAI provides an overview of NESE, including a summary of the model principles and underlying philosophy driving New York State's pathway to decarbonization goals through the 2040's.

In Section 2, LAI explains the model approach to support the derivation of MtM benefits, including delineation of the key input variables used to support the gas price forecast under the but-for test as well as the electric wholesale simulation modeling, including the incorporation of the gas constraint.

In Section 3, LAI summarizes the primary financial metrics associated with the MtM results.

In Section 4, LAI addresses how NESE will support NGrid's reduced reliance on CNG.

In Section 5, LAI summarizes key conclusions. In Section 5, key conclusions and observations are listed.

1 Section 1: Introduction

National Grid ("NGrid") is submitting an Addendum to its March 2025 Long Term Plan ("LTP") that evaluates the implications of NESE, for National Grid's gas customers and New York's energy system.[1] NGrid has previously determined that the only existing delivery point in KEDNY that can accommodate a material increase in local Design Day deliverability is the terminus of the Transco pipeline at the Floyd Bennett Field into the New York Facilities System ("NYFS").[2] NESE is designed to deliver 400 MDth/d at the Floyd Bennett Field, requiring improvements on the Transco mainline to supply incremental volumes to the Transco-Rockaway Interconnect.[3] NGrid will also require some system improvements to enable the delivery of the full NESE volume.

Transco's decision to pursue NESE reflects recent executive orders that "make clear that agencies, including FERC, have been directed to support infrastructure development, particularly in the northeastern United States where the NESE Project will enhance reliability, flexibility, and efficiency."[4] Governor Hochul has acknowledged that increasing pipeline capacity could help lower energy costs and has indicated that the state would "[c]onsider the benefits at a time when energy prices are through the roof and families in every corner of our state are suffering high bills for groceries and utilities."[5] In this study, LAI has therefore placed emphasis on the economic benefits attributable to NESE through reduced costs in wholesale electric energy markets administered by the New York Independent System Operator ("NYISO") over the assumed contract term, January 1, 2028 to December 31, 2042. Other economic benefits associated with the NGrid's reduced reliance on Compressed Natural Gas ("CNG") are also addressed.

1.1 NESE Project Description

On March 27, 2017, Transco submitted a Certificate of Public Convenience and Necessity ("CPCN") application at the Federal Energy Regulatory Commission ("FERC") under Section 210 of the Natural Gas Act.[6] Transco's application sought to expand its capacity deliverable to the Rockaway Transfer Point in New York waters by 400 MDth/d. The Rockaway Transfer Point is the

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[1] Petition of Transcontinental Gas Pipe Line Company, LLC for Expedited Reissuance of Certificate Authority, May 29, 2025 ("Transco Petition"), pp. 7-8.

[2] The New York Facilities System is a high-pressure gas transmission system serving the three downstate New York distribution companies. Weblink: https://dec.ny.gov/sites/default/files/2024-02/dpsresponseletter.pdf.

KEDNY and KEDLI have a unique arrangement with Con Edison for the operation of the high pressure gas transmission system known as the New York Facilities ("NYF") Agreement. The NYF Agreement denotes the systems of each company as severally constructed and owned systems while facilitating the exchange of gas between the companies. 2025 LTP, page 12.

[3] National Grid, "Final Gas System Long-Term Plan," March 7, 2005, https://www.nationalgrid.com/document/558131/download, ("National Grid Long-Term Plan"), pages 85-87.

[3] National Grid Long-Term Plan, page 83

[4] Transco Petition, p. 2.

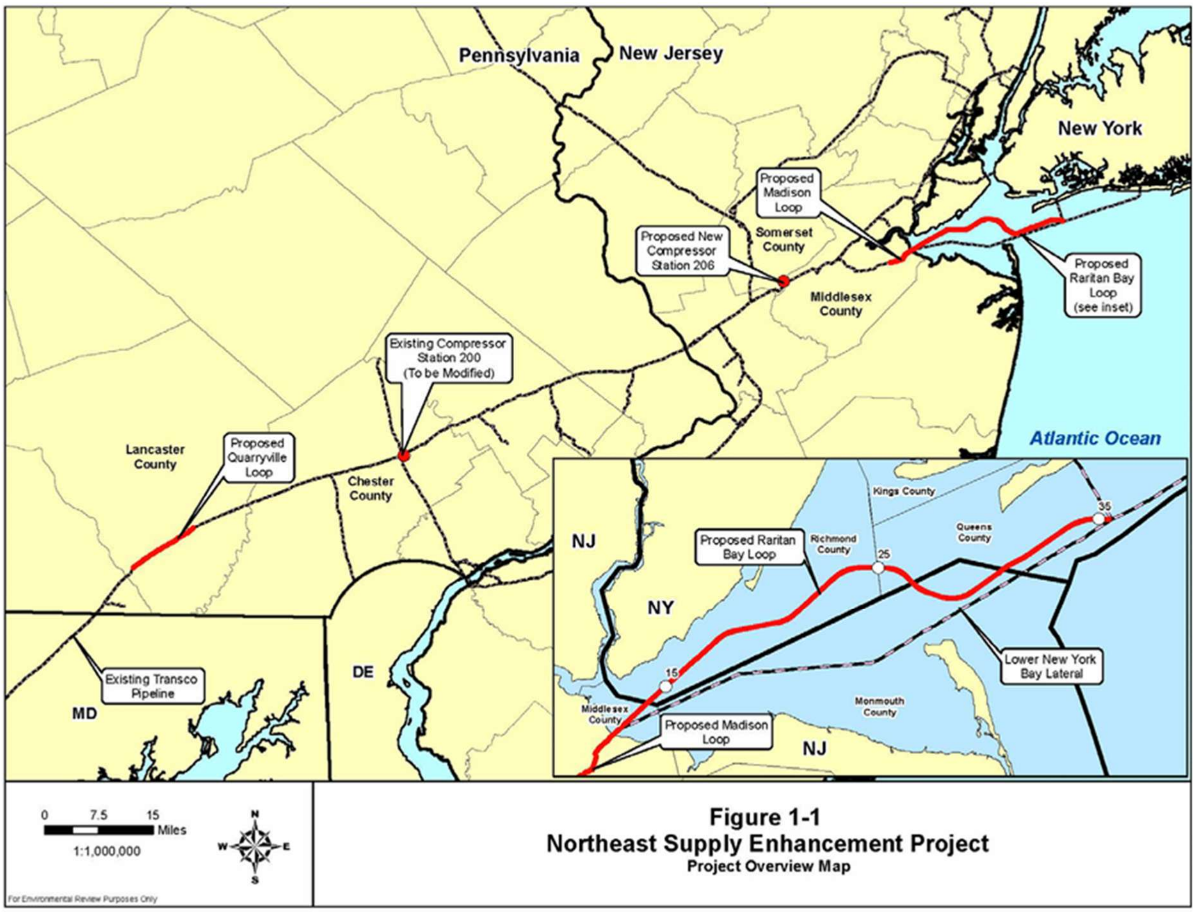
[5] Williams to Revive Plans for N.Y. Natural Gas Pipelines - The New York Times

[6] https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20170327-5102 Transco, Northeast Supply Enhancement Project Transmittal Letter.

interconnection point between Transco's existing Lower New York Bay Lateral and existing offshore Rockaway Delivery Lateral. NESE will include a new 32,000 horsepower gas-powered compressor station in New Jersey (Station 206), and the addition of a 21,902-horsepower electric-motor driven compressor to the existing Station 200 in Pennsylvania.[7]

As shown in Figure 2, NESE also includes 37 miles of new looped pipeline, namely, the Quarryville Loop in Lancaster County, Pennsylvania, the Madison Loop in Middlesex County, New Jersey and the Raritan Bay Loop in Middlesex and Monmouth Counties, New Jersey, as well as Queens and Richmond Counties, New York.

Figure 2: NESE Project Overview Map[8]



[7] Transco, Northeast Supply Enhancement Project Transmittal Letter . Pages 1-2 to 1-3.

[8] "Northeast Supply Enhancement Project: Final Environmental Impact Statement," Federal Energy Regulatory Commission; January 2019 (https://www.ferc.gov/sites/default/files/2020-05/part-1.pdf), page 1-2.

FERC issued a final environmental impact statement for NESE in early 2019.[9] FERC certification was obtained in mid-2019.[10] However New York State Department of Environmental Conservation (NYDEC) and New Jersey Department of Environmental Protection denied the water quality certifications requested in Transco's State jurisdictional permit applications in New York and New Jersey. Transco then sought and received two extensions from the FERC to complete construction of the Project. The second and most recent extension of time order granted Transco an extension until May 3, 2024, to complete construction of the Project and place it into service.[11]

On May 29, 2025 Transco petitioned FERC to reissue the CPCN authorizing NESE, requesting expedited action on its request by August 29, 2025. This timetable would enable Transco to start construction by the end of 2025 in order to complete construction and begin service by December 2027. In its petition Transco explained that "The purpose, scope, and impacts of the Project have not changed."[12]

1.2 NESE Benefits

At the wholesale level, high delivered gas prices to downstate New York have put consistent upward pressure on wholesale energy prices in New York City and Long Island. The upward pressure in leading gas price benchmark prices knock-on elsewhere in New York. The total wholesale electric price benefits are addressed in Section 2.2.7.

The leading price benchmark for delivered gas prices to downstate New York is Transco Zone 6-NY. Underlying the cost of goods sold, Transco Zone 6-NY is usually the primary cost component that drives day-to-day changes in wholesale energy prices in New York City and Long Island. As NYISO explains in its 2025 Power Trends report "The cost of fuels used in electricity generation, such as natural gas, directly impacts wholesale electricity prices."[13]

NGrid's Reference Case Scenario in the 2025 LTP indicates that New York is not yet in a position where the pathway to full electrification and decarbonization goals can be achieved by 2040.[14] NGrid nevertheless remains committed to facilitating New York State's CLCPA objectives. LAI expects that downstate New York, in particular, and New York State, at large, are likely to remain

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[9] "Northeast Supply Enhancement Project: Final Environmental Impact Statement," Federal Energy Regulatory Commission; January 2019 (https://www.ferc.gov/sites/default/files/2020-05/part-1.pdf)

[10] "Williams secures FERC approval for Northeast Supply Enhancement project," NS Energy; May 6, 2019 (https://www.nsenergybusiness.com/news/williams-northeast-supply-enhancement-project/)

[11] FERC Docket No. CP17-101-005, January 18, 2024 (https://www.ferc.gov/media/c-5-cp17-101-005).

[12] Petition of Transcontinental Gas Pipe Line Company, LLC for Expedited Reissuance of Certificate Authority, May 29, 2025, p. 4.

[13] NYISO, 2025 Power Trends Report, p. 31.

[14] It "reflects today's legal and policy framework, which incorporates important first steps at reducing GHG emissions" and accounts for clean energy investments approved by the Commission or planned under existing legislation but "does not include the impact of CLCPA actions that have not yet been planned or implemented." 2025 LTP, pages 16-17.

dependent on fossil fuels for both gas-grid and electric-grid reliability through 2040, perhaps longer.[15] Reliance on natural gas during cold weather events compels NGrid to expand its portfolio to ensure reliable service in the downstate market, including the ability to selectively add residential and commercial loads in accord with the all-electric buildings law.[16] NYISO rules governing local sourcing requirements across the NYFS coupled with delays encountered in the timely development of the 9 GW nameplate offshore wind target heightens NYISO's reliance on the thermal fleet for resource adequacy.[17]

The wholesale electric energy benefits ascribable to NESE are addressed in Sections 2 and 3 in this study. Like reduced reliance on CNG, beneficial price effects in the wholesale electric market administered by NYISO also represent second-order benefits attributable to NESE, but are large, sustainable, and state-wide.

1.2.1 Operating Benefits of NESE on Long Island and NYC

LAI assesses the operating and economic benefits ascribable to NESE on the KEDLI and KEDNY local distribution systems.[18] The incremental capacity associated with NESE will allow NGrid to reduce its reliance on CNG to supplement gas delivered via pipelines from upstream sources and NGrid's LNG facilities at Greenpoint and Holtsville. NGrid's use of CNG is necessary to supplement local pressure in isolated pockets of KEDLI's system that are vulnerable to pressure decay under extreme temperature conditions, as well as to provide peak hour supplies to the combined NGrid system. NGrid is not the only gas utility in the U.S. that relies on CNG under adverse operating conditions, but it is heavily dependent on CNG to meet peak-hour send-out requirements during cold snaps. Such reliance on CNG raises technical considerations about gas-grid reliability, safety, environmental emissions, and cost.

While the addition of 400 MDth/d through NESE is needed to strengthen NGrid's portfolio to reliably serve core customers on KEDLI and KEDNY, another benefit is the reduction in CNG reliance in downstate New York. In LAI's opinion, this is a prudent and desirable course of action

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[15] Of 14 GW of land-based wind and solar awarded contracts with NYSERDA under the Clean Energy Standard, just 1.3 GW has been deployed and over 8 GW have canceled their contracts. The NYPSC has adopted a target of 6 GW by 2030, including at least 3 GW participating in the NYISO markets. A large number of storage projects are in the interconnection queue, but few have been completed and none are currently listed as "Under Construction." 2024 State of the Market Report for the NYISO Markets. Potomac Economics. May 2025. Pages iii, 15-16. Weblink: https://www.potomaceconomics.com/wp-content/uploads/2025/05/NYISO-2024-SOM-Full-Report_5-14-2025-final.pdf

[16] Starting in 2026, the all-electric buildings law will require most new buildings in New York to use electric heat and appliances. Weblink: https://nyassembly.gov/all-electric-buildings/

[17] Of 14 GW of land-based wind and solar awarded contracts with NYSERDA under the Clean Energy Standard, just 1.3 GW has been deployed and over 8 GW have canceled their contracts. All 8 GW of awarded offshore wind projects have canceled their original contracts. 2024 State of the Market Report for the NYISO Markets. Potomac Economics. May 2025. Page iii. Weblink: https://www.potomaceconomics.com/wp-content/uploads/2025/05/NYISO-2024-SOM-Full-Report_5-14-2025-final.pdf

[18] Unless otherwise noted, KEDLI and KEDNY are used to refer NGrid's distribution franchises on Long Island and New York City, respectively. Throughout this section, references to NGrid are synonymous with KEDLI and KEDNY.

in light of the operational complexities related to the CNG supply chain, including dispatch, replenishment, environmental and cost considerations.

The operational and economic issues associated with NGrid's reliance on CNG in New York City and Long Island are addressed in detail in Section 4.

1.2.2 Other Benefits

NGrid may be able to use its NESE entitlement to reduce the need for backup fuel due to operational constraints on the NYFS. Additional supply from NESE will improve pressure and flow on the NYFS, allowing NGrid's system operators, and potentially Consolidated Edison ("ConEd"), to adopt less aggressive cold-day curtailment requirements for generators connected to this systems. In addition, NESE provides additional resilience to the NYFS, which may allow for less minimum oil burn under New York State Reliability Council's ("NYSRC") local reliability rules that are meant to ensure reliability during gas-side contingencies. Both KEDLI and KEDNY have peak shaving contracts with congenators.[19] Also, NGrid's gas DR programs are derived from its Load Shedding program, which incentivizes large commercial, industrial, and multi-family firm service customers to switch to a back-up fuel, usually oil. The addition of NESE should reduce the amount of oil used under its Load Shedding Program.[20]

NESE confers another vital reliability benefit across KEDLI and KEDNY. NGrid's design day planning has zero contingency or allowable reserve margin, "[i]n other words, the system is designed to balance supply and demand with no disruption and assumes forecasted peak demand is not exceeded and that all available gas capacity resources will be available."[21] With NESE, NGrid can maintain a reserve margin. Simply put, NESE is valuable insurance.

There is another operational dynamic warranting brief discussion. Sometimes suppliers underperform. Freeze-ups "in the field" during Winter Storm Elliot ("WSE") resulted in failure to deliver supply to pipelines and consequent downstream supply cuts across the NYFS. Both Con Edison and NGrid were only hours away from potentially calamitous service disruptions.[22]

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[19] LTP p. 66.

[20] LTP p. 131.

[21] National Grid Long-term Plan, p. xiv.

[22] Gas production in the Marcellus and Utica shale regions declined by 23% and 54%, respectively. These production shortfalls led to significant drops in pipeline pressure, which in turn disrupted downstream deliveries to NGrid and ConEd. See FERC, NERC and Regional Entity Staff, Winter Storm Elliott Report: Inquiry into Bulk-Power System Operations During December 2022, October 2023, https://www.ferc.gov/media/winter-storm-elliott-report-inquiry-bulk-power-system-operations-during-december-2022, pp. 86-87, 110.

Table 4: KEDNY and KEDLI Supply Cuts for Gas Days December 24-27, 2022

Date	Supply Cut
December 24	93,220 Dth
December 25	86,008 Dth
December 26	58,928 Dth
December 27	2,872 Dth
Total	241,028 Dth

Following the events of WSE and in light of the continued risk of supplier underperformance NGrid is considering the incorporation of "contingency measures into [its] supply portfolio to backstop producer/supplier underperformance and interstate pipeline pressure concerns such as establishing a reserve margin to preserve reliable service while also ensuring affordability."[23]

The addition of NESE would have partially mitigated the adverse operating effects shown as supply cuts in Table 4. This is because when Transco administers curtailments under conditions of *force majeure*, it does so on an equiproportional basis across the affected supply chain. In this case such curtailments to firm entitlement holders would have included Pennsylvania, New Jersey and New York. Therefore, the addition of 400 MDth/d would have increased both pressure and flow into the NYFS, all other things being the same.

The additional gas supply from the NESE project will provide more gas supply for gas-fired power generation on Long Island. Additional on-island energy and capacity may be necessary in order to connect large loads to Zone K. The DoE has listed Brookhaven National Laboratory as one of sixteen potential sites for developing AI infrastructure in a Request for Information. The Request for Information also notes that the existing Caithness Long Island Energy Center could be the site of a new 750 MW gas turbine plant for the data center.[24] Supporting data center development aligns with New York State's goals to be an AI leader and spur economic development.

1.3 Model Philosophy for Climate Goals

LAI modeling assumptions reflect known and knowable "state of the world." LAI generally assumes current regulatory and legislative frameworks will not be altered by major new legislation. New York State's Climate Leadership and Community Protection Act ("CLCPA") establishes clean energy goals including producing 70% of electricity from renewable sources by 2030, 9 GW of OSW by 2035, decarbonizing the electricity sector by 2040 and limiting GHG emissions to 15% of 1990 emissions by 2050. CLCPA also directs New York Public Service Commission ("NYPSC"), NYSERDA and other state agencies to promulgate regulations to achieve these goals.[25] As we understand it, New York's current and proposed regulations are insufficient to achieve the aforementioned CLCPA goals. Moreover, there is no broad stakeholder consensus

[23] National Grid Long-term Plan, p. 60.

[24] Federal Register, Volume 90, No. 65. https://www.govinfo.gov/content/pkg/FR-2025-04-07/pdf/2025-05936.pdf

[25] NY Senate Bill 2019-S6599. https://www.nysenate.gov/legislation/bills/2019/S6599

regarding when New York will achieve the clean energy and emissions targets. The lack of consensus forces LAI to exercise judgment in the pathway to CLCPA goals in this study.

LAI's modeling assumptions are generally consistent with the approach NGrid used in developing the Reference Case Scenario in its 2024 Long-term Plan. NGrid's approach "reflects today's legal and policy framework, which incorporates important first steps at reducing GHG emissions" and accounts for clean energy investments approved by the Commission or planned under existing legislation but "does not include the impact of CLCPA actions that have not yet been planned or implemented."[26]

Analysis presented in NYSERDA's 2024 Draft Clean Energy Standard ("CES") Biennial Review concludes that a delay in achieving the 70% goal may be unavoidable and recommends that the state pursue "70% statewide power generation from renewables before 2033 if actual load growth is lower than the base case forecast, in 2033 under the base case scenario, or by 2035 in the high load growth scenario."[27] On May 15, 2025 the NYPSC found:

> [A]pproximately 23,486 GWh will need to be procured *to achieve the 2030 Target in 2033*. The Biennial Review proposed to procure these needed resources through six Tier 1 solicitations between 2024 and 2029. … approximately 3,900 GWh of onshore large-scale renewables resources would need to be procured per year, or approximately 5,600 GWh per year when accounting for attrition, in order to maintain trajectory towards the 2030 Target. The Biennial Review also highlights the important contribution of offshore wind projects towards reaching the increased renewables level needed to achieve 70% renewables.[28]

In the same Order the NYPSC acknowledged changes in federal policy have put some of its OSW development in doubt and notes that the next Biennial Review in 2026 will "further increases to the Tier 1 annual procurement target beyond what was proposed in the Biennial Review to offset potential [losses] in OSW."[29] Taking into account expected delays in OSW and uncertainty regarding the supply of Tier 1 eligible projects and attrition, LAI assumes that New York will reach 70% renewables in 2035.

The NYPSC also took notice of "the current state of the federal policies slowing or halting the siting and construction of OSW projects."[30] Based on the current administration's opposition to the construction, permitting and leasing of OSW in federal waters, LAI assumes that no new OSW projects will begin construction before 2029. We interpret the loss of commercial momentum delaying the realization of the 9 GW target OSW goal by roughly five years. This means that the 9 GW target objective will not be realized until 2040. For New York to achieve its 2040 electric

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[26] National Grid Long-term Plan, page 16.

[27] NYSERDA, Draft Clean Energy Standard Biennial Review, July 1, 2024, page 59.

[28] NYPSC, Order Adopting Clean Energy Standard Biennial Review as Final and Making Other Findings, May 15, 2025, CASE 15-E-0302, pp. 18-19.

[29] Ibid, p. 34.

[30] Ibid, p. 54.

sector decarbonization goal, vast quantities of dispatchable emission-free resources ("DEFRs") will be needed. For example, NYISO's 2023 Outlook "projects that at least 20 GW of DEFR capacity would be needed by 2040 to replace the current 25.3 GW of fossil generation to support the achievement of CLCPA mandates."[31]

The Outlook also notes that "such DEFR technologies are not commercially viable today at the necessary scale … there remains significant work in implementation and logistics that must be overcome to economically justify transitioning the dispatchable fleet to some combination of new technologies in the next 15 years. The research, development, and construction lead times necessary for these technologies may extend beyond the policy mandate timeline, in which case other existing generation technologies may be required to remain in operation."[32] LAI therefore assumes that existing gas-fired generation not currently scheduled for retirement will be needed to support system reliability beyond 2040.

LAI does not make explicit assumptions regarding the state's ability to meet its GHG 85% emissions reduction goal by 2050.

Table 5: Summary of New York CLCPA Clean Energy Targets

CLCPA Goal	Status	LAI Assumption
70% Renewable Electricity by 2030	Targeting 2033	70% Renewable by 2035
9,000 MW of OSW by 2035	Delayed	9,000 MW by 2040
Decarbonize Electric Sector by 2040	Relies on 20+ GW of DEFRs	Modelling ends in 2042 Compatible with Decarbonized Electric Sector by 2050
GHG 85% below 1990 by 2050		Modelling ends in 2042, electric sector only

[31] 2023-2042-System-Resource-Outlook.pdf p. 9.

[32] Id.

2 Section 2: NESE Impact on Natural Gas and Electricity Pricing and GHG emissions

In this section, LAI provides an overview of the gas price modeling framework upon which LAI has relied in order to derive the peak seasonal change in leading gas prices indices of relevance in the downstate market, in particular. LAI identifies the primary modifications to the gas price modeling framework we have incorporated. Also included in Section 2 is an extensive discussion of the electric dispatch modeling framework we have used to assess CLCPA mandates. Import and export assumptions governing transmission interchange are provided. In addition to resource additions and retirements, LAI addresses renewable output profiles, the timing of offshore wind nameplate additions, and energy storage resource additions. Finally, LAI provides technical information pertaining to the definition of the gas constraint convention incorporated in the simulation model with and without NESE.

2.1 Natural Gas Price Modeling

Gas price analysis was performed using RBAC's Gas Pipeline Competition Model ("GPCM"). GPCM is a standard modeling tool used by many major industry participants including pipeline operators, storage facility owners, regulators, and consultants. Notable organizations that utilize GPCM include FERC,[33] the Midcontinent Independent System Operator,[34] and S&P Global.[35] GPCM is a network partial equilibrium model which simulates North America's production, interstate pipelines, storage facilities, and the entitlements associated with gas customers. In a partial equilibrium model, the economic equilibrium condition analyzes a specific but-for scenario in which certain conditions are different. Hence, all else remains constant, except for the changes being analyzed.[36] Pipelines are represented by a series of zones. Each zone may have links to production areas, storage facilities, interconnections with other pipelines, and/or to end users. Monthly demand curves for the end users and capacities for the pipeline links and zones are input into GPCM. Model outputs include average monthly zonal prices, pipeline utilization levels, and deliveries to end users.

In this section LAI reviews the general structure of the GPCM model. Next, we identify the key modifications implemented by LAI in the GPCM base case. Finally, we report price impacts with and without NESE.

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[33] Federal Energy Regulatory Commission, Winter 2014-15 Energy Market Assessment, October 2014. https://www.ferc.gov/sites/default/files/2020-05/10-16-14-A-3.pdf

[34] Midcontinent Independent System Operator, Long Range Transmission Planning, September 2024. https://cdn.misoenergy.org/MTEP24%20Chapter%202%20-%20Regional%20Long%20Range%20Transmission%20Planning658124.pdf

[35] S&P Global, Methodology and Specifications Guide, December 2024. https://www.spglobal.com/commodityinsights/PlattsContent/_assets/_files/en/our-methodology/methodology-specifications/m2ms-gas.pdf

[36] In a partial equilibrium model feedback effects are excluded.

2.1.1 Structure of GPCM Analysis

The originating structure for the GPCM analysis was RBAC's Q1-2025 base case, which was the most recent database available from the licensor at the time of this study. LAI's changes to the natural gas infrastructure modeled in the GPCM base case include updates to the Transco NESE project, the Iroquois Enhancement by Compression Project (ExC), and the capacity of certain NYFS pipeline interconnections. LAI's GPCM model runs included a "with NESE" scenario and a "without NESE" scenario. In the "without NESE" scenario, any updates to the GPCM zones and links associated with the NESE project were turned off. LAI's analysis assumes that the NESE project is commercialized in January 2028.[37]

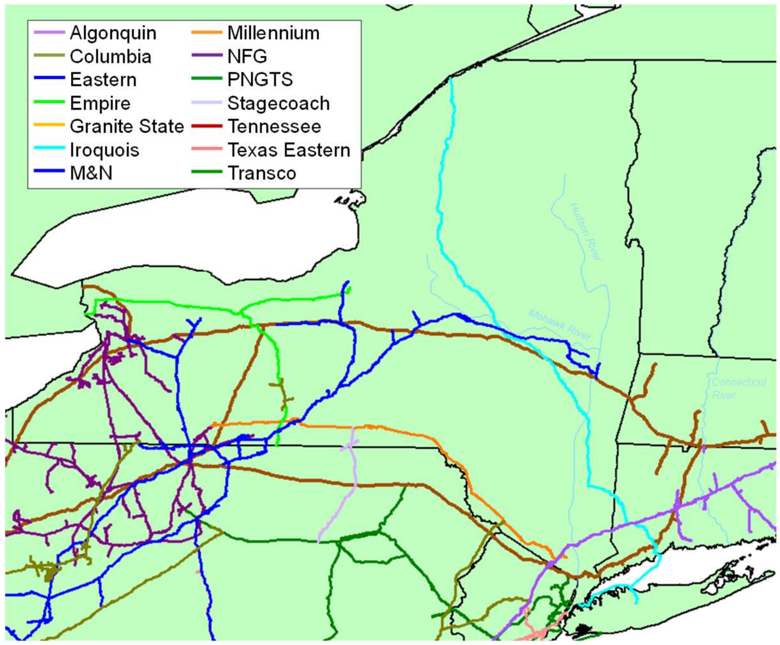
2.1.2 Modifications to RBAC Base Case

LAI's changes to the natural gas infrastructure modeled in the GPCM base case include updates to the Transco NESE project, the Iroquois ExC project, and the capacity of certain NYFS pipeline interconnections. In particular, NESE was modeled as an increased linkage between Transco's mainline Station 195 in Pennsylvania and Station 210 in New Jersey, as well as a parallel path connecting Station 210 in New Jersey and the New York Lower Bay Loop. NESE is also modeled to increase Transco's interconnection with the NYFS on the Rockaway lateral. Each of these changes involving NESE incremented capacity by 400 MDth/d was added to the interconnection between Transco's Lower NY Bay Loop and the Long Island portion of the NYFS to reflect current infrastructure deliverability.[38] Iroquois' ExC was modified from GPCM's base case in order to reflect the addition of 125 MDth/d in the downstate market at South Commack and Hunts Point.

[37] The anticipated in-service date is December 2027, but GPCM modeling has been conducted on a calendar year basis. Therefore, price effects for one month in 2027 have been ignored.

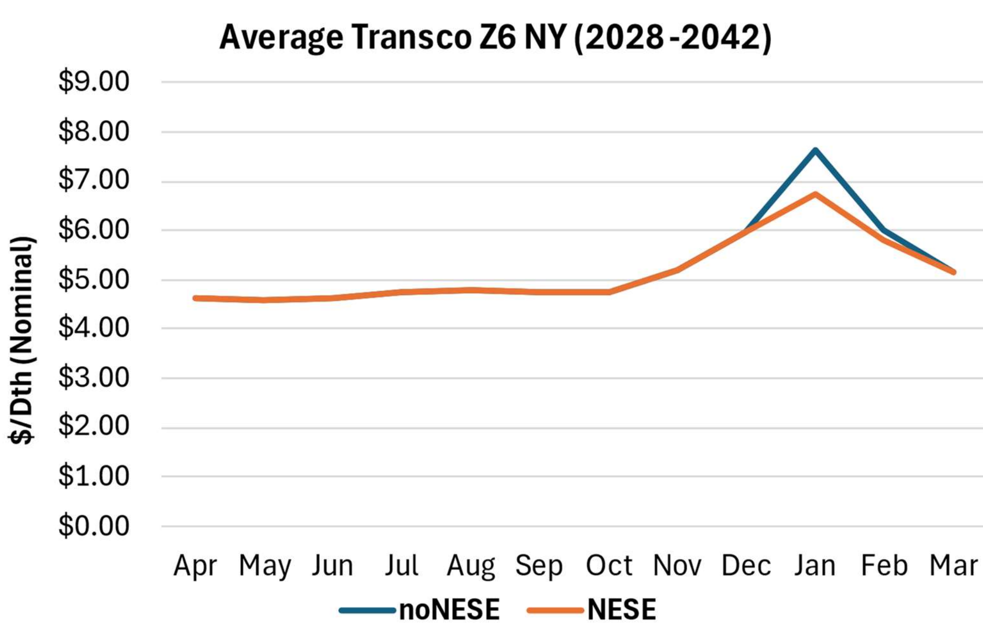
[38] GPCM unit conventions are expressed in MMBtu. One million BTU = 0.99933 Dth, about the same.

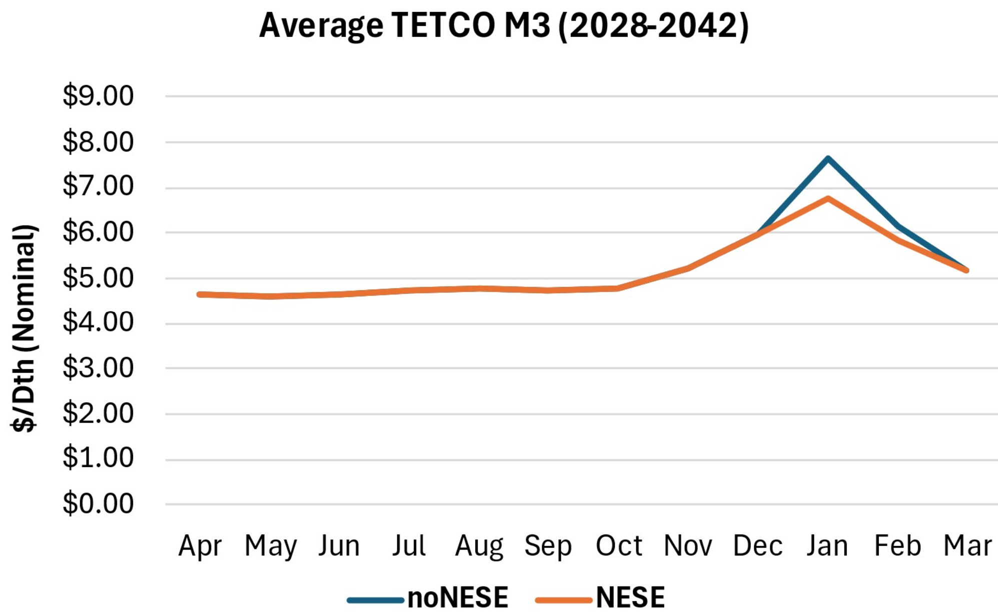
Figure 3: New York State Gas Pipeline Network

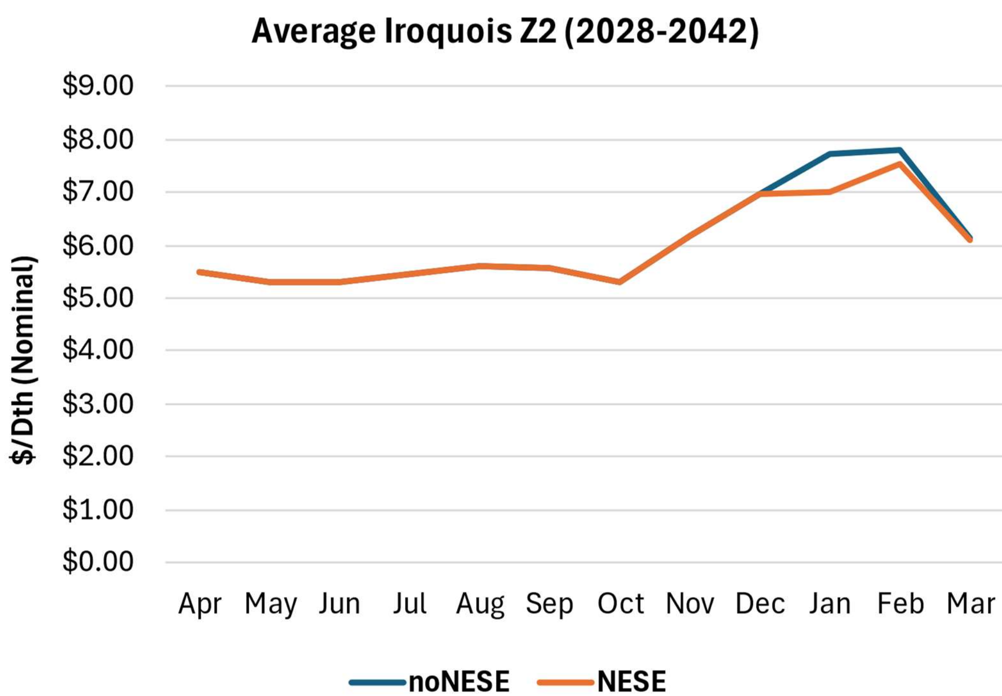


NGrid provided LAI with a normal weather monthly forecast, which was used to modify NGrid's residential, commercial and industrial (RCI) demand curves in New York City and Long Island in GPCM. All other demand curves were unchanged from GPCM's 2025 Q1 base case, including electric sector demand curves and non-National Grid RCI demand.

Figure 4: New York Gas Price Forecasts with and without NESE




Average TETCO M3 (2028-2042)
$/Dth (Nominal)
$9.00
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
noNESE
NESE


Average Iroquois Z2 (2028-2042)
$/Dth (Nominal)
$9.00
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
noNESE
NESE

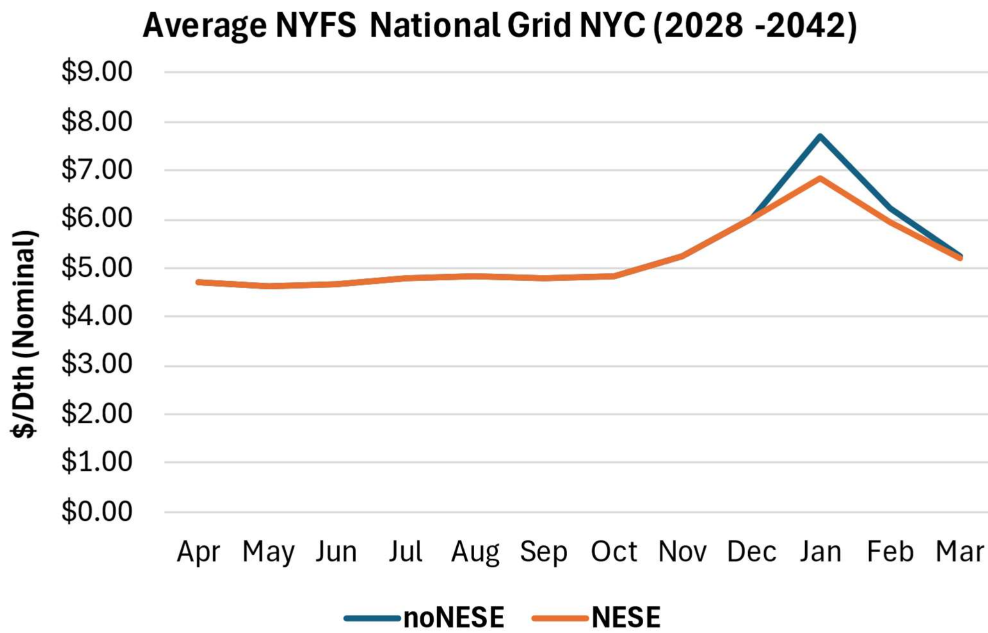


Table 6: NESE Average January Natural Gas Price Impact by Year and Index

Years	Iroquois Z2	Transco Z6 NY	TETCO M3
2028-2032	$0.62	$0.76	$0.76
2033-2037	$0.73	$0.90	$0.90
2038-2042	$0.81	$1.00	$1.00

2.2 Electric Dispatch Modeling

LAI utilized Aurora, a production cost model licensed by Energy Exemplar, to forecast power market energy prices. LAI uses the default database provided by Energy Exemplar as a foundation for Aurora modeling. LAI then augmented Energy Exemplar's database with extensive customization based on public data sources, proprietary calculations, and professional judgment. LAI's Aurora analysis utilized a "but-for" comparison, where the inclusion of NESE is represented by an increase in natural gas available to electric generation and a reduction in winter gas prices. Conversely, in the "without NESE" case less natural gas is available to electric generation and winter gas prices are higher than in the "with NESE" case.

As noted in section 1.3, base case modeling assumptions reflect known and knowable expectations of a future electric grid. Many input assumptions and data utilized in the Aurora model are obtained from NYISO's 2023 – 2042 System and Resource Outlook ("2023 Outlook") materials or NYISO planning materials cited by said Outlook. Aurora Base case assumptions resemble a middle ground between the Outlook Contract Case, which includes various contracted renewable generation and transmission projects, and the Policy Cases, which examine different pathways for full achievement of the CLCPA mandates.[39] The Aurora Base Case includes policy expectations for continued procurement of on-shore renewables and offshore wind, as well as energy storage, consistent with various NYSERDA initiatives supported by NYPSC orders. The Aurora Base Case does not achieve the zero emissions grid by 2040 target, which is not supported by current CLCPA actions.

2.2.1 Study Region and Model Framework

LAI utilized Aurora in a zonal configuration with the study region modeled to include the eleven NYISO load zones A through K. This zonal configuration is consistent with NYISO modeling included in the 2023 Outlook, the 2024 Reliability Needs Assessment ("RNA"), and the NYSRC Installed Capacity Requirement reports.[40]

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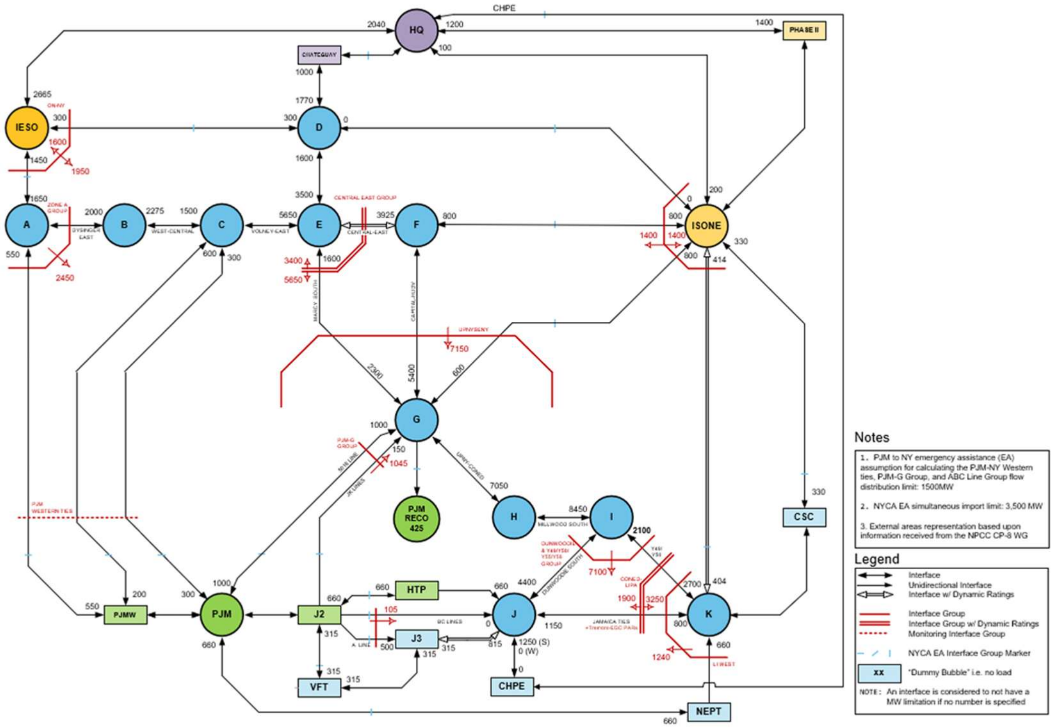
[39] 2023-2042 System & Resource Outlook (The Outlook) A Report from the New York Independent System Operator, July 23, 2024. See page 20.

https://www.nyiso.com/documents/20142/46037414/2023-2042-System-Resource-Outlook.pdf

[40] It is also consistent with the NPCC Northeast Gas/Electric System Study conducted with direction from NYISO. See Northeast Gas Electric Study, prepared for NPCC by Levitan & Associates, January 21, 2025.

https://cdn.prod.website-files.com/67229043316834b1a60feba3/678fee912264907c381a0f68_NPCC%20Northeast%20Gas%20Electric%20System%20Study.pdf

Figure 5: Illustrative NYISO Zonal System Representation[41]



LAI modeled external regions as virtual generators. Transmission limits include adjustments to reflect the Long Island Public Policy Transmission Need project and the Northern New York Priority Transmission Project. The Clean Path New York project was not included in the transmission topology, as the contract was terminated.[42] The 2023 Outlook utilized an amalgamation of various sources to set interface limits.[43] LAI relied on a similar approach, but used some additional sources published after the 2023 Outlook, namely the 2024 RNA[44] and 2024-2025 Winter Operating Study.[45]

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[41] 2024 Reliability Needs Assessment ("2024 RNA"): A Report from the New York Independent System Operator Appendices, November 19, 2024. See page 44.

[42] Per NYSERDA, "NYSERDA and Clean Path NY have mutually agreed to terminate the Project's Tier 4 REC Purchase and Sale Agreement." See https://www.nyserda.ny.gov/All-Programs/Large-Scale-Renewables/Tier-Four. Accessed June 19, 2025.

[43] 2023-2042 System & Resource Outlook Update, NYISO presentation to the Electric System Planning Working Group by Sarah Carkner, February 22, 2024. See slide 23.

https://www.nyiso.com/documents/20142/43078666/03_02222024_2023-2042_System&Resource_Outlook_Update.pdf

[44] 2024 RNA, pages 42-44.

https://www.nyiso.com/documents/20142/48283847/2024-RNA-Appendices.pdf

[45] NYISO Operating Study Winter 2024 2025: A Report by the New York Independent System Operator, October 2025. https://www.nyiso.com/documents/20142/3691300/Winter2024-25%20Operating-Study-Report-APPROVED.pdf

2.2.2 Import & Export Assumptions

Transfers with external regions are modeled as virtual generators with fixed import and export profiles based on historical flow data. LAI modeled all transfer profiles as the average of every hour of the week within a given month (168 x 12) based on 2022-2024 data.[46] Given the variability in Hydro-Québec ("HQ") transfers in recent years, averaging 2022-2024 flow data provides a mid-point representation of HQ import energy over existing ties in the long run. Input profiles determine the capability of imports in a given hour, but transfers may be reduced based on economic dispatch logic within the model.

Champlain Hudson Power Express ("CHPE") is modeled as a 1250 MW injection into Zone J. CHPE is set as a firm import at 95% capacity factor (approximately 10.4 TWh annually). This is consistent with the 2023 Outlook.[47] Imports on existing ties with both HQ and the Independent Electric System Operator of Ontario ("IESO") are allowed to adjust down relative to historical profiles as needed in any given dispatch hour based on market conditions. CHPE has a valuable fixed price contract to deliver energy into an import-constrained zone, whereas the existing ties are market-based imports into increasingly export-constrained zones.[48]

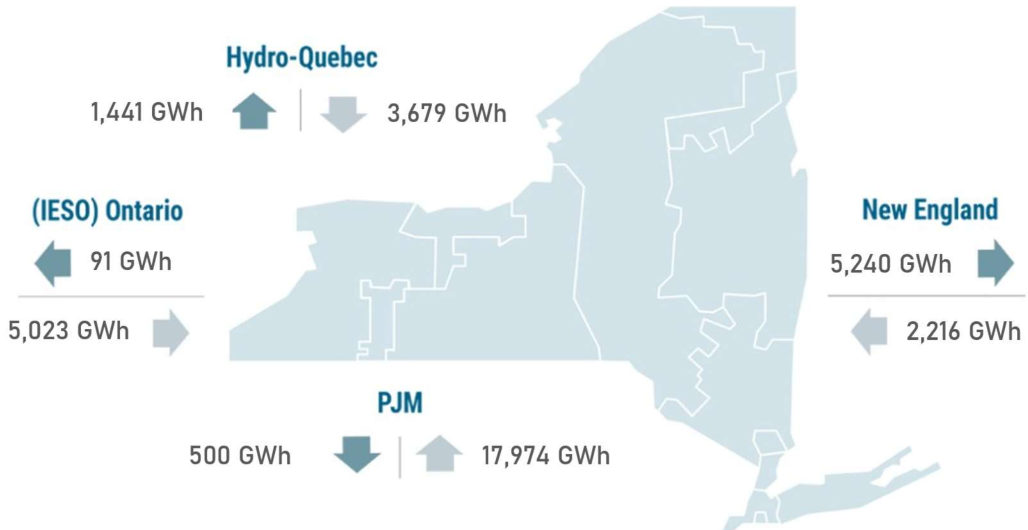
AC Transfers with PJM are allocated between Zones C and G, proportional to transfer limits. Controllable ties with PJM (Neptune, Hudson Transmission Project and the Linden Variable Frequency Transformer Project) are set to be curtailed before native renewable energy and Canadian imports. AC Transfers with ISO-NE are allocated equally between Zones F and G. The Cross Sound Cable is set to be curtailed before Offshore Wind in Zone K.

[46] See Power Grid Data, NYISO, Interface Limits and Flows. https://www.nyiso.com/power-grid-data

[47] See Outlook Appendix I: Transmission Congestion Analysis Figure I-12, p13. CHPE annual energy output is between 94% and 95% in all years for both lower demand and higher demand scenarios. https://www.nyiso.com/documents/20142/46037616/Appendix-I%20-Transmission-Congestion-Analysis.pdf

[48] The bid quantity and pricing are available in the contract posted on NYSERDA's web site:
https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Clean-Energy-Standard/CHPE-contract.pdf

Figure 6: 2022-2024 Average NYISO Imports and Exports to Adjacent Regions[49]



2.2.3 Demand Forecast

The NYISO 2025 Gold Book and 2023 Outlook are the primary sources for the demand forecast in Aurora. The Gold Book provides total annual energy, peak, behind-the-meter solar ("BTM PV") energy, and large load energy for all years from 2025 through 2055.[50] The Outlook provides hourly demand profiles and BTM PV profiles by zone for the years 2025, 2035, 2040, and 2042.[51]

2.2.3.1 Peak Demand & Energy Forecast

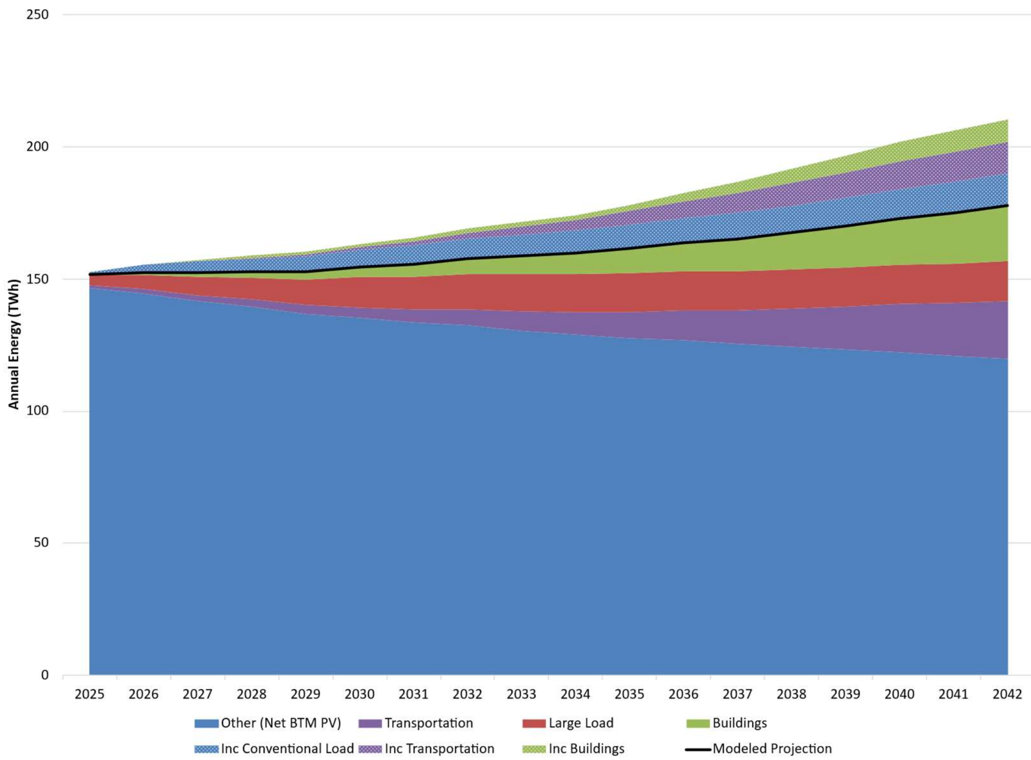
Peak demand and energy forecasts are drawn from the 2025 Gold Book and are derived from the Lower Demand Scenario and Baseline Forecast. Figure 7 shows the modeled annual load projection. and offers a comparison of demand under the projection to the Baseline Forecast, which would represent the top of the curve.

[49] Graphic based on NYISO Power Trends 2025 Report, p24
https://www.nyiso.com/documents/20142/2223020/2025-Power-Trends.pdf

[50] 2025 Load and Capacity Data: A report by The New York Independent System Operator, Inc. Gold Book
https://www.nyiso.com/documents/20142/2226333/2025-Gold-Book-Public.pdf

[51] 2023-2042 System & Resource Outlook Data Document: Forecast Assumptions, "Load_Baseline" sheet.
https://www.nyiso.com/documents/20142/45816558/2023-2042-System-Resource-Outlook-Forecasts.xlsx
BTM PV profiles from this source were also utilized.

Figure 7: Annual Demand Forecast



The Low Demand scenario differs from the Baseline Forecast in several respects, particularly with regard to transportation and building electrification.[52] The rate of building electrification in the Lower Demand Scenario aligns better with the electrification assumptions embedded in NGrid's 2024 Local Transmission Plan. Lower expectations for vehicle electrification are reasonable given current and expected changes in federal policy. LAI modeled BTM PV and large loads as discrete resources by zone, which allows shifting assumptions and defined hourly profiles independent of the total demand forecast. Therefore, base peak and energy forecast inputs were modified to remove the impact of BTM PV and large loads. LAI modeled BTM PV as supply but it is included in reporting as reduced demand.

2.2.3.2 Hourly Demand Shape and Renewable Output Profiles

LAI set monthly peak and total energy based on seasonal peaks and annual energy reported in the Gold Book while the hourly shape associated with that peak and energy is determined by the System Outlook profiles. The hourly demand shape modeled in Aurora is based on the 2023 NYISO Outlook Baseline Demand scenario. To capture shifting demand profiles over time, LAI interpolated hourly values between the Outlook's profiles for 2025 and 2042 hourly data to create unique demand profiles for each zone for every year. The Outlook load shapes are based

[52] 2025 Gold Book, page 15 contains a summary of various load scenario assumptions.

on the 2018 weather year.[53] However, the timing of the winter and summer peaks appears to be normalized in some fashion, as winter peaks in the Outlook profiles occur during the second week of January, rather than the first per actual historical peak.[54]

LAI also used sources that reflect the 2018 historical weather year to align intermittent resource output with load. Onshore renewable profiles are adopted from 2023 Outlook materials.[55] For offshore wind, LAI adopted output profiles from another NYISO source developed by DNV for the Installed Capacity Market ("ICAP") Working Group, as this source identified profiles by leasing area instead of aggregating by zone.[56] In order to line up winter peak with 2018 weather, LAI sampled the last week of 2017 to better align cold weather with actual renewable output.

2.2.4 Resource Additions and Retirements

2.2.4.1 Additions

To refine project-specific additions, LAI referenced the NYISO Interconnection Queue and included projects that have accepted cost allocation or reached a subsequent milestone. Projects with awarded and active NYSERDA Tier 1 contracts were also included. Based on the review of the Interconnection Queue and Tier 1 contracts, approximately 9.3 GW of new capacity is expected to come online between 2025 and 2028. Of this total, 60% is solar, 22% is storage, and 18% is wind.

To meet the CLCPA 70% by 2030 renewable energy target, LAI included generic land-based wind and solar additions, with the target achieved in 2035. In the Draft CES Biennial Review, the New York Department of Public Service ("DPS") and NYSERDA found that an annual procurement amount of 5,600 GWh per year over six years would reach the 70% target by 2033. Notably, this estimate assumed additional offshore wind beyond the fourth solicitation, which has not yet been contracted, and a 30% attrition rate.[57] The NYPSC approved the 5,600 GWh procurement target in a May 15 order.[58] Due to the lower load forecast, LAI uses lower land-based renewable buildout projects and effectively assumes a higher attrition rate (about 50%) than the Biennial Review. BTM PV projections are based on the 2025 NYISO Gold Book. LAI assumes Sunrise Wind

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[53] 2023-2042 System & Resource Outlook Appendix B: Production Cost Assumptions Matrix, A Report from the New York Independent System Operator, July 22, 2024. See page 2.

https://www.nyiso.com/documents/20142/46037616/Appendix-B-Production-Cost-Assumptions-Matrix.pdf

[54] Per the 2025 Gold Book Table I-18. Also, the 2018 historical summer peak occurred in late August, not July.

[55] 2023-2042 System & Resource Outlook Data Document: Hourly production profiles, posted July 25, 2024.

https://www.nyiso.com/documents/20142/45816558/2023-2042-System-Resource-Outlook-Zonal-LBW-UPV-OSW-2000-2023-Shapes.xlsx

[56] Offshore Wind Profile Development, posted February 2, 2023 for February 7, 2023 ICAP WG meeting. https://www.nyiso.com/documents/20142/36079056/4%20NYISO_OffshoreWind_Hourly_NetCapacityFactor.xlsx

[57] Draft Clean Energy Standard Biennial Review, NYSERDA and NY DPS, filed July 1, 2024 in Case 15-E-0302.

See page 96.

[58] Order Adopting Clean Energy Standard Biennial Review as Final and Making Other Findings, Issued May 15, 2025 in Case 15-E-0302.

and Empire Wind reach commercial operation in 2027 given that both projects are under construction and President Trump has reversed prior opposition to the construction of Empire Wind. LAI assumes that OSW additions begin in 2035 and scale to 9 GW by 2040, contributing to long-term CES compliance. Generic land-based solar and wind additions begin in 2030 and grow to 2,700 MW of solar and 4,800 MW of wind by 2035. More modest additions to meet the 70% target as load grows continue through 2050, reaching 6,000 MW of solar and 9,000 MW of land-based wind.

New York has established an energy storage deployment target of 6 GW by 2030, with at least 35% of the total capacity required to be in Zones G to K to support emissions reductions in disadvantaged communities.[59] The generic storage buildout to meet state target assumes a 90%/10% split between 4-hour and 8-hour systems in 2028, reflecting the current dominance of shorter-duration technologies in the interconnection queue. As 8-hour storage systems become more cost-effective, their share of new additions grows over the rest of the study period. The projected storage additions include proposed projects in the NYISO Interconnection Queue and NYSERDA Tier 1 contract, behind-the-meter storage capacity as included in the 2025 NYISO Gold Book load forecast, and generic storage additions.

The 2021 Outlook noted that:

> The exclusion of DEFRs as a new technology option, while enforcing the retirement of fossil generators via the zero emission by 2040 policy, exhausts the amount of land-based wind built and results in the replacement of 45 GW of DEFR capacity in Scenario 1 with 30 GW of offshore wind and 40 GW of energy storage. Note that this capacity replacement estimate is intended to be a directional proxy and would not fully substitute for the attributes provided by either today's fossil fueled fleet or by future DEFRs.[60]

This higher level of deployment is intended to address the growing need for flexible, emissions-free capacity to meet winter peak in the absence of DEFRs and is necessary to maintain reliability and balance load against intermittent resources.

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[59] Order Establishing Updated Energy Storage Goal and Deployment Policy, June 20, 2024, Page 59

https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Energy-Storage/2024-06-6GW-Energy-Storage-Order.pdf

[60] 2021-2040 System & Resource Outlook: A Report from the New York Independent System Operator September 22, 2022, see page 11.

https://www.nyiso.com/documents/20142/46036414/2021-2040-Outlook-Report.pdf

Figure 8: Renewable Resource Expansion

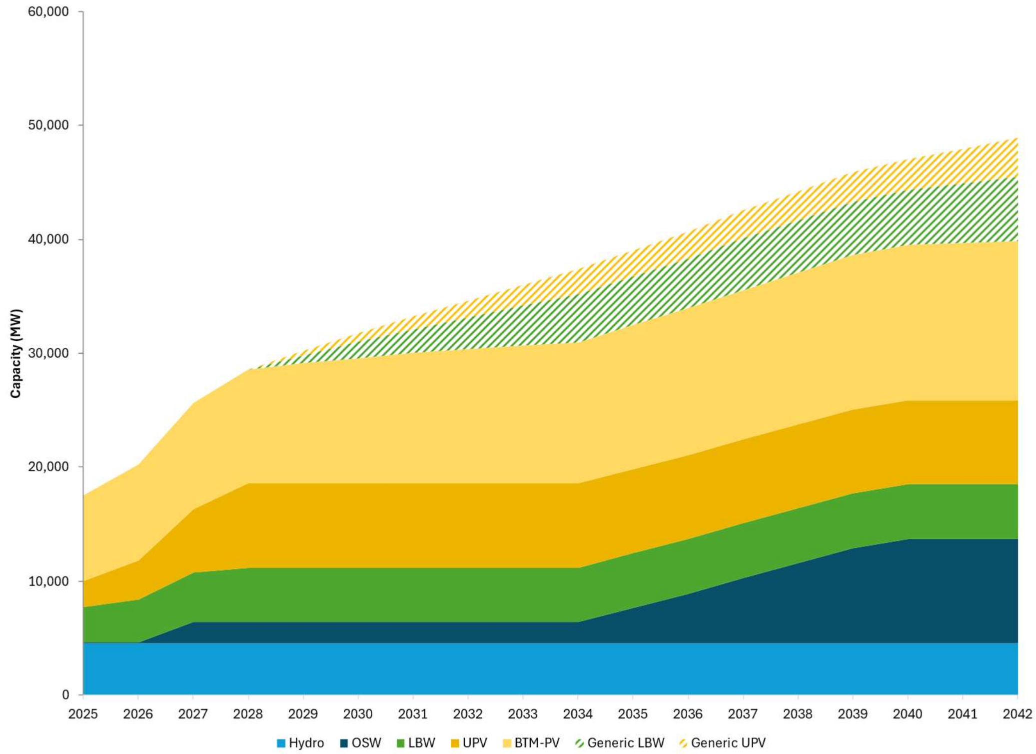
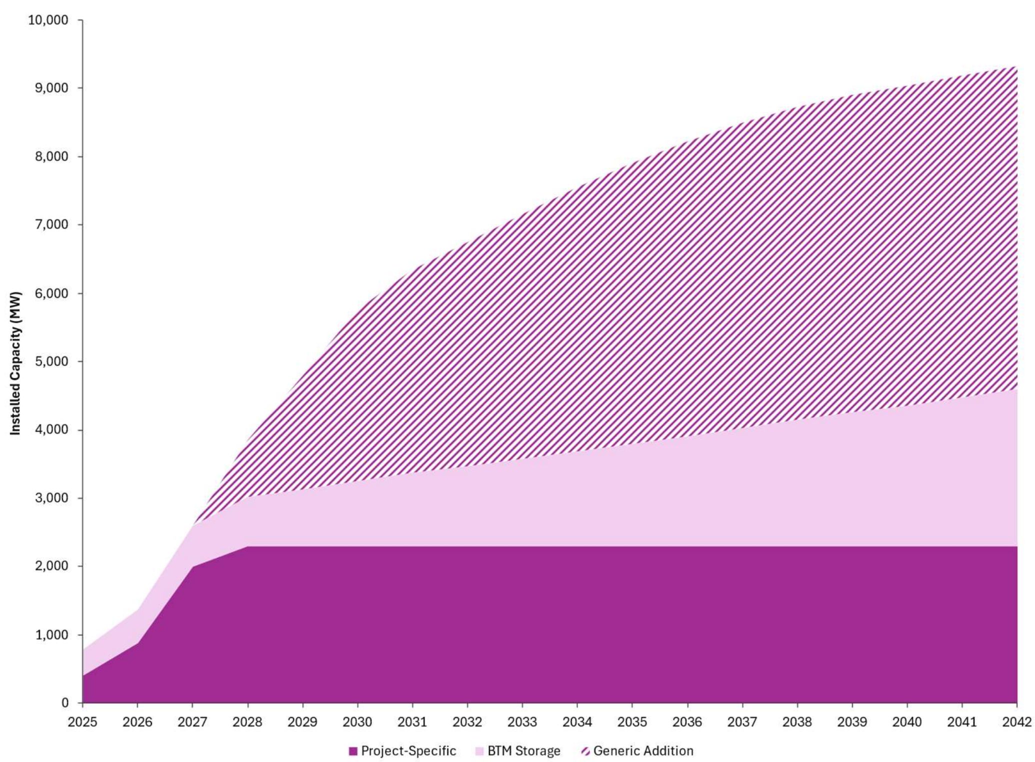


Figure 9: Energy Storage Resource Additions



2.2.4.2 Retirements

Generation retirements reflect deactivation notices and potential generator status changes as documented in the Gold Book.[61] These entries include compliance plans for the NY DEC's Peaker Rule and New York Power Authority ("NYPA") small gas retirements. In addition, one of the Long Island Power Authority's ("LIPA") steam turbine units is retired in 2030 pursuant to LIPA's 2023 Integrated Resource Plan.[62] LAI assumes that all existing nuclear generation remains in operation through 2047. The 2023 Outlook assumes that existing nuclear units remain in operation throughout the entire study period. Nine Mile Point and Ginna have submitted notice of intent for subsequent NRC license renewal.[63]

Other existing thermal generators remain in operation to maintain resource adequacy and meet peak demand. In the Policy cases of the Outlook, fossil resources are replaced with DEFRs, which are modeled as generic resources that do not represent a specific technology type. The 2023 Outlook notes that hydrogen and advanced nuclear generation technologies are candidates to fill this role. However,

> Currently, both technologies have shown limited commercial viability on the proof of concept. Even assuming that they are commercially viable, there remains significant work in the implementation and logistics that must be overcome to economically justify transitioning the dispatchable fleet to some combination of new technologies in the next 15 years.[64]

Even if these technologies gain some level of technological maturity over the next decade or longer, transitioning the fossil fleet would require retirement and replacement of about 26 GW of fossil per the Outlook 2035 values.[65] Given the potential costs and commercialization barriers to wide adoption of these DEFR technologies, coordinated policy and planning will be needed to cultivate these zero emissions power sources.

2.2.5 Emissions Prices

LAI used the same emissions allowance price forecast as NYISO adopted for the Outlook.[66] The main driver of emissions costs which affects dispatch is Regional Greenhouse Gas Initiative

[61] 2025 Gold Book, see pages 130-133.

[62] 2023 Integrated Resource Plan Summary Guide, March 2024. See page 35.
https://www.flipsnack.com/lipower/2023-irp-summary-guide/download-pdf.html

[63] Status of Subsequent License Renewal Applications, U.S. Nuclear Regulatory Commission.
https://www.nrc.gov/reactors/operating/licensing/renewal/subsequent-license-renewal.html

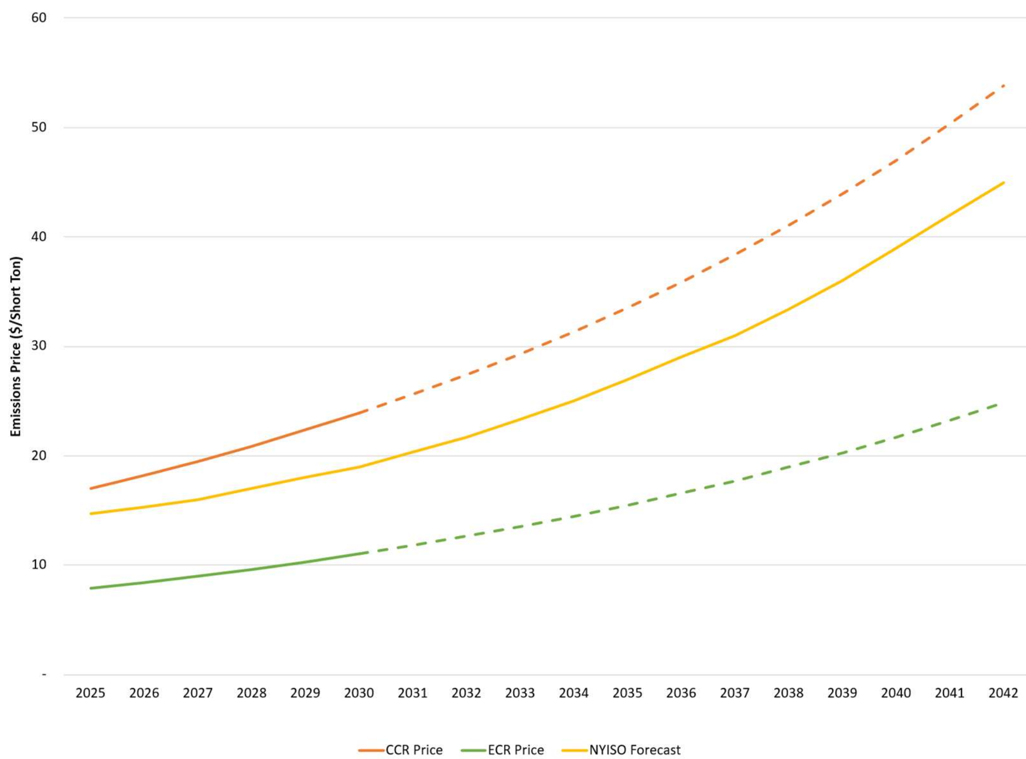
[64] Appendix F: Dispatchable Emission-Free Resources, July 22, 2024, see page 3.
https://www.nyiso.com/documents/20142/46037616/Appendix-F-Dispatchable-Emission-Free%20Resources.pdf

[65] See 2023-2042 System & Resource Outlook, page 39.

[66] Economic Planning Process: 2023-2042 System & Resource Outlook, NYISO presentation to the Electric System Planning Working Group by Sarah Carkner, September 21, 2023. See slide 19. https://www.nyiso.com/documents/20142/40143257/05a_09212023_ESPWG_2023-2042_Outlook_Update.pdf

("RGGI") CO_2 allowance prices. NYISO's forecast falls within two price control values that are part of RGGI. The Cost Containment Reserve ("CCR") is a price point where additional supply of allowances are made available to modulate allowance prices, and the Emissions Containment Reserve ("ECR") is a floor price where supply is reduced. Given the lack of merchant development of renewables among RGGI member states and delays and cancellations for offshore wind contracts, the strong growth rate on NYISO's forecast RGGI price trajectory is reasonable.

Figure 10: RGGI Price Projection



Other emissions allowance prices on SO_2 and NO_X are implemented in the model, but have a minimal impact on dispatch costs and price formation.

2.2.6 Gas Price and Constraint with and without NESE

LAI estimated daily gas available to generators in a similar manner as done in the Fuel and Energy Study ("FES Study") that was conducted for NYISO.[67] Gas available to New York generators equals the expected gas supply into New York's interstate gas system minus the expected exports into New England and estimated New York LDC demand for pipeline gas for the 2018 weather year.[68]

[67] Fuel and Energy Security In New York State: An Assessment of Winter Operational Risks for a Power System in Transition, Analysis Group November 2023. See pages 34-40. https://www.nyiso.com/documents/20142/41258685/Analysis Group-2023-Fuel-Security-Study-Final.pdf

[68] Consistent with the use for renewable profiles, some 2017 weather year data is included to set the daily gas constraint coincident with winter peak load.

The addition of NESE increases the pipeline capacity able to flow into New York State by 400 MDth/d, and therefore increases the gas constraint by the same magnitude in the "with NESE" modeling.

LAI estimated upstate and downstate[69] LDC demand for pipeline gas by first compiling meter-level scheduled quantity data from each pipeline's electronic bulletin boards ("EBB") for the last available scheduling cycle (Intraday 3) for the period of December 2017 to February 2025. Meter totals are aggregated to LDC and region totals. Hourly generation data was downloaded from the EPA's Continuous Emissions Monitoring System ("CEMS") database for each New York generator behind LDC city gates. Emissions rates (short tons CO_2/MWh) were used to determine which generators were burning natural gas, as opposed to oil, during a given hour. The hourly gas usage was then compiled by gas day, then totaled by utility. LAI exercised professional judgment to exclude smaller utility gas usage where we observed significant data gaps on certain pipelines. In performing the regression analysis, LAI excluded about 15% of statewide design day pipeline demand, and later included a multiplier to add back omitted demand.

Zonal New York weather data was downloaded from NYISO's website. Daily population-weighted heating degree day ("HDD") values for statewide New York, upstate New York, and downstate New York were calculated from the zonal NYISO data. LAI then performed a quadratic regression using the daily scheduled quantity data (net on-system generation usage) and relevant HDD.

To evaluate accuracy, design day HDDs were input into the regression formulas to estimate downstate and upstate design day LDC pipeline demand and compared to the LDCs' design day estimates (net on-system gas supplies such as LNG, CNG, and RNG). Design day HDDs and forecast demand were sourced from the LDCs' most recent winter supply reviews.[70] The HDDs were weighted proportionally to LDC design day demand. A design day true up factor was applied in order to ensure that inputting the regional design day HDD resulted in design day LDC pipeline demand for the winter of 2024-25. A regional growth factor is applied for estimating demand in future winters through the 2028-29 winter according to the LDCs' winter supply reviews. The growth factor for winters after 2028-29 were derived from United States Energy Information Administration ("EIA") 2025 Annual Energy Outlook ("AEO") RCI estimates for the Middle Atlantic region.

Lastly, a scheduling buffer of 7.5% was applied to forecast LDC demand to account for uncertainty and the LDCs' conservative scheduling practices on cold days, especially in the early NAESB scheduling cycles.[71] High penalties associated with operational flow orders ("OFOs") and weather

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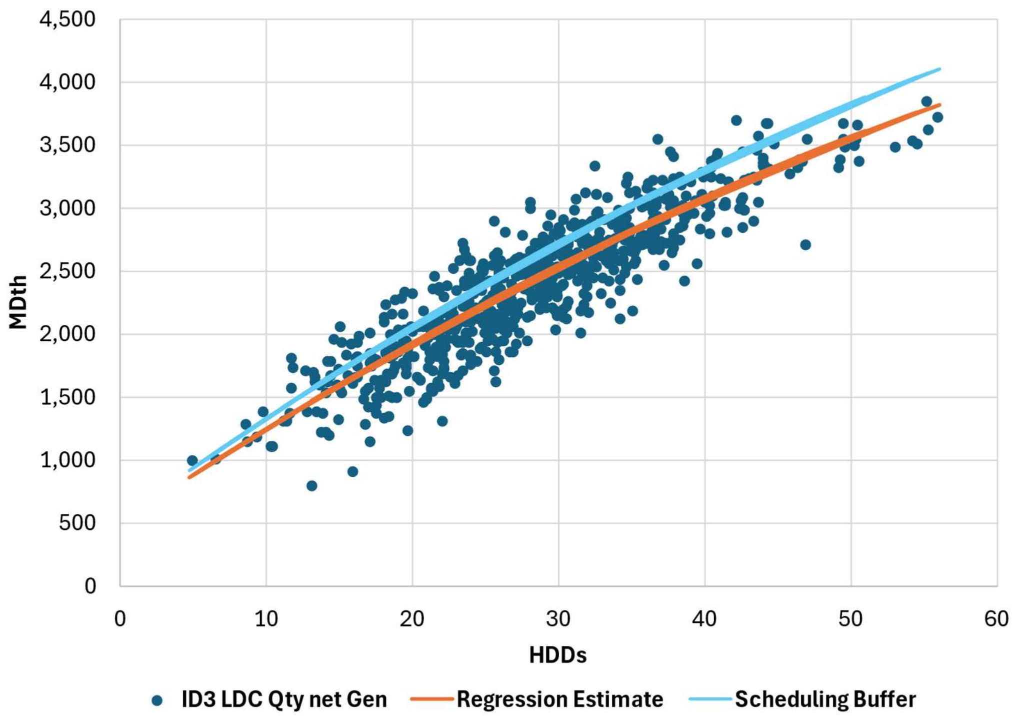
[69] Downstate LDCs include Con Ed, KEDNY, KEDLI, Orange & Rockland, and Central Hudson. All other LDCs are considered upstate.

[70] The most recent winter supply reviews at the time of this study were filed in DPS docket 24-M-0205.

[71] LAI did not include a scheduling buffer in the NPCC Gas/Electric Study Aurora modeling, as the intention was to stress the physical capabilities of the gas system. With respect to that study, "NYISO has noted that the gas availability forecast may be somewhat aggressive with respect to the realities of the gas market. Available gas for generation may not be fungible across different pipeline locations, and given the relatively large requirements of

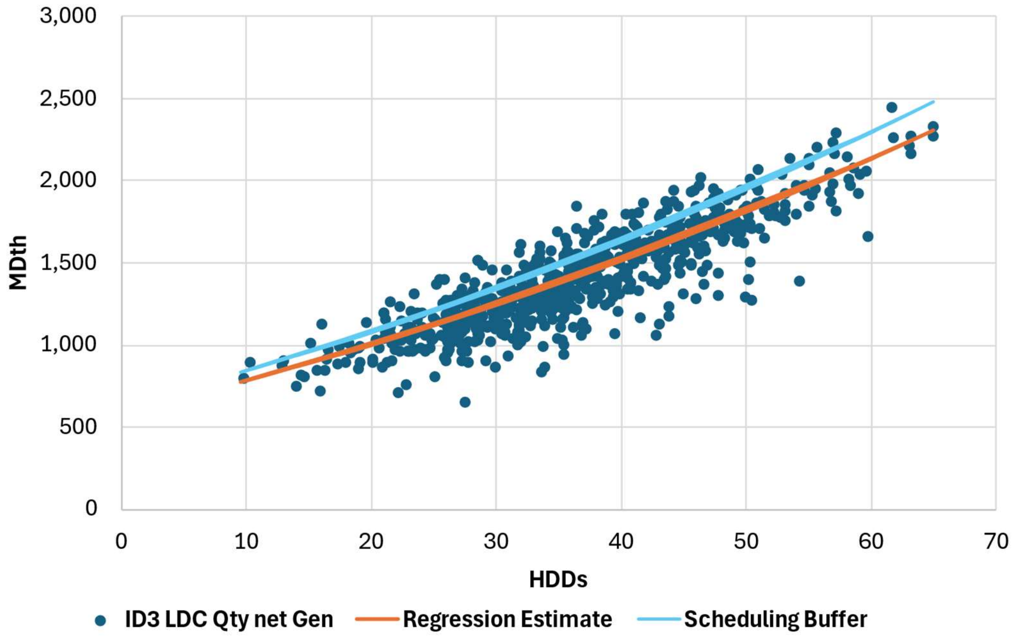
swings between the NAESB timely cycle and the close of the relevant gas day incentivize LDCs to reserve more quantity on the pipe than is forecast. The scheduling buffer adjustment also helps correct for some of the lower data points that may be a result of faulty or lacking data from the pipeline EBBs.

Figure 11: Downstate New York Scheduled Quantity Regression



some generators, quantities may not be able to be utilized in whole."[71] Other sources indicate that the scheduling buffer is 10%. See https://www.iso-ne.com/static-assets/documents/2023/02/a07e_mc_2023_02_07-09_ls_power_unit_specific_gas_modeling_memo.pdf

Figure 12: Upstate NY Scheduled Quantity Regression

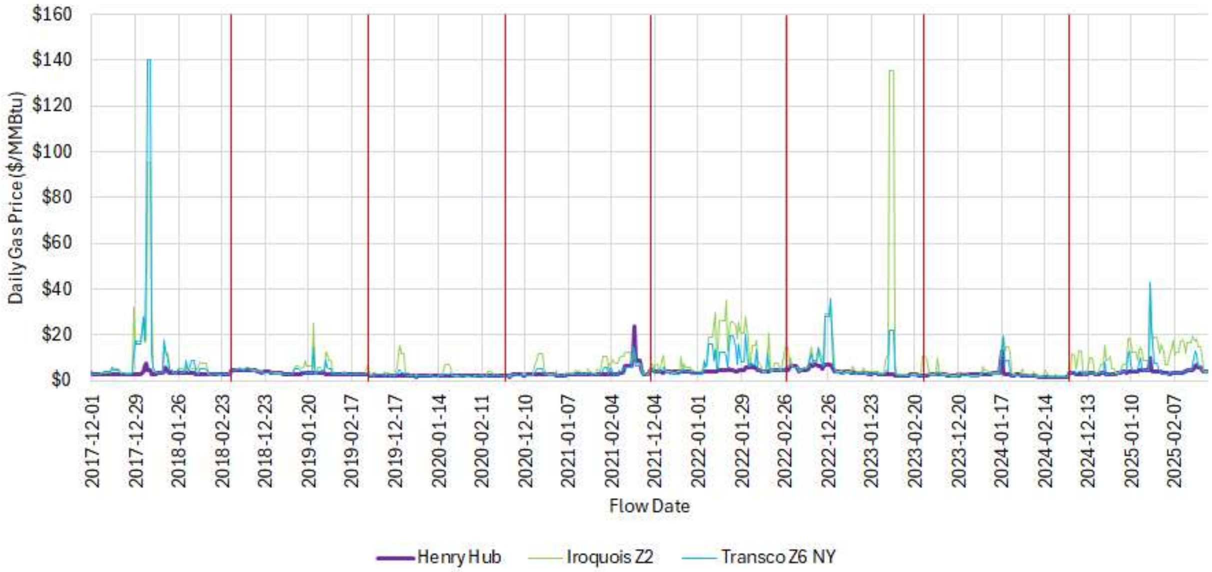


LAI's daily gas constraint modeling represents a reasonable mechanism to evaluate daily price volatility in the gas and electric markets. Gas futures prices are elevated relative to GPCM's monthly forecast due to instances of daily volatility during cold weather conditions, supply and transportation disruptions, and forecast uncertainty over the weekends, particularly long holiday weekends when markets are comparatively illiquid.

Over the last decade, New York has been impacted by a series of winter natural gas price spikes. These natural gas spikes are primarily driven by increased demand during extreme winter weather. On a few occasions, with WSE being the most notable, freeze-offs and other reductions in supply also contributed to price spikes.

Daily spot prices for Transco Z6 and Iroquois Z2 are highly correlated, and can spike significantly over the Henry Hub benchmark during the winter months of December, January and February. In calendar years 2024, 2023 and 2022, the correlations between Transco Z6 NY and Iroquois Z2 were 0.846, 0.961, and 0.816, respectively. The historical daily spot prices for Winter 2017 through Winter 2024 are shown in Figure 13 below. This graph omits the non-winter months and uses red lines to indicate the gap between winters.

Figure 13. Transco Z6 NY, Iroquois Z2 and Henry Hub Daily Gas Prices, Winters 2017-2024[72]

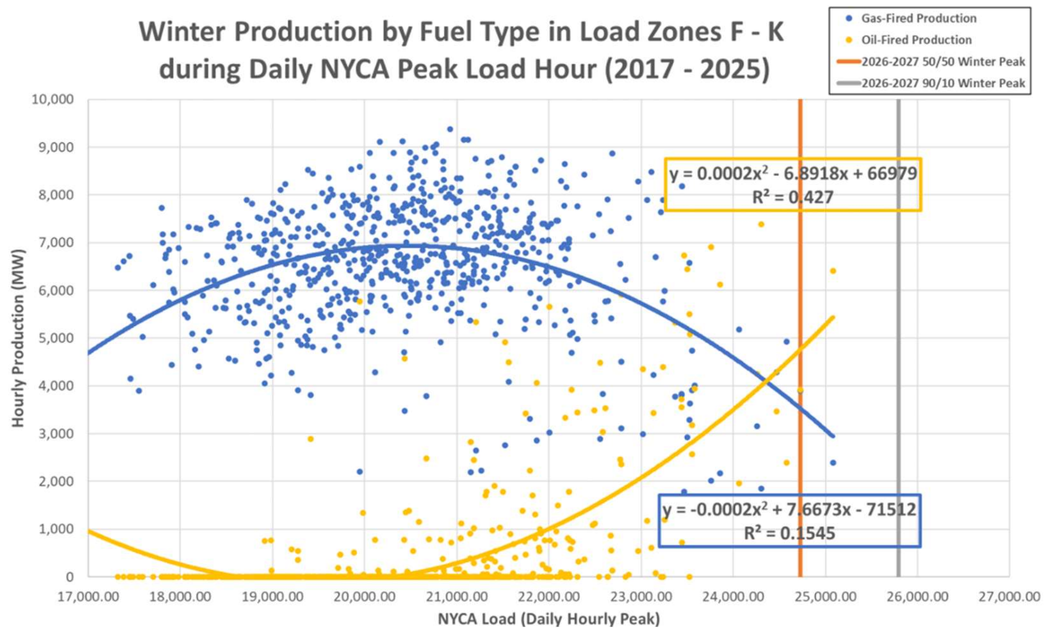


New York and the Northeast at large experienced cold weather yielding high daily gas prices in December 2017 and January 2018. Prices were less volatile over the next two winters due to a combination of factors including relatively moderate weather. Over the last few years, New York, and the greater Northeast have been hit with a series of natural gas price spikes associated with WSE and other extreme winter weather. Over the eight winters sampled above, both Transco Z6 NY and Iroquois Z2 prices spiked above $10/MMBtu on 56 days, or a week on average.

NYISO analysis indicates that gas to oil switching occurs at conditions below the winter peak. NYISO developed a constraint on gas-fired generation in Zones F-K as a part of its Installed Reserve Margin modeling. To specify the constraint, NYISO developed a regression of production by fuel type to evaluate the use of oil-fired generation during winters from 2017 to 2025.

[72] Daily gas prices were sourced from SNL via S&P Capital IQ Pro.

Figure 14: NYISO Available Gas Production Analysis [73]



The recently updated recommendation for "available gas" under this analysis was for 3,100 MW of available gas to be used for fuel availability constraints modeling at daily peak load conditions between 24 and 25 GW (NYISO's estimated 2026-2027 winter peak fell in this range). During more adverse weather conditions, and therefore higher peak load, available gas is assumed to be lower.[74] Also, oil production is always non-zero when NYISO has daily peak load greater than 24 GW.

2.2.7 Results

Gas-fired generation declines as renewable resources are developed to meet the 70% CES target and the 9 GW offshore wind goal. After 2040, gas-fired generation increases as load grows.

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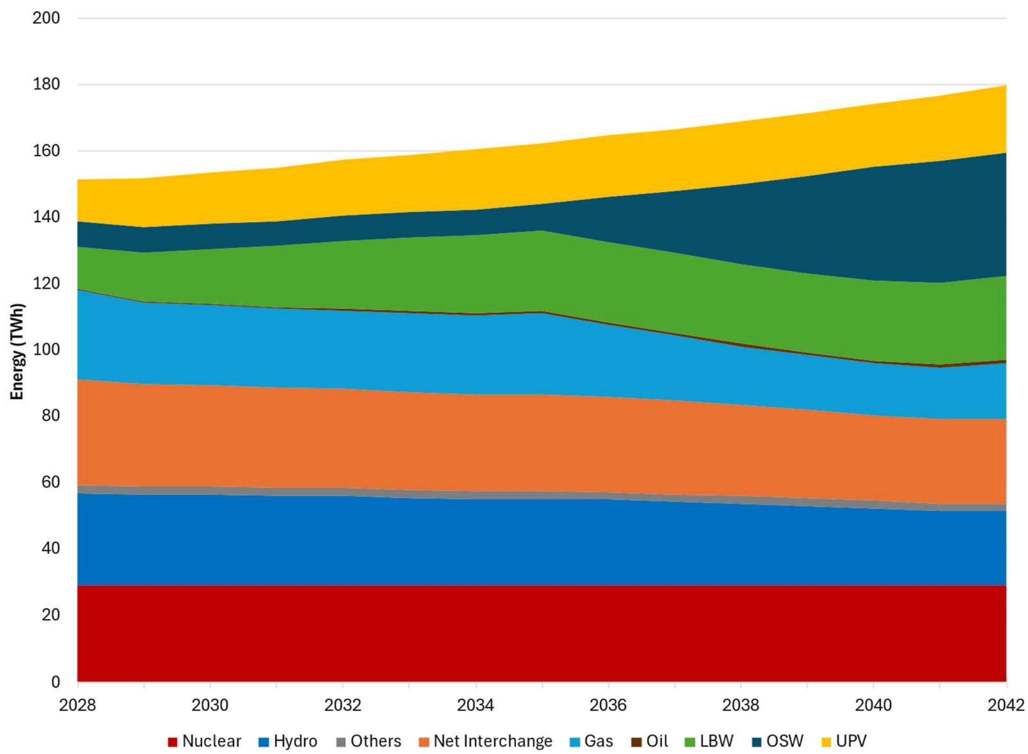
[73] Fuel Availability Constraints Modeling Phase 2, March 5, 2025 NYISO Presentation to the NYSRC Installed Capacity Subcommittee. See slide 12.

https://www.nysrc.org/wp-content/uploads/2025/03/Fuel-Availability-Constraints.pdf

[74] *Id*, slide 13.

Figure 15: Energy Generation without NESE



Prices across NYISO stay fairly level on an annual basis drop as clean energy reduces the use of gas-fired generation, but overall demand grows. Winter prices increase as NYISO becomes winter-peaking. The greatest price differences between the “With NESE” and “Without NESE” cases occur in January, resulting from the impact of gas constraints and high seasonal demand. The January price reduction is $35.5/MWh on average, followed by $4.1/MWh on average in December between 2028 to 2042. Outside the winter season, monthly prices remain relatively stable across both cases, with minimal differences observed during shoulder and summer months.

Figure 16: Annual Average NYISO Price

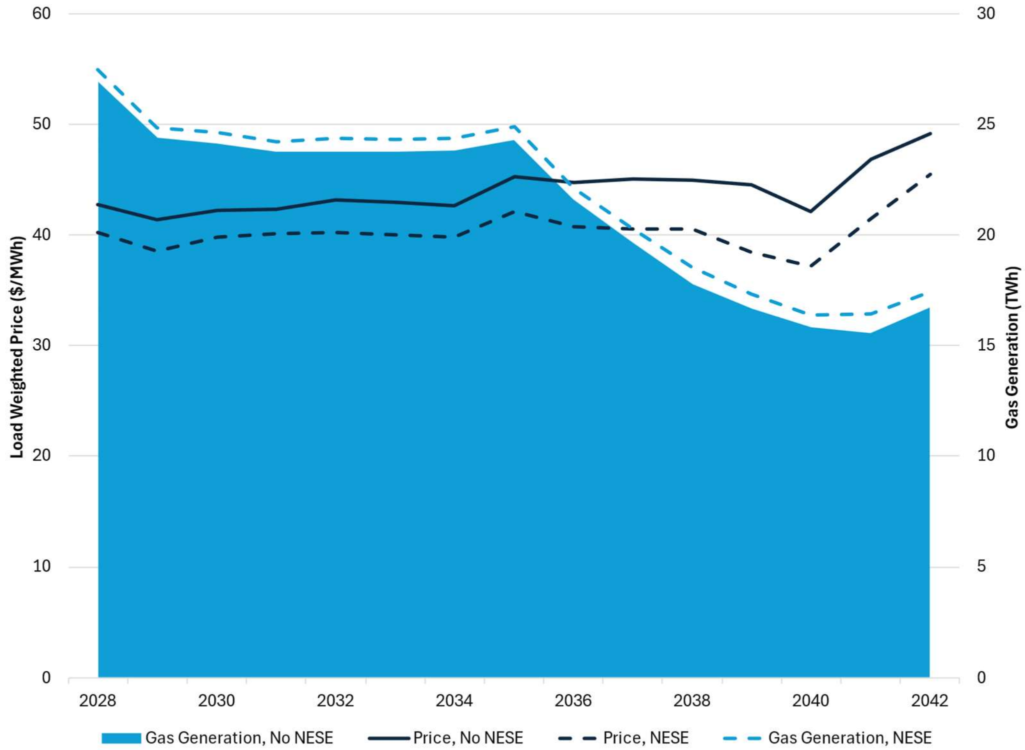
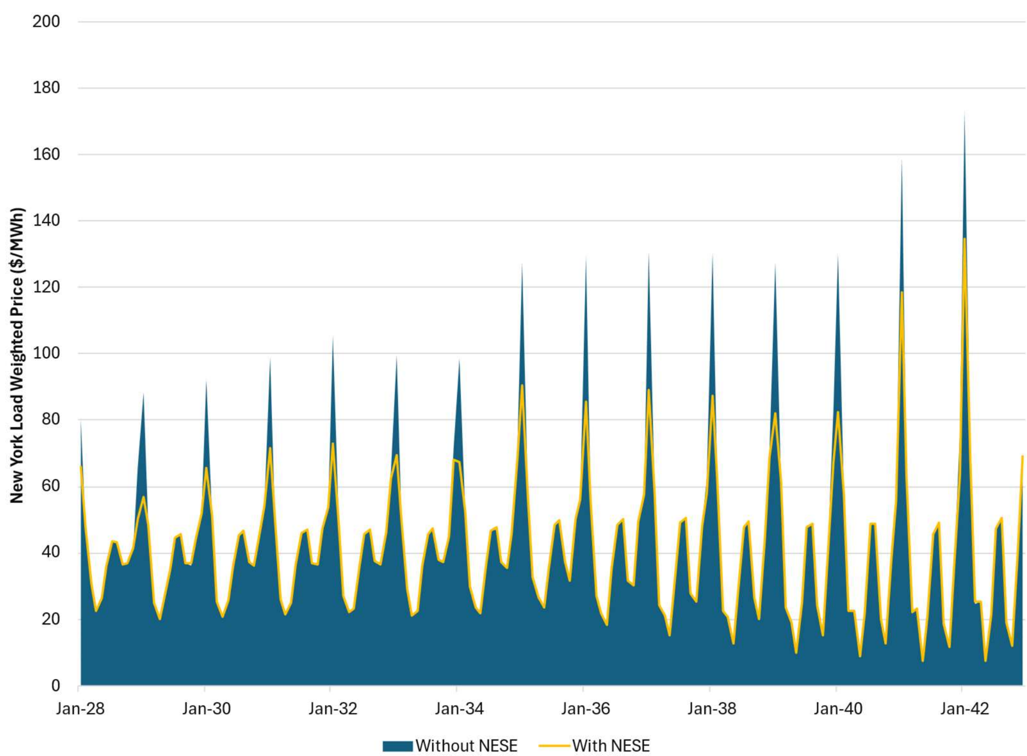


Figure 17: Monthly NYISO Price



Additional pipeline capacity from NESE reduces how often the daily gas constraint binds, and therefore reduces the need for oil switching. The changes to gas prices and daily gas constraints also lead to some small changes in storage cycling and the use of limited amount of other dispatchable resources in NYISO such as biomass.

Figure 18: Gas Constrained Days

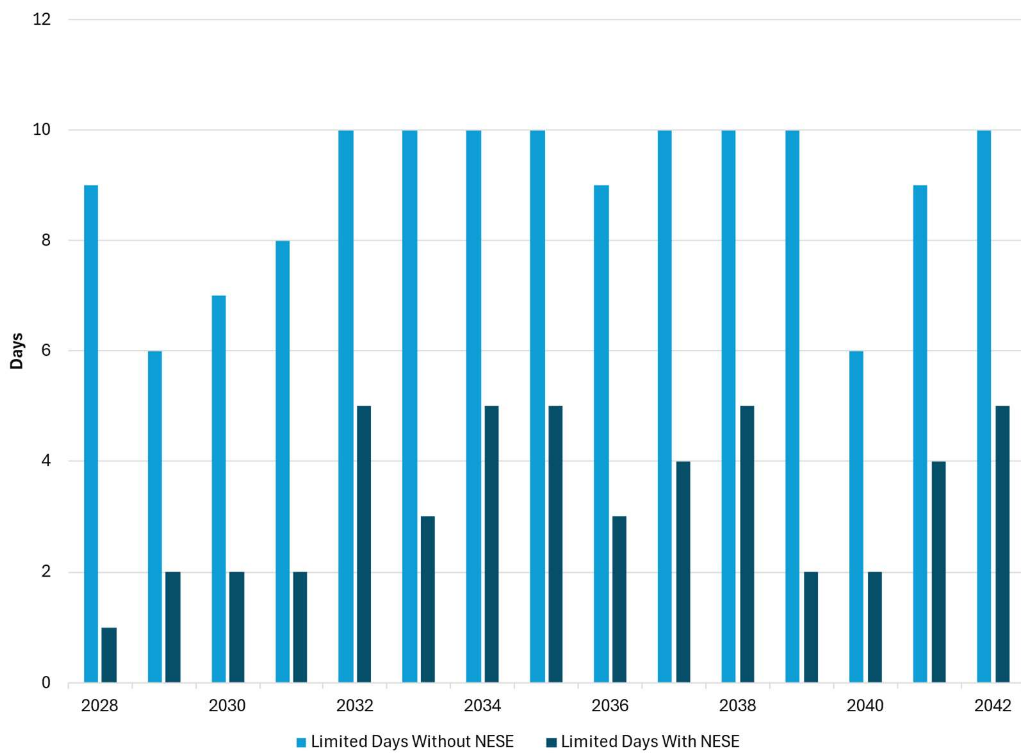
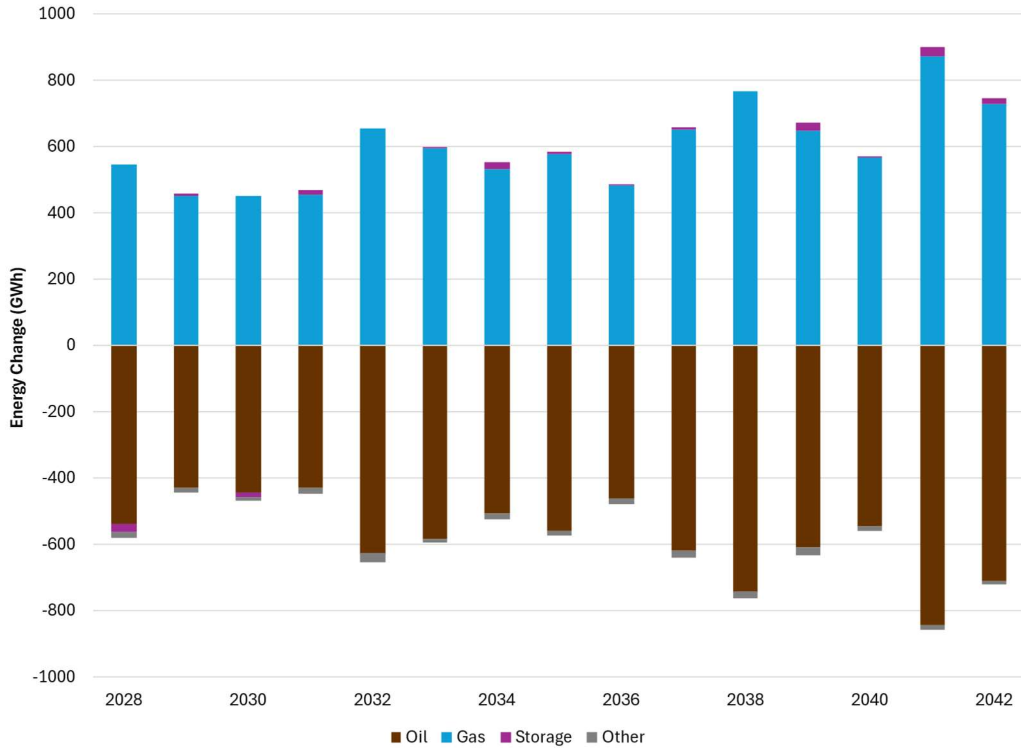


Figure 19: Change in Energy Generation between with and without NESE



Adding NESE does not displace clean energy generation, as wind and solar resources are price-takers, that is, zero-marginal cost resources generally do not set the NYISO energy clearing price. Both gas and oil-fired generators provide valuable flexibility to follow load net of renewable generation. The addition of NESE results in modest but measurable reductions in GHG emissions attributable to the electric sector, primarily due to displacement of oil-fired generation with natural gas. While oil generation represents a small fraction of the overall system mix, the addition of NESE reduces oil use by 85%. To quantify these benefits, we used annual changes in fossil fuel consumption between the base and NESE cases and applied the fuel-cycle CO_2-equivalent ("CO_2e") emission factors published by NYSERDA.[75]

These emission factors reflect full fuel-cycle emissions, including both combustion-related GHGs (CO_2, CH_4, and N_2O) and upstream out-of-state emissions associated with fuel extraction, production, and delivery to New York. This approach aligns with the accounting framework defined under CLCPA and is consistent with how New York measures progress toward statewide GHG reduction goals.

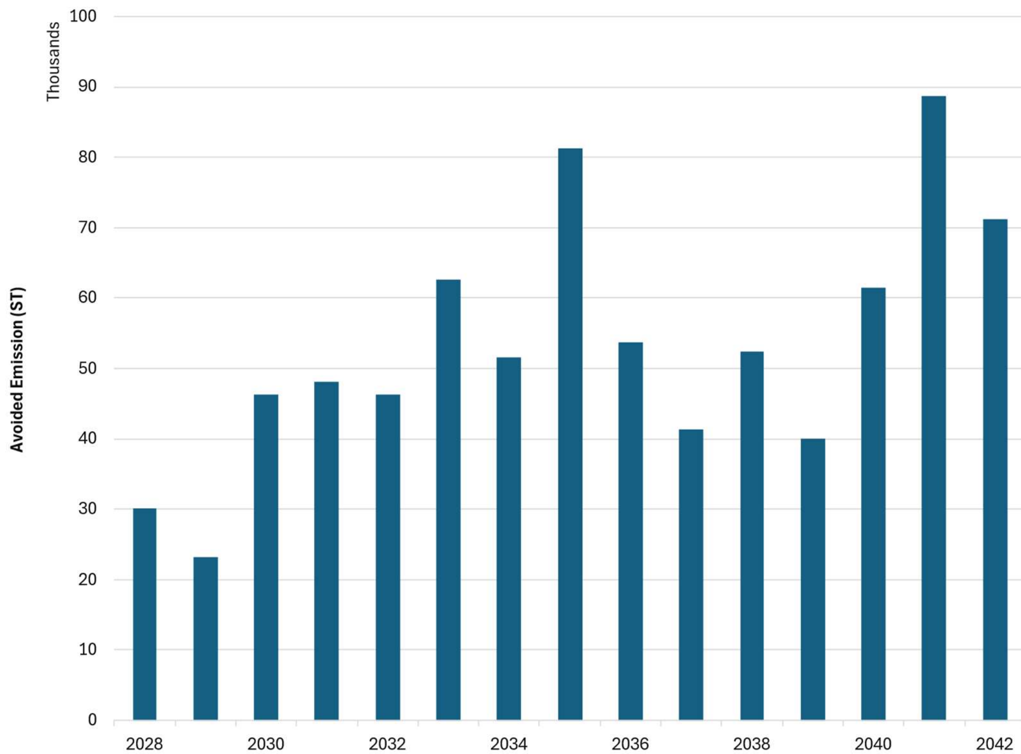
Based on this methodology, annual avoided GHG emissions from NESE range from approximately 23,200 to 88,800 short tons of CO_2e, depending on the level of oil displacement in each year.

[75] NYSERDA, Fossil and Biogenic Fuel Greenhouse Gas Emission Factors, Appendix A, page A-1
https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Energy-Analysis/22-23-Fossil-and-Biogenic-Fuel-Greenhouse-Gas-Emission-Factors.pdf

These reductions are greatest in years when oil generation is most prominent in the base case. These emissions reductions are modest and represent a 0.29% decrease from the No NESE case, as significant changes in oil and gas usage only occur on a handful of days.

Emission benefits were then monetized using the Social Cost of Carbon ("SCC") values from New York State's Value of Carbon guidance using 2% discount rate.[76] Avoided climate damages average $9.1million annually in nominal terms between 2028 to 2042, reflecting both the volume of avoided emissions and the escalating SCC over time. RGGI allowance costs, which are embedded in dispatch costs and energy market pricing, are netted out of the calculation.

Figure 20: Avoided Emissions



Reducing oil consumption for power generation also reduces criteria pollutant emissions such as sulfur dioxides and nitrous oxides. These emissions can contribute to adverse health outcomes.

[76] NYSDEC, 2023 Update, NYS Value of Carbon Guidance, Table A1, page 2
https://extapps.dec.ny.gov/docs/administration_pdf/vocapp23.pdf

3 Section 3: Mark-to-Market Assessment of Impact of Ratepayer Costs

3.1 Modeling Approach

Results of electric price modeling processed to determine the market value of electric load in each relevant zone for each month of the study period as the sum of the hourly products of zonal load (MWh) and hourly price ($/MWh). Hourly data for load and market value of load have been aggregated into calendar year metrics reflecting the peak winter period where NESE affects the wholesale electric market. The process has been repeated for the simulation runs for the base scenario and each sensitivity scenario with and without NESE. Differentials between the with and without NESE cases have been calculated for each season and year. Present values of the differentials over the study period have been calculated for total impact and divided by present value of load to determine a levelized energy price impact.

This approach considers only the impact of NESE on the wholesale cost of power for three discrete aggregated zones during the peak heating season. The three aggregated zones are Zones J-K, Zones F-G-H-I, and Zones A-E. The MTM impacts are then tallied each year for NYISO as a whole. Because NESE does not yield price benefits during the non-heating season, LAI reports the MTM benefit for the three months when the inclusion of NESE has a resultant impact on Transco Zone 6-NY, Iroquois Z2 and TETCO M3. The three months are January, February and December.[77]

MTM results are centered on the differential wholesale value year- over-year for a fifteen year study horizon, 2028 through 2042.[78]

3.2 Compiled Winter Season Results

Price benefits due to NESE are driven by two key dynamics: first, reduced gas pricing resulting in decreased gas generator bids on unconstrained days when gas is on the margin; and second, reduced number of days when gas is constrained and oil becomes the marginal resource.

The reduction in gas constrained days is the primary driver of the wholesale electric energy price benefits reported in this section. On days that are constrained in the without NESE case, generators switch to oil as the marginal resource. The resultant cost-to-load increases significantly. Additional gas supply from NESE allows generators to avoid switching to oil on some of those days, thereby reducing the electric market price significantly.

Cost-to-Load totals (products of load and zonal price by hour) are shown for each year for the “With NESE” and “Without NESE” cases in Figure. The annual differential cost between the “With NESE” and “Without NESE” cases is also shown. Cost-to-load in both cases rises as winter demand grows. In 2040, the balance of Offshore Wind manages to outpace winter peak, resulting in reduced total cost-to-load relative to the previous year. However, in 2041 and 2042 winter peak

[77] December reported on a CY basis rather than December through February. Such treatment has no bearing on the MTM results.

[78] The term governing NGrid’s Transportation Supply Agreement with Williams may be longer than 15 years, but is unknown at this time.

increases significantly and renewable additions are lower, resulting in an increase in cost-to-load across both cases.

Figure shows the annual peak winter month differential cost-to-load measures for each year and aggregated zone.

Figure 21: Winter Season Cost-to-Load by Case

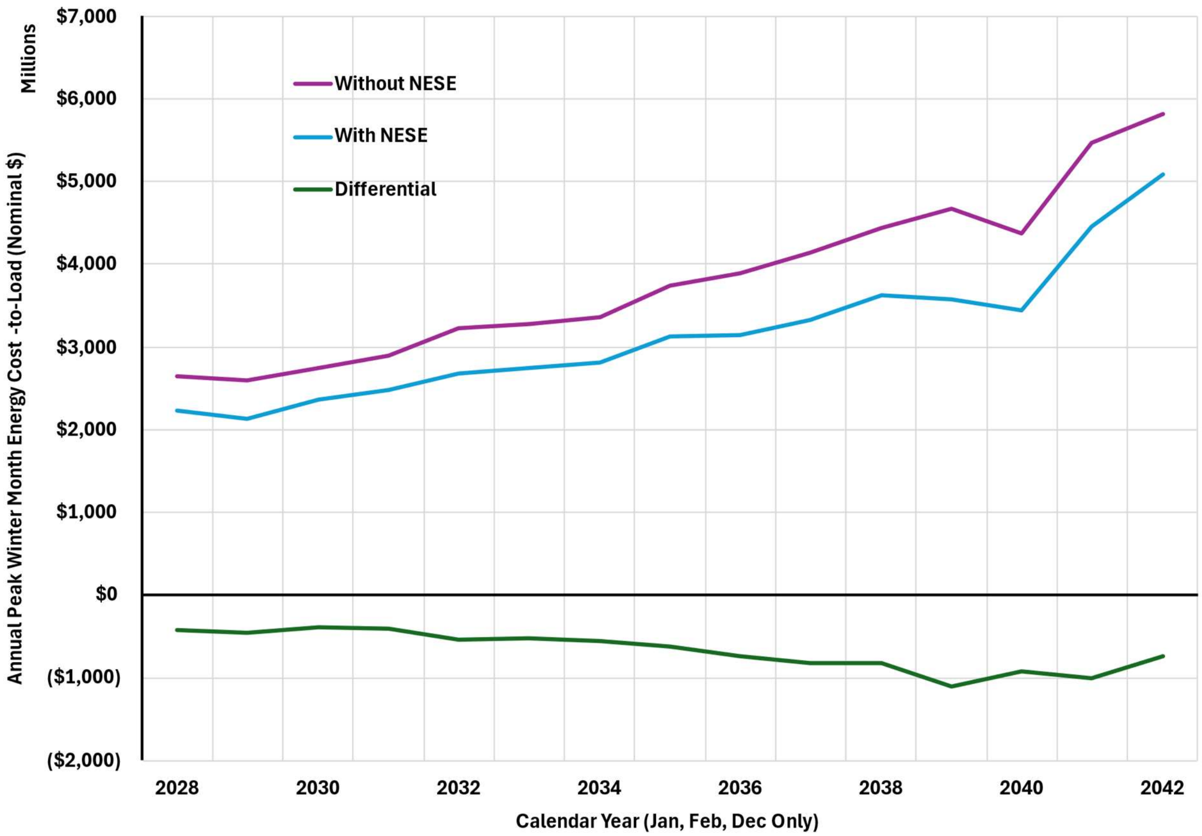
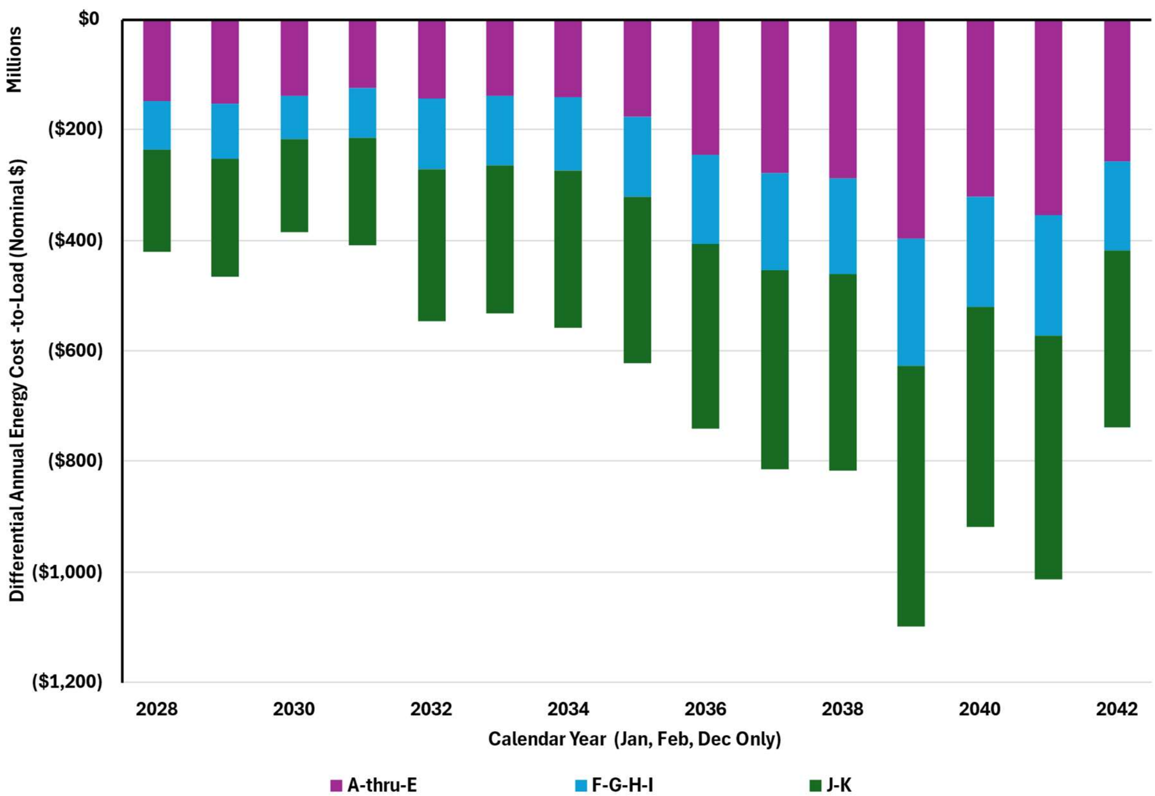


Figure shows the differential cost-to-load amounts broken out by aggregated zone for each year.

The MTM benefit of NESE in the electric market is steady through the mid-2030s due to a general balance between winter demand growth and onshore renewable growth across NYISO. However, during the period from 2035-2039, additional Offshore Wind generation works in concert with NESE. The additional Offshore Wind generation from 2035-2039 is not enough to reduce the number of gas constrained days in the without NESE case, but it does reduce gas burn enough to unlock additional days in the with NESE case. This dynamic is compounded by the fact that winter peak increases at a faster pace through the study horizon. From 2028 to 2029, winter peak only increases by 200 MW, while from 2038 to 2039, winter peak increases by 720 MW. By the end of the study horizon, winter peak is growing at a rate of 860 MW per year.

The values in Figure and Figure are nominal. Load growth and inflation are the main drivers of the increase in cost-to-load.

Figure 22: Winter Nominal Differential Cost-to-Load by Aggregated Zone

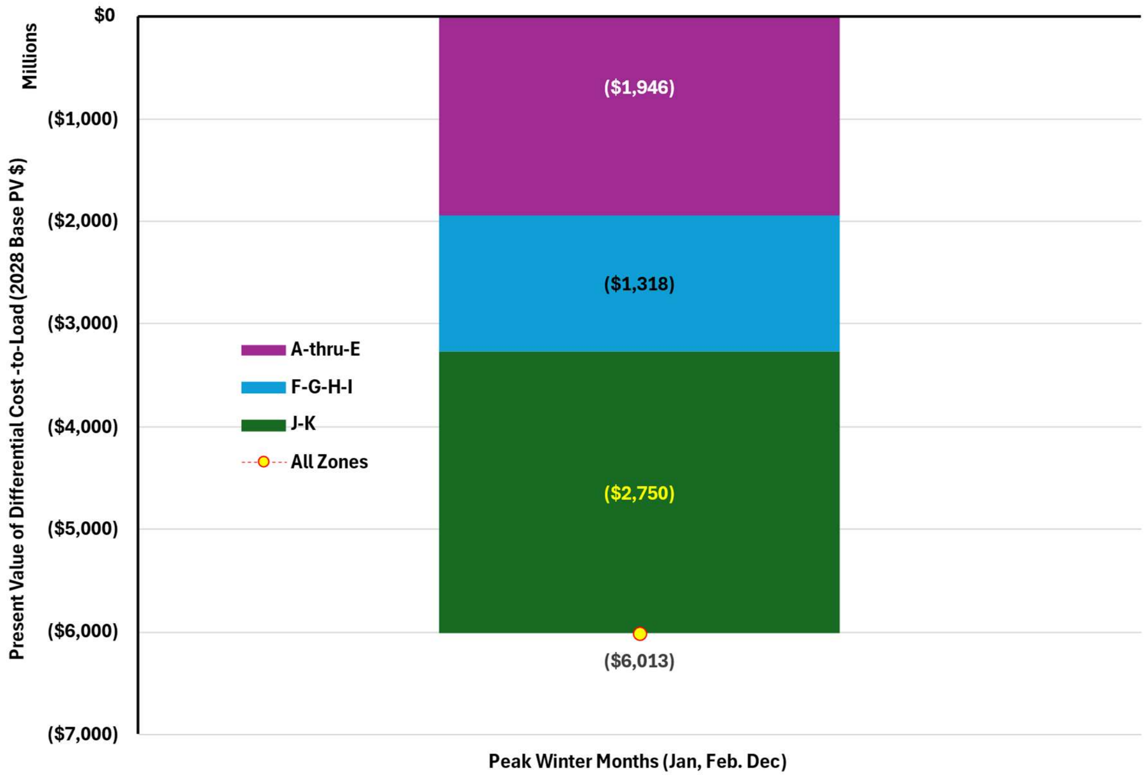


3.3 Present Value Results

LAI selected a nominal discount rate of 7.0% to present summations of costs and benefits over the 15-year study period on a present value ("PV") basis. The rate is representative of those used in many ratepayer-oriented analyses of policy and procurement options. Calendar year cash flows were discounted to the end of the first year of the NESE project, 2028.

PV results for the differential cost-to-load for NESE are summarized in Figure 23.

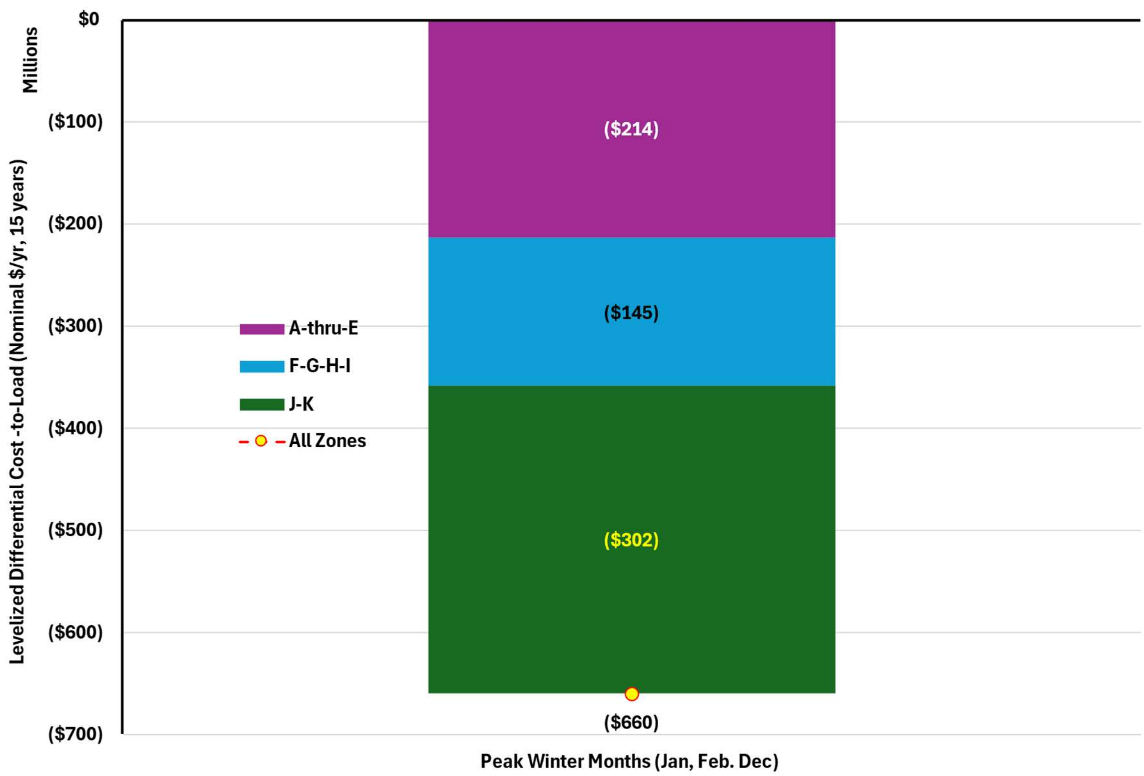
Figure 23: Present Value of Differential Cost-to-Load



3.4 Levelized and Unit(Price) Cost-to-Load Results

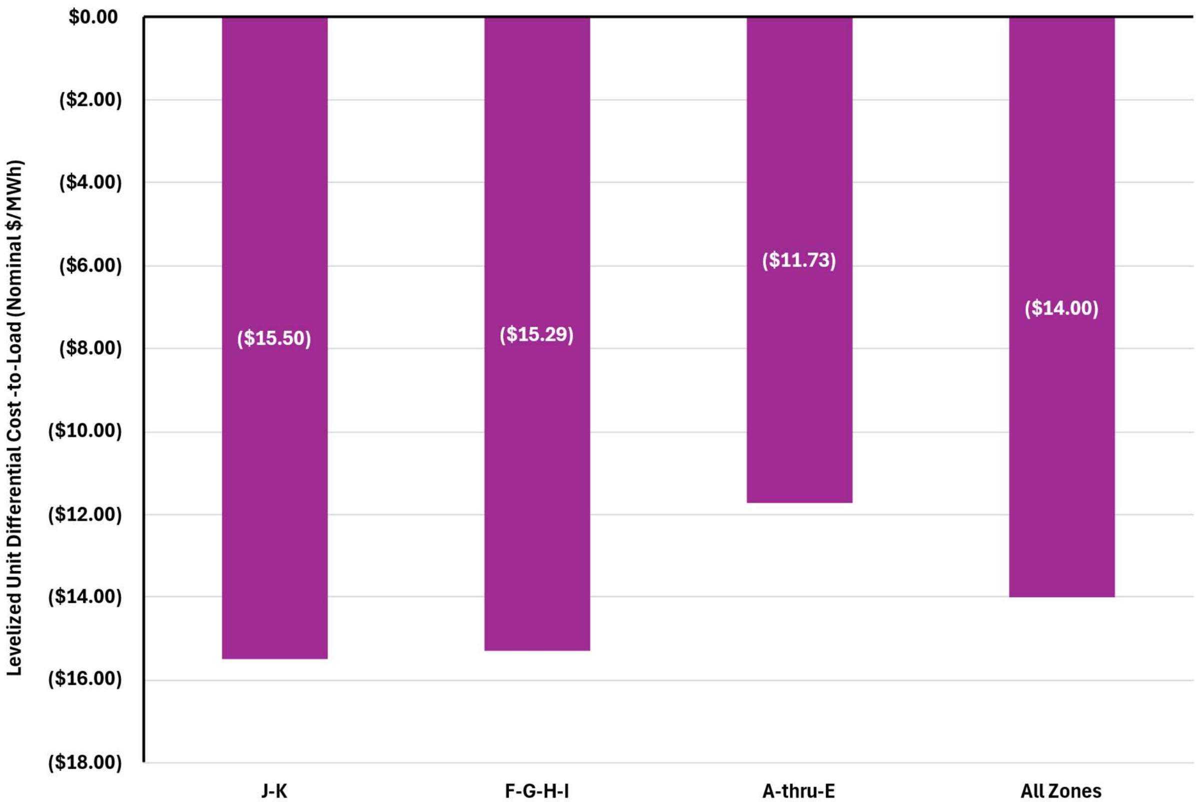
The cost-to-load effects of NESE can also be expressed on an equivalent level annual cost basis. Figure 24 shows the 15-year levelized nominal dollar equivalent of the string of annual cost differentials for each aggregated zone and for the state load as a whole. The Zone J-K aggregate sees a levelized annual benefit of $302 million for 15 years, while New York as a whole sees $660 million per year.

Figure 24: Levelized Annual Differential Cost-to-Load



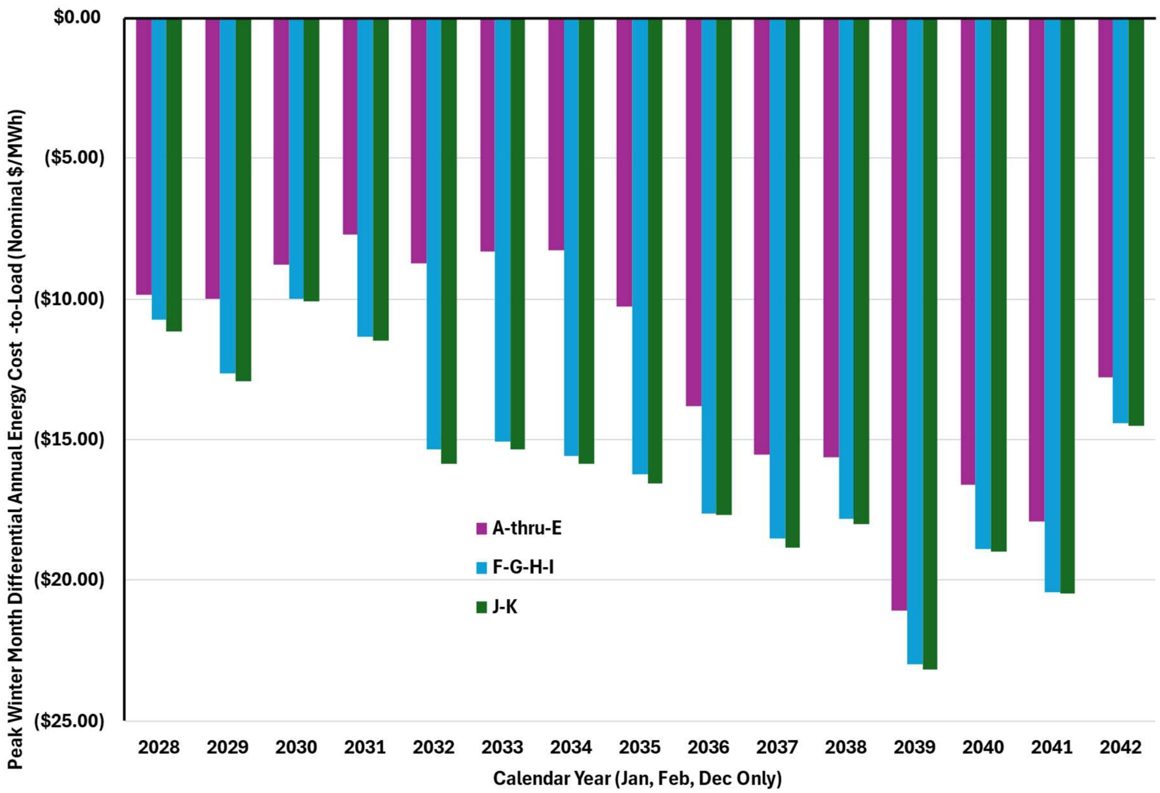
The PV benefit can also be expressed on a levelized $/MWh basis. In this case, the cost-to-load differential PV is divided by the PV of the corresponding load. Since we address the peak winter months only, the denominator is the "present value" of the load for the corresponding months only. This is not related to an average price impact over a full year, but only the price for those specific months. Results are shown in Figure 25 for each aggregated zone.

Figure 25: Levelized Unit Differential Cost-to-Load



Cost-to-load impacts are most acute in J-K as gas-fired generation in J-K is most affected by the reductions in delivered gas prices that NESE creates. Zones F-I have a strong unit differential as well because the primary driver of congestion is the Central-East Group interface between E and F, G. The UPNY-SENY interface also drives some congestion, but F does not separate from G-K nearly as much as A-E. Averages of winter-month cost-to-load differentials can also be expressed in nominal dollars by year. Figure 26**Error! Reference source not found.** shows these results by aggregated zone and calendar year. The gap between unit cost to load in A-E and G-K grows with the addition of land-based renewables from 2028 to 2034 and then shrinks with the addition of offshore wind downstate from 2035 through 2040.

Figure 26: Average Annual Differential Cost-to-Load (Winter Peak Months)



4 Section 4: NGrid's evaluation of NESE is driven by its gas reliability benefits

In 2019 NGrid announced that it would stop connecting new gas customers because of a forecast shortfall in the supply of natural gas needed to meet growing demand in New York City and Long Island due to Transco not receiving the necessary water quality certification for the NESE Project from NYDEC. As part of a settlement NGrid agreed to lift the service restrictions and implement various short-term measures to continue serving new customers. The measures enabling the lifting of these restrictions included the addition of CNG and short-term supply contracts, i.e., "citygate peaking."[79] From 2020 through 2022, NGrid issued four Gas Long-Term Capacity Reports analyzing natural gas capacity constraints and available options for meeting long-term demand in the local distribution systems operated by KEDNY and KEDLI in Brooklyn, Queens, Staten Island and Long Island. The basis for lifting these restrictions was NGrid's ability to reliably meet system requirements to serve RCI customers. It was not based on an analysis of potential wholesale electric energy price benefits explained by new gas supply into New York City and Long Island.

NGrid's February 2020 Long-Term Capacity Report presented three approaches to close the capacity deficit in order to end the moratorium on new gas hook-ups. The options included: first, the addition of large infrastructure; second, a combination of distributed infrastructure solutions with incremental no-infrastructure solutions; and third , reliance on no-infrastructure solutions.[80] In May 2020, NGrid published its Gas Long-Term Capacity Supplemental Report which recommended two solutions: new pipeline infrastructure, namely NESE, or a portfolio of targeted distributed infrastructure and non-gas infrastructure options. Shortly thereafter, NYDEC denied required NESE permits, thereby dimming NESE's prospects for commercial success. NGrid has since pursued the other recommended solution—identified in the Supplemental Report as "Option A: LNG Vaporization and Iroquois Gas Transmission System, L.P. enhancements to existing infrastructure, combined with incremental energy efficiency and demand response."[81]

Since 2020, NGrid's response to local constraints in New York City and Long Island has included the development of additional CNG facilities at strategic locations that are vulnerable to minimum pressure constraints during cold snaps. In close consultation with DPS Staff and New York State Energy Research and Development Authority ("NYSERDA"), NGrid also expanded its demand response programs. NGrid has also entered into a precedent agreement with Iroquois for ExC project. NGrid's entitlement on ExC is one-half of the 125 MDth/d of incremental capacity deliverable into Long Island and New York City at South Commack and Hunts Point, respectively.[82]

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[79] National Grid Long-term Plan pp. 57-58, 61.

[80] Microsoft Word - CM7918 LTCR_FINAL WORD 2.21.20.docx

[81] Natural Gas Long-Term Capacity – Second Supplemental Report, June 2021, p. 5.

https://millawesome.s3.amazonaws.com/NationalGrid-LTC-Longform-Report-Digital_ADA.pdf

[82] National Grid Long-Term Plan, pp. 83-84.

Finally, NGrid entered into commercial agreements to support the proposed addition of Vaporizers 13 and 14 at the Greenpoint LNG facility.[83]

As a result of the longer development timelines and difficulties permitting pipeline and LNG infrastructure, NGrid has become increasingly reliant on CNG to meet demand on the coldest days. As discussed in Section 1.2.1, NGrid has the opportunity to significantly reduce its reliance on CNG when NESE begins operation.

4.1 NESE Will Reduce NGrid's Reliance on CNG

Firm pipeline capacity is the backbone of both gas-grid and electric-grid reliability. Throughout the heating season, pipeline deliverability does not present operational risks unless there is a *force majeure* event, a rare occurrence on the major trunk pipelines serving the NYFS. As NGrid and the DPS have noted, reliance on CNG to meet Design Day conditions is subject to many logistical challenges associated with trailer availability, replenishment and driving during inclement weather conditions.[84]

In January 2025, LAI published the Northeast Gas/Electric System Study on behalf of NPCC. This study was sponsored by NPCC, NERC, NYISO, ISO-NE and the Northeast Gas Association. Working in close consultation with NGrid and ConEd, LAI noted:

> In the downstate market on the New York Facilities System, the existing gas infrastructure is unable to meet demand for most generators during a cold snap. Operating risk in New York City and Long Island is already mitigated because scheduled generation mostly operates on oil. A few plants have firm transportation entitlements, but they represent a small fraction of the total thermal nameplate. Other mitigation is realizable through the activation of generator auto-swap capability. Recent experience with Winter Storm Elliot reveals the fragility of the New York Facilities System when upstream supply is materially reduced.[85]

Hydraulic modeling conducted by NGrid and ConEd addressed gas-grid resilience under an array of gas-side contingencies affecting on-island and in-city deliverability. Integral to NGrid's ability to meet peak day send-out today and for the foreseeable future, absent a more robust solution such as NESE, is its reliance on CNG.

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[83] Greenpoint Vaporizers 13 and 14 Long Term Capacity Project Report, August 29, 2022
https://greenpointenergycenter.com/wp-content/uploads/2022/12/Long-Term-Capacity-Project-Report-.pdf

[84] PA Report, page 24

[85] NPCC Northeast Gas/Electric System Study, Public Version, pg. 5, January 21, 2025. Available at: https://cdn.prod.website-files.com/67229043316834b1a60feba3/678fee912264907c381a0f68_NPCC%20Northeast%20Gas%20Electric%20System%20Study.pdf.

4.2 Background on National Grid's CNG Use

NGrid currently operates six CNG injection sites, five of which are downstate on KEDLI's system, and two LNG facilities, both of which are downstate.[86] The CNG and LNG supplemental peaking facilities are an integral part of NGrid's supply portfolio and therefore critical in meeting Design Day sendout, particularly the highest demand hour within the Design Day. Beginning in 2016/17, NGrid began utilizing CNG injection services at one location in Nassau County after it was determined that the gas supply and accompanying pressure would be inadequate to serve customer requirements on a Design Day.[87] Since the winter of 2016/17 NGrid has added CNG injection capability at four additional sites on Long Island to meet current and forecasted peak day requirements. Three of the five downstate CNG injection sites are in Nassau County and two in Suffolk County. From an operational dispatch perspective, each NGrid CNG facility is designed to inject natural gas into the local system during the morning and evening periods for a total of eight hours on peak days.[88]

The CNG sites provide critical supply and pressure support and are needed to provide service to existing customers under extreme cold or outage contingencies. In the downstate market, the need is acute during peak hourly conditions, less so during non-peak hours. While there is no absolute temperature trigger warranting CNG injections in the local system, operating history shows CNG dispatch when temperatures fall below 10°F to 15°F.[89] From an operational standpoint, NGrid can balance local pressure requirements under harsh temperature conditions through mobilization of a flexible fleet of CNG trailers to existing CNG sites that can effectively remedy pressure decay. However, the principal drawback when local operating constraints arise is reliance on trucks that often travel long distances under hazardous driving conditions to unload product just-in-time. LAI believes that NGrid does not have other options to ensure safe and reliable performance in the isolated pockets where the CNG injection sites are located. NGrid typically dispatches CNG trucks to injection sites when temperatures are 10°F or less. CNG supply contracts typically require 24-48 hours' notice for trailer delivery.[90] Changing out the trailers takes up to eight hours per site. Therefore, each site is limited to two injection cycles of four hours plus two trailer replacement cycles of eight hours within a 24-hour period.[91]

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[86] NGrid also uses CNG in upstate New York, but to a lesser extent than in downstate New York on a peak-hour basis. There is one existing CNG injection site on the Niagara Mohawk system ("NiMo"), in Moreau, NY. A second NiMo injection site is presently scheduled to be available for Winter 2025/26. NGrid has indicated that it does not intend to build additional CNG injection sites in the NiMo service territory after this second site is commercialized.

[87] A Design Day is the coldest winter day that brings the highest daily customer demand for which the Company plans. A Peak Day is either what is actually experienced as coldest day/highest load, or generically connotes a "cold day."

[88] Final Gas System Long-Term Plan, National Grid, filed March 7, 2025 in NY PSC Case No. 24-G-0248 (2025 LTP), page 65. Available at: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={A0787295-0000-C326-8242-99A89A2A32D0}.

[89] 2025 LTP, page xxi.

[90] 2025 LTP, page 59.

[91] 2025 LTP, page 59.

Table 7 summarizes NGrid's downstate Winter 2025/26 Design Day gas supply sources, with CNG representing 1.8% of supply. While CNG makes a relatively small contribution to the supply mix, it is required to ensure safe and reliable operations when temperatures are extremely low, or outage contingencies occur. The NGrid March 2025 report noted that while the daily CNG supply for all sites represents approximately 3% of the Design Day supply, it is "critical because it accounts for approximately 7% of the peak hour supply."[92]

Table 7. Downstate NY Winter 2025/26 Design Day Supply Sources[93]

Supply Source	Design Day Capacity	
	(MDth/d)	% of Total
Firm Pipeline and Storage	2,390	79.9%
LNG	395	13.2%
City Gate Peaking	98	3.3%
CNG	53	1.8%
Cogen Peaking Contracts	56	1.9%
RNG	<1	
Total	2,992	100.0%

Total CNG energy storage at individual sites is inherently limited. CNG has a much lower compressibility ratio (1:100) than LNG (1:600), in other words, one-sixth the available compression to boost system requirements under duress.[94] The lower compressibility ratio means that CNG furnishes much less pressure and flow when dispatched relative to NGrid's scheduling of vaporized LNG at the satellite tanks. Substituting CNG for the capacity of Greenpoint LNG would require 794 trucks per day, or approximately 4,500 trucks to equal the full LNG storage capacity.[95] The scale of this substitution underlines the necessity of retaining the existing downstate LNG facilities.

Unlike LNG at Greenpoint and Holtsville where all product is manufactured on-site during the non-heating season when gas prices are stable and usually much lower cost than during the peak heating season, CNG supply is exposed to daily winter market price volatility.[96] CNG refill happens when gas prices are usually the highest throughout the peak heating season, December through February. While hedging arrangements are available to NGrid to lock in pricing prior to the heating season, actual CNG dispatch is dependent on heating degree days, which are difficult to

[92] 2025 LTP, page 65.

[93] Data drawn from PA Consulting's Final Report on National Grid's Final Long Term Gas Plan, filed on May 16, 2025 in NY PSC Case No. 24-G-0248 ("PA Report"), page 18. CNG's supply contribution will reach approximately 3% in 2026-2027 when the CNG total is 88 MDth/d. Available at: https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={90E2E896-0000-C026-B180-5DFEC0456948}.

[94] 2025 LTP, Page 125.

[95] 1,680,000 Dth at Greenpoint divided by CNG truck capacity of approximately 367 Dth/day.

[96] 2025 LTP, pages 122-123.

predict accurately going into the peak heating season. Therefore we have ignored NGrid's ability to mitigate CNG price risk through risk management.

4.3 NGRID Remains Dependent on CNG for Peak-Day Sendout on LI and NYC

In LAI's opinion, there is no feasible alternative to CNG in the *current* operating environment. NGrid has observed that its service territories are located in areas where incremental gas sources are not readily available. There is minimal unsubscribed interstate gas pipeline capacity with deliverability to NGrid distribution systems. Iroquois' ExC Project is designed to add 125 MDth/d to Long Island and New York City by "leveraging" its underutilized Zone 1 capacity from Waddington to Wright, NY. The ExC Project would alleviate but not eliminate local constraints in Suffolk County and in New York City at the Hunts Point terminus in the Bronx. In addition, Williams' NESE Project is designed to add 400 MDth/d at the Floyd Bennett Field in the Rockaways, thereby increasing both pressure and flow into a congested part of the NYFS. On a Design Day, hydraulic modeling indicates CNG flows into NYC mitigates pressure and supply constraints. Both ExC and NESE would reduce NGrid's reliance on CNG, but not eliminate it due to localized pressure considerations.

In February 2024, PSC Staff noted that "the existing assets relied upon by Con Edison and National Grid have little to no headroom for Design Day growth and these utilities are already overly relying on CNG – an inherently unreliable source of gas during the cold winter months."[97] NGrid agrees that incremental CNG beyond what is currently in progress is not a viable option in Downstate NY.[98]

NGrid reports that the boost in operating pressure and flow into the NYFS ascribable to NESE will significantly reduce NGrid's reliance on CNG. Three of the existing downstate CNG injection sites would no longer be needed, subject to annual forecasts and hydraulic modeling. NGrid's operational experts have represented that this adjustment to their operations would not jeopardize NGrid's ability to maintain safe and reliable local operation on Long Island and New York City. The resultant avoided supply cost for the three sites would amount to roughly $50 million per year. In addition to the avoided supply cost per site, it costs NGrid approximately $1.7 million annually to operate each CNG site. Hence, the sum of the avoided supply and operating cost amounts to about $55 million per year for the three sites.

If NESE is added to NGrid's supply portfolio, NGrid would still need to periodically assess its supplemental peaking needs over a multi-year time horizon. NGrid's periodic review would likely focus on changes in the supply portfolio, demand forecast, infrastructure, and operational needs in the event multi-year CNG contracts are once again needed in response to growth pressures on

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[97] DPS letter to DEC, Feb 26, 2024, "DEC Application IDs: 3-1326-00211/00001 (Dover Compressor Station); 4-1922-00049/00004 (Athens Compressor Station)", page 8. Available at: https://dec.ny.gov/sites/default/files/2024-02/dpsresponseletter.pdf.

[98] 2025 LTP, page 12.

Long Island and NYC.[99] NGrid will look for opportunities to downsize once verifiable downward trends in demand are consistently observed.

NGrid reducing its reliance on CNG would also be consistent with its neighboring utility, ConEd. On November 17, 2023, ConEd informed the NYPSC that:

> "As of November 16, 2023, a combination of lower peak demand forecast and increased supply resulting from the Tennessee East 300 Project coming online resolves the Westchester supply-demand gap, eliminates the need for any delivered services in later years, including near-term elimination of the need for compressed natural gas to support the moratorium region's peak demand, and generally supports reliability of gas service throughout our service territory."[100]

ConEd's realization of the Tennessee East 300 Project to remedy pressure problems in Westchester is comparable to the operating benefits NGrid will realize through NESE.

4.4 Value of Avoided Emissions

If 17,600 Dth/d of CNG sendout, and the associated 48 daily truck round-trips, are avoided at each of the three CNG injection sites that would no longer be needed following the addition of NESE, approximately 36 short tons of CO_2 emissions would be avoided per day per site. Using the most-recently published EPA value for the social cost of carbon of $190/metric ton (2020 dollars) using a 2% discount rate, the value of these avoided emissions would be approximately $6,200 (2020 dollars) per site per day of operation that is not needed.[101] The EPA is currently revisiting the social cost of carbon following President Trump's "Unleashing American Energy" Executive Order.[102]

The NYDEC recently published a report on the social cost of carbon value in August 2023, with a central value of $121/metric ton (2020 dollars).[103] This would value the avoided emissions at approximately $4,000 (2020 dollars) per site per day.

4.5 Conclusions

LAI's review of NGrid's long term resource plan coupled with our experience in New York on diverse matters pertaining to gas/electric resilience results in the following conclusions:

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[99] Information received from National Grid.

[100] "Re: Cases 16-G-0061,17-G-0606, 23-G-0147, Notice Ending Temporary Gas Service Moratorium," Consolidated Edison; November 17, 2023 (https://www.buildersinstitute.org/wp-content/uploads/2023/11/7058DE8B-0000-C111-B833-FB86958E0261.pdf)

[101] https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf

[102] Available at: https://www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/

[103] Available at: https://extapps.dec.ny.gov/docs/administration_pdf/vocguide23final.pdf.

- NESE will substantially bolster pressure and flow into the NYFS, which will enable NGrid to reduce reliance on CNG going-forward without impairing local system safety and reliability;
- NESE will provide NGrid the opportunity to avoid significant annual fuel supply and non-fuel operating costs at three CNG sites, providing ratepayer benefits in the amount of about $55 million per year in total;
- NESE will strengthen NGrid's ability to lessen CNG reliance on Long Island and New York City, which will result in material carbon reduction benefits due to avoided truck haulage (largely diesel fuel) from remote locations to KEDLI and KEDNY;
- Reducing NGrid reliance on CNG will reduce congestion on already busy highways into and across Long Island and New York City during often hazardous driving conditions, while reducing the likelihood of potential accidents;
- NGrid may wish to continue exploring safe, secure and affordable solutions to eliminate CNG reliance on Long Island and New York City, including conventional pipeline solutions; and,
- The aforementioned benefits are second-order in nature and are therefore not intended to represent the main rationale for NESE.

5 Section 5: Conclusions

Primary conclusions are four-fold, as follows:

1. The addition of the 400 MDth/d NESE Project will likely yield substantial and robust wholesale electric energy savings over the 15-year period. Over the first five years, the expected wholesale energy savings in New York City and Long Island average $207 million per year. Across NYISO, including downstate New York, the average savings during the first five years is expected to be $446 million per year. Over the full 15-year period, levelized nominal statewide savings is $660 million per year. Of this amount, the levelized savings in New York City and Long Island is $302 million (46%). Levelized savings in the Capital District and Lower Hudson Valley is $145 million (22%). Levelized nominal savings in Upstate New York is expected to be $214 million (32%). Actual savings for each of three regions may be higher or lower than the derived price impact.

2. The NESE addition results in power sector GHG emission reductions ranging from 23,200 to 88,800 short tons of CO_2e. The avoided climate damages average $9.1 million annually from 2028 to 2042.

3. The addition of the NESE Project will strengthen NGrid's ability to meet peak-day sendout requirements in New York City and Long Island under cold temperature conditions and/or outage contingencies along the supply chain from the Marcellus producing basin to downstate New York. By lessening congestion at key aggregation points in New Jersey, NESE will relieve price pressure on leading gas price indices of relevance in both gas and power markets in downstate New York, which confers price benefits throughout New York State over the 15-year period. By bolstering pressure at the Floyd Bennett receipt point on the NYFS, NGrid will significantly reduce its reliance on CNG facilities during cold snaps, in particular, the peak hour when NGrid is reliant on CNG. The avoided cost of reduced CNG reliance attributable to NESE is $55 million per year. Reduced reliance on CNG going-forward will not impair local system safety and reliability in New York City and Long Island.

4. The addition of NESE constitutes a strategic operational hedge in the downstate market that will help preserve NGrid's operational flexibility and obligation to serve over the long-term.