

Natural Gas Demand Forecast through 2032 and Natural Gas Topology Tool

PREPARED FOR ISO NEW ENGLAND



Michael Sloan
Managing Director
ICF Advisory Services
703-218-2758
Michael.Sloan@ICF.com

Andrew Griffith
Manager
ICF Advisory Services
703-272-6749
Andrew.Griffith@ICF.com

Anant Garg
Consultant
ICF Advisory Services
Anant.Garg@ICF.com

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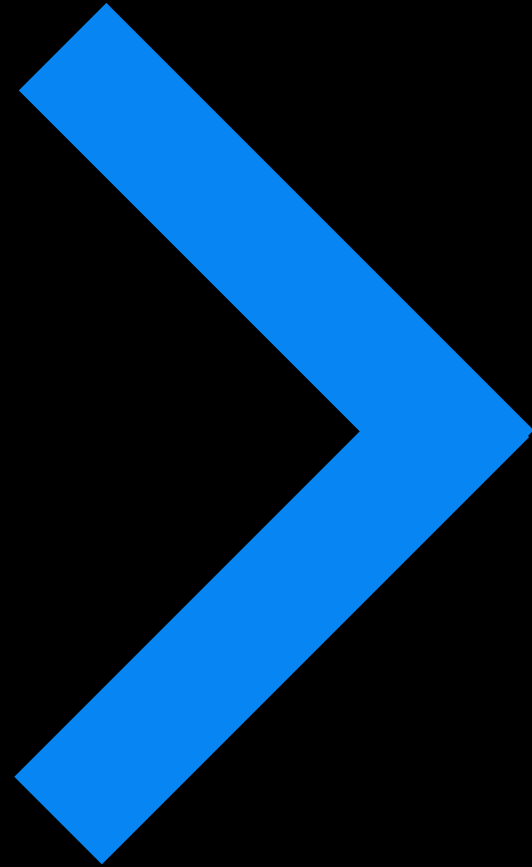
- In 2022, ISO New England (ISO-NE) retained ICF Resources, LLC to perform updates to prior work that was done for ISO-NE from 2014 to 2019. These updates concern the performance of several types of natural gas demand and supply in New England.
- Over the same time period, ICF performed numerous analyses of the New England natural gas and power markets for power generation facilities and utilities.
- ICF provided ISO New England (ISO-NE) with three deliverables:
 - A revised 10-year forecast of New England's natural gas utility demand.
 - A revised 10-year forecast of the Canadian Maritime Provinces' natural gas demand by sector.
 - An updated ICF Natural Gas Topology Tool (NGTT), which includes the following based on the revised natural gas demand forecast and most recent historical market data.
- This presentation provides a summary of those deliverables.

→ Introduction

- The ICF forecasts for annual, winter peak day, and design day natural gas demand in New England and the Canadian Maritimes provinces are used as inputs for two tools being used in the Resource Capacity Accreditation (RCA) process:
 - The ICF Natural Gas Topology Tool (NGTT), which models natural gas supply and demand in New England
 - The Levitan & Associates LNG import model
- ICF forecasted demand for the next ten years however only the forecast for the next four years is being used in the RCA process

→ ICF and the Resource Capacity Accreditation (RCA)

New England Demand



- Historical LDC annual demand is based on survey data collected by the EIA Form 176 – “Annual Report of Natural and Supplemental Gas Supply and Disposition”.
 - The most recent year of historical annual demand data provided by EIA-176 is for 2020. The 2020 data was released in October 2021.
- For the forecast, ICF reviewed the public utility/service commission (PUC/PSC) websites for each of the six New England states to locate the most recently filed Integrated Resource Plans (IRPs) for each utility.
 - The IRPs provide projections for both annual gas demand and peak winter day (design day) gas demand for the utility’s firm customers.
 - The LDC projections represent projected net growth in demand, which includes the impacts of energy efficiency and conservation programs.
 - Most of the IRP filings project demand through 2025. For the long-term forecast (through 2032), ICF has assumed that demand growth rates decelerate after 2025, as the pool of potential new customers declines.
 - The large LDCs that have filed IRPs make up over 90% of New England’s total firm LDC gas demand.
 - Small municipal gas utilities and small, privately held utilities in Maine are not required to file comprehensive IRPs. For the utilities with no IRPs, ICF has assumed that demand grows at the average growth rate of other LDCs in the same state.

→ Methodology

| State | LDC | Year Filed | Forecast Years in IRP | Annual Demand in 2022 (BBtu) | As % of New England Total Demand |
|-------|---|------------|--------------------------------|------------------------------|----------------------------------|
| CT | CT Natural Gas Corp. | 2020 | 2021-2025 | 39,014 | 7.5% |
| CT | Norwich (City of) | n/a | n/a - based on CT avg | 1,060 | 0.2% |
| CT | Southern Connecticut Gas Co. | 2020 | 2021-2025 | 35,241 | 6.8% |
| CT | Yankee Gas Services Co. | 2020 | 2021-2025 | 57,963 | 11.2% |
| MA | Berkshire Gas Co. | 2021 | 2020-2024 | 7,490 | 1.4% |
| MA | Blackstone Gas Co | 2019 | 2018-2023 | 221 | 0.0% |
| MA | Columbia Gas of Massachusetts (Bay State) | 2021 | 2020-2024 | 47,729 | 9.2% |
| MA | Fitchburg Gas & Electric Light | 2021 | 2021-2025 | 2,579 | 0.5% |
| MA | Holyoke Gas & Electric (City of) | n/a | n/a - based on MA avg | 2,168 | 0.4% |
| MA | Liberty Utilities (New England Gas Company) | 2020 | 2020-2024 | 6,547 | 1.3% |
| MA | Middleborough (Town of) | n/a | n/a - based on MA avg | 1,038 | 0.2% |
| MA | National Grid MA | 2021 | 2021-2025 | 162,030 | 31.2% |
| MA | NSTAR Gas Co. | 2021 | 2020-2024 | 52,189 | 10.1% |
| MA | Wakefield Municipal Gas Light | n/a | n/a - based on MA avg | 633 | 0.1% |
| MA | Westfield (City of) | n/a | n/a - based on MA avg | 1,679 | 0.3% |
| ME | Bangor Gas Co. LLC | n/a | n/a - based on ME avg | 5,287 | 1.0% |
| ME | Maine Natural Gas | n/a | n/a - based on ME avg | 2,381 | 0.5% |
| ME | Northern Utilities Inc. | 2019 | 2019-2023 | 11,926 | 2.3% |
| ME | Summit Natural Gas | n/a | n/a - based on ME avg | 4,408 | 0.8% |
| NH | EnergyNorth Natural Gas Inc. | 2019 | 2018-2038 | 16,585 | 3.2% |
| NH | Northern Utilities Inc. | 2019 | 2019-2023 | 9,372 | 1.8% |
| RI | Narragansett Electric Co. | 2021 | 2021-2025 | 37,325 | 7.2% |
| VT | Vermont Gas Systems, Inc. | n/a | n/a - based on New England avg | 13,850 | 2.7% |
| | Total* | | | 518,718 | 100.0% |

* "Total" may not equal sum due to rounding

→ Gas LDCs Included in the 10-Year Forecast

- Under normal weather conditions, annual LDC natural gas demand was expected to be 518,718 BBtu in 2022, and 578,273 BBtu by 2032.
 - Over the entire 10-year period, the aggregate growth rate averages 1.1%.
 - Growth is faster in the near-term (through 2020-2025) and is then assumed to decelerate.
- The LDC with the highest projected growth rate is Liberty Utilities (Energy North – NH), with growth of 3.1% per year through 2022-2027 and 1.7% from 2027-2032.
- New Hampshire is the fastest growing state with annual gas load projected to grow by nearly 2.4% in the near-term (2022-2027) and 1.3% in the long-term (2027-2032).
- New England annual gas demand is also driven by the National Grid & NSTAR Utilities in Massachusetts.
 - For National Grid, demand is driven by increases in send-out to Boston, Essex, Lowell, and Cape Cod for 2021 – 2025 in the new IRP Filings.

→ Annual Natural Gas Demand

| | Demand (BBtu per Year) | | | | CAGR | | | |
|------------------------------|------------------------|----------------|----------------|----------------|-------------|-------------|-------------|-------------|
| | 2020 | 2022 | 2027 | 2032 | 2017-22 | 2022-27 | 2027-32 | 2022-32 |
| CT | 128,610 | 133,279 | 139,419 | 144,341 | 0.5% | 0.9% | 0.7% | 0.8% |
| MA | 242,746 | 284,304 | 305,465 | 320,269 | 2.4% | 1.4% | 1.0% | 1.2% |
| ME | 22,126 | 24,003 | 25,523 | 26,466 | 4.5% | 1.2% | 0.7% | 1.0% |
| NH | 24,262 | 25,957 | 29,201 | 31,211 | 1.3% | 2.4% | 1.3% | 1.9% |
| RI | 38,934 | 37,325 | 39,386 | 40,668 | -1.3% | 1.1% | 0.6% | 0.9% |
| VT | 13,491 | 13,850 | 14,661 | 15,318 | 2.3% | 1.1% | 0.9% | 1.0% |
| Total Gas LDC Demand* | 470,170 | 518,718 | 553,656 | 578,273 | 1.6% | 1.3% | 0.9% | 1.1% |

* "Total" may not equal sum due to rounding

→ Annual Gas Demand in BBtu per Year, by State

- Design day natural gas demands are based on each LDC's projection for firm demand on a much colder-than-normal winter day.
 - Each LDC uses a different standard for selecting the design day temperature, but it generally represents the coldest day observed in the past 20 to 40 years in the LDC's service territory.
- Under design day conditions, LDC winter peak day demand was projected to reach 4,983 BBtu in 2021/22 and 5,464 BBtu by 2031/32.
 - Projected growth in winter peak demand generally mirrors the growth in annual demand, but the rate of growth is slightly lower than annual demand growth.
- Winter peak day in Connecticut and Massachusetts is projected to increase by 377 BBtu by 2031/32.
 - Together, these two states account for 78% of New England's winter peak day growth between 2021/22 and 2031/32.
 - Yankee Gas (CT) and National Grid (MA) account for most of the growth in these two states.
- New Hampshire has the highest percentage increase in winter peak day demand, but it is growing from a relatively small base.
 - By 2031/32, New Hampshire winter peak day increases by about 17% to nearly 300 BBtu.

→ Winter Peak (Design Day) Gas Demand

| | Demand (BBtu per Day) | | | | CAGR | | | |
|------------------------------|-----------------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|
| | 2019/20 | 2021/22 | 2026/27 | 2031/32 | 2017-22 | 2022-27 | 2027-32 | 2022-32 |
| CT | 1,114 | 1,189 | 1,216 | 1,234 | 3.7% | 0.5% | 0.2% | 0.4% |
| MA | 2,597 | 2,728 | 2,932 | 3,060 | 2.9% | 1.5% | 0.6% | 1.2% |
| ME | 312 | 325 | 346 | 357 | 1.7% | 1.3% | 0.4% | 0.9% |
| NH | 216 | 256 | 285 | 300 | 2.7% | 2.1% | 0.8% | 1.6% |
| RI | 373 | 398 | 419 | 419 | 1.4% | 1.0% | 0.0% | 0.5% |
| VT | 88 | 87 | 93 | 95 | 4.6% | 1.2% | 0.3% | 0.8% |
| Total Gas LDC Demand* | 4,699 | 4,983 | 5,290 | 5,464 | 2.9% | 1.2% | 0.5% | 0.9% |

* "Total" may not equal sum due to rounding

→ Winter Peak (Design Day) Gas Demand in BBtu, by State

| | | Annual Consumption, BBTu/year | | | | | | |
|--|-------|-------------------------------|---------|---------|---------|---------|---------|--------------|
| | | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2023-28 CAGR |
| 2019 Forecast | CT | 138,223 | 139,864 | 141,527 | 143,211 | 144,909 | 146,629 | 1.2% |
| | MA | 296,688 | 298,851 | 300,887 | 302,940 | 304,988 | 307,054 | 0.7% |
| | ME | 22,992 | 23,263 | 23,411 | 23,560 | 23,678 | 23,796 | 0.7% |
| | NH | 29,234 | 29,901 | 30,287 | 30,718 | 31,109 | 31,532 | 1.5% |
| | RI | 38,752 | 39,359 | 39,450 | 39,624 | 39,533 | 39,612 | 0.4% |
| | VT | 12,380 | 12,564 | 12,752 | 12,942 | 13,047 | 13,154 | 1.2% |
| | Total | 538,268 | 543,803 | 548,314 | 552,996 | 557,264 | 561,776 | 0.9% |
| 2022 Forecast | CT | 135,392 | 136,919 | 137,505 | 138,459 | 139,419 | 140,388 | 0.7% |
| | MA | 290,369 | 296,329 | 299,707 | 302,585 | 305,465 | 308,376 | 1.2% |
| | ME | 24,346 | 24,698 | 25,056 | 25,318 | 25,523 | 25,730 | 1.1% |
| | NH | 27,370 | 27,994 | 28,438 | 28,817 | 29,201 | 29,591 | 1.6% |
| | RI | 38,030 | 38,809 | 38,885 | 39,135 | 39,386 | 39,639 | 0.8% |
| | VT | 14,033 | 14,218 | 14,406 | 14,533 | 14,661 | 14,790 | 1.1% |
| | Total | 529,540 | 538,967 | 543,996 | 548,847 | 553,656 | 558,514 | 1.1% |
| Change Between 2022 and 2019 Forecasts | CT | -2,832 | -2,946 | -4,022 | -4,752 | -5,490 | -6,241 | |
| | MA | -6,319 | -2,522 | -1,180 | -355 | 477 | 1,322 | |
| | ME | 1,355 | 1,434 | 1,645 | 1,758 | 1,845 | 1,934 | |
| | NH | -1,864 | -1,907 | -1,849 | -1,901 | -1,907 | -1,941 | |
| | RI | -722 | -550 | -565 | -490 | -147 | 27 | |
| | VT | 1,653 | 1,654 | 1,654 | 1,591 | 1,614 | 1,637 | |
| | Total | -8,728 | -4,836 | -4,318 | -4,149 | -3,607 | -3,262 | |

* "Total" may not equal sum due to rounding

→ 2019 vs 2022 Annual Gas Demand Forecast

| | | Design Day (Winter Peak) Values, BBTu/day | | | | | | |
|--|-------|---|---------|---------|---------|---------|---------|----------------------|
| | | 2022/23 | 2023/24 | 2024/25 | 2025/26 | 2026/27 | 2027/28 | 2022/23-2027/28 CAGR |
| 2019 Forecast | CT | 1,214 | 1,223 | 1,233 | 1,242 | 1,252 | 1,261 | 0.8% |
| | MA | 2,777 | 2,797 | 2,816 | 2,835 | 2,854 | 2,873 | 0.7% |
| | ME | 327 | 330 | 332 | 334 | 336 | 338 | 0.6% |
| | NH | 266 | 271 | 276 | 280 | 283 | 286 | 1.5% |
| | RI | 389 | 393 | 397 | 401 | 400 | 400 | 0.6% |
| | VT | 74 | 75 | 75 | 76 | 76 | 77 | 0.6% |
| | Total | 5,047 | 5,090 | 5,129 | 5,168 | 5,202 | 5,235 | 0.7% |
| 2022 Forecast | CT | 1,196 | 1,202 | 1,208 | 1,212 | 1,216 | 1,219 | 0.4% |
| | MA | 2,787 | 2,840 | 2,882 | 2,907 | 2,932 | 2,957 | 1.2% |
| | ME | 329 | 334 | 338 | 342 | 346 | 348 | 1.1% |
| | NH | 267 | 273 | 277 | 281 | 285 | 288 | 1.5% |
| | RI | 405 | 412 | 415 | 419 | 419 | 419 | 0.7% |
| | VT | 88 | 89 | 90 | 91 | 93 | 93 | 1.1% |
| | Total | 5,072 | 5,150 | 5,211 | 5,252 | 5,290 | 5,324 | 1.0% |
| Change Between 2022 and 2019 Forecasts | CT | -19 | -21 | -24 | -30 | -36 | -42 | |
| | MA | 11 | 43 | 66 | 72 | 78 | 84 | |
| | ME | 2 | 3 | 6 | 8 | 9 | 10 | |
| | NH | 1 | 1 | 1 | 1 | 1 | 1 | |
| | RI | 16 | 19 | 18 | 18 | 19 | 19 | |
| | VT | 14 | 14 | 15 | 16 | 16 | 16 | |
| | Total | 25 | 60 | 82 | 84 | 88 | 89 | |

* "Total" may not equal sum due to rounding

→ 2019 vs 2022 Peak Day Gas Demand Forecast

Annual Energy Efficiency (EE) Savings

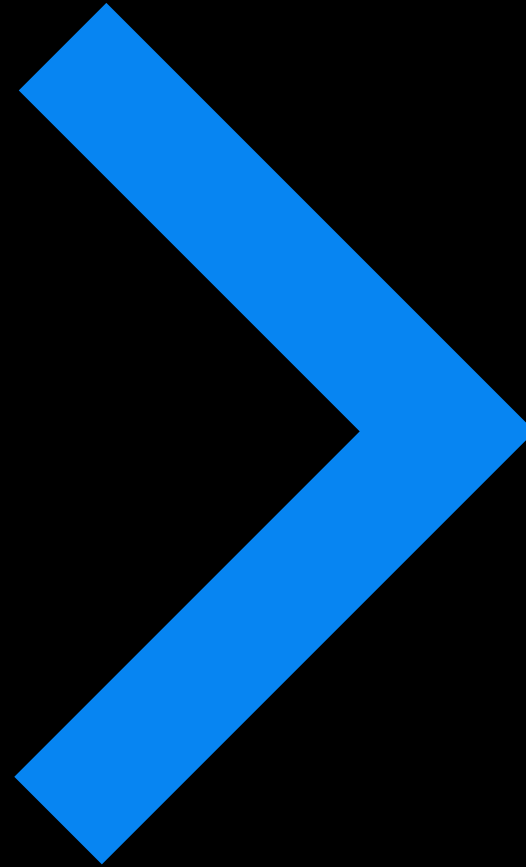
- Under normal weather conditions, annual LDC EE savings were expected to be 2,818 BBtu in 2022, 5,330 BBtu in 2027, and 9,436 BBtu by 2032.
 - Over the entire 10-year period, the aggregate EE growth rate averages about 12.8%.
- Annual EE savings in Connecticut and Massachusetts is projected to increase by 4,520 BBtu by 2032.
 - Together, these two states account for 68% of New England's EE/conservation efforts between 2022 and 2032.
- For 2022, EE/conservation reduced demand by 0.5%. By 2027, energy efficiency is expected to reduce annual demand by 1.0%.

Winter Peak/Design Day Energy Efficiency (EE) Savings

- Many New England LDCs do not report winter peak (design day) EE savings forecast within their IRP.
 - ICF has estimated them based on their relationship between annual demand outlook and annual EE savings from conservation efforts.
- From 2022 to 2032, New England winter peak energy efficiency savings are projected to increase from 26.5 to 86.3 BBtu/day (a 12.5% increase).
- For the 2021/22 winter, EE/conservation reduced demand by 0.5%. By the 2026/27 winter, energy efficiency is expected to reduce peak day demand by 0.9%.

→ Annual and Winter Peak Energy Efficiency Savings

Canadian Maritimes Provinces Demand



- The Canadian Maritimes provinces include New Brunswick (NB), Nova Scotia (NS), and Prince Edward Island (PEI).
 - There is no natural gas production in Prince Edward Island (PEI) and there are no natural gas pipeline systems serving the island region.
 - The small amount of natural gas demand for industrial use in PEI is trucked as compressed natural gas (CNG) from other Maritimes regions.
- The largest gas consumers are Nova Scotia Power's Tufts Cove generating station, Emera's Bayside power plant, and Irving Oil's Saint John refinery.
- There are two local gas distribution companies (Gas LDCs) in Maritimes Canada: Liberty Utilities in New Brunswick and Heritage in Nova Scotia.
- Other industrial facilities also receive gas from the Maritimes & Northeast (M&N) Pipeline.
- Offshore oil and gas production ceased in Nova Scotia at the end of 2018 as both Sable Offshore Energy Project and Deep Panuke projects were decommissioned in 2018.

→ Background

- Historical LDC annual demand is based on survey data collected by Statistics Canada.
 - The most recent year of complete historical, annual demand data provided by StatCan is for 2021.
- For the forecast, ICF reviewed the provincial utility/energy and review boards commission (NSUARB/NBUEB) websites for each of the two Maritimes provinces to locate the data available in public domain.
- ICF adjusted gas demand projection (annual and peak) for Heritage Gas based on the previous information provided by the utility (for years 2019/20 and 2032/33) based on expert judgement on recent market trends.
- Liberty Utilities (New Brunswick) does not project annual gas demand beyond 2027 and there were no filings that provided information regarding a peak day demand forecast beyond 2020.
 - ICF assumes an annual demand growth rate of 1.4% from 2027-2032.
 - ICF assumes the peak day demand growth rate of 2.1% from 2022-2027 and 0.7% from 2028-2032.

→ Methodology

| Province | Entity Type | LDC | Year IRP or Rate Application Filed | Forecast Years in IRP | Annual Demand in 2022 (Bbtu) | As % of Maritimes Total Demand |
|----------|-------------|-----------------------------|------------------------------------|-----------------------|------------------------------|--------------------------------|
| NB | LDC | NB Liberty Utilities | 2021 | 2022-2027 | 5,747.6 | 8.8% |
| NB | POWER | New Brunswick Power | NA | NA | 10,673.3 | 16.3% |
| NB | INDUSTRIAL | Irving Oil Refinery | NA | NA | 21,353.8 | 32.6% |
| NB | INDUSTRIAL | Other Industrial | NA | NA | 2,429.0 | 3.7% |
| NS | POWER | Nova Scotia Power | 2021 | 2022 - 2031 | 16,356.4 | 25.0% |
| NS | LDC | Heritage Gas | NA ⁺ | NA | 7,747.8 | 11.8% |
| NS | INDUSTRIAL | Other Industrial | NA | NA | 1,222.8 | 1.9% |
| PEI | CNG | Industrial Demand (via CNG) | NA | NA | 1,042.7 | - |
| | | *TOTAL | | | 65,530.6 | 100.0% |

**Not counting PEI as the CNG demand would be accounted for in commercial demand growth from NB and NS regions*

**ICF received a forecast from Heritage under a non-disclosure agreement*

→ Maritimes Gas Consumers Included in the 15-Year Forecast

- Under normal weather conditions, Maritimes annual gas demand is projected to grow from 65,530.6 BBtu in 2022 to 68,363.9 BBtu by 2025 and then decline to 56,122.1 BBtu by 2032.
 - Over the 10-year period (2022–32), the compound annual growth rate (CAGR) averages about -1.5%.
- The natural gas demand over the long-term is projected to be low mainly due to reduction in natural gas demand from New Brunswick Power due to scheduled retirement of Grandview and Bayside gas-fired units by 2027 based on its latest IRP.
- Natural gas demand in Nova Scotia is projected to be flat as growth in projected LDC demand from Heritage Gas is offset by declining gas use within the power sector.
- The LDC with the highest projected growth rate is Liberty Utilities (NB) with an average growth of 2.8% per year through 2032.

→ Forecast Demand: Annual Gas Demand

| Province | Entity Name | Demand (BBtu per year) | | | | Compound Annual Growth rate (CAGR) | | | |
|-------------------|--|------------------------|----------|----------|----------|------------------------------------|---------|---------|---------|
| | | 2017 | 2022 | 2027 | 2032 | 2017-22 | 2022-27 | 2027-32 | 2022-32 |
| NB | NB Liberty Utilities | 5,425.5 | 5,747.6 | 7,066.7 | 7,577.7 | 1.2% | 4.2% | 1.4% | 2.8% |
| NB | New Brunswick Power | 8,589.9 | 10,673.3 | 4,381.5 | 1,953.8 | 4.4% | -16.3% | -14.9% | -15.6% |
| NB | Irving Oil Refinery | 19,041.2 | 21,353.8 | 19,575.0 | 17,004.7 | 2.3% | -1.7% | -2.8% | -2.3% |
| NB | Other Industrial | 972.1 | 2,429.0 | 2,226.6 | 1,934.3 | n/a | -1.7% | -2.8% | -2.3% |
| NS | Nova Scotia Power | 13,842.1 | 16,356.4 | 18,735.7 | 18,621.9 | 3.4% | 2.8% | -0.1% | 1.3% |
| NS | Heritage Gas | 7,120.5 | 7,747.8 | 8,024.2 | 8,118.8 | 1.7% | 0.7% | 0.2% | 0.5% |
| NS | Other Industrial | 4,224.4 | 1,222.8 | 1,158.4 | 910.9 | n/a | -1.1% | -4.7% | -2.9% |
| PEI | Industrial Demand (via CNG from NB and NS) | 1,165.9 | 1,042.7 | 985.8 | 824.7 | -2.2% | -1.1% | -3.5% | -2.3% |
| *Total Gas Demand | | 59,215.8 | 65,530.6 | 61,168.1 | 56,122.1 | 2.0% | -1.4% | -1.7% | -1.5% |

➔ Maritimes Annual Gas Demand (Bbtu/yr) & CAGR (%) by End-Use Consumer



* "Total" may not equal to sum due to independent rounding, PEI's historical CNG demand is accounted for in historical commercial demand from NB and NS regions

- Winter Peak Day gas demand estimates are based on inputs from Heritage Gas and NB Liberty Utilities
- Total Gas LDC winter peak day demand was projected to be 91.9 BBtu/day in 2021/22 and 102.74 BBtu/day by 2031/32.
 - Projected growth in winter design-day peak demand generally mirrors the growth in annual demand, but the rate of growth is higher than annual demand growth.
 - The compound annual growth rate (CAGR) for winter peak day from 2022 to 2032 averages about 1.1%.
- Design day gas demand for Heritage Gas LDC is based on firm demand for weather similar to the one experienced on the coldest day over the past 35 years.
- Design day gas demand for NB Liberty Utilities is assumed to be 120% of the peak winter day gas demand based on input from the utility.
- Total Gas LDC design day demand was projected to be 116.7 BBtu/day in 2021/22 and 130.5 BBtu/day by 2031/32.

→ Forecast Winter Peak Day (Design Day) Gas Demand

| | | Winter Peak Day Demand (BBtu per Day) | | | | Compound Annual Growth rate (CAGR) | | | |
|-------------------|-------------------|---------------------------------------|---------|---------|---------|------------------------------------|---------|---------|---------|
| Province | Entity Name | 2016/17 | 2021/22 | 2026/27 | 2031/32 | 2017-22 | 2022-27 | 2027-32 | 2022-32 |
| NB | Liberty Utilities | 36.6 | 40.2 | 44.6 | 46.2 | 1.90% | 2.10% | 0.70% | 1.40% |
| NS | Heritage Gas | 43.7 | 51.8 | 54.9 | 56.6 | 3.40% | 1.20% | 0.60% | 0.90% |
| *Total Gas Demand | | 80.3 | 91.9 | 99.5 | 102.7 | 2.70% | 1.60% | 0.60% | 1.10% |

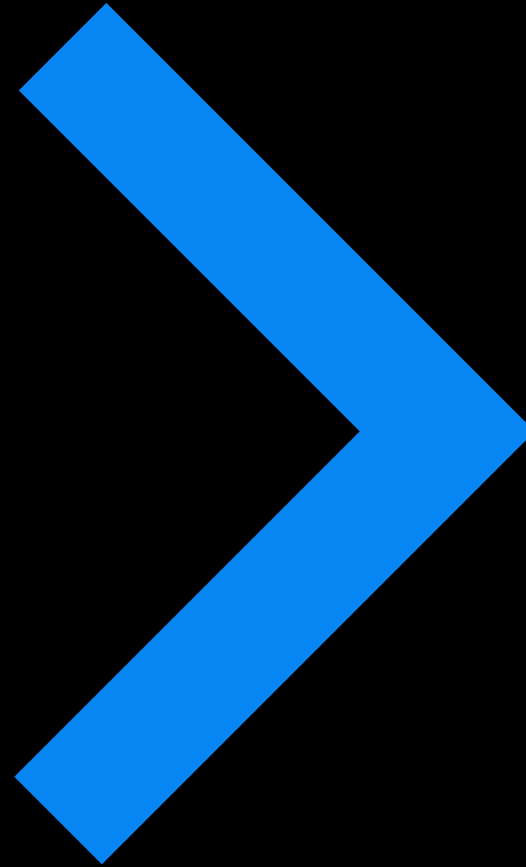
| | | Design Day Demand (BBtu per Day) | | | | Compound Annual Growth rate (CAGR) | | | |
|-------------------|-------------------|----------------------------------|---------|---------|---------|------------------------------------|---------|---------|---------|
| Province | Entity Name | 2016/17 | 2021/22 | 2026/27 | 2031/32 | 2017-22 | 2022-27 | 2027-32 | 2022-32 |
| NB | Liberty Utilities | 47.8 | 52.5 | 58.3 | 60.3 | 1.90% | 2.10% | 0.70% | 1.40% |
| NS | Heritage Gas | 60.3 | 64.2 | 68.1 | 70.2 | 1.30% | 1.20% | 0.60% | 0.90% |
| *Total Gas Demand | | 108 | 117 | 126 | 130.5 | 1.50% | 1.60% | 0.60% | 1.10% |

→ Forecast Winter Peak Day (Design Day) Gas Demand (BBtu/d) & CAGR (%) for Maritimes Gas LDCs

- Currently, natural gas demand in Maritimes Canada is heavily dominated by gas use in the industrial and power sectors.
- Historically, winter peak day demand from Gas LDCs (Heritage and Liberty Utilities) in Maritimes is estimated to be less than 40% of the overall peak winter gas demand for Maritimes Canada.
- Firm commitments on M&N Pipeline were 78,226 MMBtu/day for 2021 and 118,226 MMBtu/day in 2022. The M&N Pipeline reduced the MN365 firm transportation toll from C\$ 0.90/GJ in 2021 to C\$ 0.81/GJ in 2022.
- Currently, there is a small amount of onshore natural gas production in New Brunswick, primarily due to the moratoria and bans on fracking in the region.
- Although the gas LDC demand growth is projected to grow over time, total gas demand declines overall due to large drop in projected gas use from the power sector in the long-term.
- Growth in industrial gas use will be mainly driven by economic and trade activity and switching between natural gas and oil.
- Future growth in natural gas demand in the Maritimes region will depend heavily on carbon prices and the competitiveness of natural gas against propane and oil prices, electrification, LNG exports and future federal and provincial regulations.

→ Conclusions

ICF/ISO-NE Natural Gas Topology Tool (NGTT)



The NGTT is projects natural gas supplies available to New England generators for a seven-day period, given user supplied assumptions for daily mean temperatures.

- Assumes that gas supplies remaining for New England's electric generators is a function of the total regional gas supply (from available pipeline capacity, sendout from regional LNG import terminals, and LNG peak shaving facilities sendout) minus firm LDC demand.
- Uses as inputs the New England and Canadian Maritimes annual demand forecast

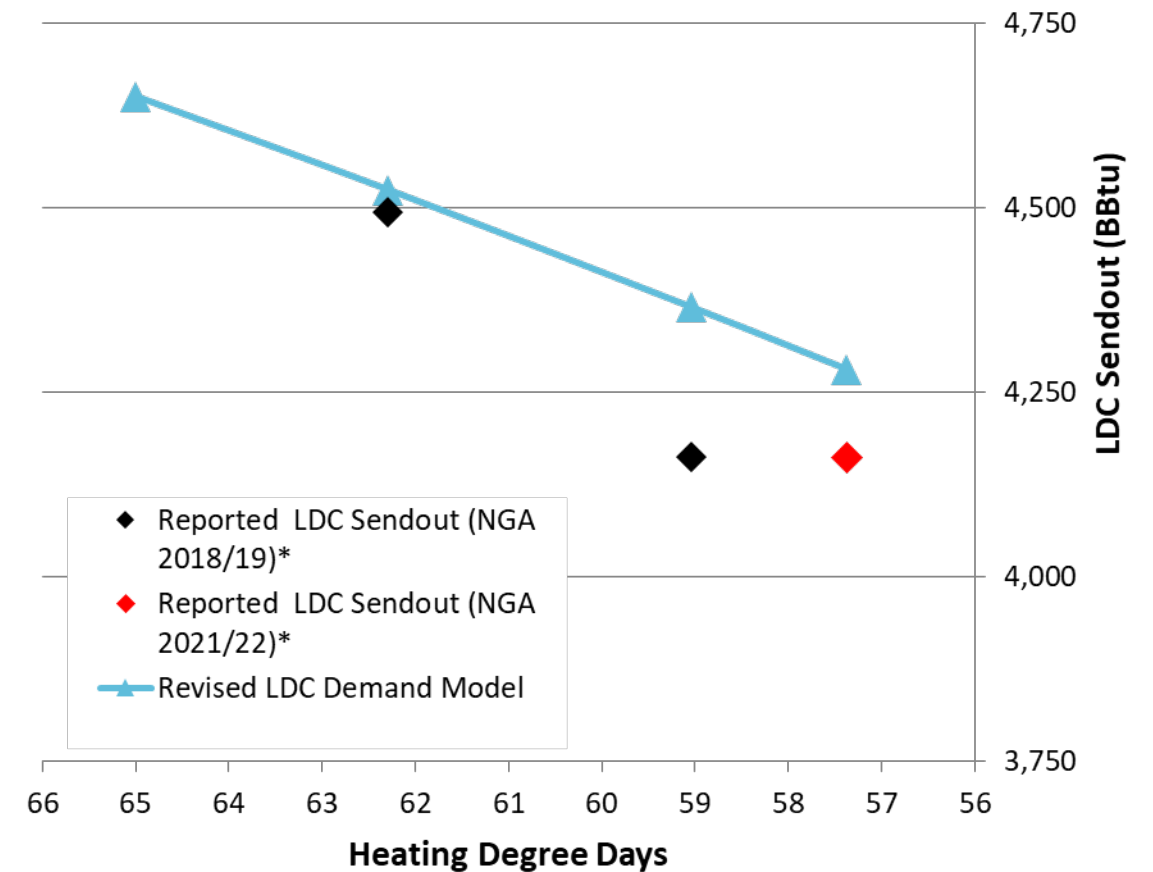
The 2022 version of the ICF/ISO-NE Natural Gas Topology Tool (NGTT):

- Updated the firm LDC demand annual growth rates and the base year to 2021 .
- Updated the Everett LNG (Distrigas) regression fit based on sendout from Everett LNG terminal.
- Updated the St. John LNG (Canaport) regression fit.
- Estimated the Northeast Gateway Deepwater Port (Buoy-System) LNG sendout.

→ Introduction

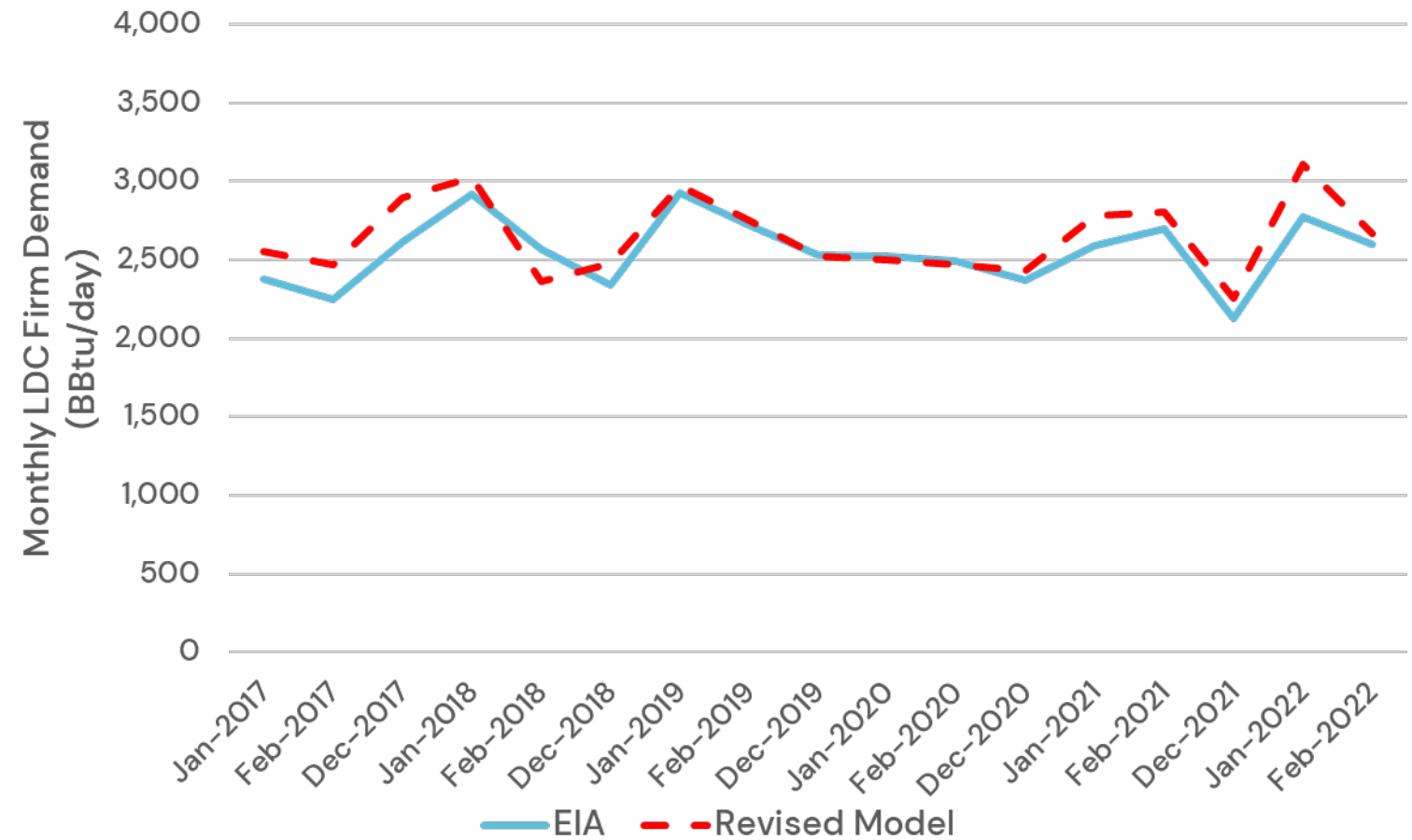
- The Northeast Gas Association (NGA) provided ISO-NE with recent sendout data and revised design day estimates for 17 of the 22 New England Gas LDCs .
- These 17 LDCs represent approximately 98% of the region's firm demand (based on 2021 EIA 176 data); the estimates for total New England LDC sendout were adjusted upward to account for the LDCs that did not report.
- Sendout data was provided for one day: January 15th, 2022.
- This was one of the coldest days in 2021/22 winter (Dec-Feb), with average daily temperature of 7.6 degrees F.
- Based on the new LDC sendout data from NGA for 2022, the gas LDC firm demand fit developed for ISO-NE in 2019 was still valid; however, the annual growth rate and intercept values were updated.

**2021/22 Winter Daily LDC Firm Demand:
3-day Sample Data versus Model Projection**

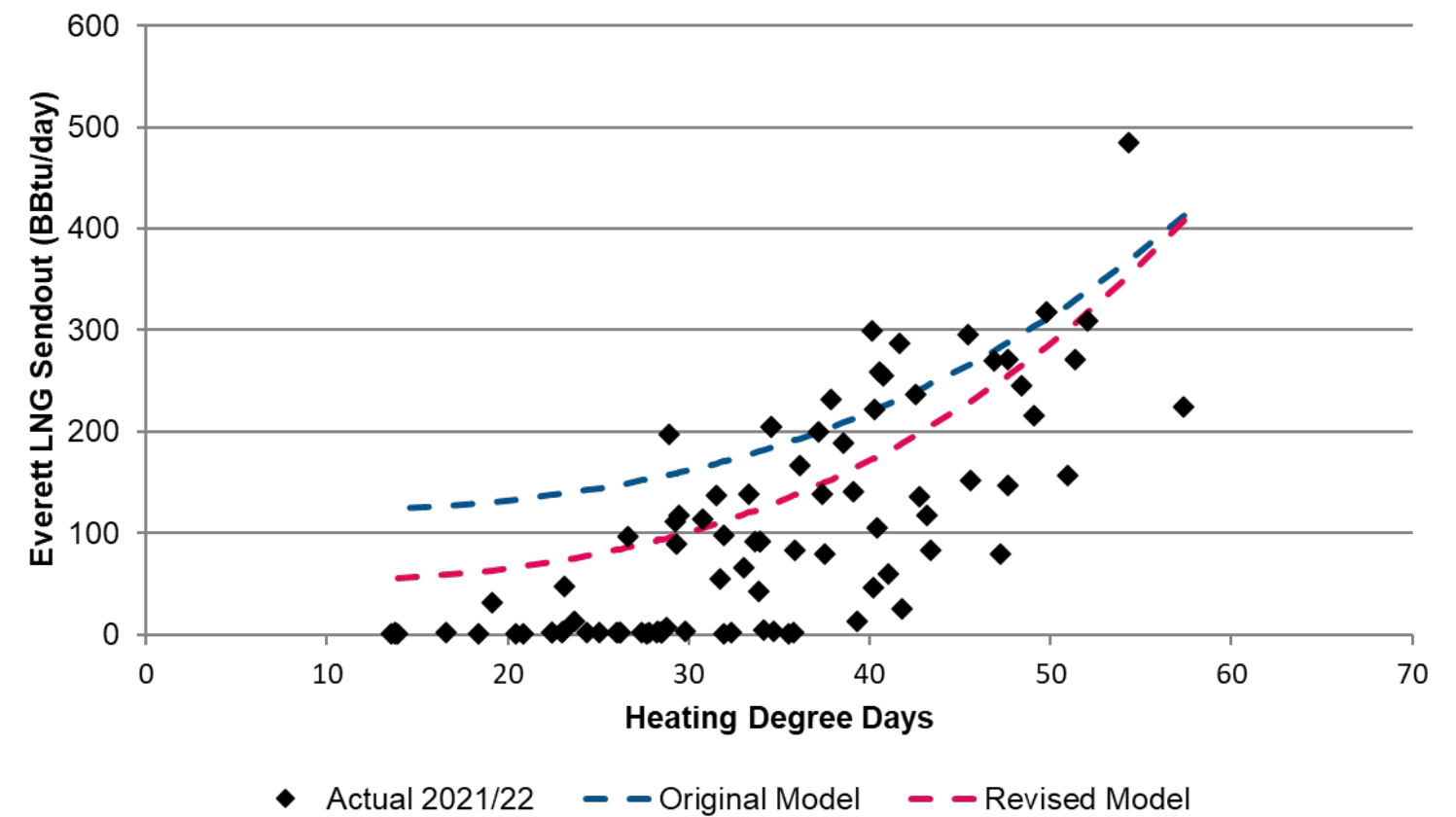
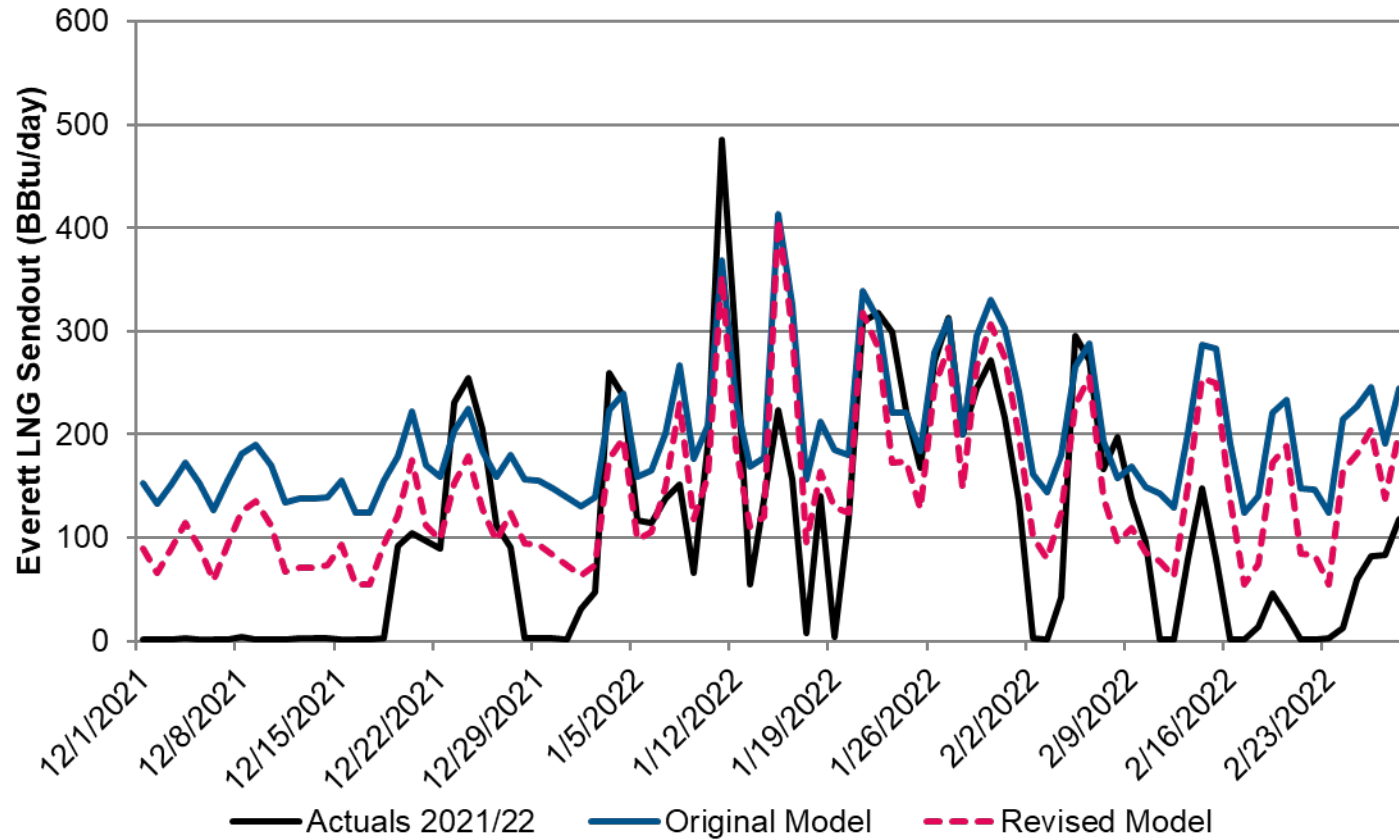


→ 2022 NGTT Updated Gas LDC Firm Demand: Actual vs Projected for Peak Days in 2021/22 Winter

- The daily LDC firm demand curve that was developed for NGTT aligns with EIA's monthly natural gas consumption by state values from residential, commercial, and industrial (RCI) sectors in New England for the winter months since January 2017.



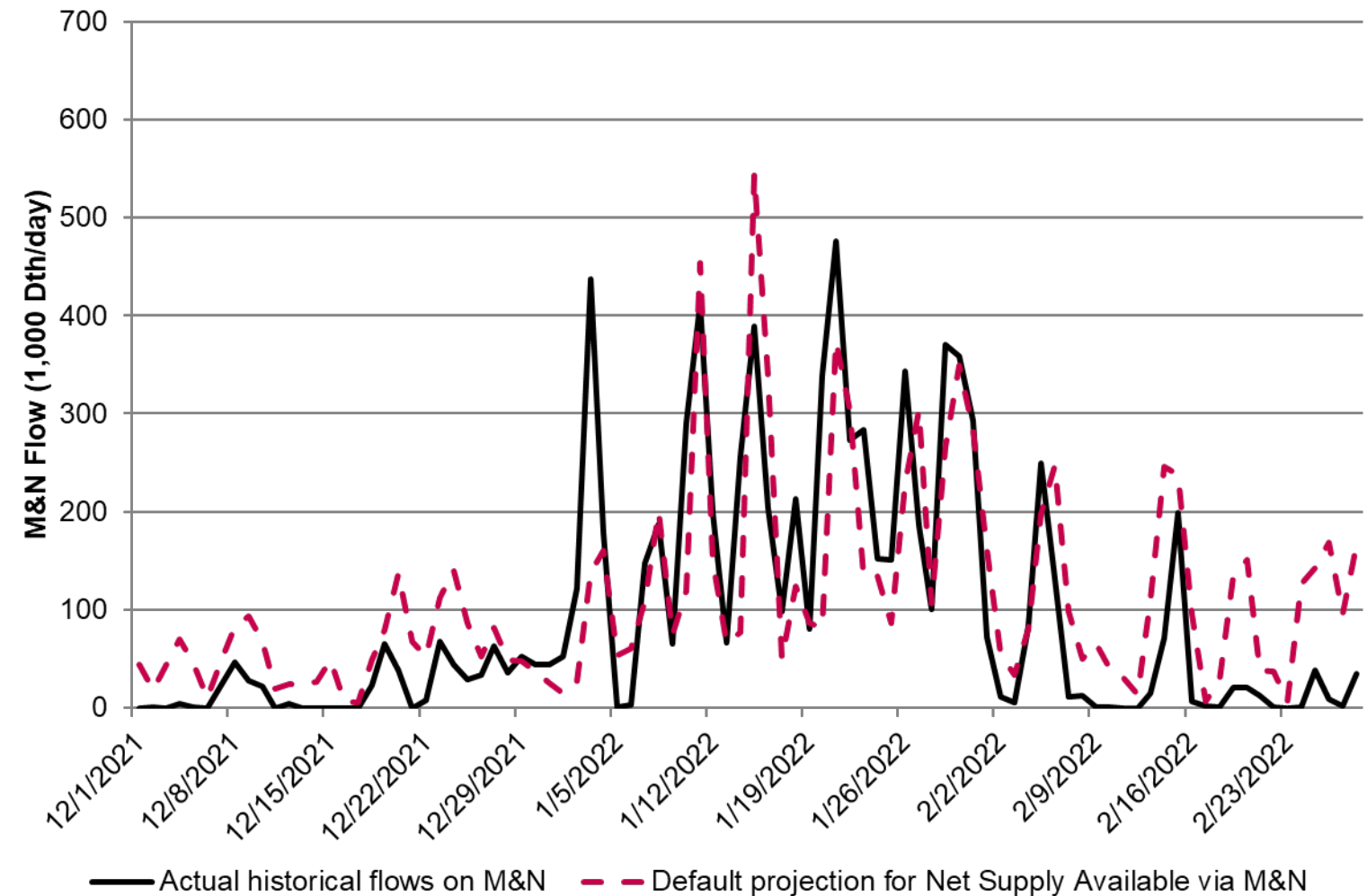
→ Gas LDC Firm Demand



- The Everett LNG sendout fit was slightly adjusted based on historical daily sendout for Winter 2021/22 from Everett terminal to AGT, TGP and to Mystic units 8 and 9.

→ Everett LNG Sendout

- ICF revised the St. John LNG sendout and updated the demand and supply assumptions for Eastern Canada in the NGTT to project the net supply available to New England via the M&N Pipeline.
- During the winter of 2021/22, flows averaged 0.09 MBBtu/d out of New England into New Brunswick. M&N Flows into New England peaked at 0.475 MBBtu/d on January 21, 2022 mainly due to deliveries from the St. John terminal.
- The complete shut-down of offshore production at the end of 2018 and increasing natural gas demand in Eastern Canada will continue to reduce the natural gas supply available for export to the New England region during winter season.



→ Maritimes & Northeast (M&N) Pipeline Winter Daily Flows

Historical New England Interstate Pipeline Flows vs. Natural Gas Topology Tool Forecast

| Gas Flow Day (BBtu) | 2/3/2023 | 2/4/2023 |
|--|----------|----------|
| HDDs | 52 | 61 |
| Historical Flows | | |
| Portland Natural Gas Transmission System (Pittsburg) | 406 | 424 |
| Algonquin Gas Transmission (Southeast Compressor) | 1,872 | 1,810 |
| Tennessee Gas Pipeline (STA 249 to MLV 256) | 1,119 | 1,175 |
| Iroquois Gas Transmission System (LDC Deliveries) | 37 | 45 |
| Maritimes & Northeast Pipeline (Baileyville) | 498 | 314 |
| Everett LNG Sendout | 169 | 202 |
| ICF/ISO-NE Natural Gas Topology Tool | | |
| Portland Natural Gas Transmission System (Capacity) | 399 | 399 |
| Algonquin Gas Transmission (Capacity) | 1,907 | 1,907 |
| Tennessee Gas Pipeline (Capacity) | 1,494 | 1,494 |
| Iroquois Gas Transmission System (Capacity) | 273 | 273 |
| Modeled Net Supply Available via M&N | 175 | 443 |
| Modeled Everett LNG Sendout | 393 | 615 |
| Modeled LDC Peakshaving Sendout | 458 | 852 |
| Total Regional Gas Supplies | 5,098 | 5,983 |
| Modeled Firm LDC Demand | 4,160 | 4,639 |
| NGTT Forecast of Potentially Available Gas | 938 | 1,344 |

- Design day planning for New England utilities uses 68–80 effective degree days (EDDs) which are generally 3–8 degree days greater than heating degree days (HDDs). These days were not design day conditions and the historical flow data shows flows reported at one segment of each pipeline, not the total flows.
- On February 3rd and 4th:
 - The oil and coal fleet was generating at high levels.
 - The vaporization of LNG implies that all the available (lower cost) pipeline gas was committed to customers
 - Other constraints to the west of New England were limiting pipeline flows and New England’s oil and coal fleet reduced the share of gas used in New England.
- The NGTT forecasted that 938 BBtu and 1,344 BBtu could be available on February 3rd and 4th, respectively.

→ February 2023 Example

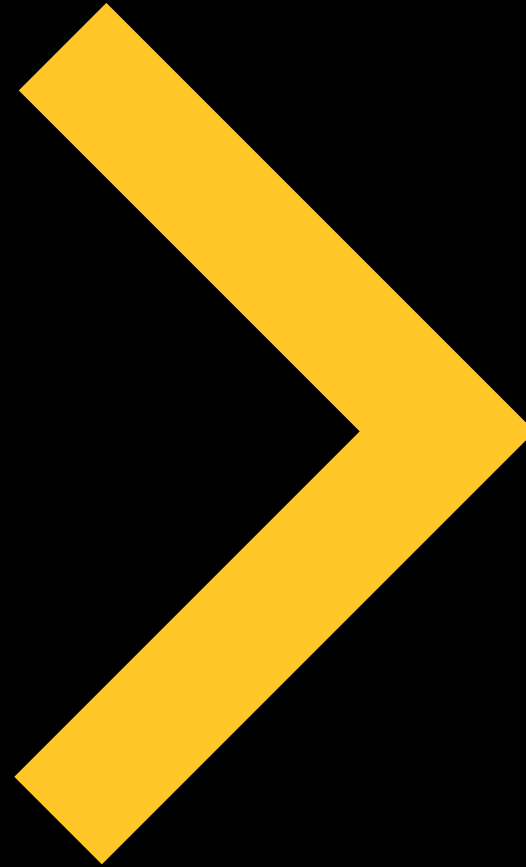
Historical New England Interstate Pipeline Flows vs. Natural Gas Topology Tool Forecast

| Gas Flow Day (BBtu) | 1/15/2022 |
|--|-----------|
| HDDs | 58 |
| Historical Flows | |
| Portland Natural Gas Transmission System (Pittsburg) | 382 |
| Algonquin Gas Transmission (Southeast Compressor) | 1,583 |
| Tennessee Gas Pipeline (STA 249 to MLV 256) | 1,257 |
| Iroquois Gas Transmission System (LDC Deliveries) | 56 |
| Maritimes & Northeast Pipeline (Baileyville) | 247 |
| Everett LNG Sendout | 172 |
| Northeast Gateway LNG Sendout | 29 |
| LDC Peakshaving Sendout | 950 |
| Total Actual Regional Gas Supplies | 4,646 |
| Actual Firm LDC Demand | 4,191 |
| ICF/ISO-NE Natural Gas Topology Tool | |
| Portland Natural Gas Transmission System (Capacity) | 399 |
| Algonquin Gas Transmission (Capacity) | 1,907 |
| Tennessee Gas Pipeline (Capacity) | 1,494 |
| Iroquois Gas Transmission System (Capacity) | 273 |
| Modeled Net Supply Available via M&N | 374 |
| Modeled Everett LNG Sendout | 548 |
| Modeled Northeast Gateway LNG Sendout | 381 |
| Modeled LDC Peakshaving Sendout | 740 |
| Total Potential Regional Gas Supplies | 6,116 |
| Modeled Firm LDC Demand | 4,422 |
| NGTT Forecast of Potentially Available Gas | 1,693 |

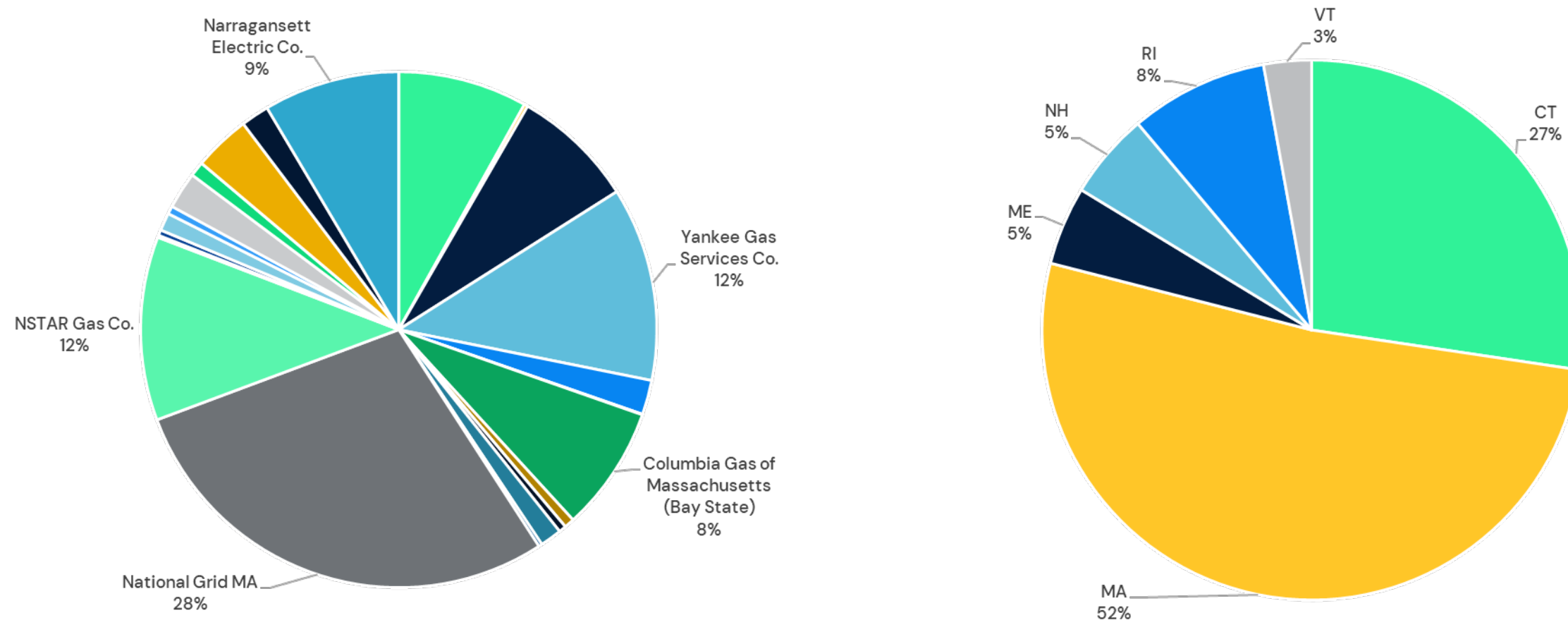
- Design day planning for New England utilities uses 68–80 effective degree days (EDDs) which are generally 3–8 degree days greater than heating degree days (HDDs). These days were not design day conditions and the historical flow data shows flows reported at one segment of each pipeline, not the total flows.
- The NGTT forecasted that 1,313 BBtu could be available.
 - Everett LNG has a 912 BBtu/day sendout capacity (including Mystic 8 & 9) and the peakshaving LNG has a 1,456 BBtu/day sendout capacity.
- “Available Capacity” from any source can be changed in the NGTT to account for market changes.
 - Everett LNG sendout capacity to AGT and TGP is about 457 BBtu/day.

→ **January 2022 Example**

Appendix



- Total annual natural gas demand in 2020 was 470,170 BBtu according to EIA; Peak Winter Day natural gas demand was 4,698 BBtu/d.
- The top 5 gas utilities account for 69% of New England’s total LDC natural gas demand.
- When summed by state, Massachusetts accounts for over half of all LDC gas demand.



→ Historical Demand by Gas LDC and State, 2020

| | | Demand (BBtu per Year) | | | | CAGR | | | |
|-----------------------|---|------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | 2020 | 2022 | 2027 | 2032 | 2017-22 | 2022-27 | 2027-32 | 2022-32 |
| CT | CT Natural Gas Corp. | 36,977 | 39,014 | 39,249 | 40,007 | 1.0% | 0.1% | 0.4% | 0.3% |
| CT | Norwich (City of) | 1,045 | 1,060 | 1,107 | 1,138 | 0.5% | 0.9% | 0.7% | 0.8% |
| CT | Southern Connecticut Gas Co. | 35,106 | 35,241 | 36,079 | 36,716 | -0.1% | 0.5% | 0.4% | 0.4% |
| CT | Yankee Gas Services Co. | 55,482 | 57,963 | 62,984 | 66,481 | 0.6% | 1.7% | 1.1% | 1.4% |
| MA | Berkshire Gas Co. | 9,857 | 7,490 | 7,634 | 7,735 | -5.9% | 0.4% | 0.3% | 0.3% |
| MA | Blackstone Gas Co | 185 | 221 | 243 | 257 | 2.9% | 1.8% | 1.2% | 1.5% |
| MA | Columbia Gas of Massachusetts (Bay State) | 35,808 | 47,729 | 49,189 | 50,152 | -1.8% | 0.6% | 0.4% | 0.5% |
| MA | Fitchburg Gas & Electric Light | 2,884 | 2,579 | 2,595 | 2,601 | -3.4% | 0.1% | 0.0% | 0.1% |
| MA | Holyoke Gas & Electric (City of) | 2,087 | 2,168 | 2,318 | 2,408 | 2.4% | 1.4% | 1.0% | 1.2% |
| MA | Liberty Utilities (New England Gas Company) | 6,186 | 6,547 | 6,786 | 6,959 | 0.8% | 0.7% | 0.5% | 0.6% |
| MA | Middleborough (Town of) | 999 | 1,038 | 1,110 | 1,153 | 2.4% | 1.4% | 1.0% | 1.2% |
| MA | National Grid MA | 129,921 | 162,030 | 175,839 | 185,713 | 7.0% | 1.6% | 1.1% | 1.4% |
| MA | NSTAR Gas Co. | 52,594 | 52,189 | 57,279 | 60,723 | -2.7% | 1.9% | 1.2% | 1.5% |
| MA | Wakefield Municipal Gas Light | 609 | 633 | 677 | 703 | 2.4% | 1.4% | 1.0% | 1.2% |
| MA | Westfield (City of) | 1,616 | 1,679 | 1,795 | 1,864 | 2.4% | 1.4% | 1.0% | 1.2% |
| ME | Bangor Gas Co. LLC | 5,070 | 5,287 | 5,609 | 5,792 | 3.0% | 1.3% | 0.8% | 1.0% |
| ME | Maine Natural Gas | 2,283 | 2,381 | 2,526 | 2,609 | 3.0% | 1.3% | 0.8% | 1.0% |
| ME | Northern Utilities Inc. | 10,546 | 11,926 | 12,712 | 13,234 | 3.0% | 1.3% | 0.8% | 1.0% |
| ME | Summit Natural Gas | 4,227 | 4,408 | 4,677 | 4,830 | 3.0% | 1.3% | 0.8% | 1.0% |
| NH | EnergyNorth Natural Gas Inc. | 16,216 | 16,585 | 19,283 | 20,934 | 0.4% | 3.1% | 1.7% | 2.4% |
| NH | Northern Utilities Inc. | 8,046 | 9,372 | 9,918 | 10,277 | 2.9% | 1.1% | 0.7% | 0.9% |
| RI | Narragansett Electric Co. | 38,934 | 37,325 | 39,386 | 40,668 | -1.3% | 1.1% | 0.6% | 0.9% |
| VT | Vermont Gas Systems, Inc. | 13,491 | 13,850 | 14,661 | 15,318 | 2.3% | 1.1% | 0.9% | 1.0% |
| Total Gas LDC Demand* | | 470,170 | 518,718 | 553,656 | 578,273 | 1.6% | 1.3% | 0.9% | 1.1% |

* "Total" may not equal sum due to rounding

→ Annual Gas Demand in BBtu per Year, by LDC

| | | Demand (BBtu per Day) | | | | CAGR | | | |
|-----------------------|---|-----------------------|---------|---------|---------|---------|---------|---------|---------|
| | | 2019/20 | 2021/22 | 2026/27 | 2031/32 | 2017-22 | 2022-27 | 2027-32 | 2022-32 |
| CT | CT Natural Gas Corp. | 354 | 357 | 359 | 361 | 2.8% | 0.1% | 0.1% | 0.1% |
| CT | Norwich (City of) | 12 | 13 | 14 | 14 | 3.7% | 0.5% | 0.2% | 0.3% |
| CT | Southern Connecticut Gas Co. | 301 | 327 | 332 | 335 | 3.4% | 0.3% | 0.2% | 0.2% |
| CT | Yankee Gas Services Co. | 446 | 492 | 512 | 524 | 4.5% | 0.8% | 0.5% | 0.6% |
| MA | Berkshire Gas Co. | 69 | 66 | 68 | 68 | 3.0% | 0.4% | 0.3% | 0.3% |
| MA | Blackstone Gas Co | 2 | 2 | 3 | 3 | 6.1% | 2.1% | 1.0% | 1.6% |
| MA | Columbia Gas of Massachusetts (Bay State) | 493 | 516 | 533 | 545 | 1.4% | 0.7% | 0.4% | 0.5% |
| MA | Fitchburg Gas & Electric Light | 24 | 25 | 25 | 25 | 3.4% | 0.1% | 0.0% | 0.1% |
| MA | Holyoke Gas & Electric (City of) | 20 | 20 | 22 | 23 | 2.8% | 1.5% | 0.6% | 1.0% |
| MA | Liberty Utilities (New England Gas Company) | 71 | 78 | 80 | 81 | 2.3% | 0.4% | 0.3% | 0.3% |
| MA | Middleborough (Town of) | 7 | 8 | 8 | 8 | 2.8% | 1.5% | 0.6% | 1.0% |
| MA | National Grid MA | 1,338 | 1,443 | 1,577 | 1,659 | 2.8% | 1.8% | 1.0% | 1.4% |
| MA | NSTAR Gas Co. | 551 | 546 | 591 | 621 | 4.3% | 1.6% | 1.0% | 1.3% |
| MA | Wakefield Municipal Gas Light | 6 | 6 | 6 | 7 | 2.8% | 1.5% | 0.6% | 1.0% |
| MA | Westfield (City of) | 17 | 18 | 20 | 20 | 2.8% | 1.5% | 0.6% | 1.0% |
| ME | Bangor Gas Co. LLC | 186 | 191 | 203 | 209 | 2.6% | 1.3% | 0.6% | 0.9% |
| ME | Maine Natural Gas | 18 | 22 | 24 | 24 | 2.6% | 1.3% | 0.6% | 0.9% |
| ME | Northern Utilities Inc. | 89 | 93 | 99 | 103 | 2.6% | 1.3% | 0.8% | 1.0% |
| ME | Summit Natural Gas | 18 | 18 | 19 | 20 | 2.6% | 1.3% | 0.6% | 0.9% |
| NH | EnergyNorth Natural Gas Inc. | 145 | 181 | 206 | 220 | 3.3% | 2.6% | 1.3% | 2.0% |
| NH | Northern Utilities Inc. | 71 | 75 | 79 | 80 | 1.2% | 0.9% | 0.4% | 0.6% |
| RI | Narragansett Electric Co. | 373 | 398 | 419 | 419 | 1.4% | 1.0% | 0.0% | 0.5% |
| VT | Vermont Gas Systems, Inc. | 88 | 87 | 93 | 95 | 4.6% | 1.2% | 0.3% | 0.8% |
| Total Gas LDC Demand* | | 4,699 | 4,983 | 5,290 | 5,464 | 2.9% | 1.2% | 0.5% | 0.9% |

* "Total" may not equal sum due to rounding

→ Winter Peak (Design Day) Gas Demand in BBtu, by LDC

| | | Energy Efficiency (BBtu per Year) | | | CAGR | | |
|-----------------------|---|-----------------------------------|-------|-------|---------|---------|---------|
| | | 2022 | 2027 | 2032 | 2022-27 | 2027-32 | 2022-32 |
| CT | CT Natural Gas Corp. | 185 | 200 | 211 | 1.6% | 1.0% | 1.3% |
| CT | Norwich (City of) | 4 | 8 | 15 | 12.8% | 14.3% | 13.5% |
| CT | Southern Connecticut Gas Co. | 174 | 188 | 197 | 1.6% | 1.0% | 1.3% |
| CT | Yankee Gas Services Co. | 177 | 589 | 1,513 | 27.2% | 20.8% | 24.0% |
| MA | Berkshire Gas Co. | 28 | 29 | 30 | 1.2% | 0.7% | 0.9% |
| MA | Blackstone Gas Co ¹ | - | - | - | n/a | n/a | n/a |
| MA | Columbia Gas of Massachusetts (Bay State) | 511 | 673 | 803 | 5.7% | 3.6% | 4.6% |
| MA | Fitchburg Gas & Electric Light | 63 | 175 | 379 | 22.6% | 16.7% | 19.6% |
| MA | Holyoke Gas & Electric (City of) | 10 | 19 | 34 | 13.8% | 11.5% | 12.6% |
| MA | Liberty Utilities (New England Gas Company) | 110 | 322 | 727 | 23.9% | 17.7% | 20.8% |
| MA | Middleborough (Town of) | 5 | 9 | 16 | 13.8% | 11.5% | 12.6% |
| MA | National Grid MA | 171 | 172 | 173 | 0.1% | 0.1% | 0.1% |
| MA | NSTAR Gas Co. | 427 | 1,138 | 2,262 | 21.6% | 14.7% | 18.1% |
| MA | Wakefield Municipal Gas Light | 3 | 6 | 10 | 13.8% | 11.5% | 12.6% |
| MA | Westfield (City of) | 8 | 15 | 26 | 13.8% | 11.5% | 12.6% |
| ME | Bangor Gas Co. LLC | 32 | 94 | 198 | 23.6% | 16.2% | 19.8% |
| ME | Maine Natural Gas | 15 | 42 | 89 | 23.6% | 16.2% | 19.8% |
| ME | Northern Utilities Inc. | 73 | 212 | 453 | 23.8% | 16.3% | 20.0% |
| ME | Summit Natural Gas | 27 | 78 | 165 | 23.6% | 16.2% | 19.8% |
| NH | EnergyNorth Natural Gas Inc. | 150 | 175 | 195 | 3.1% | 2.2% | 2.7% |
| NH | Northern Utilities Inc. | 121 | 385 | 887 | 26.1% | 18.1% | 22.1% |
| RI | Narragansett Electric Co. | 448 | 656 | 801 | 7.9% | 4.1% | 6.0% |
| VT | Vermont Gas Systems, Inc. | 75 | 143 | 251 | 13.7% | 11.9% | 12.8% |
| Total Gas LDC Demand* | | 2,818 | 5,330 | 9,436 | 13.6% | 12.1% | 12.8% |

1 - Annual Energy Efficiency Savings of Blackstone Gas Co are included in National Grid (MA) IRP

* "Total" may not equal sum due to rounding

➔ Annual Energy Efficiency Savings in BBtu per Year, by LDC

| | Energy Efficiency (BBtu per Year) | | | CAGR | | |
|-----------------------|-----------------------------------|-------|-------|---------|---------|---------|
| | 2022 | 2027 | 2032 | 2022-27 | 2027-32 | 2022-32 |
| CT | 540 | 985 | 1,936 | 12.8% | 14.5% | 13.6% |
| MA | 1,337 | 2,559 | 4,460 | 13.9% | 11.7% | 12.8% |
| ME | 147 | 426 | 905 | 23.7% | 16.3% | 19.9% |
| NH | 271 | 560 | 1,082 | 15.6% | 14.1% | 14.9% |
| RI | 448 | 656 | 801 | 7.9% | 4.1% | 6.0% |
| VT | 75 | 143 | 251 | 13.7% | 11.9% | 12.8% |
| Total Gas LDC Demand* | 2,818 | 5,330 | 9,436 | 13.6% | 12.1% | 12.8% |

* "Total" may not equal sum due to rounding

→ Annual Energy Efficiency Savings in BBtu per Year, by State

| | | Energy Efficiency (BBtu per Day) | | | CAGR | | |
|-----------------------|---|----------------------------------|---------|---------|---------|---------|---------|
| | | 2021/22 | 2026/27 | 2031/32 | 2022-27 | 2027-32 | 2022-32 |
| CT | CT Natural Gas Corp. | 1.18 | 1.28 | 1.34 | 1.6% | 1.0% | 1.3% |
| CT | Norwich (City of) | 0.04 | 0.08 | 0.16 | 14.1% | 14.8% | 14.4% |
| CT | Southern Connecticut Gas Co. | 1.05 | 1.13 | 1.19 | 1.6% | 1.0% | 1.3% |
| CT | Yankee Gas Services Co. | 1.50 | 4.78 | 11.86 | 26.1% | 19.9% | 23.0% |
| MA | Berkshire Gas Co. | 0.24 | 0.26 | 0.27 | 1.2% | 0.7% | 1.0% |
| MA | Blackstone Gas Co ¹ | - | - | - | n/a | n/a | n/a |
| MA | Columbia Gas of Massachusetts (Bay State) | 5.53 | 7.59 | 9.07 | 6.5% | 3.6% | 5.1% |
| MA | Fitchburg Gas & Electric Light | 0.61 | 1.68 | 3.62 | 22.6% | 16.7% | 19.6% |
| MA | Holyoke Gas & Electric (City of) | 0.10 | 0.18 | 0.30 | 13.3% | 10.6% | 11.9% |
| MA | Liberty Utilities (New England Gas Company) | 0.30 | 0.88 | 1.99 | 23.9% | 17.7% | 20.8% |
| MA | Middleborough (Town of) | 0.04 | 0.07 | 0.11 | 13.3% | 10.6% | 11.9% |
| MA | National Grid MA | 1.53 | 1.55 | 1.56 | 0.3% | 0.2% | 0.2% |
| MA | NSTAR Gas Co. | 4.47 | 11.74 | 23.11 | 21.3% | 14.5% | 17.9% |
| MA | Wakefield Municipal Gas Light | 0.03 | 0.05 | 0.09 | 13.3% | 10.6% | 11.9% |
| MA | Westfield (City of) | 0.09 | 0.16 | 0.27 | 13.3% | 10.6% | 11.9% |
| ME | Bangor Gas Co. LLC | 1.17 | 3.40 | 7.16 | 23.7% | 16.1% | 19.8% |
| ME | Maine Natural Gas | 0.14 | 0.40 | 0.84 | 23.7% | 16.1% | 19.8% |
| ME | Northern Utilities Inc. | 0.57 | 1.66 | 3.54 | 23.7% | 16.3% | 20.0% |
| ME | Summit Natural Gas | 0.11 | 0.32 | 0.68 | 23.7% | 16.1% | 19.8% |
| NH | EnergyNorth Natural Gas Inc. | 1.58 | 1.77 | 1.90 | 2.3% | 1.4% | 1.9% |
| NH | Northern Utilities Inc. | 0.97 | 3.09 | 7.10 | 26.1% | 18.1% | 22.0% |
| RI | Narragansett Electric Co. | 4.78 | 7.02 | 8.70 | 8.0% | 4.4% | 6.2% |
| VT | Vermont Gas Systems, Inc. | 0.46 | 0.84 | 1.41 | 12.8% | 10.9% | 11.9% |
| Total Gas LDC Demand* | | 26.47 | 49.92 | 86.26 | 13.5% | 11.6% | 12.5% |

1 – Design Day Energy Efficiency Savings of Blackstone Gas Co are included in National Grid (MA) IRP

* "Total" may not equal sum due to rounding

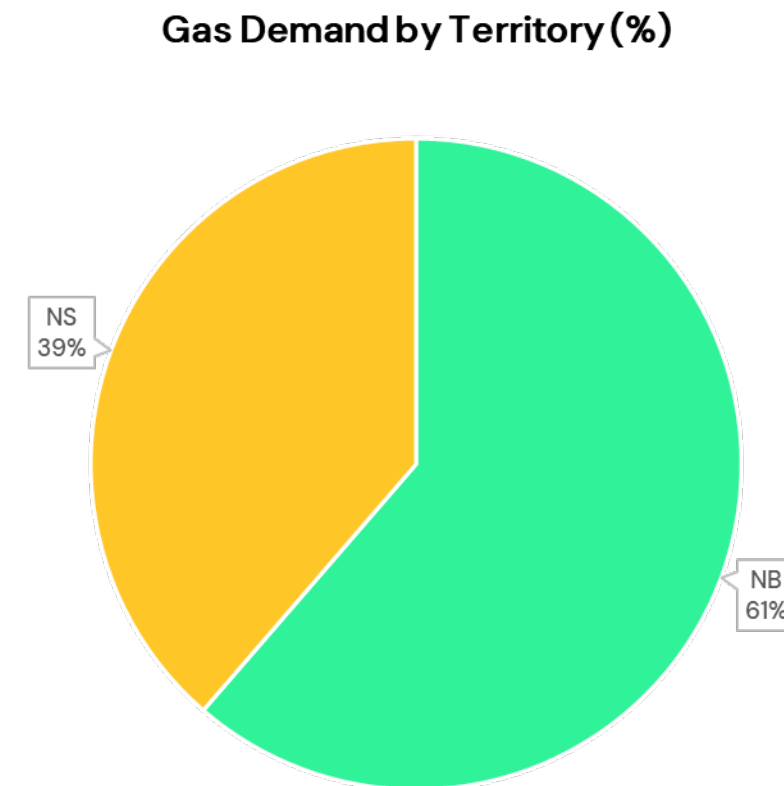
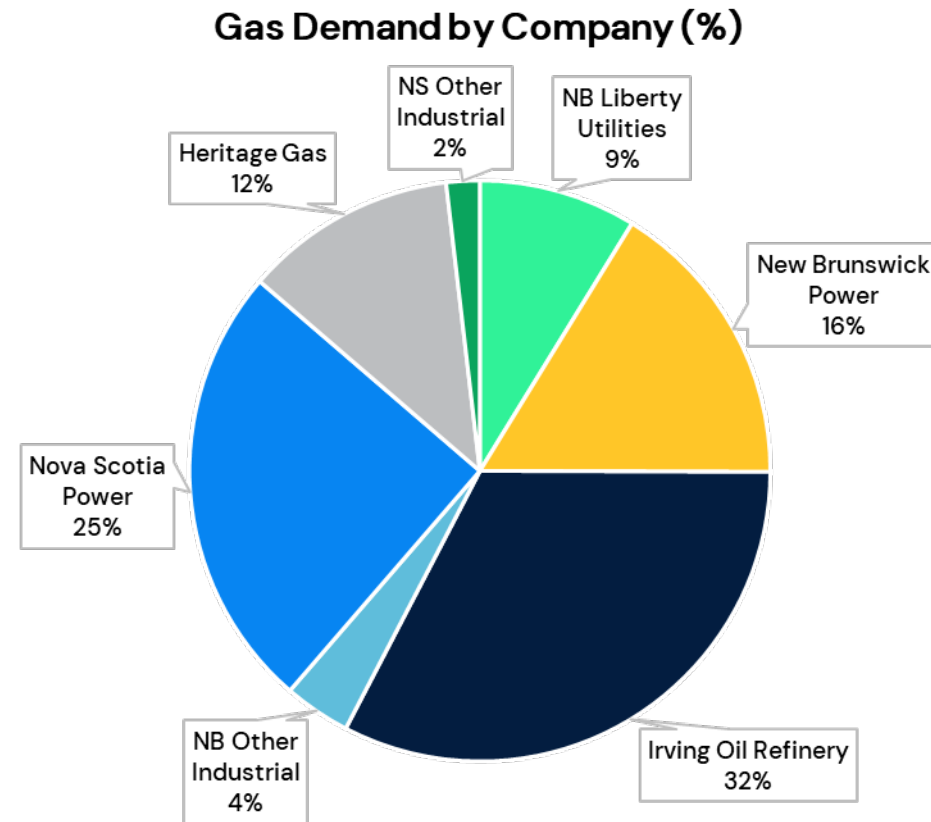
→ Winter Peak (Design Day) Energy Efficiency Savings in BBtu, by LDC

| | Energy Efficiency (BBtu per Day) | | | CAGR | | |
|-----------------------|----------------------------------|---------|---------|---------|---------|---------|
| | 2021/22 | 2026/27 | 2031/32 | 2022-27 | 2027-32 | 2022-32 |
| CT | 3.76 | 7.27 | 14.55 | 14.1% | 14.9% | 14.5% |
| MA | 12.92 | 24.15 | 40.38 | 13.3% | 10.8% | 12.1% |
| ME | 1.99 | 5.78 | 12.20 | 23.7% | 16.1% | 19.9% |
| NH | 2.55 | 4.86 | 9.01 | 13.8% | 13.1% | 13.5% |
| RI | 4.78 | 7.02 | 8.70 | 8.0% | 4.4% | 6.2% |
| VT | 0.46 | 0.84 | 1.41 | 12.8% | 10.9% | 11.9% |
| Total Gas LDC Demand* | 26.47 | 49.92 | 86.26 | 13.5% | 11.6% | 12.5% |

* "Total" may not equal sum due to rounding

→ Winter Peak (Design Day) Energy Efficiency Savings in BBtu, by State

- Total annual demand in 2022 was expected to be 65,530.6 BBtu; ICF estimates that the 2022 design day demand was 272 BBtu/d in 2022.
- The top 5 consumers account for ~90% of Maritimes natural gas demand annually.
- When summed by province, New Brunswick accounts for more than half of the gas demand within Maritimes.



➔ **2022 Annual Gas Demand by Company and Province**

| Province | Entity Name | 2016 | 2017 | 2018 | 2019 | 2020 |
|----------|-----------------------------|-----------|-----------|-----------|-----------|-----------|
| NB | Residential | 522.84 | 556.28 | 574.3 | 572.61 | 544.52 |
| NB | Commercial | 2,415.61 | 2,401.92 | 2,683.65 | 2,760.55 | 2,611.03 |
| NB | Industrial | 19,940.71 | 20,013.33 | 20,085.95 | 23,422.55 | 22,749.54 |
| NB | Power | 19,001.77 | 11,057.22 | 12,434.11 | 12,182.19 | 19,153.97 |
| NS | Residential | 224.64 | 243.28 | 283.49 | 310.95 | 278.14 |
| NS | Commercial | 4,798.09 | 6,338.71 | 6,704.85 | 7,081.65 | 6,732.42 |
| NS | Industrial | 4,164.72 | 4,762.97 | 3,248.49 | 4,165.93 | 3,736.73 |
| NS | Power | 11,924.26 | 13,842.09 | 14,860.85 | 14,592.05 | 18,574.51 |
| PEI | Industrial Demand (via CNG) | 1,080.60 | 1,165.91 | 729.88 | 1,033.21 | 966.86 |
| | *Total Gas Demand | 62,992.64 | 59,215.78 | 60,875.68 | 65,088.48 | 74,380.87 |

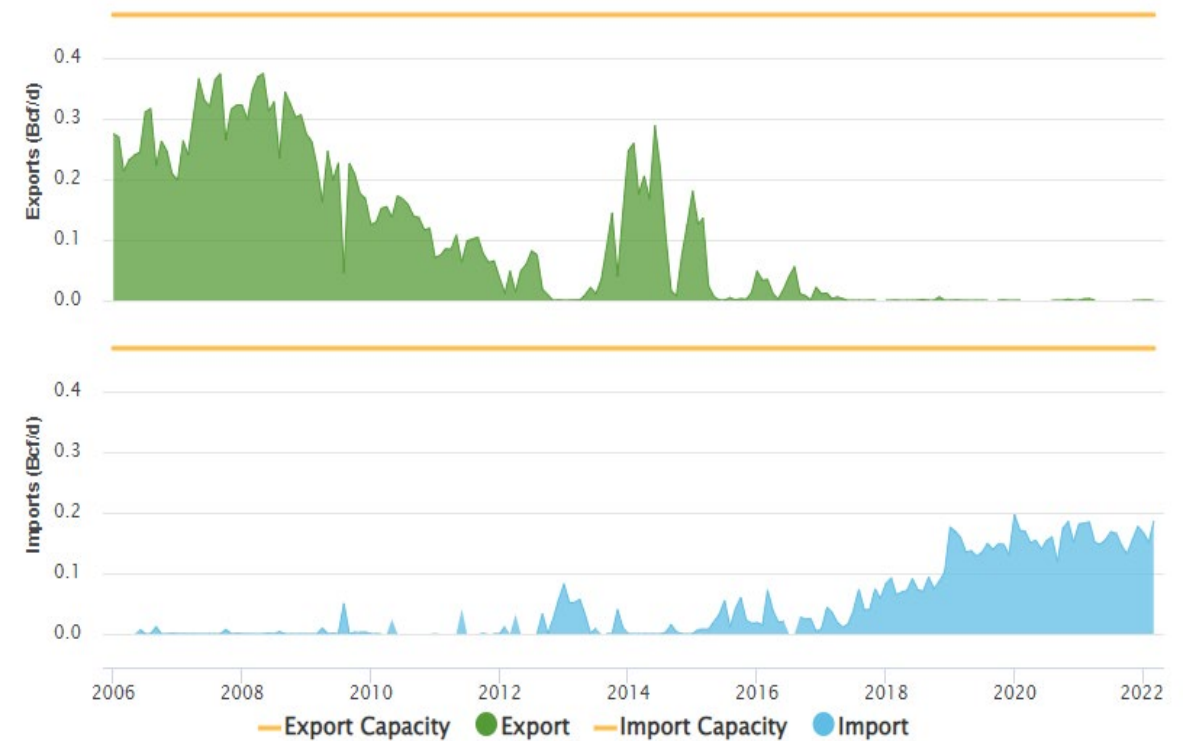
→ 5-Year Historical Maritimes Gas Demand by Province and Sector

- Firm contract commitments on the M&N Pipeline increased from 78,226 MMBtu/day for 2021 to 118,226 MMBtu/day in 2022.
 - The M&N Pipeline entered into six precedent agreements for MN365 (firm) for a minimum term of 35 months (October 2020 to September 2023).
 - Heritage Gas Limited signed a MN365 (firm) transportation contract on the M&N Pipeline with a total maximum daily transportation quantity (“MDTQ”) of 10,030 MMBtu per day.
 - Irving Oil signed three, long-term (12–15 year) MN365 (firm) transportation contracts on the M&N Pipeline for 65,196 MMBtu/day with M&NP starting October 2020.
 - Energie New Brunswick Power signed a 15–year long-term contract for 40,000 MMBtu/day with the M&N Pipeline starting November 2021 for a newly acquired gas fired plant at Bayside.

→ M&NP Contractual Obligations in 2021 – 2023

- The Maritimes region is now heavily dependent on pipeline imports from US and Canaport LNG during peak winter periods to meet the demand.
- The only M&N Pipeline Canada direct domestic supply is sourced from the Corridor Resources production in Sussex, New Brunswick. The production is seasonal to take advantage of premium winter demand and averages only 10 BBtu per day during those winter months.
- Over the past few years, the exports from the Canadian Maritimes to the U.S. decreased due to the shutdown of offshore production in Nova Scotia, while the imports increased to meet the demand in the region.

Baileyville, ME / St. Stephen N.B. – monthly traffic (direction of flow: north)



▼ Annual Average Throughput: Baileyville, ME / St. Stephen N.B. (Bcf/d)

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Export | 0.25 | 0.31 | 0.32 | 0.20 | 0.14 | 0.08 | 0.03 | 0.04 | 0.16 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Import | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.03 | 0.00 | 0.02 | 0.02 | 0.04 | 0.08 | 0.15 | 0.16 | 0.16 | 0.17 |
| Total | 0.26 | 0.31 | 0.32 | 0.21 | 0.14 | 0.09 | 0.05 | 0.07 | 0.16 | 0.06 | 0.05 | 0.04 | 0.08 | 0.15 | 0.16 | 0.16 | 0.17 |

→ Daily Flows on Canadian M&N Pipeline at Baileyville, ME

- In 2019, Nova Scotia implemented the new cap-and-trade program to reduce greenhouse gas emissions and keep the cost of carbon pricing low for all stakeholders in Nova Scotia.
- New Brunswick has implemented an Output-Based Pricing System for facilities emitting 50,000 tonnes or more of greenhouse gas emissions annually.
- The Canada Carbon Pricing System (CCPS) is expected to achieve newly defined emission reduction targets of 40–45% below 2005 levels by 2030 and starting on the path towards a net-zero carbon footprint by 2050.
- Canada's carbon price is set to rise to C\$170 a tonne by 2030 from C\$50 a tonne in 2022 and may accelerate the shift away from coal and oil-fired generation towards cleaner natural gas generation, presenting a potential upside to the gas demand outlook.

→ Uncertainty in Maritimes Canada Carbon Pricing

- In its most recent 10-year plan, New Brunswick Power does not project major additions to its system until the partial replacement/life extension of the Milbank/St. Rose station in 2031. Grandview, Grand Manan and Bayside gas plants in New Brunswick plan to retire in 2025–2027. In accordance with federal regulations, New Brunswick’s Belledune coal plant will have to retire by 2030.
- While Nova Scotia has not outlined formal plans for increasing natural gas fired generating usage, the majority of generation in the province will be affected by its cap-and-trade program as it is sourced from coal, as compared to lower emitting natural gas generation.
- The exact impact of carbon pricing policies is unclear at this stage and will depend on the paths the provinces choose in adapting to carbon pricing.
- Natural gas as a transition fuel away from heavily taxed coal, oil, and coke has the potential to increase demand for natural gas, whereas increased reliance on renewables, hydro and emerging technologies such as distributed resources, storage and demand side management would lead to less potential upside for gas demand.

→ Uncertainty in Maritimes Canada Power Sector Gas Use

Get in touch with us:



Michael Sloan
Managing Director
ICF Advisory Services
703-218-2758
Michael.Sloan@ICF.com

Andrew Griffith
Manager
ICF Advisory Services
703-272-6749
Andrew.Griffith@ICF.com

Anant Garg
Consultant
ICF Advisory Services
Anant.Garg@ICF.com

icf.com

 [linkedin.com/company/icf-international/](https://www.linkedin.com/company/icf-international/)

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