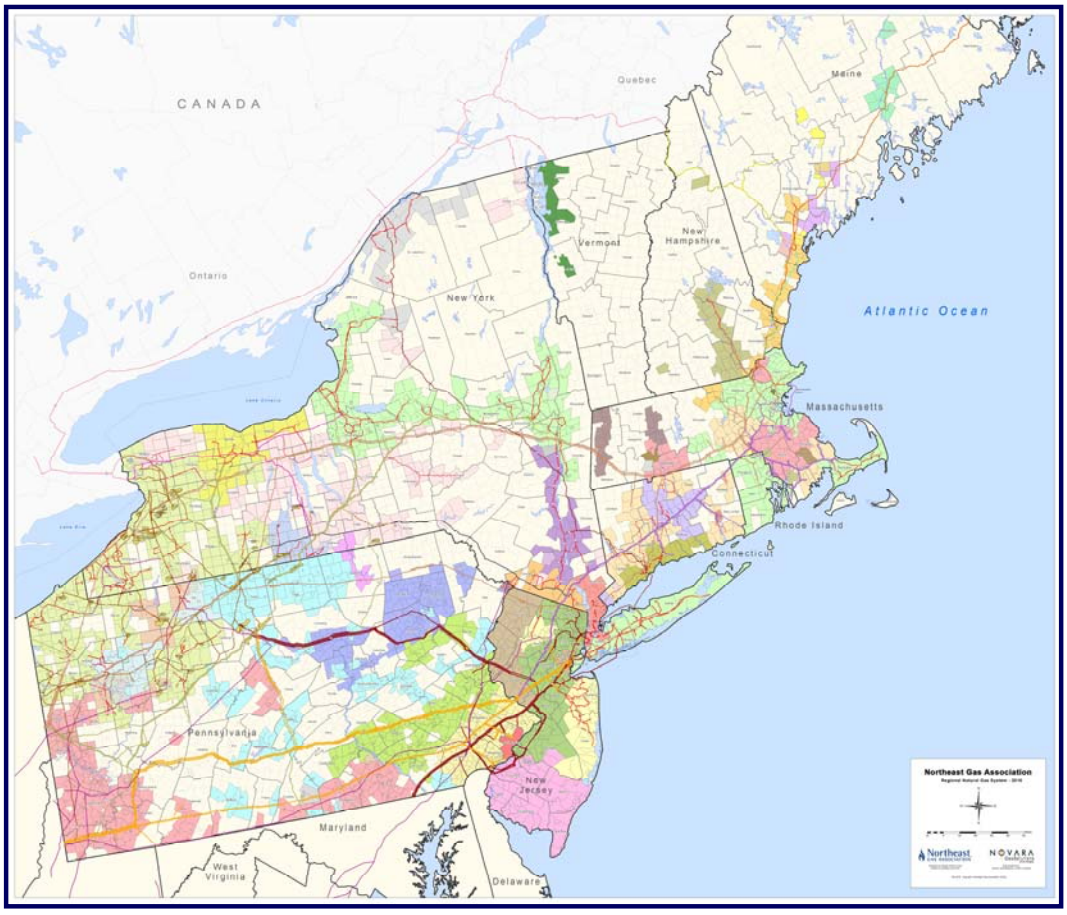
2017
STATISTICAL
GUIDE



Northeast
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NORTHEAST GAS MARKET AT-A-GLANCE

	NEW ENGLAND	*NEW YORK*	*NEW JERSEY*	*PENNSYL-VANIA*
Gas Customers	**2.7 million**	**5 million**	**3 million**	**3 million**
Annual Consumption (2016)	**871 Bcf**	**1,267 Bcf**	**757 Bcf**	**1,071 Bcf**
Interstate Pipelines	**5**	**11**	**5**	**7**
Miles of transmission pipeline	**2,680**	**4,569**	**1,588**	**10,053**
Underground Storage	**-**	**246 Bcf**	**-**	**761 Bcf**
LNG import facilities	**3**	**-**	**-**	**-**
Gas production in-state, annual (2016)	**-**	**13 Bcf**	**-**	**5,245 Bcf**
Gas Efficiency Program Budgets (2016)	**$280.2 million**	**$158.4 million**	**$70.7 million**	**$9.6 million**
Primary energy consumption, leading fuels, % (2015)	**Natural Gas, 30%** Oil, 44% Nuclear, 10% Coal, 1% Renewables, 11%	**Natural Gas, 38%** Oil, 35% Nuclear, 13% Coal, 1% Renewables, 11%	**Natural Gas, 34%** Oil, 43% Nuclear, 15% Coal, 1% Renewables, 4%	**Natural Gas, 30%** Oil, 26% Nuclear, 19% Coal, 20% Renewables, 5%
Gas as a share of residential home heating fuels (2016)	**39%**	**59%**	**75%**	**52%**
Total population	**14.7 million**	**19.7 million**	**8.9 million**	**12.8 million**
Gross state domestic product (GDP, 2017; % of U.S)	**$1,019 billion** ***5.3%***	**$1,500 billion** ***7.9%***	**$592 billion** ***3.1%***	**$746 billion** ***3.9%***

Sources: NGA, NYSERDA, NY DEC, NJ BPU, American Council for an Energy Efficient Economy, U.S. EIA, PHMSA, U.S. Census Bureau, U.S. BEA
Updated by NGA, November 2017

STATISTICAL GUIDE TO THE NORTHEAST U.S. NATURAL GAS INDUSTRY *2017*

An annual review of statistics and trends relating to the region's natural gas industry

Northeast GAS ASSOCIATION

November 2017

The NGA *Statistical Guide* is intended as an introduction to the natural gas market in the Northeast U.S. region of New England, New Jersey, New York and Pennsylvania. Included are basic statistics on end-use markets, infrastructure, and natural gas issues and trends - from technology applications to environmental topics.

Regional information is updated through calendar year 2016, where available. As much as possible the most recent data from other sources are presented.

NGA is grateful to its member companies for their cooperation and support in providing data and information for presentation in a regional tabulation.

Other particularly helpful sources of information are the U.S. Department of Energy/Energy Information Administration, the Federal Energy Regulatory Commission, Canada's National Energy Board, and the New York State Energy Research and Development Authority.

The Guide is prepared by Stephen Leahy of NGA. Please feel free to forward any suggestions, comments and revisions to:
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SECTIONS

The Year in Review
2017

The Northeast Gas Association (NGA) is pleased to present this annual overview of market characteristics and recent developments in the Northeast region of the United States. This overview summarizes the key features of the natural gas system in New England, New Jersey, New York, and Pennsylvania, and then discusses several current market issues (including new infrastructure, new technology R&D, supply and price trends, and regional and national environmental topics).

MARKET BACKGROUND

Population and Economy

The Northeast region comprises the nine states of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The composite population is 56 million (17.2% of the U.S.). Total state domestic product for the region is $3.8 trillion (20% of the U.S. total).

Regional Natural Gas Market

The nine-state region has 13.7 million natural gas customers (18.5% of the U.S. total of 74 million). Total annual gas sendout on the regional gas system is 3.9 trillion cubic feet (Tcf), or 16% of U.S. total consumption (measured in volumes delivered to consumers).

Primary Energy

Natural gas represents 30% of the primary energy consumption of the six New England states, 34% of New Jersey, 38% of New York, and 30% of Pennsylvania, compared to the national average of 29% (based on U.S. EIA data, 2015).

Gas Customers

New England has 2.7 million natural gas customers. Residential customers total 2.4 million; commercial and industrial customers number over 260,000.

New Jersey has 3 million natural gas customers. Residential customers total 2.7 million; commercial and industrial customers number about 250,000.

New York has 5 million natural gas customers. Residential customers total 4.5 million; commercial and industrial customers number about 400,000.

Pennsylvania has 3 million natural gas customers. Residential customers number 2.7 million; commercial and industrial customers number about 250,000.

Natural gas is the leading home heating fuel in all four subregions. In New England, natural gas is the leading home heating fuel (39.4%), followed by fuel oil (36%); in New Jersey, 75%, followed by electricity (13%); in New York, 59%, followed by fuel oil (21%); and in Pennsylvania, (52%), followed by electricity (23%) and fuel oil (16%).

Consumption/Sendout by Sector

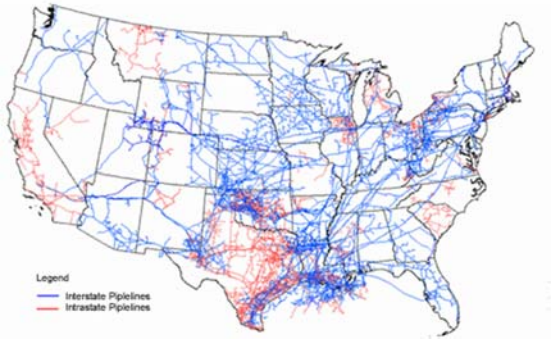
Total annual sendout in New England is 870 billion cubic feet (Bcf), in New Jersey about 760 Bcf, in New York about 1,270 Bcf, and in Pennsylvania about 1,070 Bcf (2015 EIA annual data).

In New England, gas consumption by end-use sector is 22% residential, 22% commercial, 12% industrial, and 44% power generation. In New Jersey, it is 28% residential, 20% commercial, 8% industrial, and 43% power generation. In New York, it is 32% residential, 24% commercial, 6% industrial, and 38% power generation. In Pennsylvania, it is 20% residential, 13% commercial, 20% industrial, and 47% power generation.

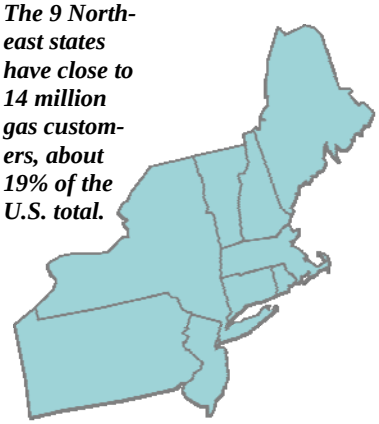
In New England, the gas distribution company, or LDC, design day demand is 4.5 Bcf per day, in New Jersey over 4 Bcf/d, and in Pennsylvania 5 Bcf/d. In New York State, total gas system demand is about 7 Bcf/d. Winter is the peak season for Northeast demand. The increasing use of gas for power generation, however, has led to higher use in the summer months, although summer demand is well below winter.

Electric Generation Sector

Based on annual fuel mix and generator applications in the queues at ISO-NE, NYISO and PJM, natural gas remains one of the leading current and projected



The U.S. interstate natural gas pipeline system includes 300,000 miles of transmission pipeline, according to the U.S. PHMSA. The EIA map on the left illustrates the extensive system.



The 9 Northeast states have close to 14 million gas customers, about 19% of the U.S. total.

fuel sources for electricity generation. In New England, natural gas represents 49% of current regional electric capacity, in New Jersey, about 58% (in-state generation), in New York, 57%, and in Pennsylvania, 29%.

Regional Market: Gas Supply Sources

Domestic production accounts for about 96% of the natural gas consumed in the U.S. The balance is imported from Canada, and a small share is imported in the form of liquefied natural gas (LNG).

Net imports as a percent of total natural gas consumption in the U.S. totaled 8% in 2011, but dropped to about 2.5% in 2016.

Historically, the Northeast region has relied on three main supply areas: Gulf Coast U.S., Canada, and LNG. During the past 20 years, supply sources expanded to include Rockies/Midcontinent gas and eastern Canada. For the Northeast, the most significant supply change has been the development in the last decade of the Marcellus and Utica Shale gas basins in Appalachia and Ohio. Marcellus production grew from 2 Bcf/d in 2008 to about 20 Bcf/d in late-2017; total Appalachian production reached 25 Bcf/d in November 2017.

As a result, the Northeast region's imports from other U.S. supply basins, Canada, and LNG have declined as the new "local" production has emerged. Marcellus production is resulting in new delivery points and new pipeline infrastructure to bring this shale gas to market, as well as reducing prices for consumers.

Canada remains valuable to the region, but with new Marcellus supplies so near, the level of exports from Canada to the Northeast U.S. has fallen by two-thirds since 2007, from 2.8 Bcf/d to 0.87 Bcf/d in 2016.

LNG imports into the U.S. were 88 Bcf in 2016, substantially lower than the high point of 771 Bcf in 2007. LNG imports still play a critical role in helping local gas utilities in the Northeast region meet winter peak day requirements; for example, LNG provides about 30% of New England's utility peak day requirements.

The Distrigas facility outside Boston imported just under 70 Bcf in 2016, which represented about 80% of total U.S. imports.

LNG inputs into the region are further enhanced via supplies from Canaport LNG in New Brunswick, Canada, which delivered another 16 Bcf in 2016.

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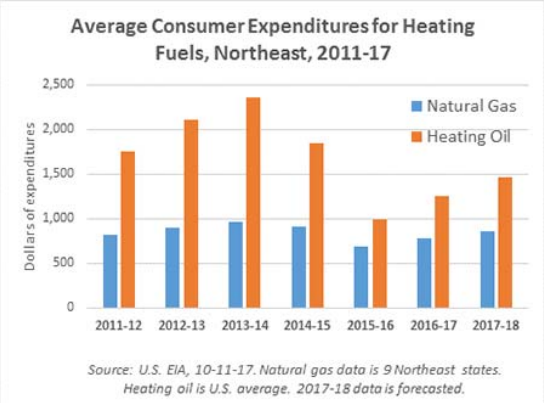

As illustrated in the chart, natural gas in the Northeast (shown in blue) has had a price advantage over heating oil for the last several years. While the price spread has narrowed, natural gas remains the heating fuel of choice: 88% of new single-family homes built in the Northeast in 2016 ran on natural gas (and 74% of multi-family units), according to the U.S. Census.

Chart source: U.S. Energy Information Administration, Oct. 2017

Pipeline and LNG Deliverability into the Region

New England

New England has 2,680 miles of gas transmission pipeline, according to the U.S. Department of Transportation/ Pipeline and Hazardous Materials Safety Administration (PHMSA).

The pipeline companies serving New England, interstate and intrastate, are: Algonquin Gas Transmission, Granite State Gas Transmission, Iroquois Gas Transmission System, Maritimes & Northeast Pipeline, Portland Natural Gas Transmission System, and Tennessee Gas Pipeline Co.

New England is the site of three import terminals for LNG, two of which are operational. The onshore terminal in Everett, outside of Boston, is owned by ENGIE and operated by its subsidiary, Distrigas of Massachusetts Corp. (DOMAC). LNG is delivered by tanker to the Distrigas terminal where there is storage capacity of 3.4 Bcf. The terminal has pipeline interconnections as well as connections with a major gas utility and a major power plant. LNG is also transported to multiple LDCs' satellite storage tanks from trucks that fuel at the DOMAC terminal. The terminal's vaporization capability is 715 MMcf/d; it also has daily sendout by truck of another 100 MMcf/d.

The offshore Northeast Gateway facility (near Cape Ann, MA) can receive LNG cargoes and inject the revaporized gas into the HubLine pipeline system of Enbridge. This offshore facility owned by Excelerate Energy became fully operational in early 2008. It had several shipments in its early years but none from 2011 to 2014. After several years of inactivity it has brought some offshore gas into the market (2.6 Bcf in 2015 and 2.3 Bcf in 2016, but none in 2017).

The offshore Neptune LNG facility owned by ENGIE (also near Cape Ann, MA) was completed in 2010. It has been inactive since its start-up, reflecting the changing market dynamics, and is presently offline.

A fourth facility, Canaport LNG, is located just over the Maine border in Saint John, New Brunswick, Canada. Owned and operated by Repsol and Irving Oil, it became operational in June 2009. It can deliver up to 1 Bcf/d into the Brunswick Pipeline, which connects with the Maritimes & Northeast Pipeline, which then can transport the volumes into New England. Since its inception, it has delivered over 400 Bcf into the regional market. Canada's National Energy Board noted in March 2017 that "Canaport is a peak demand serving facility with deliveries increasing during the winter months in response to cold temperatures."

New Jersey

New Jersey has 1,588 miles of gas transmission pipeline.

The interstate pipeline companies serving New Jersey are: Algonquin Gas Transmission, Columbia Gas Transmission, Tennessee Gas Pipeline Co., Texas Eastern Pipeline Co., and Transcontinental Gas Pipe Line Corp.

The LDCs utilize local LNG storage for peak day support.

New York

New York has 4,569 miles of gas transmission pipeline. The pipeline companies serving New York State are: Algonquin Gas Transmission, Columbia Gas Transmission, Dominion Transmission, Empire State Pipeline Co., Iroquois Gas Transmission System, Millennium Pipeline Company, National Fuel Gas Supply Co., North Country Pipeline, Stagecoach Gas Services, Tennessee Gas Pipeline Co., Texas Eastern Pipeline Co., and Transcontinental Gas Pipe Line Corp. New York also has gathering systems such as Laser Pipeline.

LNG is utilized by two local utilities in the New York City and Long Island areas. The LNG is received from the pipeline in vapor form and then liquefied. New York has no LNG import facility.

Pennsylvania

Pennsylvania has 10,053 miles of gas transmission pipeline. The pipeline companies serving Pennsylvania include: Columbia Gas Transmission, Dominion Transmission, National Fuel Gas Supply Co., Tennessee Gas Pipeline Co., Texas Eastern Pipeline Co., and Transcontinental Gas Pipe Line Corp. LNG is utilized by two LDCs, and produced by the affiliate of another utility for sale into the regional energy market.

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Regional Production

The Northeast region, a major consumer of natural gas and a high-priced energy market, is now a center of U.S. natural gas production.

The region traditionally had only limited natural gas production, in New York and Pennsylvania. (There is no gas resource production base in New Jersey or New England.) With the advancement of hydraulic fracturing and the development of the Marcellus resource base, the Northeast has developed into a significant natural gas production area.

Estimates are that the Marcellus area alone may hold as much as 500 Tcf of natural gas.

Appalachian production, centered in Pennsylvania, Ohio, and West Virginia, was at 25 Bcf/d in late-2017. Pennsylvania's annual production exceeded 5 Tcf in 2016, its highest level ever; it is now the second-largest state producer of natural gas in the nation.

Pennsylvania's recent rate of growth is actually leading the nation, notes Christina Simeone of the Kleinman Center for Energy Policy at the University of Pennsylvania. In an October 2017 paper entitled "Pennsylvania's Gas Decade," Ms. Simeone observed: "Between 2007 and 2016, Pennsylvania's annual natural gas production levels grew by almost 2,800%. The increase was larger than in any other major gas producing state, and made Pennsylvania the biggest driver of America's 32% increase in annual natural gas production. In 2007, Pennsylvania produced less than one percent of the nation's annual gas supply; by 2016 the state contributed over 16% of national annual production."

Interstate pipeline companies serving the Appalachian region continue to add interconnects from area producers. Several projects have been completed and others are in development to bring this gas to market. The primary permitting agency for interstate pipeline infrastructure is the Federal Energy Regulatory Commission (FERC). State environmental agencies among other entities are also involved in assessing siting issues at the state level, notably in terms of water and air quality certification.

Photo: PA PUC

While there is a shale gas resource in New York, use of the hydraulic fracturing process is not permitted per state regulation announced in late 2014. New York State

Another key supply point for the region is liquefied natural gas (LNG). The region has three operating import facilities, two in MA and one in New Brunswick, Canada. Nationally and regionally, LNG imports are down, as U.S. domestic production is on the increase. LNG remains especially important to New England for peak days.

does allow conventional drilling production. Total annual state output was 13.4 Bcf in 2016. The state's conventional production has steadily declined since 2007.

There is some conventional production in eastern Canada.

Gas from offshore Nova Scotia in eastern Canada continues to be produced as part of the Sable Offshore Energy Project; output, however continues to decline. Supply inputs into the Maritimes & Northeast Pipeline have dropped by 30% in the last three years, reflecting lower offshore production from the Sable and Deep Panuke fields, as well as lower LNG imports at Canaport. Decommissioning of some of the offshore Nova Scotia production is anticipated as early as 2020; in its *Canada's Energy Future 2017* forecast, the National Energy Board projected that "production ceases in 2021 when the costs of offshore operations exceed the revenue generated by the natural gas produced."

A gas production field in New Brunswick, the McCully field of Corridor Resources, which began production in 2007, provides small amounts of gas (about 8 MMcf/d) for delivery into the Maritimes and Northeast Pipeline. New Brunswick does not permit hydraulic fracturing although it has a potential gas resource base.

Regional Storage

Storage is a critical part of the natural gas supply and delivery chain. The Northeast region has considerable underground storage, notably in Pennsylvania (8.4% of the U.S. total). Underground storage in New York represents 2.7% of the U.S. total. The geology of New Jersey and New England is not suitable for underground gas storage.

As noted, LNG is another important part of the Northeast storage portfolio. Total LNG storage capacity in New York is 3.2 Bcf, in New Jersey about 4 Bcf, in Pennsylvania 6.7 Bcf, and in New England 16 Bcf on the LDC system and another 3.4 Bcf at the DOMAC import terminal. In Saint John, New Brunswick, the Canaport LNG facility has 9.9 Bcf of storage. In 2016 Gaz Métro in Quebec ex-

panded its LNG liquefaction capability from 3 Bcf to over 9 Bcf; some of its supply is positioned for the New England market.

Recent System Enhancements

2017 was a year of steady progress regarding the advancement of incremental interstate pipeline projects. Whereas 2016 was a year marked by numerous project delays, owing principally to regulatory roadblocks at the state level, several projects entered service in 2017, designed to serve the local gas utility market.

These projects include:

- Dominion: "New Market Project"
- Enbridge: "AIM Project" [partial in late 2016, fully in early Jan. 2017]
- Enbridge: "Atlantic Bridge Project" [partial]
- National Fuel Gas: "Line D Project"
- PNGTS: "C2C Project"
- Transco: "New York Bay Expansion"
- Transco: "Garden State Expansion Project" [partial]
- Tennessee: "Susquehanna West Project"
- Tennessee: "CT Expansion."

Additional projects are in the regulatory process or in development for the Northeast market over the next several years.

Planned Infrastructure Enhancements

The Northeast region's natural gas industry plans several infrastructure projects to meet growing market demand within the 2018 - 2021 timeframe. The re-

The interstate pipeline system in the Northeast accesses supplies from multiple sources. The pipelines also can access storage at different points along their systems, including local storage in Pennsylvania and New York. With prolific production underway in Appalachia, these pipeline operators are undertaking numerous projects to add facilities to bring these new supplies to local markets in the Northeast and elsewhere, changing traditional flow patterns.

gion is constrained at several points on its natural gas system, especially into New England and southern New York/Long Island. Two gas utilities in Massachusetts continue to have moratoria in place on adding new customers in certain parts of their systems due to limitations on capacity.

New supplies and infrastructure would help to ease these constraints, ameliorate the regional price disadvantage, further increase regional natural gas capacity, deliverability, flexibility and reliability, and provide economic and environmental benefits to the Northeast region.

New supply developments have transformed the traditional paths of supply sourcing into the region, creating a more flexible supply mix and a more robust delivery network.

NGA regularly posts updates on proposed projects at:

http://www.northeastgas.org/pipeline_expansion.php.

Challenges for new projects include siting, environmental concerns, and securing market position. Securing contract commitments in New England remains a vexing market issue, as the largest consuming sector, power generation, is constrained by the complex economic structure of its wholesale electricity market. Natural gas utilities on the other hand have committed to investing in incremental pipeline projects to meet system expansion and reliability needs.

LNG is another supply option, for the market in general and for gas LDCs. UGI Corp. in Pennsylvania through its subsidiary, UGI LNG, has LNG storage, associated peak shaving services, and an LNG tanker truck-loading terminal. As noted, Gaz Métro in Québec increased its liquefaction capability in 2016. South Jersey Gas added liquefaction capability in 2016. National Grid is seeking regulatory approval to add liquefaction at its Providence, Rhode Island facility. A further project is the Northeast Energy Center (NEC), proposed as a FERC regulated LNG liquefaction, storage and vaporization project to be located in central MA and connected to Tennessee Gas Pipeline. The project sponsors are affiliates of Liberty Utilities and PNEC, LLC.

Portable or mobile compressed natural gas (CNG) and LNG is another supply/delivery development. This process is designed to bring natural gas to communities and businesses not located near a pipeline or distribution system. Some large commercial and industrial facilities, such as medical centers and colleges, have opted for "portable" or "mobile" natural gas delivered by truck. In this approach, large tube trailers are filled at large compression facilities and the CNG is

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Natural gas and renewable energy are the leading growth fuels in the region, for sectors from power generation to alternate fuel transportation. Natural gas can help balance power system demand for variable sources like solar and wind. Shown here is a photo of an LNG tank on the National Grid system, along with a solar panel array.

delivered to the customer's facility, where the CNG is then de-pressurized, off-loaded, and flowed into the customer's gas (or dual-fuel) equipment.

MARKET ISSUES

Supply Outlook

In terms of U.S. natural gas supply, the outlook remains positive.

In July 2017, the Potential Gas Committee (PGC) at the Colorado School of Mines released its year-end 2016 biennial report, *Potential Supply of Natural Gas in the United States.* The updated assessment finds that the nation possesses a technically recoverable natural gas resource potential of 2,817 Tcf. This is the highest resource evaluation in the PGC's 52-year history, exceeding by 302 Tcf the previous record-high assessment from year-end 2014. The future supply of domestic natural gas continues to increase due to the emergence and advancement of key technologies that unlock gas production from reservoirs such as shale formations.

Canada, which has considerable natural gas reserves, remains an important energy partner, although its share of the U.S. natural gas market is expected to decline over the long-term. As mentioned, the growth of U.S. supplies is leading to lower imports from Canada into the Northeast. In June 2016, Canada's National Energy Board (NEB) observed in *Canada's Energy Future 2016* that "net pipeline exports of natural gas from Canada could decline to essentially zero by 2040."

Increased domestic U.S. production is also affecting LNG imports. LNG imports into the U.S. are substantially lower than a decade ago, and the focus for the U.S. gas market has shifted from *imports* to *exports*. Several LNG import facilities in the U.S. – on both coasts and especially in the Gulf - are adding liquefaction facilities so that they can export LNG to the world market. In 2016, the U.S. *exported* more LNG (187 Bcf) than it *imported* (88 Bcf), a trend that will continue. For instance, Dominion's Cove Point facility in Maryland, long an import facility, plans its first export shipment by the end of 2017.

Nevertheless, with the Northeast delivery system still constrained at certain points, regionally based LNG facilities are expected to continue to ease bottlenecks and increase supply and delivery options.

The Northeast states continue to be leaders in per capita energy efficiency.

Efficiency Initiatives

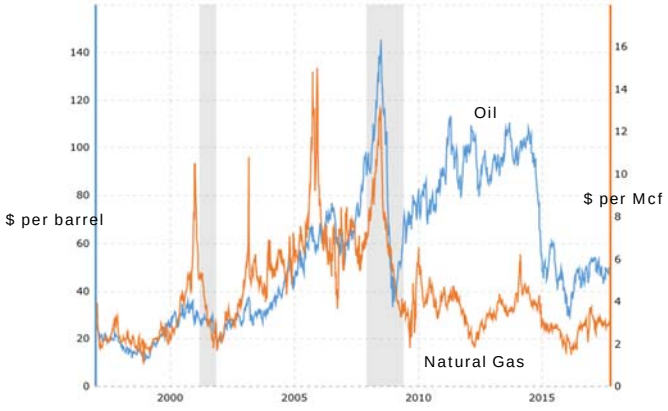
The Northeast region is a recognized national leader in per capita energy efficiency. A 2017 report by the American Council for an Energy Efficient Economy (ACEEE) noted that $1.3 billion was invested in natural gas efficiency programs nationwide in 2016 (latest data). Nearly 40% of the national total ($519 million) was invested in the nine Northeast states alone.

ACEEE notes that efficiency opportunities exist in multiple sectors: "While the roots of natural gas efficiency programs lie within residential markets, there are now programs serving multiple types of natural gas customers - from homeowners to large industries… Programs may target specific technologies that use natural gas, such as furnaces, water heaters, boilers, and cooking equipment, or they may target the systems and facilities that are served by natural gas technologies. Improving the thermal envelope of buildings is one example of programs that address whole buildings."

The greater efficiency of homes and buildings is leading to energy savings.

Price Trends

The key variables in natural gas price formation are: demand growth, the state of the national economy, production levels, storage levels, weather, and alternative fuel prices.



The wide price differential between natural gas and oil has narrowed in the last two years. Natural gas however retains a price advantage - and the projection by U.S. EIA in its "2017 Annual Energy Outlook" is that average natural gas prices for consumers will fall well below oil prices in coming decades in the U.S. ***Chart: MacroTrends, 9-17***

New York City continues to make progress in its efforts to phase out the use of heavy oil in city buildings in favor of cleaner fuels such as natural gas as part of the "NYC Clean Heat Initiative."

The natural gas price story in this new era of domestic production has been positive for both consumers and the entire U.S. economy. In July 2008, natural gas commodity prices reached $13.50/MMBtu (and oil hovered close to $150 a barrel), whereas in 2016 the average natural gas commodity price was around $2.50/MMBtu, the lowest average annual price since 1999.

Given the size of the domestic supply resource base, it is projected that the natural gas price bandwidth will stay relatively moderate. However, short-term volatility reflecting delivery constraints and weather will exist, especially in regional markets.

EIA is projecting an average price of around $3.12 in 2017 and $3.20 in 2018 as consumption (including LNG exports) rises.

The lower commodity price offers economic opportunities for the Northeast region. New York State, in its 2015 Energy Plan, observed: "Projected prices reflect continued industry success in tapping the nation's extensive shale gas resources. With its nearness to the Marcellus Shale basin, New York should participate in prices lower than those experienced from 2000 through 2010 and more similar to those of the last few years."

For Pennsylvania, the rise in in-state production and drop in commodity prices has resulted in what Christina Simeone of the Kleinman Center for Energy Policy at UPenn terms the "Pennsylvania gas discount." She wrote in October 2017: "Between 2007 and 2016, gas commodity costs have decreased significantly for all Pennsylvania consumers. Since 2013, Pennsylvania consumers have generally enjoyed a discount in natural gas commodity costs compared to national commodity prices, benchmarked at the Henry Hub… it is clear that Pennsylvania consumers enjoyed more significant cost reductions than national averages."

The robust production situation in the Northeast along with limitations on existing takeaway pipeline capacity has meant that, at certain points in the region, Marcellus gas is priced substantially lower at times than the traditional national average at Henry Hub.

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Winter Challenges

The back-to-back winters of 2013-14 and 2014-15 brought colder than normal weather to the Northeast and set new records for both pipeline and gas utility sendout. The consistent cold weather tested regional energy delivery systems and resulted in significant energy price volatility.

FERC's 2013-14 winter assessment noted that "during each of these cold events, customers who had firm transportation capacity on natural gas pipelines generally managed to secure natural gas deliveries."

Since most gas generators in New England do not have firm transportation capacity arrangements, many are unable to obtain gas during high demand periods. ISO-New England's "winter reliability program" utilizes oil through special contracts to offset the unavailability of the generators' interruptible gas arrangements; LNG is also an option. ISO-NE's program has been extended for one more winter (2017-18) in recognition of the projected constraints on the regional natural gas delivery system and the resultant impact on "non-firm" transportation customers such as many power generators.

Natural gas utility customers in the region are shielded in large part from spot market price volatility because of gas utilities' firm contract arrangements for pipeline capacity and their storage arrangements. Other market participants however, such as many power generators, do rely on non-firm capacity and are subject to spot market prices and interruptions in capacity delivery according to their contract terms.

There is an impact on regional electric prices. FERC has noted that "as natural gas is the marginal fuel for most electricity energy markets, the price of natural gas plays a leading role in setting the price of electricity." In March 2017, U.S. EIA noted that "both the Boston and New York natural gas markets have experienced winter price spikes because of pipeline constraints during periods of peak demand. Natural gas pipeline expansion projects that were completed in recent years may have reduced, but did not eliminate, sharp price increases with anticipated cold weather."

The situation in the summer months is far less challenging (although maintenance work can have local area impacts).

Again, adding new infrastructure would increase supply availability and help mitigate energy price volatility in the Northeast region.

Air emissions from power generation in the region have declined substantially in the past decade thanks in great part to the use of cleaner-burning fuels such as natural gas.
Photo: Joseph Murphy

Gas and Electric Power Generation

The regional power generation fleet, already highly reliant on natural gas, is positioned to become more so in the years ahead. Combined-cycle technology (CCT) has made the natural gas power plant the energy system of choice for the last two decades. CCT's advantages over other conventional fuel types include higher efficiency, lower heat rates, shorter construction lead times, and reduced air emissions.

Gas plants are the leading fuel types for new proposed power generation capacity in the generator queues in New Jersey (where gas represents 97% of proposed new generation), Pennsylvania (96%), and New York (56%), and is second in New England, where gas represents 37% of proposed generation and wind equals 55%.

And as more renewable resources enter the grid, natural gas will continue to serve an important and essential balancing role to provide baseload support for variable resources such as solar and wind. Natural gas and renewables can be viewed then as partners in helping create a more sustainable power system. (Another market factor to watch is energy storage, which has the potential to further transform the electric system. The Northeast states, notably Massachusetts, are key supporters of energy storage technology research and development.)

In March 2017, PJM's study on system reliability concluded that even with the addition of more natural gas and renewables, its system would remain reliable. The analysis identified "no limit to the amount of natural gas-fired generation that could be added to the system before it affected reliability."

Meanwhile, regional retirements of non-gas units continue apace. In New Jersey in 2016 PSEG announced the retirement of its last two coal units, noting the competitive market pressure presented by low natural gas prices. In Vermont in 2014, Entergy retired its nuclear plant; in Massachusetts in 2019, it will retire its Pilgrim nuclear facility; and in New York State in 2021, it will retire its Indian

A new natural gas power plant under construction in mid-2017 north of Boston.

Point nuclear facility. In 2017 in Massachusetts, Dynegy closed the large Brayton Point coal plant.

At the same time, public policy in several states in the region is clearly prioritizing non-fossil fuel units for future generation. As part of its "Reforming the Energy Vision (REV)" process, New York State is seeking to transform its electric system with the primary goal of reducing carbon emissions to meet a recently-enacted Clean Energy Standard. This approach in 2016 led the state to implement steps to subsidize nuclear units located upstate that were slated for closure as a result of competitive power market pressures (an added benefit in the state's view was preserving plant jobs in an area of the state experiencing slow economic growth).

In August 2016, the governor of Massachusetts signed an "energy diversity" bill to facilitate the import of up to 1,200 megawatts (MW) of "clean energy" from Canada and other areas, and up to 1,600 MWs of offshore wind. In October 2017, the governor of Connecticut signed legislation to review whether the state should provide an incentive to support the preservation of the Millstone nuclear unit.

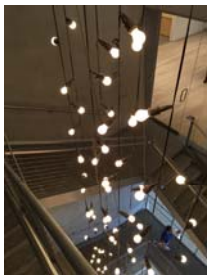
Low natural gas prices in the power market are cited as among the key determining factors in the planned retirement of many fossil and nuclear plants in the region (it is also a factor in the 2017 U.S. Department of Energy emphasis on grid resiliency, aimed in great measure to support the preservation of coal and nuclear generation nationally).

Nevertheless natural gas, which serves as the backbone of the power system regionally, will continue as the backbone while the Northeast region moves toward a system more reliant on clean energy. This reality was underscored in fall 2017 when ISO-NE released its biennial "Regional System Plan." The Plan states that "Natural-gas-fired generation's proportion of the system capacity mix is expected to grow from 44.5% in 2017 to approximately 50.9% by 2020 and 56.0% by 2026. Further retirements of coal and oil generators are expected after 2020 due to generally low natural gas prices, renewable energy additions, and pending environmental regulations."

Earlier in 2017, the head of the New England electric grid operator observed in *Commonwealth Magazine* that "The region's reliance on natural gas will only intensify... While some argue that the region is too dependent on natural-gas-fired power plants, the future hybrid power system will require reliable, flexible back-up power—exactly what efficient natural-gas-fired generators provide."

NGA "Year in Review 2017"

As the region continues to rely on natural gas for baseload generation, the lack of adequate pipeline infrastructure to meet winter power sector needs remains an unresolved issue - most notably in New England. As mentioned earlier, most power generators in New England do not contract for firm gas pipeline capacity and instead rely on "if and as available gas" non-firm capacity, or, in some cases, capacity held by third parties. Pipeline capacity is added to meet the needs of gas customers who desire and are willing to execute contracts for such firm service.



More than a decade after the January 2004 "cold snap" first exposed the regional power system's reliance on interruptible natural gas deliveries, the New England gas-electric reliability challenge remains indeterminate.

Industry Consolidation

Recently, several industry consolidations have been announced.

In September 2016, Enbridge Inc. and Spectra Energy Corporation announced a definitive merger agreement under which Enbridge and Spectra Energy would combine in a stock-for-stock merger transaction. The merger closed in the first part of 2017; the companies are joined under the name of Enbridge.

In August 2017, Algonquin Power & Utilities Corporation (APUC), based in Ontario, announced a definitive agreement by its subsidiary Liberty Utilities Co., APUC's regulated distribution utility business, to acquire St. Lawrence Gas Company, Inc. (SLG), a regulated natural gas distribution utility located in northern New York State, and its subsidiaries. SLG serves approximately 16,000 residential, commercial and industrial customers.

In October 2017, South Jersey Industries announced agreements to acquire the assets of New Jersey-based Elizabethtown Gas and Maryland-based Elkton Gas from Pivotal Utility Holdings, Inc., a subsidiary of Southern Company Gas. Upon successful completion of this transaction, SJI will become the second-largest natural gas provider in New Jersey, with service to more than 675,000 customers. In addition to Elizabethtown Gas' 288,000 customers, the company will also add over 6,000 customers in Maryland.

In November 2017, New Jersey Resources announced an agreement by its subsidiary, Adelphia Gateway, LLC, with Talen Generation, LLC (Talen Generation), a subsidiary of Talen Energy Corporation, to purchase all of Talen Generation's membership interests in Interstate Energy Company LLC, which owns and operates an existing 84-mile pipeline in southeastern Pennsylvania.

NGA "Year in Review 2017"

Natural Gas Vehicles

Natural gas vehicles (NGVs) remain a competitive alternative fuel option, especially for fleets, buses, and heavy-duty vehicles, including refuse trucks. On the environmental front, NGVs have other comparative advantages. The U.S. Department of Energy noted that "Commercially available medium - and heavy-duty natural gas engines have demonstrated over 90% reductions of carbon monoxide (CO) and particulate matter, and more than 50% reduction in nitrogen oxides (NOx) relative to commercial diesel engines."

The market for heavy-duty vehicles remains strong, especially for both the bus and refuse truck sectors. Compressed natural gas (CNG) accommodates the widest range of vehicle types, from fleet vehicles to buses and garbage trucks. There is also interest in LNG as a fuel for heavy-duty trucks that travel defined routes and even for marine transportation (such as ferries).

Even though CNG fueling stations are being added each year, availability remains relatively limited in the region.

New England has a few LNG fueling sites (in CT and MA), and some initiatives are underway in the U.S. and Canada for "LNG highways" to establish fueling stations to facilitate truck travel. New Jersey and Pennsylvania continue to experience CNG station development. In New York City, the first CNG station in the Bronx will enter service in 2018. New York State also has seen an investment in CNG "virtual pipeline" facilities at several locations.

In January 2015 the NYS Department of Environmental Conservation released new regulations for LNG. DEC observed that "The adopted regulations enable permits to be granted to safely site, construct and operate new LNG facilities under requirements established in a DEC permit…LNG offers a lower cost, cleaner fuel for truckers and an emissions benefit for the environment."

Assessing the Future Role of Natural Gas in the Regional Energy Market

The benefits of natural gas – lower price, lower emissions, domestic supply – contribute to continued levels of customer conversions and new customer development. Multiple states and municipalities are looking to natural gas to provide both greater energy choice and economic benefits to consumers and local economies, and assist in complying with air and health quality standards.

NGA "Year in Review 2017"

New Jersey's state energy master plan (EMP) released in December 2015, summarized some of the opportunities presented by natural gas: "Expansion of the State's gas distribution companies' (GDCs) intrastate pipeline capacity and the capacity of the interstate pipelines serving the state provides an opportunity for the State to take advantage of relatively low priced and abundant nearby natural gas supplies. This will assist in meeting the increased and competing demands upon natural gas supply as fuel for residential and commercial heat and electric generation. Although New Jersey is generally well-supplied with natural gas pipeline capacity for heat and existing power generation, the state lacks adequate natural gas infrastructure to support new, gas-fired electrical generation, as well as substitution for other fuels in the residential and commercial sectors. Expanding the capacity for natural gas can increase economic development with lower costs for energy and enhance environmental quality through lower emissions."

The Northeast states have added over 1 million new natural gas customers since 2009.

In recent years, efforts by several states to advance clean energy have focused on renewables. For instance, the Connecticut draft energy strategy released in summer 2017 concentrated almost entirely on electricity and clean energy options while also recognizing, nonetheless, "that at this time, natural gas provides a cost-effective, relatively cleaner energy supply that Connecticut should continue [to] count on as we build up our renewable options." The REV process in New York State, and Rhode Island's "Power Sector Transformation" report, released in fall 2017, articulate the vision of rebuilding the energy system with a clean energy focus.

Several national and regional advocacy groups and consultants are promoting "strategic electrification" or "beneficial electrification" as the new overarching energy system paradigm, under which all systems – heating, power generation, and transportation – would operate via electricity, and that all fossil fuels would be eliminated.

This viewpoint, and a related relative ambivalence about the role of natural gas, was addressed in a recent paper by the Natural Regulatory Research Institute (NRRI) ("Questioning the Future of Natural Gas", May 2017, Report No. 17-01).

Ken Costello, the report's author, noted: "A reasonable argument is that U.S. and state energy policy should encourage the use of natural gas for different uses rather than its suppression. A proper balancing of economic and environmental considerations would likely reach that conclusion. Those who advocate less natural-gas usage generally skew their finding by giving little if any weight to the economic effects…Climate change concerns should certainly be a factor in developing energy policy, but not the sole or even overriding factor."

In fall 2017, the National Association of Regulatory Utility Commissioners (NARUC) released a Task Force report on "Natural Gas Access and Expansion." The Task Force noted that "this Report is intended to provide states with educational tools and guidance on policies, mechanisms, and best practices that regulators can use to help extend natural gas service to unserved and underserved areas, where appropriate. Ultimately, we hope to educate regulators on how to bring the benefits of natural gas as an energy source to more consumers in unserved and underserved areas and hence, give consumers more energy choices."

Accessing natural gas as an affordable and reliable energy market choice for consumers remains then a viable part of the nation's – and region's – diverse energy portfolio. Natural gas, along with renewables and other fuels, and empowered by anticipated new technological breakthroughs, will help fuel the nation in an increasingly more sustainable manner.

Utility System Expansions and Fuel Conversions

Since 2009, the number of homes heating with natural gas in the Northeast region has grown by over one million (to over twelve million heating customers total).

Photo: National Grid

In 2017, several utilities completed or are in process of undertaking system expansions to meet rising demand. A further goal is to enhance system reliability by strengthening the existing system. That second goal also incorporates the growing recognition that energy systems need to "harden" their networks to deal with potential major weather events, from flooding to changing weather patterns.

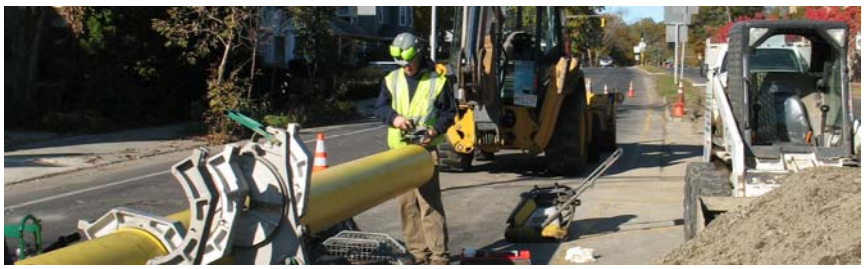
In February, South Jersey Gas received regulatory approval to proceed with its Cape Atlantic Reliability Project, which includes providing natural gas to power an electric generating plant that is switch-

ing from coal to gas.

In April, Vermont Gas completed its Addison Expansion Project, an expansion of 41 miles to Middlebury.

In April, Liberty Utilities in New Hampshire announced it had received regulatory approval to expand its distribution system to the towns of Windham and Pelham. The utility is in process of converting an existing distribution system in Keene from propane/air to CNG and LNG; and is proposing an expansion to the Hanover/Lebanon area.

In September, New Jersey Natural Gas received final regulatory approval for its Southern Reliability Link (SRL) project. The utility noted: "By reinforcing the supply of natural gas with a feed from a separate interstate supplier into the southern end of NJNG's system, the SRL will help mitigate potential customer interruptions, enhance system resiliency and ensure safe, reliable natural gas service for the region."



In October, Con Edison announced a multi-faceted approach to address gas system growth needs. Since 2011, natural gas usage on the coldest winter days in Con Edison's service territory has grown by more than 30 percent, and is expected to grow an additional 20 percent in the next 20 years. In the past five years (2011-2016), Con Edison converted 6,500 large buildings in New York City from oil to natural gas. The utility, which forecasts a shortfall in existing pipeline capacity by 2023, is considering proposals to increase pipeline capacity on its system, while also looking to increase conservation efforts and to explore renewable alternatives to natural gas heating – in recognition of the challenges faced by new pipeline expansions in the region.

In November, Columbia Gas of Massachusetts announced plans for a multi-faceted solution of five integrated supporting infrastructure projects in its western MA area. The goal is to "ensure safe, reliable, and continuous natural gas service to the Greater Springfield Service Territory that serves approximately 106,000 customers in five municipalities." Parts of this service area remain under a moratorium for new customer connections, which this larger project seeks to address as one of its benefits. Another goal is to facilitate the company's ongoing commitment to replace leak prone pipe.

Work continues throughout the region to meet demand and system requirements.

Infrastructure Siting Challenges and Regulatory Delays

Energy infrastructure has always encountered siting issues. Examples include wind turbines on mountain ridges, offshore wind farms, nuclear power units, wood plants, electric transmission, and natural gas pipelines and compressor turbines.

Some natural gas pipelines in service today in the region experienced delays in development due to siting challenges before ultimately beginning operation.

In recent years, siting challenges for fossil fuel projects have reached a new level in the U.S. and North America. Some in the environmental community argue that fossil fuels should be "kept in the ground" and that any new infrastructure must be prevented, lest, once built, it remains in service for decades and restrains the use of renewables. Natural gas as a "bridge fuel" was for several years the fossil fuel preferred by many environmentalists, since gas exhibits lower environmental impacts than coal and oil. Now, the rising use of natural gas is garnering increased attention from many groups which view gas as an obstacle to the full implementation of "clean energy."

The regulatory process remains essentially unchanged but delays at the state level are increasing, particularly regarding the issuance of state water quality certificates, adding costs and uncertainty. To secure federal approval, natural gas pipeline projects must demonstrate market need and financial viability, and their routes must meet environmental requirements. Contract commitments by proposed customers or shippers are essential to the process.

Stakeholder and community outreach are also a required and important part of the process. Local residents have legitimate questions about the impacts of new developments in a range of sectors, not just energy, and social media is empowering community organization. In the end, public policy requires a balanced weighing of costs and benefits.

The Northeast region, as a highly congested area, poses challenges for any energy development. There is demonstrated market demand for natural gas by

customers in the region. Increasing stakeholder outreach and advocating project benefits will only become more relevant in this new public environment.

Environmental Considerations & Accomplishments

Environmental issues remain central to energy system use. Highlights of some environmental topics and the role and performance of natural gas follows.

Reductions in air emissions from power generation

Because natural gas compares favorably to other fossil fuels regarding air emissions, it will remain a favored fuel for new power generation. MIT's June 2011 study on gas concluded that using very efficient natural gas-powered plants to replace coal-fired plants was "the most cost-effective way of reducing CO_2 emissions in the power sector" over the next 25 to 30 years. Natural gas will also play "a central role in integrating more intermittent renewable sources - wind and solar - into the electricity system because they can easily be brought in and out of service as needed."

In April 2017, EIA reported that energy-related CO_2 emissions in the U.S. dropped in 2016, and were 14% below the 2005 levels, mostly because of changes in the electric power sector. EIA stated that "a significant reduction in coal use for electricity generation was offset by increased generation from natural gas and renewable sources. Renewables do not emit CO_2, and a shift towards natural gas from coal lowers CO_2 because natural gas has lower emissions per unit of energy than coal and because natural gas generators typically use less energy than coal plants to generate each kilowatthour of electricity."

At the regional level, air emission trends remain favorable. NY ISO reported that from 2000 to 2016 emission rates from the power sector declined by 43% for CO_2, 87% for NOx, and 98% for SO_2. ISO-NE reported that from 2001 to 2015, total emissions from power plants in New England declined by 95% for SO_2, 68% for NO_x, and 24% for CO_2.

In February 2017 a posting by ISO-NE stated: "This ongoing trend to meet electricity needs with higher-efficiency, lower-emitting gas-fired generators instead of oil- and coal-fired generators has been the biggest contributor to the long-term decline in regional emissions." New Jersey reported that the CO_2 emission rate of fossil generation declined by 37% from 2011 to 2013.

Reductions of methane emissions in natural gas system operations

The natural gas industry is cognizant of its responsibility to reduce emissions throughout its system operations. Many of NGA's distribution and transmission company members participate in the EPA's Natural Gas STAR Program and progress continues on this front. In 2015, Natural Gas STAR partners reported methane emissions reduction of 53.5 Bcf in the U.S., providing "cross-cutting benefits" according to EPA. Reducing pipeline leaks is of paramount interest (see section on infrastructure replacement below).

Natural gas systems in total account for about a quarter of all U.S. methane emissions, or nearly 3% of all U.S. greenhouse gas (GHG) emissions. The local distribution segment is responsible for 2% of total U.S. methane emissions (source: U.S. Department of Energy report, January 2017).

Since 1990, methane emissions related to the U.S. natural gas system have declined by 16.3%, according to the EPA's April 2017 national GHG inventory report. The report noted that "The decrease in CH_4 emissions is largely due to a decrease in emissions from transmission, storage and distribution... The decrease in distribution emissions is largely attributed to increased use of plastic piping, which has lower emissions than other pipe materials, and station upgrades at metering and regulating (M&R) stations."

In the distribution sector, the main emphasis is to accelerate the replacement of older, potentially more "leak-prone" pipe. Early in 2015, a national study led by Washington State University reported that direct measurement analysis showed "decreasing methane emissions from natural gas local distribution systems in the United States." Replacement of older pipe systems and improved leak surveys were among the reasons cited for the industry performance. In 2015, an ICF study for the Commonwealth of Massachusetts reported that for the three geographic areas studied in the state, methane emissions fell within the range of 0.6 to 1.1% of all gas received. ICF noted that "the effectiveness of replacing cast iron and unprotected steel with plastic pipe to reduce emissions is clearly demonstrated in this study."

Recent updates by several states on efforts to reduce emissions include:

Pennsylvania: In January 2016, Governor Tom Wolf of PA announced a "nation-leading strategy to reduce emissions of methane." The plan is designed to protect the environment and public health, reduce climate change, and help businesses reduce the waste of a valuable product by reducing methane leaks and emissions from natural gas well sites, processing facilities, compressor stations

and along pipelines. Pennsylvania will reduce emissions during development and gas production, processing, and transmission by requiring leak detection and repair (LDAR) measures, efficiency upgrades for equipment, improved processes, implementation of best practices, and more frequent use of leak-sensing technologies.

New York: In February 2017, NYSERDA's latest annual GHG inventory for New York State showed that methane emissions from the natural gas sector declined by over 50% from 1990 to 2014. Natural gas "leakage" makes up about 11% of all state methane emissions, and 1% of all NYS greenhouse gas emissions. In May 2017, Governor Andrew Cuomo released a state methane reduction plan, that includes identifying best technologies and prioritizing replacement of leak-prone pipe in the distribution system.

Massachusetts: In March 2017, data released by the Massachusetts Department of Environmental Protection indicated that methane emissions related to natural gas systems in the Commonwealth declined by 67% from 1990 to 2014.

Connecticut: In June 2017, CT PURA's report on "lost and unaccounted for gas" found that the "contribution of methane emissions from natural gas distribution systems within Connecticut is less than one percent (0.03%) of all GHG emissions."

Shale gas development

Development of shale gas in the U.S. continues to merit analysis and technological improvements. MIT's June 2011 study on natural gas noted that "the environmental impacts of shale development are challenging but manageable." In a September 2012 paper for DOE's "Clean Cities" Program, Argonne National Laboratory noted that even as improved science-based assessments of potential environmental impacts continue, "early results indicate that the risks can be managed and lowered through existing practices."

Industry and government regulatory agencies are working to address development in an environmentally safe manner. The natural gas production industry has been addressing the issue of disclosure regarding the additives used in hydraulic fracturing. The Ground Water Protection Council (GWPC) and the Interstate Oil and Gas Compact Commission (IOGCC), with funding support from DOE, unveiled http://fracfocus.org, a web-based national registry identifying the chemical additives used in the hydraulic fracturing process on a well-by-well basis. As of late 2017, the industry had registered 127,000 wells nationwide.

An October 2011 paper by the National Regulatory Research Institute (NRRI) noted that "Based on more than one million wells drilled with fracking, however, there is little evidence that fracking directly causes groundwater con-

tamination...[R]eports show that these incidents resulted from surface spills, poor cementing jobs in wellbores, and other operational failures."

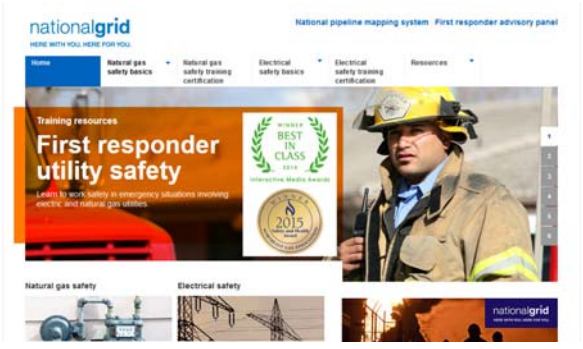
The Pennsylvania Governor's Marcellus Shale Advisory Commission reported that "The primary concerns regarding hydraulic fracturing relate to surface spills of fluids, well control and lost containment of production and flowback water on the surface." Proper procedures and oversight are necessary at all stages of the process.

The Pennsylvania Department of Environmental Protection (DEP) in its *2016 Oil and Gas Annual Report* noted that "Although the number of compliance inspections has increased over the past six years, the number of violations observed has been generally decreasing over this same time period." The rate of violations at unconventional wells is about one-third that of conventional wells. DEP further noted: "Although there is no evidence that hydraulic fracturing has resulted in a direct impact to a water supply in Pennsylvania, there are cases where related oil and gas activities have adversely affected private water supplies. DEP investigates all stray gas-related complaints and if it is determined that a water supply is adversely affected by oil and gas activities, DEP works with the responsible operator to ensure the water supply is restored or replaced."

Other issues, such as reducing the use of diesel fuel in the production process, enhancing "green completion" in the entire production cycle to reduce emission losses, and mitigating community impacts, continue to receive industry attention. The industry must be responsible for best practices at all times.

Pipeline Safety and Public Awareness

Pipeline safety is always a priority for the industry. Federal and state regulatory requirements are rigorous, and several recent regulations have been announced to enhance operations safety, from transmission and distribution integrity management to control room operations. While the rate of incidents is declining nationwide at both gas transmission and distribution levels, "high profile, high consequence" incidents, as termed by PHMSA, have occurred in California, Pennsylvania and New York in recent years.



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Both industry and government regulators continue to prioritize worker and contractor training, including addressing the prevalence of "third party damage" (the leading cause of incidents); the importance of "call before you dig" programs; increasing public awareness of natural gas; encouraging individuals to call utility or emergency personnel if they smell gas in the home or street; and maintaining and enhancing the physical components of the delivery system using methods like "accelerated infrastructure replacement" to replace older pipe materials.

NGA and its member companies continue to work on important initiatives in the areas of public awareness, worker training, awareness of third party damage, integrity management implementation, and new technologies. NGA was pleased to introduce in 2017 a "First Responder utility online safety training program" based on an award-winning program developed by National Grid.

Accelerated Pipeline Replacement

Related to safe operations and environmental performance is the accelerated replacement and repair of older pipeline system components (pipes constructed of bare steel or cast-iron) that are considered more "leak-prone". As the U.S. Department of Energy (DOE) observed in a January 2017 report: "Safety remains the primary policy driver for LDC pipeline and infrastructure repair programs. However, the significance of methane emissions is becoming more recognized and companies, regulators, and other stakeholders are seeking ways to incorporate emission reductions into utility programs while limiting the cost to consumers."

PHMSA continues to urge action on repairing older, potentially more leak-prone systems. In general, due to its older systems, the Northeast states have higher levels of such distribution pipe components than the national average. The DOE study from 2017 notes that "four States (New Jersey, New York, Massachusetts, and Pennsylvania) account for half of all the cast iron pipe in the U.S. Similarly, four states (Ohio, Pennsylvania, California, and New York) account for half of all the unprotected pipe in the U.S." The U.S. average for systems with bare steel and cast iron components is about 3%. The percentage is 31% in Rhode Island, 22% in Massachusetts, and 19% in New York. Since 2009, Rhode Island, which has the highest percentage of aged infrastructure in the region, has reduced its level of aged mains by one-third.

State regulatory agencies continue to work with utili-

ties on programs to achieve pipe replacement in an economically appropriate manner.

Renewable Natural Gas

Renewable Natural Gas (RNG), also known as bio-methane or biogas, is pipeline-quality gas derived from biomass that is fully interchangeable with natural gas. The future natural gas network could also carry renewable gas from dairy farms, waste water treatment plants, landfills, and wood waste and food waste facilities.

In a position paper a few years ago, National Grid observed that "the biggest driver of renewable gas is GHG reduction, but what makes renewable gas more compelling is that it also enhances diversity of supply while providing a solution for using local waste resources to produce renewable energy."

The Gas Technology Institute (GTI) noted that "Bio-methane and liquid biofuels provide an opportunity to supply affordable, clean, domestically-sourced energy to U.S. and global energy customers. These renewable energy sources can help companies comply with renewable portfolio standard (RPS) requirements, low carbon fuel standards, and other policy-driven efforts intended to promote the use of renewable and sustainable energy resources for power generation, transportation, and other end use market applications."

Finally, RNG has a key potential role in the transportation sector as a fuel input. The U.S. Department of Energy observes that "like conventional natural gas, RNG can be used as a transportation fuel in the form of compressed natural gas (CNG) or liquefied natural gas (LNG). RNG qualifies as an advanced biofuel under the Renewable Fuel Standard."

Vermont Gas has been actively working to introduce renewable gas, utilizing biogas from local farms. In November 2017, Middlebury College announced an initiative to significantly reduce its carbon footprint thanks to an innovative "Renewable Natural Gas" partnership with Goodrich Family Farm in Salisbury, VT, Vanguard Renewables of Wellesley, MA, and Vermont Gas. Under the terms of the agreement, Vanguard Renewables will construct, own, and operate a facility at Goodrich Family Farm that will combine cow manure and food waste to produce Renewable Natural Gas (RNG). Gas produced by the Farm Powered*

anaerobic digester will travel by pipeline to Middlebury College's main power plant. Middlebury has agreed to purchase the bulk of the facility's output. Once permits are in place, Vanguard will begin construction on the digester and Vermont Gas will start work on a 5-mile pipeline to connect the farm with the company's pipeline network in Addison County.

New Technology R&D

NGA has a significant R&D program operated by NYSEARCH.

NYSEARCH has been involved with innovative projects such as pipeline sensing and guided wave technology, and continues to utilize its own testbed facility in Johnson City, NY for advanced demonstrations. Recent success stories include the development, testing and commercialization of the Remote Methane Leak Detector (RMLD), the EXPLORER II robotics program, and tests of drones for gas company facility inspection flights. NYSEARCH is also conducting an evaluation and test program for methane emissions technology.

NGA also has had a program with the Gas Technology Institute (GTI) to help facilitate knowledge transfers regarding new technologies that can enhance operations, safety, efficiency, and analysis.

NGA and its member companies continue to support innovative advances in natural gas technology.

Technology research & development continues to be essential to industry progress in such areas as supply development, environmental improvements, and increased operational safety.

Photo: NYSEARCH

II.

REGIONAL ENERGY OVERVIEW

This section provides an introduction to the energy scene in the Northeast region.

Among the areas addressed are:

- *economic profile*
- *primary energy mix*
- *electric generation mix*
- *state energy consumption.*

NORTHEAST ECONOMIC PROFILE

STATE	POPULATION (2016)	HOUSEHOLDS (2016) [occupied housing units]	LABOR FORCE (Aug. 2017) [thousands]	GROSS DOMESTIC PRODUCT (GDP) (2017, 1st qtr) [$ billions]	GDP as % OF U.S. TOTAL (2016)	PER CAPITA PERSONAL INCOME (2016)
Connecticut	3,576,452	1,357,269	1,923	268	1.4	$71,033
Maine	1,331,479	531,660	705	60	0.3	$44,316
Massachusetts	6,811,779	2,579,398	3,680	520	2.7	$65,137
New Hampshire	1,334,795	520,643	752	80	0.4	$58,322
New Jersey	8,944,469	3,194,519	4,515	592	3.1	$61,698
New York	19,745,289	7,209,054	9,657	1,500	7.9	$60,534
Pennsylvania	12,784,227	4,937,771	6,429	746	3.9	$51,270
Rhode Island	1,056,426	408,239	556	59	0.3	$51,576
Vermont	624,594	254,851	344	32	0.2	$50,320
U.S.	**323,127,513**	**118,860,065**	**160,571**	**18,911**	**100**	$49,571

Sources: U.S. Bureau of the Census, U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics. GDP = current dollar.

TOTAL PRIMARY ENERGY CONSUMPTION

A comparison of primary energy consumption in the Northeast states indicates a strong role for petroleum, reflecting the inclusion of the transportation sector, a very small role for coal compared to the national average, a varying role for nuclear, a growing share for renewables, and a solid and growing share for natural gas.

Percentage by State per Fuel Type

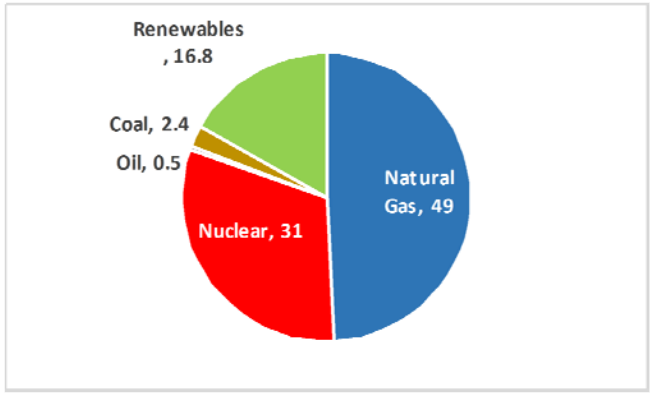
	Natural Gas	Oil	Nuclear	Renewables	Coal	Electric Flows
CT	**35**	**42**	**24**	**5**	**1**	**-7**
ME	**13**	**48**	**-**	**36**	**-**	
MA	**32**	**39**	**4**	**6**	**1**	**18**
NH	**23**	**49**	**32**	**19**	**4**	**-27**
NJ	**34**	**43**	**15**	**4**	**1**	**3**
NY	**38**	**35**	**13**	**11**	**1**	**1**
PA	**30**	**26**	**19**	**5**	**20**	
RI	**48**	**43**	**-**	**4**	**-**	**5**
VT	**9**	**62**	**0**	**25**	**-**	**-24**
US	***29***	***37***	***9***	***10***	***16***	

Sources: U.S. Energy Information Administration (EIA), "State Energy Data Report 2015," released 2017. Electric flows shown for states where numbers make material difference.

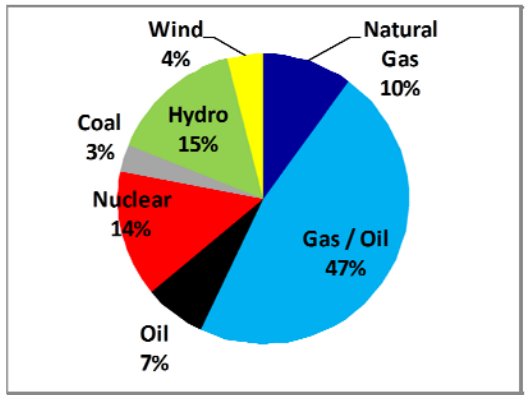
ELECTRIC GENERATION FUEL SOURCE

(% of total)

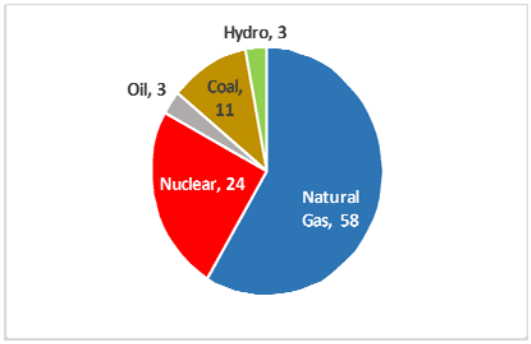
NEW ENGLAND



NEW YORK

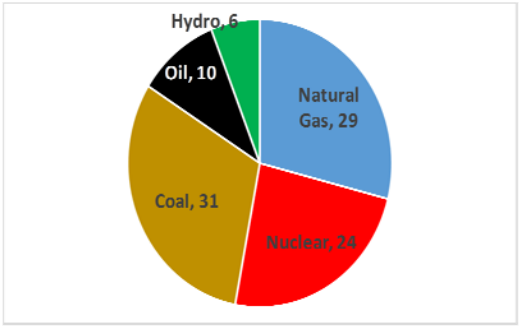


NEW JERSEY



Sources:
ISO New England, 2016 sources of total electric energy production;
NY ISO, 2017 "Power Trends";
PJM, "2016 Regional Transmission Expansion Plan, State Reports," released 2017.

PENNSYLVANIA



ENERGY CONSUMPTION BY MAJOR SOURCE

The Northeast states consume less energy per capita than the U.S. on average. Source: U.S. Energy Information Administration, "State Energy Data Report 2015," released 2017. Sum of fuel totals is not equal to total consumption due to other energy components not shown. Rank signifies level of state consumption compared to 50 U.S. states and District of Columbia. Electricity is that sold to end users. The data for fuels in TBtu is EIA's estimates for the year 2015.

	Per Capita, 2015, Consumption		***Natural Gas***		***Petroleum***		***Coal***		***Electricity***	
	MMBtu	**Rank**	**TBtu**	**Rank**	**TBtu**	**Rank**	**TBtu**	**Rank**	**TBtu**	**Rank**
CT	209.7	*46*	260.9	*32*	327.3	*33*	6.5	*46*	100.6	*37*
ME	305.1	*26*	54.2	*48*	202.7	*41*	2.6	*48*	40.6	*44*
MA	213.0	*43*	457.5	*20*	585.0	*20*	24.2	*39*	186.4	*26*
NH	229.5	*41*	70.8	*47*	156.0	*46*	11.0	*44*	37.5	*47*
NJ	256.0	*37*	779.3	*10*	1,015.0	*9*	22.9	*40*	257.6	*21*
NY	188.6	*51*	1,397.4	*4*	1,346.0	*5*	41.2	*35*	508.1	*5*
PA	303.4	*27*	1,344.7	*6*	1,212.8	*6*	878.8	*3*	499.3	*6*
RI	192.0	*50*	96.5	*44*	90.3	*49*	-	*50*	26.2	*49*
VT	210.8	*45*	12.2	*50*	84.4	*50*	-	*51*	18.8	*51*
Northeast			***4,473.5***		***5,019.5***		***987.2***		***1,675.1***	
U.S.	303.1		***28,246.4***		***36,871.3***		***15,549.0***		***12,825.7***	

III.

SUPPLIES & INFRASTRUCTURE

This section provides an introduction to the natural gas delivery network in the Northeast.

Among the areas addressed are:

- *Description of pipeline systems*
- *Liquefied natural gas (LNG)*
- *Sources of regional gas supply*
- *Proposed infrastructure enhancements.*

Description of Pipelines/LNG Import Facilities Serving the Northeast Market

Algonquin Gas Transmission Company is a business unit of Spectra Energy Partners, an Enbridge company. Its system incorporates approximately 1,129 miles of pipe. Its system commences in NJ, connecting with Texas Eastern, and extends through NY, CT, northern RI, and eastern and southeastern MA. Its capacity is 3.08 Bcf/d.

Columbia Gas Transmission, Inc. is a subsidiary of TransCanada and is headquartered in Houston, TX. The company serves customers along its nearly 12,000-mile pipeline system in 10 Northeastern, Midwestern, and Mid-Atlantic states. It transports an average of 3 Bcf/day. It enters New York State through Pennsylvania and runs along the southern counties of New York bordering Pennsylvania; it also serves New Jersey. It has storage of 664 Bcf.

Con Ed Transmission (CET) invests in electric and gas transmission projects. The company was established in January 2016 after parent company Consolidated Edison, Inc. identified electric and gas transmission as two key areas of expertise and focus for the business. The company anticipates growth in the need for electric and gas transmission projects to meet the nation's changing energy priorities. CET falls under the oversight of the Federal Energy Regulatory Commission. CET operates Con Edison Gas Midstream, LLC, which invests in gas pipeline and storage businesses. CET is purchasing a 50-percent stake in a gas pipeline and storage business in Pennsylvania and New York, worth $2 billion. CET is forming the joint venture with Crestwood Equity Partners. Known as Stagecoach Gas Services, the project provides a critical link between natural gas fields and the high demand for gas in the Northeast. CET purchased 50 -percent equity interest in the Pennsylvania-Southern New York gas pipeline and storage business for about $975 million, with an implied market value of almost $2 billion.

Distrigas of Massachusetts Corporation (DOMAC), a subsidiary of ENGIE, owns and operates an LNG import terminal in Everett, Massachusetts. It interconnects with both the Tennessee and Algonquin systems. It began operation in 1971. Its vaporization sendout is approx. 715 MMcf/d, with another 100 MMcf/d by truck. Its storage is 3.4 Bcf. The facility has received over 1,200 cargoes, and served more than 350,000 truck loads.

Dominion Transmission, Inc., headquartered in Richmond, VA, is the interstate gas transmission subsidiary of Dominion Resources. Primarily a provider of gas transportation and storage services, Dominion Transmission, Inc. operates the world's largest underground natural gas storage system. Dominion Transmission, Inc. maintains 7,800 miles of pipeline in six states—Ohio, West Virginia, Pennsylvania, New York, Maryland and Virginia. The system enters New York State through Pennsylvania, and continues to points in western, central, and eastern New York, extending to the Albany area.

Granite State Gas Transmission, Inc. is a unit of Unitil. Granite State operates 86-miles of underground interstate pipeline extending from the MA-NH border through the New Hampshire coastal area to Portland, Maine, transporting gas from other pipeline companies. The NH portion began operation in 1956; in 1966 the line was extended to Maine.

Iroquois Gas Transmission System is a 416-mile interstate pipeline owned by a partnership of 4 U.S. and Canadian energy companies. It began operation in 1991. It transports natural gas from TransCanada PipeLine at the Ontario/NY border as well as Marcellus receipts, and travels through NY and CT to Long Island and into the New York City area. It has a physical receipt capability of 1.62 Bcf/d. It interconnects with TransCanada, Dominion, Tennessee and Algonquin.

Maritimes & Northeast Pipeline (M&NE) is a partnership of Enbridge, Emera and ExxonMobil. It transports gas from the Maritimes to markets in Atlantic Canada and New England. The total pipeline is 684 miles. U.S. capacity is 833 MMcf/d; its capacity in Canada is 555 MMcf/d.

Millennium Pipeline traverses New York's lower Hudson Valley and Southern Tier. It is comprised of 220 miles of 30 inch diameter steel pipeline and is capable of transporting up to 850,000 dekatherms per day of natural gas. It is owned by subsidiaries of TransCanada/ Columbia Pipeline Group, National Grid and DTE Energy. It began commercial operations in December 2008. It interconnects with eight systems.

National Fuel Gas Supply Corporation provides interstate natural gas transmission and storage for affiliated and nonaffiliated companies through an integrated gas pipeline system of 2,300 miles that extends from southwestern Pennsylvania to the New York-Canadian border at the Niagara River. It also owns and operates 31 underground natural gas storage areas.

North Country Pipeline is an intrastate pipeline of approximately 22 miles that runs from the Canadian border in northeastern New York near Champlain to the Plattsburgh area, with natural gas imported from the TransCanada system. It has a capacity of about 100 DTH/ day.

Portland Natural Gas Transmission (PNGTS) is sponsored by an international consortium of energy companies - TC Pipelines LP and Gaz Métro. It transports western Canadian gas to New England from an interconnection with TransCanada PipeLines (through the TQM extension). On the U.S. side, it involves approximately 300 miles of pipeline including 50 miles of variously sized laterals, extending through northern NH to southern Maine and interconnecting with Maritimes & Northeast through the Joint Facilities. Its current capacity is 210 Dth/d. It interconnects with the Maritimes & Northeast Pipeline at Westbrook, Maine; from there, the Joint Facilities line extends to Dracut, MA.

Repsol operates the Canaport LNG facility located in Saint John, New Brunswick, Canada; its project partner is Irving Oil. The facility received its first shipment in June 2009. The physical infrastructure consists of three storage tanks with total capacity of 9.9 Bcf. The terminal has a maximum sendout capacity of 1.2 Bcf/day. Regasified LNG from the terminal

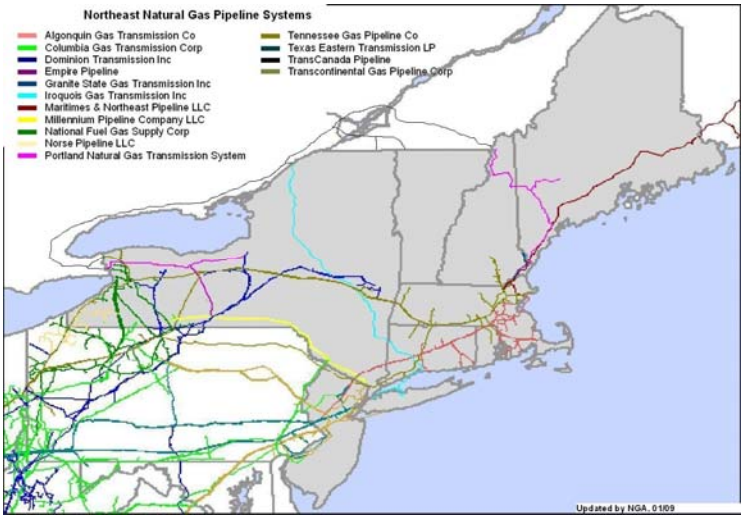
flows through the Brunswick Pipeline, a 90 mile pipeline connecting the terminal to the Maritimes & Northeast Pipeline at the Maine border. Since its start-up, it has delivered about 350 Bcf to the market.

Tennessee Gas Pipeline Company is a business unit of Kinder Morgan. The Tennessee Gas Pipeline has 11,778 miles of pipeline. Tennessee's system enters New England at two points: western Mass. near West Pittsfield and southern Connecticut near Greenwich. It enters New York at several points – from southwestern Pennsylvania, central Pennsylvania, an interconnect at Niagara, and through New Jersey into the New York City area and on to Connecticut. It has 99 Bcf of storage, and a capacity of ~9.6 Bcf/d.

Texas Eastern Transmission Company is a business unit of Spectra Energy Partners, an Enbridge company. Its system incorporates approximately 9,096 miles of pipe, from the U.S. Gulf Coast to New Jersey. Its peak capacity is 10.84 Bcf/d, with storage of 74 Bcf.

TransCanada PipeLine has a network of approximately 56,000 miles of pipeline which tap into virtually all major gas supply basins in North America. It interconnects with several systems serving the Northeast. It has more than 664 Bcf of working gas storage capacity. It acquired the Columbia Pipeline Group in the U.S. in 2016.

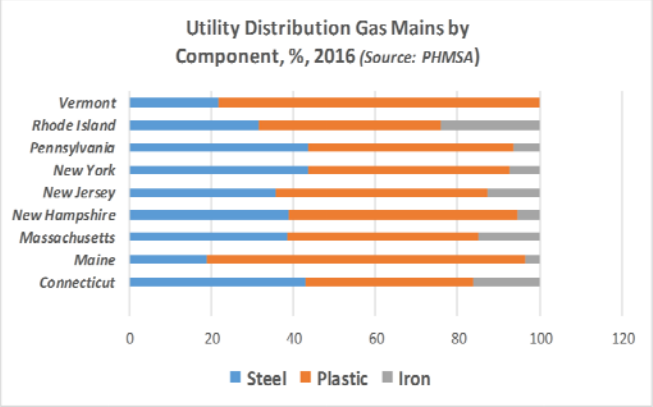
Transcontinental (Transco) is a subsidiary of Williams Company. The Transco pipeline comprises a 10,200-mile pipeline system, extending from South Texas to New York City. The peak system design capacity is 10.9 billion cubic feet per day. In the Northeast, it provides gas service to New York City, New Jersey and the Mid-Atlantic region. It has 197 Bcf of seasonal storage.



UTILITY MILES OF PIPELINE AND MAIN, NORTHEAST

The miles of pipeline and distribution mains form a basic indicator of access to the gas market. The Northeast has continued to increase both its transmission and distribution systems; planned infrastructure enhancements and LDC system growth will produce increases to these numbers in coming years.

The chart below shows percentage of pipeline mains by material by state as of 2016. Plastic pipe is in the 40-50 percentile range for most states in the region, but is the dominant method for new distribution pipe, and now represents 55% of all U.S. miles of main.



STATE / U.S.	DISTRIBUTION MAIN MILES	TRANSMISSION MILES
Connecticut	8,034	592
Maine	1,210	510
Massachusetts	21,631	1,135
New Hampshire	1,944	251
New Jersey	34,775	1,588
New York	48,900	4,569
Pennsylvania	48,139	10,053
Rhode Island	3,193	96
Vermont	822	96
U.S. total	1,286,244	300,324

Source: PHMSA, U.S. Department of Transportation, 2016 data.

NORTHEAST PIPELINE PROJECTS IN PROCESS

2017 saw several incremental infrastructure projects placed into service in the region. Several other projects are in the regulatory and development process for the period 2018-2020 and are summarized below. This list changes with market conditions—please visit NGA's web site during the year for updated listings.

PROJECT	COMPANY	DESCRIPTION	EST. IN-SERVICE	STATUS
Atlantic Bridge	Enbridge	Incremental expansion on Algonquin and Maritimes & Northeast, to serve New England and Canadian Maritimes. Proposed capacity of ~133,000 Dth/d. Partial service began in Nov. 2017 at 40,000/day.	2018	Announced, Feb. 2014. Open season held, Feb.- March, 2014. Filed with FERC, Oct. 2015. Received environmental assessment from FERC, 5-16. FERC issues certificate, 1-17. FERC allows construction work to begin on certain facilities in CT, 3-17. Partial service began, Nov. 2017.
Garden State Expansion Project	Williams/Transco	The project has been designed to provide up to 180,000 dekatherms per day of natural gas service in two phases to a new delivery point with New Jersey Natural Gas in Burlington County, N.J. The project will include the installation of a new compressor station, meter and regulating station on land located in Burlington County, N.J. It will also require modifications and the addition of compression at an existing compressor station. No expansion of the pipeline is required.	2018 (Phase II)	Filed with FERC, Feb. 2015. Approved by FERC, 4-16. Phase I went into service in Sept. 2017 (20 MDth/d).
Northern Access	National Fuel Gas Supply & Empire Pipeline	Capacity of 350,000 Dth/day on Empire, and 140,000 to be delivered to Tennessee 200 line. Approx. 99 miles of 24" pipeline and a compressor station upgrade and one new compressor station.	2018	FERC issues environmental assessment, 7-16. Approved by FERC, 2-17. NYS DEC denies water quality certificates, 4-17. National Fuel appealing DEC decision to federal court; considering options.

This table is based on publicly-available information as of Nov. 2017; project details may change.

NORTHEAST PIPELINE PROJECTS IN PROCESS (cont'd)

PROJECT	COMPANY	DESCRIPTION	EST. IN-SERVICE	STATUS
Valley Lateral Project	Millennium Pipeline	The Project will connect Millennium's gas mainline to CPV's energy center in Wawayanda, NY, and provide access to natural gas for its new 650 MW combined-cycle electric power generating facility.	2018	Filed with FERC, Nov. 2015. Received environmental assessment from FERC, 5-16. Approved by FERC, 11-16. NYS DEC issued conditional denial of water quality certificate, 8-17. FERC issues order finding NYS DEC had waived its water quality certification authority, citing state's delay in review process, 9-17.
PennEast Project	AGL Resources, NJR Pipeline Company, South Jersey Industries, UGI Energy Services, Enbridge and PSE&G Power LLC	100-mile pipeline intended to bring lower cost natural gas produced in the Marcellus Shale region to homes and businesses in Pennsylvania and New Jersey. Designed to provide natural gas service to the equivalent of 4.7 million homes, up to 1 Bcf per day. PennEast is investing nearly $1 billion to build the pipeline with the costs split among the four entities.	2018	Announced Aug. 2014. Open season held August 2014. In FERC pre-filing process, Oct. 2014. Filed with FERC, Sept. 2015. FERC issued draft EIS, 7-16. FERC issued final EIS, 4-17.
Eastern System Upgrade	Millennium Pipeline	Proposal to upgrade and expand the eastern end of the system. It includes an estimated 7.8 miles of mostly 30" looped pipeline, upgrades to existing Hancock compressor station, new compression capabilities at a facility in Sullivan County, and upgrades to existing Ramapo meter and regulator station in Rockland Co.	Fall 2018	Entered pre-filing process with FERC, 2-16. Filed with FERC, 7-16. FERC issued draft EIS, 3-17. NY DEC granted water and air quality permits, 8-17. Approved by FERC, 11-17.
Atlantic Sunrise	Williams / Transco	Approx. 200 miles of pipe, incl. about 185 miles of new pipe in PA, 11 miles of pipeline looping in PA, 2.5 miles of pipeline replacement in VA, and associated equipment and facilities. Designed to increase deliveries by 1.7 Bcf/d to markets in Mid-Atlantic and Southeastern U.S.	Mid-2018 for full project capacity	FERC issued certificate, 2-17. Received FERC approval to place portion of the project into early service, 8-17.

This table is based on publicly-available information as of Nov. 2017; project details may change.

NORTHEAST PIPELINE PROJECTS IN PROCESS (cont'd)

PROJECT	COMPANY	DESCRIPTION	EST. IN-SERVICE	STATUS
Constitution Pipeline	Cabot/Williams	Approx. 124-mile Constitution Pipeline is designed to extend from Susquehanna County, PA, to the Iroquois Gas Transmission and Tennessee Gas Pipeline systems in Schoharie County, N.Y. Proposed capacity of 650 MMCf/d. Cabot and Southwestern are shippers.	2018+	Announced spring 2012. Filed with FERC, 6-13. FERC issued final EIS, 10-14. Authorized by FERC, 12-2-14. NYS DEC denies water quality permit, 4-22-16; company affirms plans to continue with project, 4-25-16. FERC grants 2-year extension, 7-16. U.S. Court of Appeals for 2nd District upholds NYS DEC denial of certificate, 8-17. Developer plans to refer issue to FERC per other federal court decision.
Wright Interconnect Project (WIP)	Iroquois Gas Transmission	WIP will enable delivery of up to 650,000 Dth/d of natural gas from the terminus of the proposed Constitution Pipeline in Schoharie County, NY into both Iroquois and the Tennessee Gas Pipeline under a 15 year capacity lease agreement with Constitution.	2018+	Announced 1-13. Filed with FERC, 6-13. FERC issued final EIS, 10-14. Authorized by FERC, 12-2-14. FERC grants 2-year extension, 8-16.
Portland Xpress (PXP)	Portland Natural Gas Transmission (PNGTS)	PNGTS has executed Precedent Agreements with several Local Distribution Companies (LDCs) in New England and Atlantic Canada to re-contract certain system capacity set to expire in 2019 as well as expand the PNGTS system to bring its certificated capacity up to 0.3 Bcf/d. The approximately $80 million Portland XPress Project (PXP) will proceed concurrently with upstream capacity expansions. The in-service dates of PXP are being phased-in over a three-year period beginning November 1, 2018.	2018-20	Announced 3-17.

This table is based on publicly-available information as of Nov. 2017; project details may change.

NORTHEAST PIPELINE PROJECTS IN PROCESS (cont'd)

PROJECT	COMPANY	DESCRIPTION	EST. IN-SERVICE	STATUS
Empire North Expansion	Empire Pipeline	The proposed project size is 300,000-338,000 Dth/d. Transportation paths: Jackson/Corning to Chippawa/Hopewell. Open Season concluded Nov. 2015. 3 new compressor stations.	Nov. 2019	Open season concluded, Nov. 2015.
Northeast Supply Enhancement	Williams / Transco	The project would add natural gas pipeline infrastructure in PA, NJ and NY. It is designed to provide customers access to an additional 400 million cubic feet of natural gas per day (enough natural gas to serve the daily needs of about 2.3 million homes). The project will provide service to National Grid.	2019	In FERC pre-filing, May 2016. Filed with FERC, 3-17.
Rivervale South to Market	Williams / Transco	Designed to provide up to 190,000 dekatherms per day of firm natural gas transportation service. The project will require a new 0.61 mile pipe segment along the existing Transco pipeline in Bergen County, N.J., modifications to four existing pipeline metering facilities in N.J. and N.Y., and an uprate of 10.35 miles of existing pipe in Bergen County, N.J.	2019	Announced, 9-17.
Northeast Gateway	Williams / Transco	Designed to create 65,000 dekatherms per day of firm transportation capacity for northeastern markets. Transco has executed precedent agreements with PSEG Power, LLC (PSEG) and UGI Energy Services, LLC for firm transportation service under the project. Will consist of adding electric horsepower at an existing Transco compressor station in New Jersey, in addition to making modifications to two existing Transco meter stations.	2020	Filed with FERC, 11-17.

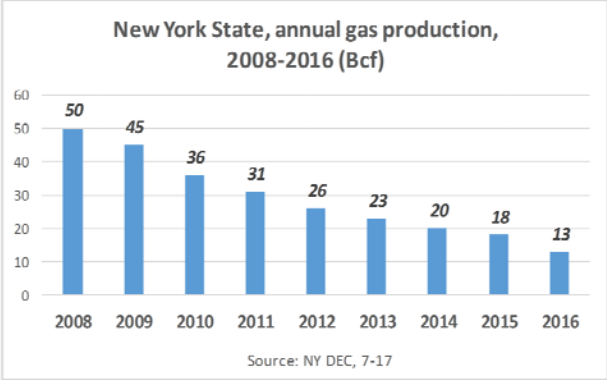
This table is based on publicly-available information as of Nov. 2017; project details may change.

NORTHEAST PIPELINE PROJECTS IN PROCESS (cont'd)

PROJECT	COMPANY	DESCRIPTION	EST. IN-SERVICE	STATUS
Access Northeast	Enbridge, Eversource Energy, National Grid	The gas pipeline expansion project will enhance the Algonquin and Maritimes pipeline systems and market area storage assets in New England to deliver up to one billion cubic feet of natural gas per day for electric generation markets. Would provide 925 MMCf/d of capacity in NY, CT, RI and MA, incl. 6.8 Bcf of LNG at proposed facility in Acushnet, MA.	2020+	Announced 9-14. Open season held first half of 2015. In FERC pre-filing, Nov. 2015. MA Supreme Court ruled in Aug. 2016 that electric utilities could not invest in pipeline capacity. Project developers announce withdrawal of application from FERC review process, 6-17: "we are putting pre-permitting activities on hold but we are still advancing the project."

This table is based on publicly-available information as of Nov. 2017; project details may change.

NATURAL GAS PRODUCTION IN NORTHEAST U.S.



Source: NY State Dept. of Environmental Conservation/ Office of Oil & Gas

The New York State Department of Environmental Conservation / Division of Mineral Resources reports that gas production in the state in 2016 was 13.4 billion cubic feet (Bcf), down from 17.8 Bcf in 2015. Annual production is less than half what it was in 2008. The 2016 production was driven by wells in the Trenton-Black River formation in the Finger Lakes region, as well as in the Medina formation. The production is from conventional gas wells; the hydraulic fracturing drilling process is not permitted in the state.

Natural gas production in the Northeast continues steady and rapid growth, as illustrated in the chart prepared by the U.S. Energy Information Administration (EIA). Marcellus production as of fall 2017 is about 20 Bcf per day, while Utica production is another 3 Bcf/d.

In January 2017, the U.S. EIA, assessing its long-term national gas supply forecast, observed: "Continued development of the Marcellus and Utica plays in the East is the main driver of growth in total U.S. shale gas production and the main source of total U.S. dry natural gas production." Pennsylvania's annual natural gas production has grown from 0.5 Tcf in 2010 to 5.2 Tcf in 2016.

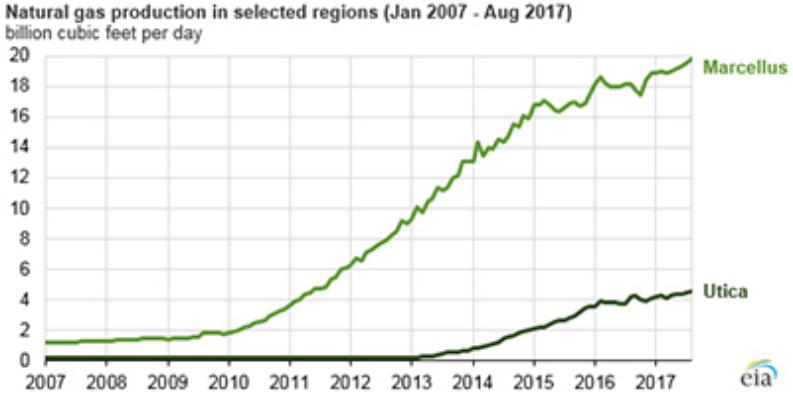
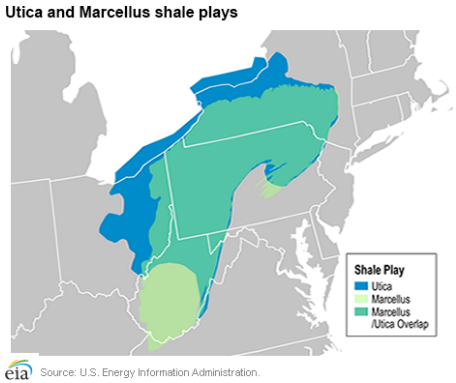


Chart: U.S. Energy Information Administration, Aug. 2017

SHALE GAS DEVELOPMENT IN THE NORTHEAST / MIDWEST



Map: U.S. EIA

Significant shale gas basins have emerged in the Northeast region in recent years: the Marcellus Shale and Utica Shale in the Appalachian basin. The Marcellus Shale runs through several mid-Atlantic states, including West Virginia, Pennsylvania and New York. Shale gas now represents over 50% of U.S. dry natural gas production—up from 5% in 2007.

Estimates are that the Marcellus basin alone may hold as much as 500 trillion cubic feet (Tcf) of natural gas.

Current Marcellus production is centered in Pennsylvania and West Virginia. Production there has reached 20 billion cubic feet per day, and is expected to grow further in coming years. Pennsylvania is now the 2nd largest producing state of natural gas, behind only Texas.

The Utica Shale, centered principally in Ohio, is both an oil and natural gas play. Natural gas production has grown from 0.1 Bcf/d in December 2012 to over 4 Bcf/d in 2017, according to U.S. EIA.

In the next decade, output from Northeast gas production could run as high as 35 to 45 Bcf per day.

New technology in the form of horizontal drilling has enabled producers in recent years to access the shale gas in a technically and economically feasible manner.

Already, as outlined in preceding pages, the interstate pipelines in the Northeast are working to increase their interconnections to bring these new supplies to market.

Shale gas production is not permitted in New York State although conventional production is.

INCREASING GAS POTENTIAL IN THE U.S.

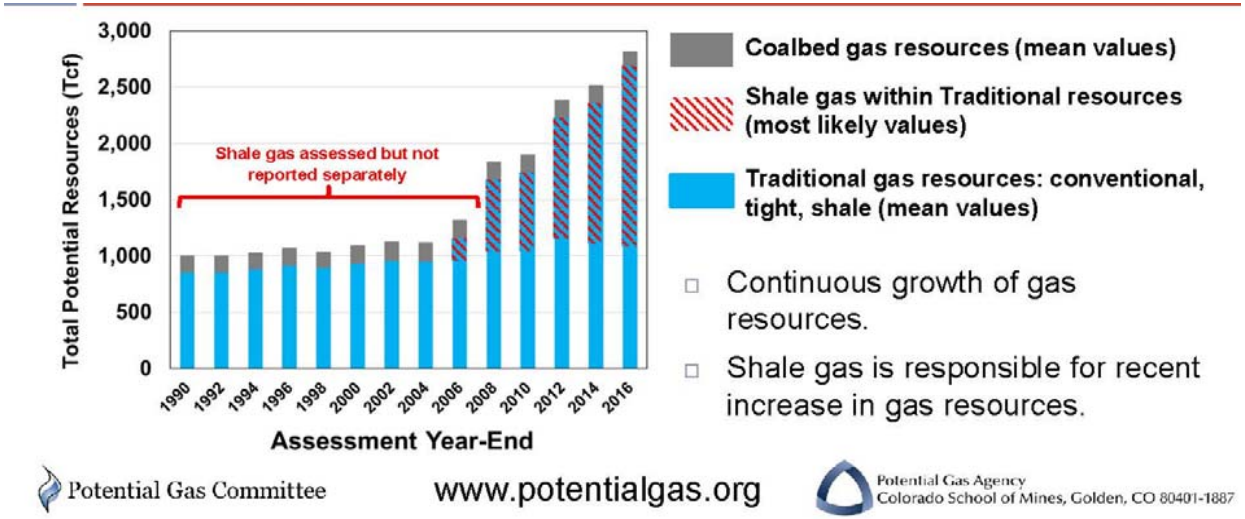


Chart: Potential Gas Committee, July 2017

Every 2 years, the Potential Gas Committee (PGC) of the Colorado School of Mines releases a long-term assessment of U.S. potential natural gas supply. Its 2016 assessment, released in July 2017, and illustrated in the PGC chart above, shows an increase in total estimated potential supplies from the previous study, due in large part to shale (shown in the red stripe). According to this latest assessment, the U.S. possesses a total technically recoverable resource base of 2,817 trillion cubic feet (Tcf). The 2016 assessment is "the highest resource evaluation in the Committee's 52-year history."

LNG SERVING NEW ENGLAND MARKET

Import facilities:

Distrigas terminal, Everett, MA (part of ENGIE). Began operation in 1971.
• Storage of 3.4 billion cubic feet.
• On a sustainable basis, the vaporization capacity is approximately 715 million cubic feet per day.
• Additional sendout capability of 100 MMBtu/d in liquid via truck.

Canaport facility, Saint John, NB, Canada. Began operation in 2009.
• Operated by Repsol in partnership with Irving Oil.
• Sendout capability of 1 Bcf/d in vapor via Brunswick Pipeline into Maritimes & Northeast.
• Three storage tanks of 3.3 Bcf each, or ~10 Bcf total.

Northeast Gateway facility, offshore Cape Ann, MA. Began operation in 2008.
• Operated by Excelerate Energy.
• Sendout capability of 0.4 to 0.8 Bcf/d in vapor via underwater HubLine.

Neptune facility, offshore Gloucester, MA (part of ENGIE). Completed in 2010.
• Connects to underwater pipeline, HubLine, via 13.4 miles of offshore pipe. Not currently operating.

LDC satellite tanks/peak-shaving units:

• 43 tanks in 28 communities in 5 states (CT, ME, MA, NH, RI).
• LDCs' total LNG storage capacity is 16 Bcf.
• LDCs' vaporization capacity is 1.4 Bcf/day.
• Liquefaction is available at 5 LDC-owned facilities -
total liquefaction capability is 43,500 MMBtu/day.

LNG IN NEW JERSEY

• Storage capacity of approximately 3.7 Bcf.
• LDC tanks in 6 communities, owned by 4 LDCs, as well as one pipeline-owned facility.

LNG IN NEW YORK

LDC-owned peak-shaving plants:

• New York City area and Long Island, on Con Edison and National Grid systems.
• Storage capacity of approximately 3.2 Bcf.
• LNG obtained via liquefaction of pipeline gas.
• Vaporization capacity is approximately 0.56 Bcf/day.
• Liquefaction capacity is 19,850 MMBtu/day.

LNG IN PENNSYLVANIA

- Two utilities, PECO Energy and PGW, utilize LNG peakshaving with storage capacity of approximately 5.45 Bcf.
• UGI LNG has storage capacity of 1.25 Bcf, for sale into Mid-Atlantic market.

NORTHEAST NATURAL GAS STORAGE

Storage is essential to the natural gas supply and delivery system. The principal storage system in the U.S. is underground storage, in salt caverns, aquifers, and depleted oil and gas fields. There are 415 such facilities in the U.S., with demonstrated peak working gas capacity of about 4.8 Tcf.

For the Northeast, there are two main types of storage: underground, and liquefied natural gas (LNG).

Pennsylvania has considerable underground gas storage, 49 facilities totaling 760 Bcf, which represents 8.2% of total U.S. capacity.

New York has 26 underground storage facilities with 246 Bcf of working gas capacity. New York's underground storage represents 2.7% of the U.S. total.

There is no underground storage in New England or New Jersey, as the map indicates, because of the unsuitability of the region's geology.

The region also accesses underground storage in Canada, notably the Dawn facility in Ontario.

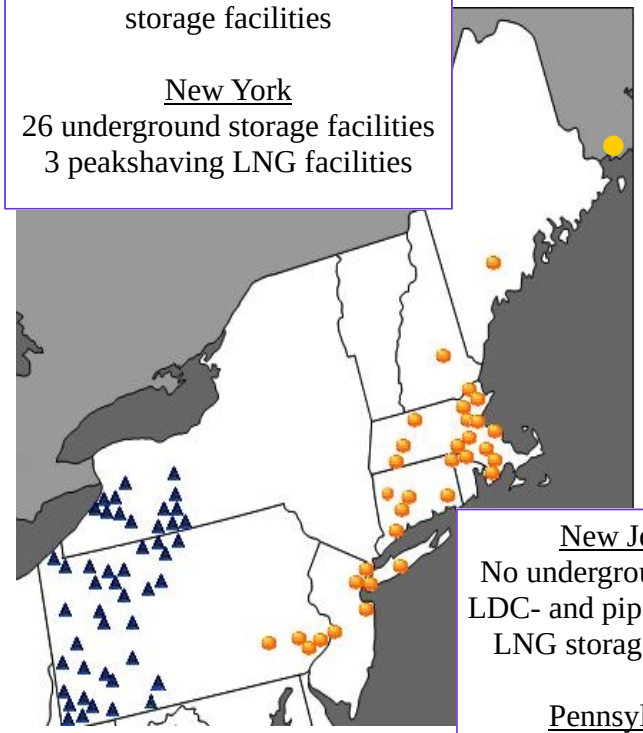
New England and New Jersey do utilize LNG. There are two LNG import facilities currently operating in the greater Boston area. There is also a facility in New Brunswick, Canada, close to the U.S. border in Maine.

In addition, the LDCs operate above-ground LNG storage tanks for peak-shaving.

As noted in previous pages, gas utilities in several Northeastern states (CT, ME, MA, NH, NJ, NY, PA, RI) utilize LNG for peakshaving and system support.

<u>New England</u>
No underground storage
2 operating LNG import facilities
28 LDC-owned LNG
storage facilities

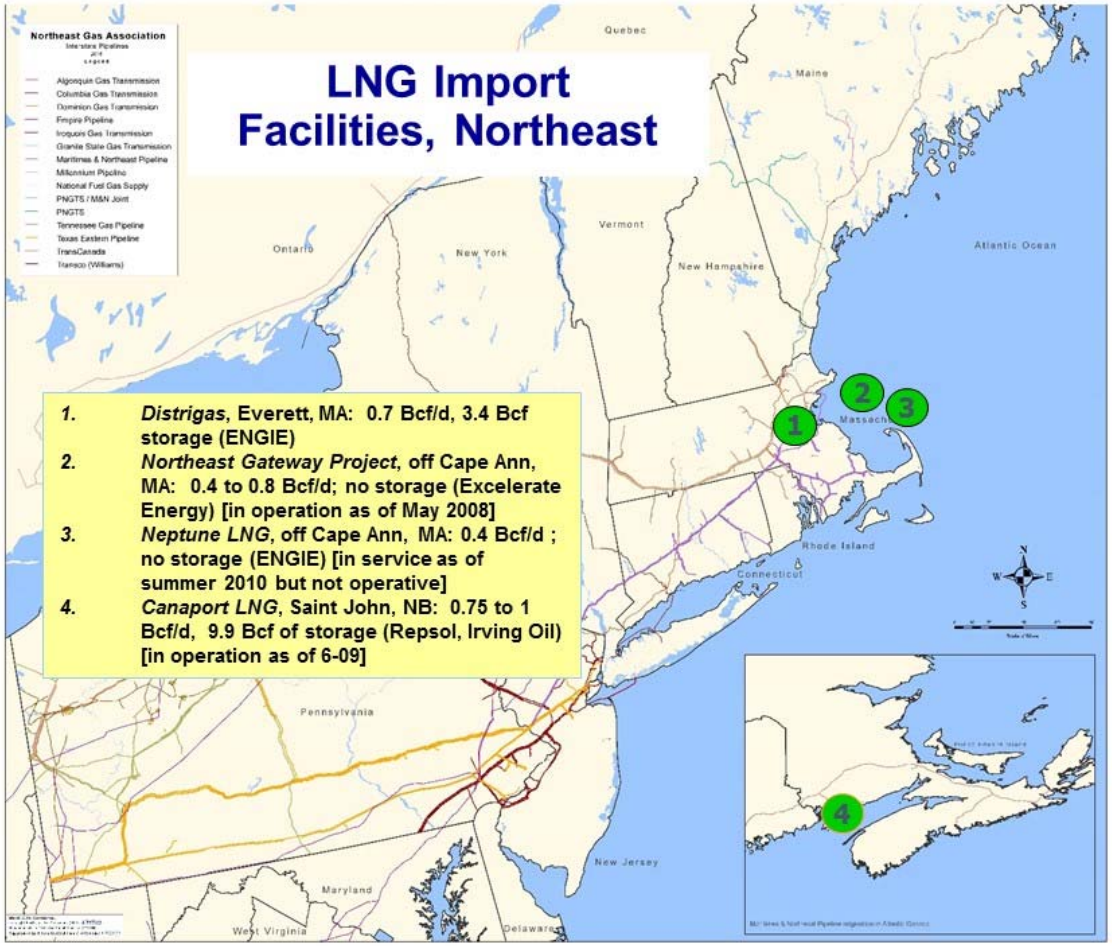
<u>New York</u>
26 underground storage facilities
3 peakshaving LNG facilities



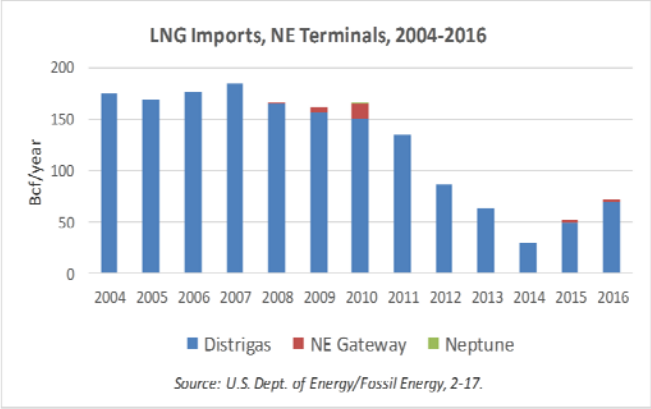
Blue = underground storage, orange = LNG.
Source: U.S. EIA

<u>New Jersey</u>
No underground storage
LDC- and pipeline-owned
LNG storage facilities

<u>Pennsylvania</u>
49 underground storage
facilities
3 LNG storage or
peakshaving facilities


LNG Import Facilities, Northeast
Northeast Gas Association
Interstate Pipelines
Algonquin Gas Transmission
Columbia Gas Transmission
Dominion Gas Transmission
Empire Pipeline
Iroquois Gas Transmission
Granite State Gas Transmission
Maritimes & Northeast Pipeline
Millennium Pipeline
National Fuel Gas Supply
PNGTS / M&N Joint
PNGTS
Tennessee Gas Pipeline
Texas Eastern Pipeline
TransCanada
Transco (Williams)
1. Distrigas, Everett, MA: 0.7 Bcf/d, 3.4 Bcf storage (ENGIE)
2. Northeast Gateway Project, off Cape Ann, MA: 0.4 to 0.8 Bcf/d; no storage (Excelerate Energy) [in operation as of May 2008]
3. Neptune LNG, off Cape Ann, MA: 0.4 Bcf/d ; no storage (ENGIE) [in service as of summer 2010 but not operative]
4. Canaport LNG, Saint John, NB: 0.75 to 1 Bcf/d, 9.9 Bcf of storage (Repsol, Irving Oil) [in operation as of 6-09]
Quebec
Maine
Vermont
New Hampshire
Ontario
New York
Atlantic Ocean
Rhode Island
Connecticut
Pennsylvania
New Jersey
Maryland
West Virginia
Delaware
N
W
E
S

LNG ANNUAL VOLUMES IMPORTED INTO NEW ENGLAND TERMINALS



LNG imports into New England facilities were 72.2 Bcf in 2016, compared to 52 in 2015. Distrigas of MA imported 69.9 Bcf of that total, or 83% of all U.S. ship imports in 2016. An offshore LNG facility - Northeast Gateway - had its first cargoes in several years in early 2015 and 2016, helping to meet winter demand by providing another roughly 2.5 Bcf to the market in both 2015 and 2016. It imported no cargoes in the winter of 2016/17.

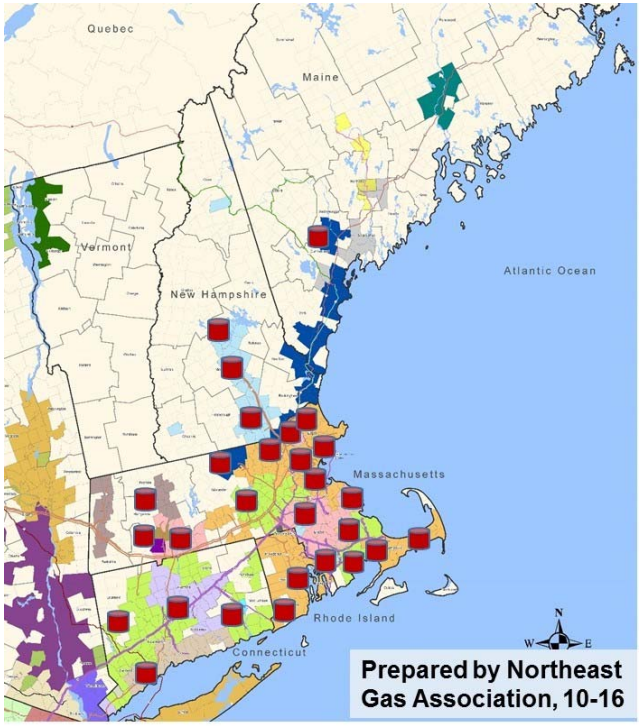
Source: U.S. Department of Energy, Office of Fossil Energy, Office of Natural Gas & Petroleum Import Activities.

Liquefied natural gas (LNG) is an important component of the region's gas supply, especially for peak winter needs. Distrigas of Massachusetts Corp. (DOMAC), a subsidiary of ENGIE, owns and operates a land-based facility at Everett, MA. There is also one operating facility located offshore near Gloucester, MA—Northeast Gateway—owned by Excelerate Energy. ENGIE owns another off-shore facility called Neptune, also near Gloucester, MA, but it is not currently operating.

Repsol's Canaport LNG facility in nearby New Brunswick, Canada has supplied over 400 Bcf to the market since it began operation in mid-2009. It provided about 16 Bcf to the regional market in 2016. In 2016, Canaport received 4 LNG import cargoes, compared to 8 in 2015 (source: Canada's National Energy Board).

Photo: Distrigas / ENGIE

LNG STORAGE HELD BY NEW ENGLAND GAS UTILITIES



Map prepared by NGA. Red tanks indicate LNG satellite tanks owned and operated by gas LDCs. Locations approximate.

Liquefied natural gas (LNG) is a key form of in-region storage for natural gas utilities in the North-east—but particularly so in New England. For some of the larger utilities, LNG can represent 35 to 40% of peak day supply.

LNG on the gas utility system provides not only peak day supply but also pressure support at key points on the systems.

The map shows the location of LNG tanks in the New England re-gion. LNG is stored by utilities in 28 communities in 5 New England states.

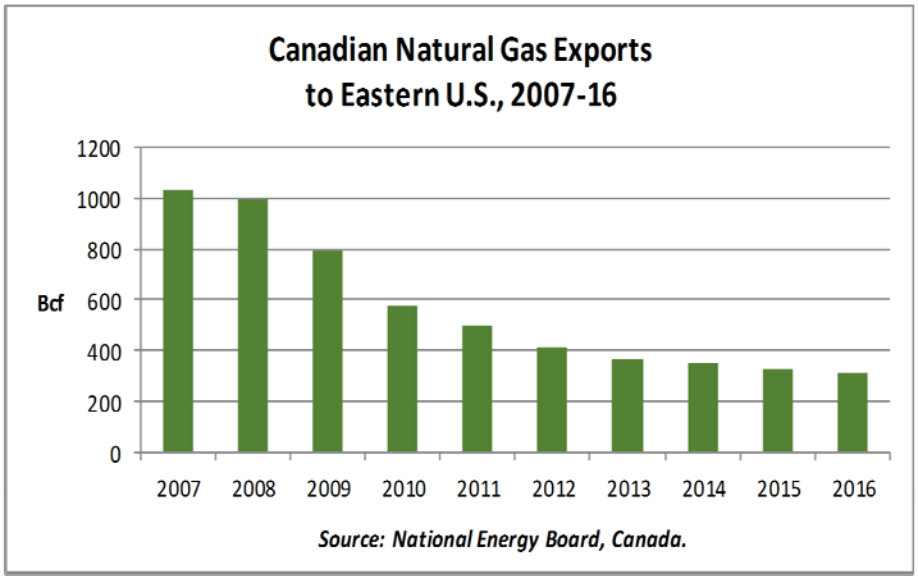
PROPANE / LP AIR: STORAGE CAPACITY AT NEW ENGLAND GAS LDCs

Year	Number of Communities with Facilities	Number of Tanks	Storage Capacity in Gallons
1998	**46**	**346**	**16,053,819**
2017	**13**	**88**	**3,928,132**

As natural gas pipeline capacity and LNG storage have increased in the region, propane storage at the natural gas utility level has declined. Propane/air was often used to supplement gas pipeline capacity for several utilities in the Northeast, particularly in New England.

The rise of natural gas production in the Appalachian region meanwhile is creating opportunities for considerable propane development in the region.

CANADIAN GAS EXPORTS TO THE NORTHEAST U.S.



Canadian imports have long been a major source of U.S. - and Northeast - natural gas supply. The Northeast has drawn supplies from Alberta, offshore Nova Scotia and New Brunswick. Increasingly however the supply dynamic is changing, as U.S. domestic production rises, reducing the need for imports. As indicated in the chart above, Eastern U.S. imports have declined considerably over the last few years. Canadian gas exports to the northeast U.S. are down by over 60% since 2007.

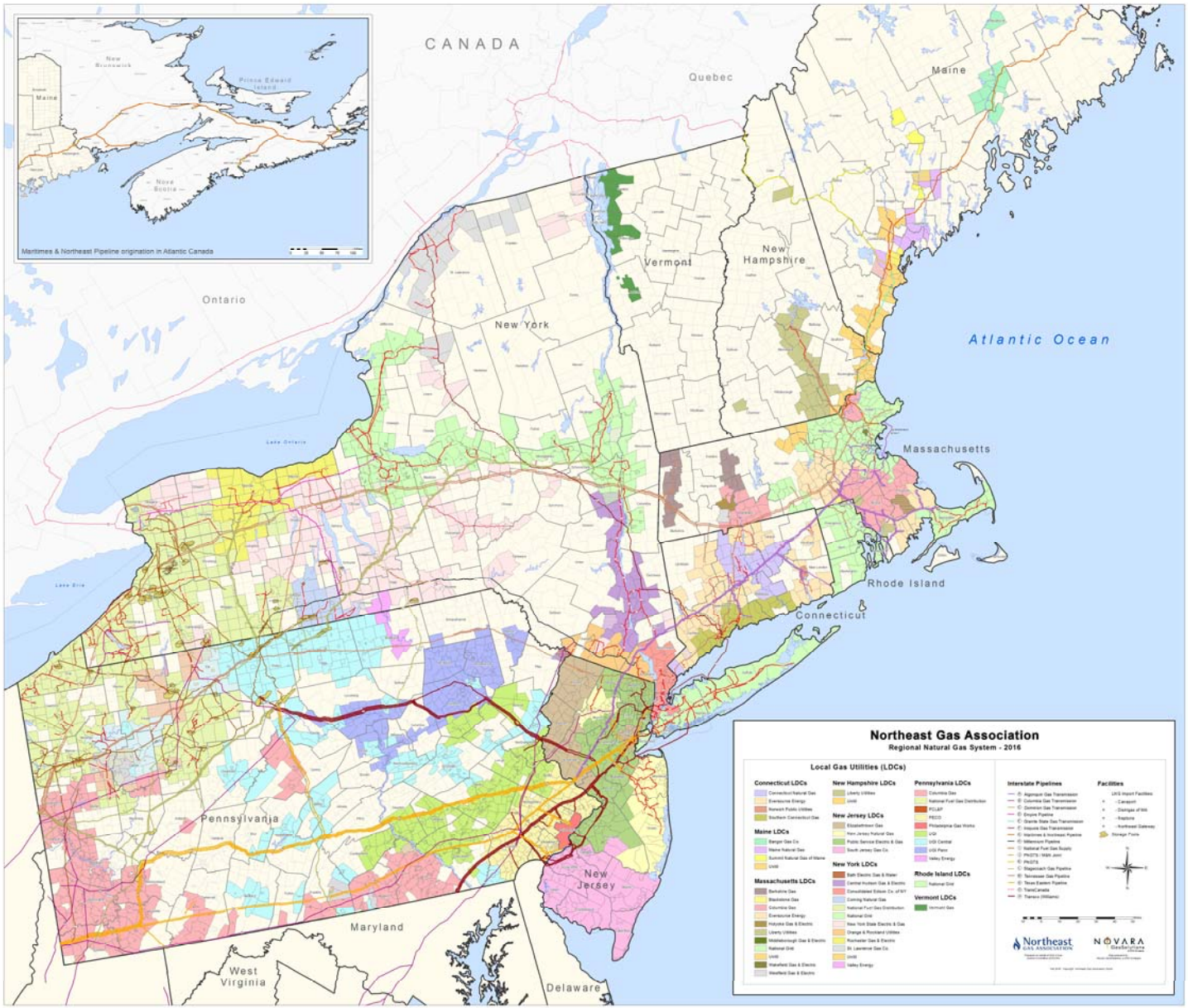
IV.

NATURAL GAS TRENDS IN THE NORTHEAST

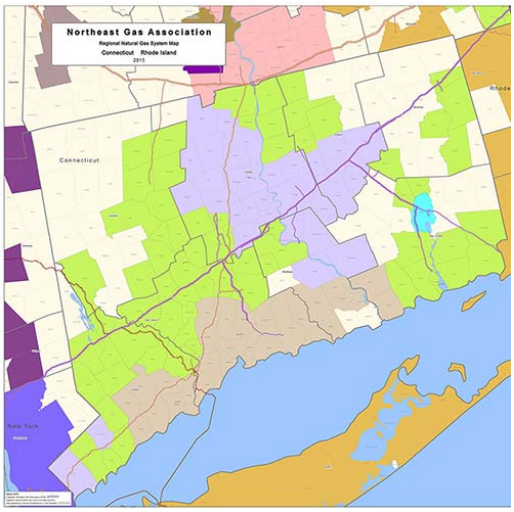
This section provides an introduction to the natural gas industry in the Northeast.

Among the areas addressed are:

- *Gas consumption by sector*
- *Price trends*
- *Growth areas*
- *Gas & power generation.*


CANADA
Quebec
Maine
Vermont
New Hampshire
Ontario
New York
Atlantic Ocean
Massachusetts
Rhode Island
Connecticut
Pennsylvania
New Jersey
Maryland
West Virginia
Delaware
Maritimes & Northeast Pipeline origination in Atlantic Canada
Northeast Gas Association
Regional Natural Gas System - 2016
Local Gas Utilities (LDCs)
Connecticut LDCs
Maine LDCs
Massachusetts LDCs
New Hampshire LDCs
New Jersey LDCs
New York LDCs
Pennsylvania LDCs
Rhode Island LDCs
Vermont LDCs
Interstate Pipelines
Facilities

CONNECTICUT



Natural Gas Utilities in Connecticut

There are 4 natural gas utilities:

Connecticut Natural Gas
(purple area on map)

Eversource (Yankee Gas Services Co.)
(lime-green area on map)

Norwich Public Utilities
(aqua area on map)

The Southern Connecticut Gas Co.
(light brown area on map)

Natural Gas Utility Customers:

There are approximately 615,000 natural gas customers in the state.

Natural Gas Efficiency Program Spending (2016):
$43.8 million

Natural Gas Use in Connecticut

Primary energy: 35%

Electric generation capacity: 39%

% of households with gas as main heating fuel: 35%

Annual consumption: 243 billion cubic feet (Bcf) of natural gas.

Natural Gas Pipelines Serving Connecticut

- ***Algonquin Gas Transmission***, a subsidiary of Enbridge.
- ***Iroquois Gas Transmission***.
- ***Tennessee Gas Pipeline Company***, a subsidiary of Kinder Morgan.

LNG Storage in Connecticut

There are utility liquefied natural gas (LNG) storage facilities in four communities.

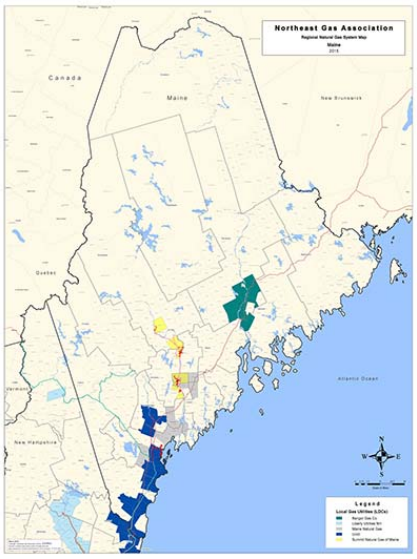
Underground Storage

None.

Natural Gas Production

None.

MAINE



Natural Gas Utilities in Maine

There are 4 natural gas utilities:

Bangor Natural Gas
(green area on map)

Maine Natural Gas
(grey area on map)

Summit Natural Gas
(yellow area on map)

Unitil
(blue area on map)

Natural Gas Use in Maine

Primary energy: 13%

Electric generation capacity: 34%

% of households with gas as main heating fuel: 8%

Annual consumption: 53 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers:

There are approximately 43,000 natural gas customers in the state.

Natural Gas Pipelines Serving Maine

4 natural gas pipelines transport gas:

- ***Portland Natural Gas Transmission (PNGTS).*** It is owned by TC Pipelines LP and Gaz Métro.
- ***Maritimes & Northeast Pipeline***. It is owned by Emera, Enbridge and Exxon Mobil.
- ***Joint Facilities of PNGTS and Maritimes & Northeast Pipeline***.
- ***Granite State Gas Transmission***. It is owned by Unitil.

LNG Storage in Maine

There is a utility liquefied natural gas (LNG) storage facility in 1 community.

Underground Storage

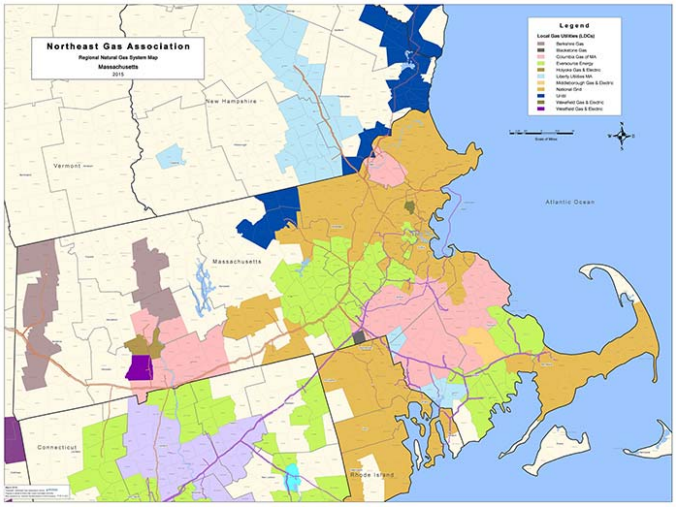
None.

Natural Gas Production

None.

Natural Gas Efficiency Program Spending (2016):
$1 million

MASSACHUSETTS



Natural Gas Pipelines Serving Massachusetts

- ***Algonquin Gas Transmission***, a subsidiary of Enbridge.
- ***Tennessee Gas Pipeline Company***, a subsidiary of Kinder Morgan.
- ***Joint Facilities of PNGTS and Maritimes & Northeast***.

Natural Gas Use in Massachusetts

Primary energy: 32%

Electric generation capacity: 43%

% of households with gas as main heating fuel: 52%

Annual consumption: 424 billion cubic feet (Bcf) of natural gas.

Local Gas Utilities:

There are eleven natural gas utilities in the state.

Natural Gas Utility Customers:

There are approximately 1.6 million natural gas customers in the state.

Natural Gas Efficiency Program Spending (2016):
$201.7 million

LNG Import Facilities

There are two in operation —one onshore, one offshore.

- **Distrigas of Massachusetts**, a subsidiary of ENGIE
- **Northeast Gateway**, a subsidiary of Excelerate Energy

LNG Storage in Massachusetts

There are utility liquefied natural gas (LNG) storage facilities in 18 communities.

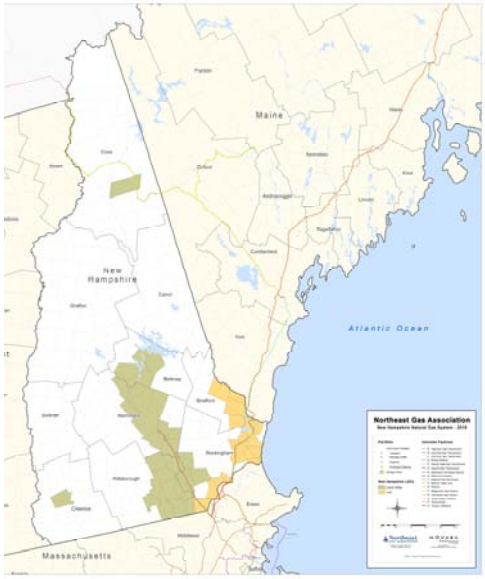
Underground Storage

None.

Natural Gas Production

None.

NEW HAMPSHIRE



Natural Gas Utilities in New Hampshire

There are 2 natural gas utilities:

Liberty Utilities
(brown area on map)

Unitil Corp.
(orange area on map)

Natural Gas Use in New Hampshire

Primary energy: 23%

Electric generation capacity: 28%

% of households with gas as main heating fuel: 21%

Annual consumption: 58 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers :

There are approximately 122,000 natural gas customers in the state.

Natural Gas Pipelines Serving New Hampshire

4 natural gas pipelines transport gas:

- ***Portland Natural Gas Transmission (PNGTS).*** It is owned by TC Pipelines LP and Gaz Métro.
- ***Tennessee Gas Pipeline Company***, a subsidiary of Kinder Morgan.
- ***Joint Facilities of PNGTS and Maritimes & Northeast Pipeline***.
- ***Granite State Gas Transmission***. It is owned by Unitil.

LNG Storage in New Hampshire

There are utility liquefied natural gas (LNG) storage facilities in 3 communities.

Underground Storage

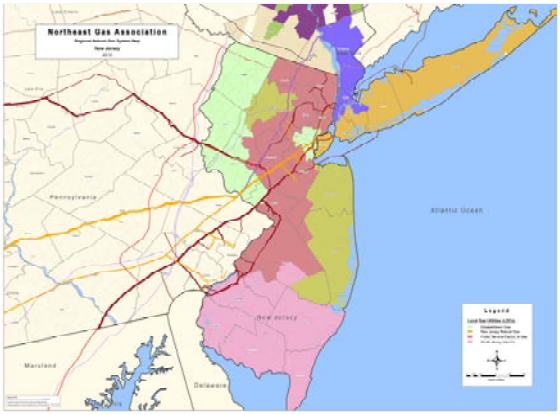
None.

Natural Gas Production

None.

Natural Gas Efficiency Program Spending (2016):
$6.3 million

NEW JERSEY



Natural Gas Utilities in New Jersey

There are 4 natural gas utilities:

Elizabethtown Gas
(pale green area on map)

New Jersey Natural Gas
(lime green area on map)

PSE&G
(light red area on map)

South Jersey Gas
(light purple area on map)

Natural Gas Use in New Jersey

Primary energy: 34%

Electric generation capacity: 58%

% of households with gas as main heating fuel: 75%

Annual consumption: 757 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers:

There are approximately 3 million natural gas customers in the state.

Natural Gas Pipelines Serving New Jersey

- ***Algonquin Gas Transmission and Texas Eastern Transmission***, subsidiaries of Enbridge.
- ***Columbia Transmission,*** a subsidiary of TransCanada.
- ***Dominion Transmission***
- ***Tennessee Gas Pipeline Company***, a subsidiary of Kinder Morgan.
- ***Transcontinental Pipeline***, a subsidiary of Williams.

LNG Storage in New Jersey

There are utility liquefied natural gas (LNG) storage facilities in several communities.

Underground Storage

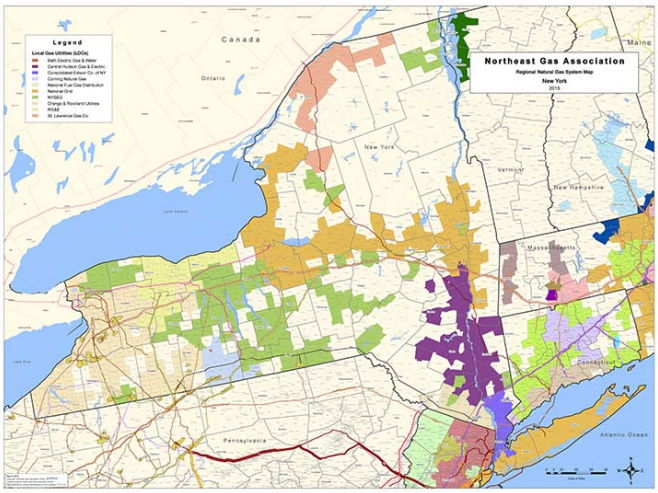
None.

Natural Gas Production

None.

Natural Gas Efficiency Program Spending (2016):
$70.7 million

NEW YORK



Natural Gas Use in New York

Primary energy: 38%

Electric generation capacity: 57% gas, and/or gas/oil.

% of households with gas as main heating fuel: 59%

Annual consumption: 1,267 billion cubic feet (Bcf) of natural gas.

Local Gas Utilities:

There are ten natural gas utilities in the state.

Natural Gas Utility Customers:

There are 5 million natural gas customers in the state.

Natural Gas Production

In 2016, production was 13 Bcf.

Natural Gas Efficiency Program Spending (2016):
$158.4 million

Natural Gas Pipelines Serving NY

- ***Algonquin Gas Transmission and Texas Eastern***
- ***Columbia Transmission***
- ***Dominion***
- ***Empire Pipeline***
- ***Iroquois Gas Transmission***
- ***Millennium Pipeline***
- ***National Fuel Gas Supply***
- ***North County Pipeline***
- ***Stagecoach Gas Pipeline & Storage***
- ***Tennessee Gas Pipeline Company***
- ***Transcontinental Pipeline.***

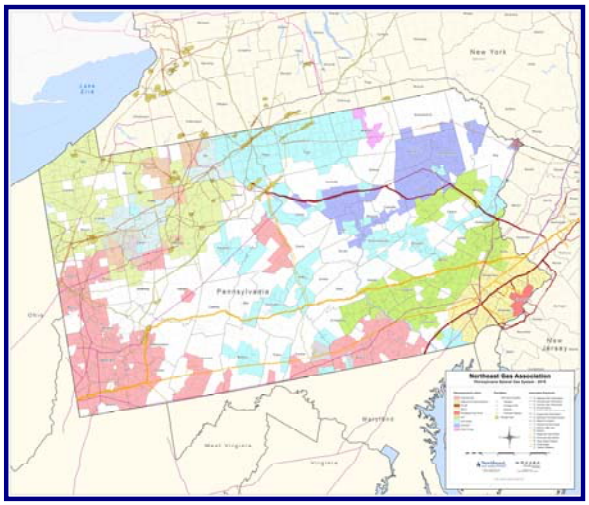
LNG Storage in New York

There are utility liquefied natural gas (LNG) storage facilities in three communities.

Underground Storage

246 Bcf.

PENNSYLVANIA



Natural Gas Use in PA

Primary energy: 30%

Electric generation capacity: 29%

% of households with gas as main heating fuel: 52%

Annual consumption: 1,071 billion cubic feet (Bcf) of natural gas.

Local Gas Utilities:

There are eleven natural gas utilities in the state.

Natural Gas Utility Customers:

There are 3 million natural gas customers in the state.

Natural Gas Production

In 2016, production was 5.2 Tcf.

Natural Gas Pipelines Serving PA

- ***Columbia Transmission (TransCanada)***
- ***Dominion Transmission***
- ***Equitrans***
- ***National Fuel Gas Supply***
- ***Tennessee Gas Pipeline Company***
- ***Texas Eastern Transmission***
- ***Transcontinental Pipeline.***

LNG Storage

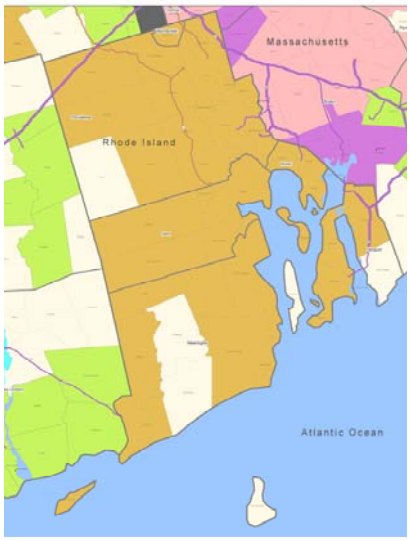
There are four liquefied natural gas (LNG) facilities.

Underground Storage

761 Bcf.

Natural Gas Efficiency Program Spending (2016):
$9.6 million

RHODE ISLAND



Natural Gas Utility in Rhode Island

There is 1 natural gas utility:

National Grid
(tan area on map)

Natural Gas Use in Rhode Island

Primary energy: 48%

Electric generation capacity: 96%

% of households with gas as main heating fuel: 54%

Annual consumption: 83 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers:

There are approximately 263,000 natural gas customers in the state.

Natural Gas Pipelines Serving Rhode Island

2 natural gas pipelines transport gas:

- ***Algonquin Gas Transmission,*** a subsidiary of Enbridge.
- ***Tennessee Gas Pipeline,*** a subsidiary of Kinder Morgan.

LNG Storage in Rhode Island

There are utility liquefied natural gas (LNG) storage facilities in 2 communities.

Underground Storage

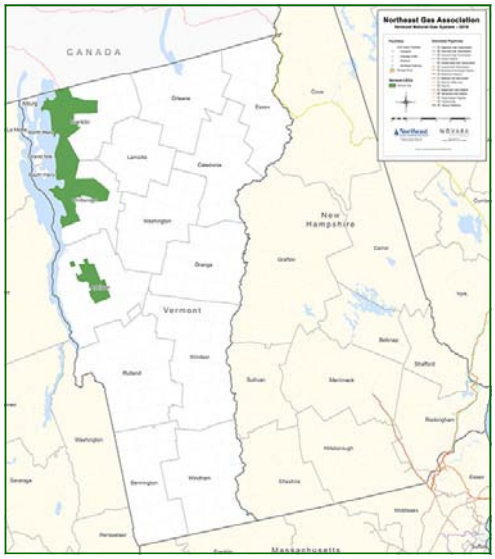
None.

Natural Gas Production

None.

Natural Gas Efficiency Program Spending (2016):
$24.6 million

VERMONT



Natural Gas Utility in Vermont

There is 1 natural gas utility:

Vermont Gas Systems
(dark green area on map)

Natural Gas Use in Vermont

Primary energy: 9%

Electric generation capacity: 0%

% of households with gas as main heating fuel: 18%

Annual consumption: 12 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers :

There are 50,000 natural gas customers in the state.

Natural Gas Pipeline Supplying Vermont

1 natural gas pipeline transports gas to the VT border:

- ***TransCanada Pipeline***

LNG Utility Storage in Vermont

None.

Underground Storage

None.

Natural Gas Production

None.

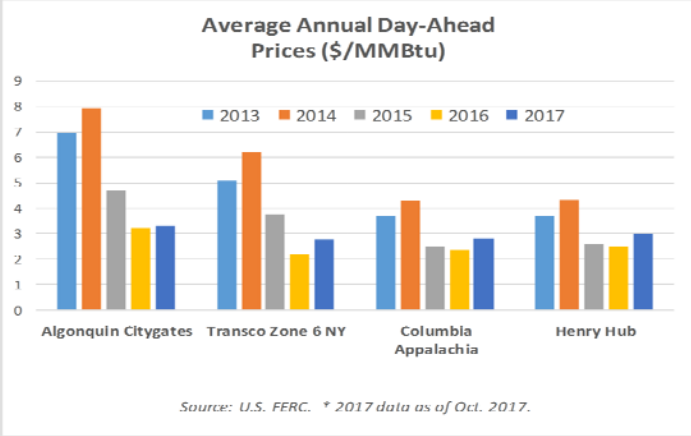
Natural Gas Efficiency Program Spending (2016):
$2.8 million

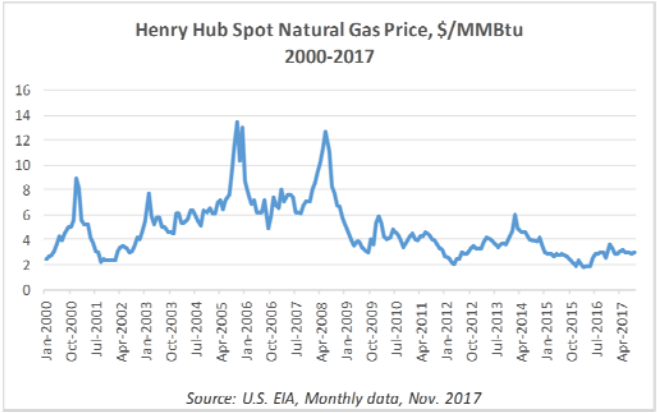
NORTHEAST STATES' ANNUAL NATURAL GAS CONSUMPTION BY SECTOR, 2016 (Bcf)

STATE	RESIDEN-TIAL	COMMER-CIAL	INDUSTRI-AL	ELECTRIC POWER	*TOTAL**
CT	46	50	24	122	***242***
ME	3	9	19	22	***53***
MA	112	105	46	160	***423***
NH	7	9	8	34	***58***
NJ	216	153	61	328	***758***
NY	411	301	77	478	***1,267***
PA	216	143	212	501	***1,072***
RI	17	11	8	47	***83***
VT	4	6	2	—	***12***

*Source: U.S. Energy Information Administration, "Natural Gas Annual 2016," released September 2017. Numbers are rounded off. Delivered energy consumption. * Vehicle fuel consumption not shown, which slightly increases total number for some states.*

NATURAL GAS PRICE TRENDS





U.S. natural gas prices in 2017 have continued on a stable path. Commodity prices in 2017 have been relatively low, at around $3.00/MMBtu for the Henry Hub annual average. U.S. EIA projects the 2018 Henry Hub price to be in the range of $3.20. The Northeast market remains higher-priced than the national average, particularly in New England, reflecting infrastructure constraints, but milder weather in recent years has resulted in less winter price volatility. The entire Northeast region experienced considerable spot price volatility in the "polar vortex" winter of 2013-14, and again in the winter of 2014-15, although the heights were less extreme. U.S. EIA noted in March 2017 that "natural gas pipeline expansion projects that were completed in recent years [in the North-east] have reduced, but did not eliminate, sharp price increases with anticipated cold weather."

The region's proximity to abundant shale gas resources remains however a positive factor. As the New York State Energy Planning Board observed in its June 2015 "New York State Energy Plan": "Projected prices reflect continued industry success in tapping the nation's extensive shale gas resources. With its nearness to the Marcellus Shale basin, New York should participate in prices lower than those experienced from 2000 through 2010 and more similar to those of the last few years."

RESIDENTIAL HEATING FUELS

Natural gas continues to make inroads in the residential heating market in the region. This table illustrates the leading house heating fuels, by percentage, for the years 1990, 2000 and 2016.

For the 9 state region, natural gas in 2016 represented 54% of home heating, compared to 22% for heating oil and 15% for electricity.

According to the most recent data, natural gas represented 59% of the home heating market in New York state, and three-fourths of the home heating market in New Jersey. In Pennsylvania, gas heats 52% of homes.

In New England, gas's share is 39.4% . Heating oil is second at 36.0%. Electricity is 13.7%.

Source: U.S. Census Bureau, "Profile of Selected Housing Characteristics." Data is 2016, 1-year estimates.

STATE	2016 %	2000 %	1990 %
Connecticut	**Gas, 35** Oil, 41 Elec., 17	**Gas, 29** Oil, 52.4 Elec., 14.6	**Gas, 26.3** Oil, 54.4 Elec., 15.1
Maine	**Gas, 8** Oil, 63 Wood, 10	**Gas, 3.5** Oil, 80.2 Elec., 4.4	**Gas, 1.8** Oil, 69.5 Elec., 11.7
Massachusetts	**Gas, 52** Oil, 27 Elec., 16	**Gas, 43.9** Oil, 39.4 Elec., 12.4	**Gas, 38** Oil, 44 Elec., 13.5
New Hampshire	**Gas, 21** Oil, 44 Propane, 16	**Gas, 18.4** Oil, 58.1 Elec., 7.6	**Gas, 15.2** Oil, 55.8 Elec., 12.4
New Jersey	**Gas, 75** Oil, 8 Elec., 13	**Gas, 66.8** Oil, 19.4 Elec., 10.3	**Gas, 57.5** Oil, 29.2 Elec., 10
New York	**Gas, 59** Oil, 21 Elec., 12	**Gas, 51.7** Oil, 33.1 Elec., 8.7	**Gas, 45.7** Oil, 39.6 Elec., 8.5
Pennsylvania	**Gas, 52** Oil, 16 Elec., 23	**Gas, 51** Oil, 25.5 Elec., 16.5	**Gas, 49.5** Oil, 27.9 Elec., 14.8
Rhode Island	**Gas, 54** Oil, 30 Elec., 11	**Gas, 46.3** Oil, 42.1 Elec., 7.6	**Gas, 40.7** Oil, 47 Elec., 7.9
Vermont	**Gas, 18** Oil, 42 Wood, 15 Propane, 17%	**Gas, 12.1** Oil, 58.6 Elec., 4.7 Wood, 9.4	**Gas, 8** Oil, 54.3 Elec., 9.1

CHANGES IN NORTHEAST HOME HEATING CUSTOMER BASE, 2009-17

Number of households by primary space heating fuel, Northeast states (in thousands)

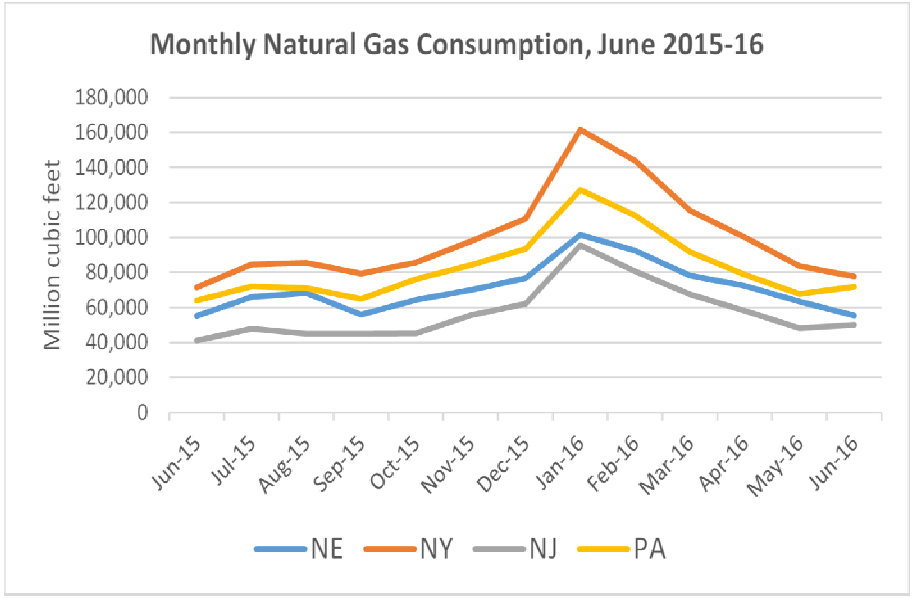
	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Natural Gas	10,992	11,118	11,236	11,345	11,522	11,694	11,786	11,913	12,011
Heating Oil	6,016	5,858	5,701	5,458	5,241	5,092	4,913	4,767	4,620
Propane	733	744	761	813	845	855	888	899	901
Electricity	2,645	2,776	2,894	3,011	3,036	3,090	3,356	3,356	3,421
Wood	501	512	548	582	585	569	515	515	388

U.S. EIA data indicates that the number of natural gas households in the Northeast U.S. has increased by over 1 million since 2009. (Note: The 2017/18 numbers are still preliminary.)

In the same period, heating oil lost 1.4 million households, electricity gained 776,000, and propane gained 168,000.

Source: U.S. EIA, October 2017

NEW ENGLAND / NEW JERSEY / NEW YORK / PENNSYLVANIA MONTHLY LOAD CURVE



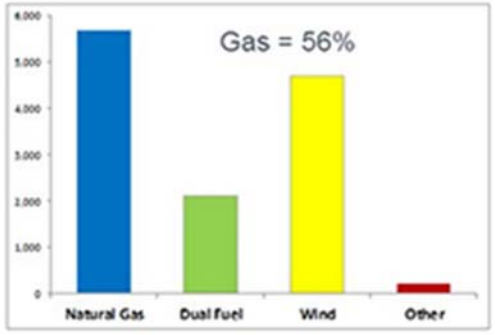
Source: U.S. Energy Information Administration, "Natural Gas Monthly"

This graph displays the monthly variations in gas consumption in New England, New Jersey, New York and Pennsylvania for the illustrative period of June 2015 through June 2016. As can be seen, all four regions are winter-peaking systems. January 2016 represents the highest monthly consumption period for all of the states.

Even with milder weather in recent winters, many of the region's utilities continue to set new peaks, reflecting new customer additions.

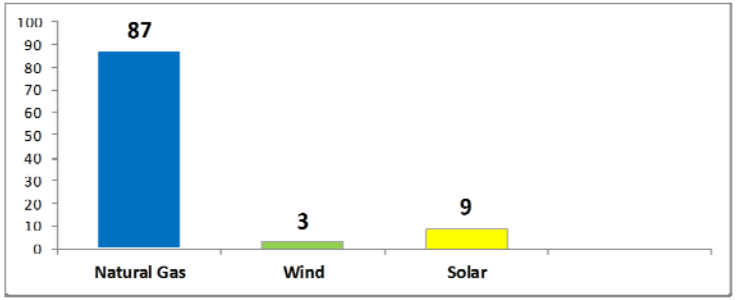
PROJECTED NATURAL GAS ADDITIONS IN REGIONAL ELECTRIC GENERATION SECTOR

PROPOSED GENERATOR ADDITIONS, NEW YORK, Megawatts (Source: NY ISO, "Power Trends 2017")

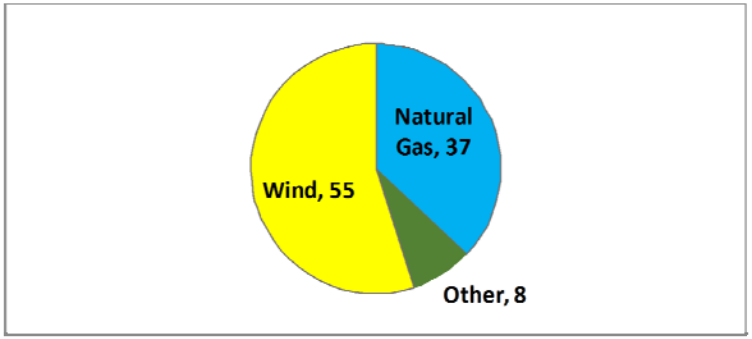


Natural gas has been an increasingly significant fuel in the Northeast electric power system. The region's three electric grid operators, as shown in these graphics, report that natural gas remains the leading or second choice for proposed new power plants. Renewable energy, imported hydro from Canada, and efficiency (not portrayed) are the other leading projected future power sources at this time.

PROPOSED GENERATOR ADDITIONS, PJM, Percentage (Source: PJM Generator Queue, as of Dec. 2016)



PROPOSED GENERATOR ADDITIONS, NEW ENGLAND, Percentage of nameplate capacity (Source: ISO-NE Generator Queue, as of 8-17)



V.

TECHNOLOGY & ENVIRONMENTAL ISSUES

New technologies and environmental issues have been key drivers in shaping the regional gas market in recent years.

Among the areas addressed are:

- *Natural gas vehicles*
- *Power generation technologies*
- *Efficiency investments*
- *Environmental issues*
- *RD&D advances.*

NATURAL GAS VEHICLES

Natural gas fueled vehicles (also known as NGVs) have shown steady growth in recent years nationally and regionally. These vehicles provide environmental benefits, reliability, cost-effectiveness, and are sourced from domestic supplies. Natural gas fuels 23% of all transit buses in the U.S., and over 60% of new refuse truck orders are natural gas fueled.

The availability of public fueling stations remains a challenge. According to the U.S. Department of Energy's Alternative Fuels Data Center, Pennsylvania has 51 public compressed natural gas (CNG) stations, New York State has 35, New Jersey has 13, and New England has 26. Nationally, there are 943 CNG fueling stations. Efforts are underway to increase the number of publicly available stations. Pennsylvania has established a "Natural Gas Energy Development Program" to award grants to promote the use of domestic natural gas as a vehicle fuel in Pennsylvania.

The private sector is at the same time establishing its own network for private fleets, from delivery vans to trucks. Companies with specific daily travel routes are finding it makes sense to use CNG or LNG, depending on weight and distance. There are public LNG fueling stations available in Connecticut, Massachusetts and Pennsylvania. In Canada, there is also a "blue road" of LNG fueling stations linking Quebec and Ontario trucking routes.

There is growing interest in "renewable natural gas" as an input to the transportation fuel stream. Potential sources of organics used to create renewable natural gas include food waste, agriculture waste, wastewater and landfill gas. The U.S. Department of Energy notes that "like conventional natural gas, RNG can be used as a transportation fuel in the form of compressed natural gas (CNG) or liquefied natural gas (LNG). RNG qualifies as an advanced biofuel under the Renewable Fuel Standard."

CNG AND LNG FOR OFF-SYSTEM SUPPLY

Areas not currently served by pipeline (or distribution) infrastructure are looking at ways to gain access to the fuel—and increasingly opting for portable delivery systems, often referred to as a "virtual pipeline."

In this process, CNG or LNG can be delivered via truck to serve institutional or industrial sites. The gas is transported via a trailer that also can serve to offload the gas into the facility.

This application is proving especially popular in areas of New England, New York and Eastern Canada where natural gas pipeline infrastructure has yet to reach. The new fuel system can potentially be set up in a matter of several months.

The natural gas can be sourced from the local gas distribution utility, or via the interstate transmission company.

Customers include paper mills, medical facilities, and farm/food processing.

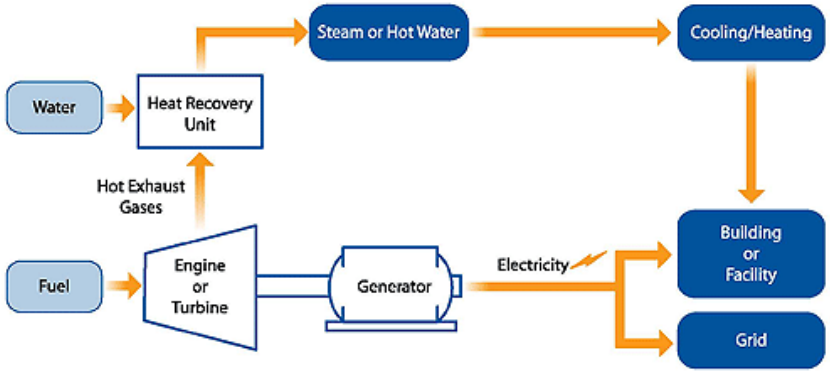
Shown in the photo is a CNG fueling station in Pembroke, NH operated by Clean Energy. The station operates as a CNG refueling stations for vehicles, but also supplies CNG by truck—the white trucks in the photo are examples.

CHP & FUEL CELLS

Natural gas is a key fuel input for energy systems that represent new technologies with opportunities for reduced air emissions, higher system efficiency, and greater reliability.

Combined heat and power (CHP)**, also known as cogeneration, is the simultaneous production of electricity and heat from a single fuel source – such as natural gas.* ***Natural gas fuels 70% of existing CHP capacity in the U.S. *Total generating capacity in the U.S. from CHP in 2014 was 83 gigawatts, representing about 8% of total capacity. The U.S. EPA notes that "gas turbines produce a high quality (high temperature) thermal output suitable for most combined heat and power applications...There is a significant amount of gas turbine based CHP capacity operating in the United States located at industrial and institutional facilities. Much of this capacity is concentrated in large combined-cycle CHP systems that maximize power production for sale to the grid. However, a significant number of simple-cycle gas turbine based CHP systems are in operation at a variety of applications including oil recovery, chemicals, paper production, food processing, and universities." CHP is environmentally beneficial. EPA reports that "because of their relatively high efficiency and reliance on natural gas as the primary fuel, gas turbines emit substantially less carbon dioxide (CO2) per kilowatt-hour (kWh) generated than any other fossil technology in general commercial use."*

Gas Turbine or Engine with Heat Recovery Unit *Source: U.S. EPA*



***Fuel Cells** use "hydrogen as the fuel in an electrochemical process, similar to what occurs in a battery, that generates electricity" (EPA). The primary fuel source for the fuel cell is hydrogen, which can be obtained from natural gas and other fuels containing hydrocarbons. Fuel cells provide great advancements in efficiency and lower emissions. The National Academy of Science noted in an Oct. 2009 report that, looking ahead, "natural gas-powered fuel cells could become mainstream and generate significant amounts of electricity."*

NYSEARCH: Innovative R&D

NGA's NYSEARCH is recognized as one of the leading gas industry research and development organizations in the U.S., with pioneering programs that have received national and international recognition. NYSEARCH has recorded significant RD&D achievements - monitoring technology developments, identifying common needs, performing market research, evaluating potential technical solutions, and conducting product development.

Recent success stories include the development, testing and commercialization of the Remote Methane Leak Detector (RMLD), the EXPLORER II robotics program, and testing of drone systems for gas company facility inspection flights. In 2017, NYSEARCH continued its work on evaluating technologies to measure methane emissions.

For further information, visit the NYSEARCH web site at www.nysearch.org.

RENEWABLE NATURAL GAS

***Renewable Natural Gas (RNG)**, also known as bio-methane or biogas, is pipeline quality gas derived from biomass that is fully interchangeable with natural gas. The future natural gas network could include renewable gas from dairy farms, waste water treatment plants, landfills, wood waste and food waste plants.*

The Gas Technology Institute (GTI) observes that "Bio-methane and liquid biofuels provide an opportunity to supply affordable, clean, domestically-sourced energy to U.S. and global energy customers. These renewable energy sources can help companies comply with renewable portfolio standard (RPS) requirements, low carbon fuel standards, and other policy-driven efforts intended to promote the use of renewable and sustainable energy resources for power generation, transportation, and other end use market applications."

The U.S. Department of Energy notes that "like conventional natural gas, RNG can be used as a transportation fuel in the form of compressed natural gas (CNG) or liquefied natural gas (LNG). RNG qualifies as an advanced biofuel under the Renewable Fuel Standard."

In a position paper a few years ago, National Grid observed that "the biggest driver of renewable gas is GHG reduction, but what makes renewable gas more compelling is that it also enhances diversity of supply while providing a solution for using local waste resources to produce renewable energy."

A 2017 paper by M.J. Bradley & Associates notes that "most RNG produced in the U.S. is used in the transportation and power generation sectors. With new incentives, RNG use in the natural gas distribution sector, where end-use combustion is often more efficient compared to the transportation and electric sectors, would likely increase."

FOSSIL FUEL AIR EMISSIONS COMPARISONS

Natural gas technologies for electric generation provide substantial clean air benefits over other fuel systems. The combustion turbine and combined-cycle technologies remain among the most highly-favored generating technology in the nation and region; while the fuel cell technology holds great promise for future development. And the results for the environment have been positive. A key factor in this improving environmental performance is the rising use of natural gas and the fall in coal's share of total generation. In 2016, the electric grid operator in New York reported that carbon emissions in that region have declined by 42% since 2000, and that SO2 emissions are down by 97% and NOx by 79%. The use of natural gas generation technology is a key driver in this improving power sector trend.

Comparison of Air Pollution from Fossil Fuels

(average emission rates measured in pounds for air pollutants produced per megawatt hour of electricity generated, U.S.)

	SO^2	NOx	CO_2
Natural Gas	0.1	1.7	1,135
Oil	12	4	1,672
Coal	13	6	2,249

Source: U.S. EPA

Comparing Oil and Natural Gas Emissions

Pounds per MMBtu

		Oil	Natural Gas
SO_x	✓ Higher with Oil	0.203	0.001
NO_x	✓ Higher with Oil	0.129	0.092
CO	✓ Higher with Gas	0.036	0.039
Particulates	✓ Higher with Oil	.003	.002
TOC's	✓ Higher with Oil	0.18	0.11
Organics	✓ Higher with Oil	Multiple Sources	Multiple Sources
Metals	✓ Higher with Oil	Multiple Sources	Multiple Sources

Source: GTI, "Oil and Gas Options in the Northeast: Creating the Scientific Basis for Comparing Fuel Differences," July 2003

ADDRESSING CARBON EMISSIONS

Natural gas is a contributor to greenhouse gas emissions, but is the cleanest of all fossil fuels, and as a result natural gas is included as part of the solution to the climate change challenge. At the same time, utility companies are implementing efficiency programs to reduce usage and emissions. Furthermore, natural gas companies are striving to reduce their emissions of methane, which is a greenhouse gas. Companies at all levels of the natural gas production and transmission chain are working to reduce pipeline leaks, fugitive emissions, and impacts from venting. Methane emissions from natural gas distribution systems and landfills in Massachusetts for example declined by over 65% between 1990 and 2014.

One highly successful program has been the "Natural Gas STAR" program of the U.S. EPA. The program invites voluntary participation from industry segments to reduce methane emissions. Over 1,200 billion cubic feet (Bcf) of methane emissions have been reduced by participating companies in the last ten years. A number of LDCs from the Northeast participate in this program.

EPA reports that "reducing methane emissions can result in environmental, economic, and operational benefits."

Source: U.S. EIA, 10-17

State Energy-Related CO2 Emissions
(million metric tons carbon dioxide)

State	1990	2015	Percentage Change
CT	41	37	-10.8%
ME	19	17	-12.0%
MA	84	66	-21.6%
NH	15	15	2.7%
NJ	110	112	1.5%
NY	209	168	-19.4%
PA	265	233	-12.0%
RI	9	11	22.5%
VT	6	6	10.9%
US	5,028	5,249	4.3%

ACCELERATING REPLACEMENT OF OLDER PIPE MATERIALS

Miles of Distribution Main Considered "Replacement Candidates" by Type

State	Bare Steel	Cast / Wrought Iron	Percent-age of Total Main %
CT	152	1,298	18.1%
ME	0.09	42	3.5%
MA	1,462	3,194	21.6%
NH	11	103	5.9%
NJ	1,219	4,369	16.1%
NY	5,708	3,615	19.1%
PA	6,946	2,804	20.2%
RI	241	754	31.1%
VT	--	--	0.0%

2016 data, released 2017 by PHMSA.

Accelerated repair and replacement of more "leak-prone" natural gas distribution system components is an issue receiving growing attention. The Pipeline and Hazardous Materials Safety Administration (PHMSA) of the U.S. Department of Transportation is urging action on repairing older pipe systems, which are considered more vulnerable to potential leaks.

Accelerating repair and replacement would meet safety, environmental and efficiency goals.

In July 2013, NARUC, the national state regulatory association, adopted a resolution encouraging "regulators and industry to consider sensible programs aimed at ***replacing the most vulnerable pipelines as quickly as possible along with the adoption of rate recovery mechanisms*** *that reflect the financial realities of the particular utility in question."*

Utilities in the Northeast are working aggressively to accelerate this replacement process, in concert with efforts to reduce emissions and extend the systems to meet market demand.

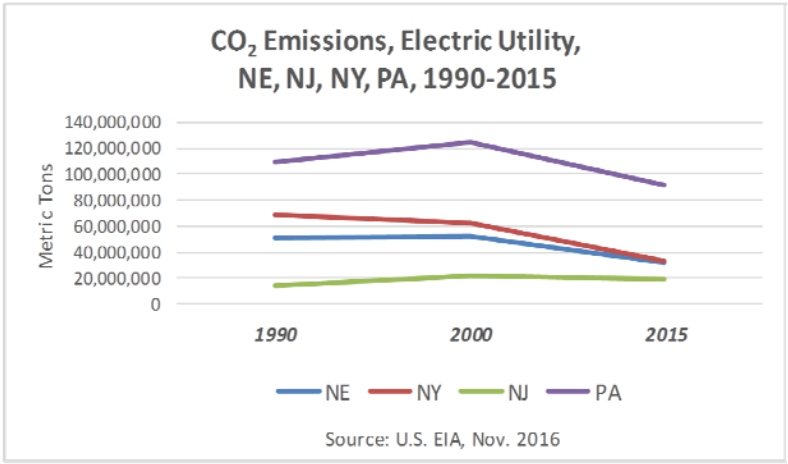
ACHIEVING EMISSIONS REDUCTIONS IN THE POWER SECTOR

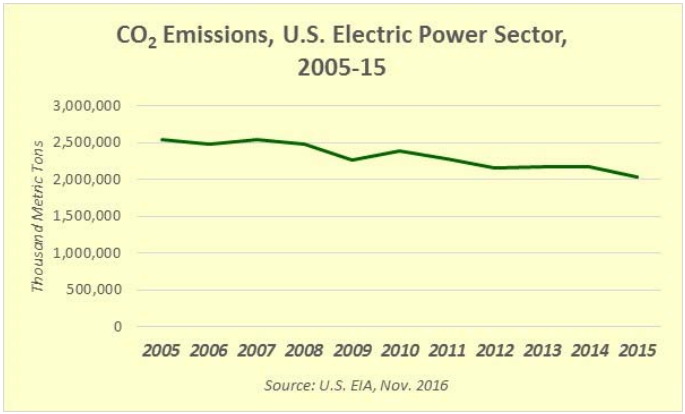
The electric utility sector in the Northeast has achieved major reductions in several air emission areas in recent years—in part thanks to new, more efficient power sources, from natural gas to renewables.

In New York State, from 2000 to 2016, NY ISO reports that emissions rates from the power sector dropped by 43% for CO_2, 87% for NOx, and 98% for SO_2.

ISO-NE reports that from 2001 to 2015, total emissions from power plants in New England dropped by 95% for sulfur dioxide (SO_2), 68% for nitrogen oxides (NOx), and 24% for CO_2.

U.S. power sector carbon emissions have fallen by 10% over the last decade, with the substitution of natural gas for coal a key driver.



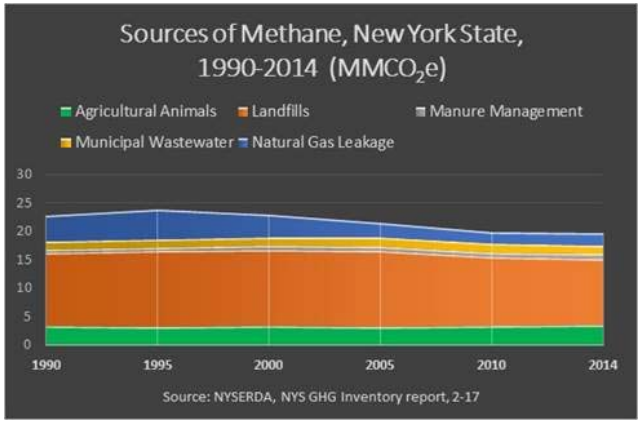


REDUCING METHANE EMISSIONS IN NATURAL GAS SYSTEMS

Natural gas systems are a leading contributor to CH_4 or methane emissions in the U.S., along with agriculture, landfills and coal mining. But methane emissions from natural gas have been trending lower overall in recent decades. CH_4 emissions from natural gas systems declined by 16% from 1990 to 2015, according to the U.S. EPA's 2015 Greenhouse Gas Inventory, released in April 2017.

The decline is due to the following, notes EPA: "The decrease in CH_4 emissions is largely due to the decrease in emissions from transmission, storage, and distribution...The decrease in distribution emissions is largely attributed to increased use of plastic piping, which has lower emissions than other pipe materials, and station upgrades at metering and regulating (M&R) stations. and their replacement with plastic pipelines." [EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, page ES-15].

At the state level, progress continues. Connecticut reported in June 2017 that the "contribution of methane emissions from natural gas distribution systems within Connecticut is less than one percent (0.03%) of all GHG emissions." The amount of natural gas leakage in New York State declined by over 50% from 1990 to 2014. The leading sources of methane emissions in the state are landfills and agricultural animals, followed by natural gas, according to NYSERDA's Feb. 2017 GHG state inventory.

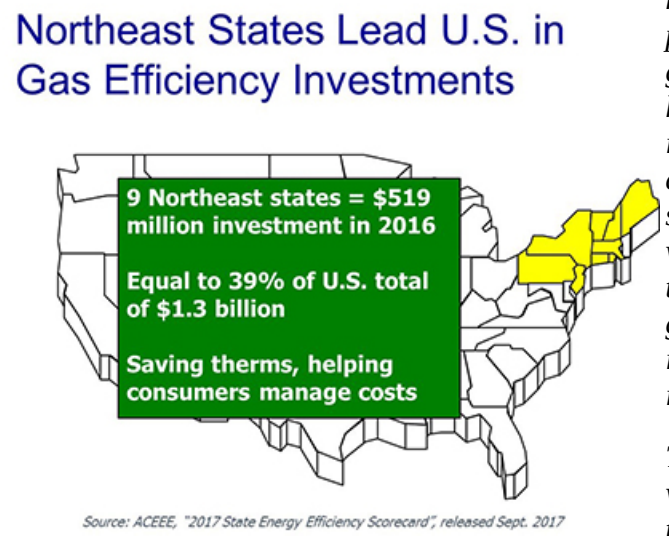


Reducing methane emissions further through infrastructure replacement, new technology applications, and best practices at all stages of the production and delivery process, is an industry priority.

NATURAL GAS EFFICIENCY

Natural gas efficiency programs are a central part of the evolving national and regional natural gas supply/ demand portfolio. Efficiency remains a resource of immense opportunity. The Northeast states already are national leaders in their per capita energy efficiency, and the utilities in the region, electric and gas, have been active for years in efficiency programs.

As the American Council for an Energy-Efficient Economy (ACEEE) has noted, efficiency opportunities exist in multiple sectors: "While the roots of natural gas efficiency programs lie within residential markets, there are now programs serving multiple types of natural gas customers - from homeowners to large industries. There are opportunities for improved energy efficiency across the spectrum of customers and technologies using natural gas. Programs may target specific technologies that use natural gas, such as furnaces, water heaters, boilers, and cooking equipment, or they may target the systems and facilities that are served by natural gas technologies. Improving the thermal envelope of buildings is one example of programs that address whole buildings."



The 2017 annual ACEEE Scorecard for Energy Efficiency, which looks at both electric and natural gas programs, found that five Northeast states were in the top 10 in the U.S.: MA, RI, VT, CT, and NY; and that all the Northeastern states were in the top 25.

In 2016, $1.3 billion was invested in natural gas efficiency programs nationwide, according to the ACEEE. Of that, over one-third of the national total ($519 million, or 39%) was invested in the nine Northeast states (CT, ME, MA, NH, NJ, NY, PA, RI and VT). This commitment will continue in coming years.

NGA's MEMBER LOCAL DISTRIBUTION COMPANIES

(as of November 2017)

Bangor Natural Gas Company
21 Main Street
Bangor, ME 04402
(207) 941-9595
www.bangorgas.com

Bath Electric, Gas & Water System
7-11 South Avenue
Bath, NY 14810
(607) 776-3072

The Berkshire Gas Company
115 Cheshire Road, P.O. Box 138
Pittsfield, MA 01202
(413) 442-1511
www.berkshiregas.com

Blackstone Gas Company
61 Main Street, P.O. Box 162
Blackstone, MA 01504
(508) 883-9516
www.blackstonegas.com

Central Hudson Gas & Electric Corp.
284 South Avenue
Poughkeepsie, NY 12601
(845) 452-2000
www.cenhud.com

Columbia Gas of Massachusetts
4 Technology Drive, Suite 250
Westborough, MA 01581
(508) 836-7000
www.columbiagasma.com

Columbia Gas of Pennsylvania
121 Champion Way, Suite 100
Canonsburg, PA 15317
www.columbiagaspa.com

Connecticut Natural Gas Corp.
77 Hartland Street, 4th floor
East Hartford, CT 06108
(860) 727-3000
www.cngcorp.com

Consolidated Edison Co. of NY, Inc.
4 Irving Place
New York, NY 10003
(212) 460-4600
www.coned.com

Corning Natural Gas Corp.
330 West William Street
Corning, NY 14830
(607) 936-3755
www.corninggas.com

NGA's LDC MEMBERS *(as of 11-17)*

Eversource Energy
One NSTAR Way
Westwood, MA 02090
(800) 592-2000

107 Selden Street
Berlin, CT 06037
(800) 286-5000
www.eversource.com

Fillmore Gas Company, Inc.
10577 New York 19
Fillmore, NY 14735
(585) 567-2272

Hamilton Municipal Gas
3 East Broad Street, PO Box 119
Hamilton, NY 13346-0119
(315) 824-1111
www.hamilton-ny.gov

Holyoke Gas & Electric Dept.
99 Suffolk Street
Holyoke, MA 01040
(413) 536-9300
www.hged.com

Liberty Utilities MA
PO Box 911
Fall River, MA 02722
(508) 324-7811
http://www.libertyutilities.com/ma/

Liberty Utilities NH
15 Buttrick Road
Londonderry, NH 03053
(800) 833-4200
www.libertyutilities.com/east/gas

Maine Natural Gas
PO Box 99
Brunswick, ME 04011
(207) 729-0420
www.mainenaturalgas.com

Middleborough Gas & Electric Dept.
32 South Main Street
Middleborough, MA 02346
(508) 947-1371
www.mgandeonline.com

National Fuel Gas Distribution Co. (NY)
6363 Main Street
Williamsville, NY 14221
(716) 857-7000
www.natfuel.com

National Fuel Gas Distribution Co. (PA)
1100 State Street
Erie, PA 16512
(814) 871-8200
www.natfuel.com

NGA's LDC MEMBERS *(as of 11-17)*

National Grid
One MetroTech Center
Brooklyn, NY 11201
(718) 403-2000
www.nationalgrid.com

40 Sylvan Road
Waltham, MA 02451
(781) 466-5000
www.nationalgrid.com

New Jersey Natural Gas Co.
1415 Wyckoff Road
Wall, NJ 07719
(732) 938-7977
www.njng.com

New York State Electric & Gas
4500 Vestal Parkway East
Binghamton, NY 13902
(607) 762-7200
www.nyseg.com

Norwich Public Utilities
173 North Main Street
Norwich, CT 06360
(860) 887-2555
www.norwichpublicutilities.com

Orange & Rockland Utilities, Inc.
One Blue Hill Plaza
Pearl River, NY 10965
(914) 352-6000
www.oru.com

PECO Energy
2301 Market Street
Philadelphia, PA 19103
(800) 841-4141
www.peco.com

Philadelphia Gas Works (PGW)
800 W. Montgomery Avenue
Philadelphia, PA 19122
(215) 235-1000
www.pgworks.com

Public Service Electric & Gas Co.
80 Park Plaza
Newark, NJ 07101
(973) 430-7000
www.pseg.com

Rochester Gas & Electric Corp.
89 East Avenue
Rochester, NY 14649
(585) 546-2700
www.rge.com

NGA's LDC MEMBERS *(as of 11-17)*

The Southern Connecticut Gas Co.
855 Main Street, P.O. Box 1540
Bridgeport, CT 06604
(203) 382-8111
www.soconngas.com

South Jersey Gas
One South Jersey Plaza
Folsom, New Jersey 08037
(609) 561-9000
www.southjerseygas.com

St. Lawrence Gas Company
33 Stearns Street
Massena, NY 13662
(315) 769-3516
www.stlawrencegas.com

Summit Natural Gas of Maine
442 Civic Center Drive, Suite 100
Augusta, ME 04330
(207) 621-8000
www.summitnaturalgasmaine.com

UGI Utilities, Inc.
2525 N. 12th Street, Suite 360
Reading, PA 19612
(610) 337-1000
www.ugi.com

Unitil
6 Liberty Lane West
Hampton, NH 03842
(888) 886-4845
www.unitil.com

Valley Energy, Inc.
523 S. Keystone Avenue
Sayre, PA 18840
(570) 888-9664
www.valley-energy.com

Vermont Gas Systems, Inc.
P.O. Box 467
S. Burlington, VT 05402
(802) 863-4511
www.vermontgas.com

Wakefield Municipal Gas & Light Department
480 North Avenue
Wakefield, MA 01880
(781) 246-6363
www.wmgld.com

Westfield Gas & Elect. Light Dept.
100 Elm Street
Westfield, MA 01085
(413) 572-0100
www.wgeld.org

TRANSMISSION COMPANIES AND LNG MEMBERS *(as of 11-17)*

Algonquin Gas Transmission Co.
890 Winter Street, Suite 300
Waltham, Massachusetts 02451
(617) 254-4050
www.enbridge.com

Con Edison Transmission
4 Irving Place
New York, NY 10003
(212) 460-6417
www.conedtransmission.com/

Distrigas of Massachusetts Corp.
20 City Square, 3rd Floor
Charlestown, Massachusetts 02129
(617) 886-8300
www.engie-na.com/business/natural-gas-lng/

Granite State Gas Transmission, Inc.
1075 Forest Avenue
Portland, Maine 04104
(207) 797-8002
www.unitil.com

Iroquois Gas Transmission System
One Corporate Drive, Suite 600
Shelton, Connecticut 06484
(203) 925-7200
www.iroquois.com

Maritimes & Northeast Pipeline
890 Winter Street, Suite 300
Waltham, Massachusetts 02451
(617) 254-4050
www.mnp-usa.com

Millennium Pipeline
One Blue Hill Plaza, 7th floor
Pearl River, NY 10965
(800).572-7515
www.millenniumpipeline.com

Portland Natural Gas Transmission System (PNGTS)
One Harbour Place, Suite 375
Portsmouth, NH 03801
(603) 559-5500
www.pngts.com

Repsol Energy North America
2001 Timberloch Place, Suite 3000
The Woodlands, Texas 77380
(281) 297-1128
www.repsolenergy.com

Tennessee Gas Pipeline Company
1001 Louisiana
Houston, TX 77002
(713) 420-2600
www.kindermorgan.com

VII. ABOUT NGA

The Northeast Gas Association (NGA) is a regional trade association that focuses on education and training, operations, planning, technology research and development, and increasing public awareness of natural gas in the Northeast U.S.

NGA represents natural gas distribution companies, transmission companies, liquefied natural gas importers, and manufacturers and suppliers to the industry. These member companies provide natural gas to approximately 13 million customers in nine states (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont).

Mission Statement

The Northeast Gas Association's mission is to promote and enhance the safe, reliable, efficient, and environmentally responsible delivery of natural gas to customers in the region, and to advocate for the industry from production to delivery.

Its web site is www.northeastgas.org/

For further information, contact NGA at:

Northeast Gas Association
75 Second Avenue, Suite 510
Needham, Massachusetts 02494-2859
Tel. 781-455-6800
Fax 781-455-6828

Its NYSEARCH office is located at:

20 Waterview Boulevard, 4th floor
Parsippany, NJ 07054
Tel. 973-265-1900
www.nysearch.org

DATA SOURCES

The data sources used in the Guide are referenced on each page. NGA is grateful to the many agencies and individuals from a variety of sectors who provided information and guidance in the preparation of this report.

Documents of particular interest include the following:

New York State Energy Research and Development Authority (NYSERDA) (www.nyserda.org)
- "Patterns and Trends - New York State Energy Profiles: 2000 - 2014"

Pennsylvania Public Utility Commission
- "Pennsylvania Gas Outlook Report 2016"

U.S. Department of Energy, Office of Fossil Energy, Office of Natural Gas & Petroleum Import and Export Activities
- "Natural Gas Imports and Exports"

U.S. Energy Information Administration (www.eia.gov)
- "Annual Energy Outlook 2017"
- "Natural Gas Annual 2016"
- "Natural Gas Monthly"
- "State Energy Data Report"

National Energy Board of Canada
- "Statistics: Natural Gas Exports and Imports"

NGA will continue during the year to provide up-to-date summaries of regional gas industry developments, and will make that information available on its web site at: www.northeastgas.org.

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Parsippany, New Jersey
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tel. 973-265-1900

www.northeastgas.org