STATISTICAL GUIDE TO THE NORTHEAST U.S. NATURAL GAS INDUSTRY 2014

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

December 2014
The NGA Statistical Guide is intended as an introduction to the natural gas market in the Northeast U.S. region of New England, New York and New Jersey. Included are basic statistics on end-use markets, infrastructure, and natural gas issues and trends - from technology applications to environmental benefits.

Regional information is updated through calendar year 2013, where available. As much as possible the most recent data from other sources are presented.

NGA is grateful to its members 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, the American Gas Association, and the New York State Energy Research and Development Authority.

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

MARKET BACKGROUND

Population & Economy

The Northeast region comprises the eight states of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. The composite population is 43 million (12% of the U.S.), with a civilian labor force of 22 million. Total state domestic product for the region is $2.75 trillion (16% of the U.S. total).

Regional Natural Gas Market

The eight-state region has 10 million natural gas customers (15% of the U.S. total of 64 million). Total annual gas sendout on the regional gas system is 2.8 trillion cubic feet (Tcf), or 12% of U.S. total consumption (measured in volumes delivered to consumers).

Primary Energy

Natural gas represents 29% of the primary energy consumption of the six New England states, 30% of New Jersey, and 36% of New York, compared to the national average of 27% (based on U.S. EIA data, 2012). The eight-state region consumes less coal than the national average, and more oil, nuclear, and renewables (primarily hydro and biomass) in general than the national average.

Gas Customers

New England has 2.6 million natural gas customers. Residential customers number 2.3 million; commercial and industrial customers number over 260,000.
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New Jersey has 2.9 million natural gas customers. Residential customers number 2.6 million; commercial and industrial customers number about 244,000.

New York has 4.7 million natural gas customers. Residential customers number 4.3 million; commercial and industrial customers number about 400,000.

In New England, fuel oil is the leading home heating fuel (39%), with gas a close second (38%). In New Jersey, gas is the clear leader (74%), with oil at 10%. In New York, gas has 56% of the heating market, with fuel oil second (25%). In summary, natural gas represents 53% and heating oil 27% of the home heating market in the eight state region.

Consumption/Sendout by Sector

In New England, gas consumption by end-use sector is 25% residential, 19% commercial, 15% industrial, and 41% power generation. In New Jersey it is 33% residential, 25% commercial, 9% industrial, and 33% power generation. In New York it is 33% residential, 24% commercial, 6% industrial, and 36% power generation. Total annual sendout in New England is about 880 billion cubic feet (Bcf), in New Jersey about 680 Bcf, and in New York about 1,250 Bcf (2013 EIA annual data).

The gas distribution company, or LDC, design day demand in New England is around 4 Bcf per day, in New Jersey over 4 Bcf/d, and in New York about 7 Bcf/d. The peak season for Northeast demand is winter. The increasing use of gas for power generation, however, has meant a rising use of gas in the summer months, while still well below the winter demand period.

Electric Generation Sector

Based on annual fuel mix and generator applications in the queue at ISO-NE, NYISO and PJM (for NJ), natural gas remains one of the leading current - and projected - fuel sources for electric generation. In New England, natural gas represents 46% of regional electric capacity, in New Jersey about 57%, and in New York over 50%.

The U.S. interstate natural gas pipeline system includes 305,000 miles of pipeline, according to the U.S. PHMSA. The EIA map on the left illustrates the extensive system.
The 8 Northeast states have 10 million gas customers, about 15% of the U.S. total.

Regional Market: Gas Supply Sources

About 95% of the natural gas consumed in the U.S. is now produced domestically. The balance is imported from Canada, with a small share from imported liquefied natural gas (LNG).

Historically, the Northeast region relied on three main supply areas: Gulf Coast U.S., Canada, and LNG. Over the last decade, the supply sources expanded to include Rockies/Midcontinent gas and eastern Canada. The biggest change has occurred in just the last several years, with the development of the Marcellus Shale gas basin in Appalachia.

Production from the Marcellus has transformed the supply dynamic into the Northeast. Marcellus production has grown from 2 Bcf/d in 2008 to over 16 Bcf/d in 2014. As a result, the Northeast region’s imports from other U.S. supply basins, Canada, and LNG, are declining, as the new “local” production has emerged. This extraordinary upswing in Northeast production is resulting in new delivery points and new pipeline infrastructure to bring this shale gas to market, and with it lower prices for consumers.

Canada remains pivotal to the region, but with new Marcellus supplies so near, the level of imports has begun to decline, falling by 50% from 2009 to 2013.

Also contributing to the regional gas mix are LNG imports. LNG remains critical in helping local gas utilities meet winter peak day requirements (i.e., LNG provides about 30% of New England’s utility peak day requirements). In 2013, LNG imports into the U.S. were 96 Bcf, considerably lower than the high point of 771 Bcf in 2007.

The Distigas facility outside Boston imported 64 Bcf in 2013, which represented 66% of total U.S. imports. LNG inputs into the region are further enhanced via supplies from the Canaport LNG in New Brunswick, Canada, which delivered another 36 Bcf to the New England market in 2013.

LNG imports to both facilities, while still significant to the region, are falling as U.S. domestic production rises, and as the price for LNG in foreign markets has become more compelling for cargoes.
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**Pipeline and LNG Deliverability into the Region**

**New England**

New England has 2,588 miles of gas transmission pipeline, according to the U.S. Department of Transportation/ Pipeline and Hazardous Materials Safety Administration (PHMSA).


In addition, New England is the site of three import terminals for liquefied natural gas (LNG). The onshore terminal is owned by GDF SUEZ NA and operated by its subsidiary, Distrigas of Massachusetts Corp. (DOMAC). The LNG is delivered by tanker to the Distrigas terminal at Everett, MA, 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 vaporization capability at its terminal is 715 MMcf/d; it also has daily sendout by truck of another 100 MMcf/day.

The Northeast Gateway facility offshore Cape Ann, MA is capable of receiving LNG cargoes and injecting the revaporized gas into the HubLine pipeline system of Spectra Energy. The offshore LNG facility, owned by Excelerate Energy, became fully operational in early 2008. It has imported shipments from Trinidad, Egypt and Qatar, but has had no shipments since 2010.

In 2010 another offshore LNG facility near Cape Ann, MA was completed – the Neptune LNG facility of GDF SUEZ. It is capable of injecting an average of 400 million cubic feet per day into Spectra’s HubLine. It has been generally inactive since its start-up, reflecting the changing market dynamics.
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 of gas a day into the Brunswick Pipeline, which connects with the Maritimes & Northeast Pipeline, which then can transport the volumes into the New England market. It sources gas principally from Trinidad but has also imported supplies from Egypt, Qatar, Norway and Peru. Since its inception, it has delivered about 340 Bcf into the regional market.

**New Jersey**

New Jersey has 1,526 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 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.

**Regional Production**

The Northeast region, a major consumer of natural gas and a high-priced energy market, is an increasingly significant locus for natural gas production.

The region traditionally has had only limited natural gas production, in New York and Pennsylvania. There is no gas resource production base in New Jersey.
or New England. As mentioned, in recent years, with the advent of hydraulic fracturing and the development of the Marcellus resource base, the Northeast has developed into a significant domestic natural gas production area.

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

Marcellus production, centered in Pennsylvania and West Virginia, has reached over 16 Bcf/d as of fall 2014. It is estimated that Northeast production could exceed 20 Bcf/d in the coming years.

The interstate pipeline companies serving the Appalachian region are adding numerous interconnects from area producers. Several projects have been completed and others are in development to bring this gas to market.

There are challenges in terms of infrastructure development, land and water access, and water treatment (water is one of the key ingredients in the hydraulic fracturing process used to dislodge the gas from the shale rock formations). State environmental agencies among others are closely involved in balancing the environmental, energy and economic development variables at the state level.

While there is a shale gas resource in New York, use of the hydraulic fracturing process is not currently permitted. As of fall 2014, the state regulatory process in New York remains underway as the state considers further analysis of potential health-related issues related to its proposed final regulations on hydraulic fracturing. New York does allow conventional drilling production. In 2013, total annual state output was 23 Bcf. The state’s conventional production has been steadily declining since 2007.

There is also 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. In August 2013, gas began flowing from Deep Panuke, another nearby offshore field. A gas production field in New Brunswick, the McCully field of Corridor Resources, began production in 2007, and provides some small amounts of gas for delivery into the Maritimes and Northeast Pipeline.

There are estimates of considerable natural gas reserves offshore Newfoundland that conceivably might be developed. Potential shale resources exist in the other Eastern Canadian provinces but no shale development is occurring.
Another key supply point for the region is liquefied natural gas (LNG). The region has four import facilities, three in MA and one in New Brunswick, Canada. Nationally and regionally, LNG imports are down, as U.S. domestic production is on the increase. Interest is growing in the U.S. for potential LNG exports, in light of the robust U.S. supply output. At the same time, LNG remains especially important to New England for peak days. Photo is of the DistriGas plant in MA.

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 (9% of the U.S. total); New York’s underground storage represents 2.7% of the U.S. total. Total gas storage in New York is 246 Bcf, with maximum deliverability of about 2 Bcf/day. 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, while LNG storage capacity in New Jersey is about 4 Bcf. LNG storage capacity in New England is 16.3 Bcf on the LDC system, and another 3.4 Bcf at the DOMAC import terminal. The Canaport LNG facility in Saint John, NB has 9.9 Bcf of storage.

Recent System Enhancements

In 2014, several system enhancements were placed into service, notably in the Pennsylvania/New Jersey/New York area. These include:

* Millennium’s “Hancock Compressor”;
* National Fuel Gas’s “Mercer Expansion”;
* Spectra’s “TEAM 2014”; and
* Tennessee’s “Rose Lake”.

Numerous projects are planned for the Northeast and New England markets over the next four years, as discussed below.

Also, local distribution companies are investing in system growth to meet growing demand – a subject that is also considered at greater length below.
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Projected Market Growth

United States
The 2014 U.S. EIA Annual Energy Outlook forecasts 0.4% annual energy growth for the United States through 2040. EIA projects that natural gas will grow at a rate of 0.8% annually, coal at 0.3%, renewables 1.6%, petroleum, -0.1%, and nuclear, 0.2%.

Regional Growth
The 2014 EIA Outlook projects a 0.4% annual growth rate for natural gas consumption in New England, and an annual rate of 0.3% in the Mid-Atlantic region – through 2040.

Planned Infrastructure Enhancements

The Northeast region’s natural gas industry plans numerous infrastructure projects to meet growing market demand within the 2015-2018 timeframe. The region remains constrained at several points on its natural gas system, especially into New England and southern New York / Long Island. New supplies and infrastructure will help to ease those constraints, and also should help to improve the regional price basis differential. The multiple projects center on bringing Marcellus Shale supplies to market. As mentioned, they will help further increase regional natural gas capacity, deliverability, flexibility and reliability, as well as provide economic and environmental benefits to the region.

A listing of proposed projects is found later in this document, and NGA regularly posts updates at http://www.northeastgas.org/pipeline_expansion.php.

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, changing traditional flow patterns.
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Challenges for new projects include siting, environmental concerns, and securing market position. The New England region to date has not had any major pipeline projects linked directly to Marcellus, although there are several proposals in development for the 2016-18 timeframe. A 2012 study by Concentric Energy Advisors for Spectra Energy estimates that if New England were to build out its regional infrastructure, the “direct benefit is estimated to range from approximately $270 to $340 million,” reflecting savings in the power generation and utility sectors, displacement of more expensive oil, and a reduction in the New England price premium. Securing contract commitments in New England however remains a difficult issue, as the largest consuming sector, power generation, is constrained by the complex economic structure of its electric market. Natural gas utilities have committed to investing in proposed pipeline projects.

A recent supply/delivery development has been the introduction of portable or mobile compressed natural gas (CNG) and LNG to bring natural gas to communities and businesses not located near a pipeline or distribution system. Some businesses and institutions, such as medical centers and colleges, are opting for natural gas delivered by truck to meet energy needs at a more competitive price. The gas is transported via a trailer that then offload the gas into the industrial or institutional facility.

MARKET ISSUES

Supply Outlook

In terms of U.S. natural gas supply, the outlook remains positive. In April 2013, the Potential Gas Committee (PGC) at the University of Colorado released its year-end 2012 biennial report: Potential Supply of Natural Gas in the United States. The report finds that the United States possesses a technically recoverable natural gas resource potential of 2,384 trillion cubic feet (Tcf). It is the highest resource evaluation in the PGC’s 48 year history. The future supply of domestic natural gas continues to grow due to the emergence and advancement of key technologies that are able to unlock gas production from reservoirs such as shale formations.

In December 2014, the U.S. Energy Information Administration (EIA) released its latest annual report on U.S. oil and gas reserves (the data
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 intermittent fuels like solar and wind. Shown here is a photo of an LNG tank on the National Grid system, along with a solar panel array installed by Grid.

is for 2013). EIA reports that total natural gas proved reserves in the country increased 10% in 2013, to reach a new record of 354 Tcf. EIA added: “At the state level, Pennsylvania and West Virginia reported the largest increases in natural gas proved reserves in 2013, driven by continued development of the Marcellus Shale gas play.” The Marcellus Shale remained the largest shale play (ranked by proved reserves) in the United States in 2013.

Canada remains an important energy partner although its share of the U.S. natural gas market is expected to continue to decline over the long-term. As noted above, the growth of U.S. supplies is leading to lower imports from Canada into the Northeast; at the same time, natural gas demand within Canada is expected to grow, leaving less for export.

As one indicator of the changing dynamic, a few pipelines in the U.S. Northeast, traditionally transporting imported supplies from Canada, are now exporting supplies to Ontario – a reversal of historical supply patterns.

The rise in domestic U.S. production is also having an impact on LNG imports into the U.S. LNG imports into the U.S. dropped by over 80% between 2007 and 2013, and the focus now for several areas of the U.S. is shifting from imports to potential exports. Several LNG import facilities in the U.S. – on both coasts and especially in the Gulf - are proposing to add liquefaction facilities so that they can export LNG to the world market. With the Northeast delivery system still constrained at certain points, the regionally-based LNG facilities will continue to ease bottlenecks and increase supply and delivery options.

Efficiency Initiatives

The Northeast region is a recognized leader in per capita energy efficiency. A 2014 report by the American Council for an Energy Efficient Economy (ACEEE) noted that in 2013 $1.4 billion was invested in natural gas efficiency programs nationwide. Over one-third of the national total ($598 million) was invested in the eight Northeast states alone.
At the state level, several public utility commissions have implemented mechanisms to “decouple” utility revenues from sales to spur greater investment in cost-effective demand-side programs. At the industry level, collaboratives such as GasNetworks in several Northeast states provide innovative ideas on new energy-efficient technologies and equipment to gas customers.

Price Trends

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

The natural gas price story in this new era of domestic production has been positive for consumers and the entire U.S. economy. In early July 2008, natural gas reached $13.50/MMBtu and oil hovered close to $150 a barrel. The average commodity price for 2013 was $3.73/MMBtu. As of fall 2014, EIA is projecting the annual rate for 2014 to be around $4.44/MMBtu, and at $3.83/MMBtu in 2015.

It is projected that the natural gas price bandwidth will stay relatively moderate over the coming years, given the size of the domestic supply resource base. EIA’s 2014 Outlook forecasts that Henry Hub spot prices will stay below $5/MMBtu in 2012 dollars through 2023, and then rise along with demand. The Henry Hub spot price in 2030 is projected by EIA to be $6/MMBtu (2012 dollars). It should be noted that long-term price forecasts are always somewhat uncertain.

However, short-term volatility reflecting delivery constraints and weather will continue, especially in regional markets. The recent winter of 2013-14 provided a clear illustration of that market’s dilemma.

The “Polar Vortex” Winter and its Implications

The winter of 2013-14 popularized the term “polar vortex” to signify unusually widespread cold weather. The U.S. saw an overall increase in heating degree day demand of 10% over the 10-year average. The cold weather covered most of the midsection and eastern parts of the country.

U.S. natural gas demand set a new all-time record of 137 Bcf on January 7, 2014, and hit a near-record of 132 Bcf on January 24 (source: FERC). Residential and commercial demand were up 15%. Interestingly, power demand for natural gas fell 1.5%. 

The Northeast states continue to be leaders in per capita energy efficiency.
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New York City continues to make progress on its efforts to phase out the use of #4 and #6 oil in city buildings in favor of cleaner fuels such as natural gas. In September 2013, the Mayor’s Office noted that the city’s air was the cleanest in decades, thanks in part to new investments in gas distribution and transmission pipelines.

Demand in the Northeast was similarly high with regional gas utility demand reaching close to design day. In New England, utility sendout fell just under 3.7 Bcf on January 3 and 7, and also set high marks on January 22-23. Several New York and New Jersey LDCs set new sendout records in January, including Central Hudson Gas & Electric (January 22), Con Edison (January 7), National Fuel Gas (January 28), National Grid (January 7), New Jersey Natural Gas and South Jersey Gas (January 7).

For the month of January, both New York and New Jersey set new monthly demand records for natural gas, exceeding previous monthly records set in 2011.

Electric demand was also high, as both PJM and NY ISO recorded new winter electric system peaks on January 7.

The U.S. energy system was challenged by the cold weather, with freezeoffs and cold weather impacts on all fuel delivery systems, including natural gas. The regional transportation and delivery system operated well during the month, meeting extended high demand. Inter-pipeline coordination proved effective and essential, especially at times of individual facility challenges (e.g., compressor outages). Many companies issued operational flow orders (OFOs) to remind customers to stay within scheduled allotments and to ensure the system stayed in balance. The pipelines noted that this winter provided real challenges in terms of weather, extended high demand and new flow directions, but overall facilities performed well. LNG inputs into the system also proved helpful at key points.

The FERC noted in its winter assessment, released in April 2014, that “during each of these cold events, customers who had firm transportation capacity on natural gas pipelines generally managed to secure natural gas deliveries.” Interruptible and sec-
ondary capacity became essentially unavailable as the pipeline systems were operating at full capacity. Most gas generators in New England do not have firm transportation and so were unable to obtain gas. ISO New England’s “winter reliability program” utilized oil through special contracts to offset the unavailability of the generators’ interruptible gas arrangements.

Besides the persistent cold weather and system challenges, the “polar vortex” winter was notable for its impact on natural gas spot market prices in the Northeast and the related impact on wholesale electric prices. As noted by FERC, “spot natural gas prices at major Northeast points broke all previous records during the January” cold, “propelled by more severe and widespread system constraints.” The spot price reached over $120/MMBtu on several days at a key point. Comparatively, some other U.S. gas hubs were trading at around $6/MMBtu at the same time.

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

There is a further significant impact on regional electric prices. FERC notes 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.”

The cold winter underscored the gas utilities’ need to secure a diverse supply portfolio, including storage.

The addition of new infrastructure in the region, and the increased supply availability, would help to mitigate the volatility of the Northeast market.

The Northeast region remains among the most constrained gas delivery areas in the U.S. This chart shows average winter day-ahead prices for several points. The Algonquin serves as a proxy for New England, the Transco for NY. Both are much higher priced than the nearby Appalachian, or the national Henry Hub.
Gas and Electric Power Generation

Gas for electric generation is the leading gas consumption sector nationally and regionally. New technology, particularly combined-cycle technology (CCT), has made the natural gas power plant the energy system of choice over 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 - along with wind - are the leading fuel type for new proposed power generation capacity in the generator queues in New Jersey, New York and New England. As the fossil fuel with the lowest carbon content, gas appears well-positioned as a viable power generation source for years to come. Natural gas also provides the potential to back-up variable energy sources such as solar and windpower.

Nationally, a trend toward coal power plant retirements in light of environmental regulations is leaving natural gas as the most likely baseload replacement source.

The regional power generation fleet, already highly dependent on natural gas, appears positioned to become more so in the near- to mid-term. In New England for instance, a nuclear plant in Vermont and a coal/oil plant in Massachusetts retired in 2014, and several more units representing thousands of megawatts have announced they will leave the regional power system within the next few years. Gas along with in-region renewables and imported hydro from Canada are seen as the most viable options for the region, along with efficiency.

There are several unresolved gas generation issues that continue to challenge the market, however. As noted 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
NGA “Year in Review 2014”

capacity is added to meet the needs of gas customers who desire firm service and are willing to execute firm contacts for such service (such as gas LDCs). Relying on essentially interruptible capacity to supply the gas resource for a majority of gas power plants, as currently occurs in New England, does present significant reliability challenges to the energy market, particularly in the winter heating season.

Very high price spikes in the spot market during the last two winter heating seasons affected the region’s energy market and economy. An increase in natural gas infrastructure capacity in New England would provide a restraint on price spikes.

But the level and timing of this increase depends upon customer commitments. The pipelines serving New England have proposed new projects but the first new infrastructure is not expected to come into service until 2016. And while natural gas utilities are committing to participate in these projects, the current electric system model in New England fails to give electric generators the proper incentives to contract for firm pipeline gas transportation, to ensure supply availability and power market reliability.

The two regional pipeline projects planned for 2016 – Spectra’s “AIM” and Tennessee’s “CT Expansion” - have gas utilities as customers but zero power generators. This remains a long-standing and unresolved power market dilemma.

In December 2013, the New England Governors issued a joint statement expressing commitment to a regional initiative that calls for development of new natural gas pipeline infrastructure as well as electric transmission infrastructure and energy efficiency. The Governors’ energy planning committee, NESCOE, worked in the first half of 2014 to develop a proposal to advance this initiative, which involved a proposed new electric tariff to support investment in new infrastructure – both gas and electric.

NGA expressed general support for the Governors’ initiative, viewing it as a possible solution to the power market’s long-standing quandary over fuel adequacy and reliability. In August 2014 the regional initiative was put on hold when the government of Massachusetts requested time to reassess its options. The states remain in discussion through NESCOE.

The U.S. FERC continues its monitoring of gas-electric market coordination issues, from communications and scheduling to pipeline capacity.

The topic will continue to be discussed at the national and regional levels, and remains a priority issue for both energy industries.
Natural Gas Vehicles

Natural gas vehicles (NGVs) remain a competitive alternative fuel option, especially for fleets, buses, and a range of heavy-duty vehicles, including refuse trucks. The price advantage compared to diesel and gasoline is strong – over 30% lower.

On the environmental front, NGVs have other comparative advantages. The U.S. Department of Energy notes: "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." ACEEE has rated the compressed natural gas (CNG) vehicle as among the “greenest vehicles” on the road in the U.S.

Compressed natural gas (CNG) accommodates the widest range of vehicles, from passenger cars to fleet vehicles to buses and garbage trucks. There is now also growing interest in LNG as a fuel for heavy-duty trucks that travel defined routes. New England has a few LNG fueling sites currently, and many initiatives are being planned in the U.S. and Canada for “LNG highways” to provide fueling stations to facilitate truck travel.

State Policies to Increase Access to Natural Gas

The benefits of natural gas – lower price, lower emissions, domestic supply, etc. – are leading to higher levels of customer conversions and new customer development. Multiple states and municipalities are looking to natural gas as a way to provide both greater energy choice and economic benefits to consumers and local economies, as well as to assist in complying with air and health quality standards. Below are some examples of developments within the region on increasing access to natural gas.

Connecticut: In February 2013, Governor Malloy issued a comprehensive state energy strategy with a key role identified for natural gas expansion. In November 2013, the state’s 3 investor-owned utilities received approval from the state regulatory authority to implement expansion plans that will add as many as 280,000 customers in the next 10 years.

Maine: Maine wants to expand the reach of natural gas service to help
businesses from paper mills to hospitals achieve lower costs – and offer more optionality to home heating customers. In June 2013, Maine enacted an energy bill that includes a provision for the State to purchase gas transmission capacity - up to 200 million feet of gas per day - to “facilitate energy cost reductions.” In November 2014, the Maine Public Utilities Commission voted to continue its investigation of possible state investment in gas pipeline capacity.

**Massachusetts:** In June 2014, Massachusetts enacted a “natural gas leaks” bill that includes a provision encouraging utility proposals on increasing “the availability of natural gas service” in the Commonwealth.

**New York City:** In 2007, the city unveiled PlaNYC, which includes a plan to phase out the use of #4 and #6 oil in city buildings in coming years and convert the structures to cleaner fuels. In September 2013, the Mayor’s Office announced the city’s air was the cleanest in 50 years – and noted that “the expansion of the regional natural gas supply and local gas distribution infrastructure” had saved money and lowered emissions. In November 2014, the Mayor’s Office released a Greenhouse Gas Emissions (GHG) inventory for the city, which noted that “the reduced carbon-intensity of the city’s electricity supply was the largest overall driver of citywide GHG emissions reductions from 2005 to 2013.” A key reason for the decline was “increased natural gas-fired generation displacing more carbon intensive oil- and coal-fired generation.”

**New York State:** In November 2012, the New York Public Service Commission initiated a proceeding to examine policies in the state regarding the expansion of natural gas service, “and consider whether we should take steps to foster its use through expansion of the natural gas delivery system or otherwise.” The state has held technical conferences to examine current policies and opportunities.

**Utility System Expansions and Fuel Conversions**

There are several operational – and planned - system expansions on local utility systems, including:

- Enbridge St. Lawrence Gas Company is installing its Franklin County expansion;
- Vermont Gas Systems is implementing Phase 1 of the Addison County system expansion, extending its system south to Middlebury by 2015. Its planned Phase 2 would bring natural gas to parts of Middlebury, Cornwall and Shoreham, and then to the International Paper Mill in Ticonder-
oga, N.Y. It envisions a third phase, to extend natural gas south to Rutland by 2020.

All natural gas utilities in the region have reported higher levels of new customers and customer conversions from other fuels, and are seeking to grow their system capabilities accordingly.

Environmental Considerations

In the Northeast, which needs to meet national, regional and state air emission requirements, energy systems - from transportation to power generation - remain a key focus of policy, regulatory and public attention.

*Reductions in air emissions from power generation*

Because natural gas compares favorably to other fossil fuels regarding air emissions, it will likely remain the favored fuel for new power generation. MIT’s June 2011 study on gas stated that using very efficient natural gas powerplants to replace coal-fired plants is “the most cost-effective way of reducing CO₂ 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 October 2014, the U.S. EIA reported that U.S. energy-related carbon emissions, after declining for several years, rose 2.5% in 2013. This was largely "the result of colder weather leading to an increase in energy intensity" from the year before. EIA noted that the rise in natural gas prices in 2013 also shifted some plant dispatch decisions, resulting in more coal-fired generation and thus higher emissions. EIA further notes that since 2005 the increased use of natural gas for
power generation and the growth in renewables have contributed to a decline in U.S. power sector carbon intensity. At the regional level, the air emissions report remains favorable. NY ISO reports that from the years 2000 to 2013, emissions rates from the power sector saw a 41% decline in CO₂, an 81% decline in NOx, and a 94% decline in SO₂. ISO New England reports that “an increase in natural-gas-fired power generation and the implementation of emission controls on the region’s fossil-fuel-fired power plants have resulted in significant reductions in air emissions in New England.” For the period from 2000-2012, SO₂ emissions in that region have declined by 92%, NOx emissions by 66%, and CO₂ by about 21%.

**Reductions of methane emissions in natural gas system operations**

The natural gas industry is cognizant of its responsibility to reduce emissions from its own system operations. Many of NGA’s distribution and transmission company members participate in the U.S. EPA’s “Natural Gas STAR” Program. Progress continues on this front. For 2012 in the U.S., Natural Gas STAR partners reported methane emissions reduction of 66 Bcf, providing “cross-cutting benefits” according to EPA. Reducing leaks is an issue of paramount interest (see section on infrastructure replacement below).

Methane emissions related to the U.S. natural gas system continue to decline, which is positive news. Since 1990, methane emissions are down by 17% according to the EPA’s April 2014 national GHG inventory report. The report noted that “The decrease in CH₄ emissions is largely due to a decrease in emissions from production and distribution…The decrease in distribution emissions is due to a decrease in cast iron and unprotected steel pipelines.”

**Shale gas development**

The development of shale gas involves other environmental issues and impacts that continue to merit analysis and technology improvements. The MIT study on natural gas notes that “the environmental impacts of shale development are challenging but manageable.” Argonne National Laboratory, in a September 2012 paper for the U.S. Department of Energy’s “Clean Cities” Program, 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 is 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 the United States Department of Energy (DOE), unveiled a web-based national registry (http://fracfocus.org) disclosing the chemical additives used in the hydraulic fracturing process on a well-by-well basis. As of November 2014, over 85,000 wells are registered.

Analyses of hydraulic fracturing as reported in the NY DEC review released in mid-2011 indicate “that no significant adverse impact to water resources is likely to occur due to underground vertical migration of fracturing fluids through the shale formations.” An October 2011 paper by the National Regulatory Research Institute (NRRI) stated that “Based on more than one million wells drilled with fracking, however, there is little evidence that fracking directly causes groundwater contamination...[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 has 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.

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, are receiving industry attention. The industry must be responsible for best practices at all times.

**Pipeline Safety**

Pipeline safety is a primary issue 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.

The rate of incidents is declining nationwide at both gas transmission and distribution levels. However, incidents do occur. “High profile, high consequence” incidents, as termed by PHMSA, have occurred in recent years in California, Pennsylvania and New York.
The 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 and encouraging the public to call the utility if they notice a smell of gas in the home or street; and maintaining and enhancing the physical components of the delivery system, through methods such as “accelerated infrastructure replacement” (see below), to replace older, more risk-prone 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.

**Accelerated Pipeline Replacement**

An issue related to safe operations and environmental performance is the replacement of older pipeline system components (pipes constructed of bare steel or cast-iron) that are considered more “leak-prone”. The accelerated repair and replacement of more “leak-prone” natural gas distribution system components is thus an issue of growing interest. PHMSA is urging action on repairing older, potentially more leak-prone systems.

In general, the Northeast states have higher levels of such distribution pipe components than the national average, due to older systems. The U.S. average for systems with bare steel and cast iron components is 7%. The percentage is 36% in Rhode Island, 25% in Massachusetts, and 23% in New York.

Replacing these older components is a priority, for safety reasons and to reduce system leaks and related emissions.

State regulatory agencies are working with utilities on programs to achieve pipe replacement in an economically appropriate manner. Rhode Island and Massachusetts have enacted legislation on this topic in recent years.

President Obama’s 2013 “Climate Action Plan” observes that “...investments to build and upgrade gas pipelines will not only put more Americans to work, but also reduce emissions and enhance economic productivity.”
NGA “Year in Review 2014”

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), and the EXPLORER II robotics program.

NGA also has a program with the Gas Technology Institute (GTI) that transfers knowledge to natural gas utility partners about new technologies that can enhance operations, safety, efficiency, and analysis.

Technology is the bridge to our energy future; investment in natural gas technology is an avenue to progress.

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

*NGA’s NYSEARCH organization is an industry leader in North America on new technology innovations.*

*NGA is also pleased to partner with the Gas Technology Institute (GTI).*

*Photos: NYSEARCH*
II.

REGIONAL ENERGY OVERVIEW

This section provides an introduction to the energy scene in New England, New York and New Jersey.

Among the areas addressed are:

- economic profile
- projected energy consumption by fuel type
- primary energy mix
- electric generation mix
- state energy consumption.
The Northeast states (New England, New Jersey and New York) represent a total population of 43 million, a
civilian labor force of 21.8 million, gross state domestic product of $2.75 trillion, and account for 16.2% of total
Statistics. U.S. population figure is for November 2014, the states are 2013 annual estimates. GDP = current dollar.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>3,596,080</td>
<td>1,488,072</td>
<td>1,870</td>
<td>249.3</td>
<td>1.5</td>
<td>$60,658</td>
</tr>
<tr>
<td>Maine</td>
<td>1,328,302</td>
<td>723,142</td>
<td>705</td>
<td>54.8</td>
<td>0.3</td>
<td>$40,924</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>6,692,824</td>
<td>2,813,641</td>
<td>3,517</td>
<td>446.3</td>
<td>2.6</td>
<td>$57,248</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>1,323,459</td>
<td>616,496</td>
<td>740</td>
<td>67.8</td>
<td>0.4</td>
<td>$51,013</td>
</tr>
<tr>
<td>New Jersey</td>
<td>8,899,339</td>
<td>3,578,260</td>
<td>4,496</td>
<td>543.1</td>
<td>3.2</td>
<td>$55,386</td>
</tr>
<tr>
<td>New York</td>
<td>19,651,127</td>
<td>8,126,399</td>
<td>9,554</td>
<td>1,310.7</td>
<td>7.7</td>
<td>$54,462</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>1,051,511</td>
<td>461,658</td>
<td>556</td>
<td>53.2</td>
<td>0.3</td>
<td>$46,989</td>
</tr>
<tr>
<td>Vermont</td>
<td>626,630</td>
<td>323,936</td>
<td>350</td>
<td>29.5</td>
<td>0.2</td>
<td>$45,483</td>
</tr>
<tr>
<td>U.S.</td>
<td>319,273,572</td>
<td>132,802,859</td>
<td>155,959</td>
<td>16,978</td>
<td>100</td>
<td>$44,765</td>
</tr>
</tbody>
</table>
A comparison of New England, New York and New Jersey primary energy consumption indicates a strong role for petroleum, reflecting the inclusion of the transportation sector; a small role for coal compared to the national average, a consistent role for nuclear, a varying share for hydro and biofuels, and a solid share for natural gas.

ELECTRIC GENERATION FUEL SOURCE
(% of total)

NEW ENGLAND

- Natural Gas: 46%
- Nuclear: 33%
- Coal: 6%
- Oil: 1%
- Renewable: 14%
- Pumped Storage: 1%

NEW YORK

- Natural Gas: 9%
- Gas / Oil: 46%
- Nuclear: 14%
- Coal: 4%
- Hydro: 15%
- Wind: 4%

NEW JERSEY

- Natural Gas: 51%
- Nuclear: 24%
- Coal: 12%
- Oil: 10%
- Hydro: 2%
- Other: 1%

Sources:
ISO New England, 2013 sources of total electric energy production;
NY ISO, 2014 “Power Trends”;
New Jersey existing installed capacity, “PJM 2013 Regional Transmission Expansion Plan.”
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 2012," released 2014. 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 2012.

<table>
<thead>
<tr>
<th></th>
<th>Per Capita, 2012, Consumption</th>
<th>Natural Gas</th>
<th>Petroleum</th>
<th>Coal</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MMBtu</td>
<td>Rank</td>
<td>TBtu</td>
<td>Rank</td>
<td>TBtu</td>
</tr>
<tr>
<td>CT</td>
<td>203.3</td>
<td>47</td>
<td>236.3</td>
<td>33</td>
<td>315.5</td>
</tr>
<tr>
<td>ME</td>
<td>285.4</td>
<td>30</td>
<td>70.5</td>
<td>48</td>
<td>177.4</td>
</tr>
<tr>
<td>MA</td>
<td>208.6</td>
<td>45</td>
<td>430.9</td>
<td>17</td>
<td>555.5</td>
</tr>
<tr>
<td>NH</td>
<td>214.8</td>
<td>42</td>
<td>74.4</td>
<td>46</td>
<td>142.9</td>
</tr>
<tr>
<td>NJ</td>
<td>256.2</td>
<td>37</td>
<td>671.1</td>
<td>12</td>
<td>1,011.7</td>
</tr>
<tr>
<td>NY</td>
<td>179.5</td>
<td>50</td>
<td>1,261</td>
<td>5</td>
<td>1,321.6</td>
</tr>
<tr>
<td>RI</td>
<td>172.9</td>
<td>51</td>
<td>98.4</td>
<td>42</td>
<td>80.3</td>
</tr>
<tr>
<td>VT</td>
<td>205.9</td>
<td>46</td>
<td>8.3</td>
<td>50</td>
<td>76</td>
</tr>
<tr>
<td>Northeast</td>
<td></td>
<td></td>
<td>2,850.8</td>
<td></td>
<td>3,680.9</td>
</tr>
<tr>
<td>U.S.</td>
<td>302.6</td>
<td></td>
<td>26,133.6</td>
<td></td>
<td>35,691.4</td>
</tr>
</tbody>
</table>
U.S. EIA projects natural gas to grow at an annual rate of 0.4% in New England through 2040.

EIA projects growth trends for other leading energy sources as follows:

- Renewables, 1.8%
- Coal, 2%
- Nuclear, -0.4%
- Oil, -0.6%.

U.S. EIA projects natural gas to grow at an annual rate of 0.3% in the Mid-Atlantic region through 2040.

EIA projects growth trends for other leading energy sources as follows:

Renewables, 0.8%
Coal, 0.1%
Nuclear, -0.2%
Oil, -0.7%.

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. Its system incorporates approximately 1,127 miles of pipe, with 11 interconnections/receipt points. Its system commences in NJ, connecting with Texas Eastern, and extends through NY, CT, northern RI, and eastern and southeastern MA. Its capacity is 2.6 Bcf/d.

**Columbia Gas Transmission, Inc.** is a subsidiary of NiSource, Inc. and headquartered in Richmond, VA. 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 over 650 Bcf.

**Distrgas of Massachusetts Corporation (DOMAC)**, a subsidiary of GDF SUEZ NA, 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 1,100 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.

**Empire Pipeline** is a subsidiary of National Fuel Gas Company. Empire is a 24-inch diameter natural gas transmission pipeline that originates at the U.S./Canada border at Niagara, and extends easterly 249 miles from Buffalo, NY to near Syracuse and then south to Corning. Constructed in 1992 and in service since 1993, Empire has a rated capacity in excess of 750 million cubic feet per day.

**Excelerate Energy** operates the Northeast Gateway Deepwater LNG Port facility located approx. 13 miles offshore near Cape Ann, MA. The facility received its first shipment in May 2008. The physical infrastructure consists of a dual subsea buoysystem and an approx. 16 mile long pipeline connecting into the HubLine pipeline operated by Algonquin Gas Transmission. The Northeast Gateway infrastructure is designed to accommodate gas deliveries up to 800 million cubic feet per day.
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 5 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 1.6 Bcf/d.

Maritimes & Northeast Pipeline (M&NE) is a partnership of Spectra Energy, Emera and ExxonMobil. It transports gas from the Maritimes to markets in Atlantic Canada and New England. The total pipeline is 889 miles, with about 346 miles located in Maine, New Hampshire and Massachusetts. 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 NiSource, National Grid and DTE Energy. It began commercial operations in December 2008.

National Fuel Gas Supply Corporation provides interstate natural gas transmission and storage for affiliated and nonaffiliated companies through an integrated gas pipeline system of 2,877 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 and is co-owner and operator of four others.

Neptune LNG is an LNG facility located approximately ten miles off the coast of Gloucester, MA. It is owned by GDF SUEZ. It was completed in 2010. It connects with the Spectra underwater HubLine system via a 13 mile-interconnect. It is designed to deliver from 400 to 750 million cubic feet per day.

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 - TransCanada PipeLines 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 292 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 capacity is 168 MMcf/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 10 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 over 300 Bcf to the market.

**Tennessee Gas Pipeline Company** is a business unit of Kinder Morgan. The Tennessee Gas Pipeline has 13,900 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 92 Bcf of storage, 75 compressor stations, and a capacity of ~8 Bcf/d.

**Texas Eastern Transmission Company** is a business unit of Spectra Energy. Its system incorporates approximately 8,987 miles of pipe, from the U.S. Gulf Coast to New Jersey. Its capacity is 8.48 Bcf/d, with storage of 75 Bcf.

**TransCanada PipeLine** has a network of approximately 35,500 miles of pipeline which transports the majority of western Canada’s natural gas production to markets in Canada and the United States. It interconnects with several systems serving New York and New England.

**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 10.2 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 56 compressor stations and 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 expansions to these numbers in coming years.

The chart below shows percentage of pipeline mains by material by region, 2012. Plastic pipe is in the 40 percentile range for all three regions, but is the dominant method for new distribution pipe, and now represents 53% of all U.S. miles of main.

<table>
<thead>
<tr>
<th>STATE / U.S.</th>
<th>DISTRIBUTION MAIN MILES</th>
<th>TRANSMISSION MILES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>7,822</td>
<td>588</td>
</tr>
<tr>
<td>Maine</td>
<td>937</td>
<td>454</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>21,383</td>
<td>1,129</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>1,896</td>
<td>251</td>
</tr>
<tr>
<td>New Jersey</td>
<td>34,101</td>
<td>1,526</td>
</tr>
<tr>
<td>New York</td>
<td>47,988</td>
<td>4,581</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>3,179</td>
<td>95</td>
</tr>
<tr>
<td>Vermont</td>
<td>733</td>
<td>71</td>
</tr>
<tr>
<td>U.S. total</td>
<td>1,254,686</td>
<td>302,828</td>
</tr>
</tbody>
</table>

Source: PHMSA, U.S. Department of Transportation, 2013 data
NORTHEAST PIPELINE PROJECTS IN PROCESS

2014 saw several infrastructure projects placed in service in the region, to link Marcellus supplies to market. Several other projects are in the regulatory and development process for the period 2015-2018 and are summarized below. This list changes with market conditions—please visit NGA's web site during the year for updated listings.

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COMPANY</th>
<th>DESCRIPTION</th>
<th>EST. IN-SERVICE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockaway Lateral &amp; Northeast Connector</td>
<td>Williams / Transco</td>
<td>The project involves a proposed 3.2-mile 26-inch lateral, consisting of approximately 2.9 miles of offshore pipeline and approximately 0.3 miles of onshore pipeline. It is designed to provide approximately 647,000 dekatherms per day of natural gas delivery capacity to National Grid's gas distribution system in Brooklyn and Queens, NY.</td>
<td>Northeast Connector—Dec. 2014; Rockaway Lateral, 1st qtr. 2015</td>
<td>Precedent agreements signed June 2009. Filed with FERC, 1-13. FERC issues final EIS, 2-14. Approved by FERC, 5-14. Under construction.</td>
</tr>
<tr>
<td>Constitution Pipeline</td>
<td>Cabot/Williams</td>
<td>Approximately 120-mile Constitution Pipeline is being 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 announced shippers.</td>
<td>Late 2015</td>
<td>Announced spring 2012. Filed with FERC, 6-13. FERC issued final EIS, 10-14. Approved by FERC, 12-14.</td>
</tr>
<tr>
<td>Wright Interconnect Project (WIP)</td>
<td>Iroquois Gas Transmission</td>
<td>WIP will enable delivery of up to 650,000 Dth/day 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.</td>
<td>Late 2015</td>
<td>Announced 1-13. Filed with FERC, 6-13. FERC issued final EIS, 10-14. Approved by FERC, 12-14.</td>
</tr>
<tr>
<td>Niagara Expansion</td>
<td>Tennessee Gas Pipeline</td>
<td>Proposed capacity of 158,000 dekatherms per day of natural gas. Seneca will serve as the foundation shipper for TGP’s Niagara Expansion Project, which is designed to provide transportation from the prolific Marcellus Shale in Pennsylvania to TGP’s interconnect with TransCanada Pipeline in Niagara County, N.Y.</td>
<td>Nov. 2015</td>
<td>Filed with FERC, Feb. 2014</td>
</tr>
</tbody>
</table>

This table is based on publicly-available information as of Dec. 2014; project details may change.
## NORTHEAST PIPELINE PROJECTS IN PROCESS (cont’d)

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COMPANY</th>
<th>DESCRIPTION</th>
<th>EST. IN-SERVICE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuscarora Lateral</td>
<td>National Fuel Gas Supply &amp; Empire Pipeline</td>
<td>Planned capacity of 95,000 Dth/d. 17 miles of pipeline plus storage wells and lines. Market is on-system utilities (NYSEG, RG&amp;E).</td>
<td>Nov. 2015</td>
<td>Jointly filed with FERC, March 2014.</td>
</tr>
<tr>
<td>West Side 2015 Expansion</td>
<td>National Fuel Gas Supply</td>
<td>Adds 175,000 Dth/day of incremental capacity. 23 miles of 24” pipeline and additional horse-power at Mercer (TGP Sta. 219).</td>
<td>Nov. 2015</td>
<td>Filed with FERC, Feb. 2014.</td>
</tr>
<tr>
<td>New Market Project</td>
<td>Dominion Pipeline</td>
<td>Planned for customers in upstate NY (National Grid). Will include the addition of 2 new compressor stations along DTT’s existing transmission pipeline; and increased compression at an existing station. Capacity of 112 MMcf/d.</td>
<td>Nov. 2016</td>
<td>Filed application with FERC, June 2014.</td>
</tr>
<tr>
<td>AIM</td>
<td>Algonquin Gas Transmission / Spectra Energy</td>
<td>Providing 342 MMcf/d of additional capacity to move Marcellus production to Algonquin City Gates. Shippers are 6 gas utilities in New England.</td>
<td>2nd half 2016</td>
<td>Open season held, fall 2012. Filed with FERC, 2-14. FERC issues draft EIS, 8-14.</td>
</tr>
</tbody>
</table>

*This table is based on publicly-available information as of Dec. 2014; project details may change.*
<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COMPANY</th>
<th>DESCRIPTION</th>
<th>EST. IN-SERVICE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continent to Coast (C2C) Expansion</td>
<td>PNGTS</td>
<td>C2C will access natural gas supplies from key North American natural gas basins via Trans-Canada Pipeline. Atlantic Canada markets can then transport on PNGTS to an interconnect with Maritimes and Northeast Pipeline at Westbrook, ME. Shippers interested in moving natural gas further south into New England can transport on PNGTS to interconnects with other NE natural gas pipelines at Dracut, Haverhill and Methuen, MA. May raise PNGTS’ capacity of 168,000 Dth/d to a total range of 300-350,000 Dth/d.</td>
<td>Nov. 2016</td>
<td>Open season, April 1 to June 28, 2013. Open season re-convened, Dec. 2013 – Jan. 2014.</td>
</tr>
<tr>
<td>South-to-North (“SoNo”) Project</td>
<td>Iroquois Gas Transmission</td>
<td>Reverse flow on Iroquois offering physical transport to U.S./Canada border. The SoNo project would transport up to 300,000 Dth/day from Iroquois’ existing interconnects with Dominion Transmission in Canajoharie, NY and Algonquin Gas Transmission in Brookfield, CT, as well as the planned Constitution Pipeline in Wright, NY.</td>
<td>Nov. 2016</td>
<td>Open season held, Dec. 2013 – Jan. 2014.</td>
</tr>
<tr>
<td>PennEast Project</td>
<td>AGL Resources, NJR Pipeline Company, South Jersey Industries, UGI Energy Services, and PSE&amp;G Power LLC</td>
<td>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. Construction could begin in 2017 pending regulatory approvals.</td>
<td>2017/2018</td>
<td>Announced Aug. 2014. Open season held August 2014. In FERC pre-filing, 10-14.</td>
</tr>
</tbody>
</table>

This table is based on publicly-available information as of Dec. 2014; project details may change.
# NORTHEAST PIPELINE PROJECTS IN PROCESS (cont’d)

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COMPANY</th>
<th>DESCRIPTION</th>
<th>EST. IN-SERVICE</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Long Island (ELI) Project</td>
<td>Iroquois Gas Transmission</td>
<td>Proposing to build a marine lateral from its pipeline in LI Sound to a landing point at Shoreham, NY and then extent to connect with Caithness power plant and potentially National Grid.</td>
<td>2017</td>
<td>In proposal stage.</td>
</tr>
<tr>
<td>Diamond East</td>
<td>Williams / Transco</td>
<td>Designed to provide up to one billion cubic feet per day of new natural gas transportation capacity from receipt points along its Leidy Line in Lycoming County, PA and Luzerne County, PA to its Market Pool at Station 210 in Mercer County, NJ where it can provide supply diversity to Transco’s northeast market, including existing Pennsylvania, New Jersey and New York local distribution companies and power generators.</td>
<td>Mid-2018</td>
<td>Open season held, Aug. 26 to Sept. 23, 2014.</td>
</tr>
<tr>
<td>Access Northeast</td>
<td>Spectra Energy and Northeast Utilities</td>
<td>The gas pipeline expansion project will enhance the Algonquin and Maritimes pipeline systems, using existing routes to minimize effects on communities, landowners and the environment. The project will be scalable to meet growing needs, and will be capable of reliably delivering in excess of one billion cubic feet of natural gas per day to serve the region’s most efficient power plants and meet increasing demand from heating customers.</td>
<td>Nov. 2018</td>
<td>Announced 9-14.</td>
</tr>
<tr>
<td>Northeast Energy Direct (NED) Project</td>
<td>Tennessee Gas Pipeline / Kinder Morgan</td>
<td>This project is a combination of TGP’s proposed Pennsylvania to Wright, NY and Wright, NY to Dracut, MA projects. Proposes construction of approximately 50 miles of pipeline co-located with TGP’s existing system and 129 miles of greenfield pipeline, additional meter stations and compressor stations, and modifications to existing facilities in PA, NY, MA, CT, and NH. Proposed scalable capacity from 0.8 to 2.2 Bcf/d.</td>
<td>Nov. 2018</td>
<td>Open season held, Feb.-March, 2014. In July 2014, Kinder Morgan announced that 9 gas utilities in region have committed to project as initial shippers, at level of approx. 500,000 dekatherms per day (Dth/d). In FERC pre-filing process as of 9-14.</td>
</tr>
</tbody>
</table>

This table is based on publicly-available information as of Dec. 2014; project details may change.
The New York State Department of Environmental Conservation / Division of Mineral Resources reports that gas production in the state in 2013 was 23.4 billion cubic feet (Bcf), down from 26 Bcf in 2012, a decline of 11%. Annual production is half what it was in 2007. The 2013 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 under environmental review in the state.

Natural gas production in the Northeast continues steady and rapid growth, as illustrated in the chart below with data from the U.S. Energy Information Administration (EIA). Marcellus production reached 16 Bcf per day in fall 2014. U.S. EIA observed in November 2013: “This trend has reduced the cost and increased the supply of natural gas in the Northeast. This additional supply has encouraged greater use of natural gas in the Northeast...and has also reduced net inflows of natural gas into the region from other regions such as the Gulf of Mexico, the Midwest and Eastern Canada.”
SHALE GAS DEVELOPMENT IN THE NORTHEAST / MIDWEST

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 40% 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 16 billion cubic feet per day, and is expected to grow further in coming years. In its 2013 assessment of U.S. proved natural gas reserves, EIA reported that “Pennsylvania and West Virginia account for 70% of the increase in natural gas proved reserves.”

The Utica Shale, centered principally in Ohio, is both an oil and natural gas play, but production volumes have mostly been oil to date, reflecting the price spread between natural gas and oil.

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. This new infrastructure development is quickly transforming the gas supply dynamic in the region.

There are also potential shale resources located in Eastern Canada but no
In increasing gas potential in the U.S.

The major natural gas supply news of recent years has been the increasing output from unconventional gas resources, principally shale. 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 2012 assessment, released in April 2013, 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 2,384 trillion cubic feet (Tcf). The 2012 assessment is “the highest resource evaluation in the Committee’s 48-year history.” Chart: Potential Gas Committee, 4-13

U.S. natural gas reserve base

The proved reserves of natural gas continue to grow in the U.S. This reflects new discoveries and extensions of existing fields, as well as the role of technology in increasing access. The U.S. EIA chart above shows changes in the proved reserve base over the last decades. In its 2013 annual report (released in Dec. 2014), EIA noted that “U.S. proved reserves of total natural gas (including natural gas plant liquids) increased by 10% (31.3 Tcf) in 2013 and reached a record high for the United States of 354 Tcf.” Chart: U.S. EIA
**LNG SERVING NEW ENGLAND MARKET**

**Import facilities:**

- 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.

- 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.

- Operated by Excelerate Energy.
  - Sendout capability of 0.4 to 0.8 Bcf/d in vapor via underwater HubLine.

- Average sendout capability of 0.4 Bcf/day, but peak day capability of 0.75 Bcf/d.
  - Connects to underwater pipeline, HubLine, via 13.4 miles of offshore pipe.

**LDC satellite tanks/peak-shaving units:**
- 44 tanks in 29 communities in 5 states (CT, ME, MA, NH, RI).
  - LDCs’ total LNG storage capacity is 16.3 Bcf.
  - LDCs’ vaporization capacity is 1.44 Bcf/day.
- Liquefaction is available at 5 LDC-owned facilities - total liquefaction capability is 44,000 MMBtu/day.
UNDERGROUND STORAGE IN NY

- 26 natural gas storage facilities.
- Total capacity: 246 billion cubic feet.
- Maximum deliverability: 1.98 Bcf/day

Source: U.S. Energy Information Administration, New York State Dept. of Environmental Conservation

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 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.
  - Vaporization capacity is approximately 0.7 Bcf/day.
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 400 such facilities in the U.S., with demonstrated peak working gas capacity of about 4.2 Tcf.

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

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

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

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

Pennsylvania has considerable underground gas storage, 8.4% of total U.S. capacity.

New York has 26 underground storage facilities. New York’s underground storage represents about 2.7% of the U.S. total.

New York also has 3 LNG peakshaving facilities, in the downstate area.

New England
No underground storage
3 LNG import facilities
29 LDC-owned LNG storage facilities

New York
26 underground storage facilities
3 peakshaving LNG facilities

New Jersey
No underground storage
LDC- and pipeline-owned LNG storage facilities

Blue = underground storage, orange = LNG.
Source: U.S. EIA
Existing LNG Import Facilities, Northeast

1. Distriegas, Everett, MA: 0.7 Bcf/d, 3.4 Bcf storage (GDF SUEZ)
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 (GDF SUEZ) [In service as of summer 2010]
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]
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 GDF SUEZ, owns and operates a land-based facility at Everett, MA. There are also two facilities located offshore near Gloucester, MA, but they have not been active in recent years.

Repsol’s Canaport LNG facility in nearby New Brunswick, Canada has supplied over 300 Bcf to the market since it began operation in mid-2009.

The chart below from U.S. EIA shows the levels of LNG sendout from facilities such as Distrigas and Canaport over the last several Januarys. The level of sendout has been lowering, reflecting changing supply dynamics.

LNG ANNUAL VOLUMES IMPORTED INTO NEW ENGLAND TERMINALS, 2013

LNG imports into New England facilities were 64 Bcf in 2013, compared to 87 in 2012. Distrigas of MA represented nearly 2/3 of all U.S. ship imports in 2013. The two offshore LNG facilities - Northeast Gateway and Neptune - had no cargoes in 2013 and none to date in 2014 (through October). The low price of domestic shale gas and the higher price for LNG in overseas markets is rapidly changing the LNG dynamic in the U.S.

Canada has been an important supplier of natural gas to the U.S. – and the Northeast – for decades. However, as domestic production has increased in recent years in the Marcellus Shale, the annual level of exports from Canada to the Eastern U.S. has declined. In 2013, exports from Canada to the Eastern U.S. declined by 12% from 2012 levels.
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 has traditionally been used to supplement gas pipeline capacity for several utilities in the Northeast, particularly New England.

The rise of natural gas production in the Appalachian region meanwhile is creating opportunities for propane development in the region.
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.
Natural Gas Utilities in Connecticut
There are 4 natural gas utilities:

**Connecticut Natural Gas**
(light purple area on map)

**Norwich Public Utilities**
(aqua area on map)

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

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

Natural Gas Utility Customers:
There are approximately 573,000 natural gas customers in the state.

Natural Gas Use in Connecticut

**Primary energy**: 32%

**Electric generation capacity**: 32%

**% of households with gas as main heating fuel**: 34%

**Annual consumption**: 230 billion cubic feet (Bcf) of natural gas.

Natural Gas Pipelines Serving Connecticut

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

LNG Storage in Connecticut

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

Underground Storage

None.

Natural Gas Production

None.
Natural Gas Utilities in Maine
There are 4 natural gas utilities:

**Bangor Gas**
(green area on map)

**Maine Natural Gas**
(grey area on map)

**Summit Natural Gas**

**Unitil**
(blue area on map)

Natural Gas Use in Maine

**Primary energy:** 19%

**Electric generation capacity:** 49%

**% of households with gas as main heating fuel:** 6%

**Annual consumption:** 63 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers:
There are approximately 36,000 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 TransCanada PipeLines and Gaz Métro.

- **Maritimes & Northeast Pipeline.** It is owned by Emera, Spectra Energy 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 Use in Massachusetts

**Primary energy:** 31%

**Electric generation capacity:** 49%

**% of households with gas as main heating fuel:** 50%

**Annual consumption:** 437 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 Pipelines Serving Massachusetts

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

LNG Import Facilities

There are three—one onshore, two offshore.

- **Distrigas of Massachusetts**, a subsidiary of GDF SUEZ NA
- **Neptune**, a subsidiary of GDF SUEZ NA
- **Northeast Gateway**, a subsidiary of Excelerate Energy

LNG Storage in Massachusetts

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

**Underground Storage**
None.

**Natural Gas Production**
None.
Natural Gas Utilities in New Hampshire
There are 3 natural gas utilities:

Liberty Utilities
(light blue area on map)

New Hampshire Gas Co.
(red area on map)

Unitil Corp.
(dark blue area on map)

Natural Gas Use in New Hampshire
Primary energy: 26%

Electric generation capacity: 29%

% of households with gas as main heating fuel: 20%

Annual consumption: 54 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers:
There are approximately 118,000 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 TransCanada PipeLines 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 Utilities in New Jersey
There are 4 natural gas utilities:

* Elizabethtown Gas
  (pale green area on map)
* New Jersey Natural Gas
  (dark gold area on map)
* PSE&G
  (dark red area on map)
* South Jersey Gas
  (light purple area on map)

Natural Gas Utility Customers:
There are approximately 2.9 million natural gas customers in the state.

Natural Gas Pipelines Serving New Jersey

- **Columbia Transmission**, a subsidiary of NiSource.
- **Dominion Transmission**
- **Tennessee Gas Pipeline Company**, a subsidiary of Kinder Morgan.
- **Transcontinental Pipeline**, a subsidiary of Williams.

LNG Storage in New Jersey
There is utility liquefied natural gas (LNG) storage facilities in several communities.

Underground Storage
None.

Natural Gas Production
None.

**Natural Gas Use in New Jersey**

*Primary energy*: 30%

*Electric generation capacity*: 57%

% of households with gas as main heating fuel: 74%

**Annual consumption**: 681 billion cubic feet (Bcf) of natural gas.
Natural Gas Use in New York

Primary energy: 36%

Electric generation capacity: 9% gas, with another 46% of gas/oil.

% of households with gas as main heating fuel: 56%

Annual consumption: 1,249 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 approximately 4.7 million natural gas customers in the state.

Natural Gas Production
In 2013, production was 23 Bcf.

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
- Tennessee Gas Pipeline Company
- Transcontinental Pipeline.

LNG Storage in New York
There is utility liquefied natural gas (LNG) storage facilities in three communities.

Underground Storage
Approximately 246 Bcf.
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: 54%
Electric generation capacity: 98%
% of households with gas as main heating fuel: 52%
Annual consumption: 85 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers:
There are approximately 254,000 natural gas customers in the state.

Natural Gas Pipelines Serving Rhode Island
2 natural gas pipelines transport gas:
- Algonquin Gas Transmission, a subsidiary of Spectra Energy.
- Tennessee Gas Pipeline, a subsidiary of Kinder Morgan.

LNG Storage in Rhode Island
There is utility liquefied natural gas (LNG) storage facilities in 3 communities.

Underground Storage
None.

Natural Gas Production
None.
Natural Gas Utility in Vermont
There is 1 natural gas utility:

Vermont Gas Systems
(pink area on map)

Natural Gas Use in Vermont
Primary energy: 6%

Electric generation capacity: 0%

% of households with gas as main heating fuel: 17%

Annual consumption: 9.5 billion cubic feet (Bcf) of natural gas.

Natural Gas Utility Customers:
There are approximately 46,000 natural gas customers in the state.

Natural Gas Pipeline Supplying Vermont
1 natural gas pipeline transports gas to the VT border:
- TransCanada Pipelines

LNG Utility Storage in Vermont
None.

Underground Storage
None.

Natural Gas Production
None.
<table>
<thead>
<tr>
<th>STATE</th>
<th>RESIDENTIAL</th>
<th>COMMERCIAL</th>
<th>INDUSTRIAL</th>
<th>ELECTRIC POWER</th>
<th>TOTAL*</th>
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<td>CT</td>
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<td>3</td>
<td>5</td>
<td>1</td>
<td>---</td>
<td>9</td>
</tr>
</tbody>
</table>

U.S. EIA projects natural gas to grow at an annual rate of 0.4% in New England through 2040.

Projected sectoral growth rates:

- **Residential**: 0.6%
- **Commercial**: 1.1%
- **Industrial**: 1.6%
- **Power Gen**: -0.5%
- **Transportation (CNG & LNG)**: 10%

U.S. EIA projects natural gas to grow at an annual rate of 0.3% in the Mid-Atlantic region (NJ, NJ, PA) through 2040.

Projected sectoral growth rates:

- **Residential**: 0%
- **Commercial**: 0.8%
- **Industrial**: 1.9%
- **Power Gen**: -0.8%
- **Transportation (CNG & LNG)**: 10.5%

NATURAL GAS PRICE TRENDS

U.S. natural gas prices in 2013-14 have continued on a relatively steady path. Commodity prices in 2012 were very low, at $2.75/MMBtu for the Henry Hub annual average. The 2013 Henry Hub price rose to $3.73/MMBtu range, and the 2014 price is about $4.44/MMBtu. U.S. EIA projects the 2015 Henry Hub price to be in the range of $3.83. The Northeast markets remain higher-priced than the national average, particularly in New England, reflecting infrastructure constraints. The entire Northeast region experienced considerable spot price volatility in the “polar vortex” winter of 2013-14, with some points reaching over $100 per MMBtu in the daily spot market. In its October 2014 winter forecast, the U.S. FERC noted that “new pipeline capacity in the Northeast should alleviate some bottlenecks within the Marcellus producing region and the New York market area” in winter 2014-15. New England remains a highly constrained pipeline market however, with no new pipeline infrastructure available before late 2016 at the earliest.

The chart above on the left from the U.S. EIA display the generally steady commodity price trend in recent years, with the spikes on the far right illustrating the impact of the “polar vortex” of the 2013-14 winter. The chart on the right from the U.S. FERC illustrates the continuing volatility in Northeast markets, as reflected in the Algonquin (New England) and Transco (New York) average annual day-ahead price in recent years, compared to a Marcellus hub and the national benchmark, the Henry Hub.
**RESIDENTIAL HEATING FuELS**

<table>
<thead>
<tr>
<th>STATE</th>
<th>2013 %</th>
<th>1990 %</th>
<th>1980 %</th>
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<tbody>
<tr>
<td>Connecticut</td>
<td>Gas, 34</td>
<td>Oil, 44</td>
<td>Elec., 16</td>
</tr>
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<td></td>
<td>Gas, 26.3</td>
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<td>Elec., 15.1</td>
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<td>Gas, 21.6</td>
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<td>Oil, 55.8</td>
<td>Elec., 12.4</td>
</tr>
<tr>
<td></td>
<td>Gas, 11.8</td>
<td>Oil, 59.8</td>
<td>Elec., 13.4</td>
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<tr>
<td>New Jersey</td>
<td>Gas, 74</td>
<td>Oil, 10</td>
<td>Elec., 12</td>
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<td></td>
<td>Gas, 57.5</td>
<td>Oil, 29.2</td>
<td>Elec., 10</td>
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<tr>
<td></td>
<td>Gas, 44.2</td>
<td>Oil, 46</td>
<td>Elec., 7.9</td>
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<td>Gas, 56</td>
<td>Oil, 25</td>
<td>Elec., 11</td>
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<tr>
<td></td>
<td>Gas, 45.7</td>
<td>Oil, 39.6</td>
<td>Elec., 8.5</td>
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<tr>
<td></td>
<td>Gas, 39.3</td>
<td>Oil, 51.9</td>
<td>Elec., 5.1</td>
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<tr>
<td>Rhode Island</td>
<td>Gas, 52</td>
<td>Oil, 33</td>
<td>Elec., 10</td>
</tr>
<tr>
<td></td>
<td>Gas, 40.7</td>
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<td>Elec., 7.9</td>
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<tr>
<td></td>
<td>Gas, 32.3</td>
<td>Oil, 57.2</td>
<td>Elec., 6.9</td>
</tr>
<tr>
<td>Vermont</td>
<td>Gas, 17</td>
<td>Oil, 44</td>
<td>Wood, 18 Propane, 15%</td>
</tr>
<tr>
<td></td>
<td>Gas, 8</td>
<td>Oil, 54.3</td>
<td>Elec., 9.1</td>
</tr>
<tr>
<td></td>
<td>Gas, 6</td>
<td>Oil, 61</td>
<td>Elec., 10.1</td>
</tr>
</tbody>
</table>

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 1980, 1990 and 2013. For the 8 state region, natural gas in 2013 represented 53% of home heating, compared to 27% for heating oil.

According to the most recent data, natural gas represented 56% of the home heating market in New York state, and three-fourths of the home heating market in New Jersey.

In New England, gas’s share is 38%. Heating oil is the leading fuel in that sub-regional heating market, at 39%. Electricity is 13%.

Other fuels are wood and propane, of particular note in northern New England.

Source: U.S. Census Bureau, “Profile of Selected Housing Characteristics.” Data is 2013 1-year estimates.
NEW HOME HEATING FUEL CHOICE - 2012

In both the U.S. and the Northeast, natural gas is the leading fuel of choice for heating in new home construction. Electricity is the predominant new home heating source in the South, while natural gas is predominant in the Northeast, Midwest and West.

(The data presented here represents total home construction in 2012.)

Source: U.S. Bureau of the Census, American Gas Association
INCREASING ACCESS TO NATURAL GAS

The region’s natural gas utilities report continued strong numbers of service requests for new customers and for conversions from other heating fuels. At the same time, several states in the region are exploring policy and regulatory options to increase access for citizens and businesses to gain access to natural gas.

**New York**: In Nov. 2012, State Department of Public Service opened a proceeding on gas expansion in the State. There are about 500,000 customers in the State within 100 feet of an existing gas main, and about the same number further than 100 feet away from a gas main but within an approved natural gas franchise, that do not currently have gas service.

**Vermont**: Addison Natural Gas Project will extend Vermont Gas distribution system to Middlebury by 2015. Also plans to extend pipeline underneath Lake Champlain to provide service to paper mill in Ticonderoga, NY. Plans to extend to Rutland by 2020.

**New York City**: In 2007, city unveiled PlaNYC, which includes plan to phase out the use of #4 and #6 oil in city buildings in coming years and convert them to cleaner fuels. In fall 2013, the Mayor’s Office announced the city’s air was the cleanest in 50 years – and noted that “the expansion of the regional natural gas supply and local gas distribution infrastructure” had saved money and lowered emissions.

**New Jersey**: 2011 State Energy Master Plan called for expanded gas service, especially in southern portion of the State. “NJ Strong” energy investments.

**Maine**: Maine Legislature enacted Energy Bill in June 2013 that includes provision for State purchase of gas transmission capacity to “facilitate energy cost reductions” – up to 200 million feet of gas per day. PUC continues its investigation as of Nov. 2014.

**Massachusetts**: In June 2014, Legislature unanimously passed natural gas legislation that included provision on expansion of gas distribution service. State energy agency initiated study in summer 2014 to explore “low demand analysis.”

**Connecticut**: Governors’ Comprehensive Energy Strategy released in 2013 has key role for natural gas. Utilities gained approval from PURA in Nov. 2013 for their expansion plans, to add as many as 280,000 customers in next 10 years.
This graph displays the monthly variations in gas consumption in New England, New Jersey and New York, for the illustrative period of June 2013 through June 2014. As can be seen, all three regions are winter-peaking systems, recording their highest sendouts in this annual cycle in January. Many of the region’s utilities set new peaks on multiple days in January 2014. New monthly sendout records for gas were recorded in the states of CT, NJ, NY, and VT.

Source: U.S. Energy Information Administration, “Natural Gas Monthly”
PROJECTED NATURAL GAS ADDITIONS IN REGIONAL ELECTRIC GENERATION SECTOR

Natural gas has been an increasingly significant fuel in the Northeast electric power system. The region’s electric grid operators, as shown in these graphics, report that natural gas remains among the leading choices for proposed new power plants. Renewable energy, imported hydro from Canada, and efficiency (not portrayed) are the other leading future power sources at this time.
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. CNG/LNG vehicles represent 11% of all alternatively-fueled vehicles on the road in the U.S. These vehicles provide environmental benefits, reliability, cost-effectiveness, and are sourced from domestic supplies. Natural gas fuels about 20% of all transit buses in the U.S., and is a leading fuel for new trash hauler trucks.

The U.S. Department of Energy’s alternative fuel vehicle website notes that natural gas burns cleaner than conventional gasoline or diesel due to its lower carbon content.

In October 2009, the National Research Council, affiliated with the National Academy of Science, released a report which noted that, for the transportation sector, “compressed natural gas had lower damages than other options, as the technology’s operation and fuel produce very few emissions.”

The availability of public fueling stations remains a challenge. According to the U.S. Department of Energy’s Alternative Fuels Data Center, New York State has 39 public compressed natural gas (CNG) fueling stations, New Jersey has 8, and New England has 24. Nationally, there are nearly 800 CNG fueling stations in the U.S. Efforts are underway to increase the number of publicly available stations. Pennsylvania is seeking to create a CNG fueling network along its state turnpike.

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.
CNG AND LNG FOR OFF-SYSTEM SUPPLY

The surge in North American natural gas production and the decline in commodity prices is leading to a rising market demand for access to natural gas. 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.

Among the companies that are providing this service within the Northeast region today are: Global CNG; Innovative Natural Gas LLC; NG Advantage; XNG / XPress Natural Gas; and Irving Oil.

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

Shown in the photo is a CNG fueling station in Pembroke, NH that opened in the summer of 2014. The station is owned and 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. NG Advantage is refueling its trucks at this station to serve markets in the area, including a paper mill in western NH and a major hospital center on the NH/VT border.
NEW TECHNOLOGY OPTIONS: 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 over 70% of existing CHP capacity in the U.S.** Total generating capacity in the U.S. from CHP in 2012 was 82 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.”

**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.”
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), and the EXPLORER II robotics program.

For further information, visit the NYSEARCH web site at www.nysearch.org.
NGA over the last two decades has maintained a solid working partnership with GTI - the Gas Technology Institute. GTI’s objectives are to “expand the supply of affordable natural gas and renewable energy; ensure a safe and reliable energy infrastructure; promote the clean and efficient use of energy resources; and reduce carbon emissions to the environment.” Its web site is: www.gastechnology.org/

Some of GTI’s scope areas are outlined below.
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 May 2014, the electric grid operator in New York reported that carbon emissions in that region have declined by 41% since 2000, and that SO2 emissions are down by 94% and NOx by 81%. 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.)

<table>
<thead>
<tr>
<th></th>
<th>SO2</th>
<th>NOx</th>
<th>CO2</th>
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<tbody>
<tr>
<td>Natural Gas</td>
<td>0.1</td>
<td>1.7</td>
<td>1,135</td>
</tr>
<tr>
<td>Oil</td>
<td>12</td>
<td>4</td>
<td>1,672</td>
</tr>
<tr>
<td>Coal</td>
<td>13</td>
<td>6</td>
<td>2,249</td>
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</table>

Source: U.S. EPA

Comparing Oil and Natural Gas Emissions

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<thead>
<tr>
<th></th>
<th>Oil</th>
<th>Natural Gas</th>
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</thead>
<tbody>
<tr>
<td>SO2</td>
<td>0.203</td>
<td>0.001</td>
</tr>
<tr>
<td>NOx</td>
<td>0.129</td>
<td>0.082</td>
</tr>
<tr>
<td>CO</td>
<td>0.036</td>
<td>0.039</td>
</tr>
<tr>
<td>Particulates</td>
<td>0.003</td>
<td>0.002</td>
</tr>
<tr>
<td>TOC’s</td>
<td>0.16</td>
<td>0.11</td>
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<tr>
<td>Organics</td>
<td>Multiple Sources</td>
<td>Multiple Sources</td>
</tr>
<tr>
<td>Metals</td>
<td>Multiple Sources</td>
<td>Multiple Sources</td>
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</tbody>
</table>

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 noted 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.

One highly successful program has been the “Natural Gas STAR” program of the U.S. EPA. Now in its 21st year, the program invites voluntary participation from industry segments to reduce methane emissions. Over 1,500 billion cubic feet (Bcf) of methane emissions have been reduced by participating companies. NGA and a number of LDCs also participate in this program.

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

<table>
<thead>
<tr>
<th>State</th>
<th>2000</th>
<th>2011</th>
<th>Percentage Change</th>
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<tr>
<td>CT</td>
<td>41.7</td>
<td>33.1</td>
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</tr>
<tr>
<td>ME</td>
<td>22.3</td>
<td>17.8</td>
<td>-9.7%</td>
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<tr>
<td>MA</td>
<td>81.0</td>
<td>65.8</td>
<td>-18.8%</td>
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<tr>
<td>NH</td>
<td>17.4</td>
<td>16.0</td>
<td>-7.8%</td>
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<tr>
<td>NJ</td>
<td>120.4</td>
<td>110.2</td>
<td>-8.5%</td>
</tr>
<tr>
<td>NY</td>
<td>208.1</td>
<td>158.2</td>
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<tr>
<td>RI</td>
<td>11.6</td>
<td>10.7</td>
<td>-7.8%</td>
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<td>VT</td>
<td>6.7</td>
<td>5.7</td>
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<tr>
<td>US</td>
<td>5,870.3</td>
<td>5,384.0</td>
<td>-8.3%</td>
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Source: U.S. EIA, 8-14
ACCELERATING REPLACEMENT OF OLDER PIPE MATERIALS

Miles of Distribution Main Considered “Replacement Candidates” by Type

<table>
<thead>
<tr>
<th>State</th>
<th>Bare Steel</th>
<th>Cast / Wrought Iron</th>
<th>Percentage of Total Main %</th>
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<tr>
<td>CT</td>
<td>174</td>
<td>1,426</td>
<td>20.4%</td>
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<td>ME</td>
<td>2</td>
<td>51</td>
<td>5.7%</td>
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<tr>
<td>MA</td>
<td>1,698</td>
<td>3,691</td>
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<td>NH</td>
<td>30</td>
<td>125</td>
<td>8.2%</td>
</tr>
<tr>
<td>NJ</td>
<td>1,556</td>
<td>4,881</td>
<td>18.9%</td>
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<tr>
<td>NY</td>
<td>6,516</td>
<td>4,254</td>
<td>22.5%</td>
</tr>
<tr>
<td>RI</td>
<td>320</td>
<td>831</td>
<td>36.2%</td>
</tr>
<tr>
<td>VT</td>
<td>--</td>
<td>--</td>
<td>0.0%</td>
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</table>

2013 data, released 2014 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 striving to accelerate this replacement process, in concert with efforts to reduce emissions and extend the systems to meet market demand.

In June 2014, the Massachusetts Legislature unanimously enacted legislation addressing “natural gas leaks” and facilitating utility accelerated replacement.
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 April 2014, ISO-NE reported that “an increase in natural-gas-fired power generation and the implementation of emission controls on the region’s fossil-fuel-fired power plants have resulted in significant reductions in air emissions in New England.” As noted in the 2012 ISO New England Electric Generator Air Emissions Report (issued January 2014), from 2001 to 2012 total emissions for sulfur dioxide (SO2) declined by 92%, nitrogen oxides (NOx) emissions declined by 66%, while carbon dioxide (CO2) emissions decreased by about 21%.

In New York State, from 2000 to 2013, NY ISO reports that emissions rates from the power sector have seen a 41% decline in CO2, an 81% decline in NOx, and a 94% decline in SO2.
REDUCING METHANE EMISSIONS IN NATURAL GAS SYSTEMS

Natural gas systems are a leading contributor to CH4 or methane emissions in the U.S., along with agriculture, landfills and coal mining. But methane emissions from natural gas have been on the decline.

CH4 emissions from natural gas systems declined by 17% from 1990 to 2012, according to the U.S. EPA’s 2012 Greenhouse Gas Inventory, released in April 2014.

The decline is due to the following, notes EPA: “The decrease in CH4 emissions is due largely to the observed decrease in emissions from production and distribution...The decrease in distribution emissions is due to a decrease in cast iron and unprotected steel pipelines.” [EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012, page ES-14]

As the chart to the left indicates, natural gas system CO2 and methane emissions are a small portion of U.S. total greenhouse gas emissions.

Nevertheless, 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 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.

The 2014 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.

In 2013, $1.4 billion was invested in natural gas efficiency programs nationwide, according to the ACEEE. Of that, over one-third of the national total ($598 million) was invested in the eight Northeast states (CT, ME, MA, NH, NJ, NY, RI and VT). These program investments - and energy savings - will grow even further in coming years.

NGA's MEMBER LOCAL DISTRIBUTION COMPANIES
(as of November 2014)

Bangor 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

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

Enbridge St. Lawrence Gas Company
33 Stearns Street
Massena, NY 13662
(315) 769-3516
www.stlawrencegas.com
NGA's LDC MEMBERS (as of 11-14)

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
11 Northeastern Boulevard
Salem, NH 03079
(603) 328-2700
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.
6363 Main Street
Williamsville, NY 14221
(716) 857-7000
www.natfuel.com

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

New Hampshire Gas Company
32 Central Square
Keene, NH 03431
(603) 352-1230

New Jersey Natural Gas Co.
1415 Wyckoff Road
Wall, NJ 07719
(732) 938-7977
www.njng.com
<table>
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<tr>
<th>Company Name</th>
<th>Address 1</th>
<th>Address 2</th>
<th>Website</th>
</tr>
</thead>
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<tr>
<td>New York State Electric &amp; Gas</td>
<td>4500 Vestal Parkway East</td>
<td>Binghamton, NY 13902</td>
<td><a href="http://www.nyseg.com">www.nyseg.com</a></td>
</tr>
<tr>
<td>Rochester Gas &amp; Electric Corp.</td>
<td>89 East Avenue</td>
<td>Rochester, NY 14649</td>
<td><a href="http://www.rge.com">www.rge.com</a></td>
</tr>
<tr>
<td>Norwich Public Utilities</td>
<td>173 North Main Street</td>
<td>Norwich, CT 06360</td>
<td><a href="http://www.norwichpublicutilities.com">www.norwichpublicutilities.com</a></td>
</tr>
<tr>
<td>The Southern Connecticut Gas Co.</td>
<td>855 Main Street, P.O. Box 1540</td>
<td>Bridgeport, CT 06604</td>
<td><a href="http://www.soconngas.com">www.soconngas.com</a></td>
</tr>
<tr>
<td>NSTAR Gas (part of NU)</td>
<td>One NSTAR Way</td>
<td>Westwood, MA 02090</td>
<td><a href="http://www.nstar.com">www.nstar.com</a></td>
</tr>
<tr>
<td>South Jersey Gas</td>
<td>One South Jersey Plaza</td>
<td>Folsom, New Jersey 08037</td>
<td><a href="http://www.southjerseygas.com">www.southjerseygas.com</a></td>
</tr>
<tr>
<td>Orange &amp; Rockland Utilities, Inc.</td>
<td>One Blue Hill Plaza</td>
<td>Pearl River, NY 10965</td>
<td><a href="http://www.oru.com">www.oru.com</a></td>
</tr>
<tr>
<td>Summit Natural Gas of Maine</td>
<td>442 Civic Center Drive, Suite 100</td>
<td>Augusta, ME 04330</td>
<td><a href="http://www.summitnaturalgasmaine.com">www.summitnaturalgasmaine.com</a></td>
</tr>
<tr>
<td>Public Service Electric &amp; Gas Co.</td>
<td>80 Park Plaza</td>
<td>Newark, NJ 07101</td>
<td><a href="http://www.pseg.com">www.pseg.com</a></td>
</tr>
<tr>
<td>Unitil</td>
<td>6 Liberty Lane West</td>
<td>Hampton, NH 03842</td>
<td><a href="http://www.unitil.com">www.unitil.com</a></td>
</tr>
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</table>
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
9 Albion Street, P.O. Box 190
Wakefield, MA  01880
(781) 246-6363
www.wmglld.com

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

Yankee Gas Services Company
(part of NU)
107 Selden Street
Berlin, CT 06037
(800) 286-5000
www.yankeegas.com
TRANSMISSION COMPANIES AND LNG MEMBERS (as of 11-14)

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

Distrigas of Massachusetts Corp.
(part of GDF SUEZ)
20 City Square, 3rd Floor
Charlestown, Massachusetts 02129
(617) 886-8300
www.domac.com

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

North Country Gas Pipeline Corp.
99 Weed Street, PO Box 2985
Plattsburgh, New York 12901
(518) 563-1072

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

Talisman Energy USA
337 Daniel Zenker Drive
Horseheads, NY 14845
(607) 562-4000
www.talisman-energy.com

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

TransCanada PipeLines Ltd.
450 1st Street S.W.
Calgary, AB T2P 5H1
(877) 920-7473
www.transcanada.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 10 million customers in eight states (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, 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:

American Gas Association (www.aga.org)
- “Gas Facts 2014”

New York State Energy Research and Development Authority (NYSERDA) (www.nyserda.org)

- “Natural Gas Imports and Exports”

U.S. Energy Information Administration (www.eia.gov)
- “Annual Energy Outlook 2014”
- “Natural Gas Annual 2013”
- “Natural Gas Monthly”
- “State Energy Data Report 2012”

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.
75 Second Avenue, Suite 510
Needham, Massachusetts
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tel. 781-455-6800

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Parsippany, New Jersey
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