U.S. Department of Energy
Washington, DC 20585

Date: **April 15, 2014**

To: **Members of the Public**

From: **Quadrennial Energy Review Task Force Secretariat and Energy Policy and Systems Analysis Staff, United States Department of Energy**

Re: **Infrastructure Constraints in New England**

1. Introduction

On January 9, 2014, President Obama issued a Presidential Memorandum establishing a Quadrennial Energy Review. The Secretary of Energy was directed to provide support to the Quadrennial Energy Review Task Force (QER Task Force), including coordination of activities related to the preparation of the QER report, policy analysis and modeling and stakeholder engagement.

On Monday, April 21, 2014 the U.S. Department of Energy (DOE), acting in its capacity as the Secretariat for the QER Task Force, will convene a two-part public meeting to examine energy infrastructure constraints in New England and regional approaches to addressing them. Both parts of the meeting will occur on Monday, April 21, 2014. Part 1 will commence at 9:00am at the following address:

Rhode Island Convention Center
1 Sabin St (Ballroom B)
Providence, Rhode Island 02903

Part 2 will commence at 1:00pm at the following address:

The Phoenix Auditorium
Connecticut Department of Energy and Environmental Protection
79 Elm St.
Hartford, Connecticut 06106

The New England meeting will be the second in a series of regionally and topically focused meetings held in Washington, D.C., and areas around the country that confront significant energy opportunities and challenges. It will focus on infrastructure constraints for energy transmission, storage and distribution (TS&D) in New England. Four facilitated panels of experts will discuss regional infrastructure vulnerabilities and constraints for energy TS&D. At the Hartford session, representatives of the New England governors will also participate in a roundtable discussion of regional approaches for addressing New England's TS&D constraints. There will be an opportunity for the public and stakeholders to comment via an open microphone session at both locations (please see the meeting agenda for further details).

All comments should be submitted to: QERcomments@hq.doe.gov

2. Background

New England energy prices are heavily influenced by both regional and global market dynamics; energy prices are comparatively high and often volatile.[1] Some of these dynamics result from regulatory constructs and business models that do not take full account of the importance of ensuring transmission capacity in regional energy markets.

During the unusually severe winter of 2013–2014, extremely high natural gas prices (in excess of $120/MMBtu, compared to summer prices of approximately $5/MMBtu) resulted from a combination of strong demand, pipeline constraints, wellhead freeze-offs, limited regional liquefied natural gas (LNG) deliveries and a lack of storage. A regional energy crisis was narrowly averted in part because ISO New England (a regional transmission organization) took unconventional, aggressive and preemptive steps to ensure energy supplies in advance of peak demand during cold winter months (see: 6. Electricity).

These market dynamics are of increasing concern to residents, businesses and regional political leaders. Volatile energy prices put pressure on the finances of local consumers and businesses and harm New England's economic competitiveness. The New England States Committee on Electricity (NESCOE) has declared the current state of affairs to be "unsustainable."[2] To focus new investment in infrastructure in a way that creates a "reliable, affordable and diverse energy system," the governors of the six New England states joined together to commit to a regional energy infrastructure initiative.[3]

The QER will examine energy infrastructure issues around the country and make recommendations for federal legislation, executive action, research and development and market incentives to encourage modernization of the nation's energy infrastructure. Understanding the regional nature of energy infrastructure issues such as those in New England is essential to ensure that the recommendations of the QER contribute to the nation's economic competiveness, energy security and environmental stewardship.

3. Geography of New England Energy Supply

Geography is a critical factor in the challenges confronting New England's energy system. New England sits at a far northern latitude for the continental United States, is the "end of the line" in terms of gas and oil pipeline transmission, and is heavily dependent on Canadian energy imports.

New England is subject to many of the same storm systems that affect other regions of the Eastern Seaboard (e.g. hurricanes, nor'easters), but cold weather events are generally more severe in New England. Energy demand sees two seasonal peaks: one in the winter months and another in the summer.

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[1] U.S. Energy Information Administration (EIA). 2013. "Short-Term Energy Outlook Supplement: Constraints in New England likely to affect regional energy prices this winter." Available at: http://www.eia.gov/forecasts/steo/special/pdf/2013_sp_01.pdf (accessed April 14, 2014)

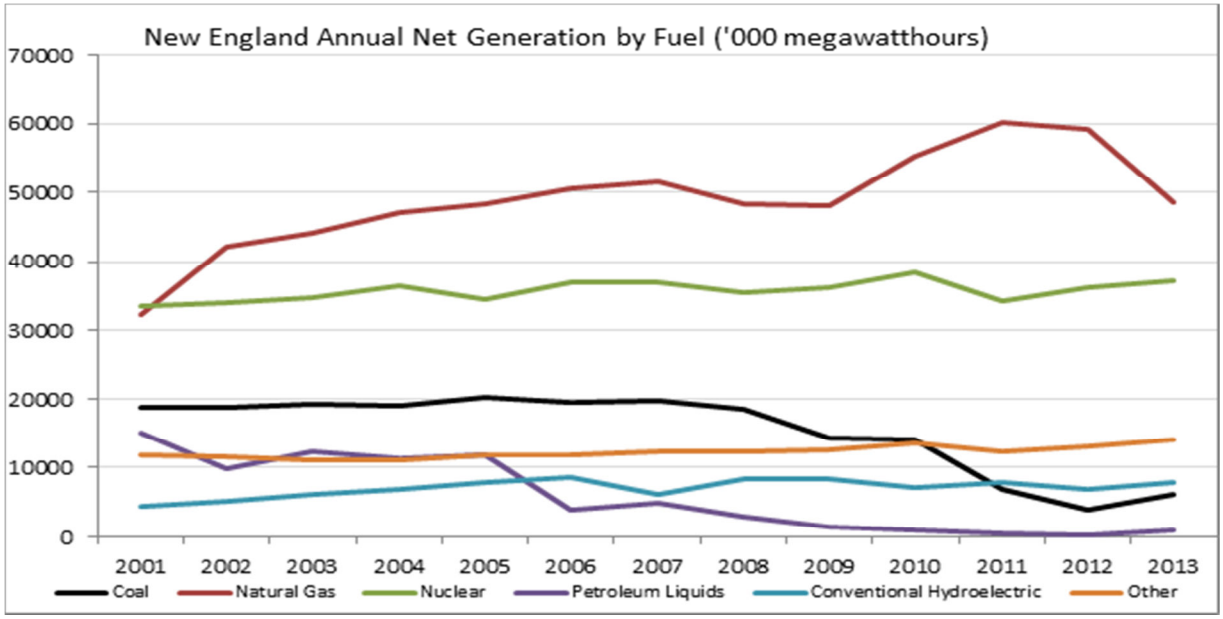
[2] New England States Committee on Electricity (NESCOE). "Regional Energy Infrastructure Initiative: Status Update & Input Opportunity." Presented to the NEPOOL Participants Committee, March 7, 2012. Available at: http://www.nescoe.com/uploads/RegionalInfrastructure_UpdatetoNEPOOL_3-7-14.pdf (accessed April 14, 2014).

[3] New England States Committee on Electricity (NESCOE). "New England Governors' Commitment to Regional Cooperation on Energy Infrastructure Issues." November 8, 2013. Available at: http://nescoe.com/uploads/New_England_Governors_Statement-Energy_12-5-13_final.pdf (accessed April 14, 2014).

4. Fuels Overview

In recent decades, New England has transitioned from a system that was heavily reliant on oil and coal to one that is significantly dependent on natural gas, nuclear and imports for its electricity generation (see Figure 1). Increasing demand for natural gas for both heating and electrical generation has been driven by economic and environmental factors: natural gas burns cleaner than heating oil and has generally been cheaper than oil. New England states have also been proactive in retiring coal from their generation system for health and environmental reasons.

Figure 1. New England Annual Net Electricity Generation by Fuel (Source: EIA[4])



5. Natural gas

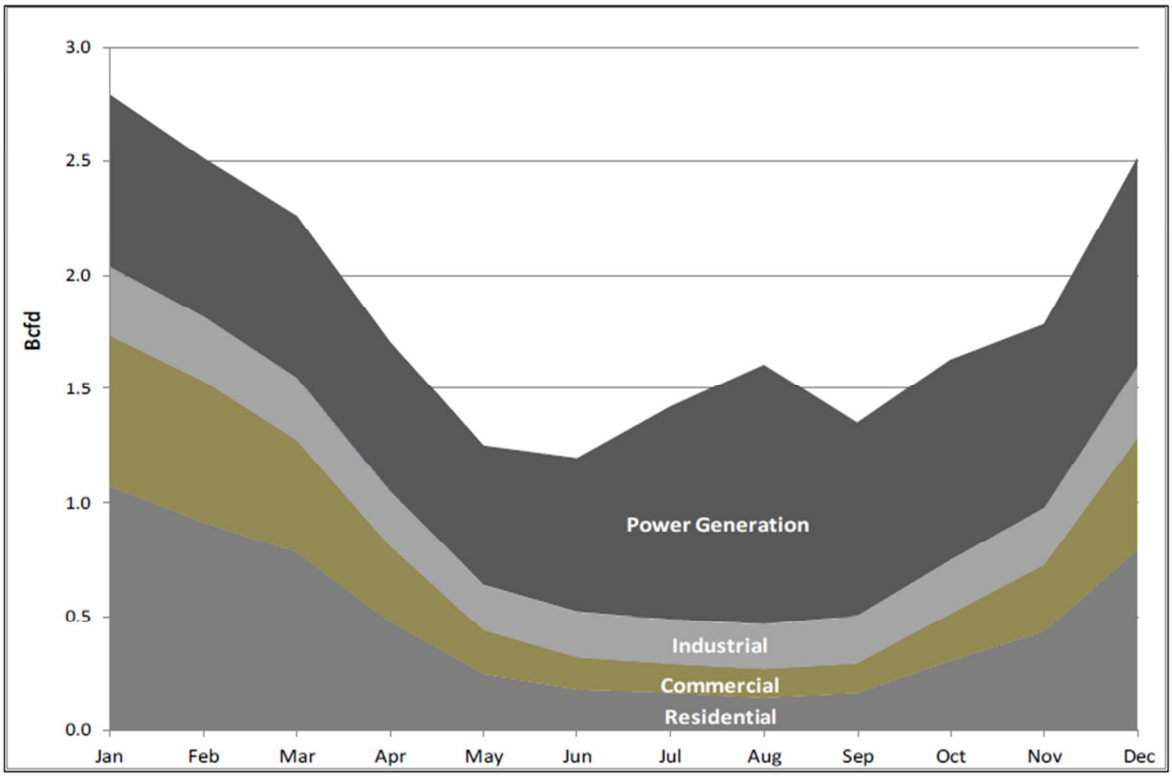
These changes have put increased pressure on the physical and regulatory system that underpins New England's energy supply. Natural gas has been a particular challenge, with New England recently experiencing the highest spot prices in the country and demand for pipeline gas that taxes transmission capacity.[5] In 2009, New England gas demand during winter months peaked around 2.75 billion cubic feet per day (Bcfd), where the summer peak was closer to 1.6 Bcfd (Figure 2). The difference in these peaks is mostly attributable to the use of natural gas for heating commercial and residential buildings in the winter, though supplies have periodically been tight during summer months when peak demand for

[4] U.S. Energy Information Administration (EIA). 2014. "Net Generation for Electric Power: New England Generation by Fuel Type." Compiled from information available at: http://www.eia.gov/electricity/data/browser/#/topic/0?agg=2,0,1&fuel=vtvo&geo=8&sec=008&freq=A&start=2001&end=2013&ctype=linechart&ltype=pin&maptype=0&rse=0&pin

[5] U.S. Energy Information Administration (EIA). 2013. "Short-Term Energy Outlook Supplement: Constraints in New England likely to affect regional energy prices this winter." Available at: http://www.eia.gov/forecasts/steo/special/pdf/2013_sp_01.pdf (accessed April 14 2014)

electricity is driven by high temperatures and the accompanying use of air conditioning.[6] These periods of peak demand drive the severe capacity shortages and associated price spikes.[7]

Figure 2. New England Monthly Gas Consumption by Sector 2009 (Source: Energy Information Administration)

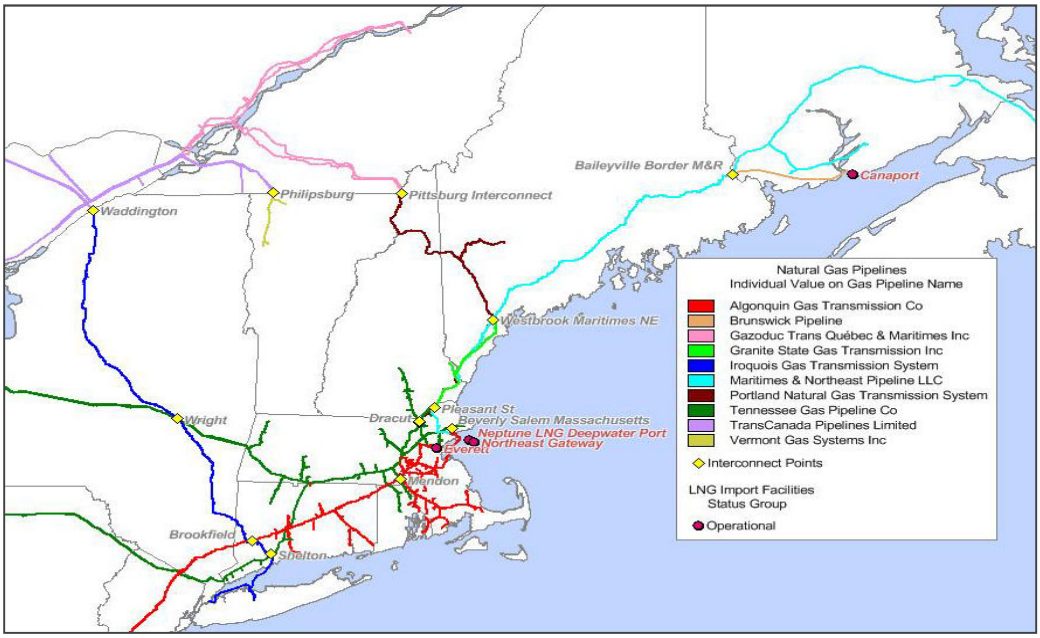


The region has no local production of natural gas and no cavern storage for natural gas. Currently, the majority of the gas supplied to New England consumers arrives via a network of pipelines from the north and southwest (Figure 3).

[6] ICF International. 2012. *Assessment of New England's Natural Gas Pipeline Capacity to Satisfy Short- and Near-Term Electric generation Needs*. Page 23. Available at: http://psb.vermont.gov/sites/psb/files/docket/7862relicense4/Exhibit%20EN-JT-15.pdf (accessed April 14, 2014)

[7] Competitive Energy Services. 2014. *Assessing Natural Gas Supply Options for New England and their Impacts on Natural Gas and Electricity Prices*. The Industrial Energy Consumer Group. Available at: http://competitive-energy.com/docs/2014/02/CES_REPORT_NaturalGasSupply_20140131_FINAL.pdf (accessed April 15, 2014)

Figure 3. Interstate and importing gas pipelines of New England (Source: ISO New England)



The major trunk lines are operated by the Tennessee Gas Pipeline Company, Algonquin Gas Transmission Corporation, Maritime Northeast, Portland Natural Gas Transmission System and the Iroquois Gas Transmission System, with smaller lines operated by the Vermont Gas System Incorporated and a variety of local distribution companies.[8]

In addition to pipelines supplying gas from onshore North American production, New England also has a significant capacity to import LNG cargoes through the Everett LNG terminal in Everett, Massachusetts, which has been in continuous operation since 1971. Everett has a send-out capability of 715MMcf/day and storage capacity of 3.4 Bcf.[9] Some LNG imported through Everett is transported via truck to "peak shaving" plants in the region and stored for periods of high demand.[10] The now-dormant Northeast Gateway and Neptune LNG Deepwater ports provide additional send-out capacity of 800 MMcf/d and 400MMcf/d respectively.[11] Additionally, the Canaport LNG terminal located in St. John, New Brunswick has the ability to feed 1.0 Bcf/d into the Maritimes and Northeast Pipeline, which has capacity to supply 833MMcf/d to New England.

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[8] U.S. Energy Information Administration. "Natural Gas Pipelines in the Northeast Region." Available at: http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/northeast.html (accessed April 15, 2014)

[9] "Send-out capability" refers to the amount of vaporized gas that a specific LNG facility can supply. Overton, Thomas. "Everett LNG Terminal at the Crossroads." *POWER*. June 2, 2013. Available at: http://www.powermag.com/everett-lng-terminal-at-the-crossroads/ (accessed April 15, 2014)

[10] U.S. Department of Energy. 2013. *Liquified Natural Gas: Understanding the Basic Facts*. National Energy Technology Laboratory. Available at: http://energy.gov/sites/prod/files/2013/04/f0/LNG_primerupd.pdf (accessed April 15, 2014)

[11] ICF International. 2012. *Assessment of New England's Natural Gas Pipeline Capacity to Satisfy Short- and Near-Term Electric generation Needs*. Pages 13–14. Available at: http://psb.vermont.gov/sites/psb/files/docket/7862relicense4/Exhibit%20EN-JT-15.pdf (accessed April 14, 2014)

The generally low cost of continental pipeline gas has created little incentive to import maritime LNG in recent years.[12] However, energy demand peaks in winter months and constraints in pipeline transmission capacity can propel dramatic spikes in natural gas prices. As a result, while LNG is expensive compared to low-cost pipeline gas under normal conditions, during severe weather conditions or other times when pipeline capacity is insufficient to supply New England's gas needs, spikes in the price for pipeline gas render LNG imports both economic and potentially necessary in order to maintain system reliability. Such extreme conditions were seen in the winter of 2013–2014. And although the Canaport and Everett facilities are essential for meeting New England's winter demand, there is a great deal of uncertainty about when and how much LNG from these facilities will be needed, creating a situation where continued operation of one or both facilities could become uneconomical.[13]

New England's natural gas pipeline system has not kept pace with demand from the power sector, declines in Canadian offshore gas field productivity and new domestic supplies coming on-line.[14] Some New England states have also implemented programs to switch residential and commercial customers from propane and home heating oil to natural gas, which could further exacerbate constraints on the system. Spectra Energy has petitioned the Federal Energy Regulatory Commission (FERC) for permission to expand capacity of the Algonquin pipeline, and Kinder Morgan has proposed to expand the Tennessee pipeline.[15]

6. Electricity

The New England electric system is heavily dependent on natural gas-fired generation—approximately 40 percent of generating capacity in New England is gas-fired. In 2013, 45 percent of the electricity produced in New England was from gas-fired units, and in 2012 more than 80 percent of the time gas-fired units set prices in ISO New England energy markets.[16,17] The next largest fuel type by capacity is oil, at approximately 22 percent.[18]

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[12] U.S. Energy Information Administration. "Global natural gas prices vary considerably." *Today in Energy*, September 30, 2011. Available at: http://www.eia.gov/todayinenergy/detail.cfm?id=3310 (accessed April 15, 2014); U.S. Department of Energy, Office of Fossil Energy and Office of Oil and Natural Gas. 2013. "Detailed Monthly and Annual LNG Import Statistics." Available at: http://energy.gov/sites/prod/files/2013/04/f0/LNG%20Historical%20Data%20Slides.pdf (accessed April 14, 2014)

[13] Competitive Energy Services. 2014. *Assessing Natural Gas Supply Options for New England and their Impacts on Natural Gas and Electricity Prices*. The Industrial Energy Consumer Group. Available at: http://competitive-energy.com/docs/2014/02/CES_REPORT_NaturalGasSupply_20140131_FINAL.pdf (accessed April 15, 2014)

[14] Ibid.

[15] Dubay, Chris. "New England Natural Gas Pipeline Projects Needed Sooner than Later." EnergyBiz, December 12, 2013. Available at: http://www.energybiz.com/article/13/12/new-england-natural-gas-pipeline-projects-needed-sooner-later (accessed April 15, 2014)

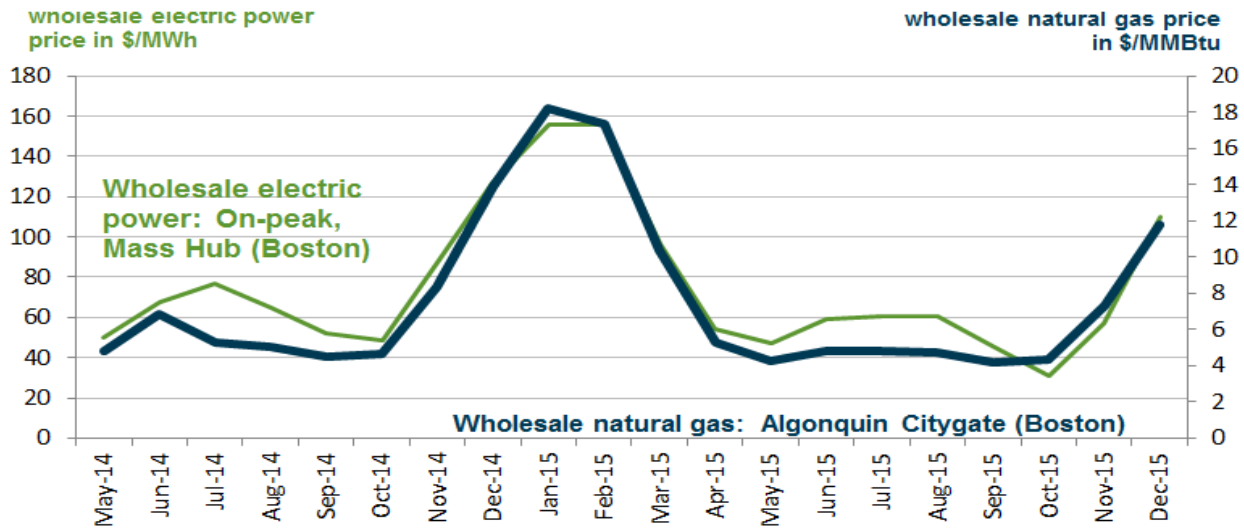
[16] ISO New England Inc. 2013. *2012 Annual Markets Report*. ISO New England Inc., Internal Markets Monitor. Page 18. Available at: http://www.iso-ne.com/markets/mkt_anlys_rpts/annl_mkt_rpts/2012/amr12_final_051513.pdf,

[17] In January 2014, oil was at times the marginal resource.

[18] U.S. Environmental Protection Agency. "Mitigation Efforts: New England States." Available at: http://www.epa.gov/region1/eco/energy/mitigation-efforts-ne.html (accessed April 15, 2014)

Another source of electricity for the region is imports via high voltage electric lines. Hydro-Québec maintains one of the world's largest systems of high voltage electric lines which transport low-cost, low-carbon hydroelectric power into New England through a +/- 450-kV DC line and a 120-kV line that connect to a series of dams in upper Quebec.[19] These lines have import capacities of 725 MW (775 MW in emergencies) and 250 MW respectively and deliver electricity directly into the ISO New England system.

Figure 4. Projected 2014–2015 prices of wholesale electricity and wholesale natural gas in New England (Source: EIA[20])



New England's efforts to import growing quantities of electricity from Hydro Quebec have suffered from local criticism on at least two counts: first, some local residents oppose the construction of large high voltage power lines necessary to transport electricity form upper Quebec; second, some New Englanders are concerned that large-scale hydro is crowding out local low-carbon renewables.

Two major generator retirements will further reduce fuel diversity in New England in coming years and increase the electric system's dependence on gas-fired generation. The 605 MW Vermont Yankee Nuclear Power Station will shut down in the fourth quarter of 2014 and Dominion has announced plans to retire New England's largest coal and oil-fired plant (Brayton Point Power Station, 1530 MW) in 2017.

As New England continues efforts to reduce criteria pollutants and decarbonize its energy system through efforts such as the RGGI, additional investments will be needed in order to integrate a growing proportion of renewables either in the form of local wind, solar or other renewable generation, or via imports from outside the region. New local low-carbon energy resources in the region are being actively pursued, but these, too, have generated various forms of local opposition. Among the most prominent of the proposed

[19] Hydro-Québec TransÉnergie. "Major Facilities" (transmission system overview map). Available at: http://www.hydroquebec.com/transenergie/en/pdf/carte_reseau.pdf (accessed April 15, 2014)
[20] Peterson, Chris. "Projected 2014–2015 prices of wholesale electricity and wholesale natural gas in New England," (unpublished data provided via personal correspondence). U.S. Energy Information Administration.

large-scale renewable development projects is Cape Wind offshore wind farm in Massachusetts. This project would provide 420 megawatts of wind capacity to the New England electric system.

7. Oil and propane

Oil plays a different role in New England than elsewhere in the country, in that it supplies both a relatively high proportion of home heating requirements and is also used for electrical generation. Many New England generation units are so-called "dual use plants" which burn natural gas predominantly but can switch to fuel oil or propane-air. In the winter of 2013–2014, oil served an important function in backstopping natural gas supplies. However, because of environmental restrictions on local air quality, the number of hours that dual fuel plants are permitted to burn fuel oil is restricted.[21] The supply chain for fuel oil is subject to its own series of constraints and vulnerabilities: fuel oil transported by barge and road traffic can be disrupted by freezing of rivers and tributaries or by poor road conditions.[22]

Propane is also a significant heating fuel for New England. Although the total proportion of propane-dependent residences in New England is small, they tend to be highly clustered. As such, the role of propane in local energy consumption is material and any infrastructure constraints surrounding its TS&D should be examined. In the winter of 2013–2014, propane shortages extended from New England to the Upper Midwest, and even to Texas and Alabama. Diverse factors contributed to these shortages, including blockages and outages on transportation corridors, record-breaking exports and high demand for drying grain crops in the Upper Midwest during the fall harvest season.[23] New England dealt with these shortages in part by importing propane through the deepwater port at Providence, Rhode Island and blending it with local supplies. Like fuel oil, propane is delivered to customers by truck, and deliveries during peak demand conditions can be affected by inclement weather.

After the price of home heating oil nearly doubled during the winter of 1999-2000, President Clinton created the New England Home Heating Oil Reserve as part of the Strategic Petroleum Reserve.[24] The 2-million barrel reserve, which was reduced to 1-million barrels in 2011, is intended to provide a buffer for regional supplies during times of extreme high demand.[25] There is no such regional reserve for propane, although a private company has proposed reopening salt cavern storage in the Finger Lakes region of New York to service New England propane needs.

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[21] U.S. Energy Information Administration. "Global natural gas prices vary considerably." *Today in Energy*, September 30, 2011. Available at: http://www.eia.gov/todayinenergy/detail.cfm?id=3310 (accessed April 15, 2014); U.S. Department of Energy, Office of Fossil Energy and Office of Oil and Natural Gas. 2013. "Detailed Monthly and Annual LNG Import Statistics." Available at: http://energy.gov/sites/prod/files/2013/04/f0/LNG%20Historical%20Data%20Slides.pdf (accessed April 14, 2014)

[22] Ibid.

[23] Knarr, Bill. "Propane Exports Put Crunch on Domestic Users, Americans Scramble for Propane Amid High Prices and Bitter Cold." CVNews, February 6, 2014. Available at: https://climateviewer.com/2014/02/06/propane-exports-put-crunch-domestic-users-americans-scramble-propane-amid-high-prices-bitter-cold/ (accessed April 15, 2014)

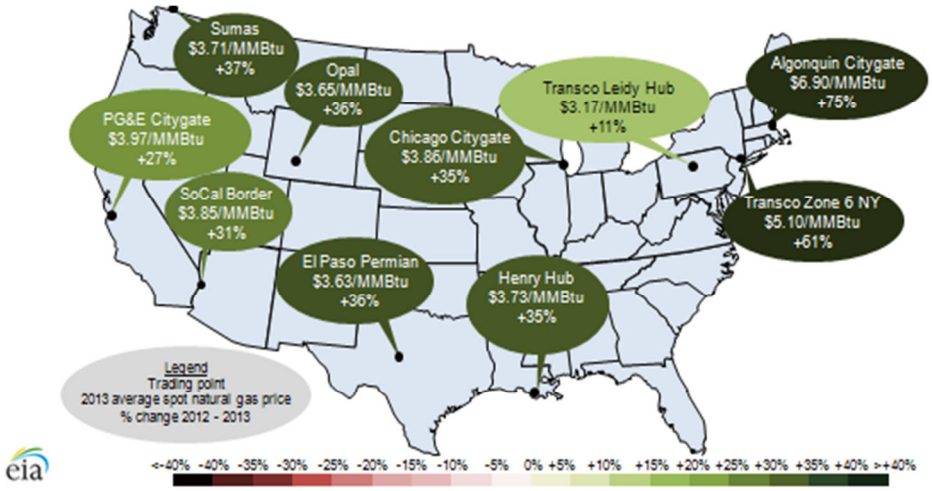
[24] Andrews, Anthony. 2013. "The Northeast Home Heating Oil Reserve and the National OIlheat Research Alliance." Congressional Research Service. Available at: https://www.hsdl.org/?view&did=745275 (accessed April 15, 2014)

[25] U.S. Department of Energy, Office of Fossil Energy. "Heating Oil Reserve." Available at: http://energy.gov/fe/services/petroleum-reserves/heating-oil-reserve (accessed April 14, 2014)

8. Critical issues

Local regulators and officials are increasingly concerned that the regulatory structure and business model that characterize New England's energy supply system do not ensure reliable, low- cost energy during periods of high demand—especially in winter months. New England had some of the highest spot prices for natural gas in the country in 2013; these prices were significantly higher than 2012 prices (Figure 4).

Figure 5. Spot natural gas prices at major trading locations through December 30, 2013 delivery date (Source: EIA[26])



In the case of natural gas, part of the problem results from the predominance of market-driven electricity generation investment within the New England region. Merchant generators in search of the lowest cost fuels have gravitated toward natural gas as a default, and no single generator has an incentive to invest in the forward contracts, firm gas transportation service, fuel diversification or storage that would be necessary to increase reliability and reduce price volatility. Industry stakeholders argue that rules implemented by ISO New England and approved by the FERC do not ensure adequate revenue recovery to support taking on material fixed-price risk (i.e., natural gas transportation reservation fees).[27]

In New England, high gas prices affect not only customers for natural gas, but also have a clear correlation with higher wholesale electricity prices. Data from the U.S. Energy Information Administration show a significant increase in retail electric prices in New England in January 2014. High

[26] U.S. Energy Information Administration. "New England and New York have largest natural gas price increases in 2013." *Today in Energy*, January 7, 2014. Available at: http://www.eia.gov/todayinenergy/detail.cfm?id=14491 (accessed April 15, 2014)

[27] Reservation fees are the fees paid by consumers of natural gas to ensure uninterrupted or "firm" service. Some consumers of natural gas are on supply contracts that are "interruptible," and thereby avoid paying reservation fees. When there are capacity constraints on a pipeline, firm contracts have priority over interruptible contracts. Sturm, Fletcher. 1997. *Trading Natural Gas: Cash futures options and swaps*. Tulsa, OK: PennWell Publishing Company. Page 21.

gas and electricity bills in New England have a direct impact on the competitiveness of regional industries and are detrimental to residential consumers.[28]

For the winter of 2013–2014, ISO New England instituted the Winter Reliability Program, which pursued demand response solutions to reduce energy demand during high stress periods and authorized payments to generators to a) test dual fuel plants to ensure their availability in the face of potential natural gas shortages, and b) store fuel oil on-site in case natural gas shortages should arise.[29]

In December, 2013, the six governors of New England announced a commitment to work together on a infrastructure agenda to address the region's energy transmission constraints.[30] As part of this agenda, the governors of New England came together under the auspices of the New England States Committee on Electricity to implement tariffs that would fund up to 3600MW of new electricity transmission and 600mmcf/day of new gas transmission capacity into the region.[31]

Another important regional aspect of the New England electricity market is that all six New England states are members of the country's first voluntary cap-and-trade program for carbon emissions, the Regional Greenhouse Gas Initiative (RGGI). Fossil-fueled electric power plants (more than 25 MW) must purchase allowances for each ton of carbon, and the requirement to purchase allowances creates an incentive to reduce emissions. The proceeds from these purchases are invested in programs that achieve further emissions reductions through energy efficiency or clean energy generation, or to help offset any increases in energy costs. From the program's inception in 2009 to 2012, RGGI states invested more than $700 million in energy efficiency, clean and renewable energy, direct energy bill assistance and greenhouse gas abatement programs.[32] RGGI estimates that the cost of the program was from 0.19% to 0.55% of average residential electricity bills in 2011.[33]

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[28] New England States Committee on Electricity (NESCOE). "New England Governors' Commitment to Regional Cooperation on Energy Infrastructure Issues." November 8, 2013. Available at: http://nescoe.com/uploads/New_England_Governors_Statement-Energy_12-5-13_final.pdf (accessed April 14, 2014).

[29] ISO New England Inc. "Filing in Compliance with Order Conditionally Accepting Bid Results; Docket No. ER 13-2266-000."October 15, 2013. Available at: http://www.iso-ne.com/regulatory/ferc/filings/2013/oct/er13-2266-000_10-15-13_winter_rel_bid_compliance_public.pdf (accessed April 15, 2014); ESS Group, Inc. 2005. D*ual-Fuel Generating Capacity and Environmental Constraints Analysis: INTERIM REPORT*. ISO New England Inc. Available at: http://www.iso-ne.com/pubs/spcl_rpts/2005/1_dual_fuel_interim_report.pdf (accessed April 15, 2014)

[30] New England States Committee on Electricity (NESCOE). "New England Governors' Commitment to Regional Cooperation on Energy Infrastructure Issues." November 8, 2013. Available at: http://nescoe.com/uploads/New_England_Governors_Statement-Energy_12-5-13_final.pdf (accessed April 14, 2014).

[31] New England States Committee on Electricity (NESCOE). "Re: Request for ISO-NE technical support and assistance with tariff filings related to electric and natural gas infrastructure in New England." January 21, 2014. Available at: http://www.nescoe.com/uploads/ISO_assistance_Trans___Gas_1_21_14_final.pdf (accessed April 14, 2014)

[32] Regional Greenhouse Gas Initiative, Inc. "RGGI Investments Provide Region's Families and Businesses with $2 Billion in Lifetime Energy Bill Savings." February 24, 2014. Available at: http://www.rggi.org/docs/PressReleases/PR022414_2012ProceedsReport.pdf (accessed April 15, 2014)

[33] Regional Greenhouse Gas Initiative, Inc. http://www.rggi.org/docs/RGGI_Fact_Sheet.pdf (accessed April 15, 2014)

According to the Energy Information Agency (EIA), coal's share of the RGGI states' generation mix fell from 23% in 2005 to 9% in 2012, and petroleum from 12% to less than 1%. Natural gas rose from 25% to 44% over the same time period. Demand for electricity in 2012 was 6% below 2005.[34]

9. Critical questions surrounding New England energy infrastructure constraints

Significant reforms may be required to improve the economics, reduce the environmental impact and augment the energy security of New England's energy system. DOE seeks public input on key questions relating to New England's energy transmission, storage and distribution system.

- What is the appropriate federal role for helping to address New England's energy infrastructure constraints? Are there any conflicts between federal, regional and state authorities that present barriers to addressing these constraints?
- What is the role of electricity imports in ensuring reliability and affordability, as well as decarbonizing New England's energy supply?
- To what extent can electric demand-side management (DSM) reduce the need for additional infrastructure?
- What are the hurdles to building additional transmission, storage and distribution capacity in New England?
- How can the federal government work with states and the private sector to address local concerns about the siting and safety of energy infrastructure?
- Would federally managed regional product reserves, similar to the Northeast Home Heating Oil Reserve, improve the resiliency of New England's energy system?
- What are the lowest-cost options for addressing volatility as a systemic weakness of energy TS&D in New England?
- What are the trade-offs between leveraging existing capacity for LNG imports and providing access to additional capacity for low-cost continental gas supply?
- Are there regulatory or financial mechanisms that could provide optionality to regulators beyond expanding current TS&D capabilities?
- What are the most cost-effective carbon savings within the New England energy system?
- Are there Research, Development and Deployment (RD&D) gaps in TS&D infrastructure that would help New England address its energy infrastructure constraints?
- What constraints and vulnerabilities are associated with other important New England fuels (e.g. propane, heating oil, wood)?
- What is the potential for reducing direct energy losses and emissions from natural gas TS&D systems? What are the barriers to increasing energy efficiency and reducing air pollution from natural gas compressors?
- What are the reliability impacts of the increased interdependence of gas and electric markets and networks?

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[34] U.S. Energy Information Administration. "Lower emissions cap for Regional Greenhouse Gas Initiative takes effect in 2014." *Today in Energy*, February 3, 2014. Available at: http://www.eia.gov/todayinenergy/detail.cfm?id=14851 (accessed April 15, 2014)

- How can New England encourage investment in gas and electric TS&D infrastructure to address vulnerabilities (e.g., cyber, physical and climate threats) in the system with flat or declining electricity demand? What cost recovery mechanisms are necessary for these investments?

All comments should be submitted to: QERcomments@hq.doe.gov