

# Natural Gas Pipelines

## Evaluating Spectra's pipeline projects in New England

Prof. Richard Sweeney

ECON3391.01, Boston College

- Natural gas an increasingly important part of energy system
- Pipeline system old and not designed for post-fracking landscape
- Significant opposition to new pipelines
- New England a microcosm of debates playing out across the country.

- Really two projects
  - Algonquin Incremental Market
  - Access Northeast
- Taken together, is this expansion a good thing?

# Algonquin Incremental Market map

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Background

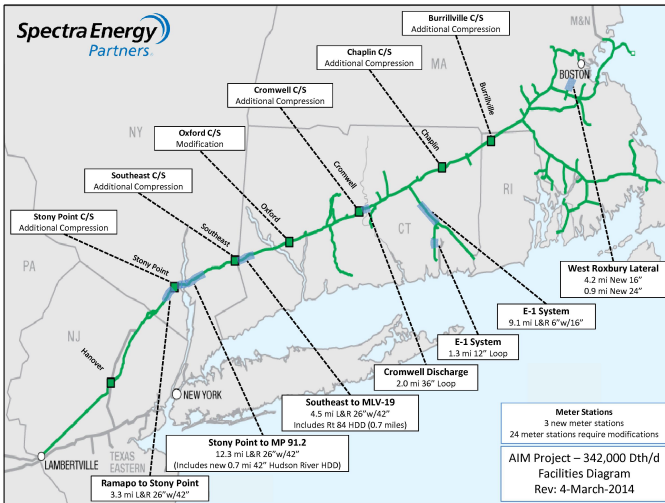
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Other policies

Market manipulation

Leaks

Safety



Source: Spectra  
Over 90% lies along existing footprint

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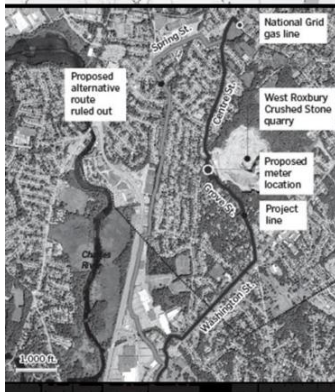
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# Access Northeast

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- Will connect 60% of New England's NG customers



Source: Spectra

# Accushnet storage

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- 25% of New Englands LNG will be stored there
- During the fall, when gas is less expensive plant will compress it to 1/600th the volume and store it at minus 260 degrees F.



Source: WBUR

# An example of current storage

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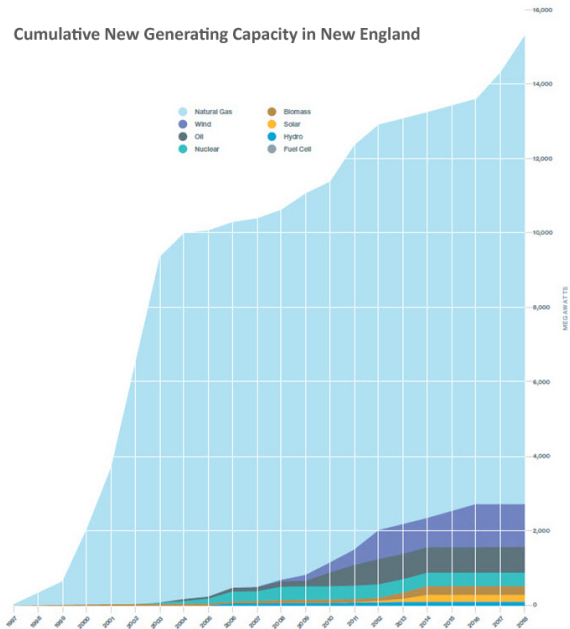
Source: WBUR



Why is this project being proposed?

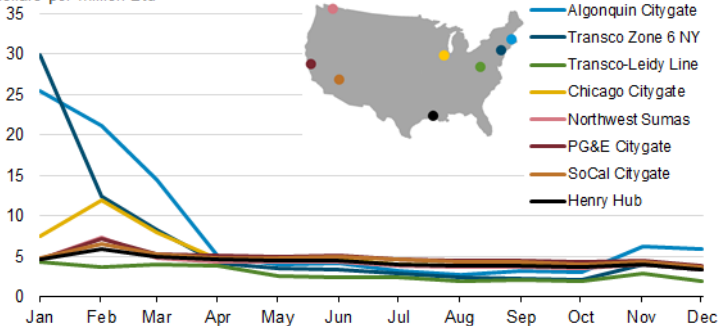
# Why is this project being proposed?

Cumulative New Generating Capacity in New England



# New England's NG pipelines are severely constrained in the winter

Monthly average natural gas spot prices at key trading locations (2014)  
dollars per million Btu



# The in turn causes electricity price volatility

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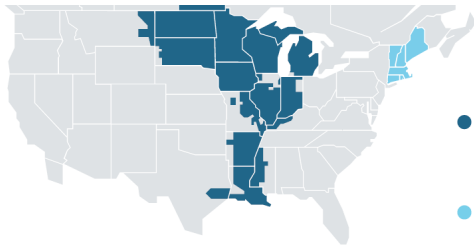
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● Midcontinent ISO  
**\$28.78/MWh**  
\$2.80/MMBtu  
(at Chicago City Gate)

● ISO New England  
**\$26.86/MWh**  
\$2/MMBtu  
(at Algonquin City Gate)



● Midcontinent ISO  
**\$29.31/MWh**  
\$3.74/MMBtu  
(at Chicago City Gate)

● ISO New England  
**\$76.64/MWh**  
\$10.70/MMBtu  
(at Algonquin City Gate)

# Short-run environmental impact

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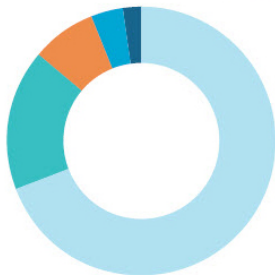
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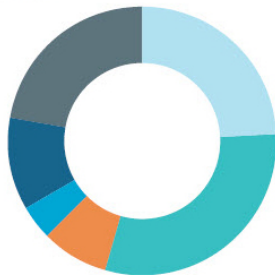
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SYSTEM FUEL MIX



October 21, 2015  
11:30 AM



February 25, 2015  
12:21 PM

	Natural Gas	70%	24%
	Nuclear	17%	30%
	Renewables	8%	8%
	Hydro	4%	4%
	Coal	2%	11%
	Oil	0%	22%

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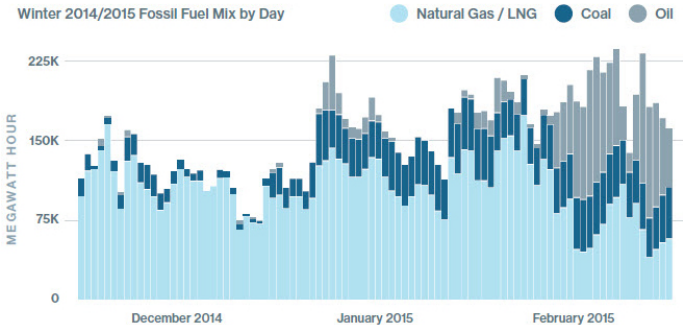
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# 30% of NE capacity (+10 GW) may be gone by 2020

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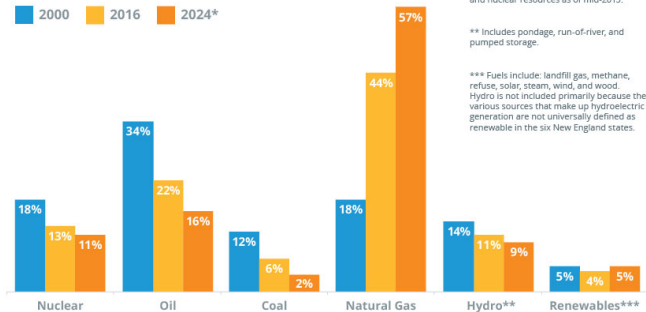
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# Situation is going to get worse

Percent of Total System Capacity by Fuel Type



\* Projected resources in 2024 assume new resources proposed in the ISO Queue and non-price retirement requests for coal, oil, and nuclear resources as of mid-2015.

\*\* Includes pondage, run-of-river, and pumped storage.

\*\*\* Fuels include: landfill gas, methane, refuse, solar, steam, wind, and wood. Hydro is not included primarily because the various sources that make up hydroelectric generation are not universally defined as renewable in the six New England states.



# Should this project go forward?

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- What are the pros and cons?

# Should this project go forward?

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- What are the pros and cons?
- How should we decide?

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- What are the pros and cons?
- How should we decide?
- Who should decide?

# Should this project go forward?

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- What are the pros and cons?
- How should we decide?
- Who should decide?

# What are the alternatives?

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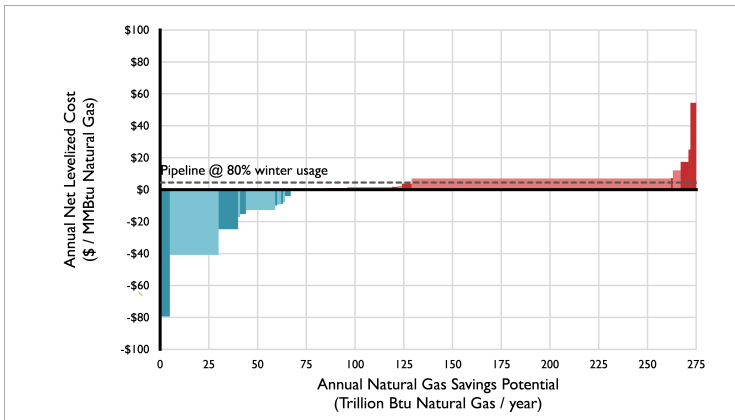
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# MA AG study: pipeline “not needed” to meet winter demand

- concluded energy efficiency and demand response would be best



- <http://www.mass.gov/ago/images/energy/reros-infographic-full.jpg>

Access Northeast probably doomed (for now)

# Utilities Can't Pass Cost Of Pipeline Construction On To Ratepayers, Mass. High Court Rules

August 17, 2016

By Matt Murphy, State House News Service



# Are we using our current pipelines well?

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- Lots of discussion over whether MA “needs” this pipeline
- But highlights concerns / observations that apply to existing system: market power, utility incentives.



- Pipelines serve both heating customers, and, increasingly, natural gas electricity generators
- Pipeline space largely tied up in long-term contracts, guaranteeing access at a predetermined rate.
- Historically, these contracts mostly held by heating demand (first priority)
- Subsequent rules loosened regulation in this market, allowing contracted parties to "release" excess capacity to other parties.
- If not all gas needed for heating, can go to increase supply to electricity market.

# While gas markets are regulated, NE electricity markets competitive

- Natural gas fired power plants typically set the price in New England.
- Potential problem: the same companies who operated in the (regulated) natural gas market, also own electricity generators that compete in the (deregulated) electricity market.
- Why would this matter?

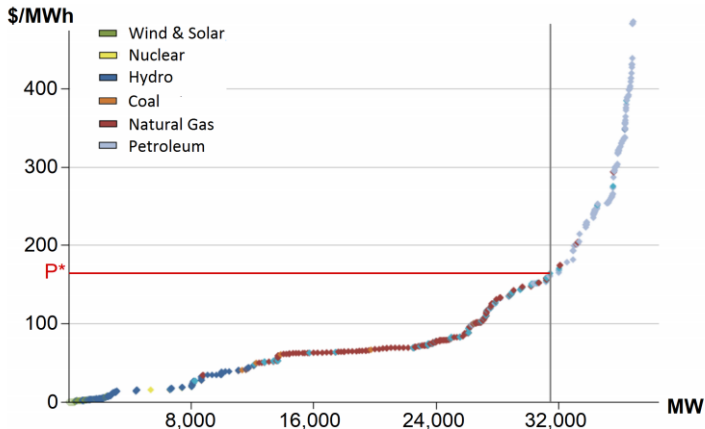
# Vertical Market Power in Interconnected Natural Gas and Electricity Markets

Levi Marks, Charles F. Mason, Kristina Mohlin

and Matthew Zaragoza-Watkins\*

## Abstract

New England is at the leading edge of an energy transition in which natural gas is playing an increasingly important role in the US electricity generation mix. In recent years, the region's wholesale natural gas and electricity markets have experienced severe, simultaneous price spikes. While frequently attributed to limited pipeline capacity serving the region, we demonstrate that such price spikes have been exacerbated by some gas distribution firms scheduling deliveries without actually flowing gas. This behavior blocks other firms from utilizing pipeline capacity, which artificially limits gas supply to the region and drives up gas and electricity prices. We estimate that capacity withholding increased average gas and electricity prices by 38% and 20%, respectively, over the three-year period we study. As a result, customers paid \$3.6 billion more for electricity. While the studied behavior may have been within the firms' contractual rights, the significant impacts in both the gas and electricity markets underscore the need to improve regulation and coordination as these two energy markets become increasingly interlinked.



Note: The underlying data corresponds to marginal cost of generation and capacity rather than bid supply offers. We are not able to use the latter here in a straightforward manner because bid data is anonymized; however, the curve here roughly matches the distribution of generators' price and quantity supply offers to the day-ahead market by fuel type and serves the purpose of illustrating the bid supply curve.

Figure 2: Impact of overscheduling capacity on the wholesale gas market on warmer days when the pipeline is uncongested (left panel) and on colder days when it is fully scheduled (right panel) [\(return\)](#)

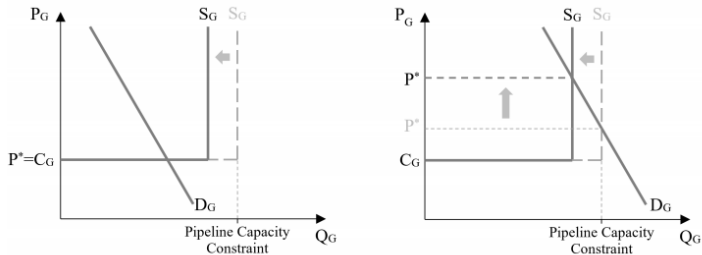


Figure 3: Impact of overscheduling capacity on the wholesale electricity market on warmer days when the pipeline is uncongested (left panel) and on colder days when it is fully scheduled (right panel) [\(return\)](#)

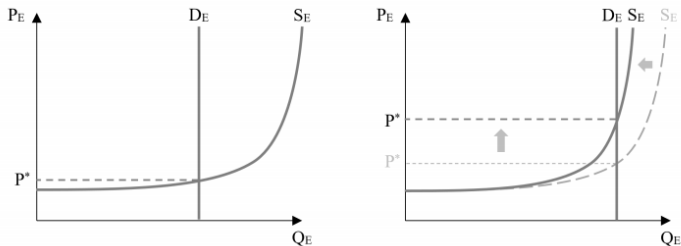


Figure 4: Impact of overscheduling capacity on the wholesale gas market (left panel) and on the electricity market (right panel). The dark shaded region in the left panel represents gas market revenues the withholding LDC sacrifices by letting their capacity go unused, which are restricted by revenue-sharing rules. The dark shaded area in the right panel corresponds to the additional revenues earned by the LDC's generation capacity from a higher wholesale electricity price. (return)

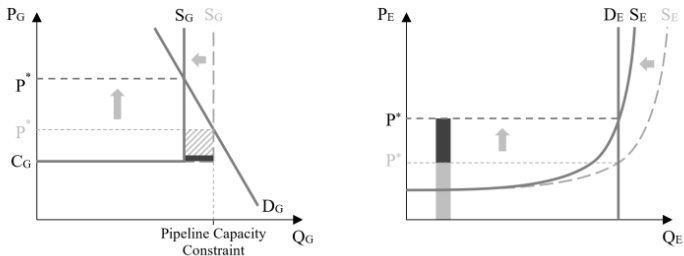
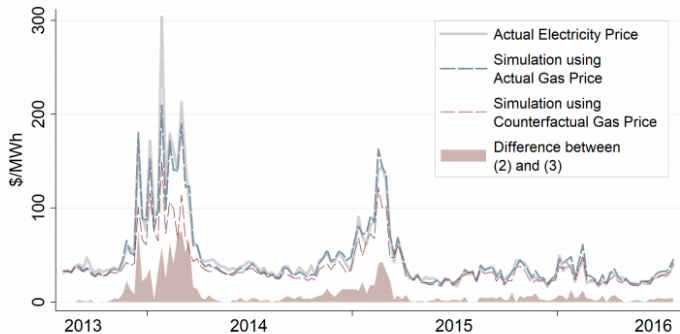


Figure 17: The strongest impacts of pipeline capacity withholding were realized during the winters of 2013-14 and 2014-15. [\(return\)](#)



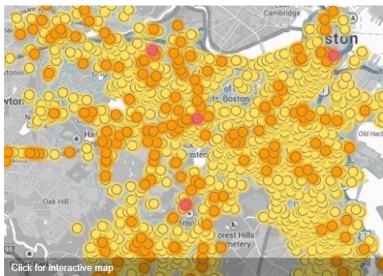


## Boston: Snapshot of natural gas leaks under the streets

Leaked natural gas – mostly methane – is a powerful contributor to climate change.

As one of the nation's oldest major cities, Boston's aging natural gas pipes are prone to corrosion and leaks.

### Explore Boston map data



### Findings

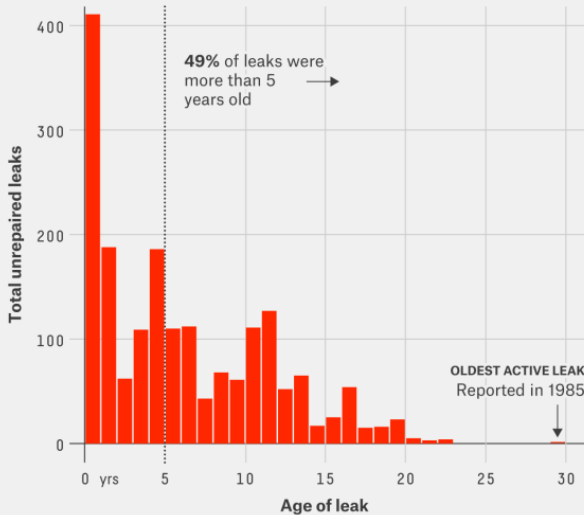
Our readings indicated an average of **about one leak for each mile** we drove.

Readings are from March through June 2013 and may not reflect current leaks, due to repairs or other changes.

If you ever smell gas, or have any reason to suspect a problem, experts say to immediately exit the building or area, then call the authorities. For more see the National Grid [safety page](#).

## How old are Boston's methane leaks?

The 1,868 reported but unrepaired methane leaks in Boston proper as of March 2, 2015



# These leaks look costly

- Methane is 34 times the global warming potential of CO<sub>2</sub>.
- In places like Boston, gas is expensive.

## PRIVATE VS. SOCIAL BENEFITS OF METHANE LEAK ABATEMENT

Firms' cost of abatement is well below societal benefits from leak abatement

\$/thousand cubic feet



\*Passed to consumers during study period

Source: Authors' calculations

# Why do these leaks persist?

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- Gas companies are regulated
- They keep people's homes warm, and tell regulators the cost
- Regulator sets price to cover cost plus a fixed return
- What's problematic about this setup?



# How safe is the current situation?

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Source: Boston Magazine

A 1977 study found that an incident could kill 3,000 people