The Missing Energy Crisis & What it Tells Us About the Energy System of the Future

By: Peter Shattuck, Jamie Howland, and Varun Kumar

May 26, 2015

Part I: The Missing Crisis

New England's energy system is at an important juncture, but we are not facing a crisis. After last year's winter, many argued for radical action to head off looming shortages and increasing prices. However, when we look at how well the energy system weathered the record-cold of 2015, the crisis narrative breaks down. Furthermore, when considering the potential financial motivations behind some of the proposed "solutions," a more complicated picture emerges. This three part analysis series endeavors to clarify this picture by describing I) the problem and risks that New England faces, II) steps that states are taking to address the problem, and III) how we arrive at a balanced solution that benefits consumers, the climate, and New England as a whole.

What's Happening

During the polar vortex two winters ago, electricity prices in New England's wholesale markets reached record levels, as cold weather exposed our over-reliance on natural gas to meet both our heating and electric generation needs. The price spikes had a spillover effect on electric rates this winter, as utilities purchased electricity supply in advance from power generators who offered higher prices expecting a repeat of high gas costs. Going into the winter of 2015, these higher electric rates led to dire predictions of escalating prices and calls for unprecedented public funding for new pipelines to feed our growing addiction to natural gas.

This winter has undermined calls for such radical action. Despite colder weather and greater demands on the energy system, prices for natural gas and electricity on wholesale markets were far lower than last winter. These lower wholesale prices will soon be filtering through to consumers when electric rates are reset for the next six-month billing cycle. These price cuts occurred without any new pipeline capacity. Instead, incremental reforms of the region's energy markets allowed us to make better use of existing resources, energy efficiency provided significant relief, and the plunge in prices for liquefied natural gas (LNG) and oil has recalibrated the economics of the region's power market.

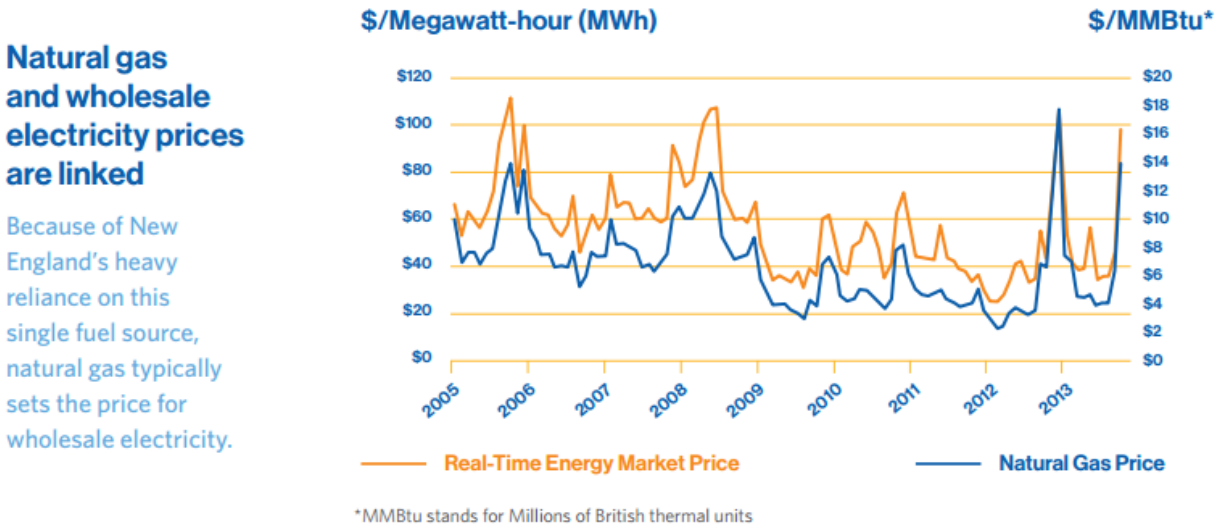
The factors that brought natural gas and electricity prices downs – market-based reforms, clean energy investments, and the unexpected drop in fossil fuel prices – have come at an important juncture. New England's energy system is going through a significant transition, as increasingly competitive renewables

offer the potential to replace outdated coal and oil generating plants and help us move beyond a combustion-based electric system. Meanwhile, technologies such as energy storage, smart energy management systems, and grid-enabled appliances are transforming passive ratepayers into empowered consumers who can help optimize the performance of the entire energy system by avoiding the need for expensive and rarely used infrastructure to meet demand peaks.

Unfortunately, our regulatory system is struggling to keep up with the pace of technological innovation. The misalignment of incentives for power generators, consumers, and--most of all--utilities fosters the real risk that the tens of billions of dollars that we will have to spend updating our energy system will be sunk into expensive, supply-side, grid-scale expenditures just as we are unlocking cleaner, cheaper, and lower risk solutions, many of which will be implemented at the consumer level.

The Problem

Depending on who you talk to, high winter prices are either caused by over-reliance on natural gas or insufficient pipeline capacity. In a sense, both arguments are valid. In 2014, 44% of the region's electricity was generated by burning natural gas. This heavy reliance on natural gas leaves us exposed to increases in gas prices, particularly on extremely cold days when gas is used to meet heating needs first because heating customers paid for gas pipelines through their gas bills. During demand peaks two winters ago (winter of 2013/2014), the scant remaining gas coming through the region's intrastate pipelines for power generators became expensive which made gas-fired power expensive as well. In the winter of 2013/2014, this link was made clear during the polar vortex when gas prices tracked electricity prices closely, as shown in the figure below from ISO-NE.



What this Winter Shows

This past winter, a more diverse fuel supply mix reduced price volatility despite harsher weather. Those who suffered through it probably do not need to be reminded how cold this winter was, but by every meaningful metric December 2014-February 2015 was colder on average than December 2013-February 2014. In addition, both winters were colder than the prior ten-year average. This past February was in fact the coldest on record in the region, with an average daily temperature of 16.9 degrees Fahrenheit, 8.5 degrees colder than the February average in 2014. Unsurprisingly, this colder weather led to greater demand for heating (tallied up as "heating degree days," a measure of the daily difference between outside temperature and 65 degrees, which is a good predictor of the energy needed for heating buildings).

Acadia Center	Avg. Daily Temp *°Fahrenheit*	Avg. Daily Low *°Fahrenheit*	Avg. Daily High *°Fahrenheit*	# Days Below 20°F Avg. Temp *Dec-Feb Total*	Heating Degree Days *Dec-Feb Total*
Winter 2014/2015	25.3	18.1	31.7	33	3552
Winter 2013/2014	26.5	19.9	32.9	27	3461
Prior 10 years Average	29.6	23.0	35.9	15	3199

Source: Acadia Center analysis of data from ISO-New England

The particularly cold weather in the middle of February and the corresponding higher heating load led to three of the five highest gas demand days ever for the Northeast. While noteworthy, the higher gas demand is not surprising. What did surprise many observers is that despite the colder weather and record gas demand, wholesale electricity prices were *43% lower* on average from December 2014 -February 2015 in comparison to December 2013-February 2014.

Acadia Center	Avg. Day Ahead Locational Marginal Price *$/MWh*	Avg. Real Time Locational Marginal Price *$/MWh*
Winter 2014/15	79.0	78.3
Winter 2013/14	139.3	138.1
% Decline Winter 2013/14 to Winter 2014/15	43%	43%

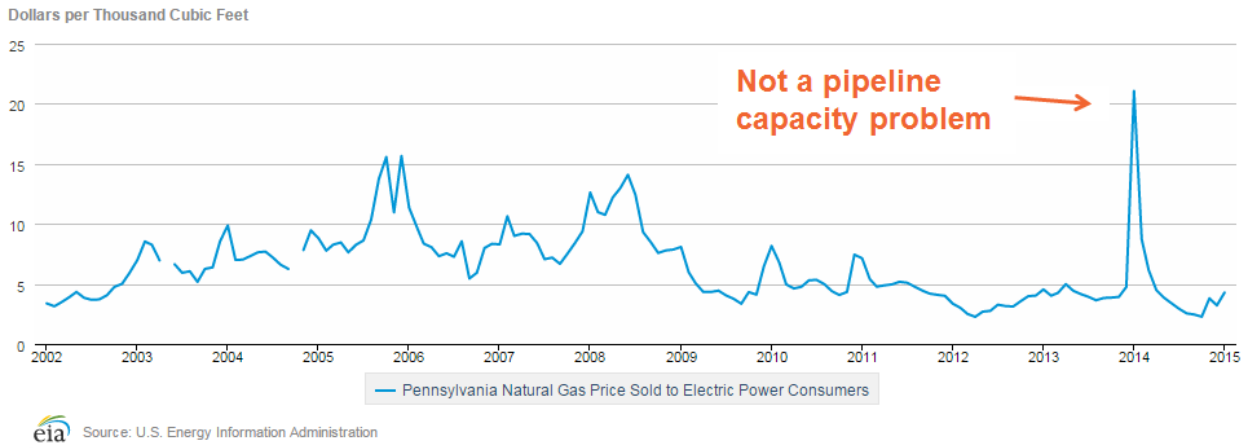
Source: Acadia Center analysis of data from ISO-New England

The mix of fuel sources that contributed to lower prices included a lot more LNG, which is brought in to the region's pipeline system on ships, rather than through transmission pipelines. Coal and oil also played a part, though it is worth noting that generation from coal and oil were down 24% and 4%, respectively, from last winter according to data from ISO-NE. Nonetheless, while limited amounts of coal and oil can be helpful in getting us through the next couple of winters until already-planned pipeline expansions and alternative sources of electricity supply come online, the higher levels of air pollution that these plants create mean that they cannot be long term solutions.

So what about expanding pipeline capacity? It is true that when pipelines coming into New England are full, consumers can pay higher prices than in other parts of the country. Building more pipeline capacity could reduce this congestion premium that New England consumers face, but doing so needs to be weighed against the cost of new pipelines, the risk of natural gas price volatility, the risk of overbuilding – which could subsidize natural gas exports and cause natural gas prices to increase – and the risk to our climate from burning more fossil fuels.

The Risks

The risk of fuel price volatility stalks any energy source that does not get its fuel for free. While natural gas prices have been low for the last few years, there is no guarantee that low prices will last. Natural gas prices are notoriously volatile, and even the recent, unexpected plunge in the price of LNG and oil on global markets should incite caution, as we could be equally blind to future price increases. Additionally, as data from the Energy Information Administration (EIA) shows, in the winter of 2014, natural gas prices in Pennsylvania – the heart of the Marcellus Shale supply region – spiked to heights similar to those we saw in New England markets when coal piles froze and increased gas generation was suddenly needed.



No amount of additional pipeline capacity will allow us to get a better price than buyers a stone's throw from the wellheads.

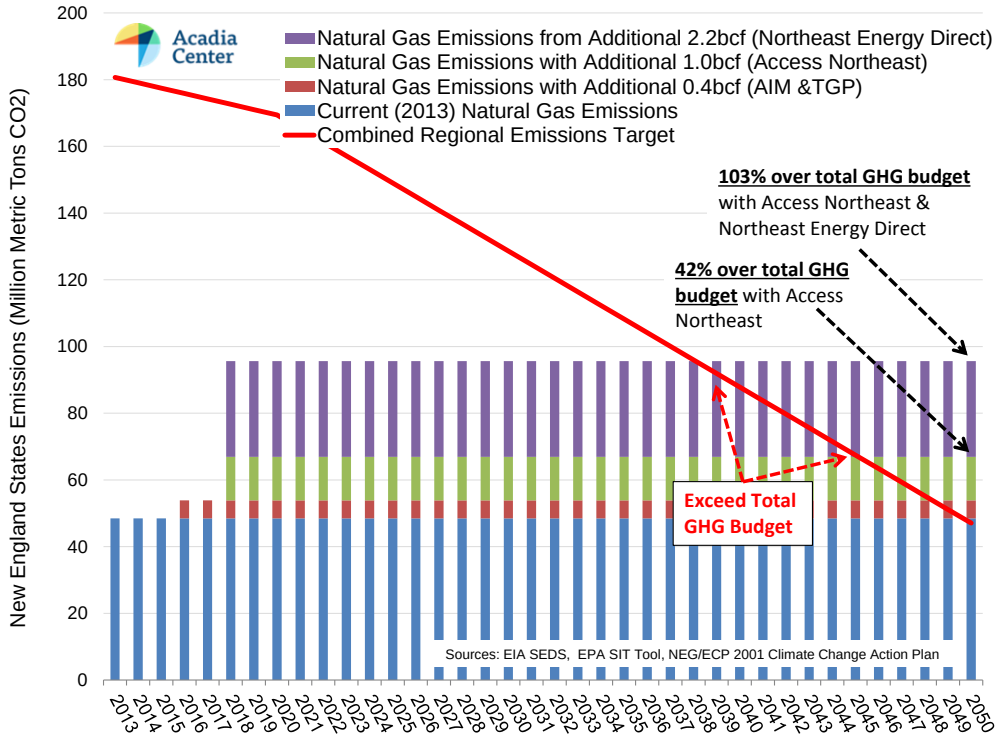
Overbuilding pipeline capacity also poses serious risks to consumers, particularly if electric customers are paying for the cost of developing additional gas pipeline capacity. The proposals on the table are very large, both in terms of capacity and cost. Kinder Morgan's Northeast Energy Direct project would carry up to 2.2 billion cubic feet per day (bcf) at an estimated development cost of $3-$5 billion. The rival Access Northeast project, backed by pipeline developer Spectra Energy and utilities National Grid and Eversource, would transport an additional 1bcf, at an estimated cost of $3 billion. In combination, these two projects could amount to $8 billion in expenditures, and expand pipeline capacity into the region by 78%.

Adding this much natural gas capacity presents the risk that New Englanders could end up picking up the tab for infrastructure largely used to transport gas through New England to export markets. Part of the Access Northeast proposal involves reversing the Maritimes and Northeast Pipeline to allow gas to flow North through New England to New Brunswick, Canada, and the owner of the Canaport LNG import facility at the Canadian terminus of this pipeline recently applied to turn the facility into an export terminal. Increasing exports could lead to higher domestic prices for natural gas, as consumers in New England would then be competing with consumers in Europe, Japan, and other markets, where prices are far higher. A 2014 study by

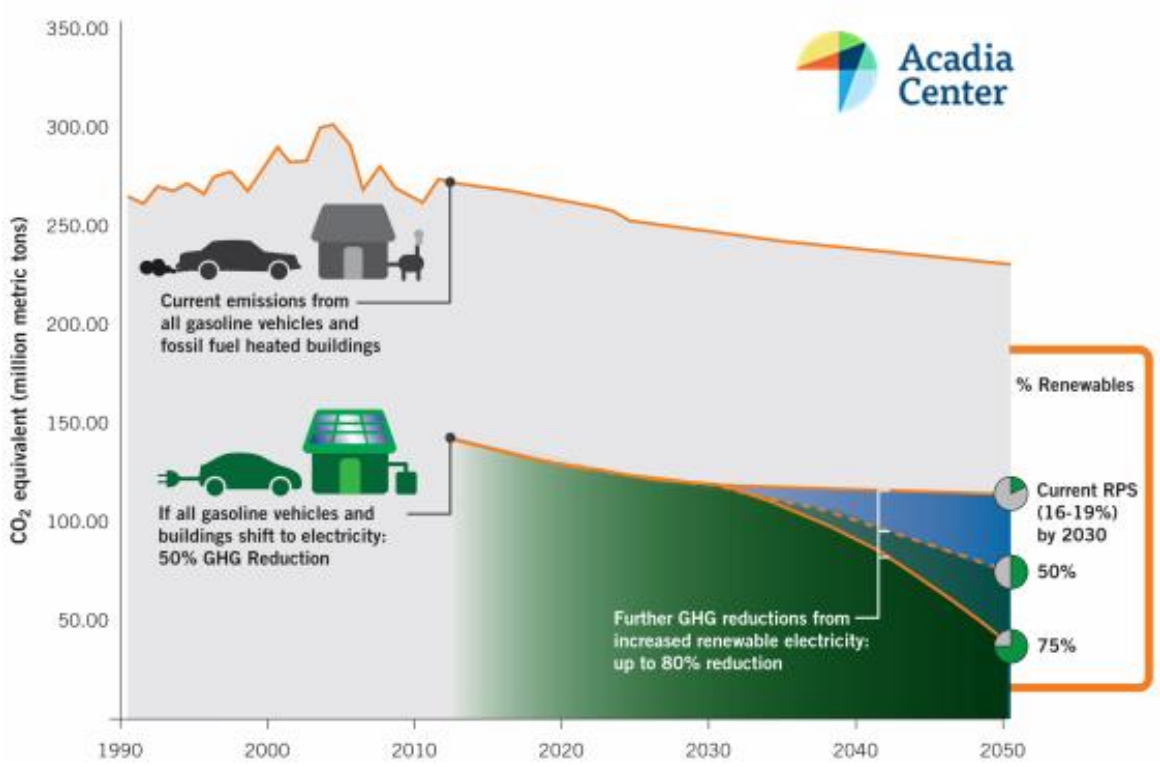
the EIA projected that a significant and rapid increase in LNG exports (reaching 20bcf of exports over 10 years) combined with low gas production could cause natural gas prices in the Northeast to increase by 45%.

Lastly, over-building pipeline capacity would make it harder to achieve the reductions in greenhouse gas (GHG) emissions that we need to address the threat of climate change and meet legal requirements. New England states have significant legally binding climate commitments, and while progress has been made toward achieving near-term targets (see Acadia Center's ClimateVision 2020), reaching the 2050 goal requires thinking *now* about the impacts of long-lived energy infrastructure investments.

The figure below shows the share of New England's combined annual GHG 'budgets' that emissions from natural gas would consume. These 'budgets' represent the GHG emissions that states can produce and still achieve statutory targets. Current (2013) levels of natural gas combustion for heating, power generation and industry would produce emissions in excess of the region's entire GHG budget in the year 2050. This means that without any increase in pipeline capacity, natural gas alone would eat up the region's entire GHG budget, leaving no allowable emissions for transportation, industry, heating oil, or propane. Assuming similar utilization rates for new pipeline capacity, the already-approved Algonquin Incremental Market and Tennessee Gas Pipeline expansions due to come online in 2016 would consume a greater portion of this budget. Access Northeast would cause the region to exceed the emissions budget in 2045, and be 42% over budget in 2050. If Northeast Energy Direct is also constructed, the total regional GHG budget would be exhausted in 2039, and emissions *from natural gas alone* would be 103% over the binding targets that states have established.



Reconciling the emissions impacts of new gas pipelines with GHG commitments appears almost impossible, as increasing our reliance on gas for electricity and heating would require potentially unachievable reductions in emissions from transportation and industry. We can reduce transportation emissions – with solutions ranging from electric vehicles (EVs) to public transportation – but achieving deep reductions here, too, depends on a clean electric sector. To reach an 80% reduction in economy-wide emissions we need to replace fossil fuel use in transportation and building heating with the use of electricity to power electric vehicles and heat pumps that are increasingly competitive with fossil-based technologies. In our 2014 report EnergyVision, Acadia Center found that replacing all of the region's gasoline-powered cars with EVs and heating systems with heat pumps would immediately decrease the region's emissions by 50%, due to the higher efficiency of heat pumps and EVs and relatively low-GHG profile of the region's power sector.



Once these efficient electric technologies replace fossil fuel use in the transportation and heating sectors, additional reductions must be driven by continuing to clean up the electric sector that 'fuels' heat pumps and EVs. Increasing over-reliance on natural gas will take us in the wrong direction – increasing the carbon intensity of the power sector and putting a finger on the scale for natural gas heating over heat pumps and other renewable heating technologies.

The next installment of this analysis series will describe the steps that states are taking (and not taking) to address winter price volatility and reshape the region's energy sector.

Peter Shattuck is Massachusetts Director, Jamie Howland is Director, Climate and Energy Analysis Center, and Varun Kumar is Policy and Data Analyst at the Acadia Center, a non-profit, research and advocacy organization committed to advancing the clean energy future.