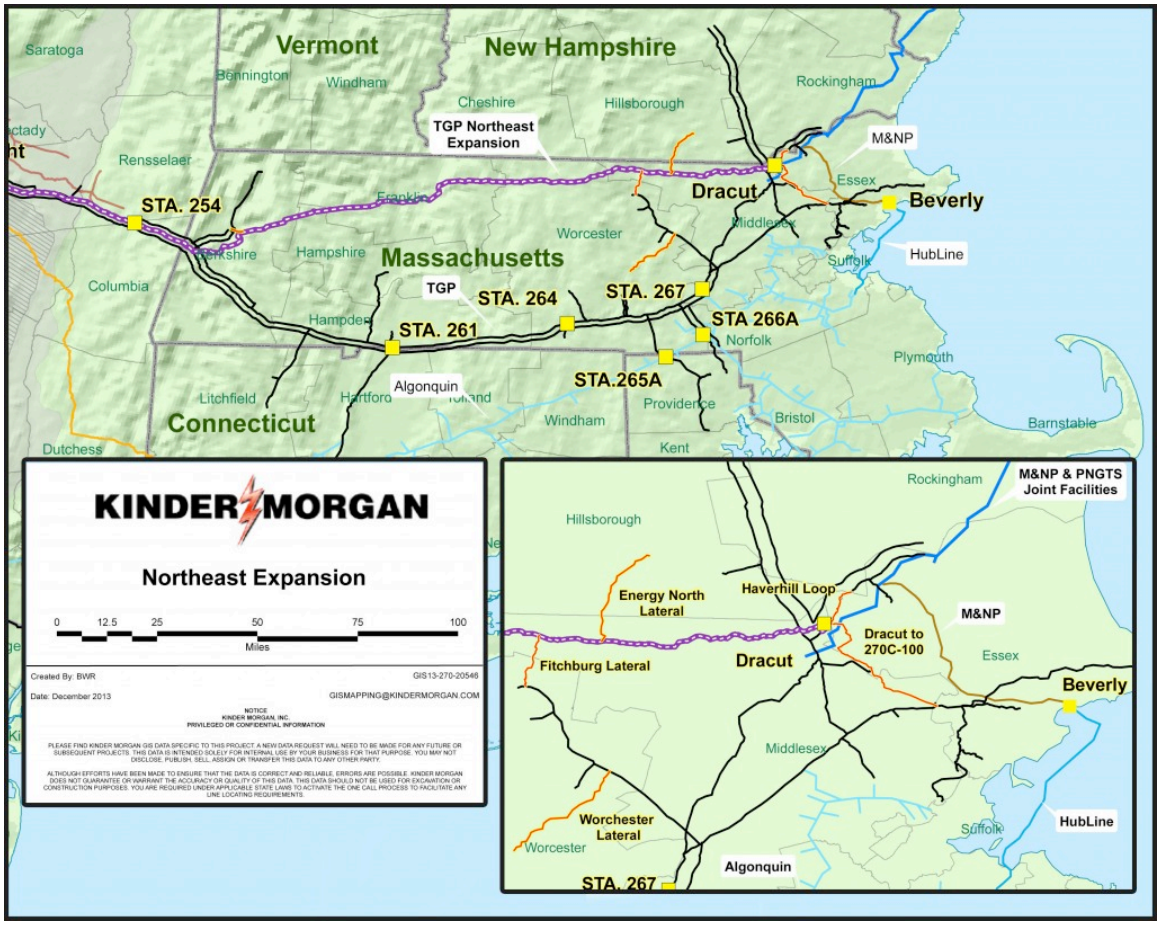
BURDEN OF PROOF



8/27/14

The case against the proposed Northeast Energy Direct (NED) fracked gas pipeline

Prepared by Michael Feldstein (michael@mfeldstein.com) and Kathy Kessler (kathy.kessler@gmail.com), with support from Berkshire Environmental Action Team and No Fracked Gas in Mass.

z

Burden of Proof

THE CASE AGAINST THE PROPOSED NORTHEAST ENERGY DIRECT (NED) FRACKED GAS PIPELINE

EXECUTIVE SUMMARY

Northeast Energy Direct is a large pipeline expansion project proposed by a subsidiary of the gas pipeline company Kinder Morgan and initially supported by the governors of the New England states. The project would bring a high-pressure, high-capacity line of fracked natural gas from the Marcellus shale fields in Pennsylvania and New York to a central hub in Dracut, MA, where it could connect with existing pipelines to Maine and Eastern Canada. The project includes building a new pipeline along a new right-of-way (often referred to as "green field construction") across the most ecologically intact portion of Massachusetts.

In order to gain approval from the Federal Energy Regulatory Commission (FERC) for the pipeline and the tariff to pay for it, the project must be shown to provide public benefits that outweigh adverse impacts and meet an environmental review that explores all reasonable alternatives. As it currently stands, the proposal fails to meet this burden on a number of fronts:

- Economic analysis provided by the pipeline's proponents shows that there is no economic benefit from the pipeline at current gas and electricity usage levels.
- The justification for the pipeline based on future demand is built on overly optimistic cost assumptions; actual pipeline costs could be multiples of the cost assumed in the projections and push the return-on-investment period out by a decade or more.
- There is reason to question current projections for the useful economic lifetime of the gas fields from which the pipeline would draw its supply, thus exacerbating return-on-investment concerns.
- Even if the proposal works as advertised, the benefits would only be in terms of regional natural gas costs relative to national natural gas costs and would provide no protection whatsoever from global rises in natural gas prices. To the contrary, the plan could lock New England into natural gas for decades, regardless of the pricing relative to other energy alternatives.
- High-pressure, high-capacity natural gas pipelines such as the one proposed can and do explode, which means that they bring significant human safety risks to anyone living near the pipeline.
- The particular gas that would be carried in the proposed pipeline is likely to be particularly high in toxins and radiation, the health impact of which has not been studied for people who would be living near the pipeline or consuming the gas in their homes.
- The fracking activity in neighboring states that would feed the proposed pipeline will generate increased ozone air pollution, the impact of which on New England has not been studied.
- Overwhelming evidence reported in studies conducted in the last few years has shown that natural gas production and distribution in general and fracked gas production in particular have a much larger impact on climate change than was previously understood, thus undermining the case for natural gas as an environmentally friendly alternative to other fossil fuels.
- The proposed pipeline route requires a new right-of-way that would cut through many miles of environmentally sensitive areas and take permanently protected land out of that protection in possible violation of Article 97 of the Massachusetts Constitution.
- A number of alternatives could plausibly be chosen to meet energy demands, either singly or in combination, including allowing natural market pricing effects to impact demand, reforming natural gas market mechanisms, increasing investment in energy efficiency, fixing leaky pipelines, and increasing investment in renewable energy. These alternatives have not been adequately studied.

INTRODUCTION: THE BURDEN OF PROOF

In December of 2013, the governors of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Maine issued a joint statement entitled "New England Governors' Commitment to Regional Cooperation on Energy Infrastructure Issues" that reads, in part,

> "Securing the future of the New England economy and environment requires strategic investments in our region's energy resources and infrastructure. These investments will provide affordable, clean, and reliable energy to power our homes and businesses; make our region more competitive by reducing energy costs; attract more investment to the region; and protect our quality of life and environment.
>
> As the region's electric and natural gas systems have become increasingly interdependent, ensuring that we are efficiently using existing resources and securing additional clean energy supplies will be critical to New England's economic future. To ensure a reliable, affordable and diverse energy system, we need investments in additional energy efficiency, renewable generation, natural gas pipelines, and electric transmission. These investments will also serve to balance intermittent generation, reduce peak demand, and displace some of the least efficient and most polluting fossil fuel generation, enabling the states to meet clean energy and greenhouse gas reduction goals while improving the economic competitiveness of our region.
>
> New England ratepayers can benefit if the states collaborate to advance our common goals. The Governors therefore commit to continue to work together, in coordination with ISO-New England and through the New England States Committee on Electricity (NESCOE), to advance a regional energy infrastructure initiative that diversifies our energy supply portfolio while ensuring that the benefits and costs of transmission and pipeline investments are shared appropriately among the New England States."[1]

In response to this letter, the president of NESCOE wrote to the President and CEO of ISO-New England (ISO-NE) requesting that ISO-NE

> "…take all necessary and appropriate action to…[gain] the approval by [the Federal Energy Regulatory Commission (FERC)] of a tariff for the recovery of the cost of firm natural gas pipeline capacity, in a manner that is effective to achieve the construction of new, or expansion of existing, pipelines."[2]

In other words, ISO-NE, at the request of the governors of the New England states and with the support of NESCOE, will be asking permission from the federal government not only to build a new pipeline for carrying natural gas into the area but also to pay for it using taxpayer dollars. The proposed tariff is essentially a sales tax on electricity. It is also a blank check, since the tariff is being sought to pay for construction and maintenance costs that are presently unknown and uncapped. While we do not yet know what the total taxpayer burden will be, the New England States Committee on Electricity's (NESCOE's) executive director notes that costs of a similar project were in the range of $2 billion.[3] Other estimates put the cost of the proposed Massachusetts-based pipeline expansion discussed here, known as Northeast Energy Direct (NED),

---

[1] http://www.governor.ri.gov/documents/press-

[2] http://www.nescoe.com/uploads/New%20England%20Governors%20Statement_Energy_2014-5-13%20final.pdf

[3] http://www.bizjournals.com/boston/blog/mass_roundup/2014/07/price-tag-should-be-key-part-of-debate-over-new.html?page=all

at closer to $4 billion.[4] And Kinder Morgan—the parent company proposing to build the pipeline in question—has said that the total pipeline project could cost as much as $6 billion.[5]

The proposed tariff is essentially a sales tax on electricity. It is also a blank check, since the tariff is being requested to pay for construction and maintenance costs that are presently unknown and uncapped.

According to federal legal requirements, any interstate natural gas pipeline must be proven to meet a number of requirements before it can be approved for construction[6]:

- It must be shown that the public benefits outweigh any adverse impacts.
- It must avoid unnecessary disruptions to the environment and unnecessary exercise of eminent domain.
- It must not harm wetlands as certified by the states under the Clean Water Act.
- It must pass an environmental review that "rigorously explore[s] and objectively evaluate[s] all reasonable alternatives," including reasonable alternative solutions that are outside of FERC's jurisdiction (e.g., increases in energy efficiency and local/intrastate power generation).

Any interstate natural gas pipeline must meet these requirements to gain approval. But a *taxpayer-funded* pipeline should be held to a higher standard. At a minimum, we should ask if a $2 billion to $6 billion taxpayer investment in a pipeline would meet the burdens above *relative to a $2 billion to $6 billion taxpayer investment in alternative means of satisfying energy demand.*

As we will show in detail in the sections that follow, ISO-NE, the governors of the New England States, NESCOE, and Kinder Morgan have not yet met these requirements and are unlikely to meet them. To begin with, the proposal fails to meet its burden even on purely economic terms. The analysis upon which the case is built assumes a pipeline cost of only $1.2 billion, shows no benefit to energy costs in the event of rising global prices in natural gas, relies upon an increase in demand that is likely preventable, and fails to account for uncertainty in long-term availability of gas from the fields that would supply the pipeline. In addition, there are substantial health, safety, and environmental impacts to consider. Some of these are well known and self-evident, such as the fact that pumping extremely high quantities of an explosive material through a community can present a danger to that community. Others are based on new scientific research, such as recent findings that methane is a more potent greenhouse gas and much more harmful to the climate than was previously realized and that natural gas production and transport is releasing much more methane into the atmosphere than was previously realized. Meanwhile, a number of plausible alternatives to the pipeline exist which could be deployed either singly or in concert that promise to provide greater economic benefit at lower cost to

[4] Ibid
[5] http://seekingalpha.com/article/1948181-kinder-morgans-management-discusses-q4-2013-results-earnings-call-transcript
[6] For an overview of the governing regulatory statutes and process, see http://theberkshireedge.com/stopping-pipeline-options/

human health and the environment. These alternatives have yet to be adequately studied or seriously considered.[7]

Given these considerations, there remains little justification for building the Northeast Energy Direct pipeline..

THE ECONOMIC CASE

The economic case for taxpayer investment in NED rests on two propositions:

- Future demand for energy, particularly electricity, will continue to rise in New England as fast as or faster than they have in the past.
- The total economic benefit from the pipeline is knowable and will exceed the taxpayer cost within a reasonable return-on-investment period.

Unfortunately, both of these propositions are questionable, particularly when considered relative to alternative investments.

Global and Local Natural Gas Prices

The entire demand case for NED is built on a Black & Veatch (BV) paper commissioned by NESCOE in 2013 to study Phase III of their demand research.[8][9] It is critical to understand what that paper does and does not claim. To begin with, BV were only looking at natural gas costs *relative to its costs elsewhere*:

> "… New England's electricity prices across all ISO New England (ISO-NE) zones are highly correlated with regional wholesale natural gas prices that are represented by distribution points known as Algonquin Pipeline City-Gates. Traditionally, gas price movements in New England have been tracked as the "basis" difference between the Algonquin City-Gates price and the national benchmark price defined at the Henry Hub in Louisiana. Black & Veatch adopted the Algonquin City-Gates basis as the principal measurement of price movements in analyses of the Base Case, High Demand Scenario, Low Demand Scenario and for selected short-term and long-term solutions to infrastructure constraints."

NED will have no impact on cost fluctuations in the national benchmark price for natural gas. If overall prices go up because global demand rises, shale fields are not as productive as originally anticipated, governmental action raises the cost of production, or for any other reason, then gas prices in New England will rise whether or not NED has been constructed. The study has nothing to say about the total energy cost for New Englanders, and little to say directly about the total natural gas cost for New Englanders. It only looks at the cost of natural gas in New England relative to the cost in the rest of the country.

---

[7] In Massachusetts, Patrick administration has recently charged the DOER with conducting such a study. As of Sept. 1, it is still in the scoping stages, but is being framed as a thorough analysis of alternative energy solutions and the possibility of a flat demand in electricity. Transparency of the process and ability for public input has also been stated as a goal of this new study.

[8] http://www.nescoe.com/uploads/Phase_III_Gas-Elec_Report_Sept._2013.pdf

[9] The Massachusetts Executive Office of Energy and Environmental Affairs has now characterized as "flawed," prompting Governor Patrick to agree to conduct a new energy study.

If overall prices go up because global demand rises, shale fields are not as productive as originally anticipated, governmental action raises the cost of production, or for any other reason, then gas prices in New England will rise whether or not NED has been constructed.

BV states that their analysis "involves detailed market projections across the North American energy market to take into account any market activity that could affect New England." Since we do not have access to the model that they used, we cannot provide a complete evaluation of which national and global gas pricing factors it takes into account. However, the assumptions listed in the paper already show significant gaps. For example, all three demand scenarios assume liquid natural gas (LNG) from the Gulf Coast and the West Coast but not from the Northeast. But the analysis also assumes that "Maritimes & Northeast Pipeline (M&NP) can reverse flow on an economic basis to meet demand growth from Maine and Maritimes Canada" for both the Base and the High Demand scenarios. Through that pipeline route, the gas from NED can make its way to export terminals in New Brunswick and Nova Scotia. Both of these terminals have applied for export licenses, and the New Brunswick terminal has already received approval to export up to 1.2 billion cubic feet per day—over half the maximum proposed capacity of NED.[10] In order to prove net benefit to the taxpayers of New England, return-on-investment analysis of the pipeline would have to take into account this export option and include an analysis of how not only national but global natural gas price fluctuations might impact costs for New Englanders, keeping in mind that natural gas prices in international markets are much higher than they are in the United States. Before the burden of proof can truly be met, the full BV model should be made public so that any other risky or unrealistic assumptions can be identified and appropriate alternative scenarios can be modeled.

Demand

Given the above context, BV also found that current demand does not justify the construction of NED. What they call the Low Demand scenario "…assumes no growth in natural gas demand in the residential, commercial, and industrial sectors." In other words, demand would remain the same as it is now (or as it was when the report was published in 2013). Under this scenario, they find that "…the existing natural gas infrastructure in New England is sufficient to support both the natural gas and electric demand…and no further solutions are economically necessary." The pipeline is economically justifiable only if future demand is greater than current demand. And as the report authors note, future demand is not inevitable and can be changed by policy and consumer decisions:

> "Black & Veatch also calculated the associated cost reduction for natural gas and electric customers under the Low Demand Scenario compared to the Base Case. These hypothetical savings can be used to approximate benefits of implementing energy efficiency and other demand-side management programs or of encouraging greater penetration of renewable thermal heating applications and non-natural gas-powered distributed generation that help to create a flat natural gas demand trajectory."

[10] http://www.thebeatnews.org/BeatTeam/gas-will-exported/

In a footnote to that comment, they observe,

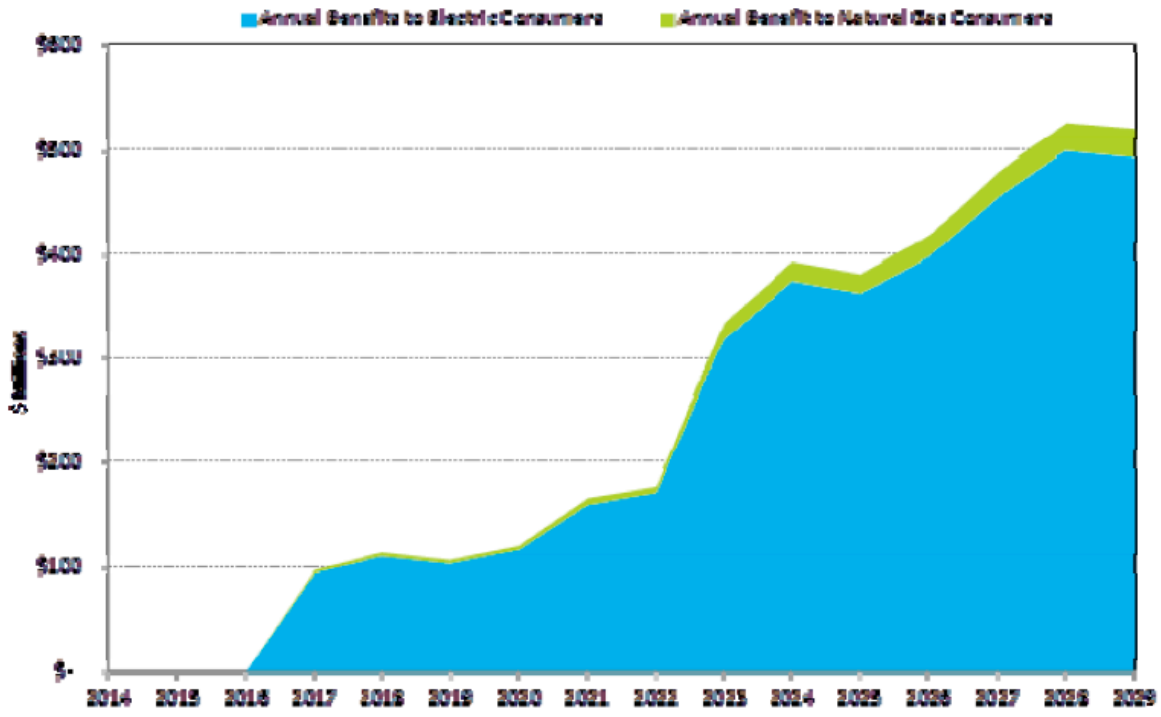
> "The costs associated with programs and measures that could achieve the extent of assumed demand reduction in the Low Demand Scenario are not known. Further analysis would be required to estimate such costs for comparison with customer savings and/or infrastructure solutions."

NESCOE's own study acknowledges that investments in energy efficiency and other measures could eliminate the economic case for the pipeline and that the research has not been done to evaluate these alternatives. At a minimum, this research would need to be conducted before the NED proposal can meet its burden of proof.

NESCOE's own study acknowledges that investments in energy efficiency and other measures could eliminate the economic case for the pipeline and that the research has not been done to evaluate these alternatives.

Net Economic Benefit

The BV scenarios that show net economic benefit from NED assume either moderate or high demand increases in the Baseline and High Demand scenarios, respectively. Both of these calculations use a $1.2 billion pipeline construction cost. Under that cost assumption, the Base Case begins to show a return on investment in 2017:



But other, more recent estimates suggest costs that could be as much as $4 billion, which would be more than three times that figure.[11] In a recent conference call, Kinder Morgan CEO Richard D. Kinder acknowledged that the total cost of the pipeline project, including the segment from Marcellus to Wright, NY will cost $6 billion, or five times more than the estimate used in the BV analysis.[12] It is not clear whether the tariff that the New England governors are proposing is intended to cover the cost of both segments or just the one that runs through Massachusetts. Extrapolating from the BV graph above, if the total cost comes in closer to $4 billion then it could take until 2027 or 2028 for taxpayers to see a net benefit. And if the total cost is $6 billion, breakeven would be achieved well past the last year in the BV analysis. Further, even that calculation only holds if the other assumptions in the BV analysis are correct. For example, their analysis assumes that 100% of the pipeline capacity will be contracted and therefore will be available at a lower cost. The Conservation Law Foundation calls this assumption "rosy" and notes several other price risks not considered in the BV model, including the possibility that increased regulation that is moving forward in a number of states could increase the cost of gas production.[13] BV themselves state in the report,

> "...it must be noted that the transportation rates offered by this pipeline could greatly exceed this estimate. Even if construction cost overruns are not experienced, lower-than-anticipated capacity subscription could lead to significant increases in the per-unit rate. For example, the per-unit rate would double if the pipeline capacity is only 50% subscribed. The projected rates also could change based on future steel costs, the diameter of the pipeline, the routing and construction delays related to local opposition."

BV acknowledges the very real possibility that their total cost estimate could be off, not incrementally but by multiples that could push back the break-even point by a decade or more.

BV acknowledges the very real possibility that their total cost estimate could be off, not incrementally but by multiples that could push back the break-even point by a decade or more.

The question of whether such a long payback period justifies the investment is heightened by the uncertainty of how long the supply of gas in the Marcellus shale fields will last. Analysis of gas industry documents by *The New York Times* suggests that the gas industry routinely provides public estimates of shale field wells that are much higher than their own data and analysis indicate, and that the best evidence we have suggests that most shale field wells will reach their end of life in a time frame that raises serious questions about net taxpayer benefit should the payback period for NED should come in on the upper end of the range of estimates:

> "The Barnett shale, which has the longest production history, provides the most reliable case study for predicting future shale gas potential. The data suggest that if the wells' production

[11] http://www.bizjournals.com/boston/blog/mass_roundup/2014/07/price-tag-should-be-key-part-of-debate-over-new.html?page=all
[12] http://seekingalpha.com/article/2322165-kinder-morgan-energy-partners-kmp-ceo-richard-kinder-on-q2-2014-results-earnings-conference-call?page=9
[13] http://www.nescoe.com/uploads/CLF_CommentsonIGER_30May2014.pdf

> continues to decline in the current manner, many will become financially unviable within 10 to 15 years."[14]

This result is for individual wells. We don't know exactly what it means for the economic life expectancy of Marcellus as a whole. The point is that the source from which NED would draw its gas is both finite and uncertain. Fracking is still in its infancy. We simply do not have the data to generalize across wells yet because many of the wells in question are too young. Despite this, New England taxpayers are being asked to subsidize this unquantifiable risk on behalf of the gas industry in exchange for a highly uncertain period of positive returns.

New England taxpayers are being asked to subsidize this unquantifiable risk on behalf of the gas industry in exchange for a highly uncertain period of positive returns.

The High Demand scenario would accelerate the point at which the NED taxpayer investment would reach breakeven. It is therefore worth looking at the assumptions that BV used to distinguish this scenario from Baseline. There are six. The first three have to do with New England states achieving lower success in energy efficiency and renewable energy goals, all three of which are largely within the control of the New England states themselves. The fourth assumption, regarding an accelerated retirement schedule for regional nuclear power plants, is also within the control of the New England states. The last two are particularly revealing. They focus on the increasing demand for natural gas outside New England diverting supplies from other pipelines and away from New England. Such demand increases could impact the availability of any natural gas supply, including the supply in NED itself. Even if NED succeeds in reducing the price for gas in New England to that of the national benchmark, rises in the national benchmark could offset those gains as more gas is exported. Certainly, the current crisis in the Ukraine suggests that there are scenarios in which international demand for American natural gas could rise dramatically, raising prices with it. Meanwhile, in order to gain the economic benefit from the pipeline paid for out of New Englanders' pockets, New England utilities will have to sign up for long-term contracts for the gas. If the benchmark gas price stays low, then New England benefits. But if national gas prices rise due to a rise in global demand or for any other reason, New England could be locked into those higher prices for years to come.

If the benchmark gas price stays low, then New England benefits. But if national gas prices rise due to a rise in global demand or for any other reason, New England could be locked into those higher prices for years to come.

In summary, the main differences between the Low Demand, Baseline, and High Demand scenarios can be attributed to (a) the New England states making effective investments in improving energy efficiency and alternative energy sources, and (b) changes in global demand, the latter of which could have either a positive or a negative influence on the net economic benefit of the pipeline. Further, the economic benefits of the

[14] http://www.nytimes.com/2011/06/26/us/26gas.html

Baseline and High Demand scenarios rely on optimistic estimates of both the cost of the pipeline and the useful life of the gas supply.

The BV analysis is based on a number of assumptions, many of which are stated clearly in the report and some of which are not. But when we look across all the assumptions and consider their cumulative impact, both in terms of the likelihood that the BV scenarios will match reality and in the degree to which they could be off, there is very little reason for New England taxpayers to be confident that the money they are being asked to spend to subsidize the gas industry will result in a good return on their investment. The burden of proof of the net benefit of the pipeline investment has not been met—even if we assume that threats to human health and safety, the environment, and property rights from the pipeline are all zero.

Of course, there is no reason to assume that threats to human health and safety, the environment, and property rights will be zero. To the contrary, they are likely to be substantial.

HUMAN HEALTH AND SAFETY

The threats of the proposed pipeline to human health and safety can be divided into two categories: those that are well understood and those that have not yet been well researched. The safety issues that go hand in hand with a high-capacity natural gas pipeline are clear and well documented. However, the gas that would be carried in NED is not the same as conventionally sourced gas. Fracked gas can contain any number of toxic and radioactive contaminants. The presence of these contaminants in our natural gas system is new, and epidemiological studies have not yet been conducted (although the human health effects of the contaminants themselves are well documented and provide cause for serious concern). Therefore, NED would also expose the people of New England to health risks that have not been quantified.

Ruptures and Explosions

Pipelines can explode. Larger pipelines can create larger explosions. These are incontrovertible facts. When evaluating the threat of explosion from the proposed pipeline, we have to consider both the likelihood of an explosion and the potential severity of the incident should one occur. Even a low-likelihood threat that has a high severity level is often considered very serious by the people who have to live with that threat. This is one reason why, for example, people do not like to live close to a nuclear reactor.

Even a low-likelihood threat that has a high severity level is often considered very serious by the people who have to live with that threat. This is one reason why, for example, people do not like to live close to a nuclear reactor.

We have good historical data from the gas industry itself on past explosions of pipelines in the same diameter range (30-36 inches) and pressure (up to 1,460 PSI)[15] as the proposed NED pipeline. A paper prepared in 2000 for the Gas Research Institute entitled, "A Model for Sizing High Consequence Areas Associated with Natural Gas Pipelines"[16] reports the following incident data:

[15] Kinder Morgan executive, select board meeting, Plainfield, MA, April 22, 2014
[16] http://nogaspipeline.org/sites/nogaspipeline.org/files/wysiwyg/docs/c-ferstudy.pdf

Date	Location	Damage	Maximum Burn Distance	Diameter (in)	Pressure (psi)
1974	Near Bealeton, VA	Burned area 700 ft by 400 ft.		30	718
1984	Near Jackson, LA	Burned area 1450 ft long by 360 ft wide (furthest fire extent 950 ft), 5 fatalities (within 65 ft, 0 ft offset), and 23 injuries (within 800 ft,180 ft offset).	Offset 180 ft. Distance 950 ft.	30	1016
1985	Near Beaumont, KY	Burned area 500 ft wide by 700 ft long. 2 houses, 3 house trailers and numerous other structures and equipment destroyed. 5 fatalities due to smoke inhalation in house 318 ft from rupture (150 ft offset), 3 people burned running from house 320 ft from rupture (200 ft offset) one hospitalized with 2nd degree burns.	Offset 350 ft. Distance 500 ft.	30	990
1986	Near Lancaster, KY	Burned area 900 ft by 1000 ft. 2 houses, 1 house trailer and numerous other structures and equipment destroyed. 3 people burned running from house 280 ft from rupture (requiring hospitalization), 5 others received minor burn injuries running from dwellings between 200 and 525 ft from rupture (250 ft offset).	Offset 700 ft. Distance 800 ft.	30	987

1994	Edison, NJ	Burned area 1400 ft long by 900 ft wide. Fire damage to dwelling units up to 900 ft from rupture, dwelling units at 500 ft and beyond caught fire between 7 to 10 minutes after failure, no fatalities but 58 injuries.	Offset 720 ft. Distance 960 ft.	36	970
1994	Maple Creek, Saskatchewan	Fire burn area 21.0 acres (8.5 hectares).		42	1207
1994	Latchford, Ontario	Fire burn area 11.8 acres (4.77 hectares), heat-affected area 18.6 acres (7.52 hectares).		36	1000
1995	Rapid City, Manitoba	Fire burn area 48.5 acres (19.6 hectares), heat-affected area 198 acres (80 hectares).		42	880

Note that all of these pipelines were below the 1,480 psi pressurization level that NED could reach. And yet, the damage done by these explosions was substantially worse than even the above table indicates. For example, a first responder's account of the 1994 incident in Edison, NJ provides disturbing details:[17]

> "Leaking natural gas from a Texas Eastern Pipeline Co. pipeline reaches atmosphere and de-pressurizes, causing an explosion ripping apart nearly 80 ft. of pipe, and sending debris flying over 3/4 mi. in all directions. The explosion is sufficient to knock sleeping residents of the Durham Woods apartment complex out of their beds and shatter windows. The rupture was felt as far away as Reading Pa. and Long Island, NY....
>
> Within 3 minutes, a spark from flying debris, static electricity, or whatever, ignites the escaping gas. A blow torch of extremely hot flames (1500-2000 *F) some 600 ft. high and 200 yards across now exists."

Within nine minutes of the rupture, four buildings were aflame due to spontaneous combustion from the heat. The ambient temperature in the apartment complex near the explosion, at midnight in March in New Jersey, was 74 degrees. The fire was so bright that one first responder was able to see the glow from Princeton, 32 miles away, and another said the area nearer to the fire "began to look like daytime, enough to warrant sunglasses." A witness from New Brunswick, the neighboring town, said,

[17] http://www.rxn.com/~uffda/archive/science/edison.txt

> "I thought it was a nuclear bomb….I have never seen anything that big. It came up in this huge orange flash and a mushroom cloud that went so far up into the sky. It lit up the night like it was daylight."[18]

"I thought it was a nuclear bomb….I have never seen anything that big. It came up in this huge orange flash and a mushroom cloud that went so far up into the sky. It lit up the night like it was daylight."

According to The New York Times, the explosion was so bright and intense that people were confused about where the fire actually was:

> "The explosion sowed confusion among emergency service workers. Half an hour after the blast, a Fire Department dispatcher said: "We've got several reports of major explosions and at least 15 fires going right now, and we're getting a lot of contradictory information. The dispatcher said that the Mobil Chemical Company plant in Edison was also ablaze, but officials near the pipeline disputed that."[19]

Meanwhile, a witness closer to the explosion described the scene as "…a disaster. Cars were burned down to metal frames. They were indistinguishable," he said. "You could actually see the plastic [from the bumpers] melted to the ground."[20]

All told, the resulting fire destroyed or severely damaged 14 apartment buildings. Over 1,500 apartment residents were evacuated, 100 were left homeless, and one person died of a heart attack."[21] The first responders evacuated the area as best they could, shut down the nearby interstate highway, and fought the secondary fires, but they did not attempt to put out the gas fire itself. Standard training for first responders in the event of a gas pipeline explosion is that they do not have the ability to extinguish the gas and should let it burn itself out. On a transmission pipeline such as NED, the gas that would need to burn itself out is all that could be contained in the highly pressurized high-capacity line between the nearest two shutoff valves, which could be miles apart.

The Edison explosion was not an isolated incident. According to the US Department of Transportation (DOT), the 10-year average for what it calls "significant" natural gas transmission pipeline incidents is 77 a year, typically including about 10 injuries, 2 fatalities, and approximately $141 million in property damage.[22] The DOT also separates out a subset of these significant incidents and calls them "serious" incidents, which they define as "an event involving a fatality or injury requiring in-patient hospitalization." Over the past ten years, there have typically been four such incidents per year in the United States.[23] With an average of 77 significant or serious pipeline incidents per year, four of which result in fatalities or hospitalizations, and many

[18] http://www.nytimes.com/1994/03/24/nyregion/huge-gas-pipeline-explosion-rocks-northeast-new-jersey.html
[19] Ibid.
[20] http://em.gmnews.com/news/2004-03-31/Front_Page/013.html
[21] http://en.wikipedia.org/wiki/Edison,_New_Jersey_natural_gas_explosion
[22] http://primis.phmsa.dot.gov/comm/reports/safety/sigpsi.html#_ngtrans
[23] http://primis.phmsa.dot.gov/comm/reports/safety/SerPSI.html?nocache=2923#_ngtrans

of which result in millions or even tens of millions of dollars in property damage, a pipeline such as NED poses a clear and significant safety risk to the people who live near it.

With an average of 77 significant or serious pipeline incidents per year, four of which result in fatalities or hospitalizations, and many of which result in millions or even tens of millions of dollars in property damage, a pipeline such as NED poses a clear and significant safety risk to the people who live near it.

Toxins, Pollutants, and Radiation Exposure

As was mentioned earlier, fracked gas poses health and safety risks beyond those of natural gas from conventional sources as a result of contaminants both from the chemicals used in the fracking process and from the natural environment of Marcellus itself. Because the focus of this paper is on the relative benefit and harm of the pipeline to the people of New England, it will not address the substantial and growing evidence of human and environmental harm that fracking can cause in the regions where it is extracted. That said, there are several pathways by which these contaminants might reach the people of New England.

To begin with, air pollution does not stop at state borders. Recent studies of natural gas fields in Texas,[24] Colorado,[25] and Wyoming[26] all have shown alarmingly high levels of ozone. This should not be surprising, since methane, the main ingredient in natural gas, is a precursor to ozone. Evidence shows that fracked gas fields could be substantially worse than conventional gas fields in this regard. For example, a study by the University of North Texas found that ozone rose by 21% in the region of fracking fields in Texas, compared with a rise of 4% in the non-fracking region.[27] According to the Environmental Protection Agency (EPA), ozone components "can travel hundreds of miles on air currents, forming ozone far from the original emissions sources."[28] Therefore, ozone pollutants from Marcellus fracking fields in New York and Pennsylvania should be capable of traveling to Massachusetts and Connecticut with sufficient wind. We are not aware of any studies regarding the potential increase in ozone exposure for the people of New England that could result from the increased fracking activity necessary to keeping NED "full". It is an unquantified health threat.

According to the Environmental Protection Agency (EPA), ozone components "can travel hundreds of miles on air currents, forming ozone far from the original emissions sources." Therefore, ozone pollutants from Marcellus fracking fields in New York and Pennsylvania should be capable of traveling to Massachusetts and Connecticut with sufficient wind.

[24] http://www.texasobserver.org/studies-links-fracking-smog-pollution-stronger-state-claims/
[25] http://cires.colorado.edu/news/press/2013/natgas.html
[26] http://www.noaanews.noaa.gov/stories2009/20090118_ozone.html
[27] http://www.texasobserver.org/studies-links-fracking-smog-pollution-stronger-state-claims/
[28] http://cfpub.epa.gov/eroe/index.cfm?fuseaction=detail.viewPDF&ch=46&lShowInd=0&subtop=341&lv=list.listByChapter&r=231327

Despite this concern, and despite the existence of both state and federal laws governing radon exposure, we are not aware of any empirical studies of the potential radon exposure from NED via vented gas at compression stations, pipeline gas leaks, or burned gas at electrical generation plants or in peoples' homes.

Second, numerous carcinogens, endocrine disruptors, and other toxins are involved in the fracking process to which New England residents may be exposed via NED. A literature review published by the National Institute of Environmental Health Sciences found a wide range of toxins in the fracking process,

> "includ[ing] methanol, ethylene glycol, naphthalene, xylene, toluene, ethylbenzene, formaldehyde, and sulfuric acid, some of which are known to be toxic, carcinogenic, and associated with reproductive harm. Many of these compounds are also regulated in other industries under the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA) as hazardous water pollutants (Safe Drinking Water Act of 1974; Clean Water Act of 1972; US HOR 2011).
>
> Many of the chemical compounds used in the process lack scientifically based maximum contaminant levels (MCLs), which render a quantification of their public health risks more difficult. Moreover, uncertainty about the chemical make-up of fracturing fluids persists due to the limitations on required chemical disclosure, driven by the Energy Policy Act of 2005 (Energy Policy Act of 2005). For instance, in many states, companies are not mandated to disclose information about the quantities, concentrations, or identities of chemicals used in the process on the principle that trade secrets might be revealed....
>
> The researchers classified the [known fracking] compounds into twelve different health effects categories. At certain concentrations or doses, more than 75% of the chemicals identified are known to negatively impact the skin, eyes, and other sensory organs, the respiratory system, the gastrointestinal system, and the liver; 52% have the potential to negatively affect the nervous system; and 37% of the chemicals are candidate endocrine disrupting chemicals....
>
> Endocrine disrupting chemicals (EDCs) present unique hazards, particularly during fetal and early childhood growth and development. They can affect the reproductive system and epigenetic mechanisms leading to pathology decades after exposure. EDCs have challenged traditional concepts in toxicology because effects at higher doses do not always predict effects at low doses. In other words, the dose does not always make the poison."[29]

"Endocrine disrupting chemicals (EDCs) present unique hazards, particularly during fetal and early childhood growth and development. They can affect the reproductive system and epigenetic mechanisms leading to pathology decades after exposure. EDCs have challenged traditional concepts in toxicology because effects at higher doses do not always predict effects at low doses. In other words, the dose does not always make the poison."

One of the contaminants that is present in the Marcellus gas itself is radon. There has been some debate recently over the degree to which this could represent a health hazard. The EPA has expressed concern that

[29] http://ehp.niehs.nih.gov/wp-content/uploads/advpub/2014/4/ehp.1307866.pdf

the radon health risk from Marcellus is being understated. In its comments on the New York State Department of Environmental Protection's (NYSDEC's) impact statement regarding proposed Marcellus fracking in that state, the EPA recommended

> "…that the conclusion about the concentrations of naturally-occurring radioactive materials (NORM), specifically that these concentrations do not indicate an exposure of concern to works or the public, should be reconsidered or possibly removed because it is based on limited data that does not represent the radiological conditions in the entire Marcellus Shale."[30]

The amount of radon that would reach the homes of New England consumers before decaying is unclear. However, radioactive decay does not put an end to its health threat. Radon decays into radioactive Lead-210, the half-life of which is 22 years.[31] We are aware of no studies regarding how much of this substance would enter New England air through kitchen stove burners, pipeline compression station vents, electrical power generation plants, and other sources.

To sum up, there are many contaminants involved in fracking, some of which are regulated in other industries, some for which we do not know the minimum exposure that will cause harm, others for which we have good reason to believe even tiny exposures can cause harm, and some for which we will need decades of longitudinal data before we will know their full health impact.[32] We are not aware of any systematic studies of the exposure levels to these toxins throughout the natural gas distribution and consumption process, including potential exposure and consequences from pipeline ruptures or explosions. Before the burden of proof can be met for NED, the net harm to human health from fracking-related contaminants must be quantified so that it can be weighed against the benefits of the pipeline.

ENVIRONMENTAL IMPACT

Recent science has shown that natural gas is not the clean fuel we hoped it would be. To the contrary, the weight of evidence increasingly suggests that it is worse than coal from a greenhouse effect perspective. Increasing New England's dependence on natural gas would therefore have serious global environmental impact regardless of the particular route of the pipeline itself. But the route could have substantial environmental consequences over and above the greenhouse issues.

Greenhouse Gas Impact

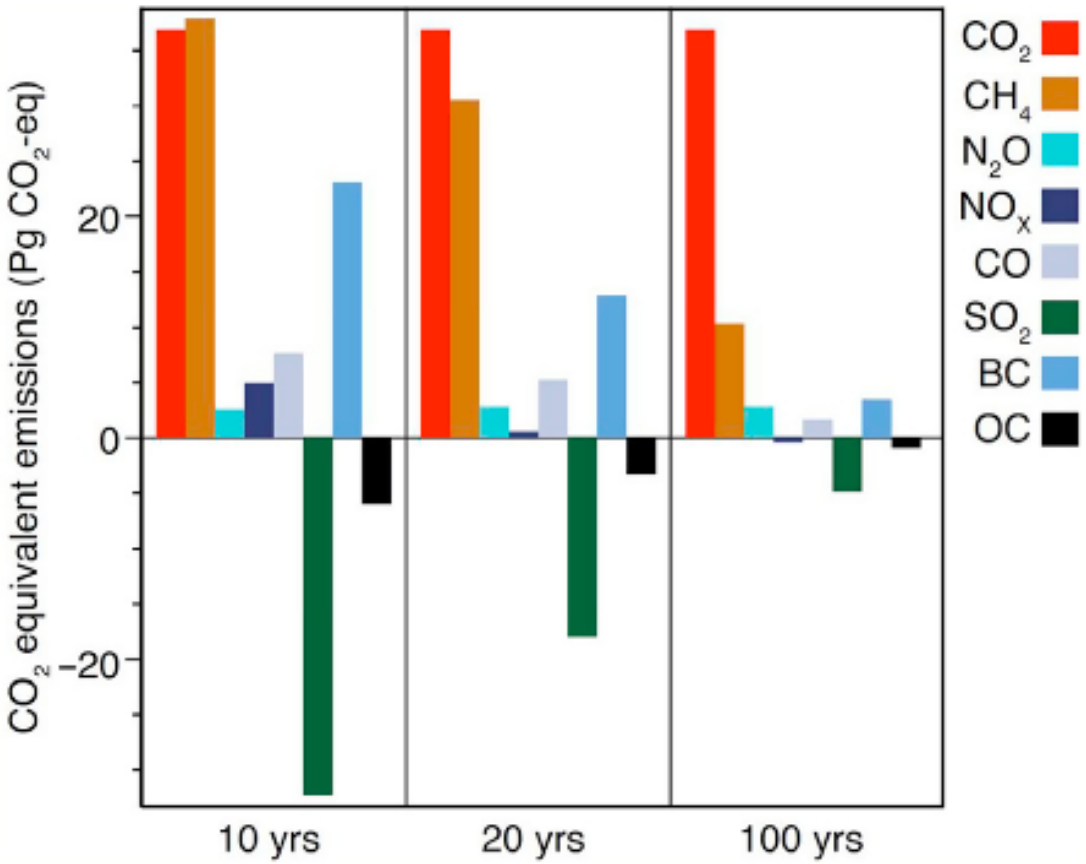
Natural gas is often touted as a "transitional fuel" from a fossil fuel-based economy to one based on renewable energy. It has this reputation because the amount of carbon dioxide produced from burning it is lower than the CO_2 produced from burning oil or coal. But CO_2 is not the only greenhouse gas. Methane (CH_4), the main component in natural gas, is also a powerful greenhouse gas. The Intergovernmental Panel on Climate Change (IPCC) recently concluded that human-produced methane will have as much impact as CO_2

30 http://www.epa.gov/region2/newsevents/pdf/EPA%20R2%20Comments%20Revised%20dSGEIS%20Enclosure.pdf

31 https://mail.google.com/mail/u/1/?ui=2#inbox/147c0c77dba32c18

32 For more on the toxicity of endocrine disruptors at low exposure levels, see http://insideclimatenews.org/sites/default/files/assets/2012-03/Endocrine%20Reviews%20article.pdf

over a 10-year period and 80% as much impact over a 20-year period (because it is 86 times more potent in the 20-year time frame but being released in smaller quantities):[33]



Because methane is a lighter-than-air gas, it can escape into the atmosphere at any time in the natural gas production and transport process between the time it is removed from the ground until it is burned in an electrical plant or home heater, from sources including the well itself, pipeline leaks, and deliberate venting or "blow-off" of gas at compressor stations along the pipeline. Research by the National Oceanic and Atmospheric Administration (NOAA) found that up to 9% of the total natural gas production is escaping into the atmosphere from the drilling sites alone at the Uinta Basin in Utah, and up to 4% at a field near Denver, CO.[34] And as was mentioned earlier, the problem is worse for fracked gas. The term "fracking" is shortened from "hydrofracturing," a process by which horizontal cracks (or "fractures") are created underground by pumping fluids into the well under high pressure. The gas industry has known for some time that the horizontal

[33] https://www.ipcc.ch/report/ar5/wg1/

[34] http://www.nature.com/polopoly_fs/1.12123!/menu/main/topColumns/topLeftColumn/pdf/493012a.pdf

drilling involved in fracking can penetrate complex unmarked networks of abandoned wells or other outlets, creating permanent and untrackable leaks for methane to escape into the atmosphere.[35]

Because methane is a lighter-than-air gas, it can escape into the atmosphere at any time in the natural gas production and transport process between the time it is removed from the ground until it is burned in an electrical plant or home heater, from sources including the well itself, pipeline leaks and deliberate venting or "blow-off" of gas at compressor stations along the pipeline.

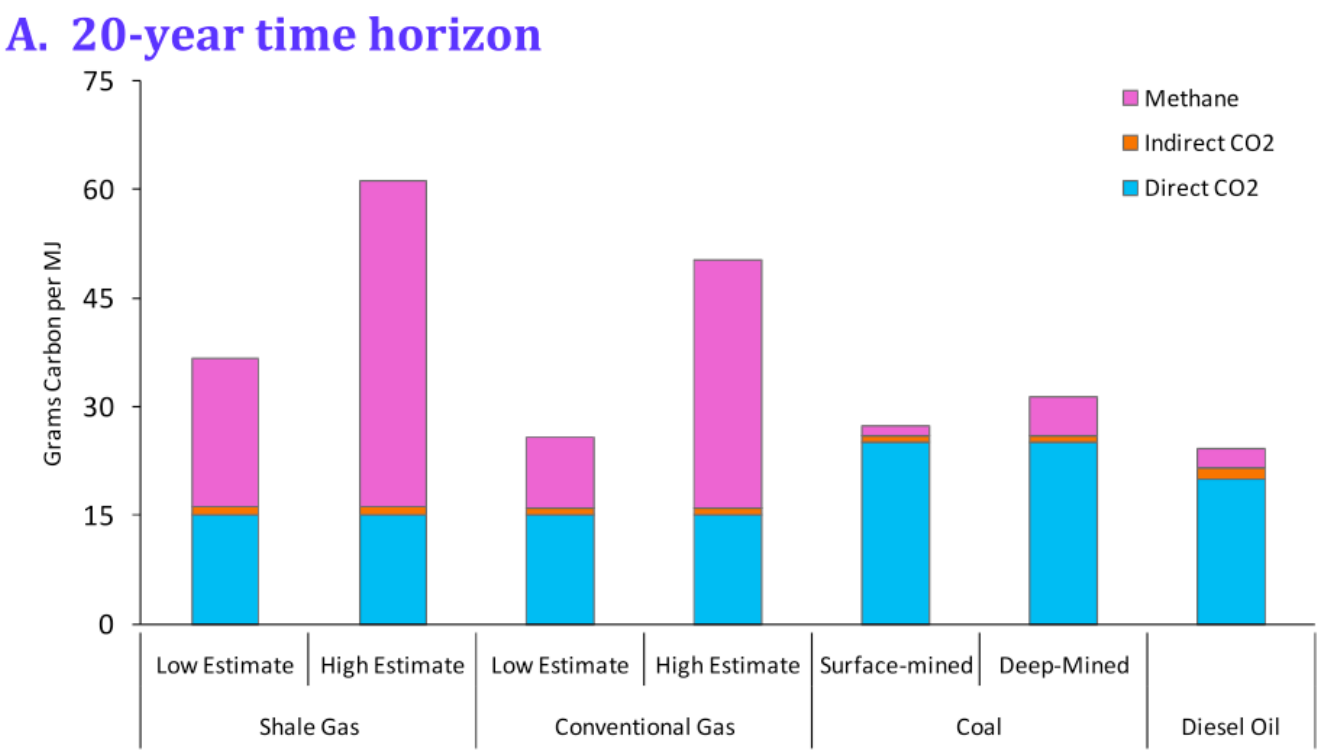
Pipelines lose a lot of natural gas (and therefore methane) to the atmosphere. According to a paper released by Massachusetts Senator Edward J. Markey,

> "Gas distribution companies in 2011 reported releasing 69 billion cubic feet of natural gas to the atmosphere, almost enough to meet the state of Maine's gas needs for a year and equal to the annual carbon dioxide emissions of about six million automobiles."[36]

Measuring the total amount of methane released during natural gas production, transport and consumption is a difficult and complex process, particularly for fracked gas, which is relatively new, and where avenues for gas to escape due to horizontal fractures are impossible to fully trace and vary widely based on the local geography. In 2011, researchers at Cornell University published the first peer-reviewed analysis comparing the total greenhouse impact of natural gas from fracked and conventional sources to other fossil fuels, taking into account all sources of methane release.[37] They concluded that the total greenhouse impact of fracked gas in particular is worse than all other fossil fuels, including coal, in a 20-year time frame.

[35] Vincent, M. (2009, January 19). *Examining our assumptions – Have oversimplifications jeopardized our ability to design optimal fracture treatments?* Lecture presented at Society of petroleum engineers hydraulic fracturing technology conference in The Woodlands, Texas.

[36] http://www.markey.senate.gov/documents/markey_lost_gas_report.pdf
[37] http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf



"Gas distribution companies in 2011 reported releasing 69 billion cubic feet of natural gas to the atmosphere, almost enough to meet the state of Maine's gas needs for a year and equal to the annual carbon dioxide emissions of about six million automobiles."

In 2014, one of the authors of this study published an update, including a comprehensive review of all research conducted between the publication of the original study and the present.[38] He found the results of the original paper to be "surprisingly robust" and concluded,

> "Using these new, best available data and a 20-year time period for comparing the warming potential of methane to carbon dioxide, the conclusion stands that both shale gas and conventional natural gas have a larger [greenhouse gas footprint] than do coal or oil, for any possible use of natural gas and particularly for the primary uses of residential and commercial heating."

The research of the last three years provides mounting evidence that, of all the energy sources that New England could fund in an attempt to meet future fuel demand, fracked gas of the type that would be transported over NED is the worst alternative from a perspective of environmental harm on a global scale. This general environmental concern has specific statutory ramifications. For example, Massachusetts has committed to specific greenhouse gas reductions via the Global Warming Solutions Act.[39] In order to assess

[38] http://www.eeb.cornell.edu/howarth/publications/Howarth_2014_ESE_methane_emissions.pdf
[39] http://www.mass.gov/eea/air-water-climate-change/climate-change/massachusetts-global-warming-solutions-act/

the potential impact of NED on the state's commitment to meet these goals, a complete carbon impact analysis from wellhead to burner tip would need to be conducted. The evidence described above strongly suggests that the results of such an analysis would prove NED to be detrimental to our efforts to meet our environmental goals.

Local Environmental Impact

The pipeline will have substantial greenhouse impact regardless of its route through New England. Any particular route will add local environmental damage to the global damage. According to FERC, the right-of-way for pipeline construction is 75 to 100 feet wide and may be wider at road and stream crossings. The maintenance right-of-way is "usually about 50 feet wide," within which trees may be cleared and grass and brush mowed—for a period of between 20 and 50 years or more.[40] Any new right-of-way will therefore be consequential in terms of environmental impact. While the pipeline route has not yet been finalized, an analysis of the currently proposed route for the 126-mile Massachusetts portion of the new pipeline against data from the Massachusetts Office of Geographic Information (MassGIS) provides a representative view of the likely impact of any new right-of-way for NED:[41]

- **Water:** It intersects 206 Wetlands, 15 Outstanding Resource Waters, 13 public water supplies, 2 scenic/protected rivers, 4 wellhead protection areas, 34 certified Vernal Pools, and 12 aquifers.
- **Habitat and Wildlife:** It intersects 72.2 miles of "core habitat" lands, including areas identified as necessary for wildlife protected under the Massachusetts Endangered Species Act or State Wildlife Action Plan, Critical Natural Landscapes, and Areas of Critical Environmental Concern (ACECs), as well as over 37 miles of secondary habitat including open recreational spaces and areas that MassGIS characterizes as "extensively forested portions of the Massachusetts landscape where forest cover is relatively un-fragmented by human development."
- **Social Protection:** It passes through close to 10 miles of primary or secondary social protection areas, including primary school lands, areas protected by the state's Environmental Justice (EJ) policies, areas protected by the Massachusetts Community Preservation Act (CPA), and places identified in the Massachusetts Historic Commission inventory.

The proposed pipeline route intersects 206 Wetlands, 15 Outstanding Resource Waters, 13 public water supplies, 2 scenic/protected rivers, 4 wellhead protection areas, 34 Vernal Pools, and 12 aquifers.

Any new right-of-way for the pipeline is likely to have similar local impacts, which is one reason why the pipeline has been widely opposed by local conservation groups including the Massachusetts Land Trust,[42] the Trustees of Reservations,[43] Mount Grace Land Trust,[44] the Nashoba Conservation Trust,[45] the Massachusetts

[40] http://www.ferc.gov/for-citizens/citizen-guides/citz-guide-gas.pdf
[41] See Appendix 1 for more details of the analysis conducted by University of Massachusetts student Samuel F. B. King.
[42] http://www.massland.org/files/enews_04252014.pdf
[43] http://www.thetrustees.org/assets/documents/about-us/Pipeline-Gov-Letter.pdf

Sierra Club,[46] and Mass Audubon.[47] From both local and global perspectives, the environmental harm of the pipeline is likely to be substantial. This conclusion can be reached without even taking into account environmental impacts at the drilling sites, including releases of high levels of benzene and ozone into the local atmosphere,[48] contamination of drinking water,[49] increased radiation,[50] and earthquakes.[51]

ALTERNATIVES

Given that FERC is required to consider alternatives to the pipeline, it is worth reviewing some of those alternatives. The options raised here are not mutually exclusive and could be used in combination. None of them have been fairly and thoroughly considered by NESCOE as possible alternatives to NED.

Let the Markets Work

When asked whether FERC would consider the option of taking no action, Commission spokesperson Tamara Young-Allen replied, "No, I don't think that has ever been selected because, after all, the Commissioners look at all the customers [for the pipeline] who have been lined up, and constructing it is necessary for them."[52] But this is a self-fulfilling prophecy. The NED tariff would effectively be a carbon subsidy and would have the opposite effect of a carbon tax. If the government artificially lowers the price of natural gas through market intervention, then demand for it will increase relative to alternatives—including energy efficiency and renewables. Far from providing a bridge to renewable energy, it will be a roadblock. In fact, ISO-NE may be actively refraining from taking the most cost-effective short-term measures provided by the market in order to artificially boost demand for the pipeline subsidy. As one pipeline owner reasoned when explaining the ISO-NE decision to rely exclusively on high-cost oil for its 2013-2014 winter reliability solution,

> "…an ISO solution [that] reduced the opportunity costs priced into the gas market during a time of high gas demand, . . . would lower gas prices and send the wrong signal about the relative scarcity of natural gas. These lower prices would also be reflected in the electricity market."[53]

---

[44] http://www.mountgrace.org/sites/default/files/Mount%20Grace%20Pipeline%20Letter%20to%20Governor%20Patrick_03.11.14.pdf

[45] http://nashobatrust.org/pipeline/

[46] http://sierraclubmass.org/wp/?incsub_wiki=kinder-morgan-tennessee-gas-pipeline

[47] http://www.mountgrace.org/sites/default/files/MassAudubon%20Pipeline%20letter%20to%20Governor%20Patrick_04.18.14_0.pdf

[48] For example, http://www.denverpost.com/environment/ci_25719742/scientists-flying-over-colorado-oil-boom-find-worse

[49] For example, http://www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-from-drilling/4328859/

For example, [50] http://www.bloomberg.com/news/2013-10-02/radiation-in-pennsylvania-creek-seen-as-legacy-of-frackin.html

[51] For example, http://time.com/84225/fracking-and-earthquake-link/

[52] http://theberkshireedge.com/stopping-pipeline-options/

[53] http://www.nofrackedgasinmass.org/notgp/wp-content/uploads/2014/06/CLF_CommentsonIGER_30May2014.pdf

There is nothing either natural or inevitable about the demand reflected by a list of customers "who have been lined up," in the FERC spokesperson's words, when short-term market prices are being manipulated and long-term prices are being subsidized.

The NED tariff would effectively be a carbon subsidy and would have the opposite effect of a carbon tax. If the government artificially lowers the price of natural gas through market intervention, then demand for it will increase relative to alternatives—including energy efficiency and renewables. Far from providing a bridge to renewable energy, it will be a roadblock.

Even within the natural gas market itself, other market participants have argued that the NED proposal favoring Kinder Morgan is likely reducing the likelihood that competitive alternatives will emerge. For example, GDF SUEZ Gas has argued,

> "…while [NESCOE'S] April 30 memo repeatedly comments that the competitive market has not satisfied the region's need in regard to natural gas delivery infrastructure, in fact multiple competitive market solutions, from new rules around generator performance incentives and strong FCM auction signals, to a number of pipeline expansion and transmission project open seasons, are all presently being actively discussed in multiple venues within the region and at the Federal Energy Regulatory Commission (FERC). Undoubtedly, the potential for a mandated solution will stultify the development of those competitive solutions as market participants will hold back on taking affirmative action until it is clear where the state proposal will end up, thus creating a self-fulfilling prophecy of the market not resolving the problem."[54]

Reduce Future Demand

According to BV, there is no need for NED as long as energy demand in New England stabilizes at 2013 levels. Simply letting the markets work may help to achieve that goal by increasing incentives for energy efficiency and conservation. As energy prices go up, energy efficiency measures such as insulation and high-efficiency heaters become more compelling investments for consumers and businesses. This increase in demand would likely drive further investment in energy efficiency businesses, with the long-term prospect of lowering the price of energy efficiency through economies of scale and investment-fueled innovation. Likewise, consumers have stronger motivation, for example, to turn their thermostats down in the winter and use air conditioning more sparingly in the summer.

The state governments of New England could choose to intervene and accelerate this process through further investment in energy efficiency subsidies. This is consistent with the current policy direction of these states. For example, in Massachusetts, the Green Communities Act establishes the principle that investor-owned private utilities must "tap into all the energy efficiency opportunities that cost less than buying electricity from power plants."[55] A presentation this year by the Deputy Commissioner of the Massachusetts Department of Energy Resources (DOER) argued that "[e]nergy efficiency has immediate beneficial impact on cost and reliability challenges," that "[s]erious consideration must be made for targeting energy efficiency investments to reduce

[54] http://www.nescoe.com/uploads/GDF-SUEZ_CommenstonIGER_30May2014.pdf
[55] http://www.mass.gov/eea/docs/doer/energy-efficiency/ee-story-booklet-web.pdf

system-wide price and reliability impacts," and that "[e]fficiency is the lowest cost option to help meet MA energy needs."[56] As energy prices rise, the return on investment in government-subsidized energy efficiency measures should also rise. For example, there should be an increase in the penetration rate of tax rebates as the net economic benefit of the efficiency measures the rebates encourage also increase. The degree to which the BV analysis fully accounted for impact of existing initiatives and anticipate new ones is not clear. One example is the accelerating impact of state and federal lighting efficiency on innovation in that sector. In the area of LEDs alone, the DoE anticipates that advances in efficiency and cost will lead to a 19% savings in site electricity consumption saving roughly 100 terrawatt-hours nationally. By 2030,

> "the annual energy savings due to the increased market penetration of LED lighting is estimated to be approximately 300 terawatt-hours, or the equivalent annual electrical output of about fifty 1,000-megawatt power plants. At today's energy prices, that would equate to approximately $30 billion in energy savings in 2030 alone. Assuming the current mix of generating power stations, these energy savings would reduce greenhouse gas emissions by 210 million metric tons of carbon. The total electricity consumption for lighting would decrease by roughly 46 percent relative to a scenario with no additional penetration of LED lighting in the market—enough electricity to completely power nearly 24 million homes in the U.S. today."[57]

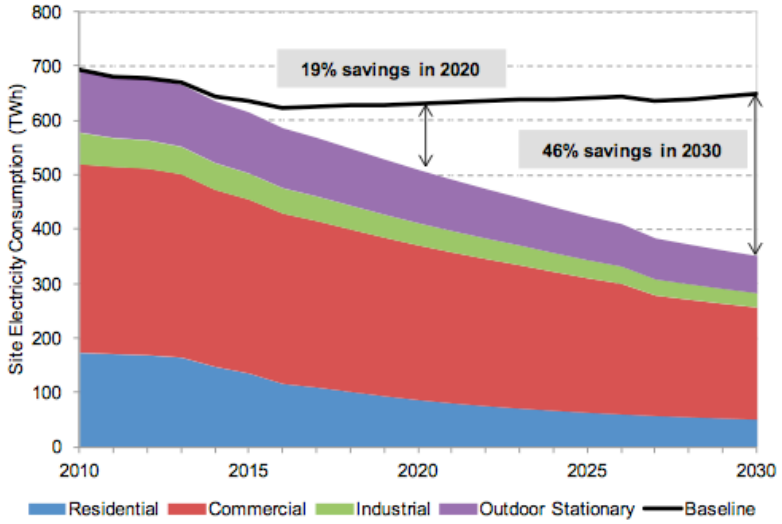


Figure ES. 1 Forecasted U.S. Lighting Energy Consumption and Savings, 2010 to 2030

Likewise, it is not clear whether the BV report anticipated the recent grid modernization order by the Massachusetts Department of Public Utilities to modernize the electrical grid, which should have the effect of alleviating daily energy peaks,[58] for example. The impact of recent government energy efficiency efforts is

[56] http://www.ma-eeac.org/Docs/7_Presentations/2014/April%202014/Energy%20Markets%20Overiew%20Presentation%20by%20DOER%20Deputy%20Commissioner%204-8-14.pdf
[57] http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/ssl_energy-savings-report_jan-2012.pdf
[58] http://web1.env.state.ma.us/DPU/FileRoomAPI/api/Attachments/Get/?path=12-76%2fOrder_1276B.pdf

snowballing, due in part to the multiplier effect from the private sector innovation that they incentivize. Any thorough analysis of New England's energy needs should include a close and current look at these changes.

Improve the Efficiency of the Market Itself

The natural gas market is not very efficient. This is particularly relevant for New England, since the primary economic problem that NED is supposed to solve is not a shortage in total gas available but a shortage in *contracted* gas. Prices are higher in New England relative to the national benchmark price because New England has to buy its gas to meet demand peaks on the spot market at higher prices than they can get for long-term contracts. The Conservation Law Foundation (CLF) has suggested a number of reforms for streamlining the market so that providers have better economic incentive and capabilities to provide reliable pricing. Their proposal to ISO to address 2013/2014 winter reliability issues focuses on contracting for energy based on its reliability and making it easier to purchase dual-fuel-based solutions.[59] CLF also notes that market reforms currently being considered by FERC and the North American Energy Standards Board (NAESB) could further alleviate the pricing issues in New England by providing better transparency and liquidity in the natural gas markets, some of which have actually been proposed by ISO-NE to FERC.[60] GDF SUEZ Gas, in a recent letter to NESCOE, commented,

> "GDF SUEZ/Distrigas appreciates the work of ISO-NE to improve market design, most notably through the Forward Capacity Market Pay for Performance Incentive (FCM-PFP) Proposal currently before the Federal Energy Regulatory Commission (FERC). We believe these proposed market reforms will enhance the prospects for additional peak LNG supply as well as new regional pipeline capacity."[61]

The potential impact of these proposals needs to be fully analyzed before NED can be justified as the best alternative.

Incentivize Gas Providers to Close Gas Leaks

According to Senator Markey's aforementioned report on gas leaks, "consumers paid at least $20 billion from 2000-2011 for gas that was unaccounted for and never used," while in Massachusetts alone "ratepayers paid an estimated $640 million to $1.5 billion from 2000-2011 for unaccounted for gas." In the latter case, that gas contributed "at least 45 percent of Massachusetts' methane emissions for large, stationary facilities" while also constituting a major source of risk for ruptures and explosions. This is because "gas companies in Massachusetts own and operate one of America's oldest natural gas pipeline distribution systems, ranking sixth among state systems in the number of miles of main distribution pipelines made of cast iron or bare steel."[62] The report suggests a number of actions that could be taken on both state and federal levels to improve the incentives for gas companies to close these leaks, thereby both increasing available supply and reducing safety and environmental concerns. Unsurprisingly, one of those measures is to cap the amount of money that will be paid to gas companies for gas that they do not actually deliver. It seems sensible to require gas companies to deliver the gas for which they have already been paid before providing them with

[59] http://www.iso-ne.com/committees/comm_wkgrps/mrkts_comm/mrkts/mtrls/2013/may302013/a2_2_clf_proposed_winter_2013_2014_reliability_solution.pptx
[60] http://www.nofrackedgasinmass.org/notgp/wp-content/uploads/2014/06/CLF_CommentsonIGER_30May2014.pdf
[61] http://www.nescoe.com/uploads/GDFSUEZ_CommentonGasLevel_10Feb2014.pdf
[62] http://www.markey.senate.gov/documents/markey_lost_gas_report.pdf

a subsidy to bring in more gas. While the current Massachusetts law in this regard is a step in the right direction, it could be strengthened and expanded to all New England states. For example, the 20-year time scale for replacing leaky pipes could be reduced.

It seems sensible to require gas companies to deliver the gas for which they have already been paid before providing them with a subsidy to bring in more gas.

Invest in Renewable Energy

Rather than investing money in new natural gas energy supply, the New England states could invest the same money in increasing renewable energy supplies. Mount Grace Land Trust Executive Director Leigh Youngblood provided one example scenario in her testimony this year before the DOE's Quadrennial Energy Review Task Force in a Hartford, Conn:

> "In lieu of a new pipeline ... the 2 billion dollar price tag of the Massachusetts section of the Tennessee Gas Pipeline could more prudently be spent installing 4KW rooftop solar systems on 100,000 homes, which would collectively generate 80 million dollars' worth of electricity annually — without compromising the land or our atmosphere. An alternative infrastructure investment such as this at this scale, 400MW, would provide numerous benefits to the public interest while avoiding both critical losses to one hundred years of prior investments in land conservation and exacerbations of climate volatility being experienced today and projected to worsen."[63]

The economics of renewables are changing rapidly. Last year Morgan Stanley reported seeing "vicious competition" from wind power in the Midwest:

> "In the Midwest, we're now seeing power agreements being signed with wind farms at as low as $25 per megawatt-hour," said Stephen Byrd, Morgan Stanley's Head of North American Equity Research for Power & Utilities and Clean Energy, at the Columbia Energy Symposium in late November. "Compare that to the variable cost of a gas plant at $30 per megawatt-hour. The all-in cost to justify the construction of a new gas plant would be above $60 per megawatt-hour."[64]

"In the Midwest, we're now seeing power agreements being signed with wind farms at as low as $25 per megawatt-hour," said Stephen Byrd, Morgan Stanley's Head of North American Equity Research for Power & Utilities and Clean Energy, at the Columbia Energy Symposium in late November. "Compare that to the variable cost of a gas plant at $30 per megawatt-hour. The all-in cost to justify the construction of a new gas plant would be above $60 per megawatt-hour."

[63] http://www.recorder.com/home/11726417-95/area-pipeline-foes-federal-energy-policy-makers-clash

[64] http://www.greentechmedia.com/articles/read/midwest-wind-cost-competitive-with-gas-and-coal

Prices for solar electricity are similarly becoming highly competitive. In January of this year, the courts upheld the Minnesota Public Utilities Commission's decision to choose investing in solar versus further investment in gas-based electrical generation based on the superior economics of the solar proposal. The project would receive no state or utility subsidies but would receive a federal tax credit.[65] Any analysis of the cost-effectiveness of renewables for New England that is even a couple of years old will need to be revised to reflect current economic realities.

As with the other alternatives listed here, the entire problem does not necessarily need to be solved with one large investment in renewables alone. Targeted investments could be combined with further investment in efficiency, instituting market reforms, incentivizing gas providers to reduce leakage, and simply refraining from artificially lowering the price of natural gas through a subsidy. All of these approaches, singly and in combination, would need to be studied before the NED proposal can meet the burden of proof as the best option for New England.

[65] http://www.startribune.com/business/238322571.html