

January 24, 2019

Debra Howland Executive Director and Secretary  
New Hampshire Public Utilities Commission  
21 S. Fruit Street, Suite 10  
Concord New Hampshire 03301

RE: DG 17-198 Granite Bridge Pipeline and LNG liquefaction and storage facility  
Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities

Dear Ms. Howland,

Thank you for accepting my comments and questions on the Granite Bridge pipeline project and associated LNG facility to be sited in Epping, NH. The reasons given for supporting Granite Bridge pipeline and LNG Liquefaction Plant are:

- 1.) It will lower heating costs for residents.
- 2.) It offers businesses more predictable fracked gas and electricity prices.
- 3.) It will help the environment by switching oil heat customers to fracked gas. Burning fracked gas produces 27% less carbon than burning oil.
- 4.) It will help the environment by making more gas available to residential customers on the very coldest days. This means there is less chance of having to “fire up” the nuclear, coal and oil fueled plants which happens when gas becomes too expensive for the gas fueled plants to operate. Fracked gas plants produce 50% less CO2 than coal plants. <https://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/environmental-impacts-of-natural-gas#.XEmdhs17IPY>
- 5.) It will take the price pressure from gas-fueled electricity generation by increasing supply to heating customers.
- 6.) It will create many jobs and help grow the economy by attracting businesses to the state and reducing the energy costs of existing businesses.
- 7.) Even taking Climate Change into account, it’s going to take a long time for renewable energy and technologies to ramp up to replace carbon-based fuels. In the meantime, burning fracked gas produces 27% less carbon than burning oil and 50% less carbon than burning coal. Granite Bridge is one of the fastest ways to reduce carbon emissions over the short term.

### **1.) Lower heating costs/emissions for residential sector**

According to the Office of Strategic Initiatives website, heating with fracked gas is the least expensive heating option at \$14.88 per million British Thermal Units (MMBTU). Heating with air source heat pumps is the next least expensive at \$20.92 per MMBTU. Heating with oil costs \$27.98 per MMBTU.

<https://www.nh.gov/osi/energy/energy-nh/fuel-prices/index.htm>

Clearly, converting more homes to fracked gas would significantly reduce carbon emissions and save homeowners nearly half of their annual heating costs!

Granite Bridge increases fracked gas capacity from the existing 117, 000 Dekatherms per day (DTH/d) to 267,000 DTH/d, more than doubling potential supply.

So, how many households could be converted thanks to Granite Bridge and what would the financial and environmental benefit be?

Liberty currently has approximately 92,000 customers, of which 80,000 are residential customers. By doubling the supply of gas into NH, Liberty should be able to double the number of households it serves.

The total potential market (all oil heating customers) includes half of all households in NH (~ 260,000). <https://www.eia.gov/state/analysis.php?sid=NH>

Of course, just building Granite Bridge doesn't cover all the costs associated with serving another 80,000 customers. Adding in the cost of a heating system at customer expense and the cost of increasing the distribution system by at least 50% (could be 100%?), converting 80,000 customers from oil to gas heat would top \$1.19 billion in costs to the economy.

What is the overall efficacy of converting 80,000 homes from oil to gas as compared with weatherization or converting heating systems to heat pumps if \$1.19 billion were invested?

In the paragraphs below under "Back of the Envelope" are the assumptions and calculations used to develop the charts below. The reduced CO2 emissions relate only to the residential portion of the carbon emissions pie (about 1/3<sup>rd</sup>).

Project Description	# of households	% CO2 reduction (residential)
Oil heat to gas	80,000	4.16%
Weatherization/EE	197,000	7.6% to 11.6%*
Air Source Heat Pumps	170,000	13.8% to 29.8%*

\*CO2 reductions depend on carbon emissions associated with electric power supply sources.

#### Individual Household savings

Project Description	Total Investment	Annual Savings	Simple Payback in years
Oil heat to gas	\$10,397	\$936	11.1
Weatherization/EE	\$6,000	\$681	8.8
Air Source Heat Pumps	\$7,000	\$504	13.9

## Total Economic impact

Project Description	# of households	Annual Savings	Total Annual Savings
Oil heat to gas	80,000	\$936	\$75 million
Weatherization/EE	197,000	\$681	\$134 million
Air Source Heat Pumps	170,000	\$504	\$87 million

Existing heating customers are unlikely to see much benefit from the LNG storage strategy as most of their gas is contracted at City Gate prices. It would be helpful if Liberty would share seven years of data on the volumes and cost of gas that they were forced to purchase at spot market prices to meet heating requirements on the coldest days. Without that data and without including the costs associated with converting pipeline gas to LNG, it is impossible to estimate savings for heating customers. It seems likely that the savings are minimal.

Please note that it takes 250 days to fill the LNG tank, so on an annual basis, the tank can hold about 10% of the annual demand for heating customers.

## 2.) Lower electricity costs/emissions for everyone

### Costs:

Even though Granite Bridge is supposed to be a project paid for by Liberty gas ratepayers, many of the proponents tout the lower electricity prices that could come from “buying gas in the summer when it’s cheap, converting it to LNG, storing it at the LNG plant, and then releasing it on peak demand days in the winter.”

60% of all the fracked gas that comes into New Hampshire goes for electricity generation. <https://www.eia.gov/state/analysis.php?sid=NH>

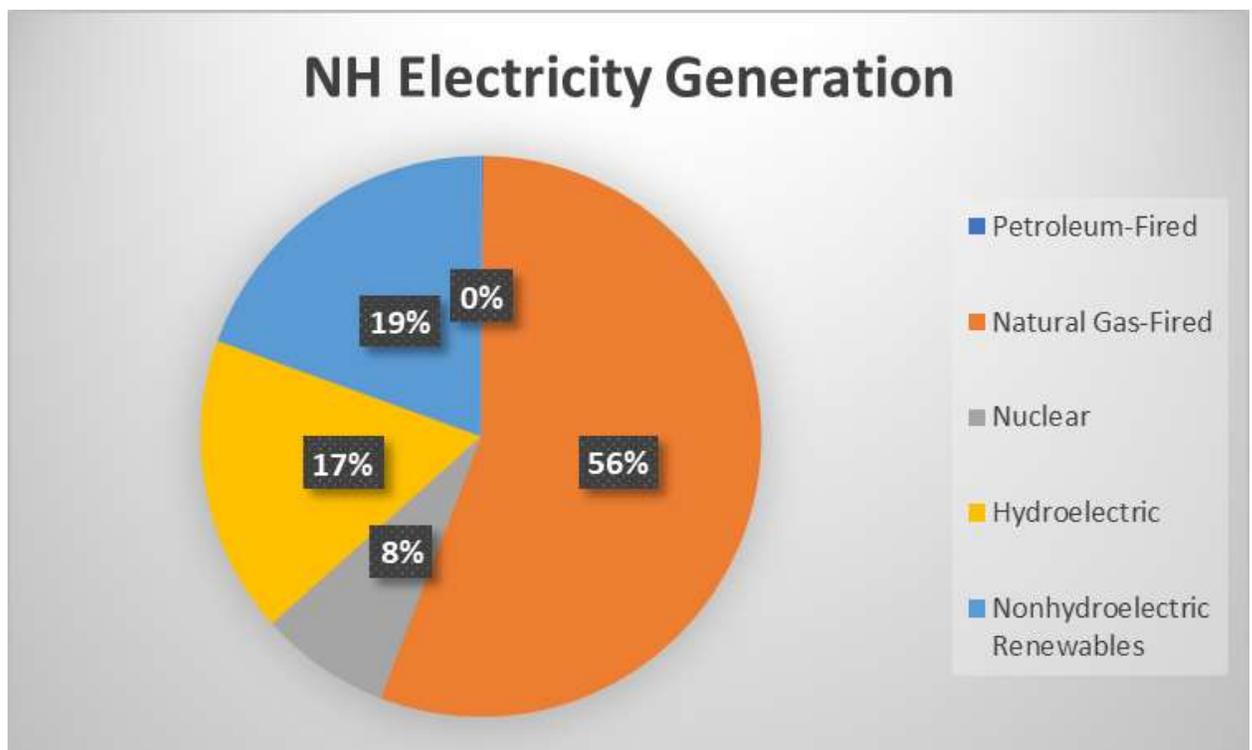
This sounds like a surprisingly large amount until you consider that electric power generators consume gas for twelve months out of the year, while heating customers use most of their gas during four months of the year. The gas utilities have firm transportation contracts for nearly all their demand. The power generators generally don’t have firm transportation contracts, instead they buy on the “Spot Market.” The Spot Market appeals to power generators because they don’t have to enter into 20-year capacity contracts that cost them money every day even when they don’t generate electricity. Since the gas utilities don’t have to supply customers from their reserved transportation capacity during the warm months, they can release that capacity to power generators for them to purchase at low prices. The problems arise during the Winter months when heating

customers are using 60% or more of the available pipeline capacity and gas-fired power generators must pay exorbitantly higher fuel prices, switch to oil, or shut down. When the gas-fired generators shut down, higher cost power like coal, oil and nuclear plants increase production to fill the gap.

The LNG liquefaction and storage plant would certainly prove a boon to power generators and electric ratepayers, especially if gas heating customers not only bear the cost of the 20-year capacity contracts, but also pay for the infrastructure to deliver that “summer gas” to the power generators when they face high spot market prices.

Although reducing the cost of fuel would reduce the energy supply portion of wholesale electricity prices, it wouldn't have any impact on the Forward Capacity Payments that nearly double the cost of wholesale electricity. Nor would it impact New Hampshire's high transmission, distribution and stranded cost charges which make up more than 50% of the bill.

**Emissions:**



New Hampshire does have some coal and petroleum generation, but their contribution is negligible on an annual basis. Nuclear generation capacity is

much greater than 8% but is also more expensive.

<https://www.eia.gov/state/?sid=NH#tabs-4>

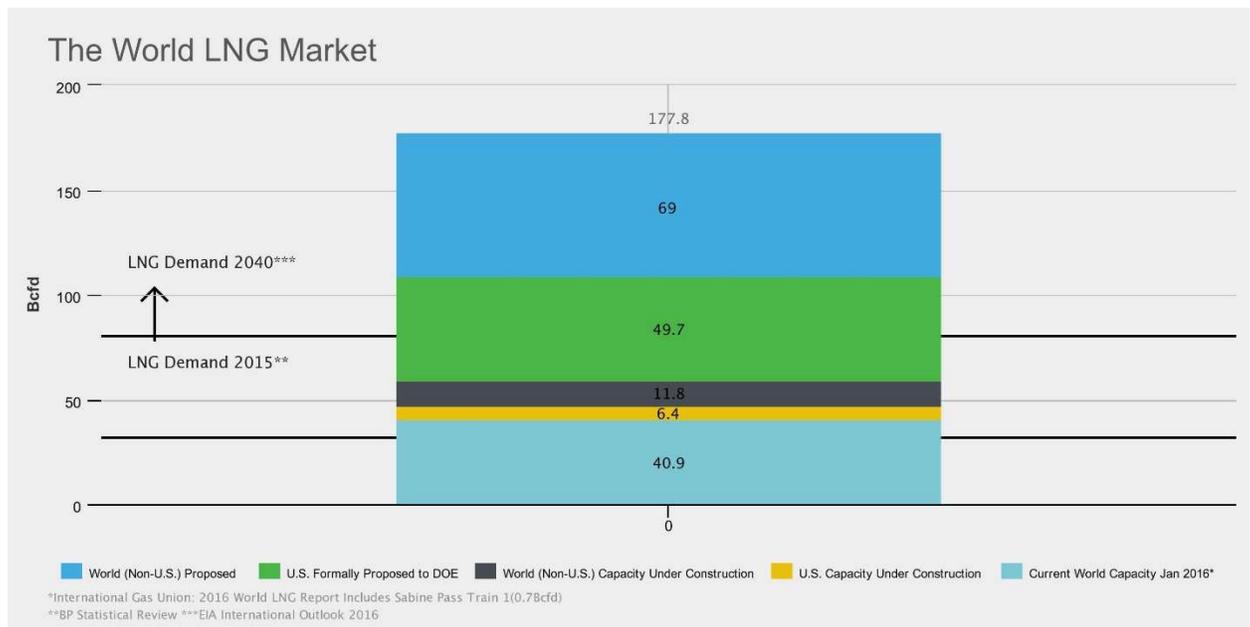
It could be argued that the availability of more gas capacity will squeeze carbon free nuclear generation, increasing our CO2 emissions by 117 pounds per MMBTU of electricity generated.

For all intents and purposes, gas fired generation has displaced nuclear, coal and oil fueled generation. Many of these alternative fueled plants are being forced out of operation because they can't compete with the price of gas fired electricity.

### Future Costs – Export

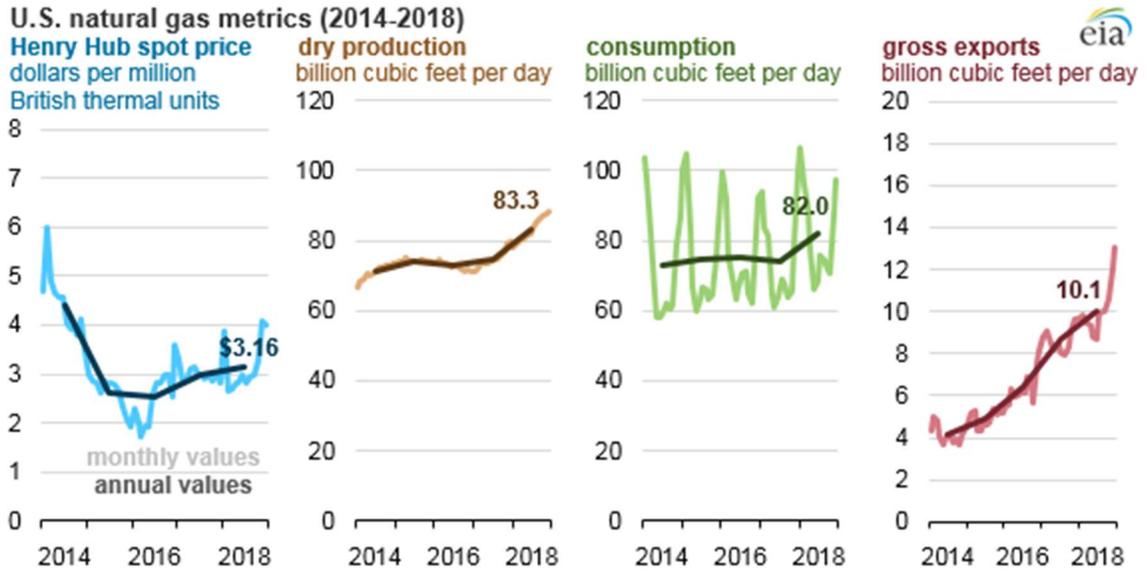
Liberty has made it clear that Granite Bridge is in no way associated with any effort to export LNG to worldwide markets. That does not mean that Granite Bridge is not impacted by the worldwide export market.

The graphic below shows projections for the worldwide LNG market.



Note that potential supply greatly exceeds demand after 2040.

The next graphic shows the rapid increase in US LNG exports and the associated increase in Spot Market gas prices as reserves are drawn down.



**Back of the envelope calculation of the environmental and economic benefit of Granite Bridge versus investing in weatherization, energy efficiency and heat pump technology.**

Assumptions:

Granite Bridge doubles the capacity of existing gas supply and number of customers served

Beyond the cost of Granite Bridge itself, doubling the number of customers will also require increasing the existing distribution infrastructure

Average cost to weatherize a home to 20% improvement = \$6000

A 20% reduction in energy use is assumed to result in a 20% reduction in CO2 emissions

A 90% reduction in energy use is assumed to result in a 90% reduction in CO2 emissions

27% reduction in CO2 emissions for converting from oil to gas heat

Average cost to install a high efficiency gas boiler = \$7000

<https://www.homeadvisor.com/cost/heating-and-cooling/install-a-boiler/>

Average cost to install an air source heat pump (leave oil boiler in place) = \$7000

<https://www.homeadvisor.com/cost/heating-and-cooling/install-a-heat-pump/>

Air source heat pump reduces use of oil boiler by 90% (some days will be too cold for efficient operation of heat pump and needs to be backed up with another source of heat)

Number of homes in NH (pop 1.4 million) 519K

<https://suburbanstats.org/population/how-many-people-live-in-new-hampshire>

Number of Liberty residential customers = 80K (out of 92K customers)

If Granite Bridge is built, 80K additional customer households could be served

Granite Bridge estimate = \$340,000,000

Liberty's existing infrastructure value = \$570,000,000 (approximately from Annual Reports includes distribution lines, metering stations, etc. page 10

<https://www.puc.nh.gov/Gas->

[Steam/Annual%20Reports/2017/engi\\_dba\\_liberty\\_annual\\_report\\_2017.pdf](https://www.puc.nh.gov/Gas-Steam/Annual%20Reports/2017/engi_dba_liberty_annual_report_2017.pdf).) Assume that at least half this investment would be required to reach 80K additional residential customers.

Cost to install 80K gas boilers =  $80K * \$7000 = \$560,000,000$

Total investment to connect and convert 80K customers to Granite Bridge = \$1.19 billion

Environmental impact of converting 80,000 homes to natural gas from oil

80K homes is 15% of total households.

15% of households reducing CO2 emissions by 27% = **4.16% total reduction** in CO2 emissions

At \$6000 per household, 197K homes could be weatherized for \$1.19 billion

197K homes is 38% of total households

38% of households reducing CO2 emission by 20% = **7.6% reduction** in CO2 emissions for heating. Since energy efficiency/weatherization also reduces electrical usage by a similar amount for electricity, we can add 53%\* of 7.6% or **4%** to the reduction in CO2 emissions for a total of **11.6%** total reduction in CO2 emissions.

At \$7000 per household, 170K households could be converted to heat pumps for \$1.19 billion

170K homes is 32.7% of total households

32.7% of households reducing CO2 emissions by 90% = **29.48% total reduction** in CO2 emissions for residential segment, but the reduction is limited by the how carbon free the electrical supply for the heat pumps is. If we calculate the reduction just based on default supply the total statewide residential segment reduction would be 47%\* of 29.48% or **13.8% overall reduction.**

\* NH has a mandated 17% renewable and at least 30% nuclear in the default supply mix. That means that 47% of electricity generation is carbon free. Households with

installed solar or who contract with competitive suppliers for 100% renewable energy will see the full reduction of carbon emissions if heat pumps are installed.

### **PAYBACK Analysis on home heating options**

Assumptions:

The cost of Granite Bridge (\$340 million) plus the cost of expanding the distribution system to serve an additional 80,000 home heating customers totals \$625 million and is shared by existing (92,000) customers and new (92,000) customers. This amounts to approximately \$3,397 per customer.

Customers heating with oil spend \$2000 per season on heat (just an assumption).

Using the ratio of \$14.88/MMBTU for gas versus \$27.98/MMBTU for oil, gas heating customers would spend approximately \$1,063 per season for heat, saving \$936 per season.

Using the ratio of \$20.92/MMBTU for heat pumps versus \$27.98/MMBTU for oil, heat pump customers would spend approximately \$1,495 per season for heat, saving \$504 per season.

Assuming a 20% reduction in oil usage due to weatherization efforts would save \$400 annually.

Average residential customer in NH uses about 650 KWH per month at 18 cents/KWH. The average annual residential electricity expenditure is \$1,404. A 20% reduction in electric costs due to weatherization and energy efficiency charges would save customers and additional \$281/year.

Total annual savings for weatherization services would be \$681/year

Total investment for switching from oil to gas includes the \$3397 for infrastructure plus \$7000 for home heating equipment for a total of \$10,397. The simple payback with \$936/year savings is 11.1 years.

Total investment for weatherization and energy efficiency services for a home using oil heat is approximately \$6000. The simple payback with \$681/year savings in combined electric and heating costs is 8.8 years.

Total investment for heat pump is estimated at \$7000/household. The simple payback with \$504/year savings is 13.9 years. Please note that households using heat pumps can often participate in the "heat smart" program that uses demand response and charges customers a lower rate for electricity that can be interrupted for a few hours at a time.