STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
IN THE MATTER OF

Central Maine Power Company **New England Clean Energy Connect** #L-27625-26-A-N #L-27625-TG-B-N; #L-27625-2C-C-N; #L-27625-VP-D-N; and #L-27625-IW-E-N	)	**APPLICATION FOR NATURAL RESOURCES PROTECTION ACT PERMIT AND SITE LOCATION OF DEVELOPMENT ACT PERMITS**

SUBMISSION OF INTERVENOR GROUP 3 WRITTEN COMMENTS

Per the Department of Environmental Protection's (Department) Fifth Procedural Order, and further email instruction from Ms. Bensinger, Intervenor Group 3 (Group 3) submits the comments attached hereto in Appendix A, as "relevant to the overall statutory and regulatory criteria."[1] These comments, by Glenn S. Poole, Edward A. Barrett, and Dana F, Connors, were each timely submitted as pre-filed direct testimony but subsequently stricken in their entirety in the Fifth Procedural Order, at paragraph 6, section d. 4).

Intervenor Groups 2 and 10 (Group 2/10) preemptively moved to strike these comments[2] on February 20, 2019 based solely on Group 3's witness list submitted on February 15, 2019. Group 3 opposed the motion by Group 2/10 on February 21, 2019. On March 7, 2019, after the comments were submitted in the form of pre-filed direct testimony, Group 2/10, joined by Intervenor Group 4, moved to strike again. Group 3 opposed both motions on March 8, 2019. As

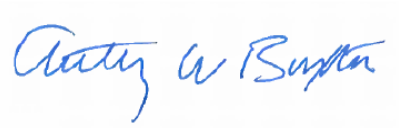
[1] Fifth Procedural Order, at ¶ 6.
[2] The comments did not actually exist at that time, but if they did, they would have been styled pre-filed direct testimony.

to relevancy "to the overall statutory and regulatory criteria," Group 3 incorporates by reference the arguments made in its February 21, 2019 and March 8, 2019 filings to the Department.

DATED: March 21, 2019

Respectfully submitted,

Spokesperson for Intervenor Group 3



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Appendix A:

Comments by Glenn S. Poole, Edward A. Barrett, and Dana F. Connors

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

and

STATE OF MAINE
LAND USE PLANNING COMMISSION

IN THE MATTER OF

CENTRAL MAINE POWER COMPANY	)
NEW ENGLAND CLEAN ENERGY CONNECT	)
#L-27625-26-A-N/#L-27625-TG-B-N/	)
#L-27625-2C-C-N/#L-27625-VP-D-N/	)
#L-27625-IW-E-N	)
CENTRAL MAINE POWER COMPANY	)
NEW ENGLAND CLEAN ENERGY CONNECT	)
SITE LAW CERTIFICATION SLC-9	)
Beattie Twp, Lowelltown Twp, Skinner Twp,	)
Appleton Twp, T5 R7 BKP WKR,	)
Hobbstown Twp, Bradstreet Twp,	)
Parlin Pond Twp, West Forks Plt, Moxie Gore,	)
The Forks Plt, Bald Mountain Twp, Concord Twp	)

Pre-Filed Direct Testimony of Glenn S. Poole

February 28, 2019

Glenn S. Poole being duly sworn submits this pre-filed testimony as follows:

I. Executive Summary

Over the past two decades, New England has transformed its electric supply from predominantly heavy oil and coal to natural gas. This transition has resulted in tremendous improvements in electric sector emissions over that time period. There has also been significant additional use of natural gas for residential and commercial heating. However, the infrastructure that supplies gas to New England has not kept up with the increased demand.

Further exacerbating this situation is the fact that the Sable Island gas fields off Nova Scotia that were expected to supply natural gas to New England over the Maritimes and Northeast pipeline have depleted far sooner than was originally expected, which has only served to amplify the problem. The result is that in the winter, gas used for home and commercial heating utilizes much, at times all, of the natural gas pipeline transportation capacity, gas becomes scarce and prices have jumped by factors of 5 or more when cold sets in. This problem is unique to New England – it simply does not occur in any other parts of North America where there are paper mills against which the few remaining mills in Maine compete.

The problem of gas pipeline capacity is not only one of high winter prices. ISO New England ("ISO-NE"), the entity that operates the New England electric markets and transmission grid is concerned that, although there is ample generation capacity in New England, there will not be enough fuel available to sustain grid operation. ISO-NE is concerned that rolling blackouts will be unavoidable and has taken steps at FERC to stave off retirement of some plants that do have secure fuel. These steps come at an additional cost to consumers. ISO-NE has performed fuel security studies, which identify storage-based hydro like that in Quebec linked by transmission to New England as a huge help towards solving this problem

These high winter gas and electric prices have had a devastating effect on Maine ratepayers, especially the Maine paper industry. Several mills have permanently shut down and there are no mills left operating on the Penobscot River where once there were six.

Now, Maine has an opportunity to have a permanent electrical interconnection with the largest hydro-electric system in the world, Hydro Quebec. The one billion dollar cost for the construction of New England Clean Energy Connect ("NECEC") project will be paid for by the ratepayers in Massachusetts, as will the cost of its operation and maintenance. Massachusetts is

willing to pay these amounts in order to satisfy its desire to purchase over 1000 MW of emission free hydro-electric supply.

The result of this purchase and the construction of the NECEC project to deliver this electricity through Maine to Massachusetts will be to lower wholesale electric prices and gas prices in the entire New England region. It will also greatly improve winter fuel security in New England, reducing the likelihood of rolling blackouts.

This is a tremendous opportunity for Maine and its ratepayers and the benefits are substantial. In reviewing the NECEC proposal, therefore, I urge the Department to consider the following items:

1. The cost of the "no action" alternative to Maine energy consumers, and the energy benefits of NECEC operation in balancing costs and benefits of NECEC pursuant to the reasonableness criteria of 38 M.R.S.A. §8480-D(1); 38 M.R.S.A. §8480-D(3); Chapter 315; Chapter 335; Chapter 375 and Chapter 375 §15.

2. New England, including Maine, suffers from a harmful energy status quo. ISO-NE operates the region's electric transmission grid and its wholesale electricity markets. The need for NECEC and its significant benefits therefore tie directly to the serious challenges the New England grid and electric markets face today and for the foreseeable future.

3. While New England's deregulated generation fleet has transitioned substantially to natural gas fired powerplants, New England's highest in the nation reliance on oil has caused Maine entities with oil heat to also transition to natural gas. The result in cold weather when gas heating demand peaks is that virtually no gas is available for power generation in New England. This problem is compounded by the inability in recent years to expand New England's gas

pipeline capacity to access gas from the very low cost Marcellus reserves less than 300 miles from Boston.

4. The shortage of natural gas in winter also is compounded by the recent and pending retirements of nearly 5,000 MW of New England's base load oil, coal and nuclear generation capacity, close to one-sixth of total New England generating capacity, as well as the permanent closure of the Sable Island and Deep Panuke natural gas fields off eastern Canada.

5. All of these factors combine to highly increase the cost of natural gas, and therefore the cost of electricity in winter. Just as importantly, these factors are threatening the very reliability of the electric grid, as ISO-New England has now warned of serious risk of rolling brownouts and blackouts as soon as 2024.

6. These three factors – expensive gas, expensive electricity and the risk of intermittent electricity supply – are extremely harmful to Maine's pulp and paper mills, other manufacturers and other businesses, even beyond the obvious harm to other consumers. Other competitors outside New England don't face these risks and their consequences. These risk and consequences have contributed to the closing of several Maine paper mills.

7. CMP's NECEC directly reduces all three of these risks. It will materially lower the cost of electricity in New England. It will reduce the need for natural gas by producing over 1000 MW of virtually base load power, simultaneously replacing 1000 MW of generation that has retired, making our grid less reliable. Lower gas demand means lower gas and electricity prices as well. It doesn't matter that Maine isn't buying power across NECEC; what matters is that someone else is, and that it substantially increases New England's electricity supply. NECEC increases Maine's fuel security.

II. Introduction and Credentials

My name is Glenn S. Poole of Orrington, Maine. I am an independent consultant testifying on behalf of Intervenor Group 3. I grew up in Monson, Maine, graduated from Monson Academy and then graduated with high honors in 1971 from the University of Maine in Orono with a degree in Electrical Engineering. During college and for a short time after, I worked for Bangor Hydro Electric Company. I then spent 45 years in the pulp and paper business, most of it at the paper mill in Bucksport, Maine. During my time in Bucksport, I participated in or led many projects, including oil, coal, tire derived fuel, biomass and natural gas for power and steam. I took on a corporate role and became Corporate Energy Manager for Verso Corporation (Verso), dealing with Verso mills in Maryland, Minnesota, Wisconsin, Michigan and Maine, and dealing with the electric utilities and Regional Transmission Organizations serving those states. I retired from Verso in December of 2016 and have been consulting for Verso on energy-related matters across the company since.

In my role as Corporate Energy Manager for Verso, my duties included:

- Managing the purchases of all fuels and electricity;
- Managing all sales of energy and capacity;
- Management of all transactions involving Renewable Energy Credits and Regional Greenhouse Gas Initiative allowances;
- Developing energy-related capital investments and major maintenance projects
- Assessing the energy impact of all proposed capital investments;
- Representing Verso before the Federal Energy Regulatory Commission, state legislative bodies, and state regulators;
- Energy risk management and development of hedging strategies; and
- Energy budgeting.

In addition to my direct energy experience working in pulp and paper, I have acquired extensive energy and New England electric grid knowledge through participation in energy advocacy groups and on regional energy committees and boards.

Before I summarize that participation, though, it will be useful to provide some background on organizations that will come up repeatedly in my testimony, the Federal Energy Regulatory Commission (FERC), ISO New England (ISO-NE) and the New England Power Pool (NEPOOL). FERC is an independent federal agency that regulates, among other things, the transmission and wholesale sales of electricity in interstate commerce, as well as electric reliability. ISO-NE is "the independent, not-for-profit company authorized by FERC to perform three critical, complex, interconnected roles for the region spanning Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and most of Maine."[1] Those roles are grid operation ("coordinate and direct the flow of electricity over the region's high-voltage transmission system"), market administration ("design, run, and oversee the billion-dollar markets that attract a large and diverse mix of participants to buy and sell wholesale electricity at the most competitive prices"), and power system planning ("do the studies, analyses, and planning to make sure New England's electricity needs will be met over the next 10 years").[2]

Finally, NEPOOL is the stakeholder voting organization that advises ISO-NE on all matters relating to New England's competitive wholesale electric market rules and transmission tariff design. Participants include generators, marketers, municipal utilities, transmission utilities, alternative energy providers, and consumers. It is through the NEPOOL stakeholder process that Participants develop positions on matters related to electricity markets and reliability. NEPOOL was voluntarily established in 1971 to coordinate New England's power system. In 1996, after FERC Orders 888 and 889 (which opened the interconnected transmission system owned and

[1] ISO-NE, "Our Three Critical Roles" website (viewed 2.20.19), available at https://www.iso-ne.com/about/what-we-do/three-roles/. ISO-NE's jurisdiction does not include portions of Aroostook County, which are interconnected only to New Brunswick Power in Canada.
[2] ISO NE, "Our Three Critical Roles" website (viewed 2.20.19), available at https://www.iso-ne.com/about/what-we-do/three-roles/.

operated by electric utilities to fair and nondiscriminatory access by independent generators—including Verso and its predecessors), NEPOOL proposed the creation of ISO-NE to independently manage the new open-access transmission system. Today, NEPOOL, ISO-NE, and FERC each play an important role in ensuring that New England has a competitively priced and reliable electricity supply—at least in theory.

With that background, my participation in advocacy groups and on regional committees and boards will make more sense. My advocacy became particularly focused in 1985, when Industrial Energy Consumer Group (IECG) was formed to lower and stabilize Maine energy costs. I served as IECG President or Vice President for many years. During my tenure, IECG participated in several important energy developments including:

- Energy deregulation in Maine (electric utilities divest generator assets);
- The creation of the Regional Greenhouse Gas Initiative;
- Full participation in the New England markets by Demand Response resources;
- Achieving consumer representation in a regional power pool for the first time; and
- Advocacy (still unsuccessful) for increased natural gas pipeline capacity into New England.

I also testified on behalf of IECG before the Maine Public Utilities Commission and the Federal Energy Regulatory Commission in a number of proceedings, including:

- *Re New England Power Pool*, 85 FERC ¶ 61,141 (1998); *Champion International Corporation and Bucksport Energy, LLC v. ISO-New England, Inc., New England Power Pool, and Central Maine Power Company*, 85 FERC ¶ 61,142 (1998) (relating to the appropriate interconnection standards for independent generators);
- *Re Public Utilities Commission, Investigation of Parameters for Exercising Authority Pursuant to Maine Energy Cost Reduction Act, 35 M.R.S.A. Section 1901*, Maine PUC Docket No. 2014-0071 (2015) (relating to the economic benefits that would be derived from construction of an interstate natural gas pipeline);
- *Re Bangor Gas Company, LLC, Request for Approval of Renewal of Multi-Year Rate Plan (35-A M.R.S. §4706)*, Maine PUC Docket No. 2012-00598 (2015) (regarding rate design issues);
- *Re Central Maine Power Company, Request for New Alternative Rate Plan ("ARP 2014")*, Maine PUC Docket No. 2013-00168 (2014) (regarding rate design principles for Central Maine Power);

- *Re Central Maine Power Company and Public Service of New Hampshire, Request for Certificate of Public Convenience and Necessity for Maine Power Reliability Program Consisting of Construction of Approximately 350 miles of 345 kV and 115 kV Transmission Lines,* Maine PUC Docket No. 2008-255 (2016) (regarding appropriate planning standards for electric transmission projects).

I remain an active participant in IECG today, as it continues to advocate for smart energy policy.

I began representing Verso at NEPOOL in 2010. My role expanded over time, and today, as a consultant to Verso, I represent Verso on the Participants Committee, the Markets Committee and the other NEPOOL Technical Committees. The Participants Committee "is NEPOOL's principal governing body, with authority to determine whether the organization supports changes in the ISO-NE Tariff, Market Rules, … or other procedures impacting the operation of the New England grid and the wholesale electric markets in New England … ."[3] The Participants Committee "is contractually tasked to represent NEPOOL's interests in regulatory and legal proceedings."[4] The Markets Committee "is responsible for reviewing and providing initial stakeholder input to ISO-NE and the Participants Committee on all changes to the design and operation of New England's wholesale electric markets."[5] As Verso's representative on these committees, I attend the monthly meetings, evaluate proposed changes to the market rules (whether by ISO-NE or other stakeholders), advocate for Verso's position, and vote accordingly. Currently, and of relevance later in my testimony, the Markets Committee is addressing ISO-NE's "interim" proposals to compensate generators for maintaining fuel inventory on the coldest days, as well as a longer-term proposal to deal with "fuel security."

Through my work with IECG and at NEPOOL, I have acquired a deep understanding of both the New England electricity and natural gas markets. Understanding these markets, and their

[3] NEPOOL, Annual Report 2018, at 28.
[4] NEPOOL, Annual Report 2018, at 29.
[5] NEPOOL, Annual Report 2018, at 30.

effects on reliability and prices, was critical to fulfilling my responsibilities as Corporate Energy Manager at Verso. It continues to be critical as I evaluate how these markets and market rule changes will affect Verso going forward.

In addition to my activities at Verso and through IECG, I was appointed by Governor Baldacci in 2009 to the inaugural Board of Directors of Efficiency Maine Trust and served as its board member representing the interests of industrials until 2013 when my term expired. I was also elected as the Chair of the Energy Resource Committee of the American Forest and Paper Association in January 2011 and served until October 2012.

III. Purpose of Testimony

The purpose of my testimony is to provide expert testimony addressing the energy-related benefits of the New England Clean Energy Connect project ("NECEC") from the perspective of an energy-intensive Maine manufacturer. For this purpose, Verso is just like most other energy consumers, just much larger. Energy benefits relate to the "reasonableness" standard that pervades the Natural Resources Protection Act, the Site Development of Location Act, and the various rules associated with those statutes. A common-sense approach to determining the reasonableness of any action balances the benefits of that action against its costs. In the case before the DEP today, I offer no opinion on the costs of the NECEC (i.e., perceived environmental impacts or harms), because I am not an environmental expert. My purpose is to urge the Department to consider and weigh appropriately the substantial energy benefits that will be delivered by the NECEC when determining whether its environmental costs are reasonable. My testimony relates to the following reasonableness inquiries:

Hearing Topic 1 ("Scenic Character and Existing Uses"):

- 38 M.R.S. §480-D (1) ("no unreasonable interference")
- Ch. 315 ("no unreasonable interference/adverse impact")

- Ch. 375 §14 ("no unreasonable effect")

Hearing Topic 2 ("Wildlife Habitat and Fisheries"):
- 38 M.R.S. §480-D (3) ("no unreasonable harm")
- Ch. 335 ("no unreasonable impact")
- Ch. 375 §15 ("no unreasonable disturbance")

Not constructing the NECEC (the no-action alternative) will perpetuate significant energy-related harm on Maine manufacturers (and all other Maine energy consumers alike) given New England's current energy circumstance. In that regard, my testimony will address the energy costs of not developing the NECEC given its specific purpose and need pursuant to Hearing Topic 3 "Alternatives Analysis."

IV. Energy-Related Costs and Benefits That Must Be Weighed in Making Reasonableness Determinations

a. Background: the Harmful Energy Status Quo in New England

During my time at and after my graduation from the University of Maine, I worked for Bangor Hydro Electric Company (now Emera Maine). This was right at the time NEPOOL was formed, and I attended some of the initial meetings of the NEPOOL committees. I left Bangor Hydro Electric Company in 1972 and started working at the Bucksport, Maine paper mill, owned by St. Regis at the time. Over the next 45 years I worked for the various owners of the mill, which included Champion International, International Paper, and Verso Corporation.

When I started at the Bucksport mill, there was about 25 megawatts ("MW') of generation located at the mill that directly served mill electricity demand. (Often the "use" of electricity is referred to as electricity demand or load.) By 2012, we had increased generation capacity to nearly 300 MW. I was directly involved in three major generation capacity additions, including being the project developer on a 175-MW combined-cycle gas turbine project with cogeneration. This project significantly increased generation at the mill, some of which was used to satisfy mill load,

the remainder being sold to the market by our project co-owner, Bucksport Energy. In the case of each capacity addition, additional on-site generation allowed us to take advantage of energy efficiency opportunities to better use the steam we produced (necessary to make paper) and to decrease our reliance on the region's electric grid. With the addition of the 175-MW gas turbine, significant emission reductions were also realized, as usage of #6 oil and coal decreased to nearly zero.

In 1972, energy was not a significant cost to mill operations. This was because New England generated much of its electricity using #6 fuel oil (called residual fuel oil), which cost only around $3.00 per barrel. Importantly, the cost difference between residual fuel oil in Maine and New England, and elsewhere in the U.S., and around the world was negligible then. Operating in Maine created no competitive disadvantage for the Bucksport mill or other similar mills across the state.

By 1985, though, the price of oil had increased by nearly 10 times, and energy became a far more critical cost to the Bucksport Mill and to all large energy users throughout Maine. With the increased price of oil, regions that relied more extensively on fuels other than oil (like hydro in Pacific Northwest (Bonneville) or Southeast (Tennessee Valley Authority)) developed a significant competitive advantage over more oil-dependent regions, especially New England. This was a contributing factor to our investments in electric generation capacity on-site, and to similar investments at the mills in Rumford, Jay, and Somerset.

In addition to making capital investments, St. Regis and other industrials invested time and money to form the Industrial Energy Consumer Group (IECG) in 1985. Through IECG, Maine manufacturers have advocated for lower energy costs in virtually every available forum, including FERC, ISO-NE, and the Maine Public Utilities Commission.

In the late 1990s, natural gas came to Maine from Nova Scotia and Quebec through two new pipelines. The Maritimes & Northeast Pipeline came down from Sable Island off of Nova Scotia through Maine connecting to existing New England gas infrastructure in Dracut, Massachusetts. The Portland Natural Gas Pipeline came down through Maine from Quebec, joining the Maritimes & Northeast Pipeline in Westbrook, Maine and continuing on to Dracut, Massachusetts as well. These pipelines changed the energy landscape in New England.

Over the next several years, five of the six New England states (the exception was Vermont) restructured their electric industries, removing generation from the vertically integrated electric utility monopoly and subjecting it to competition.[6] More efficient combined-cycle natural gas generators were able to take advantage of increased gas supplies into New England and quickly began out-competing inefficient legacy coal- and oil-fired generators that were constructed many decades earlier.[7] In 2000, natural gas accounted for 15% of the region's electricity generation, while coal and oil contributed a total of 40%; by 2018, natural gas produced 49% of the region's electricity, with coal and oil's combined contribution declining to just 2%.[8]

Besides being less expensive, natural gas is also far cleaner and more efficient than coal and oil, producing fewer air pollutants and more electricity per BTU of fuel input. Thus, as natural gas eroded coal and oil's electric market share, annual emissions fell considerably. From 2001 to 2017, New England annual emissions for sulfur dioxide, nitrogen oxides, and carbon dioxide

[6] ISO NE, "Markets" website (viewed 2.20.19), available at https://www.iso-ne.com/about/key-stats/markets/.
[7] ISO NE, "Resource Mix" website (viewed 2.20.19), available at https://www.iso-ne.com/about/key-stats/resource-mix.
[8] ISO NE, "New England Power Grid 2018-2019 Profile" available at https://www.iso-ne.com/static-assets/documents/2019/01/new_england_power_grid_regional_profile_2018-2019.pdf.

declined by 98%, 74%, and 34%, respectively.[9] If the story ended here, I would not be testifying. Sadly, it does not.

b. The Costs of Natural Gas Pipeline Constraints

For most of the year, New England's natural gas prices are at historically low levels, leading to historically low electricity prices and further emissions reductions due to burning natural gas rather than fuel oil or coal. But winter in New England is a different beast. Because New England produces no natural gas and because the gas fields off Nova Scotia are no longer producing natural gas, New England must import natural gas via a network of interstate pipelines or by tanker ship in the form of liquefied natural gas or LNG. The legacy pipeline network was designed and built long ago for local gas utilities to meet heating demand. Such gas utilities have a legal obligation to serve their customers (backstopped by regulators who ensure cost-recovery), so they are able to buy long-term rights to the space on natural gas pipelines to ensure their ability to serve. In the winter, when temperatures drop, and heating demand rises, gas utilities use up nearly all available pipeline capacity, leaving little to no fuel flowing over the pipelines for the region's new generator fleet—a fleet comprised of competing generators with no legal obligation to serve and no financial backstop to enable the purchase of new pipeline capacity (if it could ever be permitted in New England). To make matters worse, natural gas has become increasingly popular for heating in lieu of oil or propane, though New England remains the most oil-reliant region of country by a wide margin and is primed for even more gas conversions. While demand for natural gas in New England has grown precipitously for heat and electricity, the region's

[9] ISO NE, "New England Power Grid 2018-2019 Profile" available at https://www.iso-ne.com/static-assets/documents/2019/01/new_england_power_grid_regional_profile_2018-2019.pdf.

pipeline capacity has remained largely static, leading to severe wintertime pipeline congestion or constraints. The effects of these constraints manifest predominantly in the electric sector.[10]

Finally, the gas pipeline problem impacts only New England. On the coldest days of the year in other regions of the country such as the Pacific Northwest, the Upper Midwest, and the Southeast, where Maine's chief paper mill competitors are located, natural gas prices barely budge. Each of these regions is served with ample pipeline capacity that brings very cheap natural gas from the Marcellus and Utica regions in Western Pennsylvania and Ohio, the Dakotas, Texas, and the Oklahoma panhandle to their doors. Meanwhile, Maine and the rest of New England cannot get access to the lowest cost gas in the world, only 300 miles away in the prolific Marcellus Shale. Instead, this gas flows west into the Midwest and south into the Southeast where it feeds our competitors.

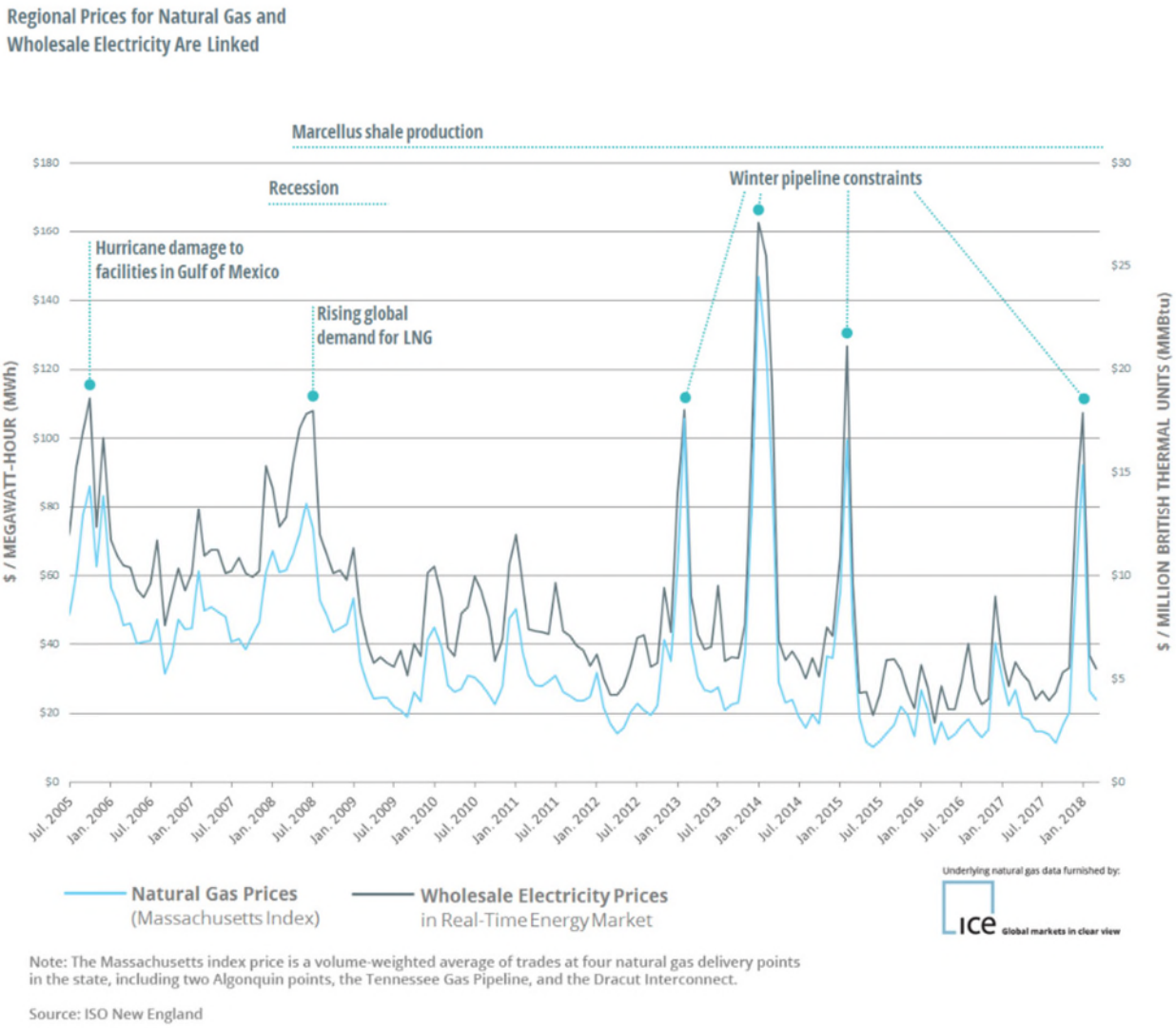
Natural gas pipeline constraints are devastating in myriad ways. They create extreme electric price volatility, pose a serious and growing electric reliability risk, cause increased electric sector emissions, and reduce the electric grid's ability to balance desirable intermittent solar and wind resources. ISO-NE describes each of these harmful effects on its "Natural Gas Infrastructure Constraints" website, attached hereto as Exhibit IG3-1-A.

I'd like to highlight some portions of this website. First, ISO-NE notes that "New England winters are unpredictable." Sophisticated energy consumers like Verso, account for winter risk by hedging, effectively buying winter "insurance". The problem is that insurance is expensive – and the cost of such insurance is directly related to the risks of price volatility. This only further adds to New England's disproportionately high annual energy costs. Even when winter is benign, Maine

[10] This problem is so severe in Western Massachusetts that local gas utilities have had to declare moratoria on new customer conversions and hook-ups.

manufacturers still pay the insurance that their sister mills outside of New England do not. Second, New England's geographic disadvantage (being "at the end of the pipeline") has created an additional electric reliability disadvantage. As I will discuss in more detail below, the lack of reliable natural gas supplies has led to those responsible for ensuring the lights do not go out to raise concerns about their ability to provide reliable electric service. This concern simply does not exist anywhere else in the country.. As long as management perceives a risk, it is real to Verso. When ISO-NE makes statements about New England's relatively more acute risks, it becomes increasingly hard to justify capital investment here. It is bad enough being at the "end of the pipeline" without year-round access to Marcellus Shale. Now, we're apparently at the "end of the transmission line" too with more risk of electric grid failure than our competitors face elsewhere. Finally, if the increasing risk of a "perfect storm" materializes, ISO-NE could be forced to order rolling blackouts. ISO-NE's alarming conclusion is that: "[w]ithout timely action and investment to address the region's fuel-security risk, the region should expect significant energy market price volatility when the gas pipelines are constrained. Plus, the region may soon be forced to take stronger—and likely costly—steps. … As a last resort, the region could have to retain some non-gas-fired generators that would otherwise retire. These may be older, expensive, and higher-emitting—a strategy that runs counter to the New England states' ambitious carbon-reduction goals." We all know that when blackouts are required, residential customers, government facilities, emergency care centers and the like will take precedence over large manufacturing companies.

The following graph shows the correlation between natural gas and electricity prices in New England and the effects of pipeline constraints, which can create the highest prices for electricity and natural gas in the world.



Note: The Massachusetts index price is a volume-weighted average of trades at four natural gas delivery points in the state, including two Algonquin points, the Tennessee Gas Pipeline, and the Dracut Interconnect.

Source: ISO New England

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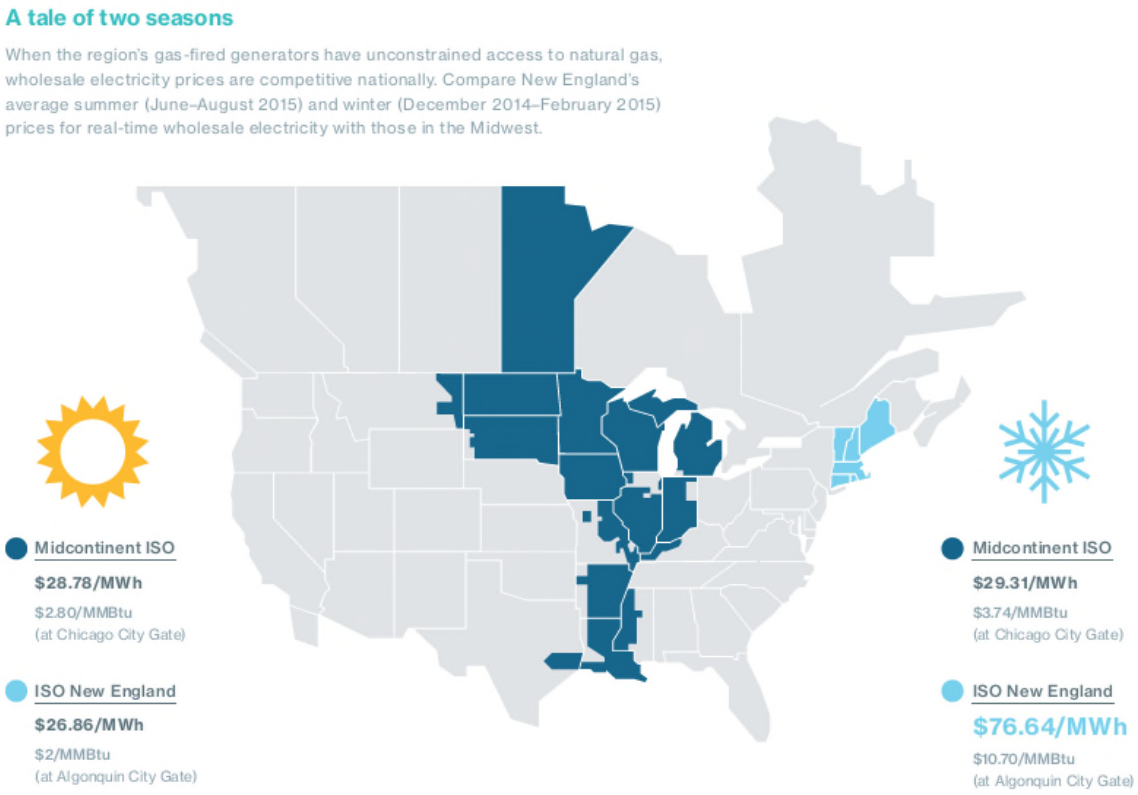
When natural gas pipeline constraints occur, the financial consequences to many Maine manufacturers can be devastating. Beyond our end-of-the-pipeline geographical disadvantage, physics plays a role. For example, simply put, turning wood into paper requires enormous amounts of energy. Even with many projects aimed at improving energy efficiency, high and volatile energy costs have become an increasingly heavy burden for many Maine industrials. Even those mills not

[11] ISO NE, "Markets" website (viewed 2.20.19), available at https://www.iso-ne.com/about/key-stats/markets/.

using natural gas cannot escape the consequences, since the price of natural gas is reflected in the price of electricity they surely use, in enormous quantities.

The problem crystalized in the winter of 2013-14, during the so-called "Polar Vortex," when heating demand for gas drove prices beyond anyone's wildest expectations. For example, as explained by ISO-NE, "gas price spikes during the frigid winter of 2013/2014 (December–February) led to a record-high average wholesale electricity price of $137.59/megawatt-hour (MWh) compared to just $27.58 MWh during the 2015/2016 'winter that wasn't.'"[12] On some cold winter days mills found themselves paying 20 times more for electricity than their sister mills were paying in the Pacific Northwest, the Upper Midwest, and the Southeast. Even in the less severe winter of 2014/2015, the impacts were staggering, as New England's average winter price for electricity tripled the winter price for electricity in the Midwest and everywhere else in the country.

[12] ISO NE, "Natural Gas Infrastructure Constraints," website (viewed February 20, 2018), available at https://www.iso-ne.com/about/regional-electricity-outlook/grid-in-transition-opportunities-and-challenges/natural-gas-infrastructure-constraints.



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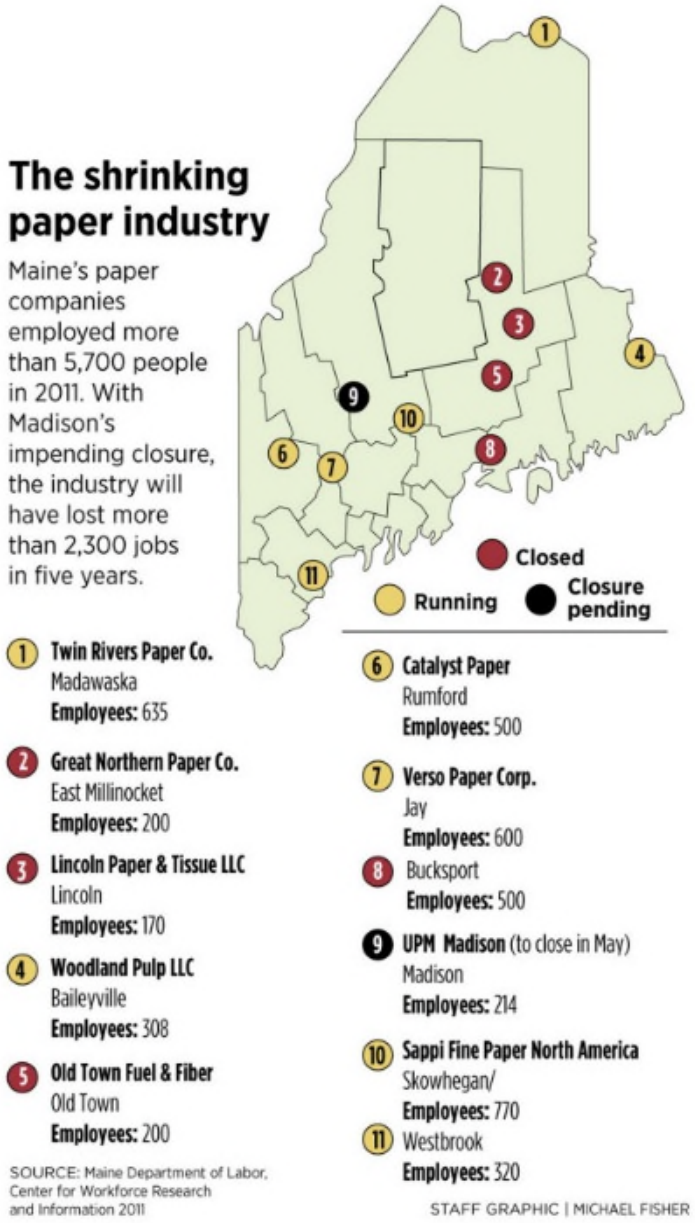
It may be hard for those not familiar with the operation of major manufacturers, such as paper mills, to fully appreciate the financial impact of pipeline constraints. By way of example, the electricity load of major paper mill may be 150 MW, which means in just one day, the mill may consume over 3.5 million kilowatt-hours of electricity. For perspective, that is equivalent to the annual electricity consumption of about 700 typical homes. The difference in prices noted above, between the three-month Polar Vortex winter months and those same months during "the winter that wasn't" is over $35 million worth of unexpected and thus unbudgeted costs borne by a mill.

[13] ISO New England, 2016 Regional Electricity Outlook, at 24.

For Maine industrials trying to budget energy costs, these incredible levels of uncertainty not experienced by competitors operating in any other place in the United States or Canada have made business decisions exceedingly complex. Uncertainty coupled with competitive disadvantage has become a major factor in both investment and operating decisions. Investment decisions are made many years in advance and operating decisions are made weeks in advance, neither of which is compatible with levels of uncertainty in New England's energy markets. To deal with this situation, some Maine mills were forced to idle during all or part of some winter months when either demand was soft (and other mills outside of New England could produce at a lower cost) or energy and other operating costs were expected to exceed product revenue. Idling a capital-intensive operation like a paper mill is an unsustainable approach, as product must be produced to cover all the capital and fixed operating costs. Many mills were not able to survive and ceased operation. Verso ceased operation of its Bucksport mill in December of 2014 and by 2016, all six paper mills that had once operated on the Penobscot River had shut down, including the four that had operated for decades shown in the chart below.[14] In 2016, the Madison, Maine paper mill owned by Madison Paper Industries and employing 214 Mainers closed, noting that energy costs were a major factor.[15]

The mills and other industrials that do continue to operate in Maine are still subject to high natural gas and electric prices and extreme price fluctuations driven by winter weather. This uncertainty is dangerous to an industry where the cost of energy can be as high as 25% of the total cost of production.

[14] Portland Press Herald, "Shutdown of Madison mill is state's fifth in two years," (March 14, 2016).
[15] Portland Press Herald, "Shutdown of Madison mill is state's fifth in two years," (March 14, 2016).



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Of course, it isn't just industrials that are hurt by natural gas pipeline constraints and energy price volatility, but in many respects, industrials serve as the "canary in the coal mine" because they consume so much energy. In fact, all electric and gas customers are subject to these high and

[16] Portland Press Herald, "Shutdown of Madison mill is state's fifth in two years," (March 14, 2016).

fluctuating prices on an almost proportionate basis, but they are typically served under retail contracts that mask wholesale volatility over a period of years. Moreover, because their monthly bills are relatively small, a large percentage increase is more easily overlooked.

The Maine Public Utilities Commission has stated, for example:

> It is estimated that wholesale electricity prices associated with Maine load were $185 million greater in the 2012/13 winter than in the winter of 2011/12, even though the 2012/13 winter was comparatively mild. More than two thirds of that total increase was attributable to just two months: January and February 2013. ISO-NE estimates that New England consumers paid $3 billion more for electricity during December, January and February of 2013-14 than they would have had adequate pipeline capacity from the south existed.[17]

It is worth nothing that the last figure cited applies to New England, of which Maine's demand is only around 9%, so roughly $270 million would be attributable to Maine electricity consumers. The point is that all Maine electric ratepayers were on the hook for over $450 million of excess electric costs caused by insufficient pipeline capacity in just two winters. They are still on the same hook – nothing has changed that would relieve them of this burden.

c. The Imminent New England Fuel Security Crisis

"Fuel security" risk is not merely a topic related to natural gas pipeline constraints, but a looming distinct challenge for all Maine energy consumers. ISO-NE describes the fuel security challenge gripping New England on its "Fuel Security for the Region's Generators" website, attached hereto as Exhibit IG3-1-B. I would like to highlight a few important aspects of that website, because they demonstrate the cost of not approving the NECEC.

[17] *Investigation of Parameters for Exercising Authority Pursuant to the Maine Energy Cost Reduction Act, 35-A M.R.S. §1901*, Order – Phase 1, at 15 (Me. P.U.C. Nov. 13, 2014) (internal citations omitted).

ISO-NE defines fuel security as "ensuring that power plants have or can get the fuel they need to run, particularly in winter" and characterizes fuel security as "the foremost challenge to ensuring a reliable power grid in New England."[18] ISO-NE has become increasingly concerned that, despite sufficient electric generation capacity to meet peak electricity demand, there will be insufficient fuel for that capacity to create electricity. It's like having three cars in your driveway with no gasoline and no way to get gasoline. The challenges are made worse by the fact that generators with the ability to store fuel (e.g., oil, coal, nuclear, liquefied natural gas (LNG)) are rapidly retiring due to economic and environmental pressures. The remaining stored-fuel generators have difficulty, especially in winter, replenishing their fuel stocks due to weather and global market forces. As this is occurring, New England is also rapidly transforming to a system that depends on electricity generated by resources that get their fuel "just-in-time" or whenever it is available (e.g., solar, wind, and pipeline natural gas), which exacerbates the problem. In the winter, at peak demand around 6:30 p.m., the sun is never shining, the wind might not be blowing, and if it's very cold, 100% of the region's natural gas pipeline capacity may be used up for heating.

To begin addressing "fuel security," ISO-NE performed a study, the "Operational Fuel-Security Analysis," in January of 2018. The study examined 23 possible future resource combinations and outage scenarios during winter 2024/2025 to determine whether there would be enough fuel to meet demand. Twenty-two scenarios required some sort of emergency action and/or resulted in reliability criteria violations by ISO-NE. Nineteen scenarios required some level of load shedding, meaning "rolling blackouts or controlled outages that disconnect blocks of customers sequentially." Major variables in the study included resource retirements, LNG availability, oil

[18] ISO NE, "Fuel Security for the Region's Generators" website (viewed 2.20.19), available at https://www.iso-ne.com/about/regional-electricity-outlook/grid-in-transition-opportunities-and-challenges/fuel-security.

tank inventories, imported electricity, and renewable resources. Notably, ISO-NE found "[r]obust levels of imported electricity from neighboring power systems are essential to continued power system reliability."[19] It concluded that:

> A resource mix with higher levels of LNG, imports, and renewables shows less system stress than the reference case. These scenarios, while based on resources dependent on uncontrollable factors—the global LNG market, the coincident winter demands of regions exporting power to New England, and weather—result in fewer hours of emergency actions, depletion of reserves, and load shedding. To achieve these levels of LNG, imports, and renewables, firm contracts for LNG delivery, assurances that electricity imports will be delivered in winter, and aggressive development of renewables, including expansion of the transmission system to import more clean energy from neighboring systems, would be required.[20]

Make no mistake about it – the phrase "expansion of the transmission system to import more clean energy from neighboring systems" means importing more electricity from Hydro Quebec over the NECEC line or any other line that can be built.

In its recent "State of the Grid" address, ISO-NE stated "[w]hile it will bring benefits, the evolving resource mix could also intensify the risk that there may not be enough energy to meet demand on the coldest days in winter. As the fleet shifts away from power plants with stored fuels to resources that depend on weather or just-in-time fuel deliveries, the risk of insufficient energy is likely to expand to other times of the year as well."[21] ISO-NE notes that emerging energy storage technologies will help during short-term emergencies (i.e., lasting several hours), but not for emergencies that last for days or weeks, like a typical cold snap or "Polar Vortex" winter. However, "[n]atural gas pipeline constraints and the variability of renewable resources create a need for "seasonal" energy storage that can provide energy security for extended periods. For the foreseeable future, seasonal storage will be provided by oil and LNG in storage tanks, as well as

[19] ISO-NE, "Operational Fuel-Security Analysis" (January 17, 2018), at 51.
[20] ISO-NE, "Operational Fuel-Security Analysis" (January 17, 2018), at 54 (emphasis added).
[21] ISO-NE, "State of the Grid: 2019," remarks and presentation, at 9 (February 20, 2019) (emphasis added).

imports from resources with onsite energy, such as hydro."[22] This quotation unquestionably refers to Hydro Quebec and additional transmission into New England, which at this point is only provided incrementally by NECEC.

Thus, for the foreseeable future until increased transmission is built to reliably import Canadian hydropower on the coldest days, fuel constraints will continue to sideline thousands of megawatts of natural-gas-fired generation that would otherwise meet electric demands. When that happens, ISO-NE will turn to power plants with stored fuel—specifically coal, oil, and LNG, if available—to meet demand. Emissions from these "stored fuel" generators will be higher than the region would otherwise experience, causing increases in carbon dioxide emissions that fly in the face of regional and Maine policy goals and laws aimed at mitigating climate change. Further, some of these generators have seasonal or annual emission limits which restrict their availability during the times they are needed most, thereby exacerbating the generation shortage and the probability of blackouts.

This is not a hypothetical or future situation; New England is facing this problem today. For example, when the Exelon Generation Company, LLC (Exelon) sought to retire Mystic Units 8 and 9 (fueled by LNG) in Boston Harbor, ISO-NE responded by petitioning FERC for waiver of several rules and to permit ISO-NE to offer Exelon an above-market contract for retention of those units based on ISO-NE's fear that winter grid reliability would be at risk.[23] Ultimately, FERC approved an above-market, cost-of-service agreement to keep Mystic Units 8 and 9 operational

[22] ISO-NE, "State of the Grid: 2019," remarks and presentation, at 17 (February 20, 2019) (emphasis added).
[23] *See* 164 FERC ¶ 61,003, *ISO New England Inc.*, ORDER DENYING WAIVER REQUEST, INSTITUTING SECTION 206 PROCEEDING, AND EXTENDING DEADLINES (July 2, 2018).

through 2024, at a cost of over $400 million, which will be paid for by all New England electricity consumers, including Maine manufacturers and other electricity consumers.[24]

Based on a finding that ISO-NE's Tariff "fails to address specific regional fuel security concerns … that could result in reliability violations as soon as year 2022," FERC also ordered ISO-NE to file interim tariff revisions that provide for further short-term, cost-of-service agreements as well as permanent tariff revisions "to better address regional fuel security concerns."[25]

ISO-NE is indeed proceeding further and further down this path. On December 3, 2018, FERC approved ISO-NE's interim proposal to use an out-of-market mechanism to address fuel security concerns.[26] At recent NEPOOL meetings I have attended, ISO-NE has proposed market rule changes that will provide additional compensation to generators that have fuel stored on cold winter days. One objective is to "[r]educe the likelihood that an (otherwise economic) resource seeks to retire because it is not fully compensated for its winter energy security attributes in the wholesale markets."[27] These proposed rule changes, along with the costs of keeping Mystic Units 8 and 9 operating, would create a cost to be borne by all electricity consumers in New England.

Although it is not large enough to fully resolve New England's fuel security issues, NECEC will help in address the problem without imposing additional costs for its fuel security benefits on New England consumers. Because the energy that will be transmitted over NECEC will be from hydroelectric units, NECEC will provide substantial fuel diversity and security benefits in hours

[24] *See* 165 FERC ¶ 61,267, *Constellation Mystic Power, LLC*, ORDER ACCEPTING AGREEMENT, SUBJECT TO CONDITION, AND DIRECTING BRIEFS (December 20, 2018).
[25] 164 FERC ¶ 61,003.
[26] See 165 FERC ¶ 61,202, ISO New England Inc., ORDER ACCEPTING COMPLIANCE FILING AND REQUIRING INFORMATIONAL FILINGS (December 3, 2018).
[27] ISO-NE, "Interim Compensation Treatment: Details of ISO's Interim Winter Energy Security Proposal" at 3 (February 5, 2019).

during which natural gas supply is constrained, such as peak winter hours. In this manner, it will provide a service similar to that of a small natural gas pipeline, effectively equivalent to the supply of gas necessary to serve a generator with a capacity of 1090 MW.

d. The Energy Benefits of NECEC

While the proposed NECEC project will not be a cure-all, it will significantly help Maine manufacturers deal with energy costs and uncertainty in several ways.

First, it is my opinion that that the NECEC will materially lower electricity prices in Maine. It stands to reason that injecting 1090 MW of firm hydroelectric supply around the clock for 20 years will depress electricity prices in Maine. The New England grid currently has approximately 31,000 MW of installed generation capacity. On an energy basis, the NECEC would provide 9,400 GWh/year to Massachusetts via a connection to the regional grid in Lewiston, Maine. This represents about 7.5% of the amount of New England's electricity demand. Just by virtue of its size and certain price certainty, NECEC will benefit Maine electric (and natural gas) consumers.

My opinion is shared by virtually every consultant that has examined this issue. For example, I have also reviewed reports by Daymark Energy Advisors ("Daymark") and London Economics International ("LEI") submitted as part of the Maine Public Utilities Commission's proceeding to determine whether to grant a "certificate of public convenient and necessity" to NECEC.[28]

In its report, Daymark calculated that the energy associated with the contract between HQ and the Massachusetts utilities would provide average annual benefits to Maine customers over

[28] Central Maine Power Company, Request for Approval of CPCN for the New England Clean Energy Connect Consisting of the Construction of a 1,200 MW HVDC Transmission Line from the Québec-Maine Border to Lewiston (NECEC) and Related Network Upgrades, Docket No. 2017-00232.

the 20 year contract of approximately $40 million, providing a net present value of energy market savings to Maine customers of approximately $454 million.[29] This would translate into an average price reduction of $3.38/MWh.[30] When the potential benefits of the uncommitted portion of the line are considered, the benefits to Maine consumers rise to $44 million per year (net present value $496 million, an average price reduction of $3.70/MWh.[31]

The Maine Public Utilities Commission retained LEI to prepare an independent analysis of the wholesale electricity market impacts of the NECEC ("LEI Report").[32] LEI "estimates that NECEC would provide Maine $346 million (in 2023 dollars) in wholesale electricity market benefits over the first 15 years of operation (2023-2037)."[33] Of the $346 million, LEI estimates that "$122 million is expected to come from wholesale energy market savings (average of $14 million per year in nominal dollars)."[34] I have no reason to doubt the conclusions of Daymark, but to err on the side of caution I will discuss the more conservative findings of LEI.

Again, LEI estimates about $14 million dollars in wholesale electricity savings per year for Maine consumers. The savings predicted by LEI is caused by price suppression, a phenomenon that can be explained by the construct and dynamics of the New England wholesale electricity market. If permitted to grossly oversimplify, let me try to explain.

Maine is part of a regional wholesale electricity market administered by ISO-NE. Wholesale electricity prices are one large component of the retail price that consumers like Verso

[29] Daniel E. Peaco, Douglas A. Smith and Jeffrey D. Bower, NECEC Transmission Project: Benefits to Maine Ratepayers – Quantitative & Qualitative Benefits (September 27, 2017) at p. 11, included as Exhibit 5 to CMP's initial filing in Maine PUC Docket No. 2017-00232 (the "Daymark Report").
[30] Daymark Report, at 11.
[31] Daymark Report, at 11.
[32] London Economics, *Independent Analysis of Electricity Market and Macroeconomic Benefits of the New England Clean Energy Connect Project*, public version (May 21, 2018) ("LEI Report").
[33] LEI Report, at 18.
[34] LEI Report, at 18.

pay for electricity. In the ISO-NE energy market, electricity generators compete each day to meet the region's demand. The generators bid (based primarily on their fuel costs) a price at which they would be willing to produce a certain quantity of electricity. ISO-NE collects the bids and stacks them up from lowest- to highest-cost, forming the supply "bid stack." Subject to certain constraints, ISO-NE dispatches generators from the bid stack in least-cost order until regional electricity demand has been met. The bid price of the last generator needed to meet demand, the marginal generator, sets the market-clearing price that all generators dispatched by ISO-NE receive for their output. The generators whose bids bid were too high, and thus were not dispatched, do not operate and receive no compensation. The generators whose bids were low, some as low as zero (or even negative), earn the differential between their bid and the market-clearing price as revenue.

The 1,090 MW of Hydro Quebec generation delivered into Maine over the NECEC will bid into the bid stack at $0/MWh. Bidding at zero, and being a price-taker, is the only way that the NECEC can ensure that it is selected by ISO-NE to be dispatched in every hour of every day throughout the year and therefore satisfy its contractual obligation to deliver energy to Massachusetts. This conclusion is supported by LEI, which states:

> Pursuant to Avangrid's commitment under the MA RFP, LEI assumed that NECEC delivers energy around the clock, totaling [redacted] GWh per year (spread evenly across all hours). LEI also assumed that the shippers on NECEC would offer as price takers in the wholesale energy market in order to fulfill their contractual obligations to Massachusetts. By virtue of these energy sales, other more expensive generation resources will not be dispatched and consequently, the market clearing price for energy (i.e., Locational Marginal Prices ("LMPs")) will decline ... .[35]

The energy delivered via the NECEC will displace electricity that would otherwise be supplied by higher-cost generators that must account for costs of fuel such as natural gas, oil, coal, or biomass. In every hour that this occurs, the market clearing price for electricity will be lowered by some

[35] LEI Report, at 18.

amount, depending on the marginal generator. Indeed, the energy delivered via the NECEC will displace the highest cost unit in every hour that it operates, lowering the market clearing price from the price bid by the displaced unit to the price bid by the next highest priced bidder not displaced by energy from the NECEC. Because the market clearing price is paid to all successful bidders, regardless of the price that they themselves bid, this represents a price reduction for every kilowatt hour sold in such hours.

This price suppression is well-timed and very important for Maine manufacturers. It will help level the playing field, as we compete with others across the U.S. While the extent of the price suppression is difficult to predict, there should be no doubt that it will occur. LEI's estimate is more conservative than Daymark's and well within the range of reason in my opinion.

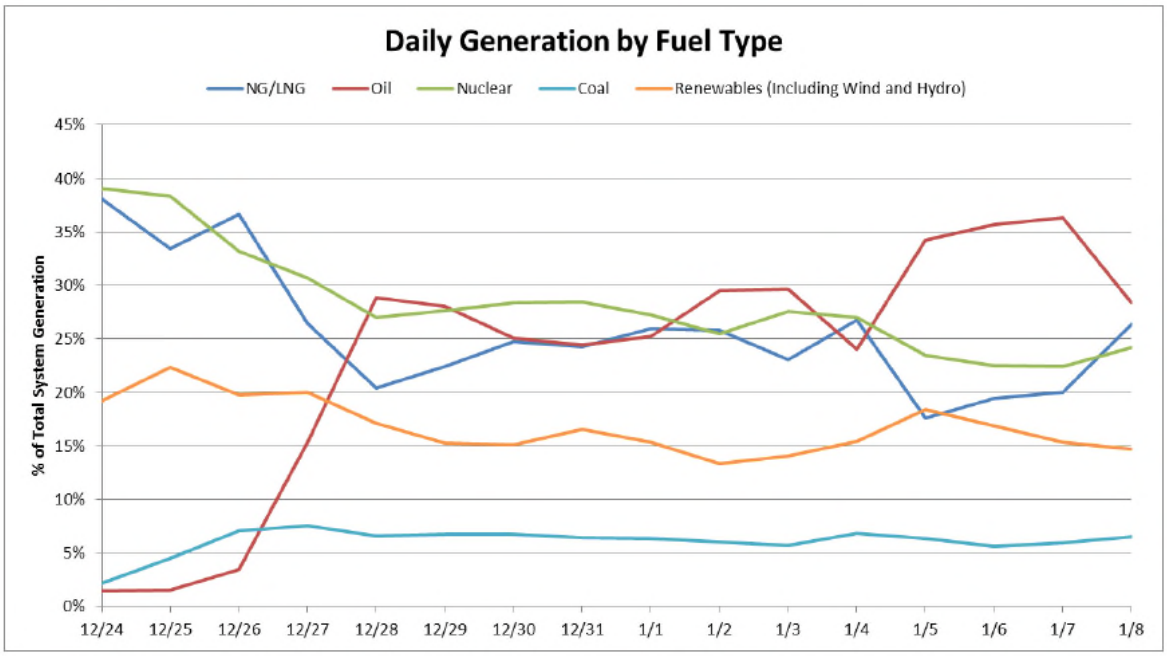
Further, beyond this direct electricity savings, for most of the year, the NECEC's incremental energy will displace natural gas on the margin. Natural-gas-fired generators set the real-time electricity price about 70% of the time.[36] 1,090 MW of hydro will thus displace one or more natural gas generators on the margin about 70% of the time. Those displaced generators will not be dispatched or consume gas, so demand for natural gas will decrease, which will alleviate pipeline constraints and reduce the price of gas transportation. Industrials who consume gas directly for their processes will benefit from the indirect price suppression of natural gas prices.

In the winter, when heating demand is so high that natural gas generators cannot operate due to pipeline constraints, the 1,090 MW of hydro will displace high-cost coal- or oil-fired generators, leading to electricity price suppression and substantial emissions savings. This will create the additional benefit of conserving storable fuels for extreme cold snaps, thus improving

[36] ISO NE, "Markets" website (viewed 2.20.19), available at https://www.iso-ne.com/about/key-stats/markets/.

regional reliability and reducing fuel security risk. Consider what happened during the severe cold snap experienced from about December 26, 2018 through January 8, 2018.

Daily Generation by Fuel Type (Percent of total)



[37]

Coal and oil generation jumped from about 2% to over 40% at times and over 30% for a 13-day period. Natural gas generation declined to under 20% at times and about 25% during the same 13-day period. During this stretch, New England's usable fuel oil stores were depleted from 68% to 19% in just eight days.[38] As noted by ISO NE, "[a]s gas became uneconomic, the entire season's oil supply rapidly depleted" and "[w]ith extended days of burning oil, several resources either had concerns about hitting federal and/or state emissions limitations or were impacted by emissions limitations." What would have happened if New England experienced just two or three more days

[37] ISO New England, "Cold Weather Operations: December 24, 2017 – January 8, 2018," slide 12 (January 16, 2018).
[38] ISO New England, "Cold Weather Operations: December 24, 2017 – January 8, 2018," slide 21 (January 16, 2018).

of frigid weather? The NECEC provides an additional level of insurance for Maine manufacturers—at no cost to us—if the next cold snap lasts longer than expected.

LEI, to some extent, has attempted to value this insurance. Its base price suppression calculation excludes extremes. To capture the potential insurance value that NECEC could provide LEI ran its market model for actual periods during which New England suffered extreme weather condition with and without NECEC.[39] LEI concluded that NECEC could have resulted, for instance, in $6.0 million in wholesale energy market savings for Maine between the five-day period from January 24-28, 2014, representing a 12% reduction in wholesale energy market costs during that period.[40] It performed a similar analysis for an extreme summer period, and found that NECEC could provide $4.3 million in wholesale energy market savings during such an event.[41]

In summary, the energy-related benefits of the NECEC line include the following:

- Price suppression and increased certainty in the energy market
- Price suppression and increased certainty in the natural gas market
- Reduced fuel security risk and emissions associated with oil- and coal-fired resources in winter

If the NECEC is not built, the benefits outlined above will not be realized. It also will send a message to industrials and others that, when the State of Maine had a chance to do something to help lower electric and natural gas prices and decrease the risk of the Maine business climate, it chose not to. The NECEC presents as opportunity to send a very different, and positive, message about Maine.

[39] LEI Report, at 11-12.
[40] LEI Report, at 12.
[41] LEI Report, at 12.

Dated at Orrington, Maine this 28th day of February, 2019

by: Glenn S Poole
Glenn S. Poole

State of Maine
Penobscot, ss

The aforenamed Glenn S. Poole did personally appear before me and made oath as to the truth of the foregoing pre-filed testimony.

Andrew Landry
Attorney at Law
Bar Number 3589

Natural Gas Infrastructure Constraints

During the last few years, inadequate infrastructure to transport natural gas has at times affected the ability of natural-gas-fired plants to get the fuel they need to perform. This fuel-security risk has become a pressing concern in New England, considering the major role natural-gas-fired generation plays in keeping the lights on and setting prices for wholesale electricity.

The performance of the largest and most flexible sector of generators is weakened by insufficient pipeline and storage capacity

New England Has Benefited from Natural-Gas-Fired-Generation

In 2000, natural gas fueled just 15% of the region's electricity. Since then, it has become the dominant fuel used to produce electricity in New England, displacing higher emitting and less economic power plants. With supply from the nearby Marcellus Shale and relatively

low construction costs, natural gas continues to be a top fuel choice for new generators. These new power plants are not only some of the most efficient in the country, but in the world. (Learn about the resource mix.)

The shift to natural gas has benefited the region in many ways:

- The use of relatively clean-burning natural gas, along with emission controls on fossil-fuel-burning generators and other factors, has contributed to a significant long-term decline in regional air emissions.
- Natural gas prices, typically lower than other fossil fuels for most of the year, have helped the annual energy market value remain well below its high of $12 billion in 2008 and reach record lows in 2016. Fuel costs are typically one of the major inputs in the wholesale price of electricity. Follow the effects of natural gas in the ISO's monthly analyses of electricity prices and demand.
- The ability of many natural-gas-fired plants to change output quickly helps to balance the variations in output from increasing levels of intermittent power resources that rely on the wind and sun.

Access to Fuel Has Become Uncertain during Winter

During many recent winters, regional gas utilities have been using most, if not all, of the capacity on the pipelines that carry natural gas into New England. This is particularly true during very cold periods when heating demand is high. This leaves very little to no pipeline capacity for electric generators, which creates a number of concerns for the power system:

- Reliability risks: Because such a large and still growing quantity of the region's generating capacity uses natural gas (learn more at Key Stats—Resource Mix), its unavailability can pose a serious risk to the reliable supply of electricity. This is particularly true when non-gas-fired resources are also unavailable, for example, due to:
  - Mechanical problems for some of the region's aging non-gas-fired generators

Reduced imports from neighboring grids dealing with the same weather

Delayed oil and LNG deliveries

Fuel-security risk is not as apparent during mild winters, when heating demand for natural gas is lower and there's more natural gas available for generators. However, New England winters are unpredictable. On the coldest days, fuel constraints could sideline thousands of megawatts of natural-gas-fired generation. When that happens, system operators turn to power plants with stored fuel—coal, oil, or nuclear—to meet demand. If the region were to experience a "perfect storm" of problems with grid resources, ISO system operators could be forced to use special measures to protect the grid. Those could include asking the public to conserve electricity or, in extreme cases, ordering load shedding (rolling blackouts affecting blocks of customers). This risk is likely to grow unless the region can find ways to offset the loss of more non-gas-fired power resources as they retire, as detailed in the ISO's *Operational Fuel-Security Analysis*.

Price volatility: Similarly, the price of natural gas tends to spike as temperatures drop and demand for the fuel increases. This has an immediate effect on wholesale electricity prices. For example, gas price spikes during the frigid winter of 2013/2014 (December–February) led to a record-high average wholesale electricity price of $137.59/megawatt-hour (MWh) compared to just $27.58 MWh during the 2015/2016 "winter that wasn't." See how prices for wholesale electricity track natural gas. More recently, price spikes were again experienced during cold snaps during December 2017 and January 2018.

Air emissions: Pipeline constraints can also affect regional air emissions during winter because the ISO has to run higher-emitting generators when gas-fired units can't access fuel or when the price of natural gas spikes.

Pipeline Development Hasn't Kept Pace with Demand

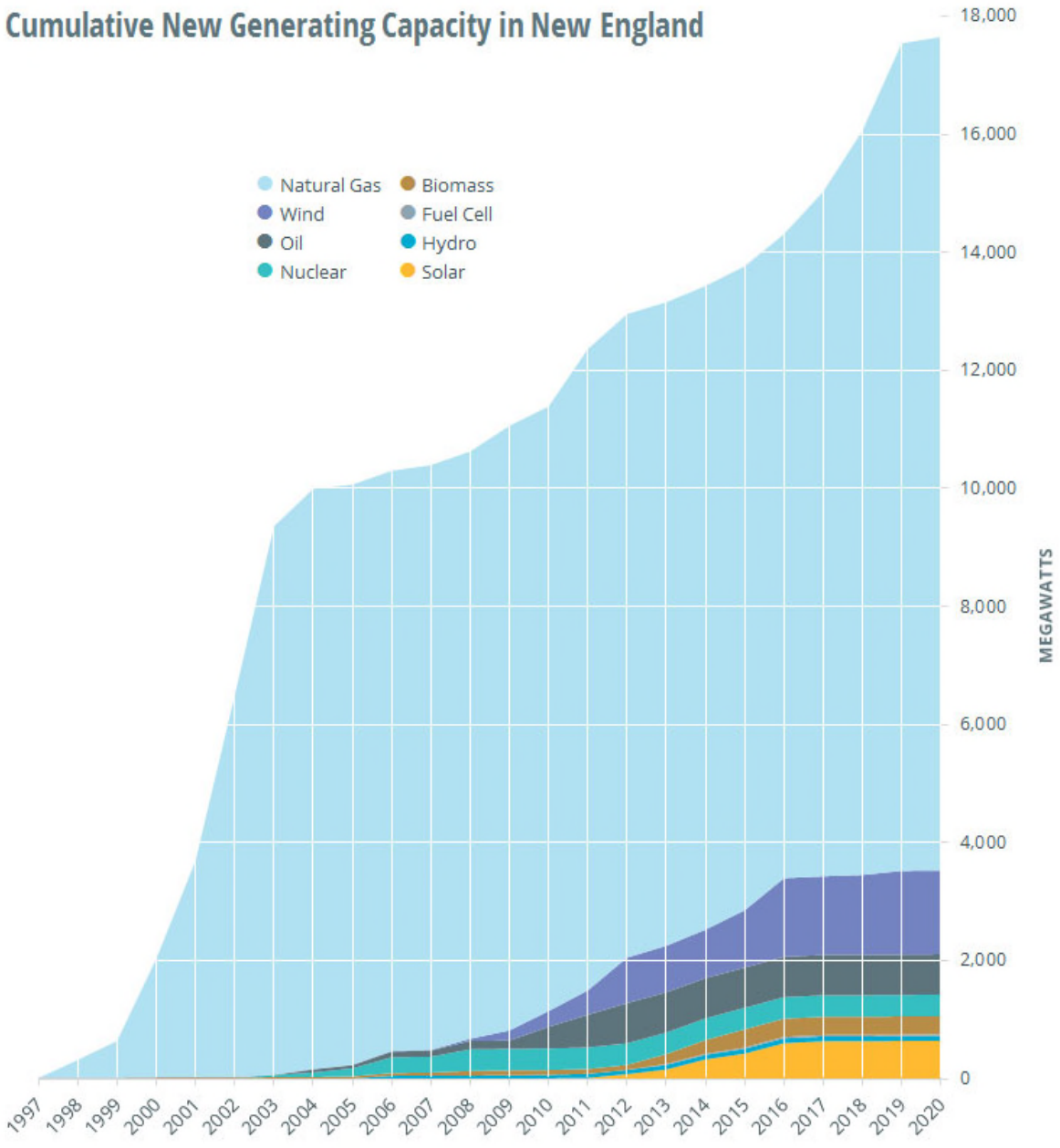
Fuel-security risks may be more acute in New England than in most other regions because New England is “at the end of the pipeline" when it comes to natural gas and the other fuels used most often to generate the region’s power. New England has no indigenous fossil fuels and therefore, fuels must be delivered by pipeline, ship, truck, or barge from distant places. Additionally, the natural gas pipeline system within New England is relatively small, and its access to the rest of the North American pipeline network is limited. This also makes the region vulnerable to pipeline interruptions. In regions with a more robust pipeline network, a failure at a single point on the pipeline system typically can be contained to a local area and routed around, but such an outage in New England will likely create significant impacts, as detailed in the ISO’s *Operational Fuel-Security Analysis.*

The tremendous growth in natural-gas-fired generating capacity is shown in the graph below. But the natural gas pipelines that deliver low-cost shale gas into the region have not been expanded at a commensurate pace. Further, pipelines are built and sized to serve customers with firm contracts for capacity, typically gas utilities, not electricity generators.

> Gas utilities commit to the long-term contracts required for incentivizing pipeline development.
>
> Generators, on the other hand, typically forego these premium contracts, instead arranging for fuel only as needed and relying on unused pipeline capacity for delivery.

Because generators have no guarantee for when or how long they’ll be called to run—and there’s no practical way for them to store excess pipeline gas or electricity on site—contracting for pipeline capacity only when needed helps natural-gas-fired generators keep their costs as low as possible to maintain competitiveness in the wholesale electricity markets.

While that strategy works for most of the year, on cold days the pipelines are running at or near maximum capacity solely to meet heating demand. During several recent winters, this situation has severely limited the delivery of fuel to much of the region’s power plants, which, in turn, threatened the reliable supply of electricity and drove up wholesale electricity prices and air emissions.



Note: New generating capacity for years 2016–2020 includes resources clearing in recent Forward Capacity Auctions.

Source: ISO New England

Some incremental pipeline capacity has been added recently under contract to gas utilities to serve increased demand from their retail gas customers. Over the next few winters, some of this capacity will likely be available for generators on the coldest days, helping to lessen fuel supply concerns and volatility in wholesale electricity prices. However, this extra capacity will eventually be used for heating, as gas utilities sign up more customers. To compound matters, most of the benefit from additional fuel available to generators on the coldest days will be canceled out as new natural-gas-fired generators fill the void of retiring non-gas-fired power plants. In other words, though the pipeline "pie" may be getting bigger, there will be more mouths to feed. When it comes to the power system's ability to meet electricity demand on the coldest days, the results may be a wash.

Generators Running on Oil also Raise Fuel-Security Concerns

Fuel security isn't just about natural gas. Adequate arrangements for oil delivery are also a concern for both generators that run exclusively on this fuel source and those natural-gas-fired generators that have the ability to switch to oil. That's why the ISO has been working to ensure these generators are properly incentivized to fill up their oil tanks before winter sets in.

"Dual-fuel technology" that allows generators to switch to oil may be the most cost-effective investment natural-gas-fired generators might take to ensure they can run when pipelines are constrained. However, state restrictions on air emissions may limit their ability to run on oil. Consequently, more natural gas plants may need to turn to LNG in winter when pipeline gas is unavailable or its price spikes.

Will Imported Liquefied Natural Gas (LNG) Fill the Gap?

While more natural-gas-fired generators may turn to LNG, several factors can impede generators' access to LNG when it's most needed.

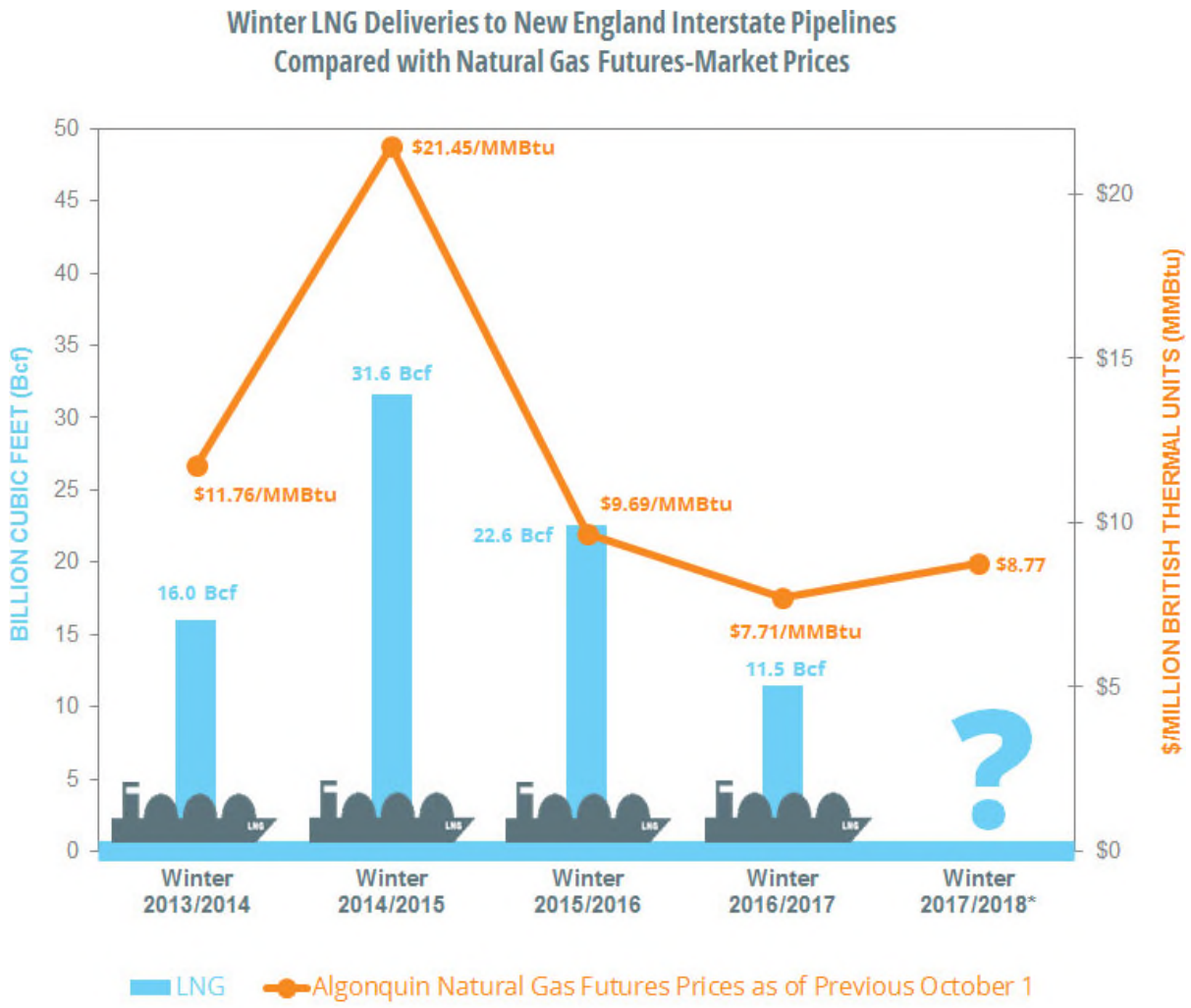
First, LNG is a global commodity that's imported to New England by ocean-going tankers, so it must

be contracted for months in advance—an option most generators elect not to pursue.

Second, the arrival of any spot LNG cargoes depends on global prices and vary from year to year; they also supply the entire Northeast and beyond—not just New England generators.

Third, severe weather could prevent the timely arrival of ships.

Over recent years, the ISO's Winter Reliability Program has helped incentivize a small number of generators to secure contracts for winter deliveries of LNG. These types of contracts, as well as the construction of on-site LNG storage, are among the options generators could invest in to satisfy upcoming performance requirements in the capacity market.



Note: Graph does not include the Mystic 8 and 9 gas-fired generators' fuel supply from the LNG facility.

*The preliminary total through mid-January 2018 was about 15.1 Bcf; more deliveries are expected before winter's end.

Source: LNG data from NatGas Analyst Tool by Genscape, a part of DMG Information (DMGI), www.genscape.com, based on scheduled deliveries posted to gas-industry bulletin boards. Futures data from *Winter Energy Market Assessment*, FERC (2014–2015, 2015–2016, and 2016–2017), and CME Group/NYMEX and OTC Global Holdings futures.

Will Adding More Renewables Help During Winter?

Wind and solar resources can offset some natural gas use, but their help with the fuel-security challenge is limited by still-low levels of regional installation, as well as the timing of their availability. Learn more in Integration of Renewable Resources and Other New

Technologies and in the ISO's *Operational Fuel-Security Analysis.*

The ISO's Efforts Have Mitigated the Fuel-Security Risk but Will Not Solve the Problem

Addressing the fuel-security issue is currently the region's highest-priority challenge. While the ISO doesn't have the authority to require generators to make long-term investments in fuel supplies, we have been developing tactics for the past six years to mitigate the fuel-security risk, such as:

- Developing new situational awareness and forecasting tools for our system operators to confirm fuel availability for natural-gas-fired units
- Improving communication and coordination with interstate pipeline operators
- Implementing Winter Reliability Programs that pay demand-response resources to be available and generators to boost winter fuel inventories of oil and LNG or to invest in dual-fuel technology (the ability to switch between different fuels, typically natural gas and oil)
- Fine-tuning the energy markets to strengthen resource performance
- Instituting "pay for performance" (PFP) enhancements that, starting in 2018, will reward resources that make the investments needed to ensure performance during periods of system stress, such as by contracting for adequate fuel, while resources that don't perform will forfeit capacity payments

While these efforts help, they are unlikely to result in a timely "fix": PFP incentives (i.e., the rate for PFP payment or forfeiture) will ramp up only gradually through 2024. Additionally, many states' increasingly stringent air emission limitations may prevent natural-gas-fired generators from installing cost-effective oil-fired backup fuel systems. As a result, the region's winter reliability concerns will continue until generators decide to sign contracts for LNG or greater natural gas pipeline capacity.

The Region May Face Expensive, Higher-Polluting Options in the Coming Years

Without timely action and investment to address the region's fuel-security risk, the region should expect significant energy market price volatility when the gas pipelines are constrained. Plus, the region may soon be forced to take stronger—and likely costly—steps.

> For example, a first step could be to further strengthen market incentives for generators to contract for fuel.
>
> As a last resort, the region could have to retain some non-gas-fired generators that would otherwise retire. These may be older, expensive, and higher-emitting—a strategy that runs counter to the New England states' ambitious carbon-reduction goals.

The ISO's *Operational Fuel-Security Analysis* sought to quantify the reliability risk so the region could discuss potential solutions with stakeholders as part of the Operational Fuel-Security Analysis Key Project.

Fuel Security for the Region's Generators

The dependable performance of New England's fleet of power plants is the cornerstone of a reliable supply of electricity, but that performance hinges on their access to fuel. Fuel-security challenges have been a growing concern, particularly for generators that run on natural gas, but also for others, such as those that either run primarily on oil or use it as an alternate fuel. To help the ISO and the region better understand the fuel-security risk and discuss how to address it, the ISO conducted a study to quantify the future risk. The findings of the Operational Fuel-Security Analysis are documented in a report issued for regional discussion in January 2018.

Download the *Operational Fuel-Security Analysis* (January 2018), the *Addendum to the Operational Fuel-Security Analysis* containing additional scenarios and sensitivities requested by stakeholders, or visit the *Operational Fuel-Security Analysis Key Project page* to see additional related materials.

Overview of the Region's Fuel-Security Risk

Fuel security—ensuring that power plants have or can get the fuel they need to run, particularly in winter—is

the foremost challenge to ensuring a reliable power grid in New England. Past operating experiences and current industry trends raise concerns about the future power system. New England has no indigenous fossil fuels and therefore, fuels must be delivered by ship, truck, pipeline, or barge from distant places. A dependable fuel supply for the region requires a fuel-delivery system that has the appropriate physical capability to transport all the fuel needed, the contractual arrangements secured in advance to ensure timely deliveries, and power plants that have fuel storage on site.

The region's fuel-security risk has been evident to the ISO since a 2004 cold snap when more than 6,000 MW of natural-gas-fired generation was unavailable, due to pipeline constraints, economic outages, and operational issues. Similar challenges have continued to crop up during cold spells in recent winters, including the most recent one in late December 2017 and early January 2018. Because the reliability of the power system was maintained throughout these events, the region's electricity consumers have been shielded from this growing risk, apart from severe price spikes some winters that eventually showed up in retail rates. However, there is a real risk that the region's fuel-security risk could worsen to the point that the ISO would be required to take more severe emergency actions to keep the lights on and protect the power grid during winter. These actions could include public pleas for electricity conservation, voltage reductions (brownouts)—and, as a last resort, load shedding (rolling blackouts).

Several factors make fuel security a growing concern:

- The regional power system is increasingly dependent on natural gas for power generation.
- The capacity of the region's natural gas infrastructure is not always adequate to deliver all the gas needed for both heating and power generation during winter.
- Natural gas is the fuel of choice for a large segment of new power plant proposals.
- The region's coal, oil, and nuclear power plants, which have fuel stored on site and are essential for reliability when natural gas is in short supply, are

retiring under increasing economic and environmental pressures.

The region has limited dual-fuel generating capability—that is, generators that can use either natural gas or oil—and emissions restrictions on burning oil are tightening.

The Operational Fuel-Security Analysis

For its analysis, the ISO chose to study the effects of a wide range of possible future power resource combinations that could materialize by winter 2024/2025, as well as the outages of several key energy resources. Actual power grid conditions could change earlier or later than winter 2024/2025. However, that year was chosen because:

The outlook for power system reliability by winter 2024/2025 is uncertain, largely due to the expected retirements of non-gas-fired power resources in the next decade.

The years until winter 2024 give the region time to address these challenges.

> The study results should not be construed as precise predictions. Rather, they provide a basis for comparing the fuel-security risk of each of the hypothetical resource combinations modeled.

The following are some highlights from the ISO's analysis. Please read the full report for details.

ISO New England studied 23 possible future resource combinations and outage scenarios during winter 2024/2025 to determine whether enough fuel would be available to meet demand and to quantify the operational risks.

These scenarios, while not a precise prediction of the future system, seek to illustrate the range of potential risks that could confront a power system if fuel and energy were constrained during winter.

The goal is for the ISO and the region to better understand these risks and inform the ISO's

subsequent discussions with stakeholders on how to mitigate them.

The study assumed that no additional natural gas pipeline capacity to serve generators would be added within the timeframe of this study and focused instead on five other variables that are likely to be key factors in power system reliability. Notable findings regarding each variable:

- Resource retirements—The retirements of coal-fired, oil-fired, and nuclear generators—resources with fuel stored on site—will have a significant impact on reliability and magnify the importance of other variables, particularly liquefied natural gas (LNG) supplies.
- LNG availability—Improving generators' advance arrangements for timely winter deliveries of LNG could significantly reduce fuel-security risk, while reduced volumes of this global commodity would raise risk.
- Oil tank inventories—The availability of oil stored in tanks on site is a key reliability factor and depends on the extent to which natural-gas-fired generators are able to add dual-fuel capability to burn oil, how often they can run on oil, and whether they have oil when needed.
- *Imported electricity*—Expanding access to electricity from neighboring power systems would help mitigate fuel-security risk but would require investment in transmission infrastructure.
- Renewable resources—Accelerating the growth of renewable resources would enhance fuel security but would not eliminate reliance on LNG. It also would likely lead to more non-gas-fired resource retirements and require transmission investment.

Energy shortfalls due to inadequate fuel would occur with almost every fuel-mix scenario in winter 2024/2025, requiring frequent use of emergency actions to keep power flowing and protect the grid. Emergency actions that would be visible to the public range from requests for energy conservation to load shedding (rolling blackouts affecting blocks of customers).

The study's findings suggest six major conclusions:

1. Outages: The region is vulnerable to the season-long outage of any of several major energy facilities.
2. Stored fuels: Power system reliability is heavily dependent on LNG and electricity imports; more dual-fuel capability is also a key reliability factor, but permitting for construction and emissions is difficult.
3. Logistics: The timely availability of fuel is critical, highlighting the importance of fuel-delivery logistics.
4. Risk trends: All but four scenarios result in fuel shortages requiring load shedding, indicating the trends affecting New England's power system may intensify the region's fuel-security risk.
5. Renewables: More renewable resources can help lessen the region's fuel-security risk but are likely to drive coal- and oil-fired generation retirements, requiring high LNG imports to counteract the loss of stored fuels.
6. Positive outcomes: Higher levels of LNG, imports, and renewables can minimize system stress and maintain reliability; to attain these higher levels, delivery assurances for LNG and electricity imports, as well as transmission expansion, will be needed.

The ISO has been discussing the study with regional stakeholders to determine the operational or market design measures that may be needed to address the region's fuel-security risk. See the Operational Fuel-Security Analysis Key Project page.

Current Trends Are Pushing the Power System toward Greater Risk

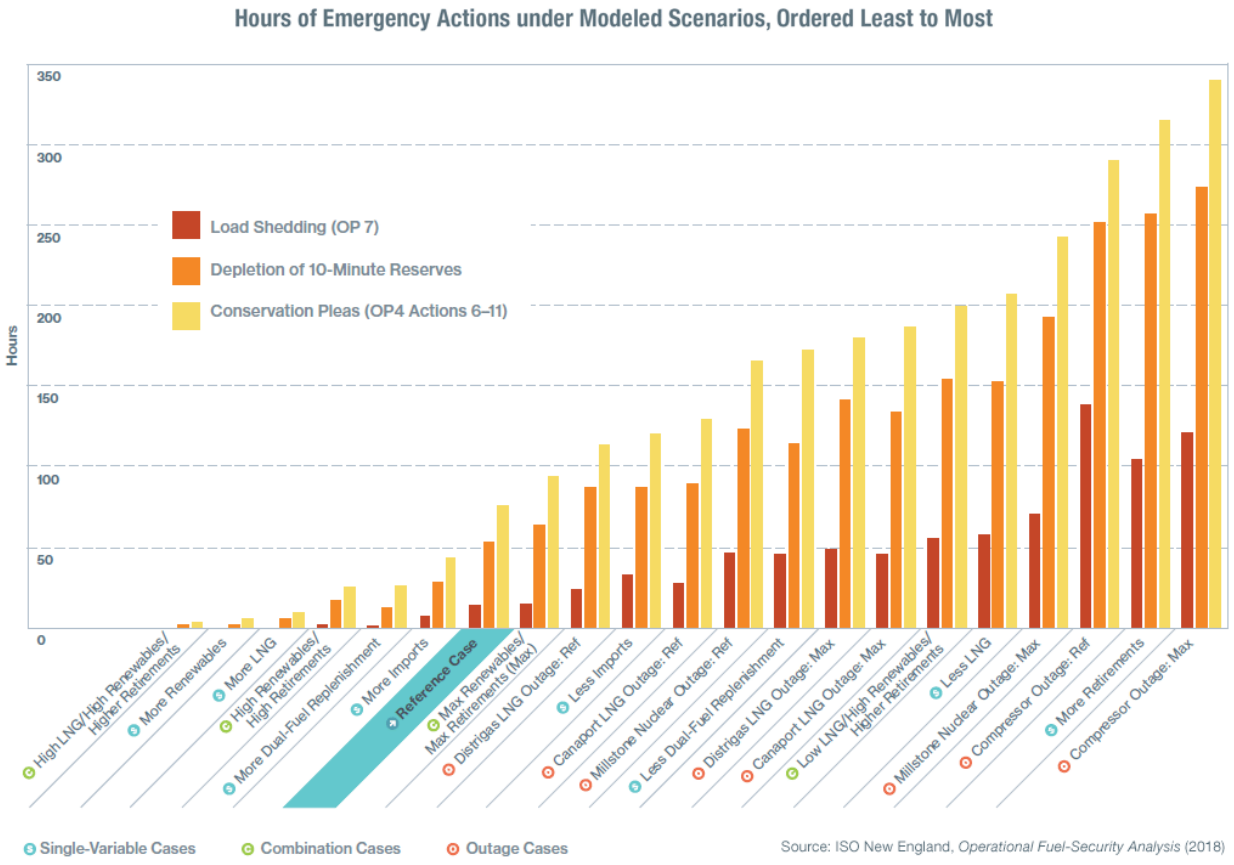
The graph below from the report illustrates the hours of different emergency actions required to maintain power system reliability in the 23 modeled scenarios. These emergency actions were among the metrics used to quantify risk.

Operating Procedure No. 4 (OP 4), Action during a Capacity Deficiency, is the procedure used most often in the ISO control room to keep supply and demand in balance. Hours of OP 4 Actions 6–11 can include voltage reductions and urgent public appeals to conserve electricity.

If OP 4 actions aren't sufficient, the ISO could deplete the system's 10-minute reserves to keep the lights on. However, reserves are the system's "insurance policy." Without them, the system is vulnerable. To maintain system balance, controlled outages—rolling blackouts—could become necessary.

As a last resort to protect the grid, the ISO would implement Operating Procedure No. 7 (OP 7), Action in an Emergency. OP 7 involves load shedding, also known as rolling blackouts or controlled outages that disconnect blocks of customers sequentially.

One of the report's major conclusions is that the trends affecting the New England power system are moving in a negative direction. All but one of the 23 modeled scenarios (the high boundary case—that is, with all variables modeled at the most favorable levels—not shown here because it is unlikely to materialize) would lead to some level of emergency actions during winter 2024/2025, as well as hours when the ISO would have to deplete 10-minute reserves. All but four scenarios would require some level of load shedding. (The low boundary case—that is, with all variables modeled at unfavorable levels—resulted in even more hours of emergency actions but was omitted because it also is unlikely.) For more details, read the report and see Appendix A, which includes a matrix of the inputs to and results of each of the modeled scenarios.



Follow the Process

Read about all the measures taken to date by the ISO to mitigate the fuel-security risk.

Read the Addendum to the Operational Fuel-Security Analysis, which contains the results of additional scenarios and sensitivities run by the ISO, as requested by regional stakeholders.

Visit the Operational Fuel-Security Analysis Key Project page to see additional related materials.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

and

STATE OF MAINE
LAND USE PLANNING COMMISSION

IN THE MATTER OF

CENTRAL MAINE POWER COMPANY	)
NEW ENGLAND CLEAN ENERGY CONNECT	)
#L-27625-26-A-N/#L-27625-TG-B-N/	)
#L-27625-2C-C-N/#L-27625-VP-D-N/	)
#L-27625-IW-E-N	)
CENTRAL MAINE POWER COMPANY	)
NEW ENGLAND CLEAN ENERGY CONNECT	)
SITE LAW CERTIFICATION SLC-9	)
Beattie Twp, Lowelltown Twp, Skinner Twp,	)
Appleton Twp, T5 R7 BKP WKR,	)
Hobbstown Twp, Bradstreet Twp,	)
Parlin Pond Twp, West Forks Plt, Moxie Gore,	)
The Forks Plt, Bald Mountain Twp, Concord Twp	)

PRE-FILED DIRECT TESTIMONY OF EDWARD A. BARRETT

February 28, 2019

Edward A. Barrett being duly sworn submits this pre-filed testimony as follows:

1. I have a B.A. Degree and an M.A. Degree in Political Science from the University of Dayton. I have worked in various capacities in municipal governments for over 40 years. I was City Manager in Bangor for over 20 years. I was appointed City Administrator in Lewiston in January 2010. I am a member of the International City Management Association and the Maine Town and City Management Association.

2. The City of Lewiston intervened in support of this project because its direct and indirect economic benefits will be substantial both in the City of Lewiston and throughout the State.

3. The City will be most substantially and directly affected by the proposed project because the proposal is to construct a converter station within the City to convert direct current to alternating current and to install new transmission lines and upgrade existing transmission lines within the community. The anticipated investment in Lewiston is estimated to be in excess of $250 million. This investment will substantially expand the City's tax base with profound beneficial effects. Based on FY 2016 data, Lewiston's assessed value per capital was $60,690 by far the lowest among Maine's ten largest municipalities where the average is over $114,000 per capita. Using U.S. Census Bureau July 1, 2017 population estimates and Maine Revenue Service 2018 data, Lewiston's per capita assessed value was approximately $61,728, still the lowest of any of the ten largest cities in Maine. At the same time, the community's median household income ($39,890) is only about 75% of Maine's overall ($53,024) and the City's poverty rate of 21.4% is 93% higher than Maine's poverty rate of 11.1%.

4. Lewiston's per capita operating expenses were the lowest among the ten largest Maine cities at only $903 per capita as against an average of $1,248. Despite the low per capita operating expenses, the City's low assessed value mathematically results in a high and burdensome municipal tax rate, particularly in light of the City's low median income and high poverty rates. After completion of the project, beginning in 2023, Lewiston anticipates receiving approximately $8.39 million in additional revenue that is badly needed to meet the community's public service needs while also reducing the property tax burden.

5. In recent years, Lewiston has welcomed a significant number of immigrants and refugees, most of whom are not native English speakers. Many of these new members of the community understandably need additional support and educational and social services to adjust to their new lives here in Maine. Likewise, about two-thirds of the students in Lewiston schools come from economically challenged backgrounds with one-third present or former English language learners. The additional tax revenues are sorely needed to address these needs and will be of enduring value in our community.

6. Evidence in the PUC proceedings forecasts, on average, over 1,600 direct, indirect and induced Maine jobs each year during the six-year development and construction period and an annual average of 291 jobs to be added during the operations period from 2023 to 2037. Because the new converter station will be constructed and operated in Lewiston, a significant proportion of those jobs will be in and near Lewiston and will generate additional economic activity rippling through our community.

7. There is no serious basis for supposing that the demand for energy in the coming decades will be less, and there is every reason to forecast that it will be greater. This project adds capacity to the New England Grid which can only result in benefits in terms of availability, wholesale cost, and retail cost of electric energy in Lewiston and throughout

Maine. Lewiston itself is a significant user of electricity, and any reduction in the City's expenditures for electricity will further benefit the community.

8. Overall, construction of the project as proposed will generate substantial, direct and indirect benefits to the City of Lewiston itself and to the community it serves. Those benefits are in the form of materially improved municipal tax revenues as a consequence of increased municipal valuation, new jobs introducing additional money into the community, which in turn ripples through the economy and strengthens our community, and improvements in the reliability, availability, and cost of electric energy for the City itself and to facilitate the City's efforts at economic development.

9. Given these benefits, it is my opinion that, if and to the extent that the Project has any adverse effect on any existing scenic, aesthetic, or recreation uses, any such effect will not be unreasonable.

Respectfully submitted,

Date: 2-28-19

Edward A. Barrett

STATE OF Maine

COUNTY OF Kennebec, February 28, 2019

The above-named Edward A. Barrett personally appeared before me and gave oath that the pre-filed testimony herein above is true and correct to the best of his knowledge, information and belief.

Garrett Corbin-Cuttle

Notary Public Bar No. 4396

My commission expires: Aug. 31, 2019

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

and

STATE OF MAINE
LAND USE PLANNING COMMISSION

IN THE MATTER OF

CENTRAL MAINE POWER COMPANY	)
NEW ENGLAND CLEAN ENERGY CONNECT	)
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Hobbstown Twp, Bradstreet Twp,	)
Parlin Pond Twp, West Forks Plt, Moxie Gore,	)
The Forks Plt, Bald Mountain Twp, Concord Twp	)

PRE-FILED DIRECT TESTIMONY OF
DANA CONNORS

February 28, 2019

Dana F. Connors being duly sworn submits this pre-filed testimony as follows:

1. I am a native of Easton, Maine. I received my B.A. in public management from the University of Maine. I served as City Manager in Presque Isle from 1968-1984. I served as Commissioner of the Maine Department of Transportation for 11 years, through the last three years of the Brennan Administration and the entire McKernan Administration. As Commissioner, I had statewide responsibilities and opportunities to become familiar with the entire State and its infrastructure. Since 1994 I have served as President of the Maine State Chamber of Commerce with a membership of 5,000 businesses throughout the State of Maine that, in the aggregate, employ hundreds of thousands of Mainers. The

Chamber's mission is to advocate not only for the businesses and their interests, but for the larger economic development and prosperity objectives of all people in Maine. The Chamber has intervened to support this project for several reasons.

2. The Chamber supports the delivery of clean hydropower into our regional transmission grid. There is no question that there will be continuing and escalating demands for energy in Maine and that any addition to the supply will be a welcome influence on the price. High energy costs are a problem for Maine businesses, especially Maine businesses that compete with companies in other parts of this country or other countries where energy costs are lower. Our surveys show that energy prices are a concern of our members. Maine's energy costs are also a problem for the State in developing or attracting new businesses. On information and belief, all the experts in the PUC proceeding on this Project agreed that the addition of wholesale supply will reduce wholesale prices for the benefit of every energy customer in New England.

3. The tangible property to be constructed, as the project is developed and completed, will become part of the property tax base of the host communities and generate much needed relief in those communities whether it is realized as a reduction in the tax rate or an increase in badly needed municipal services.

4. The project is expected to generate, on average, over 1,600 direct, indirect and induced Maine jobs each year during the six-year development and construction period. Over 850 of those jobs are direct jobs and the remainder will be indirect and induced. It need not be assumed that all of the indirect and induced jobs will simply disappear when construction is complete. It is the Chamber's experience that some of that work is likely to transition to other economic activity which will benefit not only those who are employed, but the communities in which they live and spend their money, as well as the State at large.

5. After completion and during operation it is anticipated that the project will generate almost 300 Maine jobs on average year in and year out during the operation period.

6. The jobs to be created by NECEC are steady, good paying jobs. It is the Chamber's judgment that the employment opportunities to be created by NECEC provide a concrete and substantial benefit, not only for the host communities but for the State as a whole.

7. Although not yet finalized, it is appropriate to consider the importance of the very substantial broadband benefits provided for in the stipulation now pending in the Public Utilities Commission. The stipulation calls for the final design of the NECEC transmission lines to include the necessary facilities and equipment to provide additional fiber optic capacity for the benefit of the State, and especially the host communities. This includes up to $2 million to study and, if feasible, to implement and construct a fiber optic connection between the State of Maine and the fiber optic network serving

Montreal which in turn will connect Maine with New York and Chicago without having to confront the capacity issues associated with the Boston connection. This added broadband capacity will facilitate Maine's ability to participate in the clean technology-based economic development opportunities available to those who have such broadband capacity. This is important for the State but especially for the host communities in western Maine.

8. Given these benefits, it is my opinion that, if and to the extent that the Project has any adverse effect on any scenic, aesthetic, or recreation uses, any such effect will not be unreasonable.

Respectfully submitted,

Date: 2-25-19

Dana F. Connors

STATE OF Maine

COUNTY OF Kennebec

February 25, 2019

The above-named Dana F. Connors personally appeared before me and gave oath that the pre-filed testimony herein above is true and correct to the best of his knowledge, information and belief.

Notary Public

My commission expires: ME Bar # 9208