EXHIBIT NO. TLB-1

Prepared Direct Testimony of
Tanya L. Bodell

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STATE OF MAINE PUBLIC UTILITIES COMMISSION

DOCKET NO. 2017-00232

PREPARED DIRECT TESTIMONY OF

TANYA L. BODELL

ON BEHALF OF CALPINE CORPORATION

April 30, 2017

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STATE OF MAINE PUBLIC UTILITIES COMMISSION

CENTRAL MAINE POWER COMPANY REQUEST FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF THE NEW ENGLAND CLEAN ENERGY CONNECT (NECEC) TRANSMISSION PROJECT	**DOCKET No. 2017-00232**

PREPARED DIRECT TESTIMONY OF TANYA L. BODELL

I. INTRODUCTION

Q: PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A: My name is Tanya L. Bodell. I am the Executive Director of Energyzt Advisors, LLC and co-founder of the Energyzt companies, which include Energyzt Development Partners, LLC and Energyzt Analytics, LLC. I am based in Boston, Massachusetts. My business address is PO Box 174, Cohasset, MA, 02025.

Q: WHAT ARE YOUR DUTIES IN YOUR CURRENT POSITION?

A: As the Executive Director of Energyzt, a global collaboration of energy experts who create value for clients investing in the energy industry, I manage the business operations of the Energyzt entities and provide advisory services to clients on business strategy and investment decisions. I also am responsible for overseeing the development and maintenance of our power market models and the quantitative analyses of industry data that allow our clients to make informed investment decisions. Our analytical service

offerings include energy market assessments, long-term price projections using fundamental analyses, and probability-driven analyses to create a distribution of potential outcomes and risk assessments. We also provide financial assessments of energy assets for purposes of valuation, refinancing and restructuring.

Q: PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE.

A: I have been a consultant for nearly twenty-five years, providing business advice and expert support to market participants, regulators and policy makers in the energy industry in general and the power sector in particular. Prior to establishing Energyzt in 2012, I was a Managing Director and co-founder of the Electricity Consulting Group at FTI Consulting. Prior to FTI, I was Vice President in the Energy and Environment practice at Charles River Associates, a company I joined in 2000. Prior to that, I was a consultant at Putnam, Hayes & Bartlett, which subsequently merged with Hagler Bailly to become PHB Hagler Bailly before being acquired by PA Consulting. While at Putnam, Hayes & Bartlett, I served as a primary member of the consulting teams charged with developing and implementing competitive markets in Ontario, Canada and Singapore, providing a deep understanding of market design and market rules, how wholesale electricity markets price physical constraints, and economic expectations concerning short-term and long-run impacts of capacity availability on market equilibriums. My role at each of these firms served clients in the power sector as well as other industries. My detailed resume is incorporated herein as Exhibit No. TLB-2.

Q: PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A: I have the following degrees:

- B.A. in mathematical economics from Pomona College
- M.A. in public policy from the Harris School of Public Policy at the University of Chicago
- M.B.A. from the Massachusetts Institute of Technology Sloan School of Management

Q: PLEASE HIGHLIGHT YOUR EXPERIENCE IN ASSESSING POWER MARKETS USING PRODUCTION COST MODELS.

A: I have directed multiple studies analyzing electricity markets and projecting prices for electricity products over the long term, for commercial, regulatory and litigation purposes. My work includes performing independent market price projections as well as evaluating price projections and market modeling performed by others. These assignments require an expert understanding of existing and changing market conditions, regulatory requirements surrounding the design of the markets as well as external requirements tied to environmental policy objectives, and financial realities associated with building and retiring generating units.

Q: HOW HAVE THE WORKPRODUCTS FROM THESE ASSIGNMENTS BEEN USED?

A: Deliverables that I oversaw and produced for these assignments have been used to evaluate costs and benefits of proposed infrastructure investments, make investment decisions; assess electricity markets and market power; project prices for energy, capacity and ancillary services; value generating and transmission assets; optimize asset portfolios; determine the impact of new investments on markets and the environment; inform financing decisions; and support expert testimony, as well as other objectives.

Q: HAVE YOU PREVIOUSLY SERVED AS A TESTIFYING EXPERT?

A: Yes. I have served as a testifying expert before arbitration panels, in a court of law, before the Federal Energy Regulatory Commission, before the Massachusetts Department of Public Utilities, before the Connecticut Siting Council, and before the Little Hoover Commission in California. Earlier in my career, I served as a non-testifying expert on a number of cases, often supporting the expert and having primary responsibility for the analysis and calculations that were incorporated into the testimony. A list of cases in which I have served as the testifying expert is provided in my resume.

II. PURPOSE OF TESTIMONY

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A: The purpose of my testimony is to assess the ability of NECEC to provide net benefits to Maine, including an assessment of potential costs to Maine residents in the form of lost jobs, property taxes and risks related to unintended consequences associated with the project. I also respond to the report by Daymark Energy Advisors (Daymark) prepared for Central Maine Power titled, "NECEC Transmission Project: Benefits to Maine Ratepayers, Quantitative and Qualitative Benefits," dated September 27, 2017. In addition, I critique certain conclusions by the Maine Center for Business and Economic Research (MCBER) at the University of Southern Maine concerning the employment and economic development benefits to Maine, especially where it is inconsistent with market conditions and assumptions incorporated into the Daymark study.

Q: DO YOU PROVIDE AN ALTERNATIVE CALCULATION OF BENEFITS?

A: No. My testimony explains why the Daymark study understates the costs to Maine residents, overstates certain benefits, provides a set of calculations for 2023 that illustrates the transitory reason for benefits in that year, quantifies how changes in other assumptions impacts estimated benefits, and describes the costs and risks to Maine ratepayers if NECEC proceeds.

Q: ARE YOU SPONSORING ANY EXHIBITS?

A: Yes. In addition to this testimony, I am sponsoring the following exhibits:

- **Exhibit No. TLB-2** is my resume.
- **Exhibit No. TLB-3:** Overview of the UPLAN Network Power Model
- **Exhibit No. TLB-4:** University of Maine estimate of economic benefits from the Aqua Ventus Offshore Wind Project
- **Exhibit No. TLB-5:** Memorandum from Daymark Energy Advisors to Vineyard Wind LLC, "Vineyard Wind Project Benefits Under Winter Storm Grayson," January 15, 2018.
- **Exhibit No. TLB-6:** Section 83D Request for Proposal
- **Exhibit No. TLB-7:** Section 83D Power Purchase Agreement Template

Q: PLEASE PROVIDE A SUMMARY OF YOUR CONCLUSIONS.

A: In general, the claimed benefits described by Daymark and MCBER are either non-existent or come at a significant cost to Maine residents and towns. Based on the analyses described in my testimony, I conclude the following:

- Maine's generation fleet, including biomass and hydroelectric facilities, would suffer considerable financial harm due to NECEC's subsidized energy sales into Maine.
- As a result, NECEC could cause job losses to hundreds of Maine residents and certain towns could lose millions of dollars in property tax revenue.
- Maine's highly-respected institutions such as the University of Maine and the Maine Maritime Institute could lose a critical part of the state's economic ecosystem that currently provides internships and jobs to many of its students and graduates.
- The benefits calculated by Daymark and MCBER -- energy price suppression effects, capacity market price benefits, ancillary services benefits, and diversification benefits -- are either overstated or illusory, limited by existing market rules and conditions that may be temporary in nature.
- Many of the same supposed benefits that could be provided by NECEC also can be provided by in-state resources that would generate jobs and tax base for Maine residents.
- Market modeling clearly shows that NECEC would force Maine generators to run less or shut down while generators in New York and elsewhere fire-up, depending on how Hydro-Québec sources its energy supply.
- If NECEC were to proceed, Maine effectively would be exporting its electricity industry jobs to other regions.

In summary, the claimed benefits of NECEC give the appearance of benefits to Maine by focusing only on a limited set of impacts in New England. Understanding the bigger pictures indicates that NECEC could have broader adverse economic and environmental impacts for Maine and beyond.

III. OVERVIEW

Q: PLEASE PROVIDE A BRIEF OVERVIEW OF THE MARKET CONTEXT SURROUNDING NECEC.

A: The primary purpose of the proposed NECEC project is to deliver clean energy into New England's electricity markets under a long-term contract with regulated utilities in Massachusetts so that the Commonwealth can meet its carbon emissions reduction goals and other legislative obligations (Section 83D of the 2008 *Green Communities Act*, as amended in 2016, Acts of 2016 Ch. 188, § 12). In particular, Massachusetts passed legislation signed by its Governor in August 2016 that requires utilities to engage in a competitive Request for Proposal ("RFP") process for procurement of clean energy, which can include base load hydroelectric power or a combination of hydroelectric power and Tier 1 renewables.[1] NECEC was one of 46 bids submitted in response to the RFP issued under section 83D of the legislation, and is proceeding because the announced winner -- a project utilizing existing Hydro-Québec hydroelectricity via a different proposal for a new transmission line (i.e., Northern Pass Transmission) -- could not obtain siting through New Hampshire.

[1] Distribution Companies would enter into the power purchase agreement only if the Massachusetts Department of Public Utilities found it to be a cost-effective long-term contract for clean energy.

Q: PLEASE PROVIDE A BRIEF OVERVIEW OF THE PROJECT.

A: The proposed NECEC project would be a 145-mile high voltage direct current (HVDC) transmission line with total capacity of 1,200 MW and certain upgrades to existing alternating current (AC) transmission infrastructure in Maine that would deliver an estimated 9.5 TWh of energy from existing hydroelectric power resources from Windsor, Québec to Lewiston, Maine under the assumption of a 90.5% capacity factor. Actual deliveries would be subject to energy caps in the proposed contract with Massachusetts (a minimum of 8.5 TWh up to a maximum of 9.4 TWh per year)[2] and the economic dispatch of the 105 MW of transmission capacity reserved for Maine distribution companies.[3] The Maine portion of the transmission line is estimated to cost $950 million; the Canadian portion of the transmission line would be constructed and paid for by Hydro-Québec if the project proceeds. CMP is asking for a certificate of convenience and necessity to site the Maine portion of the transmission line, which would be paid for by the contract proceeds from Massachusetts utilities.

Q: IS ALL OF THE ENERGY DELIVERED THROUGH NECEC TO BE SOLD UNDER THE CONTRACT WITH MASSACHUSETTS UTILITIES?

A: No. In exchange for siting the transmission line in Maine, Maine ratepayers would receive a call option on energy that can be delivered through 105 MW of capacity on the

[2] Hydro Renewable Energy Corp., "Section 83D Request for Proposal Application Form," p. 8.
[3] Although some of the public documentation submitted to the Maine PUC is redacted, these figures come from the public version of the bid submission by CMP and Hydro Renewable Energy, Inc. available in the NECEC submission documents: https://macleanenergy.com/83d/83d-bids

line (the details of which are not provided) and uncertain, but potentially costly, electricity market and economic impacts.

Q: IN CALCULATING BENEFITS TO MAINE, DID DAYMARK CONSIDER ONLY THE ENERGY SOLD TO MASSACHUSETTS?

A: No. Daymark modeled the transmission line as delivering 981 MW of energy each hour under the contract (Ex. NECEC-5, p. 16), or 8.6 TWh per year, close to the contractual minimum. In addition, Daymark modeled the impact if the entirety of the line was utilized.

Q: DO YOU AGREE WITH DAYMARK'S ESTIMATED BENEFITS TO MAINE RATEPAYERS?

A: No. There continue to be aspects of the proposal that have not been fully disclosed. Of those that we do have enough information to assess, it is clear that the analysis overstates the benefits or does not fully recognize the costs to Maine residents.

1) **Capacity and Energy Dedicated to CMP:** Energy price information is not available to assess whether and under what conditions the 0.9 TWh would be economic for Maine ratepayers. Therefore, we cannot make a determination as to the value of that energy supply versus market prices.
2) **Electricity Market Benefits:** Daymark's assessment of the impact on Maine energy prices does not properly account for congestion that would occur as a result of the transmission line, incorporates inputs that result in an overstatement of benefits over the long-run, and fails to consider the risk and uncertainty around its calculation of benefits.

3) **Economic Benefits:** The MCBER study incorporates assumptions that are inconsistent with Daymark's analysis, serving to overstate economic activity (and understate adverse consequences) associated with NECEC, and fails to consider fully the offsetting impacts on jobs and property taxes due to lower in-state generation resulting from reduced energy prices in Maine, and deferred investment in Maine renewable projects.

Q: BASED ON YOUR ANALYSIS, WHAT ARE YOUR CONCLUSIONS?

A: Even without performing a thorough projection of benefits through 2041, it is clear that Daymark's analysis does not consider all of the costs and risks to Maine residents that would be associated with NECEC. Greater benefits in the form of lower energy costs to Maine ratepayers are offset by higher costs in the form of displaced and potentially retired generation, lost jobs, and lower property tax revenues under conditions that reflect current market expectations. **Figure 1** provides a summary of my critique of each component of claimed benefits.

Figure 1: Summary of Conclusions

Purported Benefit	NECEC Claim	Energyzt Conclusions
Congestion	Daymark claims that there would not be any transmission congestion due to NECEC (Ex. NECEC-5, p. 6)	Congestion is likely to occur further down the system at Surowiec-South and the Maine-New Hampshire Interface, making it more costly for Maine renewables to compete going forward
Energy Prices	Energy price suppression benefits estimated to be around $2.50/MWh under the contract in 2023 Average LMP reductions of $3.38 - $3.70/MWh over 20-year period	• Reductions in energy margins to Maine generators tied to lower prices and lower dispatch • Magnitude is very dependent on natural gas and carbon price assumptions • Should fall to zero over time as the market balances

Purported Benefit	NECEC Claim	Energyzt Conclusions
Capacity Prices	Estimated using Daymark's proprietary capacity market model and an assumed 800 MW of capacity from NECEC	• Likely to be $0 – market rules make it unlikely that energy supply from NECEC will qualify and clear • If it does clear, likely to be lower than impact calculated by proprietary model due to excess supply and zones/interties which have cleared at lower prices • Comes at the cost of 800 MW of Maine state retirements, representing more than $5.5 million / year in property tax revenue
Ancillary Services	Qualitative argument that NECEC baseload energy would displace generators, increasing supply into ancillary services markets	Likely to be negligible and could increase prices • Reserve markets are oversupplied • Maine retirements caused by lower energy and capacity prices would offset any benefits by removing generation resources from the market
Hedging	Daymark claims energy supply via NECEC would	Not a unique proposition to NECEC. • Maine has the most diverse set of fuel resources in New England • Existing biomass generation provides same baseload benefits • Daymark memo on recent cold snap indicates off-shore wind can provide diversification and winter reliability benefits • In-state resources come with jobs and taxes • Winter reliability issues would not be resolved, but simply shifted to other parts of Northeast
Economic Impacts	Calculated by MCBER	• Inconsistent set of assumptions • Understates impact on Maine economy • Does not incorporate deferred renewable investment, retired plants, lost jobs, and lost property taxes • Fewer economic benefits than building a 500 MW offshore wind facility in Maine

IV. CONGESTION

Q: WHY IS TRANSMISSION CONGESTION IMPORTANT?

A: Maine has limited connectivity with New England, transmitting primarily through a single high voltage AC line. Historically, Maine has been a generation pocket and

congestion has occurred, resulting in lower energy prices in Maine than in other parts of the ISO-NE system. If transmission proves to be inadequate for NECEC to deliver its energy out of Maine, the state would become even more of a generation pocket, forcing in-state resources to reduce operations in response to lower energy prices created by the congestion. Combined with higher natural gas prices at the end of the pipeline delivery system, Maine generators would be doubly impacted by lower energy prices and high natural gas prices, resulting in less dispatch, lower profits and the risk of earlier retirements.

Q: WHAT IS THE IMPACT OF CONGESTION ON MAINE GENERATORS?

A: Although Daymark considers these lower prices a "benefit," they create a cost for Maine residents in the form of underutilization of Maine generating plants, fewer jobs and lower property taxes due to earlier retirement of existing units and lost opportunities tied to potential in-state renewable resources that would not be built. This outcome is inefficient because it does not stem from improved efficiency or competition, but from subsidized resources and an inadequate delivery system that challenge the basic underpinnings of competitive markets. Therefore, it is important to understand potential congestion issues in order to understand the context and cause of potential "benefits" for Maine residents, as well as the repercussions.

Q: DOES DAYMARK ANALYZE CONGESTION?

A: Daymark's analysis has a brief analysis of potential congestion, determines that it would occur less than 1 percent of the time, and concludes that it does not create an issue (Ex. NECEC-5, pp. 6, 31-33).

Q: WHAT DO YOU CONCLUDE?

A: I conclude that congestion is an issue that cannot be ignored, especially under alternative gas and carbon price assumptions. In the near-term, Daymark's analysis appears to understate the prevalence of transmission congestion and therefore the impact of NECEC on energy prices. Under lower gas and carbon price conditions, congestion could be even worse.

Q: WHAT IS THE BASIS FOR YOUR CONCLUSION?

A: The five primary conditions supporting my conclusions are as follows:

1) **Maine's Transmission:** Maine's high voltage system configuration is primarily a long, linear connection with New England, creating the potential for congestion.
2) **Historical Experience:** Historical price differentials between Maine and New Hampshire indicate that Maine tends to have congestion. Adding energy from NECEC to historical flows would exceed limits, indicating that significant congestion would occur on the Maine-NH interface under certain conditions due to NECEC unless upgrades are made.
3) **Generation Queue:** The ISO-NE queue for new generation includes more than 5,000 MW of new generation, primarily solar and wind projects. Even assuming a fraction of those are built starts to increase congestion on the lines, magnifying potential transmission congestion from NECEC, which would serve as the incremental resource that forces the need for transmission expansion beyond the proposed Surowiec-South Interface upgrades.

4) **UPLAN Analysis:** Our own analysis using UPLAN for the first-year operation in 2023 indicates congestion and losses with NECEC at the Maine-NH interface, contributing a sizable part of the energy price decrease.

Q: DID YOU RUN UPLAN YOURSELF?

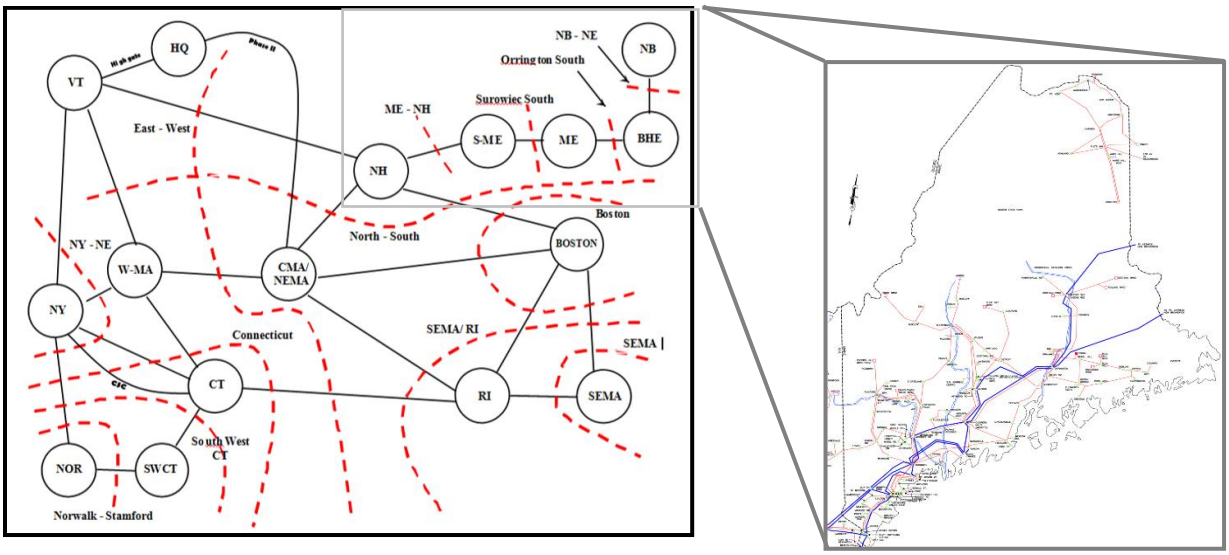
A: No. In performing the analyses described herein, I worked closely with the Calpine modeling team to use their model to run the scenarios described in my testimony. Calpine maintains this model as part of their commercial operations and uses it to make business decisions. Exhibit No. TLB-3 provides a description of the UPLAN Network Power Model.

Q: PLEASE DESCRIBE THE MAINE TRANSMISSION SYSTEM.

A: As illustrated in **Figure 2**, energy injected into Maine would have to flow through a number of transmission interfaces in order to get to Massachusetts. In particular, a high voltage direct current (HVDC) injection point at Lewiston as CMP proposes, would need to flow through three or more interfaces in order to deliver energy into Massachusetts:

- **Surowiec-South Interface** between Maine and Southern Maine;
- **ME-NH Interface** between Southern Maine and New Hampshire;
- **North-South Interface** between New Hampshire and Northern Massachusetts; and
- **Other Interfaces** in order to get to Western Massachusetts, Boston and Southern Massachusetts.

Figure 2: ISO-NE Representation of New England Interfaces

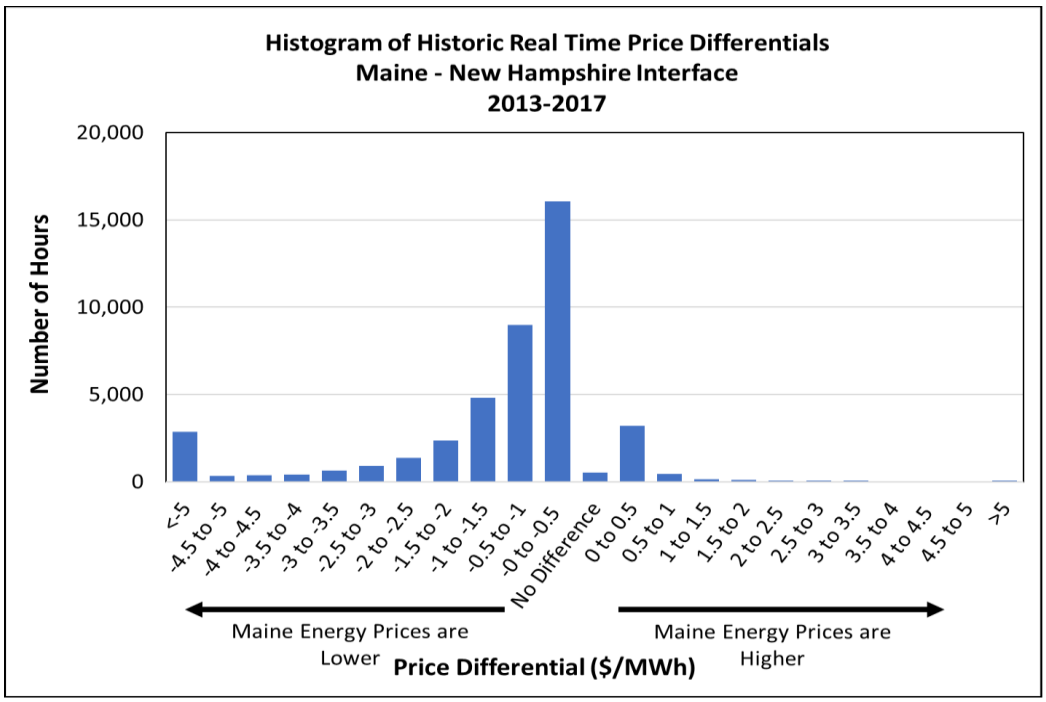


Source: ISO-NE

Q: WHAT DO HISTORICAL ENERGY PRICES INDICATE ABOUT MAINE'S POWER SECTOR?

A: Historically, Maine's zonal energy prices and locational marginal prices (LMPs) have been lower than in New Hampshire, in particular, and in the rest of New England more generally (**Figure 3**).

Figure 3: Historical Price Differentials between Maine and New Hampshire (2013–2017)



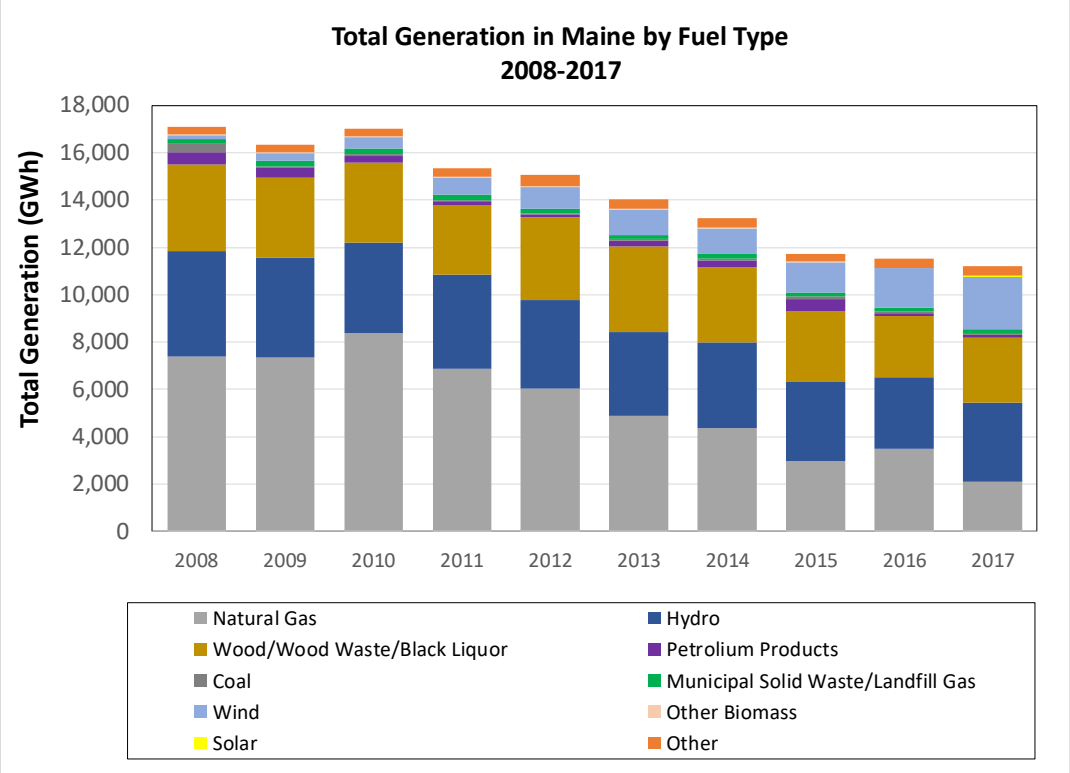
Source: Energyzt analysis of ISO-NE data

Lower prices in Maine tend to be due to congestion and losses.

Q: WHAT EFFECT HAS THIS PRICING DIFFERENTIAL HAD ON IN-STATE MAINE GENERATION?

A; The lower prices in Maine have made it more difficult for in-state generation to be competitive, reducing the frequency of dispatch of Maine's generators. At the same time, natural gas prices are higher in Maine than in other parts of New England, creating a challenging environment for natural gas-fired generators that face lower prices, less dispatch and higher fuel costs. As a result, total generation output in Maine has fallen to the point where renewable resources – hydroelectricity, wind and biomass -- now represent three-quarters of Maine's electrical energy fuel mix (**Figure 4**).

Figure 4: Historical Dispatch of Maine Generators



Source: Energyzt analysis of https://www.eia.gov/electricity/data/eia923/ and https://www.eia.gov/state/print.php?sid=ME

Q: HOW WOULD NECEC EFFECT EXISTING GENERATION?

A: NECEC could inject close to 9.5 TWh (9,500 GWh) of energy into Maine, or around 85 percent of existing in-state generation levels. For a location that already is experiencing low prices, the impact of such a large amount of energy creates even greater financial stress that can lead to early retirements. In addition to lower energy prices, some of Maine's largest plants would be displaced by NECEC energy flows, causing significant reductions in operating margins due to both price and quantity.

Q: DO THE SUROWIEC-SOUTH UPGRADES PROPOSED AS PART OF NECEC ADDRESS THIS CONGESTION SO THAT NECEC ENERGY WILL SIMPLY FLOW OUT OF MAINE?

A; No. The Surowiec-South Interface presented an obvious issue for NECEC as the transmission limit is 1,500 MW and the addition of NECEC energy would have exceeded the capacity limit during a majority of the peak hours. Although NECEC's proposed upgrades on the Surowiec-South line addresses this congestion issue, the issue would simply move to the next set of downstream interfaces, especially the Maine-New Hampshire Interface.

Q: HAVE YOU MODELED THE NUMBER OF HOURS THAT THE MAINE – NEW HAMPSHIRE INTERFACE IS CONGESTED WITH NECEC?

A: Yes. Without NECEC, the interface is not congested under any of the scenarios we ran. Under Daymark's assumptions, flows would be within 5 percent of the line limits 505 hours of the year (**Figure 5**). With a flatter supply curve more reflective of current conditions with lower natural gas prices and $5 / metric ton carbon prices, congestion would occur more often, approach the limit 803 hours or during 9 percent of the hours (**Figure 6**). The amount of congestion varies according to market conditions and the relative competitiveness of Maine units versus other New England generators. Daymark's simplistic analysis does not properly assess the potential for congestion or its consequences to existing and future Maine generation projects.

Figure 5: Congestion on Maine – New Hampshire Interface with Daymark Assumptions

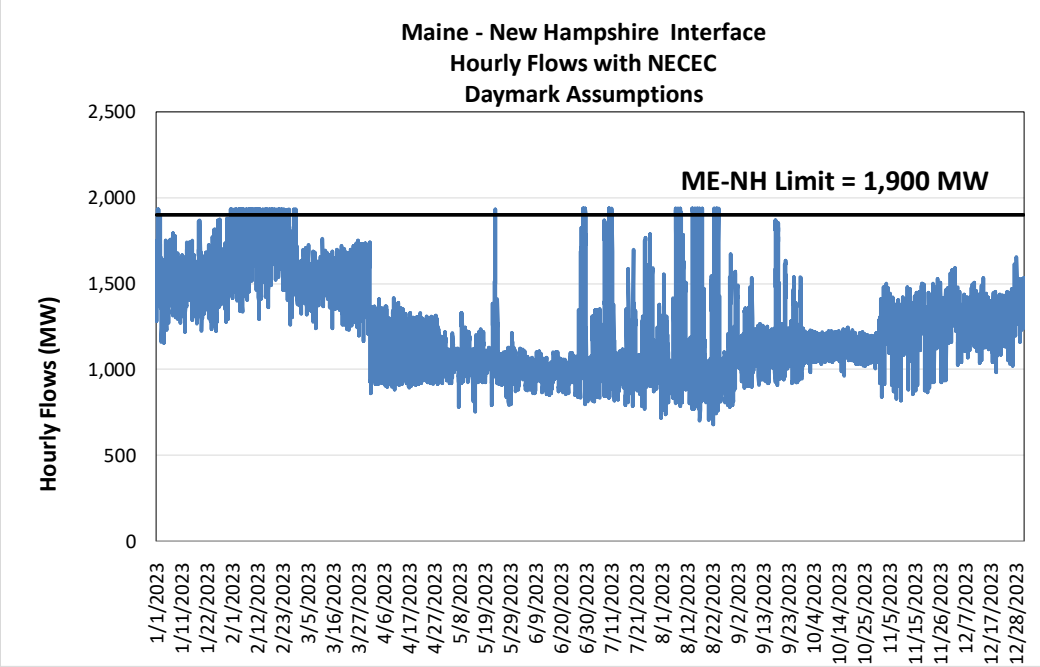
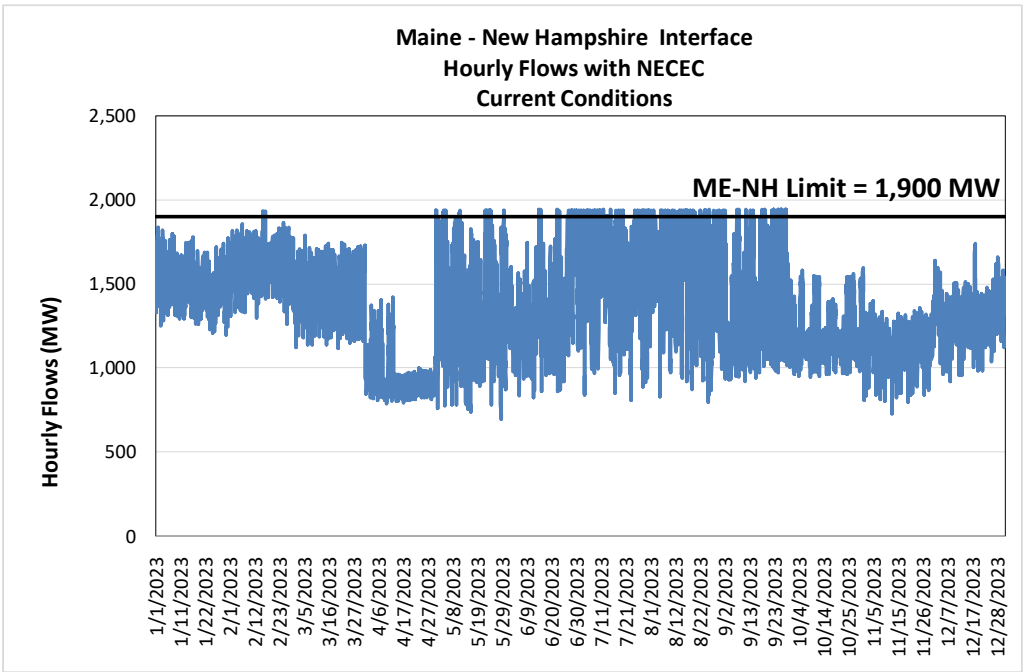


Figure 6: Congestion on Maine – New Hampshire Interface with Current Conditions



Q: WHAT IS THE IMPACT OF NECEC ON CONGESTION AT THE MAINE – NEW HAMPSHIRE INTERFACE?

A: The impact of NECEC depends on market conditions. However, an increase in congestion would serve to lower prices even further than NECEC's direct price suppression effects. In addition, higher utilization of the transmission lines increases line losses, further impacting generators in Maine.

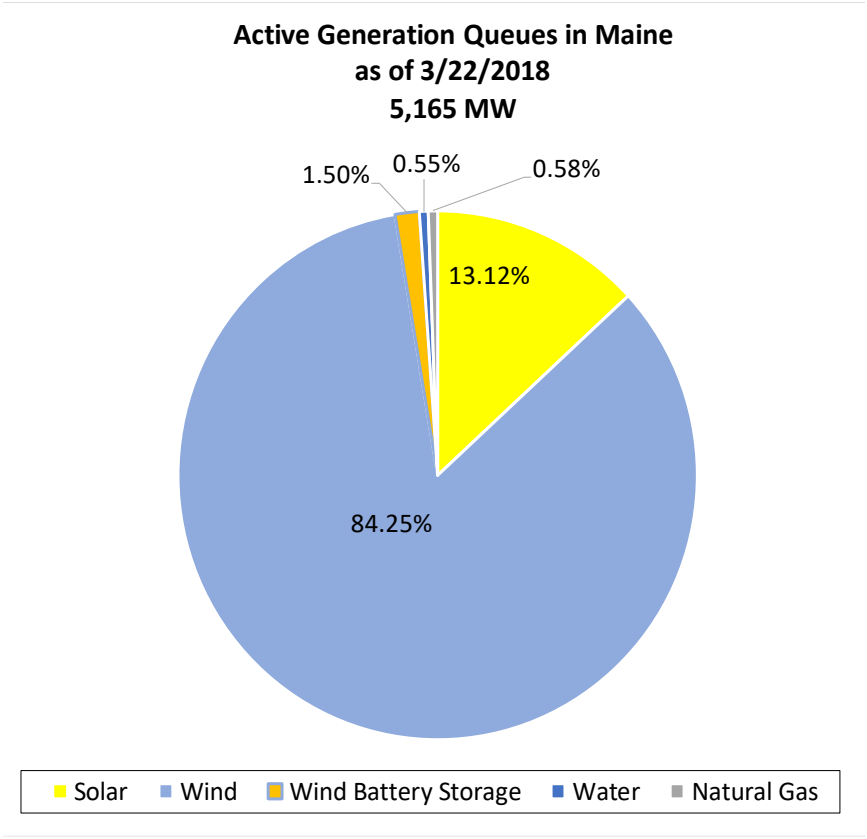
Q: HOW DOES INCREASED CONGESTION IMPACT PLANS FOR NEW RENEWABLE RESOURCES IN MAINE?

A: As a result of lower prices due to higher congestion, it would be more difficult for new plants in Maine to be financially justified and fewer plants in the queue would be built. Both the lower energy prices, increased line losses and higher costs to connect would defer or delay new investment in renewables on the north side of the Maine-New Hampshire Interface.

Q: HOW MANY POTENTIAL PROJECTS COULD THAT IMPACT?

A: Maine has 5,165 MW of new generation in the queue, of which 97 percent are renewable resources with planned operation dates by 2020 (**Figure 7**). I expect that some of those renewable projects will not come to fruition because of the proposed NECEC project's impact on market prices and congestion.

Figure 7: Maine Generation Queue



Source: Energyzt Analysis of ISO-NE Queue

V. ENERGY PRICES

Q: WHAT ARE YOUR CONCLUSIONS ABOUT DAYMARK'S ESTIMATED BENEFITS ASSOCIATED WITH LOWER ENERGY PRICES?

A: As already discussed, energy prices in Maine initially would be suppressed as a result of an additional 1,200 MW of baseload energy flowing into Lewiston, Maine. The impact would be worse in the near-term due to transmission congestion at the Maine-New Hampshire Interface. As the market moves towards equilibrium, Maine can expect a number of early plant retirements that would eliminate property tax revenue and jobs

associated with those plants. If that transmission constraint is relieved – either because of Maine generating plant retirements or ISO-NE upgrades – the Maine-related energy price benefits of NECEC would be reduced. Lower natural gas prices, lower carbon prices, and higher levels of renewables on the system compared to what Daymark assumed also would cause benefits to decline.

Q: AREN'T LOWER PRICES SIMPLY ABOUT MAINE BEING MORE COMPETITIVE?

A: No. This type of artificial, anti-competitive price suppression is inconsistent with the long-term viability of the competitive market and effectively penalizes generators who chose to invest in Maine. If NECEC becomes operational, many Maine generating plants would become less competitive, reducing their output, revenues, profitability and therefore ability to continue operations. Maine-based power plants would be curtailed through economic dispatch in order for NECEC to move its energy out of the state. The net effect of NECEC would be a cannibalization of Maine's in-state generators, their vendors, and lost opportunities for students and graduates of the University of Maine and the Maine Maritime Institute.

Q: HOW CERTAIN ARE THE BENEFITS TO MAINE RESIDENTS ASSOCIATED WITH NECEC?

A: The alleged benefits are very uncertain. **Figure 8** illustrates what the difference in energy price reductions for 2023 would be under the steep supply curve assumed by Daymark versus a flatter supply curve more representative of current conditions.

Figure 8: UPLAN Results – Change in Energy Prices under Alternative Scenarios

Change in Energy Price	Daymark Assumptions	Current Conditions
Energy	($1.78)	($1.18)
Losses	($1.35)	($0.99)
Congestion	($0.10)	($0.13)
Total Change in Price	($3.21)	($2.30)

Changing key conditions such as natural gas prices, carbon prices and renewable build-out illustrates how benefits can be significantly affected by market conditions and policy decisions. Daymark's estimates of benefits could be reduced by 30 percent if conditions anticipated today were to be realized as opposed to the rosier market price scenario in Daymark's analysis.

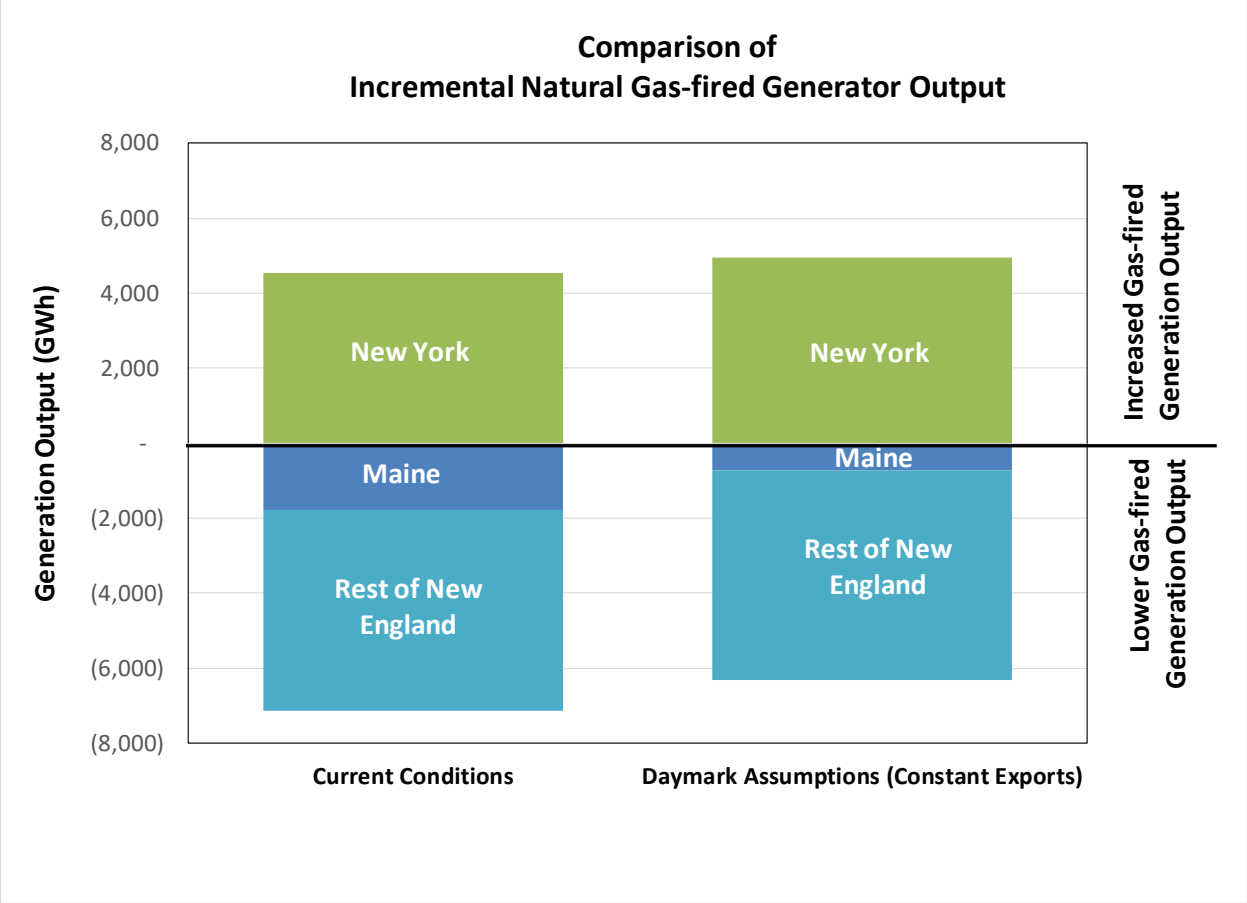
Q: IF THE PRICE CHANGE IS SO SIGNIFICANT IN DAYMARK'S ANALYSIS, WHY DON'T MORE MAINE PLANTS RETIRE ACCORDING TO THE AURORA RESULTS?

A: Aurora automatically builds and retires units to balance the market over the long-run. Under Daymark's assumptions, there are some plant retirements. However, energy prices and associated margins are higher for the more efficient natural gas plants due to the steeper supply curve resulting from a higher natural gas prices and carbon prices than currently occur. In an alternative scenario with a flatter supply curve, energy margins are already strained before NECEC appears and the inflow of that much more energy exerts even more financial stress on units that already are on the economic edge.

Q: WHAT ELSE HAPPENS TO MAINE GENERATORS?

A: As a result of NECEC, Maine and New England natural gas-fired generators produce less. They are replaced by New York generators, which fire-up and run to replace the lost Hydro-Québec sales into New York (**Figure 9**).

Figure 9: New York vs. New England: In-State Natural Gas-fired Generator Output



Q: DO YOU THINK DAYMARK'S ANALYSIS IS ACCURATE OVER THE LONG RUN?

A: No. Many of the assumptions Daymark makes tend to overstate benefits over the long-run:

1) **Unattainable Equilibrium:** Over time, equilibrium should be reached in both scenarios with and without NECEC. Yet, Daymark's model indicates benefits through 2041, indicating that there is a constraint that prevents energy markets from reaching a long-run equilibrium after the eighth year when capacity market prices equilibrate to the same level with and without NECEC.[4]
2) **Static RPS versus Carbon Reduction Goals:** Daymark assumes a fixed Renewable Portfolio Standard (RPS) for each state after 2035, even though every state in New England has a goal or target of reducing carbon emissions to around 80 percent of 1990 levels by 2050. If electrification and higher renewable integration is modeled, the supply curve would be flatter during the summer and shoulder months, and higher demand could be offset by energy efficiency and demand response programs.
3) **New Technology:** Daymark incorporates only ISO-NE near-term projections of behind-the-meter impacts on load such as energy efficiency and batteries and thereby fails to consider new technologies such as storage that are commercializing and would be available to shift demand and to create a flatter supply curve, mitigating the potential for price spikes.
4) **Dismantling of Competitive Energy Markets:** It is possible that continuing pressure on energy prices would serve to dismantle competitive energy markets, resulting in a completely different compensation structure. For example, the ISO-NE's use of

[4] In both scenarios, the long-run marginal cost of production should be equal. As the capacity market model equilibrates in the scenarios with and without NECEC after eight years, energy prices should do the same so that the combined energy and capacity market revenues equal the long-run marginal cost of production.

reliability contracts for plants such as Mystic (based on fuel security concerns) and Connecticut's potential plans to subsidize the Millstone nuclear units could be a precursor to a more dramatic market design overhaul that effectively eliminates the current design of competitive energy markets and therefore the benefit of allegedly lower energy prices on consumers over time.

In conclusion, over the longer term, Daymark's assumptions do not reflect the carbon emissions reduction goals by the New England states and therefore overstate benefits from energy markets.

VI. CAPACITY

Q: WOULD NECEC PROVIDE CAPACITY IN ISO-NE'S FORWARD CAPACITY MARKET?

A: No. NECEC alone cannot provide capacity. Hydro Renewable Energy, Inc. ("HRE") – Hydro-Québec's subsidiary, which is responsible for supplying energy through NECEC -- would have to offer capacity into the ISO-NE's capacity markets in order for Maine to realize any benefits claimed by Daymark.

Q: DOES HRE INTEND TO BID CAPACITY INTO THE FORWARD CAPACITY MARKET AS PART OF THE CONTRACT WITH MASSACHUSETTS?

A: Without the confidential version of HRE's bid, I do not know. The draft Power Purchase Agreement included as part of the Request for Proposal is written as an energy-only contract but "to the extent the proposal contemplates a Forward Capacity Market commitment," the supplier must qualify and participate in Forward Capacity Market auctions during the contract term (Exhibit No. TLB-7, "Draft PPA Firm Hydro," section 7.2(n)). Whether or not HRE

contemplates participation in the Forward Capacity Market would be indicated in its confidential Section 83D Application.

Q: WHAT IS YOUR OPINION REGARDING DAYMARK'S ASSESSMENT OF CAPACITY MARKET BENEFITS?

A: Daymark's analysis assumes that HRE will bid 800 MW of capacity into ISO-NE Forward Capacity Auctions, but does not consider the reality and evolution of ISO-NE's Forward Capacity Market rules, thereby overstating benefits and ignoring costs to Maine ratepayers. As the testimony of William Fowler (Exhibit No. WSF-1) indicates, CASPR would require a one-for-one replacement of capacity, most likely in Maine, before NECEC could obtain a capacity supply obligation. Therefore, in order for Maine residents to receive the capacity market benefits calculated by Daymark, a number of Maine plants would have to retire, leading to lost jobs and lost property tax revenues.

Q: DO YOU KNOW WHICH PLANTS WOULD HAVE TO RETIRE?

A: Not with exact certainty. However, we can identify existing plants that are at risk. The most likely candidate would be a fossil fuel peaker unit that barely operates – the William F. Wyman Power Plant ("Wyman") which is around 850 MW of capacity that could switch out with the 800 MW of capacity measured by Daymark. Wyman represents 53 full-time jobs, not including contractors, and $1.035 million in property taxes per year. However, as Wyman is the only oil-fired power plant in Maine, ISO-NE may determine the plant is needed for diversification and reliability reasons, which would preclude it from switching out with NECEC as part of CASPR.

Q: IF WYMAN HAS TO STAY IN THE GENERATION MIX, WHICH PLANTS WOULD RETIRE NEXT?

A: If Wyman did not retire, another 800 MW would have to retire before NECEC could enter into a Capacity Supply Obligation. If the plants to retire were to be limited to fossil fuel units, almost 900 MW with low capacity factors could be candidates, representing over $5.5 million in property taxes (**Figure 10**).

Figure 10: Maine Fossil Fuel Generating Units that Could Retire under CASPR

Plant Name	Nameplate (MW)	2016 Net Generation (MWh)	2016 Property Taxes	Capacity Factor	Reported Prime Mover
Mead Rumford Cogen	12.5	-	$ 367,084	0%	ST
Bucksport Generation LLC	111.6	524	$ 110,567	0%	ST
Bucksport Generation LLC	186.8	8,720	**	1%	GT
Androscoggin Energy Center	163.5	170,341	$ 1,580,573	12%	GT
Maine Independence Station	194.6	222,129	$ 188,739	13%	CA
Rumford Power, Inc	179.4	263,928	$ 3,285,287	17%	CT
Rumford Power, Inc	95.1	149,305	**	18%	CA
TOTAL	**943.5**	**814,947**	**$ 5,532,249**		

** Property taxes already are included in the table under a previous entry.

Source: Energyzt analysis based on EIA Form 923 and 840 data. Property taxes researched from county websites.

Q: HOW MANY JOBS COULD BE LOST AT MAINE'S POWER PLANTS?

A: Each combined cycle represents around 20 to 30 employees with another 25 full-time equivalents in the form of contractor services, on average, each year. Peaker plants can have less or more depending on the size. Wyman (811 MW) has around 53 full-time employees; Bucksport Generation LLC (298 MW) employs a total of 13 employees. If retirements were focused on fossil fuel plants, Maine could expect to lose at least 100 to 200 power plant jobs due to early retirements based on the list above.

Q: ARE THERE OTHER POTENTIAL JOB LOSSES?

A: Yes. Each generator relies extensively on contractors for plant operations and maintenance. A combined cycle plant such as Westbrook could contract with around 50 to 100 different vendors each year. Those companies, most of which are Maine-based, would lose a main source of their business and most likely have to shed jobs if plants in Maine retired and they could not redeploy their workforce into another industry.

Q: HOW ELSE WOULD MAINE'S ECONOMY BE IMPACTED?

A: In addition to the multiplier effect on the economy, there could be significant repercussions on Maine institutions such as the University of Maine and the Maine Maritime Academy. Nearly the entire staff at many of the Maine power plants are graduates from the Maine Maritime Academy and/or the University of Maine. Most generators and paper mills provide summer student cooperative and internship programs. These institutions would be adversely impacted by NECEC.

Q: WOULDN'T THOSE JOBS AND PROPERTY TAXES BE LOST EVEN IF NECEC WAS NOT BUILT?

A: Not necessarily. Those plants are at risk because of falling energy and capacity prices. However, with in-state replacement by renewable resources in the queue, such as new wind turbines, the lost property tax revenues and payroll would be offset by new long-term jobs and property taxes. In the case of NECEC, ongoing jobs would be replaced with temporary construction jobs, some of which would be performed by existing CMP employees and out-of-state workers.

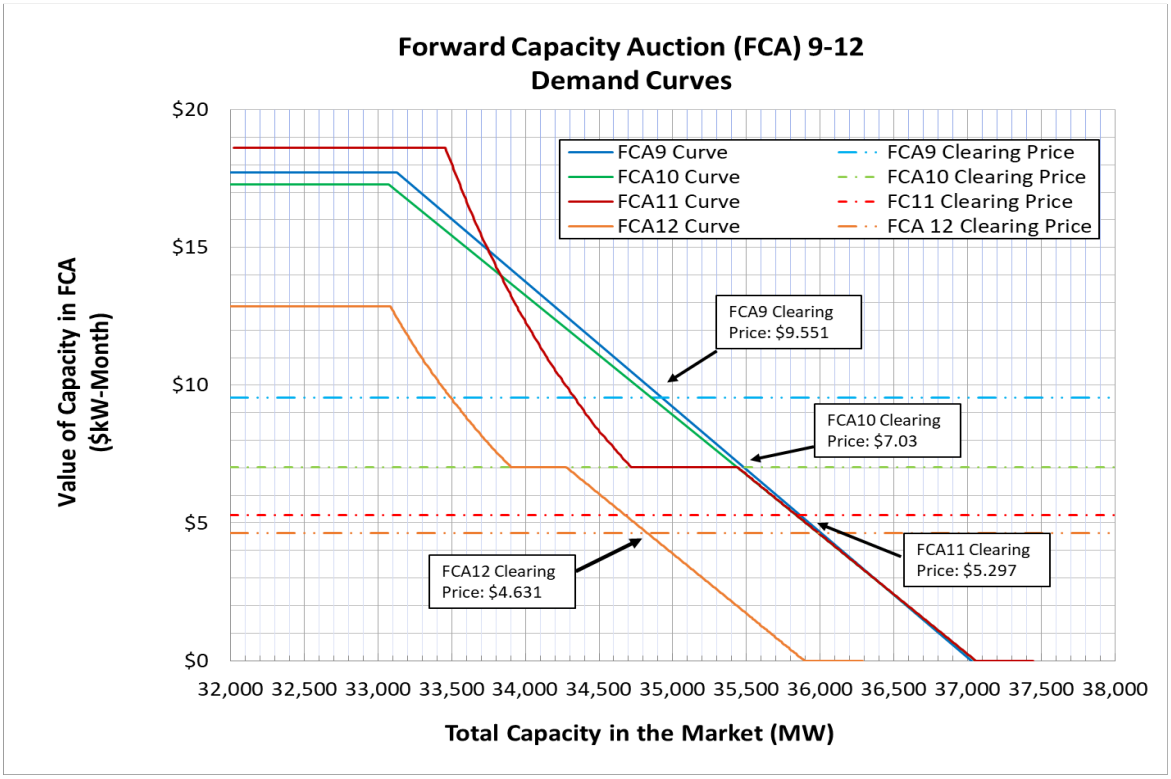
Q: DOESN'T THE MCBER ECONOMIC STUDY ACCOUNT FOR POTENTIAL JOB LOSSES?

A: Not really. MCBER's results assumed that only two plants in Maine would retire. As the analysis of energy prices and capacity market rules show, there could be significantly more plants to retire if NECEC were to proceed.

Q: IS THERE ANY OTHER REASON DAYMARK'S CALCULATED BENEFITS TO MAINE RATEPAYERS FROM LOWER CAPACITY MARKET PRICES MAY OVERSTATE BENEFITS?

A: Yes. Capacity clearing prices have fallen to historical lows. Clearing prices in FCA9 at $9.551 / kW-month have fallen to $4.631 /kW-month in FCA12 (**Figure 11**). If the market continues to be saturated with new policy resources other than NECEC, Forward Capacity Market prices would continue to fall and NECEC would not have any impact as it competes with other resources relieved of the MOPR bid in and the price setting unit reflects the cost of a new entrant. Daymark determined that this point would be reached within eight years by 2031. However, the evolving state policies emphasizing development of new renewables could cause this point to be reached sooner, especially with out-of-market contracts supporting uneconomic generating plants for reliability and fuel diversification purposes.

Figure 11: Recent Forward Capacity Market Demand Curves and Clearing Prices



Source: Energyzt analysis of ISO-NE Forward Capacity Market demand curves and market clearing prices, https://www.iso-ne.com/isoexpress/web/reports/auctions/-/tree/fca-results

In addition, the price that NECEC could obtain in the forward capacity market, if it was able to qualify and clear, could be even lower than the clearing price for the capacity market as a whole. To this point, the most recent forward capacity auction is instructive. Although the market cleared at $4.631 / kW-month, the Canadian Interties closed one round later with a Payment Rate of $3.701 / kW-month at the Phase I/II HQ Excess Interface and even lower at $3.155/kW-month at the New Brunswick Interface.[5] My understanding of the Daymark capacity market model is that it does not take into account

[5] https://www.iso-ne.com/static-assets/documents/2018/02/fca_12_result_report.pdf

differences by zone or Intertie, thereby overstating the potential impact on capacity market price savings.

VII. ANCILLARY SERVICES

Q: WHAT DOES DAYMARK SAY REGARDING THE VALUE OF NECEC TO ANCILLARY SERVICES?

A: Daymark provides a qualitative discussion of why it contends that NECEC would increase the efficiency of ancillary services markets. Daymark claims that baseload energy would free up other generating resources for use in providing ancillary services.

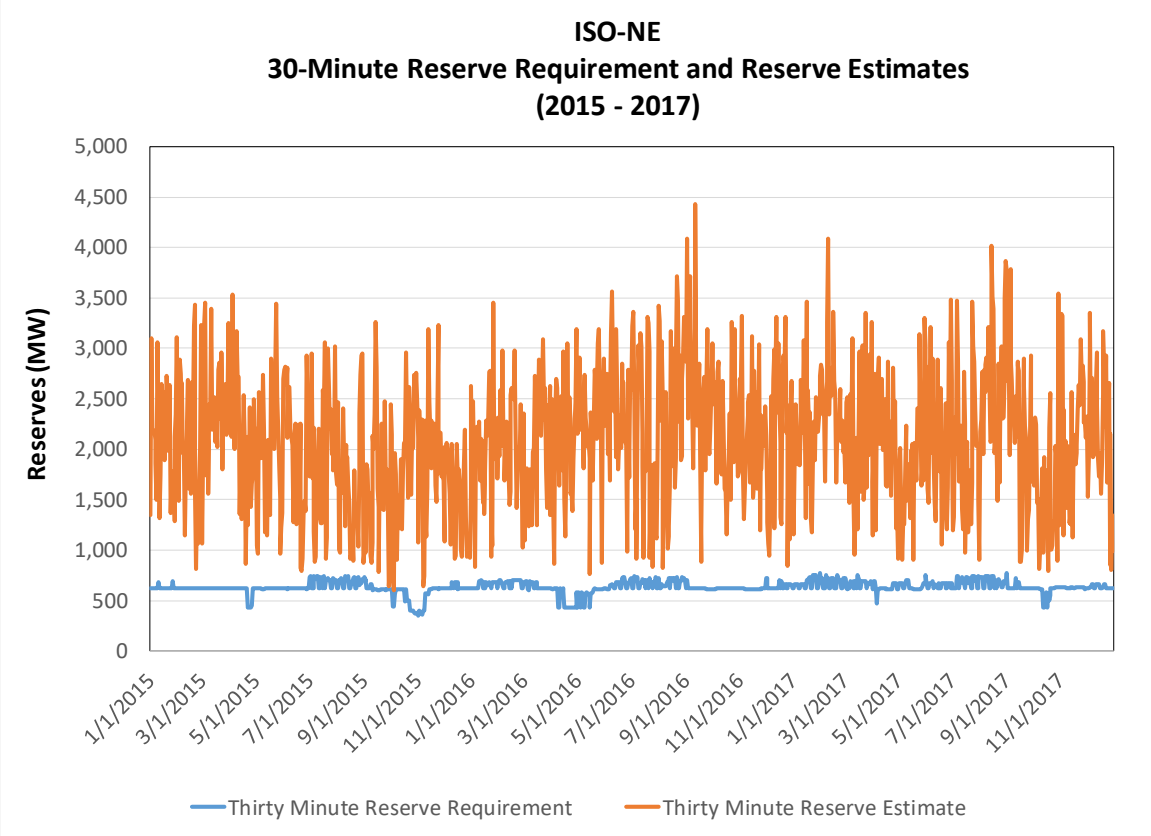
Q: DO YOU AGREE?

A: No. Daymark effectively assumes that generating plants no longer being dispatched to provide energy as a result of NECEC would remain in service and therefore provide lower-cost resources in the ancillary services market. However, multiple plants are at risk of retirement due to low capacity factors and the ancillary services markets already are saturated with those resources, rendering additional benefits in these markets negligible.

Q: WHY DO YOU SAY THE ANCILLARY SERVICES MARKETS ARE SATURATED?

A: ISO-NE morning reports provide a summary of daily reserve resources available to meet reserves, as well as an indication of whether ISO-NE had to call for reserves. **Figure 12** plots 30-minute reserves, indicating that New England's wholesale electricity markets have sufficient reserves.

Figure 12: Daily 30-Minute Reserve Requirements versus Estimates



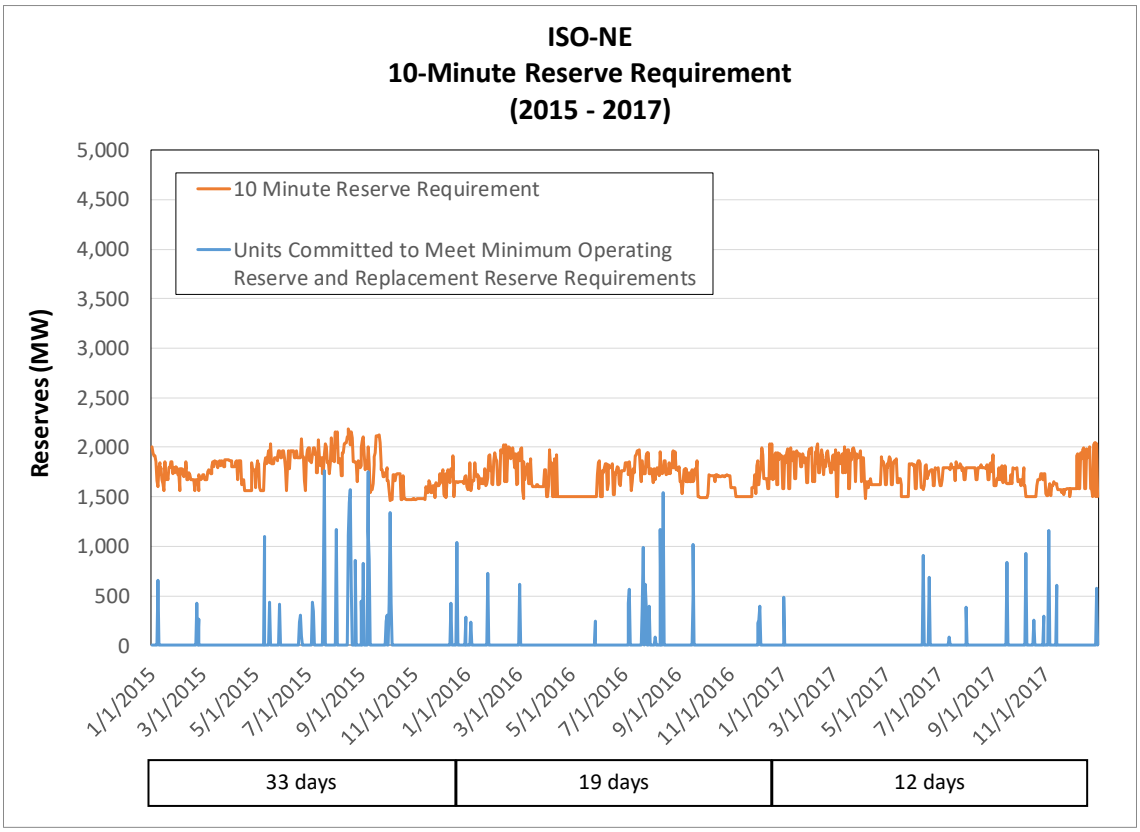
Source: Energyzt analysis of ISO-NE Morning Reports

Q: WHAT ABOUT 10-MINUTE RESERVES?

A: Spinning reserves are required to ensure that the largest first contingency can be accommodated immediately. The 10-minute reserve requirement reflects the amount of spinning reserves required on the system, and has hovered between 1,500 MW and 2,000 MW the past few years (**Figure 13)**. Generally, there are enough spinning reserves on the system that incremental units do not need to be committed, and the number of days when that occurs has been declining over the past three years. The small size of this

market would make any impact by NECEC negligible, and possibly more than offset by plant retirements.

Figure 13: 10-Minute Reserve Requirement and Units Committed



Source: Energyzt analysis of ISO-NE Morning Reports

VIII. OTHER OPERATIONAL BENEFITS

Q: DO YOU AGREE WITH DAYMARK THAT THERE WOULD BE OTHER BENEFITS FROM NECEC?

A: In theory, there could be diversification benefits associated with NECEC. However, such benefits are not unique to NECEC and could be provided by other in-state resources that also bring jobs and property taxes to the benefits of Maine residents.

Q: DOES THIS APPLY TO HEDGING BENEFITS?

A: Yes. Just as with NECEC, Maine's biomass plants provide baseload characteristics that apply a hedge to the region's electric generating resources. According to the U.S. Energy Information Agency, in 2016, 24 percent of Maine's net electricity generation came from biomass. To the extent NECEC exerts additional financial stress on the biomass plants, causing them to retire, the hedging benefits associated with NECEC would be offset.

Q: HOW ABOUT DIVERSIFICATION BENEFITS?

A: Yes, there are offsetting impacts associated with supposed benefits associated with diversification. Maine's diverse resource mix of small hydroelectric plants, on-shore wind, and off-shore wind contributes to diversification of the system. In fact, Maine's generation mix is one of the most diverse in New England -- diversification that has been exported to New England's mix and could continue to do so in the absence of NECEC. Wyman, which is at risk of retirement, is the only oil-fired peaker plant in Maine with on-site fuel storage, offering a hedge against natural gas winter price spikes. To the extent NECEC causes Wyman to retire, potential diversification benefits of NECEC would be offset.

Q: HOW ABOUT WINTER FUEL SECURITY?

A: Losing Maine-based generating units – including Wyman, biomass plants and even natural gas-fired units -- would adversely impact winter fuel security. More importantly, however, is the question of where the NECEC energy supply is sourced. According to Mr. Speyer's testimony (Exhibit JMS-1), it is very likely that the supply for NECEC would simply come from a reduction in what Québec otherwise would export into other

jurisdictions. Therefore, in order to deliver during extreme winter conditions into Maine via NECEC (i.e., a new "supply obligation"), Hydro-Québec would need to decrease its deliveries that otherwise would flow into other jurisdictions (e.g., exports into New York). Under this circumstance, providing winter reliability benefits to Maine would serve to increase the winter reliability issues in an interconnected jurisdiction, offsetting benefits to New England and Maine as a result of increased fragility across the broader system.

Q: HAS HYDRO-QUÉBEC REDUCED ITS WINTER EXPORTS IN THE PAST?

A: Yes. During extreme winter conditions, Hydro-Québec has had to reduce exports in order to meet its reserve requirements and has warned of possible curtailments of their exports. Transmission line outages or Québec's inability to meet its own reserve requirements during extreme winter conditions have suspended some or all of the Québec exports over a given line. This past winter cold snap, exports into New England from Québec were reduced due to a technical limitation on the Phase I/II Intertie.

Q: WOULD HYDRO-QUÉBEC BE REQUIRED TO GUARANTEE DELIVERY DURING WINTER PEAKS UNDER THE SECTION 83D PROCUREMENTS?

A: The obligation to guarantee winter delivery is unclear from public records. The RFP for the Massachusetts Section 83D procurement only requires bidders of firm service hydroelectric generation to ensure that the delivery profile for Winter Peak Periods are not less than 60 percent of the highest annual single hourly delivery claimed in their annual delivery profile (Exhibit TLB-6, "Section 83D RFP, section 2.2.2.7"). Without access to the confidential version of HRE's bid and proposed energy schedule, we do not

know if HRE took advantage of this accommodation. If it did, however, Daymark's constant energy flow assumption would significantly overstate the winter reliability benefits.

Q: CAN MAINE-BASED RENEWABLE RESOURCES DELIVER WINTER FUEL SECURITY BENEFITS?

A: Yes. Off-shore wind also can deliver during winter peaks. As Daymark recognized in a memorandum to Vineyard Wind LLC dated January 15, 2018 (Exhibit No. TLB-5), if the 800 MW off-shore Vineyard Wind Project had been operational, it "would have helped to mitigate the economic, environmental and reliability-related challenges facing New England and particularly the Cape Cod region, during the 96-hour period from January 4 through January 7th."[6] It seems logical that Daymark would come to similar conclusions if it were to analyze Maine offshore wind that could be built in the absence of NECEC in the same way.

Q: DOES NECEC PROVIDE INCREMENTAL BENEFIT TO MAINE RATEPAYERS THAT CANNOT ALREADY BE PROVIDED BY EXISTING OR POTENTIAL UNITS?

A: No. In fact, given that NECEC would curtail existing renewable resources in Maine, causes existing renewable units to retire, or would preclude new units from being built, these are offsetting impacts that would adjust NECEC's benefits downward. In addition, these offsetting impacts have negative repercussions for Maine residents in the form of

[6] Memorandum from Daymark Energy Advisors to Vineyard Wind LLC, "Vineyard Wind Project Benefits Under Winter Storm Grayson," January 15, 2018.

lost jobs, lost state income and income tax, and lost property taxes. NECEC's displacement of baseload and flexible dispatch plants does not provide any unique benefits to the region that are not already being provided by in-state resources.

IX. CRITIQUE OF MCBER ECONOMIC BENEFITS

Q: DO YOU AGREE WITH THE MCBER STUDY CONCLUSIONS REGARDING THE NET ECONOMIC BENEFITS TO MAIN?

A: No. First, the inconsistency between the assumptions in the Daymark study and the MCBER study makes them incompatible and therefore unable to provide a definitive insight into what would happen to energy resources and economic benefits under the same conditions. As there are offsetting effects (i.e., retirements increase with lower energy prices, but economic activity increases when energy prices are lower), lack of an internally consistent set of assumptions renders both analyses to be of limited utility. Even if the assumptions were consistent across models, however, a change in even one assumption can have dramatic impacts on the results, indicating that a more robust analysis that examines multiple scenarios to understand potential implications for Maine would be more informative than a single point estimate. As an example, it does not seem that either Daymark or MCBER considered Maine's alternatives to achieving state goals of reducing carbon emissions by 75 to 80 percent of 1990 levels by 2050.

Q: CAN YOU ILLUSTRATE THE MAGNITUDE OF THESE OFFSETTING IMPACTS?

A: Yes. The University of Maine performed an economic impact study for the 500 MW Aqua Ventus Phase II off-shore wind farm project (Exhibit TLB-4). Performing a side-

by-side comparison of the reported results indicates that during both the construction and operational stage of the projects, in-state Maine renewables would create a much greater positive economic impact and far more substantial benefits to Maine residents than NECEC would create (**Figure 14** and **Figure 15**).

Figure 14: Economic Impacts during Construction – NECEC vs. Aqua Ventus

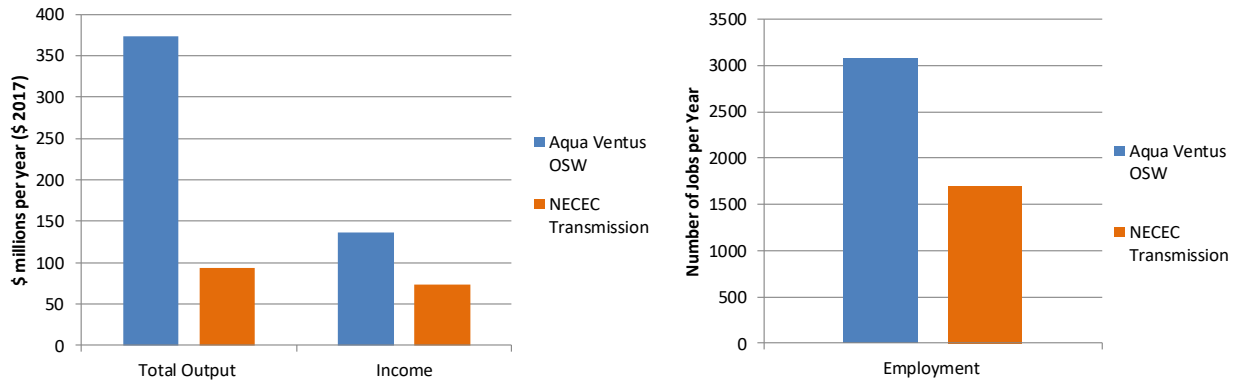
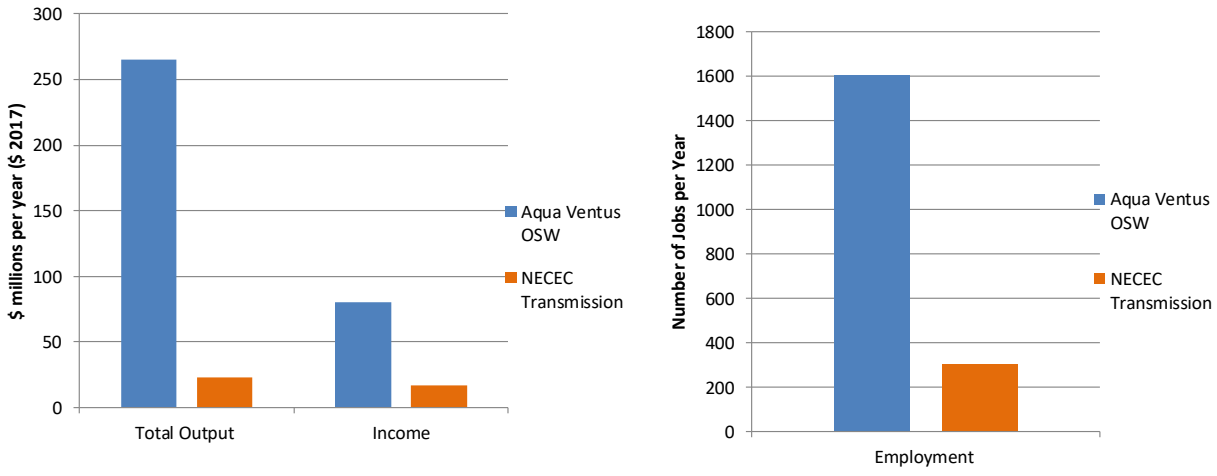


Figure 15: Economic Impacts during Operations – NECEC vs. Aqua Ventus



Source: Aqua Ventus OSW Project: Gabe, Todd M., University of Maine, School of Economics, ECONOMIC IMPACTS OF THE NEW ENGLAND AQUA VENTUS (PHASES I AND II) OFFSHORE WIND POWER PROGRAM IN MAINE, August 30, 2013, pp 16-25. http://maineaquaventus.com/wp-content/uploads/2017/05/Gabe-Report-Dec-4.pdf ; New England Clean Energy Connect Transmission Project (NECEC): New England Clean Energy Connect and Central Maine Power Company, Connect and Central Maine Power Company Request for a Certificate of Public Convenience and Necessity for the Construction of the New England Clean Energy Connect (NECEC) Transmission Project, Volume I –

Petition, State of Maine Public Utilities Commission, Docket No. 2017-00232,September 27, 2017, pp. 8,59 -64.

Q: CAN BOTH IN-STATE RESOURCES AND NECEC COEXIST?

A: Yes and no. As already mentioned, there is limited transmission out of Maine. With the proposed upgrades to the Suroweic-South Interface, the key constraints move to the Maine to New Hampshire Interface, which has a transfer capacity of only 1,900 MW. If the transmission capacity is decreased by renewable projects that already are in the queue, NECEC would not be able to flow to the rest of New England without either: 1) curtailment of existing units; or 2) expensive transmission upgrades beyond what is proposed as part of the project. Therefore, NECEC would displace in-state renewable resources over the long-run because they would be more expensive.

X. CONCLUSION

Q: CAN YOU SUMMARIZE YOUR CONCLUSIONS?

A: Potential benefits that would be associated with NECEC are uncertain and would come with a considerable cost to Maine residents. An injection of 9.5 TWh of energy into Maine's system will cause significant displacement of existing, in-state Maine generators who will operate less and potential retire early. As a result:

- NECEC's participation in ISO-NE energy markets would hasten Maine generating plant retirements, eliminating jobs and property tax base with negligible, if any, benefit over the intermediate and longer-term as other low carbon options are implemented.

- If NECEC could participate in ISO-NE's Forward Capacity Market, any pricing benefits would be offset by retirements required by CASPR, which could represent losses of more than 150 jobs and over $5.5 million in property taxes.
- Incremental benefits associated with ancillary services, diversification, and winter reliability are negligible and uncertain.
- The project would create fewer jobs and property tax income for Maine than in-state renewable projects that could be built and transmitted through the limited transmission capacity from Maine to New Hampshire.
- Given Hydro-Québec's proposal to use existing resources to supply NECEC, New York generation is likely to replace Maine generation. In effect, NECEC would cause Maine to export its power industry jobs to other states.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes, at this time, based on the information I have been provided and reviewed to date. However, I reserve the right to modify my testimony as further information is obtained through the course of this hearing.

STATE OF MAINE PUBLIC UTILITIES COMMISSION

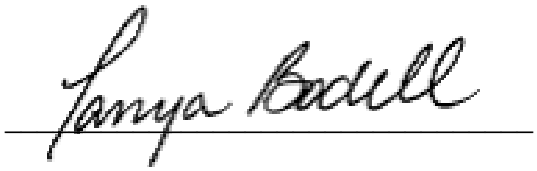
CENTRAL MAINE POWER COMPANY REQUEST FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION OF THE NEW ENGLAND CLEAN ENERGY CONNECT (NECEC) TRANSMISSION PROJECT	**DOCKET No. 2017-00232**

PREPARED DIRECT TESTIMONY OF TANYA L. BODELL

VERIFICATION

I, Tanya Lynne Bodell, certify that the facts set forth in the Testimony of Tanya L. Bodell submitted in this matter are true and correct to the best of my knowledge, information, and belief.

Date: April 30, 2018



Tanya L. Bodell