REDACTED PUBLIC VERSION

Independent Analysis of Electricity Market and Macroeconomic Benefits of the New England Clean Energy Connect Project

May 21, 2018

Prepared for

Maine Public Utilities Commission

LONDON ECONOMICS

London Economics International LLC
717 Atlantic Avenue, Suite 1A
Boston, Massachusetts 02111
T: (617) 933-7200 F: (617) 933-7201
www.londoneconomics.com

85 page Report

summer months, both of which can drive up wholesale energy prices. To analyze the market impact that NECEC could provide during these events, LEI estimated the impact NECEC would have had on ISO New England's wholesale energy market costs in two past weather-related events over a five-day period - the summer heatwave of July 2013 and the polar vortex of winter 2013/14. LEI's analysis found that NECEC (with [redacted] MW of energy flows per hour) could have resulted in \$6.0 million in wholesale energy market savings for Maine between the five-day period from January 24-28, 2014, and \$4.3 million in wholesale energy market savings between July 15-19, 2013. These savings represent a 12% and 21% reduction, in wholesale energy market costs during the January 24-28, 2014 and July 15-19, 2013 timeframes, respectively. These savings are a form of "insurance" that the project can provide electric ratepayers in the region and would be incremental to the annual wholesale energy market benefits identified in LEI's analysis under weather-normal conditions. These benefits are discussed in Section 2.4.

1.3.2 Environmental impacts

In terms of environmental benefits, LEI estimates that [redacted] TWh of hydroelectric-based energy flows on NECEC could reduce CO_2 emissions in New England by approximately 3.6 million metric tons per year. For this analysis, LEI did not monetize the social benefits of the CO_2 emissions reduction, nor did it analyze the emissions changes in other jurisdictions as a result of NECEC. These results are in line with Daymark's estimate of carbon emission reduction by 3.4 million metric tons.[12] The results of the CO_2 reduction are discussed in Section 2.5. Other greenhouse gas ("GHG") emissions include NO_X and SO_2 (which largely come from oil and coal generation). While LEI was not specifically asked to analyze the reductions in these pollutants, LEI expects the reductions to be small, as oil-fired electric production is minimal under normal weather conditions and coal-fired generation is expected to be phased out in LEI's Base Case forecast in the first few years.

1.4 Summary of LEI's independent analysis of the macroeconomic impacts to Maine

During the development and construction period of 2017 to 2022, the installation of the new transmission line and associated equipment is expected to generate 1,631 total new jobs per year and \$98.2 million increase in GDP in Maine, as presented in Figure 2, LEI's analysis for the development and construction period's macroeconomic impacts is based on \$567.8 million total local spending, and the year-by-year construction cost schedule was provided by CMP in response to ODR-003-011.[13]

For the first 15 years of the project's commercial operations (assumed to be 2023 to 2037), 291 new jobs will be created in Maine, according to LEI's analysis. Across all of New England, LEI's modeling suggests 1,826 new jobs on average per year. In addition, the Maine economy will also enjoy an increase in GDP of \$29.1 million per year. In New England, LEI's results show an increase in the six states' GDP of \$205.3 million per year on average. These benefits to the region accrue

[12] Although Daymark's analysis noted 3.1 million metric tons were attributable to NECEC in its report, 3.4 million metric tons was the approximate value for the 1086 Case based on Daymark's response to IECG-004-001, attachment 4.

[13] LEI did not adjust the project cost estimates provided by CMP. However, LEI is concerned about the local spending might have been over-estimated. Please see Section 5.2.1.

system reliability. ISO-NE also noted that a resource mix with higher levels of liquefied natural gas ("LNG"), imports, and renewables shows less system stress than its reference case, and that "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."[40]

2.5 Environmental benefits

The results of LEI's modeling show that NECEC reduces annual CO_2 emissions from New England generators by approximately 3.6 million metric tons.[41] The CO_2 emissions reduction is fairly constant over time because of the assumed level of energy flows on NECEC and the similarity in the emissions footprint of the generating resources that are being displaced by the energy flows on NECEC. This average is approximately equivalent to removing 767,000 passenger vehicles from the road based on estimates by the Environmental Protection Agency.[42]

However, the 3.6 million metric tons of CO_2 reductions estimate are based on how much CO_2 is reduced from internal New England generators. There is also substantial scientific and policy debate on how to estimate possible CO_2 emissions from large hydroelectric resources that would flow through NECEC. LEI acknowledges that large hydroelectric resources may emit carbon due to the decomposition of biological material in a newly-formed reservoir. Based on studies conducted by Hydro Québec scientists, it has been forecast that a large hydroelectric complex such as Eastmain 1/1A had a lifecycle emissions profile of greenhouse gases of 136 lbs./MWh.[43] This figure is higher than the actual historical system-wide profile of CO_2 emissions reported by Hydro Québec of 239 metric tons/TWh (approximately 0.5 lbs./MWh).[44] Although the emissions profile of new large hydroelectric plants is likely to be higher in the initial years than this lifecycle figure, it is difficult and intractable to pinpoint the exact, time-specific emissions profile of the energy flows on NECEC. Based on a lifecycle rate of 136 lbs./MWh, LEI estimates that this results in approximately [redacted] metric tons based on [redacted] GWh. This value, however, still contrasts significantly with the emissions associated with a natural gas-fired generation, which can typically emit between 700-1,000 lbs./MWh (depending on the heat rate).

Figure 17 below shows the CO_2 emissions reductions for New England over the modeling timeframe. As noted previously, as a result of nuclear retirements in New York and New England, more local fossil-fuel generation is required in 2030 and 2035. As a result, similar to the

---

40 ISO-NE, Operational Fuel-Security Analysis, January 17, 2018. <https://www.iso-ne.com/static-assets/documents/2018/01/20180117_operational_fuel-security_analysis.pdf>

41 According to the calculator available on the Environment Protection Agency website, this is equivalent to removing approximately 675,000 passenger vehicles per year. *See.* "Calculations and References." <https://www.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references#vehicles>. Accessed December 28, 2016.

42 EPA, Greenhouse Gas Equivalencies Calculator. <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

43 Teodoru, C. R., et al. (2012), The net carbon footprint of a newly created boreal hydroelectric reservoir, Global Biogeochem. Cycles, 26, GB2016.

44 Hydro Québec Production's Electricity Facts. 2013.

energy market benefits, the emissions reductions fall slightly in 2030 and 2035 as more of that fossil-fuel generation is required in the Project Case relative to the Base Case.

Figure 17. Projected CO_2 emissions reduction for New England