APPUI EXTERNE RELATIF À L'A/O 2023-01 : APPEL D'OFFRES POUR L'ACQUISITION DE 1500 MW D'ÉNERGIE ÉOLIENNE

RAPPORT DU CONSULTANT MERRIMACK ENERGY GROUP INC.

Hydro-Quebec

Benchmark Report Deliverable Two

Comparison of Benchmark Resources to Resources Selected by Hydro-Quebec Via the 2023 Wind Call for Tenders for 1,500 MW (A/O 2023-01)

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Prepared By:

1 INTRODUCTION

1.1 OVERVIEW

Merrimack Energy Group, Inc. ("Merrimack Energy") was retained by Hydro-Quebec to undertake a benchmark cost assessment of the comparative costs of wind energy resources in the Northeast United States ("US") and eastern Canadian markets relative to the costs of the proposals submitted to and selected by Hydro-Quebec in its distribution activities under its 2023 Electricity Produced from Wind Sources Call for Tenders (A/O 2023- 01), referred to herein as the 2023 Wind Call for Tenders. Hydro-Quebec issued the 2023 Wind Call for Tenders on March 31, 2023 for the purchase of a block of wind energy with a targeted capacity of 1,500 Megawatts ("MW") from projects connected to the Hydro-Quebec integrated network in order to meet the long-term electricity needs of Quebec markets.

The 2023 Wind Call for Tenders arises from the adoption by the Government of Quebec of Decree No. 285-2023. The guaranteed start dates for eligible electricity deliveries are December 1, 2027, December 1, 2028 and December 1, 2029. Bids were submitted on September 12, 2023.

Under the Call for Tenders, bidders can choose the duration of the contract, which must not be less than 20 years and must not be more than 30 years from the start of the electricity deliveries. A bidder may propose a project combining a wind farm with guaranteed power provided by an energy storage system.

Hydro-Quebec's 2023 Wind Call for Tenders requires bidders to submit proposals with the price of electricity in its offering without anticipating obtaining financial assistance. The 2023 Wind Call for Tenders document includes a description of the treatment of tax incentives should an incentive bonus be available. As a result, Hydro-Quebec is requesting that bidders submit pricing assuming that no tax credit benefits should be provided in their pricing proposals. The Call for Tenders also describes the expected sharing of benefits should bonus tax incentives be available to the project.

As part of the contract approval process associated with the projects selected via the 2023 Wind Call for Tenders, Merrimack Energy is submitting this report to assess whether the contract pricing from the selected portfolio of projects for the 1,500 MW 2023 Wind Call for Tenders is competitive and represents lowest reasonable cost when compared with market options in neighboring markets.

For this entire assignment, Merrimack Energy is required to provide two deliverables.

Deliverable 1 includes an update of Merrimack Energy's 2022 Benchmark study for Hydro-Quebec associated with benchmark costs for renewable resources. For this Deliverable 1 report Merrimack Energy was required to update the wind generated electricity benchmark as well as wind combined with energy storage (if applicable) for wind projects located in the Northeast US and eastern Canada. Merrimack Energy provided a final version of the Deliverable 1 Report to Hydro-Quebec on December 7, 2023. The Report is entitled "Benchmarking the Cost of Supplying Electricity from Wind Resources Relative to Hydro-Quebec's 2023 Wind Call for Tenders for 1,500 MW" ("2023 Benchmark Report").

Deliverable 2 requires Merrimack Energy to conduct a comparative cost assessment of the winning projects selected by Hydro-Quebec from the 2023 Wind Call for Tenders relative to the costs of the benchmark resources from Deliverable 1, similar to the assessment completed by Merrimack Energy in response to Objective 2 of Merrimack Energy's 2022-2023 assignment for Hydro-Quebec.[1] Merrimack Energy will provide a comparison of the unit costs (i.e., real levelized costs) of winning bids in Hydro-Quebec's 2023 Wind Call for Tenders issued in March, 2023 to benchmark resources potentially available in northeast power markets, including the cost of transporting the power to Quebec and factoring in the Quebec business, economic and regulatory context. Hydro-Quebec wishes to obtain an assessment of the anticipated real unit cost (in real levelized $/MWh in Cn$) per originating wind energy source as the basis for comparison to reflect the same methodology used by Hydro-Quebec for its evaluation and selection of resources.

Under its regulations, the Régie de l'énergie du Quebec ("Regie") requires that Hydro-Quebec undertake a comparative analysis of the cost of power for similar products from neighboring Northeast power markets. The "similar products" standard is important to define in undertaking the benchmark study and comparison to Call for Tenders bids and can be identified to reflect project technology, size, product specifications, contract term, timing for the Call for Tenders and project in-service date. For example, as described in Merrimack Energy's 2022 Benchmark Report, the similar product standard should include size of the resource, timing of the solicitation process for Hydro-Quebec, and commercial operation date of the project, if possible.

[1]Merrimack Energy completed two comparative cost assessment reports for the two Call for Tenders issued by Hydro-Quebec in 2021 including one which calls for the purchase of a block of renewable energy with a 480 MW capacity contribution to the winter peak with energy need of 4.2 TWh on an annual basis and a second which requires a block of wind energy having 300 MW of installed capacity.

This report focuses on comparing the cost of wind power from the bids selected in response to Hydro-Quebec's 2023 Wind Call for Tenders for 1,500 MW with the cost of resources for the same technology type in other neighboring North American markets to Quebec as a benchmark cost.[2] For the 2023 Wind Call for Tenders, all projects submitted and selected were wind projects. In addition, Merrimack Energy was focused on assessing benchmark cost information for wind that overlaps the Q3 2023 timing for submission of bids into the 2023 Wind Call for Tenders.

The methodology proposed by Merrimack Energy is designed to assess the competitive cost of long-term power from the winning bids from Hydro-Quebec's 2023 Wind Call for Tenders with general industry cost data as well as a sample of other similar wind project types proposed and under development in neighboring North American markets on a real levelized cost basis over consistent contract terms (e.g., 30-year contract terms for wind resources). The analysis will also include the cost of transmission from neighboring Northeast markets assuming the power would be purchased in the neighboring market and delivered to Quebec. In addition, Merrimack Energy will strive to use publicly available data inputs for each market as a primary source of data, if available. If publicly available sources of data are not readily available in neighboring markets, Merrimack Energy will attempt to correlate data in other markets with the data in question for the local markets and apply trends in costs to develop capital cost, operating costs and other cost inputs and assumptions in a consistent manner.

Merrimack Energy has found in preparing such benchmark studies that use of only levelized cost of energy studies can be misleading based on differences in location, capacity factor, project size, contract term, and market cost structure. When capital cost information was available, Merrimack Energy calculated the annualized costs associated with the amortization of the capital costs over the contract term and added estimates of O&M costs and transmission costs for delivering the power from the select market into Quebec, assuming Hydro-Quebec could procure similar resources in other northeast markets and deliver the power to Quebec. For this report, Merrimack Energy is relying significantly on data provided by the National Renewable Energy Laboratory ("NREL") as contained in its financial assumptions for the 2023 Electricity Annual Technology Baseline ("ATB"). Merrimack Energy relied upon the input assumptions from NREL's Market Case from the 2022 ATB for estimates of LCOE's for Merrimack Energy's 2022 Benchmark Report. Merrimack Energy is also utilizing the NREL assumptions

[2] Merrimack Energy has served as Independent Evaluator for several recent high-profile Request for Proposal processes for renewable resources in several regions of the US and has conducted analysis of renewable project costs, including the cost of wind generated electricity.

from the Market Case from the 2023 ATB for development of LCOE estimates for this report as well. In particular, Merrimack Energy is using the weighted average cost of capital ("WACC") and the Capital Cost Recovery Factor for wind projects contained in NREL's assumptions to apply to the Capital Cost Cases presented in Table 2 of this report to generate levelized costs and real levelized costs for wind projects in both US and Canadian dollars. Merrimack Energy utilized the WACC and Capital Cost Recovery Factor from this case because it allows for a calculation of LCOE values without the implications of tax credits included in the pricing.[3]

Merrimack Energy also relied upon data from other Call for Tenders or Requests for Proposals as a check on the reasonableness of the comparative costs generated.[4] As we did in previous benchmark reports, Merrimack Energy will compare the costs of wind resources bid into Hydro-Quebec's 2023 Wind Call for Tenders with similar resources in New York, New England, Ontario, New Brunswick and Nova Scotia, where applicable. Merrimack Energy also addressed other factors in preparing the sample costs including tax credits and incentives in the US and Canada, capacity factor differences, and local conditions for adjusting benchmark costs.

Since the cost of transmission and other related services varies based on project location, the initial focus of this assessment will be on a comparison of the cost of wind resource-generated energy without transmission costs. In addition, for the

[3] As noted earlier in this report, Hydro-Quebec required bidders into the 2023 Wind Call for Tenders to submit proposals with pricing that does not reflect any potential tax credit incentives or benefits. In the US, Production Tax Credits for wind have been available for some time and have been extended through the recent Inflation Reduction Act ("IRA"). Projects submitting proposals into US power procurement solicitations via Power Purchase Agreements ("PPA") commonly include a portion of the tax credit benefits in their pricing. The LCOE values reported for wind projects in the US generally have some tax credit benefits included in their pricing. Since Hydro-Quebec was seeking pricing for wind projects without any impact from tax incentives in the bid pricing, Merrimack Energy was required to provide benchmark pricing that did not include tax credit benefits for purposes of comparing the benchmark costs to bids submitted in the 2023 Wind Call for Tenders. Merrimack Energy found that NREL's Market Case for the 2023 ATB report initially calculated the pricing of wind power without tax credit benefits but then subtracted their estimated Production Tax Credit benefit of $17.62/MWh from the LCOE calculated without tax credit benefits to derive their LCOE values for wind energy. Merrimack Energy applied the Market Case methodology utilized by NREL to calculate comparable wind benchmark costs to the pricing required by Hydro-Quebec for bids submitted into the 2023 Wind Call for Tenders to ensure equitable and consistent pricing consideration.

[4] Section 3 of the Hydro-Quebec Mandate for Merrimack Energy's original assignment included as Objective 1 identification and analysis of the results of recent North American Calls for Tenders in terms of the unit cost per energy source. However, based on our role as Independent Evaluator for utility solicitations, it is very difficult to gain access to such bid data immediately after completion of a solicitation process given the confidential nature of the data and the market timing associated with Hydro-Quebec's Call for Tenders. Some data may be available from solicitations after contracts are executed and filed for approval with regulatory Commissions but the timing of such solicitations with regards to Hydro-Quebec's Call for Tenders may not correlate, particularly in light of recent price volatility.

wind resources selected, the focus of the competitive economic analysis will be on recent project costs since the cost of wind turbines and the commodities necessary to produce the turbines and related facilities has increased significantly, similar to cost increases throughout the electricity generation market. As demonstrated in Merrimack Energy's Benchmark Report, several wind power projects under development have recently announced capital cost increases for their projects. The timing of the increase in capital costs for wind turbines, any differences between subsidies for renewable resources in the US and Canada, transmission requirements, and other locational differences that influence the wind regime makes an accurate comparison between the costs of the wind resources selected by Hydro-Quebec Distribution and benchmark resources challenging.

Although it is difficult to conduct a consistent and equivalent evaluation of wind energy projects, Merrimack Energy has developed a reasonable approach for conducting the comparative cost assessment required by the Regie. The methodology undertaken by Merrimack Energy assesses the competitive cost of long-term power from the winning wind project bids into the 2023 Wind Call for Tenders relative to benchmark costs for wind generated electricity (including an assessment with and without transmission costs) based on general industry cost data as well as a sample of other wind projects proposed and under development in other North American markets on a real levelized cost basis over a 30-year term. The analysis also includes the cost of transmission from neighboring Northeast markets to Quebec.[5]

1.2 BACKGROUND

There are a number of factors that influence the cost of wind resources. These include the capital cost of the equipment, the cost of financing the project, operation, maintenance, and other administrative costs (e.g., property taxes and insurance costs), site-specific conditions, the size of the project, project configuration, and government incentives such as production tax credits, accelerated depreciation and local subsidy programs. Based on recent dramatic changes in electric power project costs resulting from such factors as: (1) supply chain constraints affecting the availability and cost of generating equipment; (2) project input commodity costs for a wide range of raw materials required in the production process such as steel, copper, cement, etc.; (3) inflationary trends

[5] The cost of transmission from each relevant market is based on the transmission tariff rate associated with neighboring markets. However, it is quite common that to deliver wind energy to the market hubs, additional transmission capacity may be required due to the general remote nature of these projects relative to the location of the best wind sites.

affecting labor and other project development costs; (4) increases in interest rates in the US and other markets which affects the cost of borrowing to construct such projects; (5) worldwide competition for renewable resources; (6) exchange rate impacts; and (7) legislative and regulatory initiatives to increase subsidies for renewable projects, it is important that the cost of benchmark resources should be assessed in conjunction with Hydro-Quebec's timing for its 2023 Wind Call for Tenders in which bids were due in September 2023 and projects are expected to come on-line in December 2027, 2028 or 2029.

The strength of the wind resource (i.e., wind regime), including wind speed and wind speed distribution over the course of the year, and the matching of the wind resource to the wind turbine power curve, is also a major determinant of project cost. These factors determine project output and the associated capacity factor of the wind system. Since most of the costs associated with a wind generation facility are fixed costs, the higher the capacity factor, the lower the per-unit cost.

However, since the cost of wind generation is highly site specific, it is very difficult to consistently and equitably compare the economics of various projects since each project has a unique set of local conditions. Unlike other generation technologies, such as combined cycle or combustion turbine facilities that generally have a standard design and fairly consistent cost characteristics, the economics of wind generation can vary considerably in a number of areas.

1.3 COST FACTORS

1.3.1 Capital Cost and Operating Costs of Wind Projects

The capital cost of wind projects has been rising rapidly over the past few years. An article on wind project costs increases by IHS Markit, a part of S&P Global, issued on January 31, 2022[6] identified the major drivers of cost increases for wind projects based on discussions with Original Equipment Manufacturers ("OEM"). The article notes that the cost of onshore wind fell 40% in the latter half of the 2010's; however, prices are now on the rise, and that trajectory is set to continue, as cost increases and COVID induced bottlenecks snarl supply chains. For example, Vestas indicated it expected costs to continue to rise through 2022 and beyond because the company expected an increased impact from cost inflation related to raw materials, wind turbine components and energy prices.

[6] IHS Markit, "North America Wind Capital Cost and LCOE Outlook", January 2022.

The article also noted that the cost increases behind the price hike span materials, freight, labor needs coming out of the pandemic, and geopolitical risk. Rising material costs for aluminum, copper, fiber glass resins, and more have played a prominent role. Higher raw material prices are resulting in higher costs for all critical components including towers, blades, power electronics, and foundations. The top of the material cost list is the increase in steel prices, which accounts for a significant portion of wind project costs. In addition, increasing transportation and logistics costs are expected to continue to affect the wind power industry throughout 2022.

Based on recent increases in capital costs (which include the cost of turbines plus balance of plant costs plus development costs plus interconnection and network upgrade costs) for wind projects, capital costs now consistently exceed $2,000/kW installed (in nominal US dollars) in markets throughout the US. Since the cost of wind power is generally higher in the Northeast than other prominent wind regions in the US such as the Pacific northwest and Midwest markets, Merrimack Energy has estimated the LCOE for wind based on a range of capital costs of $2,000/kW (US$) to $2,500/kW (US$). Actually, within the past two months we have witnessed proposals for mid-sized wind projects with capital costs (including network upgrade costs) of over $2,500/kW (US$).[7] As Merrimack Energy notes later in this report, we believe the LCOE values resulting from the $2,500/kW (US$) case are reasonable for developing a base case for New England and New York.

Merrimack Energy has also used the LevelTen index for wind cost trends for benchmark cost assessments. As Merrimack Energy noted in its 2022 Benchmark Report, the index price for wind based on LevelTen's quarterly index increased from $30.74/MWh (US$) in Q1 2021 to $49.66/MWh (US$) for Q3 2022, the timing for submission of proposals bid into Hydro-Quebec's December 2021 Calls for Tenders. As Merrimack Energy noted in the Wind Benchmark Report developed as part of Deliverable 1 for this assignment, the quarterly index for wind prepared by LevelTen has increased by $7.85/MWh (US$) from Q3 2022 to Q3 2023 or by 15.8% over the past four quarters, which corresponds with the date for submission of proposals into Hydro-Quebec's 2023 Wind Call for Tenders on September 12, 2023. Merrimack Energy calculated levelized cost for wind PPAs in New England and New York based on applying the additional increase in wind costs from LevelTen to the LCOEs calculated in the Benchmark Report.

In addition to the recovery of capital-related costs, project developers also incur annual operation, maintenance and administrative costs and other operating

[7] Merrimack Energy is also seeing increases in network upgrade costs required to construct the facilities necessary to connect the projects to the utility system due to the increasing number of renewable energy projects in utility interconnection queues throughout the US.

expenses. The largest operating expense, by far, are scheduled maintenance, turbine repair costs and warranties. Other annual operating expenses include infrastructure and balance of plant maintenance, administrative and general costs (A&G), land royalties, property taxes, project insurance, electrical usage, and contingency.

The US Department of Energy (DOE) (Land Based Wind Market Report 2022) estimated O&M costs for wind projects to average about $21/kW-year (US$) for projects that have entered service since 2010. According to DOE, O&M costs represent about 50% of all total operating costs, which according to DOE is estimated to be about $44/kW-year (US$). There are a number of other costs that should also be included in operating costs such as insurance, property taxes, capital expenditures, etc. We have seen estimates of total operating costs to range from about $35/kW-year (US$) to over $50/kW-year (US$). The NREL 2022 ATB calculates a Fixed O&M rate of $42.19/kW-year (US$) for wind projects.

Merrimack Energy is therefore using an operating cost consistent with the NREL value of $42.19/kW-year (US$) starting in 2027 and escalating annually by inflation thereafter.

2 METHODOLOGY, APPROACH, RESULTS AND CONCLUSIONS

Given the recent significant increase in the capital cost of wind projects and other generation options, a valid comparison of the market price of generation resources with the projects selected in the 2023 Wind Call for Tenders requires an assessment of only the most recent projects proposed or contracted since proposals were submitted in September, 2023. It would be expected that bidders would reflect cost changes in the wind industry into the third-quarter (Q3) of 2023 in their pricing.

To assess the pricing of bids submitted and selected from Hydro-Quebec's 2023 Wind Energy Call for Tenders (A/O 2023-01), Merrimack Energy has developed real levelized costs for market benchmark resources in neighboring power markets to compare to the real levelized cost of the bids evaluated and selected by Hydro-Quebec from the 2023 Wind Call for Tenders. Table 1 below provides a summary of the bids selected by Hydro-Quebec from its 2023 Wind Call for Tenders, including the real levelized cost with and without transmission and integration costs. Merrimack Energy has prepared real levelized benchmark costs for wind resources in neighboring Northeast power markets to match the portfolio of bids selected by Hydro-Quebec. Real levelized costs have been prepared under two cases: (1) Case 1 which does not include applicable transmission related costs for either the bids selected by Hydro-Quebec or the benchmark

resources; and (2) Case 2 which includes applicable transmission related costs for both the bids selected and benchmark resources required to deliver the power to the Quebec market. The comparative results for each case are described in this report.

Table 1: Summary of Bids Selected for 2023 Wind MW Call for Tenders for 1,500 MW

Bid No.	Type	Capacity (MW)	Energy (MWh)	COD (Yr)	Trans Cost - $2023 per MWh (Cn$)	Losses – and curtailment cost - $2023 per MWh (Cn$)	Real Levelized Cost of Energy - $2023 per MWh (Cn$)	Final Project Cost – energy, losses, transmission costs and curtailment - $2023 per MWh – (Cn$)
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
2	Wind	291.4	849,659	2029	$26.90	-$6.20	$87.40	$108.10
21	Wind	100.0	306,425	2028	$11.65	-$6.06	$81.86	$87.45
29	Wind	150.0	462,878	2029	$19.01	-$6.12	$82.57	$95.47
31	Wind	196.0	675,801	2027	$10.80	-$3.87	$58.16	$65.08
49	Wind	100.0	272,006	2027	$13.60	-$5.82	$78.56	$86.35
52	Wind	300.0	927,105	2029	$15.35	-$5.51	$74.45	$84.28
59	Wind	147.0	394,529	2028	$15.70	-$5.69	$76.87	$86.88
66	Wind	265.2	605,199	2029	$12.85	-$6.40	$86.38	$92.83
Total		1,549.6	4,493,602		$16.47	-$5.62	$77.64	$88.49

All of the selected bid proposed a contract term of 30 years. In addition to the cost information provided in Table 1 for the selected resources, three proposals had no Quebec content while the range for the remaining five projects was from 30% to 60%. Interestingly, the two lowest cost projects had Quebec Content percentage between 40% to 60%. In fact, the lowest cost proposal proposed a 60% Quebec content. On the other hand, the highest cost project selected had a 0% Quebec content. Since regional content was not binding on either project, Merrimack Energy would expect that the levels expressed by bidders would have little impact on pricing.

Merrimack Energy has developed estimates of the real levelized costs of comparable benchmark projects for the Northeast US and eastern Canada (New England, New York and Ontario) as a comparison to the real levelized costs of bids selected by Hydro-Quebec from Hydro Quebec's 2023 Wind Call for Tenders.

Merrimack Energy initially prepared an update to its 2022 Benchmark report[8] for wind only which provides estimates of comparable costs for wind resources in New England and New York ("bus bar costs") without any transmission costs included to deliver the power to the Quebec market. The benchmark cost analysis was developed using two methodologies: (1) calculate the real levelized cost based on the sum of the Net Present Value of capital cost for wind projects (including network upgrade costs and Operations and Maintenance ("O&M") costs divided by the Net Present Value of the generation from the projects for those markets from which the project emanate[9]; and (2) calculate the levelized cost of wind projects based on levelized project costs for wind projects in New England and New York based on bid data adjusted for cost increases experienced for wind projects to Q3 2023 to match the date for receipt of bids for the Hydro-Quebec 2023 Wind Call for Tenders. Since there was little information regarding benchmark costs for eastern Canadian Provinces, Merrimack Energy has utilized the benchmark costs for New England and New York as samples. The initial costs for wind (without transmission costs added) are provided in Table 2 below[10]. For example, data in the first three rows of columns 2 reflects the projected levelized cost for wind for each capital cost level identified in US$. Column 3 includes the same costs but calculated in Canadian dollars based on Hydro-Quebec's projected exchange rate for US and Canadian dollars. Columns 4-5 calculate the costs in real levelized dollars to match Hydro-Quebec's methodology for evaluating bid resources from the 2023 Wind Call for Tenders process, including Hydro-Quebec's forecasted inflation rate.

[8] See Final Report of Merrimack Energy Group, Inc., "Benchmarking the Cost of Supplying Electricity From Renewable Energy Sources Relative to Hydro-Quebec's December 2021 Call For Tenders", February, 2023. The updated benchmark report for wind was submitted to Hydro-Quebec on December 7, 2023 under Deliverable 1 and is titled "Benchmarking the Cost of Supplying Electricity from Wind Energy Resources Relative to Hydro-Quebec's 2023 Wind Call for Tenders."

[9] Data associated with capital costs of benchmark wind generation resources includes network upgrade costs since a sample of the projects utilized are based on bid data which includes network upgrade costs for the resources.

[10] The data in Columns 1-3 in Table 2 above is taken from Table 11 from Merrimack Energy's Benchmark from Deliverable 1: Summary of Northeast US Wind Costs contained in Merrimack Energy's Report entitled "Benchmarking the Cost of Supplying Electricity from Wind Energy Resources Relative to Hydro-Quebec's December 2023 Wind Call for Tenders."

Table 2: Summary of Northeast US LCOE Calculations

Resource Cost Assessment	Levelized Cost of Energy ($/MWh US$)	Levelized Cost of Energy ($/MWh Cn$)	Real Levelized Cost of Energy (2023 $/MWh US$)	Real Levelized Cost of Energy (2023 $/MWh Cn$)[11]
Col 1	Col 2	Col 3	Col 4	Col 5
Wind				
Capital Cost - $2,000/kW (US$)	$74.95	$97.43	$56.34	$73.25
Capital Cost - $2,250/kW (US$)	$82.21	$106.87	$61.80	$80.34
Capital Cost - $2,500/kW (US$)	$89.46	$116.30	$67.26	$87.44
New England LCOE (US$)	$76.77 - $81.77	$99.80 - $106.30	$57.71 - $61.48	$75.03 - $79.92
New York LCOE (US$)	$76.77 - $94.40	$99.80 - $122.72	$57.71 - $70.98	$75.03 - $92.27

The initial assessment involves a comparison of wind project costs for both the benchmark resource and Hydro-Quebec's selected bids without transmission costs included in the evaluation. Based upon a comparison of Merrimack Energy's estimate of the benchmark resource real levelized cost for wind of $87.44/MWh (2023 Cn$) based on capital costs at $2,500/kW (US$) (last column in Table 2), relative to Hydro-Quebec's real levelized cost of energy, the overall portfolio cost for Hydro-Quebec of $77.64/MWh (2023 Cn$) is much lower than the benchmark cost of $87.44/MWh (2023 Cn$). All eight wind bids selected by Hydro-Quebec are lower than the benchmark. At a capital cost of $2,250/kW, four wind projects selected by Hydro-Quebec are below the benchmark cost and four are above the benchmark.[12]

Merrimack Energy has also provided benchmark costs for comparison to the total real levelized cost of the bids selected by Hydro-Quebec (Col 9 of Table 1) that include transmission costs to deliver the power to Quebec from New England, New York, and from Ontario as well as Hydro-Quebec's tariff for point-to-point transmission service.[13] Tables 3, 4 and 5 below include the transmission costs assumed for delivery of power for wind projects from New England to Quebec,

[11] The real levelized costs reported in Columns 4 and 5 reflect the use of Hydro-Quebec's forecast of the CPI Canada as the inflation forecast for determining the real levelized cost in 2023$, which was the basis for the inflation forecast used by Hydro-Quebec in their calculations of real levelized costs as reported in Table 1.

[12] As Merrimack Energy noted, while we have included the real levelized cost of wind in New York and New England, those costs are based on Power Purchase Agreements which we believe will likely include Production Tax Credits ("PTCs") in the pricing, although we do not know whether all, a portion or none of the PTCs are included in the pricing.

[13] Hydro-Quebec informed Merrimack Energy that such transmission costs should be included in the comparative evaluation of proposals from neighboring regions relative to Hydro-Quebec's bid results. Hydro-Quebec also informed Merrimack Energy that the equivalent Hydro-Quebec Transmission rate is $8.15/MWh (Cn$).

from New York to Quebec, and from Ontario to Quebec to compare against the real levelized cost of power calculated by Hydro-Quebec and including energy losses, transmission costs and curtailment costs evaluated by Hydro-Quebec and included in the selection of the final list of wind bids selected.

Table 3: ISO-NE Services and Tariffs to Deliver Power to Hydro-Quebec System

Transmission Service	Rate	Comments
Through or Out Service – Schedule 8	$1.60895/MWh	
Schedule 1 – Scheduling, System Control and Dispatch Services	$1.751180/kW-year should equal about $.57/MWh	
Schedule A – US portion of Phase I/II HVDC facilities	Previous rate used for other benchmark studies was $2.50/MWh	A transmission customer shall pay the Schedule 20A Service Provider's Phase I/II HVDC – TF Services charge to the Schedule 20A Service Provider.

Table 4: NYISO Services and Tariffs to Deliver Power to Hydro-Quebec System

Transmission Service	Rate	Comments
NYISO Transmission Service Charge	$2.19/MWh	Rate to Hydro-Quebec from NYPA to Chateauguay
NYPA Transmission Service Charge	$4.62/MWh	TSC rates differ on each utility system. The NYPA TSC for service over the Hydro-Quebec intertie shall be no more than $4.62/MWh.

Table 5: Ontario Services and Tariffs Deliver Power to Hydro-Quebec System

Transmission Service	Rate	Comments
Ontario Export Transmission Service ("ETS") Charge (Cn $)	$1.78/MWh	Rate to Hydro-Quebec from Ontario

Table 6 provides the real levelized costs for the three wind benchmark capital cost options with transmission cost adders for ISO-NE, NYISO and Ontario to compare against the total real levelized cost determined by Hydro-Quebec for the 2023 Wind Call for Tenders. To put the real levelized calculations on an equivalent basis, Merrimack Energy used Hydro-Quebec's inflation forecast based on the CPI Canada as the basis for calculation of real levelized costs as Hydro-Quebec has

done in their evaluation of the bids selected. In addition, the Hydro-Quebec Transmission rate of $8.15/MWh (Cn$) is included in all cases.

Table 6: Real Levelized Delivered Cost Comparison for Wind Resources

Resource Cost Assessment	Real Levelized Cost of Energy (2023 $/MWh Cn$) – No Transmission Costs	Real Levelized Cost of Energy (2023 $/MWh Cn$) with Tx NYISO	Real Levelized Cost of Energy (2023 $/MWh Cn$) with Tx ISO-NE	Real Levelized Cost of Energy (2023 $/MWh Cn$) with Tx Ontario
Col 1	Col 2	Col 3	Col 4	Col 5
Wind				
Capital Cost - $2,000/kW	$73.25	$86.04	$83.96	$80.72
Capital Cost - $2,250/kW	$80.34	$93.14	$91.05	$87.82
Capital Cost - $2,500/kW	$87.44	$100.24	$98.16	$94.92

While Column 2 in Table 6 includes the real levelized cost[14] without transmission costs from each market area (i.e., New York, New England, and Ontario), the next three columns include transmission costs to deliver the wind power from each market area into Quebec.[15] As the data in Table 6 above relative to Table 1 (col 9) illustrates, at a capital cost of wind of $2,500/kW (US$), the portfolio of wind bids selected by Hydro-Quebec via the 2023 Wind Call for Tenders is lower cost relative to the benchmark resources from the neighboring markets when the impacts of transmission (and other related costs) are included. For the totality of selected bids, six of the eight bids selected by Hydro-Quebec are lower cost than comparable wind resources from New York, New England and Ontario.

Merrimack Energy's overall conclusion based on this analysis is that the average cost the portfolio of wind resources selected by Hydro-Quebec is overall lower than or competitive with wind benchmark resources from New York, New England and Ontario based on most of the capital cost cases above $2,250/kW (US$) analyzed.[16] As Merrimack Energy noted based on its Benchmark Study completed in Deliverable 1 for this assignment, we believe the capital cost case of $2,500/kW, which includes the capital cost of wind projects and interconnection costs, is the most reasonable case in the current market for wind resources in the Northeast US and eastern Canada. In addition, only one bid

[14]The real levelized cost information in Column 2 is based on Hydro-Quebec's forecast of inflation.
[15] Merrimack Energy has assumed that all transmission costs will remain fixed for the 30 year contract term.
[16] The only case where the benchmark cost is lower than Hydro-Quebec's portfolio of projects selected is for the Ontario capital cost of $2,250/kW (US$).

selected (i.e., Bid 2), is higher cost than the benchmark resources in all three regions at the capital cost case of $2,500/kW, leading to the conclusion that the portfolio of resources selected is very competitive relative to the market benchmarks, with the majority of individual bids evaluated at lower real levelized costs than the market benchmarks with and without transmission costs.