Ontario Energy Board

EB-2019-0134

Atlantic Power Corporation Motion to Review and Vary OEB Decision and Order

IESO Response and Evidence

May 8, 2019

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1.0 KEY FINDINGS/RECOMMENDATIONS

This evidence is being prepared in response to a letter from the Ontario Energy Board (OEB) dated April 8, 2019 and the Notice of Hearing and Procedural Order 1, issued April 30, 2019, following Atlantic Power Corporation's application to review and vary the August 23, 2018 Decision and Order of the OEB in the EB-2018-0098 proceeding (the 2018 Decision), which granted Hydro One Networks Inc. (Hydro One) leave to construct the Kapuskasing Area Reinforcement (KAR) Project.

This report concludes that upgrading the transmission circuit H9K between Carmichael Falls Junction (JCT) and Spruce Fall JCT, and the installation of a capacitor bank and reactor at the Kapuskasing Transformer Station (TS) remains to be the recommended solution as it is still expected to be the least cost solution for meeting reliability in the Kapuskasing area.

Hydro One indicated in their update to the OEB that the station work associated with the project is now expected to be in-service January 2021, and not June 2020. This delay could cause a risk that voltage performance in the area violates planning criteria. However, the transmission studies show that this violation arises under a number of conservative planning conditions. The IESO believes that there is sufficient margin in the planning assumptions to accommodate the delay of the station work. The IESO expects that Hydro One will make all efforts to expedite the station work.

2.0 INTRODUCTION

The purpose of this evidence is to provide the IESO's response to the OEB, as ordered in its April 30, 2019 notice of hearing and Procedural Order No. 1 following Atlantic Power Corporation's motion to review and vary the OEB's 2018 Decision, granting Hydro One leave to construct the KAR Project.

3.0 PREVIOUS ECONOMIC ANALYSIS

The IESO's pre-filed evidence, included as part of Hydro One's LTC application, considered transmission and generation options to address the Kapuskasing area needs. These options, as well as their original costs, are summarized below.

3.1 Transmission Option (the KAR Project)

The transmission option included advancing the replacement of the 32 km section of circuit H9K between Carmichael Falls JCT and Spruce Falls JCT to increase the rating to at least 310 A and includes the installation of a 10 Mvar capacitor bank. The replacement of H9K was considered as an advancement given that it is expected to reach end of life between 2029 and 2034. The cost of this option, as per the IESO's pre-filed evidence, was estimated as $8.4 M - $10.5 M for a 10 and 15-year advancement, respectively.

3.2 Generation Options

The generation options included installing a new 10 MW generator in the area, or executing a new supply contract at an existing generation facility for at least 10 MW of supply, until H9K reaches end of life between 2029 and 2034 and is replaced. In the generation options, a capacitor bank is required at the end of the contract term for the generator, aligning with the replacement of H9K. The cost of these options, as per the IESO's pre-filed evidence, was estimated as $43 M to $47 M for a 10 and 15-year advancement and a new 10 MW generator in the area, or greater than $38 M for the new supply contract at an existing generation facility.

A 10 Mvar reactor bank at Kapuskasing TS was also included as part of the IESO's recommendation in the pre-filed evidence. This equipment is required immediately regardless of whether the needs are met by transmission or generation.

4.0 UPDATED ECONOMIC ANALYSIS

The IESO has updated the economic evaluation of the generation and transmission options in light of the following key changes and developments since the original economic assessment was conducted:

- Updated cost estimate and in-service dates for the KAR Project from Hydro One;
- Submission of Atlantic Power's expected costs for their Calstock GS and Kapuskasing GS facility to the OEB; and,
- The IESO's announcement and ongoing development of a transitional capacity auction (TCA). The TCA will evolve the existing Demand Response Auction (DRA) to enable competition between additional resource types, starting with dispatchable non-committed generators in December 2019.

Each of these key changes and developments is discussed further below in the context of the updated economic evaluation. Other refinements have been made to the economic evaluation for clarity and are also described below. The results of the updated economic evaluation are presented in Appendix A.

4.1 Updated Costs and In-Service Dates for the KAR Project

Hydro One states in its Change Notification Letter to the OEB, dated March 18, 2019 that there is a need for increased scope of work to accommodate the new reactive facilities (i.e. the capacitor bank and the reactor) at Kapuskasing TS. As a result, the new cost estimate to complete the project is approximately $32.1 M ($14.8 M in lines costs and $17.3 M in station costs). The project cost estimate previously provided by Hydro One in their LTC application is approximately $21.07 M ($15.07 M in lines costs and $6 M in station costs).

The IESO requested a detailed cost breakdown for the revised station scope of work from Hydro One to better understand how the increased costs should be considered in the transmission and generation options; this cost breakdown is shown below in Table 1.

The reactor at Kapuskasing TS is needed regardless of whether a transmission or generation solution is deployed to meet the area's needs. The reactor is needed today in both the transmission and generation options and, as such, costs associated with the reactor were not included in the original cost analysis as they are common to all options. Therefore, any costs as part of the revised station scope of work that are attributable to the reactor have similarly been excluded from the updated cost analysis completed by the IESO.

The timing of the need for the capacitor bank at Kapuskasking TS depends on the type of solution for the area, as the need is triggered by the expiration of local generation contracts. For the transmission option, the capacitor bank is needed at the same time as the upgrade of transmission circuit H9K. For the generation options, the capacitor bank is required when transmission circuit H9K reaches end of life and is refurbished between 2029 and 2034. Therefore, the difference between the transmission and generation options in light of the revised station scope of work is the net present value cost of advancing the capacitor bank by 8-13 years[1].

The costs that can be attributed to the capacitor bank and timed with its installation are identified in Table 1, below, and total approximately $5.6 M. For comparison, the total capital cost of the capacitor bank from Hydro One used in the IESO's pre-filed evidence is $2.0 M. The majority of the incremental costs provided by Hydro One are associated with station work to accommodate the installation of the reactor (which must also account for the eventual installation of the capacitor bank) and thus have equal impact on both the transmission and generation options.

The updated cost associated with the lines work (i.e., decrease from $15.07 M to $14.8 M) and capacitor bank (i.e., increase from $2.0 M to $5.6 M) was used in the IESO's updated cost evaluation, together with the new in-service dates for the upgraded H9K transmission circuit (March 2020 vs October 2019 in the pre-filed evidence) and station work (January 2021 vs October 2019 in the pre-filed evidence).

[1] The IESO's pre-filed evidence used a 10 and 15-year timeframe, assuming a 2019 in-service date. The new timeframe of 8-13 years reflects the new in-service dates provided by Hydro One.

Table 1: Detailed Cost Breakdown of the Revised Station Scope of Work

Station Work Item	Total Cost ($M)	Amount Attributed to Capacitor Bank in Hydro One Update ($M)	Amount Attributed to Capacitor Bank Cost in Pre-filed Evidence ($M)
Capacitor Bank	3.1	3.1	2.0
Reactor	4.5	-	
Other Yard Work	1.5	0.75	
SC1 Relocation	0.4	-	
Building Extension	3.6	-	
Grounding	0.2	0.1	
VR2 Removal	0.6	-	
Station Service	0.4	0.2	
Other Removals	0.6	0.3	
Terminal Stations	0.6	0.3	
Cable Trench	1.0	0.5	
Road/Civil Work	0.7	0.35	
Total	17.2	**5.6**	**2.0**

(Source: Hydro One)

4.2 Atlantic Power's Actual Costs for Kapuskasing Generating Station (GS)

The IESO has updated the economic evaluation of the generation option to reflect the information provided by Atlantic Power to the OEB in its evidence for the Kapuskasing GS facility, submitted on April 19, 2019 as Exhibit 1, EB-2019-0134. The costs for Calstock GS have not been used in the updated economic assessment given that they are higher than the estimate provided for Kapuskasing GS. The information used by the IESO includes:

- The annual total costs less fuel expenses from Appendix A, which are assumed to be in nominal dollars. The fuel expense was assumed to be attributable to the cost of fuel to produce electricity, which would be compensated through the energy market and HOEP. If any fuel is being used for building heating or station load, this would need to be included in the capacity cost.
- Annual total costs less fuel expenses for the period of 2031 – 2033 is represented by the average of the costs in previous years as no costs beyond 2030 were provided by Atlantic Power. The generating option would need to run to 2033 in the event that H9K is upgraded at the end of its expected life range. It is not clear from Atlantic Power's evidence if any capital injection is required to maintain the Kapuskasing GS facility

beyond 2030. If a capital injection is required, this would need to be added to the cost of the generation option.

- It is not clear whether Atlantic Power has included the cost of converting the facility to a remote-dispatchable peaking plant in the total cost estimates. If any capital is required to bring the facility from mothballed self-scheduling CCGT to an operable dispatchable SCGT, this cost would also need to be added to the cost of the generation option.

The impact of this change on the cost of the generation option is a reduction of approximately $10.0 M to $18.0 M. As noted above, there are a number of aspects related to Atlantic Power's costs that the IESO would like to confirm before validating these values.

4.3 Capacity Value and the Transitional Capacity Auction (TCA)

Since the 2018 Decision in EB-2018-0098, the IESO has announced and started development[2] of the TCA, which will evolve the existing DRA to enable competition between additional resource types, starting in December 2019. Given this development, the IESO has included a sensitivity analysis of potential system capacity value to determine the impact on the cost of the generation option. The assumptions and approach are described below.

- The system capacity value credited to the generation option is based on 10 MW, which is the magnitude of the local area need. A sensitivity has also been conducted in which Kapuskasing GS is assumed to be credited up to its full 25 MW of capacity.
- No discount has been applied to represent local area congestion that could limit deliverability of capacity from Kapuskasing GS to the broader Ontario power system to serve load.
- A range of possible system capacity values has been considered and based on the 2019 northeast DRA clearing price, as calculated by the average of summer and winter daily prices in the 2019 Post-Auction Report[3]. Payments are made per business day and a factor of 251 – representing 251 business days per year – is used to convert the auction prices from daily to annual amounts. The system capacity value is assumed to range from 0.5 to 1.5 times the 2019 northeast DRA clearing price. While a range has been considered to study the sensitivity of system capacity value, the IESO does not expect the cost of capacity in the Northeast to increase above current levels given the availability of supply in the Northeast zone.

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[2] The TCA Phase 1 Design Document was published on April 11, 2019 on the IESO's website.

[3] http://reports.ieso.ca/public/DR-PostAuctionSummary/PUB_DR-PostAuctionSummary_2019.xml

- No system capacity value has been credited in 2020. As stated in Atlantic Power's evidence, the Kapuskasing GS facility will require modifications in 2020 to resume and convert operation to a remote-dispatchable peaking facility. Therefore, the earliest the Kapuskasing GS facility could begin to participate in the TCA is for a 2021 commitment period.

The impact of including a system capacity value for 10 MW is a reduction in the cost of the generation option by $2.3 M to $3.4 M, depending on the assumed system capacity value.

4.4 Other Refinements

The economic evaluation has been updated to 2019 Canadian Dollars; the previous analysis was based on 2017 Canadian Dollars.

The IESO's pre-filed evidence presented the cost of the transmission option relative to the status quo, that is the cost of upgrading transmission circuit H9K and installing a capacitor bank in 2019 minus the cost of upgrading H9K when it reaches end of life between 2029 and 2034 (i.e., the "advancement" cost). To provide clarity, the IESO has chosen to present the updated economic assessment using the full cost of options. As such, the transmission option reflects the cost of upgrading transmission circuit H9K and installing a capacitor bank, according to Hydro One's updated in-service dates, and the cost of the generation option includes the cost of upgrading H9K and installing a capacitor bank between 2029 and 2034.

4.5 Summary of Differences Between the IESO's Evaluation and Atlantic Power's

A summary of key differences between the IESO's assumptions in its updated economic evaluation and Atlantic Power's evidence in Exhibit 1, EB-2019-0134 are summarized below:

Table 2: Key Differences Between IESO's Assumptions and Atlantic Power Evidence

Factor	IESO Assumption	Atlantic Power's Evidence	IESO Rationale
System Capacity Value (Years 2020-2023)	~ $34,000/MW-Year (2019 CAD/MW-Year)	~ $72,000/MW-Year (2018 CAD/MW-Year)	IESO based this on most recent DRA clearing price in the northeast zone. Note that DRA Clearing prices have consistently fallen over time. In the future, competition in the northeast zone is expected to increase, which is expected to drive down costs.
System Capacity Value (Years 2024-2030)	~ $34,000/MW-Year (2019 CAD/MW-Year)	~ $120,000/MW-Year	IESO continues to use the most recent DRA clearing price in the northeast zone. Although the

Factor	IESO Assumption	Atlantic Power's Evidence	IESO Rationale
		(2018 CAD/MW-Year)	global need for capacity increases over this timeframe, the cost of capacity in the northeast is expected to remain lower compared to other zones due to the supply demand balance in the northeast and no incremental need for global capacity specifically in the northeast is expected to arise.
Kapuskasing Capacity Costs	Excludes fuel cost	Includes fuel cost	The IESO has removed the fuel cost from the capacity cost. This assumes the fuel cost is attributable to the fuel required for producing electricity and not for maintaining capacity. If the fuel cost includes fuel that is used for building heating or station load, this portion of the cost should be included in the capacity cost.
System Energy Value	Not included.	Energy values were derived from 2018 HOEP prices, increasing by 5% annually as the demand increases	IESO evaluation did not consider an energy value given that there is no incremental system need for energy and there are no expected savings via displacement of more expensive energy.
Generator Lifespan	Case 1: 8 years (2020-2028) if H9K upgraded for 2029 Case 2: 13 years (2020-2033) if H9K upgraded for 2034	10 years (2020-2030)	IESO evaluation in Case 1 considered the H9K upgrade for 2029, after which the generator solution is no longer required. IESO evaluation in Case 2 considered the H9K upgrade for 2034, after which the generator solution is no longer required. Since there was no generator cost data from 2031-2034 in the evidence provided, the average generator cost was considered during these years.

4.6 Results

The results of the IESO's updated economic evaluation are presented in Tables A-1 and A-2 in Appendix A. The results show that the transmission option is the least cost solution, by approximately $13.0 M to $18.7 M for 10 MW of system capacity value ranging between 0.5 to 1.5 times the 2019 northeast DRA clearing price. The results of the sensitivity analysis also show that the transmission option remains to be the least cost solution even when the full capacity of Kapuskasing GS, i.e., 25 MW, is credited with a system capacity value equal to 1.5 times the 2019 DRA clearing price in the northeast.

The IESO's updated cost evaluation used the costs provided by Atlantic Power in Exhibit 1, EB-2019-0134 for Kapuskasing GS as a best-case estimate; however, the IESO has questions regarding fuel costs for station support, as well as capital injections required for operating the generator post 2030 and for resuming and converting operations to a remote-dispatchable peaking facility. Additional costs related to these items would increase the cost of the generation option.

In addition, the IESO has not included any sunk costs incurred by Hydro One to date for the development of the KAR Project since being granted LTC. These sunk costs would further increase the cost of the generation option.

5.0 RECOMMENDED SOLUTION

The IESO has concluded that upgrading transmission circuit H9K between Carmichael Falls JCT and Spruce Falls JCT, and the installation of a capacitor bank and reactor at the Kapuskasing TS (i.e., the transmission option) remains to be the recommended solution as it is still expected to be the least cost solution for meeting reliability in the Kapuskasing area.

In addition to being least cost, the transmission solution could also benefit the area by enabling additional generator output to be transferred out of the area.

In order for the IESO to consider a different recommended solution, the cost of the generation option would need to be at least on par with the transmission option. As shown in the results for the updated economic evaluation, the IESO does not expect the cost of the generation option to be on par with the transmission option, even when using a best-case estimate for the costs of the generating facility and crediting the full capacity of Kapuskasing GS, i.e., 25 MW, with a system capacity value equal to 1.5 times the 2019 northeast DRA clearing prices.

6.0 IN-SERVICE DATE AND NEED FOR INTERIM SOLUTION

As indicated in the IESO's pre-filed evidence, upgrading transmission circuit H9K between Carmichael Falls JCT and Spruce Falls JCT, and installing a capacitor bank must be completed by June 2020, when local generation facilities' contracts will have expired. The reactor is needed today. While the need for the project is June 2020, Hydro One originally proposed an in-service date of October 2019.

As per Hydro One's March 18, 2019 letter to the OEB, it is now expected that the upgraded H9K transmission circuit will be in-service by March 2020, which is before the expiration of the local generation facilities' contracts and sufficient to meet the timing of the need.

The station work, which includes the capacitor bank and the reactor, are now expected to be in-service by January 2021. This delay will create a risk that voltage performance in the area violates planning criteria. However, the transmission studies show that this violation arises under the convolution of a number of conservative planning conditions including: loss of two transmission elements at peak electricity load with 98% dependable hydroelectric generation conditions in the Kapuskasing area. While this scenario has a reasonable chance of occurring within a long period of time, it is highly unlikely to occur between June 2020 and January 2021. Considering also that these reinforcements are required to address a local area reliability concern and not bulk system reliability concern, the IESO believes that there is sufficient margin in the planning assumptions to accommodate the delay of the station work and, as such, an interim solution, such as the solution identified by Atlantic Power in its evidence regarding the transitional arrangement for Calstock GS, is not recommended at this time. The IESO expects that Hydro One will make all efforts to expedite the station work, bringing the in-service date as close as possible to March 2020 when the upgraded transmission line is put into service.

At this point, the IESO cannot speculate if there is a date beyond which interim measures would be required. Further delays would need to be assessed against planning conditions known at the time, to understand the risk of violating voltage performance criteria.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The IESO's analysis concludes that the transmission solution of upgrading the H9K circuit, still remains to be the recommended solution as it is still expected to be the least cost solution for meeting reliability in the Kapuskasing area.

The IESO continues to recommend an in-service date of June 2020 but given the delay indicated by Hydro One to January 2021, the IESO believes that there is sufficient margin on the planning assumptions to accommodate the delay of the station work so there is no interim solution recommended at this time.

APPENDIX A: RESULTS

Table A-1: Updated Economic Evaluation Results Compared to Previous Evaluation

<table>
<tr><th>Option</th><th colspan="2">Description</th><th>NPV (M, $2019)</th><th>H9K Upgraded by 2029 NPV (M, $2019)</th><th>H9K Upgraded by 2034 NPV (M, $2019)</th><th>Summary of Changes</th></tr>
<tr><td rowspan="2">Transmission</td><td>Updated</td><td>Upgrade H9K for 2020 and Install Capacitor Bank for 2021</td><td>24.4</td><td>n/a</td><td>n/a</td><td rowspan="2">• Representing full cost of option (i.e., not advancement cost).
• Updated lines and capacitor bank costs from Hydro One.</td></tr>
<tr><td>Based on Previous Evaluation</td><td>Upgrade H9K and Install Capacitor Bank for 2019</td><td>19.6

(19.2 $2017)</td><td>n/a</td><td>n/a</td></tr>
<tr><td rowspan="5">Generation</td><td rowspan="4">Updated</td><td>Operate Kapuskasing GS until H9K reaches end of life</td><td>n/a</td><td>21.9</td><td>33.0</td><td rowspan="5">• Representing full cost of option (i.e., generation plus transmission upgrades at end of life).
• Reflects generation costs provided by Atlantic Power.
• Reflects updated lines and capacitor bank costs from Hydro One.</td></tr>
<tr><td>Credit for value of 10 MW of capacity @2019 northeast DRA clearing price</td><td>n/a</td><td>-2.1</td><td>-3.1</td></tr>
<tr><td>Upgrade H9K and install capacitor bank at end of life</td><td>n/a</td><td>17.4</td><td>14.3</td></tr>
<tr><td>Total Updated Generation Cost</td><td>n/a</td><td>37.1</td><td>42.8</td></tr>
<tr><td>Based on Previous Evaluation</td><td>Execute a new supply contract at an existing generation facility for at least 10 MW of supply and operate until H9K reaches end of life and is upgraded</td><td>n/a</td><td>39.9

38.3 ($2017)</td><td>41.6

40.0 ($2017)</td></tr>
</table>

APPENDIX A: RESULTS

Table A-2: Net Delta Between Generation and Transmission Options with sensitivity for system capacity value ranging between 0 to 1.5 times the 2019 northeast DRA clearing price and 0 to 2.5 times the qualified capacity.

Case 1: Early H9K Upgrade (2029)

Net Delta Between Generation and Transmission Options ($k)			Qualified Capacity (MW)					
		% DRA Clearing Price	0 MW	5 MW	**10 MW**	15 MW	20 MW	25 MW
Capacity Value ($/MW-Year)	0	0	$14,923	$14,923	**$14,923**	$14,923	$14,923	$14,923
	17,175	50	$14,923	$14,816	**$14,709**	$14,602	$14,496	$14,389
	25,762	75	$14,923	$14,683	**$14,442**	$14,202	$13,961	$13,720
	34,349	100	$14,923	$14,496	**$14,068**	$13,640	$13,213	$12,785
	42,937	125	$14,923	$14,255	**$13,587**	$12,919	$12,250	$11,582
	$51,524	150	$14,923	$13,961	**$12,999**	$12,037	$11,074	$10,112

APPENDIX A: RESULTS

Table A-2: Net Delta Between Generation and Transmission Options with sensitivity for system capacity value ranging between 0 to 1.5 times the 2019 northeast DRA clearing price and 0 to 2.5 times the qualified capacity

Case 2: Late H9K Upgrade (2034)

Net Delta Between Generation and Transmission Options ($k)			Qualified Capacity (MW)					
		% DRA Clearing Price	0 MW	5 MW	**10 MW**	15 MW	20 MW	25 MW
Capacity Value ($/MW-Year)	0	0	$21,478	$21,478	**$21,478**	$21,478	$21,478	$21,478
	17,175	50	$21,478	$21,326	**$21,173**	$21,020	$20,868	$20,715
	25,762	75	$21,478	$21,135	**$20,791**	$20,448	$20,105	$19,761
	34,349	100	$21,478	$20,868	**$20,257**	$19,647	$19,036	$18,426
	42,937	125	$21,478	$20,524	**$19,570**	$18,616	$17,662	$16,708
	$51,524	150	$21,478	$20,105	**$18,731**	$17,357	$15,983	$14,610