COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF APPEALS AND DISPUTE RESOLUTION

In the Matter of	OADR Docket Nos. 2019-008, 2019-009, 2019-010, 2019-011, 2019-012 and 2019-013
Algonquin Gas Transmission LLC	Air Quality Plan Approval Weymouth, MA

PRE-FILED DIRECT TESTIMONY OF THOMAS A. CUSHING

A. Qualifications

1. My name is Thomas A. Cushing. I have been employed by the Massachusetts Department of Environmental Protection ("MassDEP" or "Department") since 1987. I have been the Air Quality Section Chief with MassDEP's Bureau of Air and Waste in the Southeastern Regional Office since 2012. As Section Chief, I am responsible for administering the air permitting activities and major source air compliance activities in MassDEP's Southeast Region. I make the final air permitting determinations for air plan applications submitted in accordance with 310 CMR 7.02.

2. Prior to my role as Section Chief, I worked in MassDEP's Air Permit Section in various capacities, most recently as the new source permitting lead in the Southeast Regional Office. As the new source permitting lead, I recommended permitting decisions to the Air Permit Section Chief. I received a Bachelor of Science in Chemical Engineering from Clarkson University. I subsequently took graduate courses in Public Administration at Union College. I have also taken numerous technical and regulatory

training courses sponsored by NESCAUM and the United States Environmental Protection Agency ("EPA").

3. My work at MassDEP includes supervising the administration and enforcement of the Massachusetts Clean Air Act, M.G.L., c. 111, sections 142A-O and the Regulations that implement the Act at 310 CMR 7.00 et seq. I also supervise the administration and enforcement of federal regulations issued pursuant to the Clean Air Act of 1963 and subsequent Amendments passed in 1970, 1977, and 1990. A copy of my resume is attached as Exhibit 1.

B. Introduction

4. Based on my review of the information cited below, it is my professional opinion that the July 24, 2020 Addendum to the Air Plan Approval dated January 11, 2019 meets the requirements of MassDEP's Air Pollution Control Regulations at 310 CMR 7.00.

Sources of information relied upon in filing my testimony include:

- Algonquin's "Addendum to Non-Major Comprehensive Plan Approval Application" dated July 24, 2020 including the amended Addendum dated August 7, 2020,
- Direct testimony of Mr. Christopher Harvey of Enbridge, dated July 24, 2020 including all exhibits attached thereto,
- Direct testimony of Ms. Nancy Kist of Enbridge, dated July 16, 2020, including all exhibits attached thereto,
- Direct testimony of Mr. John Heintz of Algonquin, dated July 23, 2020, including all exhibits attached thereto,

- Direct testimony of Mr. L. Barry Goodrich of Enbridge, dated July 23, 2020, including all exhibits attached thereto,
- Supplemental Direct Testimony of L. Barry Goodrich dated August 7, 2020, including all exhibits attached thereto,
- Direct testimony of Ms. Wendy Merz of Trinity Consultants dated July 24, 2020.
- Algonquin supporting documentation contained in document "Hyperlinks in PFDT.pdf," which includes:
    - MassDEP *Best Available Control Technology Guidance*, dated June 2011
    - EPA's draft *New Source Review Workshop Manual* dated October 1990,
    - EPA's *Emission & Generation Resource Integrated Database (eGRID)*
    - *2018 ISO New England Electric Generator Air Emissions Report*,
    - EPA Air Pollution Control Cost Manual, Chapter 2 *Cost Estimation: Concepts and Methodology*,
    - U.S. Energy Information Administration *Average retail price of electricity, annual*
    - AP-42: Compilation of Air Emissions Factors, Chapter 3 *Stationary Gas Turbines*,
    - 40 CFR 60 Subpart KKKK—Standards of Performance for Stationary Combustion Turbines
    - FERC *Cost-of-Service Rate Filings*,
    - Town of Weymouth Property Viewer
    - Massachusetts Department of Environmental Protection (MassDEP) *Top Case Best Available Control Technology (BACT) Guidelines*,

- Correspondence dated August 4, 2020 and August 6, 2020 from the Town of Weymouth,
- Algonquin's August 4, 2020 response to my July 29, 2020 request for information,
- Algonquin's August 5, 2020 response to my August 3, 2020 request for information (including a corrected document dated August 7, 2020), Algonquin's August 7, 2020 response to my August 5, 2020 request for information.

C. The Project

5. Algonquin Gas Transmission, LCC's ("Algonquin's") proposed project ("the Project") consists of one (1) Solar Taurus 60-7802 natural gas fired combustion turbine used to provide power to one natural gas compressor. The compressor will support capacity upgrades and expansion of Algonquin's natural gas pipeline system. Additional infrastructure that is part of the project includes the associated piping components.

6. This Project also includes additional equipment, which are exempt from plan approval. The exempt equipment and the basis for exemption are listed in Table 1 of the Air Plan Approval. Additionally, Algonquin has proposed the installation and operation of one (1) Waukesha model VGF24GL natural gas fired emergency generator set. The emergency engine generator set is subject to the Industry Performance Standards for Emergency Engines and Emergency Turbines at 310 CMR 7.26(42), which establishes performance standards in lieu of permitting.

7. The Project will be located at an existing Metering and Regulation station ("M&R"), which includes several natural gas-fired heaters and boilers ("the Facility").

The Facility is located on a site surrounded by Route 3A, Calpine Fore River Energy Center, and the Fore River. The nearest public access is on the eastern property line, the nearest residences are approximately 840 feet to the southeast of the Facility.

8. The Project's emissions are presented in Air Plan Approval SE-15-027. *See* Basic Documents. Additionally, Table 3-16 of the May 25, 2018 Air Plan Application identifies the total Project emissions of 52,090 tons per year ("tpy") of CO_2 equivalent. *See* Basic Documents.

9. These emission limitations, which are Federally Enforceable,[1] establish the Facility as a Non-Major source for all regulated pollutants, including hazardous air pollutants.

10. In October 2015, Algonquin submitted a Non-Major Comprehensive Plan Application ("NMCPA"). Revisions to the NMCPA were submitted in September 2016 and on May 25, 2018. The NMCPA was supported by a Sound Impact Assessment Report dated October 15, 2018.

11. On January 11, 2019, MassDEP issued a Non-Major Comprehensive Air Quality Plan Approval ("Plan Approval") to Algonquin. The Plan Approval was appealed by six Petitioners and an adjudicatory hearing was held over four days in May and June 2019. The Presiding Officer issued a Recommended Final Decision ("RFD") on June 27, 2019 upholding the Plan Approval and the Commissioner of MassDEP issued a Final Decision on July 12, 2019 affirming the RFD. MassDEP issued a final Plan Approval on August 26, 2019.

[1] See 310 CMR 7.00 definitions

12. Under the Natural Gas Act, Petitioners challenged the final Plan Approval at the United States Court of Appeals for the First Circuit ("First Circuit"). On June 3, 2020, the First Circuit vacated the Plan Approval and remanded the case to MassDEP for consideration of an electric motor drive ("EMD") as Best Available Control Technology ("BACT").[2] On August 31, 2020, the First Circuit granted Algonquin's Petition for Rehearing and the First Circuit remanded the air permit to MassDEP without vacating it.[3]

D. Revised BACT Analysis.

13. BACT requires the establishment of [an] emission limitation[s] for the facility being permitted based on the maximum degree of reduction of any regulated air contaminant for which MassDEP determines is achievable for such facility on a case-by-case basis. A BACT determination cannot allow emissions in excess of any New Source Performance Standard ("NSPS") or any National Emission Standards for Hazardous Air Pollutants ("NESHAPs").[4]

14. BACT is established using a top-down BACT analysis which is described below in subsection (b). In lieu of an emission-unit-specific top-down BACT analysis, an applicant may propose an emission control limitation by proposing a top level of control from the most recent plan approval or other action issued by the Department.[5]

[2] Town of Weymouth v. Massachusetts Department of Environmental Protection, 961 F.3d 34 (2020)
[3] Town of Weymouth v. Massachusetts Department of Environmental Protection, 2020 U.S. App. LEXIS 27667.
[4] 310 CMR 7.00 - definition of "Best Available Control Technology"
[5] 310 CMR 7.02(8)

(a) Top-Case BACT

15. The pre-filed direct testimonies of Mr. Goodrich and Ms. Merz and the Addendum characterize the emission control limitation associated with the proposed Solar Taurus turbine as top-case BACT.[6] However, MassDEP has not addressed top-case BACT for this Project. MassDEP's BACT Guidance states, in part: "As a condition of issuing a written Plan Approval to you for your Non-Major or Major Comprehensive Plan Application (CPA) under 310 CMR 7.02(5) or Limited Plan Application (LPA) under 310 CMR 7.02(4), the Department of Environmental Protection (MassDEP) must determine BACT for your proposal [footnote omitted]. To achieve this, your plan application must include: Top-Down or case-by-case analysis of BACT; or Top-Case BACT (BACT as defined by MassDEP in previous relevant decisions or guidelines)..." [7] Although Algonquin's BACT emission limits contained in Table 8A of the August 2019 Plan Approval are consistent with previous relevant decisions of the Department, the BACT emission limits in this case were established in a top-down manner and as such were not proposed as top-case in Algonquin's application[8]. At the time Algonquin's Air Plan Application was submitted, Approvals for Tennessee Gas Pipeline and Hopkinton LNG had not been issued, top-case BACT had not been established by MassDEP and thus a top-down BACT analysis was necessary.

[6] W. Merz pre-filed direct at paragraph 10, LB Goodrich pre-filed direct at paragraph 7, and Addendum at Section 3.1.
[7] Best Available Control Technology (BACT) Guidance, June 2011, 1
[8] Non-Major Comprehensive Plan Approval Updated Permit Application revised May 2018, Section 5.

(b) Top-Down BACT

16. A top-down BACT evaluation is done in accordance with a prescribed five-step process, namely 1: Identify all control technologies, 2: Eliminate technically infeasible options, 3: Rank remaining control technologies by control effectiveness, 4: Evaluate most effective controls and document results, 5: Select BACT.[9]

1. Step 1- Identify All Control Technologies

17. Algonquin's Addendum characterizes the use of an EMD as redefining the source and argues that it should be excluded from step 1 of the BACT analysis. MassDEP's position on redefining the source is addressed in the pre-filed direct testimony of Mr. Glenn Keith. However, consistent with the First Circuit's decision, Step 1 of this BACT analysis was conducted for an EMD.

2. Step 2 – Eliminate Technically Infeasible Options

18. In Step 2, evaluating technically feasible options, "[a] demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review."[10] Section 4.3 of the Addendum states in part, "[t]here is inadequate electricity supply at the Facility to support an EMD. Overcoming the absence of power would require significant infrastructure outside of the Facility." However, this statement does not "…show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the

[9] EPA NSR Workshop Manual, Table B-1.
[10] EPA NSR Workshop Manual, B.7

control option on the emissions unit under review."[11] Based on information contained in the BACT addendum, which includes vendor quotes for upgrades to the electrical infrastructure, the use of an EMD is technically feasible. The required infrastructure upgrades are more appropriately evaluated as part of the economic analysis in Step 4.

3. Step 3 – Rank Remaining Control Technologies by Control Effectiveness

19. For Step 3, ranking the technologies by control effectiveness, "all remaining control alternatives not eliminated in step 2 are ranked and then listed in order of overall control effectiveness for the pollutant under review, with the most effective control alternative at the top."[12] The EMD has no emissions and as such is ranked higher in control effectiveness than the SoLoNOx Taurus 60 natural gas fired turbine.

4. Step 4 – Evaluate Most Effective Controls and Document Results

20. For Step 4, evaluating the most effective controls and documenting the results, "the energy, environmental, and economic impacts are considered to arrive at the final level of control."[13] The focus should be on the direct impacts of the control alternative, and both beneficial and adverse effects should be taken into consideration.[14]

21. The Massachusetts Air Pollution Control Regulations (310 CMR 7.00 et seq.) define BACT as:

> an emission limitation based on the maximum degree of reduction of any regulated air contaminant emitted from or which results from any regulated facility which the Department, on a case-by-case basis taking into account *energy,*

[11] EPA NSR Workshop Manual, page. B20.
[12] EPA NSR Workshop Manual, B.7
[13] EPA NSR Workshop Manual, B.8
[14] Ibid.

> *environmental, and economic impacts and other costs,* determines is achievable for such facility through application of production processes and available methods, systems and techniques for control of each such contaminant. The best available control technology determination shall not allow emissions in excess of any emissions standard established under the New Source Performance Standards, National Emissions Standards for Hazardous Air Pollutants or under any other applicable section of 310 CMR 7.00, and may include a design feature, equipment specification, work practice, operating standard or combination thereof. (emphasis added)

A. Energy Impacts

22. In evaluating the energy impacts as required by the regulatory definition of BACT and the NSR Manual, MassDEP's BACT Guidance provides the following "[y]ou must also weigh the energy impacts of a given control technique or technology by estimating its direct energy consumption compared with that of alternatives. As a matter of course, energy impacts and costs are considered in the economic impacts assessment of Top-Down BACT."[15] Accordingly, the cost of natural gas and electricity are included as elements of the economic impacts analysis. See paragraphs 53 and 55 below and Exhibit 2. There were no other energy impacts evaluated.

B. Environmental Impacts

23. According to the MassDEP BACT Guidance, in considering environmental impacts, preference should be given to a "technology or technique that achieves the required reduction in air contaminant emissions with the greatest degree of pollution prevention."[16] In addition, "the cleanest outcome is required unless it can be eliminated based on technological or economic infeasibility."[17]

[15] MassDEP Best Available Control Technology (BACT) Guidance, p. 4
[16] MassDEP Best Available Control Technology (BACT) Guidance, p. 3
[17] Id.

24. Algonquin identified the environmental impacts of the EMD as "[a]n increase in indirect air emissions (from the upstream generation of electricity); [a]n increase in the amount of land disturbed; and [t]he creation of new permanent visual and noise impacts."[18]

25. As part of its environmental impacts analysis Algonquin quantified upstream air emissions of NOx and SO_2 for the EMD option and compared them to emissions from the SoLoNOx Taurus 60 natural gas fired turbine.[19] Additionally, the Addendum states "[a] comparison of NOx emission rates during these high impact time periods shown in Table 4-5 clearly demonstrates the SoLoNOx Taurus 60 natural gas fired turbine's environmental benefit over EMD with respect to potential impacts on ozone NAAQS attainment during these periods"[20]

26. Algonquin's comparison of indirect upstream emissions associated with an EMD and direct stack emissions of the SoLoNOx Taurus 60 misses the point of an environmental impacts analysis within the context of a BACT analysis. The environmental impacts associated with a facility's air emissions are more appropriately based on impacts to ambient concentrations of criteria pollutants, which are addressed through an air quality impact analysis (emissions dispersion modeling). The EPA's NSR Guidance clearly addresses this issue by stating "[t]he environmental impacts analysis is not to be confused with the air quality impact analysis (i.e., ambient concentrations),

[18] Addendum to Non-Major Comprehensive Plan Approval Application, Section 4.4.2
[19] Addendum, Table 4-4, page 4-10
[20] Addendum, Table 4-4, page 4-11

which is an independent statutory and regulatory requirement and is conducted separately from the BACT analysis.[2122]

27. The environmental impacts portion of the BACT analysis concentrates on impacts other than impacts on air quality (i.e., ambient concentrations) due to emissions of the regulated pollutant in question, such as solid or hazardous waste generation, discharges of polluted water from a control device, visibility impacts, or emissions of unregulated pollutants.[23]

28. Although there may be collateral upstream emissions of criteria pollutants associated with the generation of electricity, they are to be excluded from the environmental impacts analysis within the context of a BACT analysis.

29. The Addendum states that the use of an EMD would result in approximately 3 acres of additional land disturbed. Algonquin did note that much of the disturbed land would be restored and revegetated. An unquantified portion of the 3 acres of land would be permanently disturbed due to the construction of an additional substation. There would also be visual impacts due to the construction of a new substation. There are no other environmental impacts such as solid or hazardous waste generation or discharges of polluted water related to an EMD.

30. An EMD would have only limited environmental impact and accordingly, environmental impact does not exclude it as BACT. The permanent disturbance of less than 3 acres of land, limited additional visual impacts and sound impacts in an industrial

[22] EPA NSR Workshop Manual, page B.46.
[23] ibid

area are not considered a significant or unusual environmental impact, and as such does not affect the selection or elimination of EMD as BACT.[24]

C. Economic Impact

31. According to the NSR Manual "[c]ost effectiveness is the economic criterion used to assess the potential for achieving an objective at least cost. Effectiveness is measured in terms of tons of pollutant emissions removed. Cost is measured in terms of annualized control costs. The cost effectiveness calculations can be conducted on an average, or incremental basis."[25]

32. "Average cost effectiveness (total annualized costs of control divided by annual emission reductions, or the difference between the baseline emission rate and the controlled emission rate) is a way to present the costs of control."[26] Average cost effectiveness is calculated using the following formula from the NSR Manual:

$$\text{Average cost Effectiveness (dollars per ton removed)} = \frac{\text{Control option annualized cost}}{\text{Baseline emissions rate - Control option emissions rate}}$$

Costs are calculated in (annualized) dollars per year ($/yr) and emissions rates are calculated in tons per year (tons/yr). The result is a cost effectiveness number in (annualized) dollars per ton ($/ton) of pollutant removed.[27]

33. Algonquin proposed a combustion turbine to power the compressor, therefore baseline emissions are based on the use of a combustion turbine. In the Addendum, baseline emissions for NOx were based on the use of a dry low NOx ("SoLoNOx")

[24] EPA NSR Workshop Manual, page B.47.
[25] EPA NSR Workshop Manual, page B.36.
[26] ibid
[27] ibid

burner design, which limits NOx emissions to 9 ppmvd. The First Circuit's June 3, 2020 Opinion states in footnote 8, on page 21, "The electric motor, unlike the SCR discussed below, is a process-control technology, rather than an add-on technology (i.e., the compressor station needs either an electric motor or a SoLoNOx turbine, but not both). As such, the baseline emissions rate is not the emissions rate of the SoLoNOx turbine." Based upon my professional experience and knowledge of the EPA NSR Manual, my position determining the baseline emission rate is not the same as the First Circuit's approach.

34. SoLoNOx is a combustion design, which is inherent to the turbine's design and is not an add-on pollution control. SoLoNOx cannot be disengaged, and the turbine cannot be operated without SoLoNOx (at ambient temperatures above approximately 0°F). The NSR Manual requires baseline emissions to be established at design capacity, without control. "The baseline emissions rate represents a realistic scenario of upper boundary uncontrolled emissions for the source." [28] Because SoLoNOx technology is part of the physical design of the turbine, the NOx emissions of 9 ppmvd from that unit as designed, at maximum capacity, should be used to calculate baseline emissions for comparison to an EMD.

35. Acknowledging the First Circuit's opinion that the emissions rate of the SoLoNOx turbine is not the appropriate baseline emissions rate for evaluating an EMD, MassDEP has nonetheless considered that in a direct comparison with the SoLoNOx turbine, the EMD would effectively eliminate 100% of the emissions under evaluation and should be evaluated using the same underlying assumptions to ensure comparative

[28] EPA NSR Workshop Manual, B.37

results. I established the baseline, established a basis for determining cost of control, and established the basis for calculating cost effectiveness (i.e., cost per pollutant then cost for aggregated pollutants).

36. To address the First Circuit's position that emissions associated with a SoLoNOx Taurus 60 natural gas fired turbine is not the correct baseline when evaluating an EMD, I also evaluated a compressor turbine with a higher emission rate as a higher alternative baseline.

37. In establishing a higher alternative turbine baseline of 25 ppmvd for evaluation, Algonquin considered the regulatory limits contained in EPA's NSPS subpart KKKK.[29]

38. Based on my evaluation of alternative baseline emissions, I found that 25 ppmvd is appropriate although I did not rely on Algonquin's methodology of consulting the NSPS to establish the baseline emissions since the approach is inconsistent with EPA guidance which states: "The NSPS/NESHAP requirements or the application of controls, including other controls necessary to comply with State or local air pollution regulations, are not considered in calculating the baseline emissions. In other words, baseline emissions are essentially uncontrolled emissions, calculated using realistic upper boundary operating assumptions."[30] In establishing the baseline, I considered the emission rates of turbines for pipeline service that are currently available for sale in the United States. Correspondence from Solar Turbines states "Solar Turbines offers the Taurus 60 7802S with three different emissions levels for natural gas pipeline

[29] Addendum, page 4-21
[30] NSR Workshop Manual, page B-37

applications in the U.S.: 25, 15 and 9 ppm NOx @15% O_2."[31] As such, the alternative "worst-case" baseline for NOx emissions should be 25 ppmvd.

39. Algonquin established the CO and VOC emissions baselines as 17.28 tons per year and 2.64 tons per year, respectively. The CO and VOC emissions baselines were based on the emission limits established in the Plan Approval, which are based on the use of a 2-way catalytic control device to provide emissions reduction for both CO and VOCs.[32],[33]

40. As previously stated in paragraph 38, "[t]he NSPS/NESHAP requirements or the application of controls, including other controls necessary to comply with State or local air pollution regulations, are not considered in calculating the baseline emissions."[34] Accordingly, the CO and VOC emissions baselines should be based on emissions absent control and therefore are properly set at 37.42 and 2.79 tons per year, respectively, as identified in table 4-12 of the Addendum, "Alternative Baseline Emissions."[35]

41. The cost of using an EMD as a process-control technology for elimination of emissions from the source are the additional capital and operational costs above those costs associated with the proposed project, i.e. a turbine powered compressor.

42. The additional capital costs associated with the use of an EMD include a net reduction associated with eliminating equipment and costs unique to the turbine and a net increase associated with the infrastructure costs unique to an EMD.

[31] Pre-filed Direct Testimony of L. Barry Goodrich, exhibit 2
[32] Addendum, page 4-19
[33] Plan Approval dated August 26, 2019, page 14
[34] NSR Workshop Manual, page B.37
[35] Amended Addendum, page 4-23

43. The capital costs were annualized over a fifty-year period, using an interest rate based on current after-tax real rate of return, as calculated using Algonquin's 2019 FERC Financial Report Form No.2.[36] It should be noted that the longer the service life and the lower the interest rate, the lower the annualized capital costs and the lower the cost effectiveness in dollars per ton. A fifty-year period for the economic life of the project exceeds the 10 to 20 years that EPA considers typical but is based on Algonquin's expected life of an EMD.[37] The interest rate of 10.137% is consistent with EPA guidance, which states "The value used in most control costs analyses is 10 percent in keeping with current EPA guidelines and Office of Management and Budget recommendations for regulatory analyses."[38] The interest rate of 10.137% represents Algonquin's true cost of capital, which comports well with EPA guidance, which states "In assessing these private decisions, interest rates that face firms must be used, not social rates." [39]

44. The additional annual operating costs include a net reduction associated with operational costs uniquely associated with the turbine and a net increase for the operational costs uniquely associated with an EMD.

45. As discussed in paragraphs 31 and 32 above, cost effectiveness of an EMD as BACT is the total of annualized capital costs plus annual operating costs divided by baseline emissions. The numerator of $7,087,730 is the same regardless of whether the emissions associated with a 9 ppmvd (NOx) or a 25 ppmvd (NOx) turbine is evaluated as a baseline. The denominator (emissions controlled) varies based on unit evaluated. I

[36] Pre-filed direct testimony of Christopher Harvey, Exhibit 5
[37] NSR Workshop Manual, Appendix B, page b.10
[38] NSR Workshop Manual, Appendix B, page b.11
[39] EPA Control cost Manual, page 17

calculated the cost effectiveness using the difference between the baseline emission rate and the controlled emission rate and my evaluation of cost effectiveness of an EMD as BACT is presented in Exhibit 2.

46. Based on my evaluation of EMD as BACT, I found that the cost of using an EMD exceeds MassDEP's cost effectiveness ranges contained in MassDEP's BACT Guidance, which is $11,000 to $13,000 per ton of NOx and VOC controlled and $4,000 to 6,000 per ton of CO and SO_2 controlled.[40] See paragraph 68.

E. Evaluation of the Town of Weymouth correspondence

47. On August 4, and on August 6, 2020 MassDEP received two separate correspondences from the Town of Weymouth (Exhibits 3 and 4, respectively) which recommended MassDEP obtain additional information in order to make a more fully informed decision regarding the BACT determination.

48. I considered the Town of Weymouth's August 4 letter as follows:

49. Items 1 and 2 – During discussions with Algonquin on or about July 29, 2020, I was informed that the referenced June 2020 communication was considered confidential by National Grid and could not be provided. As a follow-up to the Town of Weymouth's letter, I again requested the information in my request for information dated August 5, 2020. Algonquin provided the requested document and it contains information about the Edgar substation.[41]

[40] MassDEP BACT Guidance, page 5.
[41] Algonquin August 7 response to request for information, Exhibit 1

50. Items 3, 4, 6, and 11 - In my August 5, 2020 request for information, I requested Algonquin to provide a discussion of transmission level power (115 kV) and distribution level power (13.8 kV) for powering an EMD. Algonquin provided a response in their August 7, 2020 response document. As part of their response, Algonquin (Enbridge) stated it has exclusively provided transmission line power to support its EMD installations in the US since 2008. See Exhibit 5. A list of ten Enbridge EMD-equipped installations in the US since 2008 and the associated voltage for each project was provided as part of the response. EPA guidance allows for standard industry practice in establishing cost effectiveness by stating "Although permit conditions are normally used to make operating assumptions enforceable, the use of 'standard industry practice' parameters for cost effectiveness calculations (but **not** applicability determinations) can be acceptable without permit conditions." [42]

51. Item 5 – In my August 5, 2020 request for information, I requested Algonquin to provide a map that identifies the proposed route of the underground cable that was used for costing purposes. Algonquin provided the requested map in their August 7, 2020 response document.

52. Item 7 - In my August 5, 2020 request for information, I requested information regarding whether National Grid could subsidize any of the capital costs associated with an EMD. Algonquin provided a response in their August 7, 2020 response document which states "Enbridge would be responsible for all costs associate [sic] with the service." See Exhibit 5.

[42] EPA NSR Workshop Manual, page B.39

53. Item 8 - I did not request this information from Algonquin because the cost of gas used for the BACT cost evaluation of selective catalytic control (SCR) in the original Application was based on data from the US Energy Information Administration for 2014 in Massachusetts.[43] The cost of natural gas used for the BACT analysis in the Addendum is based on the permitted annual fuel usage of the SoLoNOx Taurus 60 turbine at average annual temperature and maximum horsepower and a unit price for the fuel calculated based on the Algonquin city-gate price and the calculation set forth in Algonquin's FERC Gas Tariff, Sixth Revised Vol. 1, General Terms and Conditions (the "Tariff"), Section 25.[44] The EPA Air Pollution Control Cost Manual addresses the use of average cost data and site-specific information as follows:

> "The industrial user is more likely to have site-specific and detailed information than the average cost and sizing information used in a study estimate. The methodology laid out in this Manual can provide cost estimates that are more accurate when using detailed site-specific information. The anecdotal evidence from most testimonials volunteered by industrial users indicates that much greater accuracy than 30 percent probable error can be attained. However, this Manual does not assume that detailed site-specific information will always be available to estimate costs associated with installing and operating pollution abatement equipment at a much higher accuracy level. This Manual retains the conclusion that the cost methodology laid out in this chapter and information in each control measure chapter with 30% probable error is relevant to be used in air pollution control cost estimation for permitting actions. It is the affected industry source that bears the burden of providing information of sufficient quality that will yield cost estimates of at least a study-level estimate for permitting decisions pertaining to their facilities."[45]

Even though the use of site-specific gas rates could result in a more refined analysis than would the use of average cost data from the US Energy Information Administration, the

[43] Non-Major Comprehensive Plan Application Updated Permit Application, Revised May 2018, Attachment E, Table 1, footnote 5.
[44] Addendum, page 4-15
[45] EPA Air Pollution Control Cost Manual, Chapter 2 *Cost Estimation: Concepts and Methodology*, Section 2.3

EPA acknowledges the use of average cost data is sufficient for a study-level estimate associated with a BACT analysis.

54. Item 9 - I did not request information regarding the natural gas referenced in the May 2018 BACT SCR cost calculation because analysis of the SCR is not at issue in this BACT determination.[46]

55. Item 10 – I did not request this information because Algonquin provided documentation of the electric rate in its Addendum. The Town of Weymouth pointed out that the month of May 2020 had lower industrial electric rates than the electric rate use in the BACT analysis. The electric power rate of $0.1437 per kilowatt-hour ("kW-hr") used by Algonquin was an average industrial electric rate for calendar year 2019 from the same data source (www.eia.gov) cited by the Town of Weymouth in the August 4 letter.[47] The use of electric rates based on a single month's data during a shoulder season, which was during a time when Covid-19 restrictions were in place does not provide representative electric pricing for a unit which would be operating year-round. The EPA Air Pollution Control Cost Manual succinctly addresses this issue "[t]he basis of direct costs and recovery credits is one year, as this period allows for seasonal variations in production (and emissions generation) and is directly usable in financial analyses."[48]

56. Item 12, Analysis of Transmission Losses – I did not request this information from Algonquin. Algonquin presented electrical grid efficiency as part of their energy impacts assessment and environmental impacts assessment of an EMD within the BACT

[46] *Petitioners v. Massachusetts Department of Environmental Protection*, No. 19-1797, 26-31
[47] Addendum, page 4-16 and Appendix C, Table 1.
[48] EPA Air Pollution Control Cost Manual, Chapter 2 *Cost Estimation: Concepts and Methodology*, section 2.4.2

analysis in the Addendum. The request for equivalent natural gas pipeline losses associated with the operation of the turbine is not necessary because the scope of the BACT analysis is limited to evaluation of an EMD. Ultimately, the BACT determination was based on cost effectiveness.

57. Item 12 – I did not request information regarding gearbox efficiency. Gearbox efficiency is an essential part of the calculations necessary to calculate the equivalent electrical demand of an EMD at an equivalent power output to the turbine.[49] On the other hand, gearbox efficiency information for the Solar turbine is not necessary because fuel use is based on manufacturer's data and established fuel use limitations.[50]

58. I evaluated the Town of Weymouth's August 6, 2020 letter as follows:

59. Items 13, 14, 15, and 16 – I did not request information relative to storage options, grid reliability, forced outages or behind-the-meter generations options because they are not relevant to the cost effectiveness evaluation. Although these were mentioned in the BACT Addendum, they were not a factor in MassDEP's BACT analysis and determination.

60. Item 17 - I did not request this information because Algonquin did not contemplate the construction of a new building. The referenced building was part of MassDEP's January 24, 2020 Air Plan Approval issued to Tennessee Gas Pipeline discussed in paragraphs 15 and 61. Electrical system upgrades were included as capital costs associated with an EMD, so the need for electrical system upgrades was documented and quotes were provided to substantiate the costs.

[49] Addendum, page 4-8 and 4-9
[50] See proposed Air Plan Approval, Table 8A

61. Item 18 - I did not request this information because wetland issues were not a consideration in the BACT evaluation. The wetland issues relative to Worthington Brook that were quoted by the Town of Weymouth were from MassDEP's January 24, 2020 Air Plan Approval issued to Tennessee Gas Pipeline, which was included as Appendix A in the BACT addendum[51].

62. Item 19 - I did not request this information as the need for upgrades was addressed to my satisfaction in the pre-filed direct testimony of Mr. John Heintz, paragraphs 10-11, which was based on communications with National Grid. Additionally, Algonquin's August 7, 2020 response to the request for information identified the need for 115 kV power. See Exhibit 5, p.2

63. Item 20 - I did not request information as the issue of level of service was addressed to my satisfaction in Algonquin's discussion of transmission level power and distribution level power in Algonquin's August 7 response to my August 5th request for information. See Exhibit 5.

64. Item 21 - I did not request this information as the need for a high voltage line was discussed to my satisfaction in the pre-filed direct testimony of Mr. John Heintz, paragraphs 12 -14. Algonquin's August 7 response to my request for information also addressed alternative distribution level service as an alternative. See Exhibit 5, p.2. The $8.5 million quote was documented in Exhibit 2 of Mr. John Heintz's pre-filed direct testimony, a Revised Budgetary Estimate Proposal for the 115 kV Substation at the Enbridge Weymouth Compressor Station in Weymouth, MA from Dashell Corporation.

[51] BACT Addendum, Appendix A, page 8 of 50

65. Item 22 - I did not request this information as the need for a substation was established to my satisfaction in paragraphs 10-11 of the pre-filed direct testimony of Mr. John Heintz and additional documentation provided in Algonquin's August 7, 2020 response to request for information (the June 2020 National Grid correspondence). See Exhibit 5.

66. Item 23 - I did not request this information because the right of way purchase costs are documented to my satisfaction on page 4 in the pre-filed direct testimony of Ms. Nancy Kist, including Exhibits 1 and 2.

67. Item 24 - I did not request this information because the $693,764 cost associated with the medium voltage line is documented to my satisfaction in the pre-filed direct testimony of Mr. John Heintz, paragraph 19, including the price quote provided by J.L. Allen.

68. After considering comments submitted by the Town of Weymouth relative to capital costs associated with additional infrastructure, I conducted additional analysis of the costs and found that cost effectiveness is driven by the higher annual operating costs associated with an EMD. Based on my review, even when capital costs are eliminated from consideration on the 25 ppmvd turbine, the cost of control for NOx is $192,505 per ton, the cost of control for CO is $155,979 per ton and the cost of control for all pollutants (aggregated) is $75,999 per ton.[52] Similarly, on the 9 ppmvd turbine, the cost of control for NOx is $581,928 per ton, the cost of control for CO is $337,774 per ton and the cost of control for all pollutants (aggregated) is $161,370 per ton.

[52] Exhibit 2

Using the formula presented in paragraph 32:

Using the 25 ppmvd turbine as the baseline

$$\$192{,}505 \text{ (dollars per ton NOx removed)} = \frac{\$5{,}836{,}737}{30.32 \text{ tons} - 0.0 \text{ tons}}$$

$$\$155{,}979 \text{ (dollars per ton CO removed)} = \frac{\$5{,}836{,}737}{37.42 \text{ tons} - 0.0 \text{ tons}}$$

$$\$75{,}999 \text{ (dollars per ton removed aggregated)} = \frac{\$5{,}836{,}737}{76.8 \text{ tons} - 0.0 \text{ tons}}$$

Using the 9 ppmvd turbine as the baseline

$$\$581{,}928 \text{ (dollars per ton NOx removed)} = \frac{\$5{,}836{,}737}{10.03 \text{ tons} - 0.0 \text{ tons}}$$

$$\$337{,}744 \text{ (dollars per ton CO removed)} = \frac{\$5{,}836{,}737}{17.28 \text{ tons} - 0.0 \text{ tons}}$$

$$\$161{,}370 \text{ (dollars per ton removed aggregated)} = \frac{\$5{,}836{,}737}{36.17 - 0.0}$$

Even without inclusion of the capital costs this still exceeds the cost ranges of $11,000 to $13,000 per ton of NOx controlled and $4,000 to 6,000 per ton of CO controlled.[53]

[53] MassDEP BACT Guidance, p. 5.

69. Based on my review of the sources in information in paragraph 4, it is my professional opinion that the use of an electric motor drive does not represent Best Available Control Technology for the proposed compressor station.

Signed under the penalties of perjury this 29th day of September 2020.

Thomas A. Cushing

Thomas A. Cushing

EXHIBIT 1

THOMAS A. CUSHING

Thomas.Cushing@mass.gov (508) 946-2824

EDUCATION

Clarkson University
Potsdam, New York 13676
Bachelor of Science, Chemical Engineering, 1986

Union College
Schenectady, New York 12308

PROFESSIONAL EXPERIENCE

Commonwealth of Massachusetts 2012 to present
Department of Environmental Protection
Environmental Engineer V, Air Permit Section Chief
Supervise the Air Permit Section in MassDEP's Southeast Region. A program with multiple tiers of staff, responsible for all aspects of air quality permitting and compliance testing prescribed burning, and fire burn training.
Responsible for planning and directing air permitting, compliance, enforcement, compliance assistance activities, regulatory guidance, and ensuring that decision-making, recordkeeping, data management and fee tracking associated with such activities is conducted in accordance with MassDEP statutes, regulations, and policies.
Provide strategic coordination with both internal and external organizations such as Compliance & Enforcement, Asbestos, Solid Waste, REACT, Waste Water, Office of General Counsel, EPA, Office of Attorney General, Department of Justice, and local communities.
Responsible for all aspects of personnel activities, including hiring, performance evaluation and review, and staff development.
Participate in regulation and policy development. Assist in special projects including EIPAS development.
Assist Management in developing public outreach.
Develop section priorities and direct efforts of staff.
Represent SERO at air permit chief meetings for the purpose of program development and policy implementation.
Monitor staff performance, redirecting efforts as needed to achieve goals.

Commonwealth of Massachusetts 2005 to 2012
Department of Environmental Protection
Environmental Engineer IV
Supervise New Source Review for air quality program in MassDEP's Southeast Region including staff assignments and ensuring tasks are completed. Review staff work product to ensure consistency with Department's regional offices, consistency with enforcement actions, consistency with BACT, MACT, LAER, NSPS and other Federal and State requirements. Provide guidance and regulatory interpretations to the public, other states, legislators, industry, MassDEP's Compliance and Enforcement program, and other regulatory agencies including the USEPA, MEPA, OTA, and the Energy Facilities Siting Board. Provide comment on draft regulations. Assist in the development and implementation of Department initiatives and inter-regional enforcement.

Commonwealth of Massachusetts 1994 to 2005
Department of Environmental Protection
Environmental Engineer III
Responsible for all phases of new source and Title V Operating Permit processing, from pre-application guidance through post approval follow-up. Evaluate engineering reports and the technical design of complex production activities, combustion equipment, and air pollution control equipment. Negotiate permit standards, ensuring compliance with all Federal and State criteria. Provide regulatory guidance and assistance relative to air pollution control, pollution prevention, and associated technology. Coordinate permitting requirements with EPA, municipalities, MassDEP's compliance/enforcement efforts, other MassDEP Bureaus and Regions, and multiple other parties.

Commonwealth of Massachusetts 1989 to 1994
Department of Environmental Protection
Environmental Engineer II
Conducted multi-media inspections of complex industrial facilities to determine compliance with hazardous waste, Air Quality, Industrial Waste Water, and Toxic Use Reduction Act regulations, and policies. Developed and prepared enforcement strategies. Provided technical assistance and regulatory guidance to industry. Aided industry in identifying pollution prevention and pollution reduction opportunities. Conducted training of Department personnel. Served as liaison with other government agencies including EPA, Attorney General's Office, Department of Justice, and municipal authorities.

Commonwealth of Massachusetts 1987 to 1989
Department of Environmental Protection
Environmental Engineer I
Responsible for overseeing water system rehabilitation grant program, resulting in millions of dollars in infrastructure improvements. Reviewed grant applications, plans and specifications, contracts, and technical reports. Coordinated project funding throughout project cycle.

EXHIBIT 2

Algonquin EMD BACT cost analysis

Description	EMD cost	turbine cost	Net cost increase for EMD	Notes
	Capital costs			
baseline cost	$ 98,062,212	$ 98,062,212	$ -	
cost increase for EMD		$ 2,358,087	$ (2,358,087)	
upgrade Edgar station	$ 1,300,000		$ 1,300,000	
high voltage transmission	$ 8,500,000		$ 8,500,000	
Right of way	$ 619,460		$ 619,460	
medium volt substation	$ 3,950,000		$ 3,950,000	
raise elev of medium substation	$ 768,000		$ 768,000	
medium volt line install	$ 693,764		$ 693,764	
fuel gas equip savings		$ 209,756	$ (209,756)	
fuel gas install savings		$ 198,823	$ (198,823)	
air intake install savings		$ 306,406	$ (306,406)	
turbine exhaust install savings		$ 516,075	$ (516,075)	
total capital Investment	$ 113,893,436	$ 101,651,359	$ 12,242,077	
Annualized capital cost			**$ 1,250,993**	where: C[i(1+i)n]/[(1+i)n-1]
				C= total capital investment
				i= 10.137%
	Annual operating costs			n= 50 years
maintenance		207,403	(207,403)	
electrical	7,943,500		7,943,500	
stack testing		27,500	(27,500)	
catalyst replacement		37,487	(37,487)	
fuel		1,834,373	(1,834,373)	
annual operating cost subtotal	7,943,500	2,106,763	5,836,737	sum of sum of annual costs
Total annual control cost			$ 7,087,730	Annualized capital cost + annual operating cost subtotal

Cost of Control for EMD

pollutant controlled 9 ppm unit	emissions controlled (tons)	capital cost included **$/ton**	without capital costs **$/ton**
NOx	10.03	706,653	581,928
CO	17.28	410,170	337,774
VOC	2.64	2,684,746	2,210,885
PM	1.99	3,561,673	2,933,034
SO2	4.23	1,675,586	1,379,843
aggregated pollutants	36.17	195,956	161,370
pollutant controlled 25 ppm unit			
NOx	30.32	233,764	192,505
CO	37.42	189,410	155,979
VOC	2.79	2,540,405	2,092,020
PM	2.01	3,526,234	2,903,849
SO2	4.26	1,663,786	1,370,126
aggregated pollutants	76.80	92,288	75,999

EXHIBIT 3

MiyaresHarrington

J. Raymond Miyares Thomas J. Harrington Christopher H. Heep Donna M. Brewer Jennie M. Merrill
Rebekah Lacey Bryan Bertram Ivria Glass Fried Alexandra B. Rubin Katherine E. Stock Ethan B. Dively

August 4, 2020

By Electronic Mail

Mike Dingle, Esq.
Chief, Litigation

MacDara Fallon, Esq.
Senior Counsel

Jennie E. Outman, Esq.
Senior Counsel

Lauren Karam, Esq.
Counsel

Department of Environmental Protection
Office of General Counsel
One Winter Street
Boston, MA 02108

Re: In the Matter of Algonquin Gas Transmission, LLC
OADR Docket Nos. 2019-008, 2019-009, 2019-010, 2019-011, 2019-012 and 2019-013

Dear Counsel:

As you know, we represent the Town of Weymouth and associated petitioners in these consolidated proceedings. On July 24, Algonquin Gas Transmission, LLC ("Algonquin") submitted to the Southeast Regional Office ("SERO") Staff an "Addendum to Non-Major Comprehensive Air Plan Approval," prepared by Trinity Consultants (the "EMD BACT Analysis"), and supporting prefiled witness testimony. Pursuant to the Commissioner's remand schedule, SERO now has until August 7 to review the Electric Motor Drive ("EMD") BACT Analysis and request from Algonquin such additional information and analysis that it requires to complete its BACT determination (following a public comment period) on September 29.

We write to you because Weymouth's own experts have preliminarily reviewed the EMD BACT Analysis and believe that there are additional information and analysis that are necessary to reach a final BACT determination, and that SERO should therefore request from Algonquin. Rather than identifying these items during a public comment period or a post-determination adjudication, we believe that they are better raised now while SERO still has an opportunity to request that Algonquin supplement the record. Doing so also gives SERO an opportunity to see Weymouth's concerns about missing information and analysis in advance, with an opportunity to consider those concerns thoroughly as part of its own process.

1. **Communications with National Grid.**

   The Prefiled Direct Testimony of John Heintz, on page 3, refers to "communications in June 2020 with representatives from National Grid," but does not supply copies of those communications. We suggest that SERO request copies of any written documentation of communications to or from National Grid concerning the proposed Weymouth Compressor Station's use of an EMD, not restricted to only June 2020 or the specifically referenced communications. If Algonquin is relying on technical or other information from National Grid, SERO should have access to those documents so that SERO can properly consider that information.

2. **Edgar Substation Information.**

   An important issue related to the EMD BACT alternative is the potential use of the Edgar substation to provide electrical power. We suggest that SERO request from Algonquin the rated megavolt amperes ("MVA") capacity of the Edgar substation and the actual annual peak MVA load on the Edgar Substation, for calendar years 2015 through and including 2019. Such data are necessary to evaluate the representation that the Edgar substation "does not have the capacity to provide the level of service that would be required to power the EMD."

3. **Explanation for 115 kV Transmission Voltage Supply.**

   Algonquin's vendors propose to install a 115 kV high voltage transmission supply from the Edgar substation, instead of 13.8 kV distribution voltage supply also available at Edgar substation, and a 30 MVA substation capacity for the proposed 6 MVA load, medium voltage EMD. We suggest that SERO request that Algonquin evaluate installation of a 13.8 kV distribution voltage supply for its medium voltage EMD.

4. **National Grid Unit Costs for 13.8-kV Underground Transmission Line.**

   Algonquin provides certain cost estimates to construct an underground transmission line from the Edgar substation to the proposed Compressor Station. In relation to the request immediately above, we suggest that SERO request from Algonquin documentation of National Grid's unit cost to install an underground 13.8-kV transmission line.

5. **Underground Transmission Line Route.**

   Algonquin states that an underground transmission line from the Edgar substation would be approximately 0.5 miles and pass under a road and bridge. We suggest that SERO request that Algonquin supply a map (properly scaled so as to determine distance) that contains its proposed transmission line route and that depicts any alternative routes considered by Algonquin.

6. **Currently Configured Electric Supply to the Compressor Station.**

   As currently configured for a combustion turbine, the proposed Weymouth Compressor Station receives electrical power. We suggest that SERO request from Algonquin details about that electrical power supply, including: origin point; length of the conductor from the origin point to the Compressor Station; route of the conductor (ideally depicted on a map); whether the conductor is an overhead transmission line or undergrounded; and the type (e.g. 477AAC), voltage, and amperage rating of the conductor.

7. **Electric Power Supply Infrastructure Costs.**

   We suggest that SERO require Algonquin to explain whether and to what extent National Grid will be responsible for any costs referenced in the EMD BACT Analysis for electric power supply infrastructure (including but not limited to interconnection with the proposed Compressor Station). We suggest that SERO require any such response to include all D.P.U.-approved and other National Grid documents relevant to those costs and calculations, including the relevant D.P.U.-approved tariff and National Grid connection terms and conditions.

8. **Natural Gas Costs.**

   In its prior BACT analyses (most recently in 2018), Algonquin used the Massachusetts statewide industrial retail natural gas rate (in 2015 dollars, $11.34/MMBtu) when calculating BACT costs. But in the EMD BACT Analysis, Algonquin changes that price assumption to what appears to be the wholesale rate and, in any event, a much lower rate: $3.04 MMBtu. We suggest that SERO request that Algonquin explain the rationale for this change from its prior analyses.

9. **Natural Gas Source.**

   We suggest that SERO ask Algonquin to confirm that the natural gas referenced in the May 2018 BACT SCR cost-effectiveness calculation is the natural gas fuel used by the proposed Taurus 60 gas turbine, and that the additional natural gas fuel cost shown in the SCR cost-effectiveness calculation is associated with overcoming the pressure drop across the SCR.

10. **Industrial Electrical Power Retail Rate.**

    Algonquin uses an industrial retail rate for electrical power of $0.1437 per kW-hour. We suggest that SERO ask Algonquin to provide documentation confirming that rate where the U.S. Energy Information Administration lists the rate as $0.1387 for May 2020. (https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a)

11. Spartan EMD Technical Information.

We suggest that SERO confirm from Algonquin that the Spartan EMD it proposed for the Weymouth Compressor Station includes an input transformer and request that Algonquin supply 13.8 kV distribution voltage, available from the Edgar substation, to the input transformer.

12. Analysis of Transmission Losses.

Algonquin calculated certain, purported electrical grid efficiency losses as part of its EMD BACT analysis. Algonquin, however, omits any analysis of natural gas pipeline transmission losses, including in the form of compressor station power demand and natural gas consumption at compressor stations from the source of the natural gas to Weymouth. We suggest that SERO request from Algonquin such an analysis. Further, we suggest that SERO request from Algonquin the gearbox efficiency for the Solar Taurus 60 combustion turbine it proposed to operate at the Weymouth Compressor Station.

* * *

Thank you in advance for your consideration of this letter. Please also relay our similar thanks to SERO. Should SERO have any questions concerning the content of this letter, it should not hesitate to contact us (through your office). Finally, please note that we provide this letter to assist SERO in its decision-making. In doing so, we do not intend to waive Weymouth's rights to advance any arguments concerning these or other matters (including the relevance of any of this information to BACT for the Weymouth Compressor Station) in the future, for any reason. To the contrary, Weymouth reserves, and does not waive, all rights.

Sincerely,

J. Raymond Miyares
Bryan F. Bertram
Katherine E. Stock

cc: Service List

EXHIBIT 4

MiyaresHarrington

J. Raymond Miyares Thomas J. Harrington Christopher H. Heep Donna M. Brewer Jennie M. Merrill
Rebekah Lacey Bryan Bertram Ivria Glass Fried Alexandra B. Rubin Katherine E. Stock Ethan B. Dively

August 6, 2020

By Electronic Mail

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Department of Environmental Protection
Office of General Counsel
One Winter Street
Boston, MA 02108

Re: In the Matter of Algonquin Gas Transmission, LLC
OADR Docket Nos. 2019-008, 2019-009, 2019-010, 2019-011, 2019-012 and 2019-013

Dear Counsel:

This letter will supplement the correspondence sent to you on August 4. Since that letter, our experts have conducted additional reviews of the EMD BACT Analysis and supporting prefiled written testimony submitted to the Southeast Regional Office ("SERO") and believe that still more information and analysis are necessary to reach a final BACT determination, which SERO should therefore request from Algonquin. In making its requests to Algonquin, we suggest that SERO should seek supporting materials, notes, studies, and workbooks (with formulae intact) related to the requested information and analysis, in order to allow for SERO and the public to understand and evaluate the submissions provided.

13. Storage Options.

The EMD BACT Analysis states that installing an electric motor drive (EMD) instead of a natural gas-fired turbine would "cause substantial upstream air emissions" (p. 4-8), and that "natural gas delivery to the Maritimes system would cease during a power outage, preventing the delivery of natural gas from south of the compressor station to points north" (p. 4-7). We suggest that SERO ask Algonquin whether it considered battery or other storage options in order to mitigate natural gas delivery disruptions during a power outage and upstream emissions. If so, we suggest that SERO request that its analysis of storage options be provided.

14. Grid Reliability.

The EMD BACT Analysis states that (p. 4-6) "The Facility would be unable to meet its basic business purpose with an EMD when power from the grid is unavailable. That is, during electric power outages, Algonquin would not be able to transport gas from the lower pressure Algonquin system into the higher pressure system." We suggest that SERO request information on the number, extent and duration of blackouts that have impacted the project area, or the greater Boston area, in the 21st century.

15. Taurus 60 Gas Turbine Availability.

We suggest that SERO ask Algonquin to provide data on the frequency and duration of periods when gas turbines in the MW capacity range of the Taurus 60 MW have historically been offline for maintenance and, separately, on the subset of periods involving forced outages due to mechanical failures. We further suggest that SERO ask Algonquin to confirm that Taurus 60 maintenance outages or forced outages will disable the proposed Weymouth compressor whether or not there is an adequate supply of natural gas to run the gas turbine.

16. Behind-the-Meter Generation Options.

We further suggest that SERO ask Algonquin whether it considered onsite solar or other behind-the-meter generation options in order to mitigate natural gas delivery disruptions during a power outage and upstream emissions. If so, we suggest that SERO request that its analysis of behind-the-meter generation options be provided.

17. Need for New Construction.

The EMD BACT Analysis states that "electric driven compression would necessitate the construction of a new building, electric substation, and ancillary equipment within TGP's existing CS 261 site." (Appendix A, p. 8 of 50). We suggest that SERO request that Algonquin provide its analysis justifying the need for the new building, electrical substation or ancillary equipment associated with the EMD alternative and demonstrating the capital costs thereof.

18. Wetlands Analysis.

The EMD BACT Analysis also states that "[g]iven the existing facilities on the site, the only location where these facilities could be located would be in the southwest portion of the site, which has a large wetland system associated with Worthington Brook" (Appendix A, p. 8 of 50). We suggest that SERO request that Algonquin provide its analysis demonstrating that the wetland system adjacent to the existing site is the only suitable location available.

19. Upgrades and Additional Infrastructure Analysis.

The EMD BACT Analysis states that: "[t]he additional major infrastructure identified for the Weymouth Station to power EMD, based on information collected for this BACT Addendum, includes the following:

- Upgrades to Existing Edgar Substation
- High Voltage Transmission Line Installation
- Right of Way Land Purchase Costs (High Voltage Transmission Line);
- Weymouth Site Substation Installation; and
- Medium Voltage Line at Weymouth Station."

(p. 4-5). We suggest that SERO request that Algonquin provide its analysis demonstrating the necessity of the station and transmission upgrades and justifying the need for additional infrastructure. Of particular interest would be any analysis of alternatives to these upgrades and new infrastructure.

20. Level of Service.

In our August 4 letter, we noted the Prefiled Direct Testimony of John Heintz, which refers to communications with representatives of National Grid. Specifically, Mr. Heintz states that, "[i]n order to provide power to an EMD for the Weymouth Compressor Station, additional infrastructure improvements are required, including, but not limited to: (1) upgrades to the existing Edgar Substation located at the Calpine Fore River Energy Center, including a new breaker ("Edgar Substation")" (p. 3, ¶9). He then states that, "the existing Edgar Substation does not have the capacity to provide the level of service that would be required to power the EMD." (p. 3, ¶10). We suggest that SERO ask Algonquin to define "level of service" as used in this testimony, and to clarify what "level of service" is required to power the EMD and what "level of service" can currently be provided at the existing Edgar Substation.

21. Need for and Cost of the Transmission Line.

In his Prefiled Direct Testimony Mr.Heintz states that: "To transmit the electricity necessary to power an EMD at the Weymouth Compressor Station, approximately one-half mile of underground high voltage transmission line would need to be installed connecting the Edgar Substation to the Weymouth Compressor Station site" (p. 4, ¶12). We suggest that SERO ask Algonquin how this need was determined, including any analysis of alternatives, and the basis for the $8.5 million cost estimate for the high voltage (115 kV) transmission line installation (EMD BACT, Table 4-6, p. 4-15).

22. New Substation.

Mr. Heintz's Pre-Filed Direct Testimony also states that, "in order to transform the transmission level voltage from the Edgar Substation down to a useable voltage, Algonquin would need to construct a new substation at the Weymouth Compressor Station site." (p. 5, ¶15). We suggest that SERO ask Algonquin how this need was determined—specifically identifying the current transmission level voltage of the Edgar Substation and providing a definition of "useable voltage" in the context of transforming the transmission level voltage of the Edgar Substation.

23. Right of Way Land Purchase Costs.

The EMD BACT Analysis lists the "Right of Way Land Purchase Costs (High Voltage Transmission Line)" as $619,460 (Appendix C, Table 2). We suggest that SERO ask Algonquin to provide the basis for this figure.

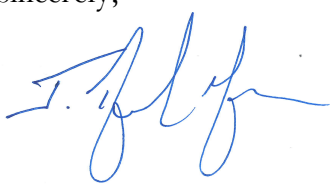
24. Medium Voltage Line Costs.

The EMD BACT Analysis lists the ""Medium Voltage Line at Weymouth Station" costs as $693,764 (Appendix C, Table 2). We suggest that SERO ask Algonquin to provide the basis for this figure.

* * *

Again, thank you in advance for your consideration of this letter, and please also relay our similar thanks to SERO. Should SERO have any questions, it should not hesitate to contact us (through your office). Finally, as stated previously, we provide this letter to assist SERO in its decision-making. In doing so, we do not intend to waive Weymouth's rights to advance any arguments concerning these or other matters (including the relevance of any of this information to BACT for the Weymouth Compressor Station) in the future, for any reason. To the contrary, Weymouth reserves, and does not waive, all rights.

Sincerely,



J. Raymond Miyares
Bryan F. Bertram
Katherine E. Stock

cc: Service List

EXHIBIT 5

memo

Date: August 7, 2020

To: Mr. Thomas Cushing, MassDEP Southeast Regional Office

From: Mr. Barry Goodrich, Enbridge
Cc: Ms. Kate Brown, Enbridge

Re: **Response to MassDEP Request for Clarifying Information on BACT Analysis for EMD Alternative Weymouth Compressor Station (Transmittal No. X266786)**

Below and attached please find Algonquin Gas Transmission, LLC's (Algonquin) response to your August 5, 2020 email requesting clarifying information on certain aspects of the BACT Analysis for EMD Alternative, which was submitted on July 24, 2020 as an Addendum to the Non-Major Comprehensive Plan Approval Application for the Weymouth Compressor Station (Addendum).

MassDEP Request 1: *A copy of the June 2020 communication from National Grid, which is referenced in the prefiled direct testimony of Mr. John Heintz. During conversations on or about July 29 and again on August 5, you indicated this document, which supports the necessity to upgrade the Edgar substation is considered confidential by National Grid and consequently, Algonquin may not be able to provide the requested document. Should you be unable to provide either the requested document or sufficient alternative documentation regarding the necessity for upgrades to the Edgar substation, MassDEP may consider excluding the costs associated the Edgar substation from the BACT analysis.*

Algonquin Response: Please find attached as Exhibit 1 hereto, a copy of the June 2020 communication from National Grid referenced in the prefiled direct testimony of Mr. John Heintz.

Enbridge provided Eversource and National Grid with specifications to supply power to a 30 MVA substation. Although the specifications that were provided were those that are necessary to support a single EMD unit, as noted in the communication, a 30 MVA substation would also be sufficient for an additional unit.

While Enbridge would normally use a soft start (or reduced voltage start) for the EMD, it would require the ability to conduct an across the line start (at motor rated terminal volatge) in the event that the soft start is unavailable. The across the line start requires a facility with capacity of approximately 27 Megavolt Amperes (MVA). Accordingly, Enbridge

specified a 30 MVA facility as the capacity required to prevent any adverse impact to the incoming utility service due to the starting conditions of the electric motor.

MassDEP Request 2: Please provide a discussion of using 115 kV transmission line power as opposed to 13.8 kV distribution line power for the electric motor drive under consideration.

Algonquin would require 115kV transmission line power to support an EMD alternative consistent with Enbridge's standard practice. Enbridge has exclusively provided transmission line power (69-250kV) to support its EMD installations in the U.S. since 2008. The following list identifies the service voltage provided for those projects.

Year	FERC Project Name	Station/Location	Service Voltage
2008	TIEMS II	Heidlersburg/PA	138kV
		Uniontown/PA	138kV
2010	TEMAX	Chambersburg/PA	115kV
	TIEMS III	Heidlersburg/PA	138kV
	TIEMS III	Uniontown/PA	138kV
2012	TEAM	Bedford/PA	138kV
2014	TEAM 2014	Delmont/PA	138kV
2016	GME	Opelousas/LA	138kV
	Access Adair South	Tompkinsville/KY	167kV
	Stratton Ridge	Angleton/TX	138kV

It is Enbridge's standard practive to utilize federally regulated transmission service for EMDs because it considers that more reliable than distribution service (<69kV) with respect to adequacy and operating reliability and thus closer to the fuel reliability that a gas turbine can provide for compression.

ENBRIDGE

memo

MassDEP Request 3: *Please provide a map, which identifies the proposed route of the underground cable that was used for costing purposes.*

Algonquin Response: Attached as Exhibit 2 hereto, please find a copy of the Atlantic Bridge Project Figure RR10 – Response 2C, created February 9, 2016, which identifies the approximate route of the underground cable that was used for costing purposes.

MassDEP Request 4: *Please identify to what extent National Grid would be responsible for costs referenced in the EMD BACT.*

Algonquin Response: Algonquin would be responsible for the costs referenced in the EMD BACT, not National Grid. *See, e.g.*, June 11, 2020 email from Joseph Murphy (National Grid) to Laurence Smith (Enbridge), attached hereto as Exhibit 1 ("Eversource would be responsible for designing and constructing any Substation modifications. Enbridge would be responsible for all the costs associated[ed] with the service.")

Exhibit 1 – Email Correspondence

Subject: FW: Enbridge Weymouth Compressor Station 138kV Transmission Service from Edgar Substation

From: Murphy, Joseph <Joseph.Murphy3@nationalgrid.com>
Sent: Thursday, June 11, 2020 12:45 PM
To: Laurence Smith <Laurence.Smith@enbridge.com>
Cc: Andy Nakanishi <Andy.Nakanishi@enbridge.com>; Paul Krawczyk <paul.krawczyk@eversource.com>; Thompson, Michael A. (Tx Commercial Svcs.) <Michael.Thompson@nationalgrid.com>; Reardon, Kevin C. <Kevin.Reardon@nationalgrid.com>
Subject: [External] RE: EXT || FW: Enbridge Weymouth Compressor Station 138kV Transmission Service from Edgar Substation

Hi Larry/ Andy,

I agree with Paul, that NGrid would provide the service, but it would be subject to an Agreement between Eversource and National Grid. Eversource would be responsible for designing and constructing any Substation modifications. Enbridge would be responsible for all the costs associate with the service. As mentioned, a formal review would require a System Impact Study and a PPA submittal at the ISO. We can't confirm Paul's number below, but concur that it is a recent/ reasonable example, assuming there is a open bay for a new Breaker. If not, the price would be more expensive to provide the service.

Given your need for an immediate answer and not knowing what would be involved with the requirements of a circuit, (particularly underground unknowns) unfortunately, it is not possible to develop an estimate specific to your project by Friday. I can confirm that the circuit between Edgar and the Point of service would be constructed, owned and operated by National Grid. All substation modifications would be constructed, owned and operated by Eversource.

If you wish to proceed with a formal request, let us know and we can start that process.

Thanks
Joe

From: Laurence Smith <Laurence.Smith@enbridge.com>
Sent: Thursday, June 11, 2020 10:29 AM
To: Murphy, Joseph <Joseph.Murphy3@nationalgrid.com>

Cc: Andy Nakanishi <Andy.Nakanishi@enbridge.com>
Subject: EXT || FW: Enbridge Weymouth Compressor Station 138kV Transmission Service from Edgar Substation

Joe,

Based on the below clarification from Eversource and the attached information previously provided by Enbridge, would it be possible for NG to provide a high level, nonbinding estimate for the cost to perform the work highlighted in yellow?

Please advise,
Larry

Laurence S. Smith

Sr. Electrical Engineer, Facilities Project Engineering
Engineering & Construction
Assigned to: Enbridge
Employee of: Aerotek
—

ENBRIDGE
TEL-713-989-8437 laurence.smith@enbridge.com
Office 5D43, 5400 Westheimer Court, Houston, TX 77056

From: Krawczyk, Paul H <paul.krawczyk@eversource.com>
Sent: Thursday, June 11, 2020 9:00 AM
To: Laurence Smith <Laurence.Smith@enbridge.com>
Cc: Andy Nakanishi <Andy.Nakanishi@enbridge.com>; Lucas, Jacob E <jacob.lucas@eversource.com>
Subject: [External] RE: Enbridge Weymouth Compressor Station 138kV Transmission Service from Edgar Substation

Larry,

This is a follow-up to my conversation with Andy regarding the below. As I noted to Andy, Enbridge's Weymouth station is in National Grids territory. So, National Grid would provide the retail service and be responsible for the underground line from Edgar Station to the Weymouth pump plant and would have to develop that cost. National Grid would also need to contract with Eversource for the 115 kV connection at Eversource's Edgar station. Engineering has not performed any review of the potential connection, but it appears that the connection would at least require the addition of one breaker. Unfortunately, it is not possible to develop an estimate specific to your project by Friday. A contract would be required, most likely with National Grid, outlining the scope and cost to perform the study and it would require following our internal cost estimating process. However, to give Enbridge an idea of the potential costs, a high level non-binding cost estimate of $3.4 million was provided to a customer in early 2015 for the addition of one breaker. While that estimate is not specific to Enbridge's project, it can give you an indication of the cost of adding a breaker.

Hope this is helpful.

Thanks,
Paul

Paul Krawczyk
Lead Transmission Analyst
Eversource Energy

(508) 441-5140

From: Laurence Smith <Laurence.Smith@enbridge.com>
Sent: Wednesday, June 10, 2020 1:57 PM
To: Krawczyk, Paul H <paul.krawczyk@eversource.com>
Cc: Andy Nakanishi <Andy.Nakanishi@enbridge.com>
Subject: Enbridge Weymouth Compressor Station 138kV Transmission Service from Edgar Substation

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Paul,

This is a follow up email to the VM Andy left you earlier today concerning the above subject. The following information should be sufficient for you to understand our needs and start a conversation with your transmission planning group:

- 9000HP Synchronist Motor Operating at Unity PF
- Normally Soft Started with 3X inrush Limit
- Occasional Across the Line Start in the event the soft starter is not available with Pre-start Notification to Eversource
- Enbridge Provided 30MVA, 138kV/13.8kV Substation with Capacity ALS and potential future HP expansion (2nd unit) included
- See attached for Arial View of proposed Line route to the Weymouth Station

As I'm sure Andy indicated in his VM, Enbridge is looking for rapid turnaround response for a high level (-50 to +200%) estimate for a scope and associated cost required for infrastructure upgrades and transmission line underground routing as noted on the attached that would be needed to support the above load addition to your Edgar substation. This request to Eversource is being driven by an urgent request from Enbridge's Air Permitting Team for engineering support in responding to certain regulatory time sensitive requests for information.

As such, it would be greatly appreciated if a call could be set up with Andy to discuss Eversource's ability to support this request.

With best regards,
Larry

Laurence S. Smith

Sr. Electrical Engineer, Facilities Project Engineering
Engineering & Construction
Assigned to: Enbridge
Employee of: Aerotek
—

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Exhibit 2 – Atlantic Bridge Project Figure RR10 – Response 2C

Legend

- New Electrical Substation
- 0.5 Mile Route for Electrical Supply

Sources: ESRI, SPECTRA

Spectra Energy Partners

Algonquin Gas Transmission, LLC
Maritimes & Northeast Pipeline, L.L.C.

Atlantic Bridge Project

Figure RR10 - Response 2C

Weymouth Compressor Station

Routes to Existing Electrical Substation

Created: 2/9/2016

TRC

14 Gabriel Drive
Augusta, ME 04330

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