

June 12, 2018

Mr. James R. Beyer
Regional Licensing and Compliance Manager
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Maine DEP
106 Hogan Road, Suite 6
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Re: Independent Peer Review of the Sound Assessment for NECEC

Dear Jim:

Tech Environmental, Inc. (TE) has completed an independent peer review of the acoustic impacts of the New England Clean Energy Connect (NECEC) electric transmission line, which will run from the border with Quebec in Beattie Township to a new converter station in Lewiston. The project includes two new substations, in Lewiston and Pownal, as well as equipment upgrades at three existing substations in Lewiston, Windsor and Cumberland. The new 345-kV, AC and 320-kV, DC transmission lines will total 147 miles in length.

The documents I received for this review are:

- Burns & McDonnell, Section 5.0 of the NECEC SLOD Application, “Noise,” 2017.
- NECEC, Response to the November 20, 2017 and December 12, 2017 MDEP Information Requests, March 29, 2018.
- Burns & McDonnell, “Raven Farm Substation Sound Study, Cumberland, Maine,” May 17, 2018.

Review Standard and Sound Sources

The purpose of this peer review is to determine if the acoustic studies submitted with the Application are reasonable and technically correct according to standard engineering practices, and whether adequate information is provided to enable the Department to draw conclusions about compliance of the NECEC with the Maine Noise Regulations.

The project will have two types of sound sources: (1) Transmission line corona discharge noise, which is loudest under wet weather conditions; and (2) Substation equipment noise, which occurs continuously day and night. These two sources are analyzed separately in the sections below.

Local Noise Standards

While this review does not address numerical sound limits, it is necessary to comment on the following text from Section 5.2.3 of the SLOD Application:

“Several municipalities that the NECEC Project passes through have their own noise regulations. The local regulations would be applied by MDEP in lieu of the MDEP noise regulation in each municipality, provided the local regulation meet[s] the requirements of MDEP Chapter 375.10(B)(1). The municipalities with local regulation are Lewiston, Greene, Leeds, New Sharon and Pownal.”

None of the five municipal ordinances regulate tonal noise. MDEP Chapter 375.10(B)(1) states:

“When a proposed development is located in a municipality which has duly enacted by ordinance an applicable quantifiable noise standard, which (1) contains limits that are not higher than the sound level limits contained in this regulation by more than 5 dBA, and (2) limits or addresses the various types of noises contained in this regulation or all the types of noises generated by the development, that local standard, rather than this regulation, shall be applied by the Board within that municipality for each of the types of sounds the ordinance regulates.”

If a proposed noise source generates Tonal Sound, a type of noise contained in the Maine Noise Regulations but not in the local ordinances, then those local ordinances will not be applied “in lieu of” the Maine Noise Regulation. Thus, establishing if NECEC sound sources will create Tonal Sound is important in evaluating the Application. As discussed below, transmission line noise is undoubtedly Tonal Sound. The information on Tonal Sound from the substations is incomplete.

Transmission Line Noise Assessment

The transmission line sound analysis covers less than two pages in Section 5.0 of the NECEC SLOD Application and provides no supporting documentation for the acoustic modeling. The Application states the Bonneville Power Administration (BPA) Corona and Field Effects Program was used to calculate expected audible noise under foul-weather/wet-conductor conditions. A wet weather sound level of 41 dBA is predicted at a distance of 75 feet from the center of the 345-kV, AC line. While that broadband sound level is consistent with verified modeling done for a similar 345-kV generator line on the Number 9 Wind Project in Aroostook County,¹ no discussion or analysis of tonal noise is provided.

The Application states the closest distance the transmission line could be to the edge of the Right of Way (ROW) is 75 feet, but it does not identify where that closest edge will occur along the project corridor. The brief summary on transmission line noise concludes with this sentence:

“However, while louder levels of audible noise could occur during foul weather, it would generally be masked by the background noise caused by rain and wind.” (page 5-2)

¹ Tech Environmental, Inc., “Independent Peer Review of the Sound Assessment for the Number Nine Wind Project – Revised,” March 8, 2016.

Wet conductor conditions and the accompanying corona discharge noise occur during mist, fog and light drizzle conditions, none of which provide “masking”. Those weather conditions are common in Maine throughout the year. Thus, the noise impact of wet weather corona discharge is generally not mitigated by storm noise. The transmission line noise assessment is incomplete.

Corona discharge under wet weather conditions typically produces a tonal sound at 120 Hz, in the 125 Hz 1/3-octave band, that is 15 to 20 dB above the sound level in adjacent octave bands.^{2,3} Such a tone qualifies as Tonal Sound, as that term is defined in the Maine Noise Regulations. Thus, the 5-dBA penalty for Tonal Sound applies to the proposed transmission lines.

We recommend the Department request the following additional information regarding the transmission line noise assessment:

1. Update the assessment to include tonal noise and discussion of the 5-dBA Tonal Sound Penalty.
2. Provide supporting documentation from the acoustic modeling.
3. List all property boundaries (show on maps, identify land owners) where the 345-kV, AC transmission line broadband sound levels under wet conductor conditions are predicted to exceed 40.0 dBA without a tonal noise penalty.
4. Provide a mitigation strategy for each instance in Item 3.

Substation Noise Assessments

Whereas varying amounts of information are provided in the noise assessments for the five substations, each is discussed in a separate section below.

Merrill Road Substation – Lewiston

At the new Merrill Road Substation in Lewiston, sound sources will include four DC-to-AC converter transformers, ten radiators and a building housing valves and reactors. Existing sound levels measured near the south property line establish that the site is not in a quiet area as defined in the Maine Noise Regulations. Acoustic modeling with CadnaA software predicted sound levels at six property line receptors (Table 5-7) and for a decibel contour map (Figure 5.2.4). While source data are provided, the ground factor “G” used in the CadnaA model is not listed. The highest predicted sound level, without a tonal noise penalty, is 48.3 dBA at receptor PL-5.

A power transformer for 60 Hz AC produces an audible tone at twice the line frequency, or 120 Hz. Depending on the transformer design, this may or may not produce a Tonal Sound at the property line.

² Muhr, M. et al., “Sound analysis and PD measurement of HV transmission lines,” Institute of High Voltage Engineering and System Management, Graz, Austria, 2004.

³ Straumann, U. and Semmler, M., “Mechanism of Tonal Emission from High-Voltage Transmission Lines,” Swiss Federal Institute of Technology, High Voltage Laboratory, 2005.

The Merrill Road Substation analysis does not discuss tonal noise and whether the Substation will produce Tonal Sound as defined by the Department. The transformers used in the acoustic modeling are a low-noise design. The sound assessment for Merrill Road Substation is incomplete.

We recommend the Department request the following additional information regarding the Merrill Road Substation noise assessment:

1. Provide the ground factor “G” used in the CadnaA modeling.
2. Provide octave band sound power levels for all noise sources used in the acoustic modeling.
3. Provide the CadnaA-predicted octave band sound levels, by source and the total, at receptor PL-5 and discuss why a Tonal Sound is, or is not, produced at that receptor.

Larrabee Road Substation – Lewiston

For the modified Larrabee Road Substation in Lewiston, three new 600 MVA transformers will replace the one existing transformer. Existing sound levels measured north of the substation establish that the site is not in a quiet area as defined in the Maine Noise Regulations. Acoustic modeling with CadnaA software predicted sound levels at seven property line receptors (Table 5-10) and for a decibel contour map (Figure 5.3.3). The Application states (page 5-16) that existing capacitors and reactors were incorporated into the model as sound sources. While source data are provided, the ground factor “G” used in the CadnaA model is not listed. The highest predicted sound level is 43.1 dBA at receptor PL-4. Given the low level of the highest predicted future sound level, a tonal noise analysis is not required.

We recommend the Department request the following additional information regarding the Larrabee Road Substation noise assessment:

1. Provide the ground factor “G” used in the CadnaA modeling.

Fickett Road Substation

At the new Fickett Road Substation in Lewiston, sound sources for the new STATCOM include two transformers, six reactors, three capacitors, five dry coolers, and two HVAC system fans. Existing sound levels measured on the site establish that the site is a quiet area as defined in the Maine Noise Regulations. Acoustic modeling with CadnaA software predicted sound levels at six property line receptors (Table 5-14) and for a decibel contour map (Figure 5.4.5). While source data are provided, the ground factor “G” used in the CadnaA model is not listed. The highest predicted sound level, without a tonal noise penalty, is 41.9 dBA at receptor PL-2.

The results presented in Table 5-14 are confusing to the reader because all of the modeled sound levels, except the results for receptor PL-2, include an added 5-dBA tonal noise penalty. The Applicant argues that broadband cooling fan noise will dominate the total sound level at PL-2, not tonal noise from the other sources. No documentation, however, is provided to support this claim, and cooling fans

themselves often have tonal characteristics. The sound assessment for Fickett Road Substation is incomplete.

We recommend the Department request the following additional information regarding the Larrabee Road Substation noise assessment:

1. Provide the ground factor “G” used in the CadnaA modeling.
2. Provide octave band sound power levels for all noise sources used in the acoustic modeling.
3. Provide the octave band CadnaA model results, by source and the total, at Receptors PL-1 and PL-2, and discuss why a Tonal Sound is, or is not, produced at those receptors. Clearly explain where a 5-dB penalty has, or has not, been added to the table results.

Coopers Mills Road Substation

For the expanded Coopers Mills Road Substation in Windsor, two new STATCOMs will be installed, and the new sound sources for each include of two transformers, six reactors, three capacitors, five dry coolers, and two HVAC system fans. Existing sound levels measured on the site establish that the site is a quiet area as defined in the Maine Noise Regulations. Acoustic modeling with CadnaA software predicted sound levels at three property line receptors (Table 5-18) and for a decibel contour map (Figure 5.5.5). While new source data are provided, the ground factor “G” used in the CadnaA model is not listed. The highest predicted sound level for the two new STATCOMs, with an added 5-dBA tonal noise penalty, is 45.8 dBA at receptor PL-3.

There is no discussion of existing sound sources at the substation in the Application, and whether these were included in the CadnaA model. The existing sound sources include “one large autotransformer, one 115/34 kV transformer, and one 115/12kV transformer”.⁴ CMP needs to confirm that these sources were in the acoustic model.

The Application includes this conclusion (page 5-30):

“Installing two new STATCOMs with the equipment sound levels in the table below may exceed the MDEP noise standards without additional mitigation, if a pure tone is measured. It is unclear at this time whether the new equipment will introduce enough tonal noise to measure a tone offsite. Additional noise control measures will be implemented as needed to achieve compliance with the MDEP noise standards.”

In the subsequent Response to Information Requests, the Applicant presents updated acoustic modeling for four property line receptors, and the highest predicted sound level for the two new STATCOMs, with a tonal noise penalty added, is 47.6 dBA at receptor PL-4. The Response then presents a mitigation strategy involving two sound walls, a 20-foot tall wall next to the main transformer and a 10-foot wall next to the STATCOM cooling fans, to lower all predicted sound levels below 45.0 dBA assuming the

⁴ CMP News, “CMP Breaks Ground on Coopers Mills Road Substation,” August 17, 2011.

new sources produce Tonal Sound and a 5-dBA penalty applies. The mitigated sound level at receptor PL-4 declines to 44.3 dBA with the addition of the two sound walls. The Response to Information Request #8 states:

“If subsequent modeling (using vendor-provided sound data on STATCOM equipment to be installed as part of the NECEC project) predicts that applicable MDEP sound level limits will be exceeded at any property lines, CMP will update its proposal to include sound walls. These walls would be designed to be mostly absorptive sound panels with standard sound reduction properties. Specific wall properties and dimensions will be determined during detailed design of the project.”

Earlier in the Response, the Applicant tells us that the updated acoustic modeling used “vendor-provided sound data” for STATCOM equipment, and the modeling results clearly show sound walls are necessary because the Applicant believes the new equipment will produce Tonal Sound at the property lines. Thus, at this point, CMP needs to confirm that its proposal for the Coopers Mills Road substation includes the two sound walls described in the Response to Information Request #8, or equivalent sound mitigation. The sound assessment for Coopers Mills Road Substation is incomplete. without a firm commitment to the sound walls.

We recommend the Department request the following additional information regarding the Coopers Mills Road Substation noise assessment:

1. Provide the ground factor “G” used in the CadnaA modeling.
2. Verify the three existing transformers were included in the CadnaA model, or redo the acoustic modeling with the three existing transformers added to the proposed new sound sources.
3. Provide a firm commitment to construct the two sound walls described in the Response to Information Request #8, or equivalent sound mitigation.

Raven Farm Substation

For the expanded Raven Farm Substation in Cumberland, a new 448 MVA transformer will be installed. Existing sound levels measured near the south property line establish that the site is not in a quiet area as defined in the Maine Noise Regulations. Acoustic modeling with CadnaA software predicted sound levels at six property line receptors (Table 5-21) and for a decibel contour map (Figure 5.6.3). The highest predicted sound level, with a 5-dBA tonal noise penalty, is 49.0 dBA at receptor PL-3.

The subsequent “Raven Farm Substation Sound Study” (May 17, 2018) presents different acoustic modeling results. In the most recent CadnaA modeling, the Applicant states that a ground factor $G=0.5$ was assumed (the value of $G=0.5$ is reasonable), and the new transformer was assumed to have a lower sound power level than in the original analysis. The highest predicted sound level, with an added 5-dBA penalty, is 44.6 dBA at receptor PL-1. The applicant states that the transformer will emit Tonal Sound and thus application of the 5-dBA penalty to all modeling results is required.

There are residential properties on all sides of the substation. The 2018 Sound Study presents three

mitigation options to achieve lower sound levels in the residential areas, and these involve the use of a lower-noise transformer and/or sound walls. The sound assessment for Raven Farm Substation is complete.

Conclusion and Summary of Recommendations

The noise assessment for the Raven Farm Substation is reasonable, technically correct and complete. The noise assessments for the transmission line and other four substations (Merrill Road, Fickett Road, Larrabee Road and Coopers Mills Road) are incomplete. The Department should request the following additional information from the Applicant:

For the transmission line noise assessment:

1. Update the assessment to include tonal noise and discussion of the 5-dBA Tonal Sound Penalty.
2. Provide supporting documentation from the acoustic modeling.
3. List all property boundaries (show on maps, identify land owners) where the 345-kV, AC transmission line broadband sound levels under wet conductor conditions are predicted to exceed 40.0 dBA without a tonal noise penalty.
4. Provide a mitigation strategy for each instance in Item 3.

For the four substation noise assessments:

1. Provide the ground factor “G” used in the CadnaA modeling.

For the Merrill Road Substation noise assessment:

1. Provide octave band sound power levels for all noise sources used in the acoustic modeling.
2. Provide the CadnaA-predicted octave band sound levels, by source and the total, at receptor PL-5 and discuss why a Tonal Sound is, or is not, produced at that receptor.

For the Larrabee Road Substation noise assessment:

1. Provide octave band sound power levels for all noise sources used in the acoustic modeling.
2. Provide the octave band CadnaA model results, by source and the total, at Receptors PL-1 and PL-2, and discuss why a Tonal Sound is, or is not, produced at those receptors. Clearly explain where a 5-dB penalty has, or has not, been added to the table results.

For the Coopers Mills Road Substation noise assessment:

1. Verify the three existing transformers were included in the CadnaA model, or redo the acoustic modeling with the three existing transformers added to the proposed new sound sources.
2. Provide a firm commitment to construct the two sound walls described in the Response to Information Request #8, or equivalent sound mitigation

Thank you for the opportunity to provide this initial independent peer review of the NECEC application. Please call if you have any questions.

Sincerely yours,

TECH ENVIRONMENTAL, INC.



Michael T. Lannan, P.E.
President
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TECH ENVIRONMENTAL, INC.



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