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March 22, 2021

Ms. Dianne Martin
 Chairwoman
 New Hampshire Site Evaluation Committee
 21 South Fruit Street, Suite 10
 Concord, NH 03301-2429

**Re: SEC Docket No. 2015-02
 Application of Antrim Wind Energy, LLC
 Post-Certificate Filings
 March 25, 2021 Public Meeting**

Dear Chairwoman Martin:

Antrim Wind Energy, LLC (“Antrim Wind”) offers the attached technical memos to assist the Site Evaluation Committee (“SEC” or “Committee”) in its deliberation of items 3. b., c., and d. on its Public Meeting Agenda for March 25, 2021. The memos represent the expert opinions of Robert O’Neal, Managing Principal of Epsilon Associates, Inc., and Kenneth Kaliski, Senior Director of RSG, Inc., that both Acentech, on behalf of Antrim Wind, and Cavanaugh Tocci, on behalf of the SEC, have correctly interpreted and applied the SEC’s rules governing sound monitoring and measurement.

As noted in his memo, Mr. Kaliski participated in the efforts of the Health and Safety Working Group that was part of the so-called Senate Bill 99 pre-rulemaking process managed by the former Governor’s Office of Energy and Planning, which led to the SEC’s current rules. In addition, Mr. O’Neal notes his 34 years of experience in the areas of community noise impacts and meteorological data collection and analyses, as well as his specific familiarity with the Antrim Wind facilities, and his background as a witness before the SEC in both the Antrim and Groton proceedings.

With respect to Agenda item 3. a., access to sound data, there was a long discussion of so-called “raw data” at the November 23, 2020 Public Meeting, with respect to which the Committee ultimately deferred a decision. Antrim Wind understands raw data to mean in this context the 1/8 second sound measurements, along with corresponding audio recordings, that underlie the hourly data provided in the seasonal sound monitoring reports. As an example of the magnitude of the data, for the winter 2020 report there were approximately 60,185,490 sound measurement records, stored in electronic format, and 93,156 minutes of corresponding audio records, which are necessary to interpret the sound measurements.

McLane Middleton, Professional Association
 Manchester, Concord, Portsmouth, NH | Woburn, Boston, MA

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As indicated at the November 23, 2020 Public Meeting, while the magnitude of the data presents certain logistical issues concerning the format and method of transmittal, Antrim Wind is prepared to provide the raw data in its existing format, consistent with the approach described by Commissioner Scott. See, Tr. p. 106, Public Meeting, November 23, 2020. In other words, insofar as the Committee determines that the raw data is relevant and should be made available to designated parties, Antrim Wind takes the position that it should only be required to give what it has, in the format that it is in. In accord with Commissioner Scott's approach, Antrim Wind therefore should not be required to create something, massage things, filter the data, or otherwise present it in some particular way.

If you have any questions, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Barry Needleman", written in a cursive style.

Barry Needleman

BN:sm

Enclosures



March 22, 2021

Jean-François Latour
Transalta Corporation
Box 19000 Station M
110 12th Avenue SW
Calgary, Alberta T2P 2M1

RE: Interpretation of NH Site Evaluation Committee Noise Standard

Dear Mr. Latour:

At your request, I reviewed the noise limits for wind turbines set by New Hampshire's Site Evaluation Committee (NH SEC). I am specifically focusing on the metric and averaging time used in the SEC's 40 dBA nighttime and 45 dBA daytime standards as applied in the postconstruction sound monitoring for Antrim Wind.

Background

Acentech was retained by TransAlta to do postconstruction sound monitoring for Antrim. Cavanaugh Tocci was retained as an independent third party to conduct monitoring at complainant locations and to conduct a peer-review of Acentech's work. Both Acentech and Cavanaugh Tocci's sound monitoring program were conducted by or under the direction of noise control engineers who are Board Certified by the Institute of Noise Control Engineering. Acentech and Cavanaugh Tocci used the one-hour L_{eq} results to compare to the SEC noise standard. Separately, The Windaction Group retained Robert Rand of Rand Acoustics LLC to conduct sound monitoring at one property. Mr. Rand used the maximum 1/8 second L_{eq} results to compare to the SEC noise standard.

Opinion

In my interpretation of the noise standard, both Acentech's and Cavanaugh Tocci's use of a not-to-exceed one-hour L_{eq} during sound monitoring at Antrim Wind was appropriate. I do not agree with Mr. Rand's interpretation of the standard as a 1/8-second maximum L_{eq} . My reasons are as follows:

- 1) The one-hour averaging time is consistent with the sound modeling protocols required under the SEC regulations. It is also more conservative than the 12-hour averaging time for daytime and nighttime specified in the noise limits.¹
- 2) The 1/8-second time interval is only mentioned as a *monitoring* interval in the SEC regulations, not as part of the noise standard averaging time. It is common practice among noise control engineers to monitor for shorter intervals than the standard's averaging time so that extraneous events can be filtered out of the sound sample. Then, the remaining sound levels are combined to create an equivalent continuous level over the averaging time. This is the method required under the standard ANSI S12.9 Part 3. This standard states that a common averaging time for the L_{eq} is one hour.
- 3) The maximum 1/8-second L_{eq} is not representative of long-term exposure to wind turbine sound. Rather, it is a short-term statistical anomaly that occurs once in 252,288,000 samples in a year. As such, it is not appropriate in a noise standard. The one-hour L_{eq} is a better representation of non-anomalous sound levels from the project.
- 4) There is no reliable way to determine the background sound level over a specific 1/8 second period, as these sounds are composed of sources that vary over time – induced by changing winds, human-made sounds, and animals. Thus, the practice of subtracting an *average* background sound level during a turbine shutdown from the *highest* measured 1/8 second when the wind turbines operate would have the tendency to bias the resulting turbine-only sound level results high.

Both my colleague at RSG, Eddie Duncan, and I served as guest experts on the SEC Health and Safety Working Group during the pre-rulemaking process. My recommendation to the SEC, as stated in the Working Group's report², was to use the one-hour L_{eq} as the averaging time and metric for a noise standard. Mr. Richard James, another guest expert on the Working Group, recommended an L_{fast} sound limit. Nowhere in the report was there a mention of a 1/8-second L_{eq} as the basis for a noise standard (it was only mentioned as a monitoring interval). While the Working Group report to the SEC is not the noise regulation, it does provide insight into the options the SEC considered.³ Given that L_{fast} is not an equivalent sound level metric, "equivalent sound levels" (i.e., L_{eq}) is mentioned directly in the SEC noise standard, and an equivalent

¹ The only time periods referenced directly in the noise limit portion of the regulation (Site 301.14.f.2) are the 12 hours during the day and 12 hours during the night. For example, "With respect to sound standards, the A-weighted equivalent sound levels produced by the applicant's energy facility during operations shall not exceed the greater of 45 dBA or 5 dBA above background levels, measured at the L-90 sound level, **between the hours of 8:00 a.m. and 8:00 p.m. each day...**" Thus the L_{eq} time period can be interpreted as between 8 am and 8 pm and between 8 pm and 8 am – that is, an L_{12h} .

² <https://www.nh.gov/osi/energy/programs/documents/sb99-rulemaking-final-deliverable.pdf>

³ In my review of the SB99 rulemaking docket, I did not find any mention of a 1/8-second L_{eq} sound limit to be recommended for consideration as a noise limit for the regulation.



sound level requires an averaging time, the use of a one-hour averaging time in this context is consistent (and the only L_{eq} averaging time) the SEC was presented with.

In conclusion, the use of the one-hour L_{eq} by Acentech and Cavanaugh Tocci as an averaging time and metric in postconstruction sound monitoring at Antrim Wind is appropriate.

Please contact me with any questions.

Sincerely,

KENNETH KALISKI, P.E, INCE BD. CERT.
Senior Director

ATTACHMENT A. QUALIFICATIONS

Kenneth Kaliski a Senior Director with Resource Systems Group, Inc. (“RSG”), where he has been employed for 35 years. He is a New Hampshire licensed professional engineer.

Mr. Kaliski is Board Certified through the Institute of Noise Control Engineering (“INCE”) and formally served on INCE’s Board of Directors and as Vice President of Board Certification. Within INCE he is currently the co-chairman of the Wind Turbine Technical Activity Committee. He is also a member of the Acoustical Society of America and serve on its Noise Technical Activity Committee.

Mr. Kaliski serves or has served as an expert on several standards committees, including ISO 9613-2 for outdoor sound propagation and ANSI S12.9 Part 4, “American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound – Part 4: Noise Assessment and Prediction of Long-term Community Response.”

He has worked on the modeling and monitoring of wind turbine sound from California to Maine. As examples in the Northeast, he managed the compliance sound monitoring project for Lempster Wind in New Hampshire, the permitting of Kingdom Community Wind in Vermont, reviewed the application of Oakfield Wind on behalf of the Town of Oakfield in Maine, and was the principal investigator for the Massachusetts Study on Wind Turbine Acoustics.

In 2020, Mr. Kaliski won the INCE William W. Lang Distinguished Noise Control Engineer award for my “... notable contributions to the field of wind turbine acoustics and use of rigorous analytics and novel approaches to advance the field of noise control engineering.”

Mr. Kaliski has been involved in the development of noise standards and guidelines for wind turbines, as well as their interpretation.

Finally, Mr. Kaliski served as a guest acoustical expert during the pre-rulemaking process in the Health and Safety Working Group. Under the moderation of Lisa Linowes, this committee included three other guest acoustical experts: Eddie Duncan, Stephen Ambrose, and Richard James, to assist the SEC in developing the sound modeling and monitoring regulations.



Sound level compliance periods 20210322.docx

PRINCIPALS

March 22, 2021

Epsilon Ref. 5731

Mr. Jean-François Latour, B. Sc., ASA
 Specialist, environment, Wind & Solar Operations
 TransAlta Corporation
 Box 1900, Station "M"
 110-12th Avenue SW
 Calgary, Alberta T2P 2M1
 Email: JeanFrancois.Latour@transalta.com

Subject: Sound Level Measurement Periods -- Antrim Wind Energy, Antrim, NH

Dear Mr. Latour:

Epsilon Associates, Inc. (Epsilon) is pleased to provide this letter to TransAlta Corporation regarding periods of sound level evaluation at the Antrim Wind Energy (AWE) project ("Project") in Antrim, NH. These apply to both the post-construction compliance program as well as any complaint response measurements.

Qualifications

I have 34 years of experience in the areas of community noise impacts, and meteorological data collection and analyses. My noise impact evaluation experience includes the design and implementation of sound level measurement programs, modeling of future impacts, conceptual mitigation analyses, and compliance testing. I am Board Certified by the Institute of Noise Control Engineers ("INCE") in Noise Control Engineering and I am a Certified Consulting Meteorologist (CCM) by the American Meteorological Society. Both of these certifications are national programs.

I have been performing sound level studies on wind energy generation facilities since 2004, and have worked on over 125 wind energy facilities across the US including several in NH. I have testified before the New Hampshire Site Evaluation Committee ("SEC") on the issue of sound levels before the SEC in Docket 2010-01, which pertained to Groton Wind, LLC's application for a certificate of site and facility. I also provided testimony to the SEC in 2012 regarding the same subject matter in connection with Antrim Wind Energy, LLC's ("AWE") application for a certificate of site and facility in Docket 2012-01, and again in 2016 for AWE (Docket No. SEC 2015-02).

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 Margaret B Briggs
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March 22, 2021

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Brief Background

The Project began commercial operation in December 2019. The first AWE quarterly sound level compliance testing program was completed by Acentech for “winter 2020” and the resultant report submitted to NH SEC on May 13, 2020. Since that time, Ms. Lisa Linowes has filed comments critical of the winter 2020 sound monitoring report and has criticized as well the work of Cavanaugh Tocci on behalf of the SEC. In a letter dated July 17, 2020, TransAlta responded to her comments. Based on my substantial experience, including working on sound issues in NH for SEC projects, TransAlta asked me to do an assessment of Ms. Linowes’ argument. This letter provides that assessment.

Time Period for Compliance

As a threshold matter, Ms. Linowes has fundamentally confused two issues – the speed at which a sound meter must be set under the SEC rules to record data vs. the actual measurement period used to assess compliance with the 45/40 dBA standard. These are two completely distinct issues. NH SEC Site 301.18(e)(6) deals only with the first issue (but Ms. Linowes mistakenly conflates this rule with the second issue). This rule requires a fast response of 0.125-seconds (one-eighth of a second) for post-construction sound testing. This is the response speed of the sound level measurement instrumentation. However, the response speed of the detector in a sound level meter is not the same as the time period to evaluate compliance with a sound standard. That is where Ms. Linowes makes her error. As illustrated below, erroneously using the sound meter setting as the compliance period would produce absurd results and make it impossible for any wind project to comply.

The widely used methodology for sound level compliance is that rapidly sampled sound levels (i.e., fast response) are aggregated into a prescribed time period (1-hour; 8-hours; 24-hours; etc.) to determine the sound level. NH SEC 301.18(e)(1) requires adherence to the ANSI/ASA S12.9-2013 Part 3 standard¹. Sections 6.7 and 6.8 of this ANSI standard note *the basic data collection procedure requires measurement of the continuous background sound for 10 minutes or more, and measurement of the sound with the source(s) in operation for the basic measurement period (e.g., 1 hour). The basic measurement period shall be divided into many small blocks of time. However, in no case shall the block of time be less than 1 second and shall divide (exactly without remainder)*

¹ “Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present,” ANSI/ASA S12.9-2013/Part 3 Reaffirmed by ANSI June 29, 2018. This standard lays out detailed steps to enable consistent measurement procedures when collecting and analyzing sound level data.

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into 3600 seconds. Therefore, as it is the basic measurement period that is used for compliance assessment, the suggestion by Ms. Linowes that one-eighth of a second is somehow meant to be the compliance period, is fundamentally incorrect. In addition, NH SEC 301.18(g) requires each post-construction sound period to measure the LA-10, LA-90, LC-10, and LC-90. These statistical sound levels are meant to be derived from a robust measurement period, such as the 1-hour example in ANSI S12.9-2013 Part 3, and trying to calculate an LA-10, LA-90, LC-10, and LC-90 from one-eighth of a second measurements is non-sensical.

The July 17, 2020 TransAlta letter² details the technical reasons why a 1-hour time interval is reasonable for the compliance evaluation of the NH SEC sound level limits, and thus those reasons will not be repeated in detail here. Epsilon supports the reasoning and conclusions in the July 17, 2020 letter. In summary, the use of a 1-hour LA-eq period for the compliance assessment is correct, and the use of a one-eighth of a second period for the compliance assessment would be incorrect.

NH SEC 301.14(f)(2) sets the “A-weighted equivalent sound levels” from wind turbines at 45 dBA or 5 dBA above background (daytime) and 40 dBA or 5 dBA above background (nighttime). The NH SEC rules do not explicitly state the time interval over which compliance is determined with the exception of the reference to the ANSI S12.9-2013 Part 3 standard and the section NH SEC 301.18(e)(1) which states “...and measurements shall include at least one nighttime hour...”. However, as a practical matter, using one-eighth of a second as the compliance time period would be unenforceable because, for example, every gust of wind will cause an “exceedance” of the NH SEC limits. Such a limit would likely result in every currently certificated NH wind project being out of compliance. And, if this type of improper measuring period were used more broadly, it would likely mean every noise source in the State of NH would be out of compliance with the limits in their local noise ordinance.

To further illustrate the problem with using a one-eighth second time interval to assess compliance, the AWE pre-construction sound level data were examined.³ Sound levels were measured 24 hours per day at five locations in January 2016 using the fast response setting, before turbines were constructed, hence representing the background sound from the existing environment. Table 1 summarizes the percentage of time that the pre-construction background sound levels were above the NH SEC standards using the “fast

² https://www.nhsec.nh.gov/projects/2015-02/post-certificate-filings/2015-02_2020-07-17_transalta_response_linowes.pdf

³ Sound Level Assessment Report, Antrim Wind Energy Project, Antrim, NH. Prepared by Epsilon Associates, Inc., February 17, 2016.

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response” sound level as a compliance measuring period. These data only included periods of time that met the NH SEC weather-related post-construction criteria:

- Ground-level wind speeds less than 3 meters/second at the microphone
- No precipitation

Table 1 AWE Pre-construction Sound Levels (Winter) Exceeding NH SEC Limits (without turbines, background sound from the environment only)

Measurement Location	% Time Over SEC Limit
1 – Franklin Pierce Highway	86%
2 – Loveren Mill Rd	46%
3 – Salmon Brook Rd	27%
4 – Reed Carr Rd	24%
5 – Gregg Lake Rd	30%

As the data in Table 1 show, before the wind energy facility existed, these short duration sound levels were over the NH SEC limits at Locations 2, 3, 4, and 5 approximately 25% to almost 50% of the time, and over the NH SEC limits 86% of the time at Location 1. It is worth pointing out that since these data were collected in January with snow cover and no vegetation, background sound level measurements during other times of year will typically be louder, and thus above the NH SEC limits an even higher percentage of time. Therefore, one-eighth of a second does not allow a clear distinction between the background sound and the turbine-only sound. The use of a 1-hour compliance period mitigates this issue.

Summary

In summary, sound level regulatory limits seek to balance land development while at the same time protecting the community from unreasonable sound. To achieve such balance, the compliance time period must:

- Be supported by ANSI S12.9-2013 Part 3 (referred to by NH SEC Rules), while one-eighth of a second is not, a 1-hour period is compatible with the prescriptions of this standard;

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- Account for the statistical reporting metrics (LA-10, LA-90, LC-10, and LC-90) as per NH SEC 301.18(g) for which a one-eighth of a second measurements is non-sensical;
- Be compatible with the pre-construction predictive sound modeling requirements per the NH SEC Rules (referring to ISO 9613-2 and IEC 61400-11). while a one-eighth of a second is not, a 1-hour period is compatible with the Rules and these standards (see reference in footnote 1 for details);
- Allow a clear distinction between the background sound and the turbine-only sound.

Considering the elements summarized above, a 1-hour sound level limit certainly accomplishes that balance while a one-eighth of a second sound level limit does not.

If you have any questions on this letter, please feel free to call me at (978) 461-6236, or e-mail me at roneal@epsilonassociates.com.

Sincerely,

EPSILON ASSOCIATES, INC.



Robert D. O'Neal, CCM, INCE Bd. Cert.
Managing Principal