

Site Evaluation Committee Public Meeting – Relevant Notes

Scope of SEC Public Meeting: “the appropriate methodologies for measurement and analysis of sound, and procedure for validating noise complaints.”

SEC Rules related to Sound Standard and Testing Procedure:

Rule 301.14 (f)(2) For wind energy systems, apply the following **standards**:

- a. 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, and the greater of 40 dBA or 5 dBA above background levels, measured at the L-90 sound level, at all other times during each day, as measured using microphone placement at least 7.5 meters from any surface where reflections may influence measured sound pressure levels, on property that is used in whole or in part for permanent or temporary residential purposes, at a location between the nearest building on the property used for such purposes and the closest wind turbine; and

Site 301.18 Sound Study Methodology. (sections a-d refer to pre-construction requirements)

(e) Post-construction noise compliance monitoring shall include:

- (1) Adherence to the standard of ANSI/ASA S12.9-2013 Part 3, available as noted in Appendix B, that requires short-term attended measurements to ensure transient noises are removed from the data, and measurements shall include at least one nighttime hour where turbines are operating at full sound power with winds less than 3 meters per second at the microphone;
- (2) Unattended long-term monitoring shall also be conducted;
- (3) Sound measurements shall be omitted when there is rain, or when temperatures are below instrumentation minima, and shall comply with the following additional specifications:
 - a. Microphones shall be placed 1 to 2 meters above ground level and at least 7.5 meters from any reflective surface, following the protocols of ANSI/ASA S12.9-2013 Part 3, available as noted in Appendix B;
 - b. Proper microphone screens shall be required;
 - c. Microphones shall be field-calibrated before and after measurements; and
 - d. An anemometer shall be located within close proximity to each microphone;

(4) Monitoring shall involve measurements being made with the turbines in both operating and non-operating modes, and supervisory control and data acquisition system data shall be used to record hub height wind speed and turbine power output;

(5) Locations shall be pre-selected where noise measurements will be taken that shall be the same locations at which predictive sound modeling study measurements were taken pursuant to subsection (c) above, and the measurements shall be performed at night with winds above 4.5 meters per second at hub height and less than 3 meters per second at ground level;

(6) All sound measurements during post-construction monitoring shall be taken at 0.125-second intervals measuring both fast response and Leq metrics; and

(7) Post-construction monitoring surveys shall be conducted once within 3 months of commissioning and once during each season thereafter for the first year, provided that:

a. Additional surveys shall be conducted at the request of the committee or the administrator; and

b. Adjustments to this schedule shall be permitted, subject to review by the committee or the administrator.

(f) Post-construction sound monitoring reports shall include a map or diagram clearly showing the following:

(1) Layout of the project area, including topography, project boundary lines, and property lines;

(2) Locations of the sound measurement points; and

(3) Distance between any sound measurement point and the nearest wind turbine.

(g) For each sound measurement period during post-construction monitoring, reports shall include each of the following measurements:

(1) LAeq, LA-10, and LA-90; and

(2) LCeq, LC-10, and LC-90.

(h) Noise emissions shall be free of audible tones, and if the presence of a pure tone frequency is detected, a 5 dB penalty shall be added to the measured dBA sound level.

(i) Validation of noise complaints submitted to the committee shall require field sound surveys, except as determined by the administrator to be unwarranted, which field studies shall be conducted under the same meteorological conditions as occurred at the time of the alleged exceedance that is the subject of the complaint.



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By email: Pamela.Monroe@sec.nh.gov

New Hampshire Site Evaluation Committee (SEC)
Attention: Pamela G. Monroe, Administrator
21 S. Fruit Street, Suite 10
Concord, NH 03301-2429

Re: Antrim Wind Energy – Post-Construction Sound Monitoring Report for Winter 2020

Dear Ms. Pamela G. Monroe,

Ms. Lisa Linowes filed a letter dated May 21, 2020 to the Site Evaluation Committee ("SEC"), providing comments regarding the Post-Construction Sound Monitoring Report for Winter 2020 ("Winter 2020 Sound Report"). Her letter was posted on the SEC website¹ under the Antrim Wind Energy (AWE) post-certificate filings in Docket No. 2015-02. Among other things, Ms. Linowes asserts that the report "*is flawed and should be rejected.*" As shown below, Ms. Linowes is wrong on all the counts set forth in her letter and it should therefore be disregarded.

This letter and its attachment have been prepared with the collaboration of our post-construction sound monitoring consultant, Acentech, who produced the Winter 2020 Sound Report.

1. **Technical responses to Ms. Linowes' comments**

Ms. Linowes makes seven erroneous comments on various sections of Acentech's Winter 2020 Sound Report. Acentech's responses to Ms. Linowes' comments are attached.

2. **Compliance assessment metric**

Ms. Linowes also argues that Acentech averaged data in hourly increments in a manner not supported by the SEC rules. She is mistaken on this count as well.

2.1. **Type of metric for the sound levels**

Site 301.14(f)(2) defines the limit in terms of A-weighted equivalent sound levels, generally denoted as LA_{eq} or A-weighted Leq. A-weighted equivalent sound level is not properly defined in

The SEC Rules are properly defined to protect the property owners, when properly applied. The SEC Rules state "not to exceed" ↳ in whose opinion?
https://www.nhsec.nh.gov/projects/2015-02/2015-02_post_certificate_filings.html

45 dBA Lfast. All prior NH wind projects show ample evidence of the limit being a "not to exceed" measurement. TransAlta and its consultants are obligated to follow the Rules, not redefine them to their advantage!

the SEC Rules. It is however defined in the ANSI S12.9-2013 Part 3², a standard referred to in the SEC Rules, which "major applications of this Standard include: [...] Measurement of source emissions as equivalent-continuous sound pressure level (LEQ)." The standard defines equivalent-continuous sound pressure level (LEQ) as follows:

"Square root of the time average of the integral of the squared sound pressure over a specified time." (emphasis added)

The compliance assessment metric is therefore clearly LA_{eq} as per the SEC Rules.

2.2. Time average/specified time for the A-weighted equivalent sound levels

To use the LA_{eq} it is important to identify the *specified time*. Justification for a 1-hour time average/specified time are summarized below.

2.2.1. Minimum measurement duration per Site 301.18(e)(1)

Site 301.18(e)(1) indicates that "[...] measurements shall include at least one nighttime hour, where turbines are operating at full sound power with winds less than 3 meters per second at the microphone" (emphasis added).

This does NOT justify their assertion of one-hour average. This specifies requirement to test for at least one hour at night between 8pm & 8AM!

2.2.2. ANSI S12.9-2013 part 3 recommendation

ANSI S12.9-2013 part 3 does not have a strict requirement on the specified time, but recommends/refers to 1 hour:

- Note from the introduction: "As an example, one hour (1 h) is used as the basic measurement duration in Part 3. One hour is not a measurement duration required by this standard; it is only an example of a basic measurement duration, though a common one."
- From introduction of section 6.7 (Basic procedure for measurement of equivalent-continuous sound pressure level): "The basic data collection procedure requires measurement of the continuous background sound for 10 min or more and measurement of the sound with the source(s) in operation for the basic measurement period (e.g., 1 h)"

*duration is NOT averaging!
- again - duration NOT averaging*

Based on the quotes above, a time average/specified time below 10 minutes would be an incompatibility with ANSI S12.9-2013 part 3, a standard referred to in the SEC Rules. Further, the standard recognize that 1 hour is a commonly used period, which aligns as well with Site 301.18(e)(1) reproduced above.

↳ for duration NOT averaging!

2.2.3. Compatibility with the pre-construction predictive sound modeling requirements

Additionally, the post-construction compliance assessment metric must be compatible with the one imposed for the pre-construction predictive sound modeling as prescribed in the SEC Rules.

² ANSI S12.9-2013 Part 3, American National Standard – Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present, American National Standards Institute, January 15, 2013

↳ No - once operational, burden is on TransAlta to apply safety factors to assure the L_{max} fast limit of 40/45 dBA is not exceeded!

→ FALSE! ISO 9613-2 does not reference IEC 61400-11

Per Site 301.18(c)(1), the predictive sound modeling must “[b]e conducted in accordance with the standards and specifications of ISO 9613-2 [...]” ISO 9613-2³ requires sound emission data for the modeling, preferably from measurements. For wind turbines, the common measurement protocol used is the one defined in IEC 61400-11⁴, another standard referred to in the SEC Rules. The calculations required by IEC 61400-11 are complex, but important aspects regarding time average/specified time are as follows:

- Per section 7.2.2 “at least 180 measurements shall be made overall for both total noise and background noise covering corresponding wind speed ranges” and “at least 10 measurements shall be made in each [hub-height 0.5 m/s] wind speed bin for both total noise and background noise.”
- Per section 7.2.3: “The equivalent continuous A-weighted sound pressure level of the noise from the wind turbine shall be measured at the reference position. Each measurement shall be integrated over a period of 10s.”
- Ultimately, the overall minimum duration of measurement would be 1800 seconds (180 x 10s) and a minimum of 100 seconds (10 x 10s) for each hub-height 0.5 m/s wind speed bins. The standard defines a complex calculation algorithm to get the apparent sound power level at each 10 m height 1 m/s wind speed bin for the wind turbine under test, which corresponds to a series of *integral of the squared sound pressure*.
- In reality, for most wind speed bins, a dataset for a specific wind turbine contains more measurements than the bare minimum required by IEC 61400-11 (to assure the minimum measurement number is reached for all wind speed bins, the more frequent wind speed bins will inevitably have more measurements). For the AWE’s turbine platform (Siemens SWT-3.2-113 2A, Rev. 0), Siemens Gamesa Renewable Energy has confirmed that the total noise measurement duration for each hub-height 0.5 m/s wind speed bins varies from 150 to 1060 seconds and the overall duration is 9330 seconds.

Based on the IEC 61400-11 elements and context summarized above, a time average/specified time below 1800 seconds (30 minutes) would lead to an incompatibility between the prescription imposed for the pre-construction predictive sound modeling and the compliance assessment metric for the post-construction sound monitoring.

In conclusion, the compliance assessment metric of 1-hour LA_{eq} aligns with Site 301.14(f)(2) and 301.18(e)(1) as well as the standards SEC Rules refers to and the standard industry practices.

The items above are not relevant to 512.9 Part 3’s observed tests. They are for laboratory grade tests under controlled weather conditions taken to provide standardized sound data to compare one wind turbine make and model to another. Acentech is misrepresenting the purpose and scope of the IEC test.

³ ISO 9613-2:1996, Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method calculation, International Organization for Standardization, December 15, 1996.

⁴ IEC 61400-11, International Standard - Wind Turbines – Part 11: Acoustic Noise Measurement Techniques, Edition 3.0, International Electrotechnical Commission, 2012-11.

3. Independent assessment of Winter 2020 Sound Report

Ms. Linowes requests additional information "[...] in electronic form as soon as possible" so that she may "[...] independently assess whether the Acentech data are of any utility for determining if Antrim Wind is operating in compliance with Site 301.14(f)(2)a [...]." Ms. Linowes misunderstands her role in the SEC's process and we believe she seeks to expand the SEC's rules to pursue her personal aims. Ms. Linowes' request should be denied because the Winter 2020 Sound Report is fully compliant with SEC Rules. See excerpt of Site 301.18:

"(f) Post-construction sound monitoring reports shall include a map or diagram clearly showing the following:

- (1) Layout of the project area, including topography, project boundary lines, and property lines;
- (2) Locations of the sound measurement points; and
- (3) Distance between any sound measurement point and the nearest wind turbine.

(g) For each sound measurement period during post-construction monitoring, reports shall include each of the following measurements:

- (1) LAeq, LA-10, and LA-90; and
- (2) LCEq, LC-10, and LC-90."

Ms. Linowes led the stakeholder group which defined the SEC Rules regarding sound standard and testing methodology. Ms. Linowes only seeks to uphold the SEC Rules as defined by statute.

The Winter 2020 Sound Report contains all those:

Item	Location in the Report
Layout of the project area, including topography, project boundary lines, and property lines	Figure 1-1, page 5 of 29
Locations of the sound measurement points	Figure 1-1, page 5 of 29
Distance between any sound measurement point and the nearest wind turbine	Table 5-1, page 14 of 29
LAeq, LA-10, LA-90, LCEq, LC-10, and LC-90 measurement results	Section 6, tables and text, pages 18 to 28 of 29 and Appendix B

Ms. Linowes' request for additional data is not supported by the SEC Rules. It would also be impractical to provide the data requested. Of note, for one location the fast-response LA_{eq, 100ms} alone for 14 days would represent 12,096,000 datapoints⁵ and the audio files about 19.35 GB;

↳ Ms. Linowes has finally received the data -

⁵ To put this number in perspective, Excel 365 has a limit of 1,048,576 rows, about 12 times less than what it would be needed to store this metric in a single column in a comprehensive single excel file. Additionally, performing sound source identification and confirming accountability beyond a reasonable doubt for each single 0.100-second (or 0.125-second) samples (about 60 millions datapoints) would be impractical, if not impossible.

it was provided on a thumb drive Page 4

these numbers represent only a fraction⁶ of the extremely large amount of data that would be required to allow a complete impartial reanalysis by a third-party⁷. Some of the information requested such as the 1-second SCADA data are not even available as most operational data such as hub-height wind speed and direction are recorded/archived only at each 10-minutes.

The Winter 2020 Sound Report as any deliverables cannot reasonably present all the raw data; even if possible, this would be onerous and inapplicable, as the Winter 2020 Sound Report compiles already all information required by the SEC Rules. The Winter 2020 Sound Report is presented in a concise way and includes the methodology and instrument descriptions and all data necessary for a legitimate peer review by an independent and impartial third-party acoustical expert.

4. Conclusion

TransAlta is committed to continue to comply and meet all the conditions of our certificate⁸, and has demonstrated as such with the Winter 2020 Sound Report. We believe we have been responsive to all stakeholder inquiries and commit to continue with open and transparent dialogue and engagement going forward. Even though the 2020 Winter Sound Report demonstrates compliance, if a stakeholder still believes the sound is above prescribed limits, we are committed to support the SEC to accommodate the independent evaluation of that complaint by a third-party noise expert⁷, as required per our certificate.

Finally, we believe that these responses should give you confidence that we have fully satisfied the post-construction sound monitoring requirements for the first campaign of the first year of operation. Accordingly, Ms. Linowes' claim that the Winter 2020 Sound Report is flawed should be disregarded.

Regards,

TRANSALTA CORPORATION



Jean-François Latour, B. Sc., ASA
Specialist, environment | Wind & Solar Operations

Encl.

⁶ Just to list a few: LA10, LA90, LCeq, LC10, LC90, 33 different 1/3 octave sound pressure levels, etc. for sound data, hub-height wind speed and direction, electrical power generation, etc. for operational data.

⁷ The independent and impartial complaint validation by a third-party noise expert as indicated in section 4 further void the relevance of submitting all raw data that led to the Winter 2020 Sound Report. We maintain that raw data submission would be unreasonable and impractical as explained previously herein.

⁸ Docket 2015-15 - Order and Certificate of Site and Facility with Conditions, March 17, 2017, issued by SEC.