STATE OF NEW HAMPSHIRE

SITE EVALUATION COMMITTEE

DOCKET NO. 2021-02

TECHNICAL AND REGULATORY REVIEW OF NEW HAMPSHIRE METHODOLOGY FOR MEASUREMENT AND ANALYSIS OF SOUND COMPLIANCE FOR WIND ENERGY SYSTEMS PURSUANT TO SITE EVALUATION COMMITTEE RULES

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I. SUMMARY

Antrim Wind Energy, Inc. ("Antrim Wind") and Epsilon Associates, Inc. ("Epsilon") prepared this analysis to address in a comprehensive fashion the proper methodology for conducting post-construction noise compliance monitoring for wind energy facilities under New Hampshire Site Evaluation Committee ("SEC") rules.

Acentech Incorporated ("Acentech") conducted three post-construction seasonal sound studies and prepared three reports on behalf of Antrim Wind, for Winter 2020, Summer 2020, and Fall 2020, which were submitted to the SEC. A fourth and final study, for Spring 2021, has been conducted and the Report is in progress. In each of the three Reports, Acentech concluded that the turbine-only sound levels for Antrim Wind were below the applicable sound limits, i.e., the greater of 45 dBA or 5 dBA above background during the day and the greater of 40 dBA or 5 dBA above background during the night.

A number of individuals, including certain stakeholders,[1] argue that Acentech did not follow SEC rules in conducting the studies and reporting its conclusions. They base this contention on the mistaken assertion that compliance with the applicable sound limit standards should be judged on the basis of 1/8 second measurement intervals instead of hourly reporting periods.

As explained herein, the SEC rules, the national standards those rules derive from (American National Standards Institute ("ANSI")),[2] and industry practice do not judge compliance with applicable sound limit standards based on 1/8 second (i.e., instantaneous) sound

[1] The individuals include Barbara Berwick, Janice Longgood (neighboring landowners) and Lisa Linowes, a longtime critic of wind projects, referred to collectively as Stakeholders for the sake of simplicity.
[2] The American National Standards Institute is the national coordinator of voluntary standards development and the clearinghouse in the United States for information on national and international standards. An American National Standard implies a consensus of those substantially concerned with its scope and provisions.

measurements. That approach is not only improper under the SEC rules and the ANSI standards but, in fact, it is impossible to use within the context of the SEC rules.[3] Moreover, the pre-construction sound monitoring for Antrim Wind was done using one hour averaging.[4] The SEC accepted this approach[5] and the Stakeholders never raised a concern about it. Accordingly, the Stakeholders' attempt to change the accepted approach after-the-fact should be rejected.

Compliance with sound limit standards for Antrim Wind is properly judged based on the hourly sound measurement periods in the reports prepared by Acentech. Multiple sound experts, also cited herein, have confirmed these conclusions. Moreover, the June 24, 2021 written comments of the New Hampshire Attorney General's Office support a finding that it was reasonable for Antrim Wind to use one-hour intervals in its post-construction sound monitoring reports to assess compliance with the SEC's sound standards.

II. BACKGROUND

On March 17, 2017, the SEC issued an Order and Certificate of Site and Facility ("Certificate"), along with a Decision and Order Granting Application for Certificate of Site and Facility ("Decision") in Docket No. 2015-02, approving the Antrim Wind facility and authorizing the commencement of construction. Antrim Wind notified the SEC on December 29, 2019, that commercial operation had commenced on December 24, 2019.

On May 13, 2020, Antrim Wind filed its Post-Construction Sound Monitoring Report for Winter 2020 ("Winter 2020 Report") with the SEC. See Attachment A. The report was the first of four seasonal post-construction monitoring surveys required by Site 301.18 (e) (7).

[3] See Section V, herein.
[4] See Antrim Wind Application, Attachment 9, SEC Docket No. 2015-02, Sound Level Assessment Report, Section 5.5 (prepared by Epsilon Associates, Inc., February 17, 2016) ("Epsilon Sound Level Report").
[5] See Decision and Order Granting Application for Certificate of Site and Facility, SEC Docket No, 2015-02 (March 17, 2017) pp. 145-154.

Among other things, the Winter 2020 Report prepared by Acentech explained the sound study methodology required by SEC rules, described the sound measurement program utilized by Acentech, and summarized the weather, turbine operation and sound monitoring data analyzed. Based on this information, Acentech concluded that the turbine-only sound levels for the monitoring locations were below the lowest sound limit standards for the facility.

On May 21, 2020, Lisa Linowes submitted a letter criticizing the Winter 2020 Report. Ms. Linowes argued that the Winter 2020 Report should be rejected. Among other things, she contended that hourly averaging of data was not supported by SEC rules.

On July 17, 2020, Antrim Wind responded to Ms. Linowes' letter and included additional support from Acentech, pointing out the errors in certain of Ms. Linowes' technical assertions as well as responding to her more general assertion about hourly averaging of data. See Attachment B. Antrim Wind explained the basis for hourly averaging, citing specifically to SEC rules and the ANSI standards that form the foundation for the SEC rules.

On July 21, 2020, the SEC held a public meeting at which it authorized the SEC Administrator to hire a technical expert to review the Winter 2020 Report. The SEC hired Cavanaugh Tocci to conduct that peer review.

At the SEC's July 29, 2020 Public Meeting, Ms. Linowes filed comments criticizing the Winter 2020 Report because it relied on 1-hour reporting periods to determine compliance with sound limit standards.

On August 11, 2020, Antrim Wind responded to comments made by Ms. Linowes at the July 21, 2020 Public Meeting. See Attachment C. Antrim Wind emphasized that Ms. Linowes fundamentally misconstrued the SEC rules. Most importantly, Site 301. 18 (e) (6) only requires that measurements be taken in 1/8 second intervals; the rule does not designate 1/8 second

measurement interval as the time period for determining compliance. As a practical matter, this conclusion is self-evident in the sense that if the 1/8 second measurements were the actual required reporting time periods for determining compliance, the attendant reports would include more than 60 million measurements and be in excess of 1 million pages. It is simply inconceivable such an outcome was the intent of the SEC rules.

On September 4, 2020, Cavanaugh Tocci, the technical expert hired by the SEC, submitted its Peer Review of the Winter 2020 Report. See Attachment D. Cavanaugh Tocci concluded that the "methods employed by Acentech are generally consistent with those of ANSI S12.9 Part 3 and meet the requirements of the NH Code Admin. R. Site 301.18 for testing."

On November 23, 2020, the SEC held a Public Meeting at which it considered the Peer Review of the Winter 2020 Report performed by Cavanaugh Tocci. The SEC voted unanimously to accept the results of the Peer Review, which endorsed the methodology and findings of the Winter 2020 Report.

On January 5, 2021, the SEC issued an Order on Pending Matters in Docket No. 2015-02. The SEC noted that the Peer Review of the Winter 2020 Report conducted by Cavanaugh Tocci confirmed that the methodology used by Acentech conformed to SEC rules and that the conclusion that Antrim Wind was in compliance with the sound limits was correctly determined. The SEC stated that

> having reviewed the Acentech report, having reviewed the peer review report from Mr. Tocci and having questioned Mr. Tocci the Committee voted to receive and accept both the Acentech report and Mr. Tocci's peer review of that report. Order on Pending Matters, p.5.

On January 25, 2021, Antrim Wind filed its Post-Construction Sound Monitoring Report for Summer 2020 (Summer 2020 Report"). Acentech concluded that the turbine-only sound levels for Antrim Wind were below the applicable sound limits.

On February 4, 2021, the Stakeholders, including Ms. Linowes, asked for rehearing of the SEC decision to accept the Winter 2020 Report and the Peer Review. The motion for rehearing, which was denied, cited procedural grounds and reiterated other arguments.

On February 11, 2021, Antrim Wind objected to the motion for rehearing filed by the Stakeholders. Antrim Wind explained that the Stakeholders had not shown good cause for rehearing inasmuch as their procedural argument was mistaken and their substantive argument merely restated prior arguments.

On March 10, 2021, Antrim Wind filed its Post-Construction Sound Monitoring Report for Fall 2020 ("Fall 2020 Report"). Acentech concluded that the turbine-only sound levels for Antrim Wind were below the applicable sound limits.

On March 22, 2021, Antrim Wind submitted technical memos from two different sound experts - Robert O'Neal of Epsilon and Kenneth Kaliski of Resource Systems Group ("RSG"). See Attachment E. Mr. O'Neal served as a peer reviewer for Counsel for the Public in the Lempster Wind proceeding and testified in the Groton and Antrim Wind proceedings on behalf of the applicants. He explained why using 1/8 second as the compliance period was wrong under the SEC rules (1/8 second is the speed at which a sound meter is set to record data and is not, and was never meant to be, the time period for determining compliance with the sound limit standard). Mr. Kaliski, who participated as a guest expert in the pre-rulemaking process managed by the Office of Energy and Planning (now the Office of Strategic Initiatives), explained why Acentech and Cavanaugh Tocci were correct to use one-hour averaging to determine compliance with the sound limit standards.

On March 24, 2021, Ms. Linowes responded to the Kaliski and O'Neal technical memos. Among other things, she downplayed Mr. Kaliski's reference to the pre-rulemaking process. She

also made the unsupported argument that the "shall not exceed" language used in Site 301.14 (f) (2) was intended to mean that that sound limit standards should not be exceeded for even an 1/8 of a second.

On March 25, 2021, the SEC held a Public Meeting at which it considered the Stakehplders' motion for rehearing regarding the Winter 2020 Report and the Peer Review. The SEC voted unanimously to deny rehearing.

On April 2, 2021, SEC Chairwoman Martin issued an Order Appointing Subcommittee. She charged the Subcommittee with reviewing the relevant law, administrative rules, the Antrim Wind Certificate, and other filings related to noise limits and sound measurement methodology, and directed that the Subcommittee file a written recommendation with the SEC.

Also on April 2, 2021, Ms. Linowes filed another letter adding to her comments at the March 25, 2021 Public Meeting. She erroneously cited other SEC wind proceedings as precedent for her mistaken theory that that sound limit standards may not be exceeded for even 1/8 of a second.

On April 20, 2021, the Subcommittee held its first Public Meeting. It discussed an Investigative Plan for fulfilling its charge then sent a letter to the Chairwoman requesting additional time to conduct its investigation.

On May 11, 2021, a number of individuals, including Ms. Linowes, filed another letter advocating the same misinterpretation of the sound rules. In addition, they said that it was troubling that the Subcommittee was seeking to hire another outside expert.

On May 14, 2021, the SEC issued its Order Denying Motion for Rehearing, saying that it did not actually approve the sound study methodology at it November 25, 2020 public meeting. The SEC, in its January 5, 2021 Order on Pending Matters, stated that it

> did not approve the methodology used by either Acentech or Cavanaugh Tocci. In the order the Committee recognized that Tocci's report confirmed the Acentech approach. However, the Committee did not adopt or approve the methodology used by either Acentech or Tocci. Order Denying Motion for Rehearing, p. 6.[6]

On May 20, 2021, Chairwoman Martin issued an Order Regarding Subcommittee Charge. She granted the request for additional time and advised that investigative counsel had been retained to advise the Subcommittee and that a sound expert with experience related to wind turbines was also being retained.

Also on May 20, 2021, Antrim Wind filed a letter responding to the May 11, 2021 filing by the Stakeholders and other individuals, and pointing out that both Antrim Wind and the independent expert hired by the SEC had correctly applied the SEC's sound rules. See Attachment F. Antrim Wind referred the Subcommittee to relevant filings, which demonstrate that the Stakeholders either misunderstood or mischaracterized the sound rules.

On May 21, 2021, the Subcommittee adopted a revised Investigative Plan that included scheduling a Public Meeting for June 17, 2021, to receive public comments regarding the appropriate methodologies for measurement and analysis of sound, and procedures for validating noise complaints. At that June 17, 2021 Public Meeting, the Subcommittee took oral comments and set a deadline of July 1, 2021, for written comments.

[6] The SEC makes a distinction between "receiving and accepting" and "adopting and approving." In accepting the Acentech report and the Cavanaugh Tocci Peer Review, the SEC acknowledged that the Peer Review confirmed that Acentech used a methodology that conformed to SEC rules and that the sound measurements were correctly determined, thus recognizing that the methodology was valid or correct. See Order on Pending Matters, p. 5.

Contrary to the SEC's characterization of the transcript of the November 23, 2020 Public Meeting, the statements of Commissioner Scott, Commissioner Sheehan, and Ms. Duprey approved and/or adopted the methodology used by Acentech and Cavnaugh Tocci. Respectively, they accepted the findings of the peer review (Tr. p. 78); concluded that the report was performed in accordance with SEC rules (Tr. p.81); was satisfied that the methodology was appropriate (Tr. p. 82); and, agreed that the report was prepared in accordance with regulations (Tr. p. 86). There may be a difference between receiving a report and accepting it, but there is no difference here between accepting a report, i.e, recognizing it as valid or correct, and adopting or approving it.

On June 24, 2021, the New Hampshire Attorney General's Office filed a written comment addressing the proper time interval for determining compliance with the SEC's sound standard set forth in Site 301.14 (f) (2). Senior Assistant Attorney General K. Allen Brooks observed that the SEC standard "functions by averaging data over a time interval" and that "it would be meaningless to have the time interval for data collection and the time interval for averaging be the same as one cannot 'average' one data point." He further analyzed the SEC rules and ultimately concluded that it is the Subcommittee's province to determine whether the one-hour interval used by Antrim Wind in its post-construction sound monitoring reports was reasonable. As a test of reasonableness, Mr. Brooks pointed to the methodology used by Antrim Wind in conducting its pre-construction sound background study and preparing its pre-construction sound reports (which employed one-hour intervals). Finally, with respect to the use of one-hour intervals for post-construction sound monitoring, Mr. Brooks stated "it comports with the intent of the Committee when it issued the Certificate in that one can assume that the Committee likely intended to compare actual operation to the approved predicted outcome in a consistent way."

III. PRINCIPLES OF SOUND LEVEL ANALYSIS

As set forth in Section IV, SEC rules set sound limit standards for Antrim Wind of 45 dBA or 5 dBA above background between the hours of 8:00 a.m. and 8:00 p.m. ("daytime") and 40 dBA or 5 dBA above background at all other times ("nighttime"). Antrim Wind, as required by SEC rules, has filed with the SEC three post-construction sound monitoring reports prepared by Acentech, all of which demonstrate that Antrim Wind is operating consistently with its Certificate and meeting the sound limit standards of Site 301.14 (f) (2).

A. Sound Measurement

Sounds we hear come from small pressure oscillations, or sound waves, that travel through the air and actuate our hearing mechanism. There are several ways in which sound levels are measured and quantified. All of them use the logarithmic decibel (dB) scale to accommodate the wide range of sound intensities found in the environment.[7] A change in sound levels of less than 3 dB is generally imperceptible to the human ear.

A sound level meter used to measure noise is a standardized instrument.[8] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The most commonly used weighting network is the A-weighting because it most closely approximates how the human ear responds to sound at various frequencies.[9]

The A-weighting network is the accepted scale used for community sound level measurements, and sounds are frequently reported as detected using a sound level meter with this weighting. A-weighted sound levels emphasize middle frequency sounds (*i.e.*, middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA". Normal speech between two people is typically around 55-60 dBA. Figure 1 below illustrates some common events and their typical respective

[7] A property of the decibel scale is that the sound pressure levels of two or more separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a 3-decibel increase (53 dB), which is equal to doubling in sound energy but not equal to a doubling in decibel quantity (100 dB). Thus, every 3-dB change in sound level represents a doubling or halving of sound energy.

[8] *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983, published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

[9] Frequencies, reported in Hertz (Hz), are detailed characterizations of sounds. The average person has the ability to hear sounds in the range of about 20 to 20,000 Hz. The range of frequencies has been organized into standardized "bins" referred to as octave bands and one-third octave bands. The frequencies for each octave band and one-third octave band are defined by ANSI standard. *American National Standard Preferred Frequencies, Frequency Levels, and Band Numbers for Acoustical Measurements,* ANSI S1.6-1984 (Reaffirmed by ANSI April 8, 2011), published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

sound pressure levels in A-weighted decibels. Typical sound sources in our environment can range between 0 dBA (threshold of hearing) to 110 dBA (rock band).

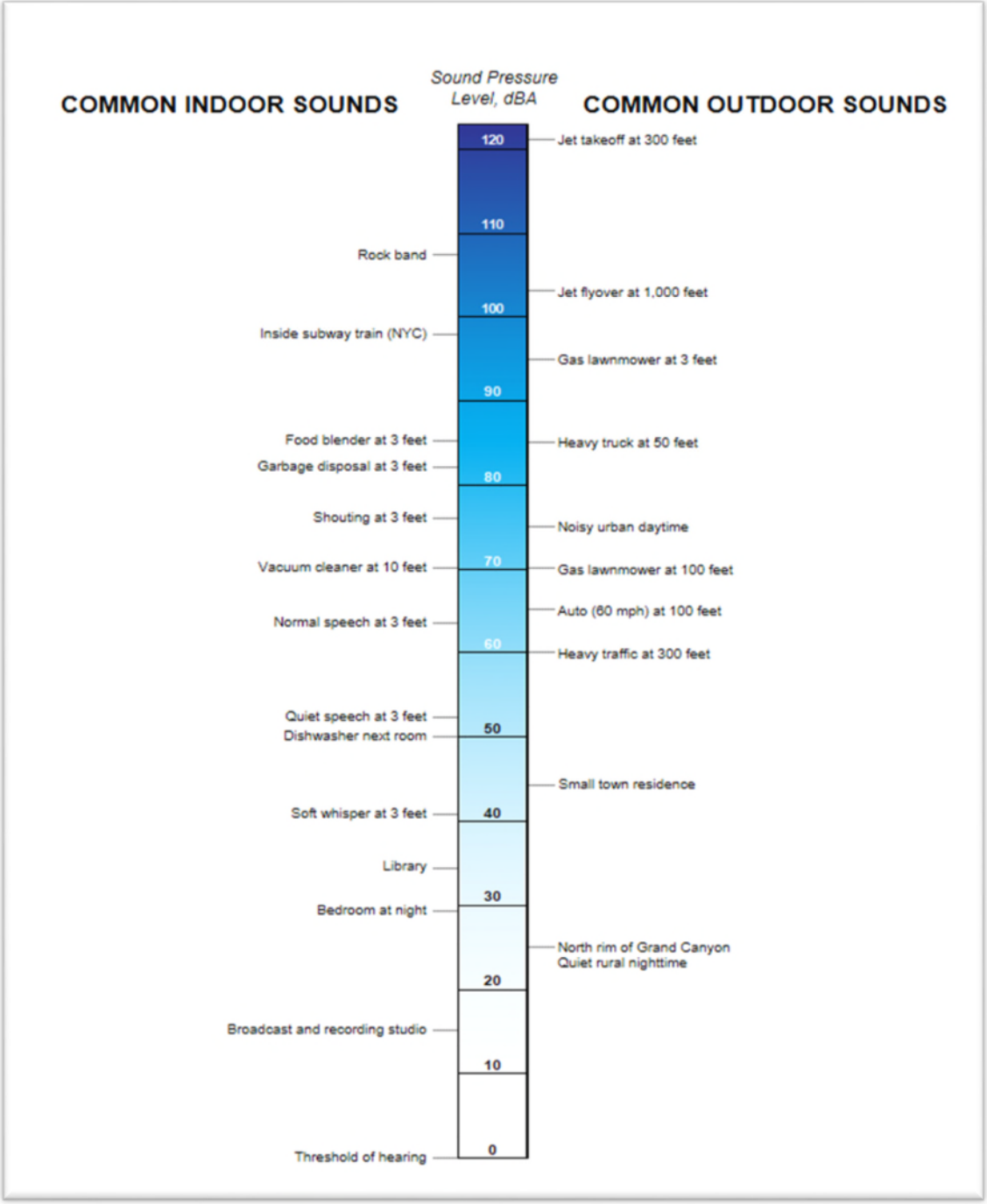

Figure 1. Common Sound Levels

Another metric used to describe sound is C-weighted (dBC). C-weighted filtering allows much of the low-frequency sound energy to pass, especially compared to A-weighting. Both the A-weighted and C-weighted filters are set by ANSI standard[10] and are shown graphically in Figure 2 below.

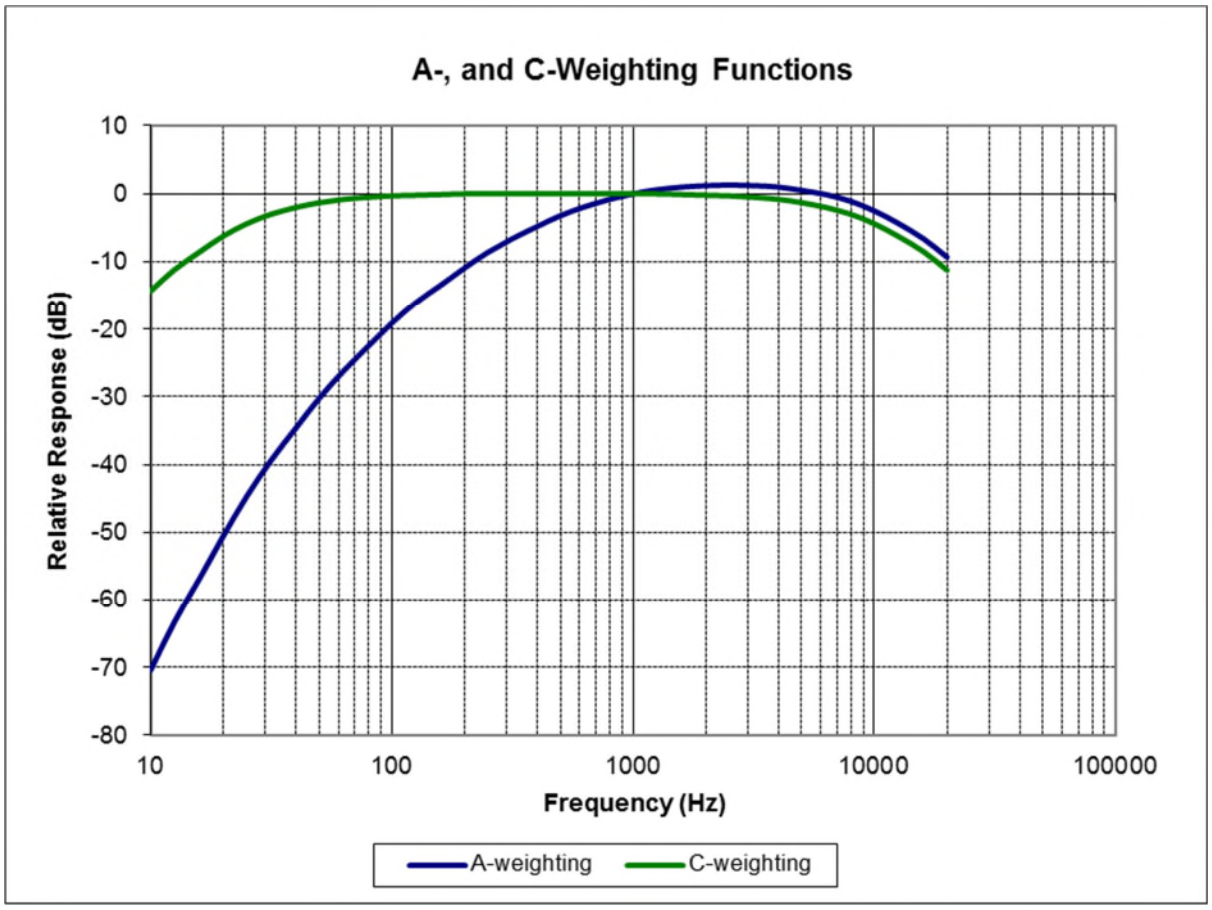

Figure 2. A-Weighting and C-Weighting Filters

[10] *American National Standard Specifications for Integrating-Averaging Sound Level Meters*, ANSI S1.43-1997 (Reaffirmed by ANSI 16 March 2007), published by the Standards Secretariat of the Acoustical Society of America, NY, NY.

B. Time and Sound Measurement Periods

Because sounds in the environment vary with time, many different sound metrics may be used to quantify them. There are two typical methods used for describing variable sounds, namely, exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted sound pressure level measurements. The SEC rules employ this approach, as is evident in Site 301.18 (g).

Exceedance levels are values from the cumulative distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where "n" can have a value of 0 to 100 in terms of percentage. Equivalent levels are designated L_{eq} and quantify a hypothetical steady sound that would have the same energy as the actual fluctuating sound observed. These sound level metrics are commonly reported in community sound monitoring and are described in more detail below.

- L_{90} is the sound level in dBA exceeded 90 percent of the time during a measurement period. The L_{90} is close to the lowest sound level observed during a measurement period. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources. The L_{90} in a 1-hour measurement period represents the quietest 6 minutes. Or stated another way, to affect the 1-hour L_{90} a sound source would need to be present for more than 54 minutes out of the 60 minutes in an hour. The L_{90} is a good indicator of steady or nearly-steady sound from a wind turbine during operation.

- L_{10} is the sound level in dBA exceeded 10 percent of the time during a measurement period. The L_{10} is close to the highest sound level observed during a measurement period. It is typically influenced by transient or intermittent noise sources. The L_{10} in a 1-hour measurement period represents the loudest 6 minutes. The L_{10} is not going to be materially influenced by wind turbine operations.

- L_{eq} sound pressure levels are commonly A-weighted and presented in dBA. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with time-averaged mean square sound pressure values, the L_{eq} is primarily controlled by loud noises if there are fluctuating sound levels.

C. Sound from Wind Turbines

An operating wind turbine produces sound from either a mechanical or aerodynamic generation source.[11] Aerodynamic sound is produced by the rotation of the turbine blades through the air.[12] Turbine blades are airfoils, which are simply structures with a shape that produces a lift force when air passes over it. Originally developed for aircraft, airfoil shapes have been adapted to provide the turning force for wind turbines by employing a shape which causes the air to travel more rapidly over the top of the airfoil than below it. The design optimizes efficiency by minimizing turbulence, which produces drag and noise. An aerodynamically efficient blade is a quiet one.

Aerodynamic sound is caused by the interaction of the turbine blade with the turbulence produced both adjacent to it (turbulent boundary layer) and in its near wake. Turbulence depends on how fast the blade is moving through the air. A 100-meter diameter blade, rotating once every three seconds, has a tip velocity of just over 100 meters per second. However, the speed reduces at positions closer to the center of rotation (the wind turbine hub). The main determinants of the turbulence are the speed of the blade and the shape and dimensions of its cross-section. At high velocities for a given blade, turbulent boundary layers develop over much of the airfoil and sound is produced when the turbulent boundary layer passes over the trailing edge.

Measurements of the location of the sound source in wind turbines indicate that the dominant sound is produced along the blade—nearer to the tip than to the hub. Reduction of turbulence sound can be facilitated through airfoil shape and by good maintenance. For

[11] Mechanical sound originates from the gearbox and control mechanisms. Standard noise control techniques typically are used to reduce mechanical sound. Mechanical noise is not typically the dominant source of noise from modern wind turbines (except for an occasional gear tone).

[12] Aerodynamic sound is present at all frequencies, from the infrasound range over low frequency sound to the normal audible range and is the dominant source. The aerodynamic noise tends to be modulated in the mid frequency range, approximately 500 to 1,000 Hertz (Hz).

example, surface irregularities resulting from damage or to accretion of additional material may increase the sound.

D. Evolution of Wind Turbine Regulation

Wind energy has grown significantly over the past 20 years. In the year 2000, less than 5,000 Megawatts (MW) of wind energy existed in the United States. That number increased to 9,046 MW in 2005, 40,346 MW in 2010, 73,891 MW in 2015, and 122,468 at the end of 2020. By the end of 2020 there were over 60,000 wind turbines spinning in 41 states.[13]

In 1974, the U.S. Environmental Protection Agency ("EPA") published the "Levels" report that examined the levels of environmental noise necessary to protect public health and welfare.[14] Based on the analysis of available scientific data, EPA specified a range of day-night sound levels necessary to protect the public health and welfare from the effects of environmental noise, with a reasonable margin of safety.

Rather than establishing standards or regulations, however, EPA identified noise levels below which the general public would not be placed at risk. Each federal agency has developed its own noise criteria for sources over which they have jurisdiction (i.e., the Federal Aviation Administration regulates aircraft and airport noise, the Federal Highway Administration regulates highway noise, and the Federal Energy Regulatory Commission regulates interstate pipelines). State and local governments were provided guidance by EPA on how to develop their own noise regulations, but the establishment of appropriate limits was left to local authorities to determine given each community's differing values and land use priorities.

[13] ACP Market Report, Fourth Quarter 2020, American Clean Power website: https://cleanpower.org/resources/american-clean-power-market-report-q4-2020/

[14] "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," US Environmental Protection Agency, Washington, DC, March 1974.

A recent paper by Kaliski *et al*. summarizes the pertinent aspects of noise ordinances and how they may be applied to wind energy.[15] A few excerpts from that paper are included here. As wind energy becomes more widespread, many local jurisdictions are updating their existing municipal codes to address wind power projects.

A critical component of these ordinances is the regulation of noise. In 2016, the Massachusetts Clean Energy Center and the Massachusetts Department of Environmental Protection issued a report titled "Massachusetts Study on Wind Turbine Acoustics" ("Acoustics Report") to provide quantitative information to improve siting and approval processes.[16] The Acoustics Report laid out four core principals in developing a regulatory framework:

- **Relevance** – The regulation should have some relevance to impacts on humans or wildlife and not be set arbitrarily.
- **Repeatability** – The metrics and procedures should result in a relatively low standard deviation among samples taken under similar conditions.
- **Predictability** – The element that is being regulated should be able to be predicted (i.e., modeled) with a high level of confidence and reliability.
- **Ease of Implementation** – The element that is being regulated should be able to be tested for compliance and enforcement purposes without a substantial burden on the public, regulating authorities, or the project operator.

The key factors to be considered when developing a standard include the metric (e.g., L_{eq}, L_{50}, L_{90}), the timescale (e.g., minutes, hours, days), location of evaluation (typically dwellings) as well as the method of evaluation (e.g., predictive modeling). The metric and timescale factors are the most relevant topics for this report and are discussed further below.

Metric. The choice of a metric (e.g., L_{eq}, L_{max}, L_{90}…) in a standard is just as important as the sound level. Different metrics may result in different outcomes for the same sound level. The

[15] Regulating and predicting wind turbine sound in the U.S., K. Kaliski, M. Bastasch, R. O'Neal, INTER-NOISE 2018, Chicago, IL, August 2018.
[16] The Acoustics Report was prepared by RSG, Epsilon, and Northeast Wind.

Acoustics Report evaluated the use of various metrics in regulating wind turbine noise. Some metrics have been found to be relevant, repeatable, predictable, and reasonable to implement. For example, with respect to the $L_{eq,}$, (as used in SEC rules and the Winter 2020 Report):

- The L_{eq} metric is relevant. Peer-reviewed studies on long-term exposure to wind turbine noise all use some type of L_{eq} metric. For example, the Health Canada studies on wind turbine noise use this metric.

- The L_{eq} is repeatable. Wind turbine sound levels measured under similar conditions yield similar results.

- The L_{eq} is predictable. Modeling using an L_{eq} metric has a high degree of reliability, as both sound emissions are provided as an L_{eq} and the International Standards Organization ("ISO") 9613-2 model is designed around predicting the L_{eq}.

- Measurements of the L_{eq} are relatively easy to implement. Most modern sound level meters can measure the $L_{eq.}$

The Acoustics Report found that instantaneous or short-term metrics like the L_{max} (as proposed by Ms. Linowes and others) were not reliable. They found that the "least predictable and stable" metrics were the L_{10} and L_{max} metrics and their use was not advised. Challenges with the L_{max} include:

- One cannot subtract background from L_{max} levels. It is extremely difficult to determine what portion of an L_{max} measurement is from the wind turbines and what is due to other background sounds.

- The L_{max} is highly variable as a metric that results in poor repeatability among similarly conducted measurements.

- The International Electroctechnical Commission ("IEC") 61400-11 turbine noise emissions specification do not report L_{max} so no turbine emissions information is available for modeling.

- The ISO 9613-2 outdoor sound propagation methodology is intended to be used for calculating equivalent continuous sound levels, not L_{max}.

- L_{max} is by definition a statistical anomaly, one that may occur 0.0000001% of a year (i.e., 1 second in a year if the period is 1-second).

Timescale. If measurements are required, the duration of the measurement interval and compliance period are needed. A common duration is one-hour and has been used in the assessment of highway noise.[17] According to the Acoustics Report, the longer the averaging time, up to one hour, (as is the case with Antrim Wind) the more predictable the outcome.

A key challenge in the measurement of noise at receiving properties is contamination from non-project sources (e.g., noise from traffic, insects, aircraft overflights, rustling vegetation, etc.). Shorter duration measurement intervals (e.g., 10, 15 or 20 minutes) can be screened for contamination and may be used to inform the assessment of a longer (e.g., one-hour) standard. For example, ANSI/ASA S12.9-2013/Part 3 provides a detailed methodology for removing "contaminated" (non-source) data and calculating a more accurate "source only" sound level.[18]

IV. APPLICABLE SEC RULES

For ease of reference, the pertinent SEC rules are quoted below. Examining the four relevant provisions of the rules (which are emphasized), in the order that they were promulgated, demonstrates that the plain language and the regulatory scheme adopted by the SEC support Antrim Wind's position. First, the SEC set decibel level standards for daytime and nighttime. Second, addressing methodology, the SEC incorporated ANSI standards as the basis for post-construction compliance monitoring procedures. Third, also addressing methodology, the SEC set forth the technical requirements for measuring sound in the field. Fourth, focusing on reporting, the SEC directed which measurements should be included for each reporting period.

[17] Table 1 to Part 772—Noise Abatement Criteria, 23 CFR Part 772, US Department of Transportation, Federal Highway Administration, "Procedures for Abatement of Highway Traffic Noise and Construction Noise."
[18] "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.

A. Standard

Site 301.14 Criteria Relative to Findings of Unreasonable Adverse Effects.

(f) In determining whether a proposed energy facility will have an unreasonable adverse effect on public health and safety, the committee shall:

(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

B. Methodology

Site 301.18 Sound Study Methodology.

(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.

C. Summary

The SEC rules include four relevant provisions for purposes of addressing the proper methodology for determining Antrim Wind's post-construction compliance. In sum, they provide:

1. Site 301.14 establishes the sound limit standard, i.e., 45 dBA or 5 dBA above background, at the L-90 level, during the day and 40 dBA or 5 dBA above background, at the L-90 level, at night.

2. Site 301.18 (e) (1) incorporates ANSI/ASA S12.9 Part 3 for post construction noise compliance monitoring.

3. Site 301.18 (e) (6) requires that all post-construction monitoring sound measurements be taken at 0.125 or 1/8 second intervals.

4. Site 301.18 (g) requires that, for each sound measurement period, reports shall include measurements of LAeq, LA-10, and LA-90, and LCeq, LC-10, and LC-90.

The critical distinction in the rules, which Ms. Linowes and the Stakeholders misinterpret, relates to the requirement that all ***measurements*** shall be taken at 1/8 second intervals. The seasonal reports, however, include statistical data for sound ***measurement periods*** of one hour consistent with ANSI standards, and such data by definition are equivalent continuous sound levels.

V. ANSI STANDARDS

Site 301.18 (e) (1) requires adherence to the ANSI/ASA S12.9-2013 Part 3 standard.[19] Sections 6.7 and 6.8 of this standard describe the basic data collection procedure, which 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

[19] "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.

basic measurement period is divided into many small blocks of time. However, in no case may the block of time be less than 1 second and it must divide (exactly without remainder) into 3600 seconds. *Therefore, the use of one-eighth of a second (0.125 second) or one-tenth of a second (0.1 second) as a compliance period would be improper*.

Furthermore, Site 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 must be derived from a robust measurement period, such as the 1-hour example in ANSI S12.9-2013 Part 3. *Trying to calculate an LA-10, LA-90, LC-10, and LC-90 from one-eighth of a second measurements is impossible as one-eighth of a second is too short a period.* Taking the lowest 10% of a 1/8 second measurement period (the SEC-required L_{90}) would be looking at a 1/80 second interval for the L-90 (10% x 0.125 second = 0.0125 seconds). As noted above, 1/8 second is the speed at which a sound meter is set to *record* data. Since the data recorded cannot be subdivided any further from 1/8 second in any meaningful way, the LA-10, LA-90, LC-10, and LC-90 values would all yield identical—and nonsensical—values.

There are two fundamental issues with regard to the time element of sound level measurements: (1) the speed at which a sound meter must be set under the SEC rules to record data, and (2) the actual measurement period used to assess compliance with the 45 dBA (daytime)/40 dBA (nighttime) standard. These are two completely distinct issues.

Site 301.18(e)(6) deals only with the first 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, which is either fast response (0.125 seconds) or slow response (1.0 second). 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.*

To further illustrate this point, Figure 3 below is a photo of an older style sound level meter with the “Response” switch shown on the front. Simply sliding this switch from “Slow” to “Fast” will change the response rate of the sound meter from 1.0 second (“slow”) to 0.125 seconds (“fast”). It does nothing to affect the measurement period of analysis for sound (10-minutes; 1-hour; 8-hours; etc.).

Figure 3. Sound Level Meter with Fast/Slow Response Setting

VI. SURVEY OF OTHER JURISDICTIONS

Ms. Linowes claimed at one time that "numerous other jurisdictions throughout the United States" have shall-not-exceed sound requirements for wind energy,[20] though more recently, in her May 11, 2021 letter, she now backs away from her earlier enthusiasm for looking to other jurisdictions by saying they are uniquely different and irrelevant. What Ms. Linowes has never said is that wind energy facilities, with one exception, have not been built in any of the jurisdictions with the highly restrictive requirements she highlights. RSG reviewed the locations cited by Ms, Linowes and provided a detailed response.[21]

Interpreting "shall not exceed" as meaning a source of sound cannot be over a limit for even one-eighth of a second during a year, or 0.0000004% of the year,[22] would pose a significant deterrent to the development of important sources of renewable energy. This is an unreasonable standard, which could put every wind project in New Hampshire subject to a sound limit out of compliance. By contrast, many other jurisdictions have adopted reasonable standards, similar to New Hampshire. A few of those are surveyed below.

New York State

Chapter XVIII, Title 19 of the New York Codes, Rules, and Regulations (NYCRR) §900-2.8(b)(1) sets sound level limits for wind energy projects in NY State which became final March 3, 2021. The rule (in part) reads as follows:

> A maximum noise limit of forty-five (45) dBA Leq (8-hour), at the outside of any existing non-participating residence, and fifty-five (55) dBA Leq (8-hour) at the outside of any existing participating residence.

[20] Letter from Ms. Lisa Linowes, Windaction Group to Ms. Pamela Monroe, NH Site Evaluation Committee, August 18, 2020.
[21] Memo from Dana Lodico & Ken Kaliski, RSG to Jean Francois Latour & Barry Needleman, March 5, 2021. Included as Attachment G.
[22] 365 days/year x 24 hours/day x 60 minutes/hour x 60 seconds/minute x 8 one-eighth-seconds/second = 252,288,000 one-eighth second periods in a year.

Maine

Chapter 375.10.I "No Adverse Environmental Effect Standards of the Site Location of Development Act—Control of Noise" from the Maine Department of Environmental Protection contains sound level limits for wind energy development as summarized below. Maine requires the use of "fast" response (one-eighth second) time for their compliance measurements as set forth below.

(2) Sound Level Limits for Routine Operation of Wind Energy Developments

The sound levels resulting from routine operation of a wind energy development measured in accordance with the measurement procedures described in subsection I (8) shall not exceed the following limits:

(a) 75 dBA at any time of day at any property line of the wind energy development or contiguous property owned or controlled by the wind energy developer, whichever is farther from the proposed wind energy development's regulated sound sources; and

(b) 55 dBA between 7:00 a.m. and 7:00 p.m. (the "daytime limit"), and 42 dBA between 7:00 p.m. and 7:00 a.m. (the "nighttime limit") at any protected location.

(5) Compliance with the Sound Level Limits

A wind energy development shall determine compliance with the sound level limits as set forth in subsection I(2) of this rule in accordance with the following:

(a) Sound level data shall be aggregated in 10-minute measurement intervals within a given compliance measurement period (daytime: 7:00 am to 7:00 pm or nighttime: 7:00 pm to 7:00 am) under the conditions set forth in subsection I(8) of this rule.

(b) Compliance will be demonstrated when the arithmetic average of the sound level of, at a minimum, twelve, 10-minute measurement intervals in a given compliance measurement period is less than or equal to the sound level limit set forth in subsection I(2).

(c) Alternatively, if a given compliance measurement period does not produce a minimum of twelve, 10-minute measurement intervals under the atmospheric and site conditions set forth in subsection I(8) of this rule, the wind energy development may combine six or more contiguous 10-minute measurement intervals from one 12 hour (7:00 am to 7:00 pm daytime or

7:00 pm to 7:00 am nighttime) compliance measurement period with six or more contiguous 10-minute intervals from another compliance measurement period. Compliance will be demonstrated when the arithmetic average of the combined 10-minute measurement intervals is less than or equal to the sound level limit set forth in subsection I (2).

Vermont

The Vermont Public Service Board (PSB) passed rule 5.700 with sound level standards for utility-scale wind energy effective July 1, 2017. Post-construction compliance monitoring is spelled out in detail but essentially requires a minimum of 120 one-minute L_{Aeq} valid data points, preferably with at least 20 valid data points in each of six wind speed categories.

(C) Facilities with a plant capacity greater than 150 kilowatts. Operation of facilities with a plant capacity greater than 150 kW shall not result in sound pressure levels in excess of 42 dBA between the hours of 7 A.M. and 9 P.M. or 39 dBA between the hours of 9 P.M. and 7 A.M., including any penalty for tonality pursuant to Section 5.710, at a distance of 100 feet from the residence of a non-participating landowner. Each turbine and any sound-producing equipment located within the footprint of the turbine array shall be set back horizontally no less than ten (10) times the turbine's height, as measured from base to the tip of a blade in the upright, vertical position, from the residence of a non-participating landowner. This minimum setback requirement may be waived on a case-by-case basis for good cause shown.

Huron County, Michigan

The Huron County Wind Energy Facility Overlay Zoning Ordinance, effective November 27, 2015, contains sound level limits for wind energy facilities of 45 dBA L_{Aeq} daytime or nighttime at a non-participating residence. Post-construction sound level compliance measurements require a minimum of two hours of measurements broken into 10-minute blocks. Compliance is demonstrated when the L_{Aeq} of every twelve representative 10-minute measurement interval is less than or equal to 45 dBA.

North Shade Township, Gratiot County, Michigan

Chapter VI of the Zoning Ordinance of the Township of North Shade, Michigan regulates sound from wind energy facilities. Section 6.5.6 has amended Chapter VI of the Zoning Ordinance to read as follows:

> Wind Energy Facilities shall not exceed 55 db(A) at the habitable structure closest to the wind energy system. This sound pressure level may be exceeded during short-term events such as utility outages and/or severe wind storms. If the ambient sound pressure level exceeds 55 dB(A), the standard shall be ambient dB(A) plus 5 dB(A).

New Haven Township, Gratiot County, Michigan

Chapter 9 of the Zoning Ordinance of New Haven Township, Michigan regulates sound from wind energy facilities. In Section 9.4.6 are applicable limits to wind energy:

> Wind Energy Facilities shall not exceed 55 db(A) at the habitable structure closest to the wind energy system. This sound pressure level may be exceeded during short-term events such as utility outages and/or severe wind storms. If the ambient sound pressure level exceeds 55 dB(A), the standard shall be ambient dB(A) plus 5 dB(A).

Minnesota

The Minnesota Pollution Control Agency regulates sound from wind energy facilities through Chapter 7030 Noise Pollution Control. Section 7030.0040 limits daytime sound at a residence to 60 dBA (L_{50}) and 65 dBA (L_{10}). Nighttime sound levels at a residence are limited to 50 dBA (L_{50}) and 55 dBA (L_{10}). Both the L_{10} and L_{50} metrics are measured over a 1-hour period.

DeWitt County, Illinois

The DeWitt County Code of Ordinances in Title XV, Chapter 153, Section 27 (DeWitt County Regulations) regulates sound from wind turbines:

> The noise design limit for each wind energy system shall not exceed 50 dBA measured as the average dBA at the location of the nearest non-participating residence from the relevant wind energy conversion system. The dBA level, however, may be exceeded during short-term events such as utility outages and or severe windstorms. The facility shall comply with State Pollution Control Board regulations at all times.

Codington County, South Dakota

Section 5.22.03(12) of Ordinance #65 Zoning Ordinance of Codington County, Noise subsection of General Provisions for Wind Energy Systems regulates sound from wind turbines:

> Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects at the property line of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.

Grant County, South Dakota

Section 1211.04(13) of the Zoning Ordinance for Grant County, Noise subsection of General Provisions for Wind Energy Systems regulates sound from wind turbines:

> Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects at the perimeter of the principal and accessory structures of existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.

South Dakota

The Public Utilities Commission of the State of South Dakota regulates wind energy facilities. In the case of Dakota Range I, LLC and Dakota Range II, LLC, approval was granted to construct and operate a wind energy facility on July 23, 2018 (Case EL18-003). The following sound condition was put on the project:

> Dakota Range shall not generate a long-term average sound pressure level (LAeq) as measured over a period of at least two weeks greater than 45 dBA at a non-participating residence or greater than 50 dBA at a participating residence.

In the case of Crowned Ridge Wind, LLC approval was granted to construct and operate a wind energy facility on July 26, 2019 (Case EL19-003). The following sound condition was put on the project:

> The Project, exclusive of all unrelated background noise, shall not generate a sound pressure level (10-minute equivalent continuous sound level, L_{eq}) of more than 45 dBA as measured within 25 feet of any non-participating residence unless the owner of the residence has signed a waiver, or more than 50 dBA (10-minute equivalent continuous sound level, L_{eq}) within 25 feet of any participating residence unless the owner of the residence has signed a waiver. The Project Owner shall, upon Commission formal

request, conduct field surveys and provide monitoring data verifying compliance with specified noise level limits. If the measured wind turbine noise level exceeds a limit set forth above, then the Project Owner shall take whatever steps are necessary in accordance with prudent operating standards to rectify the situation.

California

California, a state associated with long history of environmental regulations, does not have a statewide noise rule, rather it requires local governments to address noise in their General Plan and ordinances, and in 1977 through its now disbanded Office of Noise Control, provided local governments with a 58-page annotated "Model Community Noise Ordinance[23]." This model ordinance established "Maximum Permissible Sound Levels by Receiving Land Use" which was a level not to be exceeded 30 minutes out of each hour (L_{50}) and that was supplemented with other metrics, none of which were an instantaneous one-eighth of a second sound level or an L_{max}.

World Health Organization

Although the World Health Organization (WHO) is not a regulatory body, it has presented the results of scientific research in published papers. One such publication contains a useful guideline for putting sound levels in perspective: "Guideline for Community Noise."[24] Table 4.1 in this document states that daytime and evening outdoor living area sound levels at a residence should not exceed an L_{eq} of 55 dBA to prevent serious annoyance and an L_{eq} of 50 dBA to prevent moderate annoyance from a steady, continuous noise. At night, sound levels at the outside facades of the living spaces should not exceed an L_{eq} of 45 dBA, so that people may sleep with bedroom windows open. The time base for the WHO sound levels is 16 hours for

[23] Office of Noise Control, California Department of Health, "Model Community Noise Control Ordinance", April 1977.
[24] *Guidelines for Community Noise,* Edited by B. Berglund et al, World Health Organization, Geneva, Switzerland, 1999.

daytime and 8 hours for nighttime. In other words, they are not one-eighth of a second maximums, but apply over a longer time period.

The WHO recognized the difference between evaluating an averaging period and an instantaneous short-term maximum sound level by recommending a different guideline sound level limit outside residences at night. The same Table 4.1 in the WHO document recommends 60 dBA L_{Amax} (fast) as the limit to prevent sleep disturbance with the windows open. This is 15 dBA louder than the 8-hour nighttime L_{eq} guideline value of 45 dBA outside a residence. In other words, by its very nature a short-term maximum sound level limit should be significantly higher than the averaging-time sound level limit.

VII. DISCUSSION

The crux of the dispute that began with Ms. Linowes' May 21, 2020 letter concerns the interval of time over which the SEC should determine compliance with the sound level limits set forth in Site 301.14 (f) (2). Stakeholders have constructed an argument that the interval for judging compliance should be 1/8 second, relying on Site 301.18 (e) (6). By contrast, multiple sound experts agree that the 1/8 second intervals are simply, and unambiguously, measurement intervals that form the basis for additional analysis.

Applying the New Hampshire rules of statutory construction to the SEC rules, it is evident that their plain language, the regulatory scheme (which includes incorporating the ANSI standards), the SEC's intent, and SEC precedent all support the experts' view. See *Stihl, Inc. v. State*, 168 N.H. 332, 334-35 (2015) ("When construing its meaning, we first examine the language found in the statute, and where possible, we ascribe the plain and ordinary meanings to the words used. …When statutory language is ambiguous, however, we will consider legislative history and examine the statute's overall objective and presume that the legislature would not pass an act that would lead to an absurd or illogical result.")

A. Plain Language

The plain language of Site 301.18 (e) (6) requires that Antrim Wind take all sound measurements during post-construction monitoring at 0.125 or 1/8 second intervals, measuring both fast response and Leq metrics, which it did. There is no dispute that Antrim Wind complied with this rule and to conclude otherwise would violate accepted rules of statutory construction. See *Attitash Mountain Serv. Co. v. Schuck*, 135 N.H. 427, 429 (1992) (stating that "an agency's interpretation of its own regulations is erroneous as a matter of law when it fails to embrace the plain meaning of its regulations"); *see also Petition of State Police*, 126 N.H. 72, 76 (1985).

The Stakeholders, including Ms. Linowes, reach beyond the plain language of Site 301.18 (e) (6), however, to contend that the 1/8 second measurement intervals should be superimposed over, or read into, the dBA standards set forth in Site 301.14 (f) (2). The plain language of the two rules, alone or in combination, do not support their arguments.

Antrim Wind agrees that Site 301.14 (f) (2) sets a "shall not exceed" standard. The problem, however, is that Ms. Linowes and other Stakeholders somehow extrapolate from there to conclude that "shall not exceed" requires using the 1/8 second measurement interval from Site 301.18 (e) (6) as the basis for determining compliance. Similarly, as discussed further below, they mistakenly point to SEC decisions in other proceedings as imposing "shall not exceed" limits that equate to determining compliance on an instantaneous basis as opposed to over a period of time as derived from the ANSI standards and reflected in Site 301.18 (g).

The Stakeholders' "shall not exceed" argument is an irrelevant distraction. Antrim Wind agrees that the sound limit standard set forth in Site 301.14 (f) (2) provides that its wind turbines shall not exceed the relevant dBA limits. There is no dispute among the parties on that issue. But, as noted previously, the critical point concerns the period of time over which measurements are reported and over which the SEC assesses compliance.

On its face, the argument predicated on a 1/8 second compliance period is not logical and is fundamentally at odds with the SEC rules themselves. As explained in Section V above, reporting the LA-10, LA-90, LC-10, and LC-90 measurements for each 1/8 of a second during the post-construction monitoring periods would yield sound values of such short duration (e.g., 1/80th of a second) that they would be meaningless. The rules of construction compel the rejection of such an interpretation. See *Bovaird v. New Hampshire Dep't of Admin. Servs.*, 166 N.H. 755, 758-59 (2014) ("We use the same principles of construction in interpreting administrative rules as we use with statutes…We seek to effectuate the overall legislative purpose and to avoid an absurd or unjust result."); *see also New Hampshire Resident Partners of Lyme Timber Co. v. New Hampshire Dep't of Revenue Admin.*, 162 N.H. 98, 101 (2011).

In addition, as pointed out in Antrim Wind's March 22, 2021 letter, the Winter 2020 Report was based on the 60,185,490 sound measurements that were taken by Acentech. As noted at the March 25, 2021 Public Meeting, a report that included each of such measurements would be over 1 million pages long. Can it honestly be argued that the SEC's intent in promulgating this rule was to require such an absurd result?

Finally, Antrim used a one-hour compliance period for the pre-construction monitoring. The SEC accepted that approach. If Stakeholders were so certain that 1/8 of a second is the clear and unequivocal compliance period in New Hampshire, it is unclear why this concern was not raised about preconstruction monitoring at the appropriate time. Why wait until the project was built and operating before offering this argument? The answer is obvious. The failure to pursue this argument during preconstruction monitoring has other important dimensions.

The only way to get an effective and accurate comparison between pre- and post-construction sound for the project is to compare actual operation to the approved predicted

outcome in a consistent way, in other words, on an apples-to-apples basis. It would make no sense to use a pre-construction compliance period of one hour and then use a much shorter compliance period post-construction, as the Stakeholders now argue. Moreover, the preconstruction sound monitoring *actually showed that background noise at times exceeded the SEC sound standards for wind facilities*.[25] The only way to account for that elevated background noise post-construction is to do an apples-to-apples comparison. By contrast, Ms. Linowes' approach would ignore that pre-existing background sound or worse, actually ascribe it to the project.

B. Regulatory Scheme

Site 301.14 (f) (2) is only part of the regulatory scheme and does not address the time interval over which compliance is determined. As pointed out by the SEC in its rulemaking, Docket No. 2014-04, Site 301.14 (f) (2) establishes the standard and Site 301.18 sets forth the methodology for how and where to test. (See Tr. September 29, 2015, at p.141.) And, as explained in Section IV, Site 301.18 (e) provides step-by-step instructions on how to conduct post-construction noise compliance monitoring, while subsections (f) and (g) direct what should be included in the post-construction sound monitoring reports filed with the SEC, which reports provide the basis for the SEC to determine compliance.

Critically, the regulatory scheme adopted by the SEC, i.e., the relationship between the standard set forth in Site 301.14 (f) (2) and the post-construction noise compliance monitoring methodology set forth in Site 301.18 (e), as well as the relationship to the pre-construction sound requirements set forth in Site 301.18 (a), (b), (c), and (d), demonstrates that the one-hour period for determining compliance used in the Winter 2020 Report is reasonable and consistent with the

[25] See Epsilon Sound Assessment Report, Section 5.6.

rules. See *State v. Guay*, 164 N.H. 696, 700 (2013) (quotation omitted) ("We do not interpret statutes in isolation, however, but in the context of the overall statutory scheme."); *State v. Etienne*, 163 N.H. 57, 72 (2011) (quotation omitted) ("Our goal is to apply statutes in light of the . . . policy sought to be advanced by the entire statutory scheme."); *Sprague Energy Corp. v. Town of Newington*, 142 N.H. 804, 806 (1998)("The words of a statute should not be read in isolation; rather, all sections of a statute must be construed together.").

Furthermore, the Epsilon Sound Level Report filed as Attachment 9 to the Antrim Wind Application in Docket 2015-02, consistent with Site 301.18 (a) through (d), used one-hour reporting periods. As noted in section 5.5: "Each meter was tripod-mounted at a height of five feet above ground and set to log data every hour along with a one-minute time history ("fast" response)." The Epsilon Sound Level Report also stated: "Each meter has data logging capability and was programmed to log statistical data every ten minutes for the following parameters: L-1, L-10, L-50, L-90, Lmax, Lmin, and Leq." In addition, Appendix B, in Figures B-1, B-3, B-5, B-7, and B-9, shows LAeq measurements reported in one-hour periods for the five locations used for predictive modeling, that is, the same five locations used for the Winter 2020 Report. Hence, the regulatory scheme, as well as the conduct of Antrim Wind and its sound expert, show a consistent and correct interpretation and application of the sound study methodology set forth in Site 301.18 for both predictive and post-construction measurement, monitoring and reporting.

C. Intent

As a preliminary matter, there is nothing ambiguous about Site 301.18 (e) that would justify looking beyond the plain language of the rule in an attempt to ascertain the SEC's intent. Nevertheless, even if there were some ambiguity, Ms. Linowes' arguments do not support a

conclusion that the SEC intended that compliance with the dBA standards be determined on a 1/8 second basis.

Ms. Linowes argues that the SEC's intent in adopting Site 301.18 (e) (6) was that the 1/8 second interval for post-construction monitoring also serve as the sound measurement period for determining compliance with the sound limit standards. In her July 29, 2020 comments, she said: "The 1/8 second interval was intentionally selected by the stakeholder group for meeting the SEC sound standard. To ensure there was no confusion regarding the Leq timeframe, the 1/8 second interval was given its own rule at NH Site 301.18 (e) (6)." She somewhat modified her stance in her March 24, 2021 letter, at p.2, saying that the "stakeholder group convened under SB99 prepared a consensus document which served as the foundation for what became NH Site 301.18 (Sound Study Methodology). The stakeholder group was well aware of the Committee's "shall not exceed" precedent and worked to preserve that standard in the final rules."

In his March 22, 2021 technical memo, Mr. Kaliski recalls the stakeholder process and results very differently from Ms. Linowes. He noted:

> 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 report[2], was to use the one-hour Leq as the averaging time and metric for a noise standard. Mr. Richard James, another guest expert on the Working Group, recommended an Lfast sound limit. Nowhere in the report was there a mention of a 1/8-second Leq 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 Lfast is not an equivalent sound level metric, "equivalent sound levels" (i.e., Leq) is mentioned directly in the SEC noise standard, and an equivalent sound level requires an averaging time, the use of a one-hour averaging time in this context is consistent (and the only Leq averaging time) the SEC was presented with. (Footnotes omitted.)

Ms. Linowes' characterization of the process preceding the SEC rulemaking has no foundation and is flatly contradicted in the record. See Attachment E. Moreover, as Ms. Linowes herself said in her March 24, 2021 letter, "the SB 99 report was only a first step in an

extended rulemaking process pursuant to SB99 and SB281. Ultimately, it was the Committee that determined what recommendations would be accepted, amended, or rejected." Accordingly, it is the plain language and regulatory scheme of the rules that is relevant, not the reconstructed intent of a particular stakeholder.

D. Precedent

Ms. Linowes and the Stakeholders wrongly assert that SEC decisions in Lempster, Groton, and Antrim Wind Docket No. 2012-01 ("Antrim I") established a "wind turbine noise standard based on an 'absolute not-to-exceed' (Lmax) limit." April 2, 2021 Letter. In addition, they mischaracterize the SEC's deliberations in Antrim I as "deciding to impose existing SEC precedence [sic] (Lmax) instead of long-term averaging." Id.

The reality is that nowhere in the Lempster, Groton or Antrim I decisions or certificates did the SEC mention, much less adopt, an Lmax limit. Furthermore, the SEC deliberations in Antrim I were about whether to adopt *annual* averaging, not one-hour averaging. See Docket No. 2012-01, Antrim Wind, LLC (February 7, 2013, Morning Session) Tr. pp. 10-14. At that time, the SEC found annual averaging to be impractical and decided to rely on WHO guidelines to set the dBA limits. As noted above in Section VI, the WHO "Guideline for Community Noise" employs daytime and nighttime averaging, except in cases where an Lmax limit is expressly adopted, in which case the dBA limits would be higher.

VIII. CONCLUSION

On August 13, 2020, the Town of Antrim wrote to the SEC, commenting on the Public Meeting held on July 29, 2020. Among other things, the Board of Selectmen said:

> What we would respectfully ask is that all noise measurements taken and any third-party compliance review be completed only in accordance with existing SEC Rules and AWE's Certificate of Site and Facility. There should not be any different standard(s) applied. Providing SEC Rules and the Conditions of the approved Certificate are followed, the determination of whether AWE's resulting noise measurement are compliant or not

> should be easily ascertained by an independent third party. There should be no introduction of a different measurement standard(s) of any kind without a Rule change or if the Commission has identified some material flaw that requires a hearing to cure and with public comment allowed.

Antrim Wind agrees with the Town of Antrim and seeks no more or less from the Subcommittee. In fact, the Town of Antrim received exactly what it asked for, inasmuch as Cavanaugh Tocci conducted a third-party compliance review in accordance with SEC Rules and Antrim Wind's Certificate, and concluded that Antrim Wind was in compliance, which should have been the end of the story.

For the past year, however, Ms. Linowes has conducted a campaign seeking to convince others that Antrim Wind and the SEC are not following SEC rules. The truth, however, is the opposite of what Ms. Linowes alleges.

Five separate experts from highly reputable consulting firms, namely, Messrs. Brush and Bahtiarian from Acentech, Mr. O'Neal from Epsilon, and Mr. Kaliski from RSG, as well as the SEC's independent expert, Mr. Tocci from Cavanaugh and Tocci, have come to the same conclusions about the SEC rules governing post-construction noise compliance monitoring and Antrim Wind's compliance with those rules. In addition, the New Hampshire Attorney General's Office agreed, in addressing the one-hour intervals used by Antrim Wind, that it would be "appropriate for the Subcommittee to use the same methodology in determining post-certificate compliance that the Committee used in the application phase."

It is long past time for the SEC to clearly and definitively reject Ms. Linowes' effort to change the SEC rules retroactively and thus make it impossible for Antrim Wind, or other wind facilities, to operate important renewable energy projects in New Hampshire.