

**STATE OF VERMONT
PUBLIC UTILITY COMMISSION**

DEC 13 '19 PM 4:06
PUBLIC UTILITY COMMISSION

Amended Petition of Deerfield Wind, LLC for)
a certificate of public good authorizing it to)
construct and operate 15 turbine, 30 MW wind)
generation facility, and associated transmission)
and interconnection facilities, on approximately)
80 acres in the Green Mountain National)
Forest, located in Searsburg and Readsboro,)
Vermont, with 7 turbines to be placed on the)
east side of Route 8 on the same ridgeline as the)
existing GMP Searsburg wind facility (Eastern)
Project Area), and 8 turbines along the ridgeline)
to the west of Route 8 in the northwesterly)
orientation (Western Project Area))

Docket No. 7250

CERTIFICATE OF SERVICE

I, Gillian Bergeron, certify that on December 13, 2019, I forwarded copies of Deerfield Wind, LLC's *Notice of Appearance of Nico Lustig, Esq. and Response to Other Parties' Comments on the Spring 2019 Sound Report and to Mr. Shea's Request for OINR Testing* to the following service list by the delivery method noted:

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Dated at Burlington, Vermont, this 13th day of December, 2019.

By:


Gillian Bergeron
Paralegal

STATE OF VERMONT
PUBLIC UTILITY COMMISSION

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Docket No. 7250

DEERFIELD WIND, LLC'S RESPONSE TO
OTHER PARTIES' COMMENTS ON THE SPRING 2019 SOUND REPORT
AND TO MR. SHEA'S REQUEST FOR OINR TESTING

Pursuant to the Scheduling Order issued by the Vermont Public Utility Commission ("Commission" or "PUC") on October 16, 2019, CPG Holder Deerfield Wind, LLC ("Deerfield") hereby responds to comments submitted to the Commission on November 15, 2019 by the Department of Public Service (the "Department" or "DPS") and by Windaction Group and Thomas Shea jointly ("Windaction/Shea"), concerning: (i) the Spring 2019 Sound Monitoring Compliance Report ("the Spring 2019 Report"),¹ and (ii) Mr. Shea's March 21, 2019 request for outside to inside noise reduction testing ("OINR testing") for the Deerfield Wind Project ("Project").

For the reasons discussed herein, Deerfield submits that Windaction/Shea's criticism of the Spring 2019 Report are not supportable under the Commission-approved Sound Monitoring Protocol for Deerfield Wind (January 16, 2018) (the "Protocol"). Rather, the Commission should accept the conclusions of the Spring 2019 Report, as the Department recommends. Regarding the Shea OINR testing request, data from the Fall 2018 Sound Monitoring Compliance Report ("Fall 2018 Report") does not satisfy the Protocol's prerequisite of a Project-only sound level of 40 dBA or greater (ext., 1-hour L_{eq}) to justify such a test. As such, Deerfield disagrees with Windaction/Shea's and the Department's support for OINR testing.

¹ *Deerfield Wind – Spring 2019 Sound Monitoring Compliance Report* (Cross-Spectrum Acoustics, Inc. ("CSA"), Aug. 13, 2019, revised Oct. 11, 2019).

I. Windaction/Shea's criticism of the Spring 2019 Report is misplaced

Windaction/Shea argue that the Spring 2019 Report cannot be relied upon to determine that the Project is in compliance with the CPG sound limits, because CSA's data collection and analysis has "two fatal errors."² The claim is incorrect, as further discussed below.

1. CSA's reliance on hub height wind speeds to determine turbine operation levels.

In their critique of CSA's data collection and analysis, Windaction/Shea cite to Section 2.6 of the Protocol, which states:

During the measurement program, the turbines will be shut down for 20 minutes at a time no less [than] once per night (10 pm to 7 am) where hub height speeds are at 6 m/s or above, in order to ensure that the turbines would be operating at or near their **maximum sound output** before and after each shutdown.

Protocol at 7 (emphasis added).

Windaction/Shea go on to argue that the "hub height wind speed is not an appropriate proxy for *electric power output*" (emphasis added); therefore, CSA erred by relying on the hub height wind speed to collect data representing the turbines operating at or near their maximum sound output. Without citing to a source, Windaction/Shea claim that "[w]ind turbines typically produce their maximum sound levels when operating at or near electricity output for which the Deerfield turbines would be around 2 Megawatts each." Windaction/Shea rely on this assumption to support their analysis that the data collected by CSA was recorded when the turbines were operating below 70% of full power when the hub height speeds were at or above 6 m/s. They then claim that because the turbines were operating at significantly lower levels of power, the data in the Spring 2019 Report is biased towards showing lower noise levels.³

Windaction/Shea's criticisms are unfounded, for the simple reason that they analyzed the data for the maximum *power* output instead of the maximum *sound* output, as required in Section 2.6 of the Protocol. The attached letter from Deerfield's sound expert, Mr. Kenneth Kaliski, P.E., INCE Bd. Cert., of RSG ("Kaliski Letter"), explains that the maximum power output data for the Gamesa G87 and G97 turbines used at the Project does not equate to the maximum sound output; that is, the turbines reach at or near their maximum sound levels at 44% and 67% of their full power, respectively. *Kaliski Letter at 1-2.*

Additionally, Mr. Kaliski points out that Windaction/Shea used the incorrect time periods at monitoring Site C (Shea residence) in their comments. *Kaliski Letter at 2.* Windaction/Shea claim that the power output at turbines W7 and W8 (the turbines closest to Site C) was below 70%, when in actuality the reported power at these turbines was above 70% during the relevant recording times.

² Windaction/Shea comments at 2. Windaction/Shea do not specifically identify the "two fatal errors," but do discuss three issues in calling into question the conclusions of the Spring 2019 Report.

³ *Id.* at 2-3.

Id. The difference in power output stems from Windaction/Shea's error in converting from Pacific to Eastern Time. Using the correct sound output levels for the turbines and the corresponding corrected monitoring times, Mr. Kaliski found that the hub height wind speeds are an appropriate proxy for times when the turbines would be operating at or near their maximum sound output. *Id.* Windaction/Shea's analysis was thus in error, and should be given no weight.

2. CSA's combining of data from different shutdowns to compute the one-hour L_{eq} .

Windaction/Shea claim that in implementing the Protocol, ANSI S12.9 Part 3 is the relevant standard for how the sound level data should be analyzed. Based upon the assessment and recommendations of Mr. Kaliski, Deerfield agrees that ANSI S12.9 Part 3 is the relevant testing standard for calculating the one-hour L_{eq} , and to then determine compliance with the CPG. *Kaliski Letter at 2-3.* Mr. Kaliski notes that ANSI S12.9 Part 3 allows for the calculation of source (Project)-only sound levels by subtracting out *adjacent* background periods. *Id. at 3.* Part 3 would not permit the combining of data from disparate shutdown periods.

Windaction/Shea point out that CSA utilized a different standard for the data analysis – ANSI S12.9 Part 2. However, Part 2 is the standard for monitoring long-term wide-area average sound levels; not source-specific sound levels, and given this purpose, Part 2 allows for the combining of data from non-adjacent background periods that may have occurred many hours and days apart. *Kaliski Letter at 4.* Part 2 is thus not the appropriate standard for determining Project-specific sound levels under the Protocol, as discussed further in section III.2. below. Nonetheless, the Spring 2019 monitoring data demonstrates compliance with the CPG noise limits whether using ANSI S12.9 Part 2 or Part 3. *Id. at 3.*

3. CSA's reliance on ground wind direction to determine upwind conditions was proper.

Windaction/Shea state that the Spring 2019 Report excluded a significant amount of sound data based on ground wind direction.⁴ That is, CSA excluded sound data from its analysis if there was an upwind component to the nearest turbines for at least a portion of the specific 10-minute interval. This concern of Windaction/Shea is misplaced.

The Protocol provides that data will be excluded under the following circumstances, among others:

Events over 40 dBA (i.e., 5 dBA lower than the CPG exterior noise limit) where the hub height wind speed is sufficient to generate within 1 dB of the maximum sound power (over a reasonable period of time and number of turbines), and the **wind direction is not upwind of the nearest turbines** shall be investigated by listening to the audio tape or reviewing the spectrogram of the event and determining if the cause is wind turbine noise. If the exceedance is due to a background event, then it shall be eliminated.

Protocol at 8 (Section 3.0 Data Processing) (emphasis added).

⁴ Windaction/Shea comments at 5.

Contrary to Windaction/Shea's view, CSA properly eliminated data when the wind direction was not coming from the closest wind turbines, i.e. when the wind direction showed upwind conditions (from receiver to source). *Id.* The Protocol requires removal of such data, because the sound during upwind conditions derives from sources other than the Project. Turbine-only sound is best propagated during downwind conditions (from source to receiver). *Id.* Including sound data from upwind conditions as Windaction/Shea seem to suggest would introduce a significant volume of upwind data from periods below 40 dBA, resulting in bias in the recorded sound levels that would underestimate the overall sound levels in the reports. *Id.* at 3-4. For this reason, CSA appropriately evaluated wind direction in determining what data would be used to calculate Project-only sound levels.

II. Windaction/Shea's request for OINR testing at the Shea residence is not justified under the Protocol.

Windaction/Shea point to the Fall 2018 Report to support their request for OINR testing. However, as explained in Deerfield's prior response regarding Mr. Shea's OINR request (April 24, 2019), the Fall 2018 data cannot be utilized to justify OINR testing because there were only 10 minutes of valid data for Site C. This amount of data is not sufficient to satisfy the applicable ANSI testing standard—S12.9 Part 3—for calculating a one-hour L_{eq} . See the further discussion of the ANSI standards in section III.2. below.

Windaction/Shea claim that the Fall 2018 monitoring data is sufficient to calculate a 1-hour L_{eq} of 40 dBA or greater and thereby support Mr. Shea's request for OINR testing. In their comments, they point to language in the introduction of ANSI S12.9 Part 3 to argue that the methodology allows for "a duration as short as several minutes" to determine a one-hour L_{eq} .⁵ However, Windaction/Shea misread the import of ANSI Part 3, which provides a methodology for collecting specific sound levels regardless of the duration; it does not require a specific time measurement, and only references a one-hour L_{eq} for the purposes of an example. *Kaliski Letter at 3.* ANSI S12.9 Part 3 can be used to measure an L_{eq} of *any* duration, which is why the introduction states that the measurement duration can be as short as several minutes. This is not akin to permitting the use of only "several minutes" of data to calculate the 1-hour L_{eq} . In the body of ANSI S12.9 Part 3, the standard explains that the remaining data after filtering for excluded events "shall not be less than half the required measurement period." *Id. at 3, fn 3.* For a one-hour L_{eq} , that translates to at least 30 of 60 minutes. If there is not sufficient time in the measurement period, the data is disregarded and the measurement repeated.

Under the Commission-approved monitoring program, use of a one-hour L_{eq} was dictated by the CPG noise limit itself, and was thus incorporated into the Protocol. The ten minutes of valid data collected in the Fall 2018 Report is not sufficient to calculate the one-hour L_{eq} under ANSI S12.9 Part 3 because, as previously explained, there are not at least 30 out of 60 minutes of valid data associated with a single shutdown event.⁶ Therefore, OINR testing under the Protocol is not

⁵ Windaction/Shea comments at 5.

⁶ See *Deerfield Wind's Response to Shea Request for OINR Testing and Department of Public Service Request for Modification to Commission-Approved Sound Monitoring Protocol*, at 2-3 (Apr. 4, 2019) (data was sourced from three different shutdown periods, which violates ANSI S12.9 Part 3).

required. And, if the PUC determined that the 10-minutes of valid data is sufficient to calculate a one-hour L_{eq} ,⁷ the 10-minutes of valid data for the Fall 2018 sound monitoring period results in a turbine-only sound level of 38 dBA at Site C, which is below the 40 dBA threshold for OINR testing.

III. The Department correctly recommends accepting the Spring 2019 Report results.

The Department recommends that the Commission accept the results from the Spring 2019 Report prepared by its sound monitoring consultant, CSA. Deerfield agrees that the Spring 2019 Report correctly determined that Project-only sound levels comply with the CPG limits at all three monitoring sites.⁸ At the same time, Deerfield believes that the spring data should have been reanalyzed using the ANSI S12.9 Part 3 standard in order to provide more accurate Project-only sound levels.⁹ Deerfield's sound consultant did this recalculation and determined a turbine-only sound level of 38 dBA, i.e., the Project-only sound levels would remain within the CPG limits and did not substantively change from what CSA reported. The Spring 2019 Report, using ANSI S12.9 Part 2, concludes that the Project is in compliance with the CPG, and Mr. Kaliski's re-analysis of the results using Part 3 confirmed compliance. *Kaliski Letter at 3.*

IV. The Department's support of Mr. Shea's request for OINR testing is misplaced.

Deerfield respectfully disagrees with the Department's position supporting OINR testing at the Shea residence. The Department states that "*the best available data* for one of the two sound monitoring campaigns found sound levels of 40 dBA or higher."¹⁰ However, Deerfield and its consultant maintain that the Fall 2018 data is not the "best available data" for three reasons: (i) CSA did not exclude contaminated data that must be removed under the Protocol; (ii) had the correct methodology been used, only 10-minutes of data could be declared valid, which is insufficient to meet the one-hour L_{eq} requirement in the Protocol; and (iii) even if all 48 minutes of combined data containing high winds were considered valid, they would not be sufficient to calculate a one-hour L_{eq} according to the applicable standard, ANSI S12.9 Part 3. *Kaliski Letter at 7-8.*

First, Deerfield and the Department differ on the results of the Fall 2018 Report. That Report includes periods with average or gust windspeeds above 5 m/s per second, as measured adjacent to the microphone. This contaminated data must be excluded under the Protocol.¹¹ However, CSA did not exclude data contaminated by wind gusts in the Fall 2018 Report.

Deerfield's sound expert evaluated the Fall 2018 Report's data for any occurrences of pseudo-noise and large wind gusts that could have a significant effect on the interval L_{eq} , and found the following:

⁷ The Protocol states "that if five weeks of data monitoring are completed before two hours of valid data are collected, the monitoring period will be concluded, and the available valid periods will be used for compliance determination." Protocol at 9.

⁸ DPS November 15th filing at 2.

⁹ Deerfield November 15th filing at 5.

¹⁰ DPS November 15th filing at 2 (emphasis added).

¹¹ *Deerfield Wind's Motion for Leave to File Reply to DPS*, at 3 (Apr. 24, 2019); Deerfield Nov. 15, 2019 filing at 4.

- (i) only one 11-second wind gust was removed from the Site C data set despite four of the five valid monitoring periods having wind gusts that exceeded 9 m/s;
- (ii) CSA recorded 35 instances of “wind in trees/leaves rustling” which it did not exclude from the data set; and
- (iii) at certain times there were winds high enough to cause overload-clipping in the audio files (evidence of wind-induced pseudo-noise).

*Kaliski Letter at 6-7.*¹² Four of the five 10-minute periods which CSA declared “valid” at Site C had wind gusts greater than 5 m/s. *Id. at 6, Table 1.* Under the Protocol, these are required to be removed from the valid data, and were not.

Second, under the Protocol, data containing these types of contaminating sounds should have been excluded from the Fall 2018 Report.¹³ Had CSA excluded data with wind gusts over 5 m/s, the only remaining data would be on 10/24/2018, from 10:20 to 10:30 pm, with a wind gust speed of 4.9 m/s. *Kaliski Letter at 7, fn 9.* The resulting turbine-only sound level during this period would be 38 dBA. While this 10-minute period is not sufficient to calculate a one-hour L_{eq} , it is consistent with the more valid measurements taken in the Spring of 2019.

Third, Deerfield and the Department disagree on the applicable standard to use to determine the one-hour L_{eq} .¹⁴ CSA analyzed the data using ANSI S12.9 Part 2, which allows for the combining of disparate periods for calculating the long-term average sound level. As the standard states, “Long-term measurements of a specific source... are normally made for describing and quantifying the typical or average levels; not the highest levels.”¹⁵ In contrast, ANSI S12.9 Part 3 is used for calculating a short-term sound level, such as the one-hour L_{eq} . *Kaliski Letter at 3, fn 3.* The standard “describes recommended procedures for measurement of short-term, time-average environmental sound outdoors at one or more locations in a community for environmental assessment or planning for compatible land uses and for other purposes such as demonstrating compliance with a regulation.”¹⁶ *Id.* ANSI Part 3 is the more appropriate standard for analyzing turbine-only sound levels under the Protocol.

Deerfield’s sound expert determined that if CSA had used the ANSI S12.9 Part 3 standard, the data would not be sufficient to demonstrate sound levels at or above 40 dBA (1-hr L_{eq}). *Kaliski Letter at 8-9.* As described above, Mr. Kaliski found that during the fall period there were only five

¹² See also *Deerfield Wind’s Motion for Leave to File Reply to DPS*, at 3 (Apr. 24, 2019); and Deerfield Nov. 15, 2019 filing at 4.

¹³ Protocol at 8, Section 3.0 Data Processing.

¹⁴ *Deerfield Wind’s Motion for Leave to File Reply to DPS*, at 3 (Apr. 24, 2019); Deerfield Nov. 15, 2019 filing at 4.

¹⁵ Both ANSI S12.9 Parts 2 and 3 require the elimination of contaminating wind noise. Part 2 states: “it is helpful to know of high winds which cause excessive wind-induced noise...which can bias the measurements.” Part 3 states more directly, “To minimize the effects of wind on the microphone, sound measurements should not be taken when the wind velocity is greater than 5 m/s (11 mph or 10 knots) at the microphone position when measured at a height of 2 m above the ground.”

¹⁶ The ANSI S12.9 Part 3 standard uses an “observer present.” Since the measurements for this sound monitoring were made several times of day around turbine shutdowns at three locations, having an observer present around all shutdowns is impractical. Therefore, the Protocol only requires an observer around one shutdown event, and replaces the observer with audio recordings for the remaining shutdowns.

10-minute periods that CSA considered valid at Site C. *Id.* at 6-7. Of these five periods, four were contaminated with wind gusts that measured over 5 m/s. *Id.* At 7. Under the Protocol, wind speeds (average or gusts) at a monitoring site that are above 4 to 5 m/s are to be removed because wind at those speeds create a large amount of false noise.¹⁷ When the periods with false noise are removed (as required by the Protocol), only one of the five ten-minute periods recorded valid turbine-only sound levels for calculating the one-hour L_{eq} . That one remaining ten-minute period measured sound levels at 38 dBA—a level that is consistent with the Spring 2019 Report results—is below the 45 dBA CPG noise limit, and is below the 40 dBA trigger for OINR testing. *Kaliski Letter* at 9. While this single valid 10-minute data did not meet the minimum 30 minutes required to calculate a one-hour L_{eq} , under ANSI S12.9 Part 3, it is the “best available data” that comports to the requirements of the Protocol. The only valid data demonstrates that the threshold to trigger an OINR test under the Protocol was not met.

V. Conclusion

For the reasons stated above, the Commission should (i) accept the results of the Spring 2019 Report; (ii) find that ANSI S12.9 Part 3 is the appropriate testing standard; and (iii) find that the threshold for requiring OINR testing at the Shea residence has not been satisfied.¹⁸

Dated at Burlington, Vermont, this 13th day of December, 2019.

DEERFIELD WIND, LLC



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¹⁷ Protocol at Section 3.0.

¹⁸ In the event the Commission has further concerns regarding the OINR issue, Deerfield believes that an appropriate option would be to repeat the sound monitoring at the Shea residence during the Fall of 2020, rather than requiring an OINR test now based upon insufficient data that fails to satisfy the requirements of the Protocol.



DEC 13 '19 PM4:07
PUBLIC UTILITY COMMISSION

December 13, 2019

Roberts Batarags
Deerfield Wind, LLC
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Portland OR 97209

RE: Response to Deerfield Filings of November 15, 2019

Dear Mr. Batarags,

This memorandum summarizes our response to the Wind Action/Shea and Department of Public Service ("DPS" or "Department") filings to the Vermont Public Utility Commission (PUC), both dated November 15, 2019, regarding the sound monitoring conducted by Cross Spectrum Acoustics ("CSA") at Deerfield Wind and the request by Mr. Shea for OINR testing at his home ("Site C"). In summary, our findings reinforce our prior conclusion that the Fall 2018 sound monitoring at Site C is flawed in such a way as to make it unusable for determining whether OINR testing is called for under the PUC-approved Deerfield Wind Sound Monitoring Protocol (the "Protocol").¹ In addition, CSA adopted changes to its methodology during the Spring 2019 sound monitoring that partially correct these flaws, making this monitoring season the only one that should be relied on to assess the OINR criteria at Site C.

Response to Wind Action/Shea Filing

Issue 1: CSA's reliance on hub height wind speeds to determine turbine operation levels.

The Wind Action/Shea filing argues that CSA relied on hub height wind speeds to determine turbine operation levels. As required under the Protocol, CSA correctly assessed valid periods where the wind turbines are at or near their maximum sound power by using a cutoff of 6 m/s. However, without evidence of what the actual sound power is, Wind Action/Shea states that "wind turbines typically produce their maximum sound levels when operating at or near full electricity power..." While wind turbines produce full sound power at full electrical output, they also produce at or near their full sound output at lower electricity output. In the case of the Gamesa G87, the highest

¹ "Final Sound Monitoring Protocol for Deerfield Wind," as corrected January 16, 2018.

sound power (± 1 dB) is reached at approximately 870 kW (44% of full power) and for the Gamesa G97 it is 1,350 kW (67% of full power).

To support their claims, Wind Action/Shea attach a large table showing wind turbine hub height wind speed and calculated percent of full power for each valid turbine-on period in which compliance was calculated by CSA. However, the table has several inaccuracies:

- At Site A, the 5/19/2019 6:30 to 6:40² period is not included as a compliance period in the Spring 2019 Monitoring Report but is given as part of the Wind Action/Shea data.
- At Site B, there are several errors. The 5/21/2019 03:10 to 3:20 period shown in the Wind Action/Shea table was excluded by CSA, so should not be included in their table. However, the 5/18/2019 3:10 to 3:20 period should have been included in the table (but was not), as it was one of CSA's valid periods.

While these periods are incorrectly represented, they are all during times of high wind turbine output.

The errors made by Wind Action/Shea at Monitoring Site C are notably different. Their data for 5/19/2019 between 06:00 and 06:50 were not adjusted to account for the three-hour time difference between the Deerfield site and its operation center in Portland, Oregon. As a result, the data shown were actually for between 09:00 and 09:50 EDT — not within a compliance period. While the Wind Action/Shea table shows these five periods range between 384 and 2,000 kW for the closest turbines (W7 and W8), the actual turbine output was between 1,998 and 2,006 kW during the compliance periods, which is effectively full power output.

Note that our conclusions above are based on the evaluation of the Spring 2019 Sound Monitoring Report, as revised in October 2019. That report displays times in a more consistent manner, and/or makes clear any time zone or labeling differences between data provided by Deerfield and CSA.

When using the correct times from the revised report, all of the compliance periods at Site C (Mr. Shea's home) are at or near full sound power output at the closest wind turbines. Thus, the CSA analysis for Site C is correct.

Issue 2: CSA's combining of data from different shutdowns to compute the one-hour L_{eq}

Wind Action/Shea suggests that ANSI S12.9 Part 3 allows for only "several minutes" of data to calculate a one-hour L_{eq} . This is clearly incorrect and highly misleading. I correctly cite passages in ANSI S12.9 Part 3 in my April 4, 2019 memo attached to Deerfield's filing to the PUC to demonstrate that the amount of data collected by CSA to determine the one-hour L_{eq} was insufficient. The Wind Action/Shea rebuttal is that the introduction of ANSI S12.9 Part 3 states that:

² In Wind Action/Shea's Exhibit A, the "Time" column is the end of the 10-minute period, expressed in military time. So, "6:40" represents 6:30 am to 6:40 am.



As an example, one hour (1 h) is used as the basic measurement duration in [ANSI S12.9] 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.

The quoted language from Part 3 only means that one can measure any duration of a L_{eq} . It makes no reference as to the minimum data requirements needed to calculate a one-hour L_{eq} , which is the measurement duration *required* under the Protocol for OINR testing. In fact, as discussed further below on Page 7, only 9 minutes 27 seconds of valid data was collected for Site C in the Fall. Under the ANSI S12.9 Part 3 standard, and by using common sense, 9.5 minutes of data cannot be used to determine a one-hour equivalent average sound level.³

The Wind Action/Shea filing also argues that the turbine-on sound level should be calculated with the adjacent background sound level rather than the average of all measured background sound level, as called for under the ANSI S12.9 Part 3 Standard. We agree with this approach. However, our calculations show that this correction would not change the conclusions of the CSA report. Our recalculation of Spring turbine-only sound levels using adjacent background periods yields a sound level of the 38 dBA at Site C—the same as calculated by CSA.

Issue 3: CSA's reliance on ground wind direction to determine upwind conditions

The Wind Action/Shea filing points out that the “automatic exclusion of sound data based on ground wind direction alone is not defensible and likely contributed to CSA's inability to collect sufficient data.” Sound data from upwind conditions (winds blowing from the receiver to the source) are excluded in the Protocol because these conditions are not favorable to sound propagation and thus would not reflect worst-case, Project-only sound levels. Higher sound levels are expected during downwind conditions, when the winds are blowing from the source to the receiver. So, CSA's approach is properly conservative, and correctly excluded upwind conditions.

While Wind Action/Shea argue that sound events below 40 dBA should not be excluded due to wind direction alone, the result of now including those sound events would likely

³ In previous filings, the DPS argued that ANSI S12.9 Part 2, intended to measure long-term average wide area sound levels, allows for the combination of measurements taken days apart to calculate a single one-hour L_{eq} . However, ANSI S12.9 Part 2 is not applicable here. That standard states, “Long-term measurements of a specific source... are normally made for describing and quantifying the typical or average levels; not the highest levels.” On the other hand, ANSI S12.9 Part 3 is used for calculating short-term sound levels, like the one-hour L_{eq} . The standard “describes recommended procedures for measurement of short-term, time-average environmental sound outdoors at one or more locations in a community for environmental assessment or planning for compatible land uses and for other purposes such as demonstrating compliance with a regulation.” Note that ANSI S12.9 Part 3 is used with an observer present. In this case, the Protocol requires that an observer be present around at least one shutdown event at each of the three monitoring locations. Having an observer present for all shutdowns is impractical. The Protocol allows audio recordings and spectrograms as an acceptable substitute.

be to lower the turbine-only sound level (because the previously excluded events are all below 40 dBA) and further reduce the estimated sound levels below the CPG noise limit. The Protocol's purpose of limiting the screening events above 40 dBA was to avoid spending resources on evaluating sound events that are below the CPG noise limits. CSA did more work than was required under the Protocol to screen additional events below 40 dBA to ensure that only worst-case downwind propagation conditions were included.

Response to DPS Filing

In its November 15, 2019 filing the DPS states that:

Deerfield argued the applicable noise testing standard is ANSI S12.9 Part 3, and that this standard requires that the one-hour Leq be based on at least 30 minutes of data obtained during a single shutdown. The Department argued that while the Protocol makes no reference to an applicable standard the more relevant standard is ANSI S12.9 Part 2, and that under either standard, minutes from different shutdowns could be combined to form the one-hour Leq.

As stated in Deerfield Wind's November 15, 2019 filing, the ANSI S12.9 Part 2 standard is for monitoring long-term, wide-area average sound levels. In this case, we are focusing on determining the short-term (one hour) equivalent continuous sound levels. This is the subject of ANSI S12.9 Part 3, which allows one to calculate source-only sound levels by subtracting out adjacent background periods. The Protocol evaluates short-term sound one hour before and after distinct shutdown events, and then uses observations of audio recordings and other data to filter out non-turbine sounds (according to the Protocol), similar to the procedures of ANSI S12.9 Part 3.

However, DPS does not address the most important issue that was partially corrected in the Spring sound monitoring campaign. That is, the Fall sound monitoring did not exclude wind gusts over 5 m/s, wind gusts that caused the sound recordings to clip, or periods which were identified as wind gusts by CSA, where no wind turbine sound was audible, and were still kept in the data set. There is no argument that, by keeping these non-wind turbine sounds in the turbine-On data, the Fall sound measurements were biased high. Therefore, CSA did not collect sufficient data at Site C during the Fall and the data that was collected was contaminated by wind-induced noise and wind-induced pseudo-noise (false sounds created by interaction with wind, especially over 4 to 5 m/s). Note that CSA acknowledged our previous comments on this issue by shortening the wind speed data collection logging periods in the Spring monitoring protocol such that the times of high wind speeds could be refined.

Under the Protocol:

Data during some periods will be removed from the results. These include periods when:

- Wind speeds (average **or gusts**) at a monitoring site are above 4 to 5 m/s – Winds above 5 m/s create a large amount of false noise generated from



pressure fluctuations around the microphone. Data for wind speeds between 4 and 5 m/s (or below, as needed) should be carefully reviewed to identify any wind contamination that creates pseudo-noise or wind-induced noise that is sufficient to mask wind turbine sound prior to its inclusion in the filtered data set...

- **Spikes are present that are not consistent with wind turbine operation...**

Events over 40 dBA (i.e., 5 dBA lower than the CPG exterior noise limit) where the hub height wind speed is sufficient to generate within 1 dB of the maximum sound power (over a reasonable period of time and number of turbines), and the wind direction is not upwind of the nearest turbines shall be investigated by listening to the audio tape or reviewing the spectrogram of the event and determining if the cause is wind turbine noise. **If the exceedance is due to a background event, then it shall be eliminated.**

(emphases added).

In RSG's April 4 memorandum attached to Deerfield's filing to the PUC, we reported that only 48 minutes of data at Site C were considered valid by CSA. In addition, we noted that the Protocol requires that "[t]he sound monitoring report will include a description of each reason why data has been removed from the monitoring results. The removed data will be retained by the sound monitoring consultant and provided to the Commission." At the time, we had not received those times from CSA. After the April 4 filing, CSA did send us the time periods that were considered valid. Reviewing this new information, we found that only 10 minutes of data at Site C were actually valid during the Fall monitoring period. This is explained further below.

During the Fall monitoring periods, there were five 10-minute periods that CSA considered valid at Site C. After removing mostly man-made noise,⁴ 48 valid turbine-on minutes remained. Of these five periods, *four of the five had wind gusts over 5 meters per second.*⁵ These are marked in red in Table 1 below. These periods "will" be eliminated according to the Protocol and they were not in the original Fall 2018 monitoring report or the October 2019 revised version.

⁴ 11 seconds of data were reportedly removed due to "Wind Gust." The remaining were reportedly removed due to "Aircraft" and "Car/Truck."

⁵ The contamination of sound data from wind is a well-recognized issue. ANSI S12.9 Parts 2 and 3 require the filtering of contaminating wind noise. Part 2 states that "it is helpful to know of high winds which cause excessive wind-induced noise... which can bias the measurements." Part 3 states more directly, "To minimize the effects of wind on the microphone, sound measurements should not be taken when the wind velocity is greater than 5 m/s (11 mph or 10 knots) at the microphone position when measured at a height of 2 m above the ground."

TABLE 1: CSA VALID PERIODS AT SITE C FOR FALL 2018

Date/Time (starting at)	Wind Gust Speed	Turbine-only sound level ⁶
10/24/2018 22:20	4.9 m/s	38 dBA
11/08/2018 03:40	11.0 m/s	42 dBA
11/14/2018 00:00	10.5 m/s	42 dBA
11/14/2018 00:10	12.8 m/s	42 dBA
11/14/2018 00:20	9.2 m/s	41 dBA

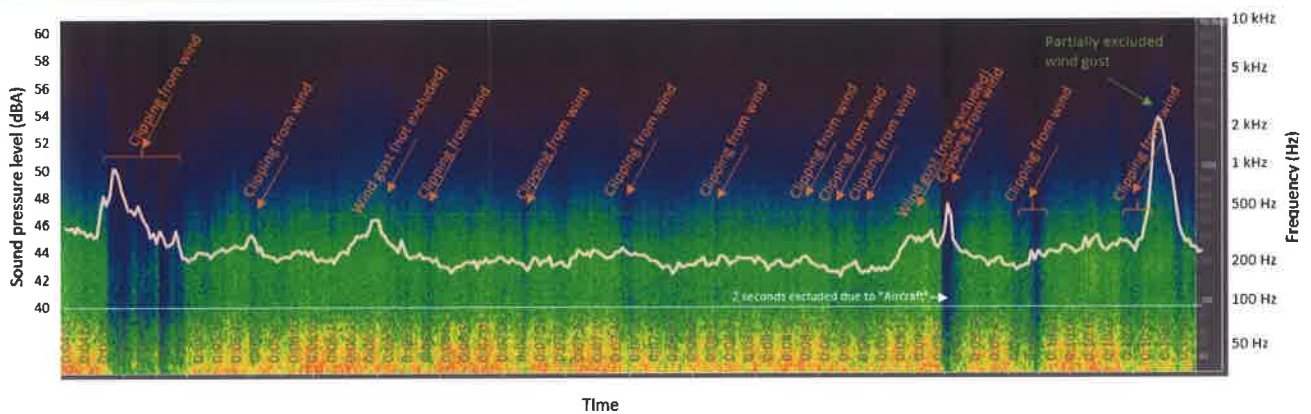


FIGURE 1: ISSUES FOR ONE SIX-MINUTE PERIOD DETERMINED BY CSA TO BE VALID DURING THE FALL 2018 SOUND MEASUREMENTS AT SITE C

Figure 1, above, highlights the problems we uncovered in the Fall 2018 sound measurements at Site C. This figure shows the time between 00:04:51 and 00:10:45 on November 14, 2018. This is during periods considered “valid” by CSA. On the left axis is the measured sound level. The sound level is shown as the light-colored line going through the plot from left to right. The colored background portion of the figure is a spectrogram. This plot is generated by RSG from the audio recording made by CSA. In it, frequency is shown on the vertical axis on the right, and the intensity of the sound is shown through the color intensity, going from blues to reds. Several conclusions can be drawn from this plot:

- The color intensity of the spectrogram should follow the measured sound level. However, in several important instances, it does not. For 30 seconds starting at 0:05:00, the wind is so strong that it overloads the audio recording—as shown by the decline in the spectrogram intensity (the blue color during this period). However, the sound level measured by the sound level meter increases to as

⁶ Calculated by taking the CSA-measured turbine-on sound level minus the background sound level for the adjacent shutdown period.



much as 50.1 dBA. This is the type of event that the Protocol specifically addresses as invalid—wind-causing pseudo-noise in the microphone.

- This wind-caused clipping from gusty winds occurs 11 times more during this period. Some were recognized as non-turbine and designated by CSA as “Wind in Trees/Leaves Rustling (do not exclude)” (emphasis added). This is shown in Figure 2, which is a portion of the CSA spreadsheet showing the noise events they identified during the period covered by Figure 1.⁷
- The first set of data that were excluded was a two-second period starting at 00:09:30 due to “Aircraft” (Figure 2). The source of the sound could not be confirmed by RSG since it occurred during a wind-caused clipping of the audio file. However, looking at the spectrogram, there is no characteristic indication of aircraft during this period (like Doppler shifting tones). The increase in sound during this time was likely due to wind gusts, and, in fact was much longer than two seconds.
- The second excluded event was an 11-second period marked as “Wind Gust” in Figure 2. This gust increased the sound level to over 50 dBA. However, CSA only excluded 11 seconds of the 16-second event.

		WAV file		Period to Exclude			
Exceedance Time	WAV file	Start of WAV file	Elapsed Time	Type of Event	Start	End	Time Excluded
0:05:07	2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:47:16	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00
0:06:30	2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:48:39	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00
0:09:30	2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:51:39	Aircraft	0:09:30	0:09:32	0:00:02
0:10:38	2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:52:47	Wind Gust	0:10:34	0:10:45	0:00:11

FIGURE 2: EXTRACT FROM CSA SPREADSHEET SHOWING DATA EXCLUSIONS DURING THE SAME PERIOD AS FIGURE 1⁸

In reviewing the audio files during all of the periods that had wind gusts over 5 m/s, there was no obvious audible indication of wind turbine sound. These gusty 10-minute periods should all have been excluded from the data under the Protocol.

The only remaining valid period during the 2018 Fall monitoring period at Site C was a 9-minute 27-second period at 10/24/2018 between 22:20 and 22:30,⁹ where the turbine-only sound level was 38 dBA. While 9.5 minutes is not sufficient to calculate a one-hour

⁷ During the 30 minutes of “valid” periods on 11/14/2018, 11 events were identified as “Wind in Trees/Leaves Rustling (do not exclude)” and were not removed from the data. During the November 8, 2018 valid period, four events were similarly marked, and not excluded.

⁸ See Appendix A to this letter for all of CSA’s screening for the five 10-minute sound monitoring periods.

⁹ The period had 33 seconds of “Car/Truck” removed from the data, for a total of 9 minutes 27 seconds. This period had two “Wind in Trees/Leaves Rustling (do not exclude)” periods which were not removed from the data. The wind gust during this period was 4.9 m/s, within the range required under the Protocol for a more careful review for wind-induced noise.

L_{eq} , as required under the Protocol or ANSI S12.9 Part 3,¹⁰ the resulting 38 dBA is consistent with the Site C sound level found in CSA's Spring 2019 sound monitoring.

One question that may be asked is why the sound level during these turbine-on periods was 3 dB higher than the background period if only wind was contributing to the sound. The answer is that the wind speeds were higher during the "valid" turbine-on periods than during the background period. As a result, what was calculated by CSA as the turbine-only sound level is largely a measurement of the change of the sound from the wind. As shown in Figure 3, where the wind speed during the three periods CSA determined were valid, starting at 0:00, 0:10, and 0:20 on 11/14/2018, the wind speed was 14 to 15 m/s at hub height. This is high enough such that the closest wind turbines, W7 and W8, were generating their maximum sound power. However, during the background period, the wind speeds declined to 12 m/s. This drop in wind speed does not change the sound output of the turbine, but it does change the amount of wind-induced sound, resulting in a 3 dB lower sound level during the background period.

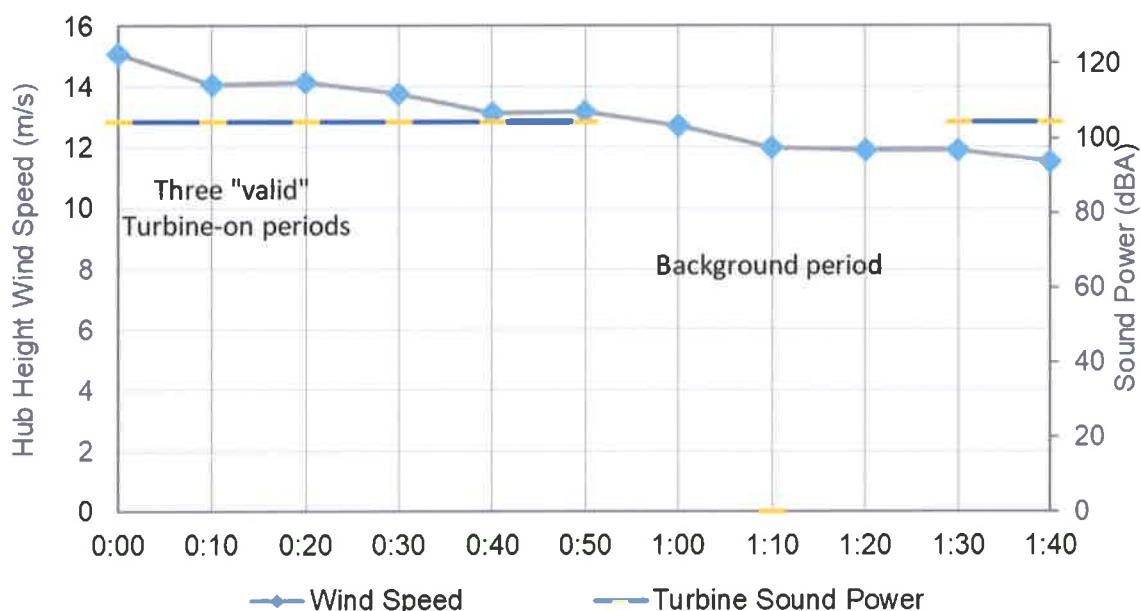


FIGURE 3: WIND SPEED DURING THE THREE "VALID" MONITORING PERIODS AND BACKGROUND PERIOD OF 11/14/2018

To confirm this, RSG listened to the audio during this period, and found no evidence of obvious wind turbine sound. This step is required under the Protocol, where any

¹⁰ ANSI S12.9 Part 3 allows for the filtering of contaminating data. However, if too much data is removed, the resulting L_{eq} is no longer valid. ANSI S12.9 Part 3 states, "Because of corrections for transient background sounds, the actual reported data collection time, T_g , in seconds, may be less than the basic measurement period, but shall not be less than half of the required measurement period." So, a one-hour L_{eq} requires at least 30 minutes of valid data. If sufficient data is not obtained, then the measurement can be repeated, but the standard provides no provisions for the combination of separate time-disparate measurements to accumulate to the minimum amount of time.



“exceedance due to a background event must be eliminated.” In this case, they were not.

As a result, the Department’s recommendation that the Commission grant Mr. Shea’s motion because “the best available data for one of the two sound monitoring campaigns found sound levels of 40 dBA or higher” is not supported. The Fall sound monitoring data is flawed in that it contains insufficient data to calculate a one-hour L_{eq} (9 minutes 27 seconds after excluding wind gusts), and what data is included in CSA’s Fall Monitoring Report inarguably includes contaminating non-wind turbine data that biases the resulting L_{eq} high. It is therefore not “the best available data.” The issues that created these problems were partially corrected in the Spring, where CSA lowered the wind speed logging interval from 10 to 1 minute, making the Spring results the best available for determining whether the OINR test is called for.

In summary, it is my professional opinion that the Deerfield Wind project complies with both the exterior and interior sound limits set under its CPG, and that the minimum requirements established by the PUC under the Protocol to offer OINR testing to the Shea home are not met.

Sincerely,

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

APPENDIX A. CSA SCREENING FOR ITS FIVE VALID PERIODS IN THE FALL 2018 MONITORING

October 24, 2018

						Period to Exclude		
		WAV file		Start of	WAV file	Elapsed		
Exceedance Time	WAV file	WAV file	Time	Type of Event	Start	End	Excluded	Time
1	22:22:31 2018-10-24_SLM_002_Audio_AGC_00	14:43:07	7:39:24	Car/Truck	22:22:30	22:23:03	0:00:33	
2	22:27:21 2018-10-24_SLM_002_Audio_AGC_00	14:43:07	7:44:14	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
3	22:29:56 2018-10-24_SLM_002_Audio_AGC_00	14:43:07	7:46:49	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	

November 7, 2018

						Period to Exclude		
		WAV file		Start of	WAV file	Elapsed		
Exceedance Time	WAV file	WAV file	Time	Type of Event	Start	End	Excluded	Time
1	2:18:03 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	0:09:58	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
2	2:19:24 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	0:05:19	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
3	2:29:11 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	0:15:06	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
4	2:29:29 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	0:15:24	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
5	3:45:50 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	1:31:45	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
6	3:46:18 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	1:32:13	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
7	3:46:59 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	1:32:54	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
8	3:49:21 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	1:35:16	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
9	4:06:54 2018-11-07_SLM_001_Audio_AGC_01	2:14:05	1:52:49	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	

November 14, 2018

						Period to Exclude		
		WAV file		Start of	WAV file	Elapsed		
Exceedance Time	WAV file	WAV file	Time	Type of Event	Start	End	Excluded	Time
1	0:00:15 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:42:24	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
2	0:01:04 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:43:13	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
3	0:04:23 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:46:32	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
4	0:05:07 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:47:16	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
5	0:06:30 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:48:39	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
6	0:09:30 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:51:39	Aircraft	0:09:30	0:09:32	0:00:02	
7	0:10:38 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:52:47	Wind Gust	0:10:34	0:10:45	0:00:11	
8	0:13:31 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:55:40	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
9	0:18:27 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	9:00:36	Aircraft	0:18:00	0:18:36	0:00:36	
10	0:13:47 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	8:55:56	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
11	0:22:36 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	9:04:45	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
12	0:24:23 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	9:06:32	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
13	0:25:54 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	9:08:03	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	
14	0:27:48 2018-11-13_SLM_001_Audio_AGC_00	15:17:51	9:09:57	Wind in Trees/Leaves Rustling (do not exclude)			0:00:00	