MEMO

TO: Michael Carey

FROM: Eddie Duncan, INCE Bd. Cert

DATE: January 15, 2020

SUBJECT: Response to Tech Environmental's Noise Impact Assessment Review for Silver Maples Wind

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Tech Environmental (TE) provided a review, dated January 8, 2020, of the RSG's Noise Impact Assessment (NIA) for Silver Maple Wind. The NIA was published on July 16, 2019. The purpose of TE's review was to determine if the NIA was "reasonable and technically correct according to standard engineering practices and if the proposed project will comply with the Town of Clifton sound limits." TE concluded that the NIA was incomplete for several reasons. We disagree with that conclusion. Some of the key issues that are discussed in the review include:

- Application of Maine DEP's noise regulations; specifically, a penalty for Short Duration Repetitive Sounds (SDRS), if present.
- The use of a 2 dB uncertainty "K" factor in the model.
- Ground factor and reflections.
- Noise Reduced Operations (NRO) and the wind speed and wind sector over which NRO should be applied.

Each of these issues are addressed below.

Application of Maine DEP Noise Regulations

While preparing the NIA, it was RSG's and SWEB's understanding that since the Clifton Land Use Ordinance has a more stringent noise limit than the State, that the Clifton limits applied and not Maine DEP's. The Town of Clifton has a limit of 35 dBA (average $L_{90,\ 10\text{-minute}}$)[1] within 100 feet of a Sensitive Receptor and 45 dBA (average $L_{90,\ 10\text{-minute}}$) at the property line, while the Maine DEP limit is 42 dBA ($L_{eq,\ 1\text{-hour}}$).

In the review, TE points out that SDRS are discussed in the Ordinance, but that the Ordinance does not apply a 5 dB penalty like the DEP regulation.

When comparing two noise limits or regulations, it is important to look at the whole regulation. Based on how the limits were planned, it is often the case that combining

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[1] The average $L_{90,\ 10\text{-minute}}$ is the average of 48 valid measurement periods for which an L_{90} value of turbine only sound can be quantified. (Clifton Land Use Ordinance, 14.8.A.)

parts of one regulation with another does not match the intent of either regulation. In this case, the 5 dB SDRS penalty that the Maine DEP uses is tied to the 42 dBA ($L_{eq,\ 1\text{-}hour}$) limit. The regulation for Maine DEP could have also been written differently, such that, the SDRS penalty was automatically accounted for in the overall limit. In that case SDRS wouldn't even be something to be evaluated, and instead the sound level limit would be 37 dBA ($L_{eq,\ 1\text{-}hour}$). For the Town of Clifton, they do not have an SDRS penalty and that lack of penalty in their regulation is tied to their limit of 35 dBA ($L_{90,\ 10\text{-}minute}$). The 5 dB SDRS penalty applies to the Maine DEP 42 dBA limit not the Clifton 35 dBA limit. As such, even if a 5 dB penalty is applied to the DEP limit of 42 dBA for the entirety of a monitoring period, the limit would be 37 dBA which is less stringent than the Clifton limit of 35 dBA.

Regardless of whether the SDRS penalty applies to the Maine DEP limit or the Clifton limit, SDRS was evaluated in the Pisgah Mountain Post-Construction Report (1/18/2018) and there were no compliance periods where an SDRS penalty would have applied.

2 dB Uncertainty Factor

Typically, when modeling the continuous equivalent sound level (L_{eq}), commonly referred to as the average sound level from a wind turbine, the common practice is to use a ground factor of G=0.5 and add 2 dB to the manufacturer's apparent sound power level, which as TE points out, results in projected sound pressure levels that "are conservative estimates and reasonably account for known uncertainties." Alternatively, the use of G=0 with no additional uncertainty can be used. In this case, the Town of Clifton does not regulate the $L_{eq,}$ but rather the average L_{90}. Given that a different metric is used, different model settings are appropriate to accurately model the specific metric $L_{90.}$ Based on research in how sound propagates from wind turbines and how modeling is conducted for given metrics[2], we know that the accurate, yet still conservative, way to model the L_{90} from wind turbines is to use a ground factor of G=0, without adding 2 dB to the model results. Therefore, we disagree with TE's assertion that not adding 2 dB to the apparent sound power level of the turbine was an error that resulted in an underestimation by 2 dB. Rather, G=0 without adding 2 dB, results in an accurate yet conservative calculation of the L_{90}.

For the most part though, the difference between these two methods (G=0.5, +2dB versus G=0) is immaterial as the difference in projected sound levels, on average, is approximately 0.1 dB.

Ground Factor and Reflections

TE points out that we used a ground factor of G=0, but appears to discount the conservatism of this approach since the modeling parameters and settings listed on page 364 of the NIA state that no reflections were modeled. However, since we used spectral ground attenuation with G=0, ground reflections are accounted for in the model.

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[2] RSG, et al. "Massachusetts Study on Wind Turbine Acoustics", Massachusetts Clean Energy Center and Department of Environmental Protection, 2016.

That is, the ground is made completely reflective. The reflection settings that TE appears to be referring to is only applicable to reflections that occur off of vertical surfaces such as large buildings, and it is not common practice to model reflections throughout an entire project area off of vertical surfaces, as buildings are not even included in the model, and post-construction monitoring is done such that the impact of vertical reflective surfaces are minimized.[3]

NRO and Sound Power Levels of Turbine S1

The NIA states that NRO would need to be implemented when winds exceed 8 m/s or greater and are from the southeast direction ±22.5°. TE states that the direction should be ±45° based on their experience and based on the definition of "downwind propagation" in ISO 9613-2, the modeling standard used for the NIA, which defines downwind propagation as ±45°. With the closest receiver over half a mile away and most others over ¾ of a mile away, we question whether width of ±45° is really necessary. To be fair, there is little research to support whether ±22.5° is more or less appropriate than ±45°. This could potentially be an issue that is addressed with the results of post-construction monitoring.

TE also states that since the NRO for Turbine S1 results in a sound power level of 97 dBA, but the turbines without NRO exceed a sound power level of 97 dBA for wind speeds of 7 m/s, that the NRO should be applicable for Turbine S1 when winds speeds are 7 m/s or greater instead of 8 m/s as recommended in the NIA. We disagree and hold that 8 m/s is the wind speed threshold for when the NRO to Turbine S1 should be triggered. The model assumes that all Silver Maple Turbines are operating at a sound power level of 103.9 dBA at a speed of 9 m/s or higher except for Turbine S1 which is operating at a sound power level of 97 dBA in NRO mode. If the wind speed is 8 m/s or less, then all turbines would be operating at a lower sound level (102.9 dBA) given the manufacturer data. The additive effect of all turbines operating at a lower sound level at lower wind speeds offsets the need to use NRO. Therefore, the NIA is correct that NRO is only needed on T1 at wind speeds above 8 m/s.

We hope memorandum helps to address some of TE's concerns, and are happy to discuss this information with Maine DEP and TE.

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[3] Chapter 375(10)(I)(8)(b)(2) states, "To the greatest extent possible, compliance measurement locations shall be at the center of unobstructed areas that are maintained free of vegetation and other structures or material that is greater than 2 feet in height for a 75-foot radius around the sound and audio monitoring equipment."