

MEMO

TO: Melissa Schmit, Geronimo Energy

FROM: Eddie Duncan, INCE Bd. Cert.

DATE: September 30, 2019

SUBJECT: North Dakota's Proposed Noise Rule Modifications for Wind Power Projects

It is our understanding that the North Dakota Public Service Commission (PSC) is in the process of updating the rules related to noise from wind power projects in Docket PU-19-290, Energy Conversion Facility Siting Criteria. In the Docket, the PSC staff are recommending changing the sound level limit for wind power projects contained in ND Administrative Code 69-06-08-01(4) from 50 dBA to 45 dBA. The limit is applicable within 100 feet of an inhabited residence or a community building.

At the request of Geronimo Energy, RSG has reviewed the proposed rule changes and observed the live stream of the PSC hearing on September 19, 2019. We have several comments that may help inform and improve the rule change, but before providing these comments, we provide a brief description about RSG and our qualifications in this area.

RSG Qualifications

RSG staff have substantial experience with renewable energy projects, including pre- and post-construction noise assessments and acoustical research. We are leaders in the field of acoustics from wind energy projects. Examples of this leadership includes:

- Conducting research for Lawrence Berkeley National Laboratory on audibility noise annoyance from wind turbines,
- Conducting research for the Massachusetts Clean Energy Center on wind turbine acoustics to help inform regulatory approaches,
- Serving as co-chair of the Wind Turbine Noise Technical Activity Committee at the Institute of Noise Control Engineering
- Presenting regularly at the Institute of Noise Control Engineering Europe's international Wind Turbine Noise Conference.

RSG's introduction to wind energy sector work came in 1993 through assisting the State of Maine's Land Use Regulatory Commission with the evaluation of a large wind development in the western part of the state. Since then we have continued to work with both public and private entities across the country to evaluate noise from proposed

projects. One of the projects for which we conducted a noise assessment is Crocker Wind Farm in South Dakota which the PSC staff references in its testimony for Docket PU-19-290.

Comments on the Proposed Sound Level Limit Change

While sound level limits do vary from jurisdiction to jurisdiction, the sound level limit of 45 dBA is commonly applied to wind power projects throughout the country. RSG does not advocate for a specific sound level limit, because it is up to each jurisdiction to decide. We do recommend that in developing noise policy and regulation that the jurisdiction consider four essential characteristics for a good noise policy:

Four Characteristics of Good Noise Policy

1. Relevance – What is the reason for the limit? Is it scientifically based and not just an arbitrary value?
2. Repeatability – When measuring for the limit, would you get the same response given the same environmental conditions?
3. Predictability – Can the sound level be accurately predicted prior to construction?
4. Ease of Implementation – Is it possible for a professional to make predictions and measurements to evaluate a project against the limit without an inordinately burdensome and costly process?

In addition to these four characteristics, there are four elements that are critical for a good noise standard to contain:

Four Critical Elements of a Good Noise Standard

1. Sound Level – The level of the sound from the source of interest and the weighting applied to those levels.
2. Sound Metric – The statistic that is used to describe the sound.
3. Averaging Time – How long the sound levels are measured.
4. Location – Where the sound is measured.

Based on our review of the existing rule and the proposed changes, the North Dakota limit contains two of the four critical elements of a good noise standard. It specifies a sound level limit, 50 dBA in the existing rule and 45 dBA in the proposed rule. It also specifies a location, within 100 feet of an inhabited residence or a community building. The proposed rule does not, however, specify a sound metric or averaging time. Without these elements the rule is ambiguous.



The recommended metric for wind turbine environmental sound standards is the equivalent continuous sound level, which when abbreviated is referred to as the L_{eq} . L_{eq} is the best metric for use in wind turbine noise regulations for a number of reasons:¹

- The IEC² 61400-11 and -14 standards for specifying wind turbine sound output is L_{eq} -based.
- The ISO 9613-2 standard for outdoor sound propagation predictions is L_{eq} -based.
- Studies on long-term impacts of sound and people's reaction to sound are L_{eq} -based.
- Turbine-only L_{eq} (that is, sound attributable to a project) can be calculated by subtracting out background sound mathematically.

The L_{eq} can be applied over any specified time period, but a time period *must* be specified. In a neighboring jurisdiction, South Dakota, the limits have been applied over a two-week period. Testimony from PSC staff references Crocker Wind in South Dakota as using a 45 dBA limit. It is important to note that the 45 dBA limit for Crocker Wind was an L_{eq} applied over a period of at least two weeks at non-participating residences. It is worth noting however, that it is very difficult to measure for compliance purposes the sound level attributable to a wind power project over a two-week period, because one must account for background sound levels which constantly change. It may be fine to set a limit of 45 dBA L_{eq} over a two-week period, but any compliance testing may need to be over a shorter duration to account for background sound levels, and with results then scaled to a two-week average.

The World Health Organization also uses an outdoor guideline level of 45 dBA averaged over the course of an eight-hour night ($L_{eq(8-hr)}$) to protect against sleep disturbance.³ An eight-hour L_{eq} is more practical for compliance monitoring, but it still may require testing over a sample of shorter durations to account for fluctuations in background sound levels over the eight-hour period.

Comments on Testimony Provided by PSC Staff

During the hearing on September 19, 2019, PSC staff were asked if a limit lower than 45 dBA would result in even less complaints, and the PSC staff responded that he thought it would. Complaints about noise are often driven by noise annoyance, and particularly at levels of 45 dBA or less, one's perception of sound is based on a number of factors other than the actual sound level produced. For example, recent studies found that an individual's annoyance with a wind project's sound is correlated with age, prior support or opposition to a wind project, visual appearance, perceived fairness in the permitting process, personal financial benefit from a wind project, and reported noise sensitivity of

¹ Kaliski, K., Bastasch, M., O'Neal, R., "Regulating and predicting wind turbine sound in the U.S.," Proceedings of Inter-Noise2018, Chicago, IL, August 2018.

² International Electrotechnical Commission

³ WHO, "Guidelines for Community Noise," 1999.

the individual.⁴ In other words, projected sound levels are only one of many factors that determine an individual's reaction to a project, and it is not even the strongest factor of those mentioned. Depending on the interplay of these other factors, reducing the sound level limit below 45 dBA may not result in less annoyance or complaints.

Recommendations to the PSC

Based on the information in this memorandum, RSG does not dispute the appropriateness of the proposed 45 dBA limit applied at residences, but we do recommend that the proposed rule changes incorporate a sound level metric and specification of an averaging time. Without these elements the rule is open to arbitrary interpretation and application.

We offer the following language as an example of how this recommendation may be incorporated into the proposed rule change:

A wind energy conversion facility site must not include a geographic area where, due to operation of the facility, the equivalent continuous sound levels over any continuous eight-hour period within one hundred feet of an inhabited residence or a community building will exceed 45 dBA. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.

We hope this review and information has been helpful, and we thank you for the opportunity to provide comments.

⁴Haac, T. Ryan, et. al. "Wind turbine audibility and noise annoyance in a national U.S. survey: Individual perception and influencing factors." J. Acoust. Soc. Am. 146 (2), August 2019.

Michaud, David S., et. al. "Personal and situational variables associated with wind turbine noise annoyance." J. Acoust. Soc. Am. 139 (3), March 2016.