414 Nicollet Mall
Minneapolis, MN 55401

August 17, 2021

VIA ELECTRONIC FILING

Mr. Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
Saint Paul, MN 55101-2147

Re: Reply Comments

In the Matter of the Application for an Amendment to Site Permit to Repower the 100.5 MW Grand Meadow Wind Farm in Mower County, Minnesota
MPUC Docket No. IP-6646/WS-07-839

Dear Mr. Seuffert:

Northern States Power Company, doing business as Xcel Energy, ("Xcel Energy") provides these reply comments responding to comments received related to its Application for an Amendment to Site Permit ("Application") to Repower the 100.5 MW Grand Meadow Wind Farm in Mower County, Minnesota (the "Project").

Initial comments were filed by the Minnesota Department of Natural Resources ("MDNR"), LIUNA of Minnesota and North Dakota ("LIUNA"),[1] and the Minnesota Department of Transportation ("MnDOT"). In addition, two individuals provided comments during the public meeting held on July 19, 2021 in Dexter, Minnesota.[2] The Minnesota Department of Commerce, Energy Environmental Review and Analysis ("DOC-EERA") staff also requested Xcel Energy provide additional information regarding its noise modeling methodology.[3]

MDNR Response

The MDNR provided brief comments relating to potential impacts to the Mower County Management Snowmobile Trail in response to information in the Application regarding crane crossings of the trail and the distance from the trail to the nearest turbine. MDNR noted that avoiding construction activity

[1] Xcel Energy appreciates LIUNA's support for the Project and has no further reply.
[2] A virtual public hearing was also held on July 20, 2021, but no members of the public offered oral comments at that meeting.
[3] DOC-EERA Comments and Recommendations on Application Completeness (June 24, 2021) (DOC-EERA Comments) at 4.

from December 1 through April 1 would prevent temporary impacts to trail users. Xcel Energy does not currently plan to construct the Project over the winter but will coordinate with trail contacts should that be necessary. Xcel Energy appreciates MDNR's recognition that snowmobilers have safely used the trail during operation of the existing Grand Meadow Wind Farm, and Xcel Energy does not anticipate any other modifications are necessary but will coordinate with the trail contacts if needed.

MnDOT Response

Xcel Energy has reviewed MnDOT's comments regarding signage and additional permitting coordination and will engage with MnDOT to ensure early coordination on these issues prior to construction.

Public Comments

Two members of the public spoke at the public meeting on July 19, 2021 and expressed concerns regarding trash left on the construction site at a neighboring wind project. As noted at the hearing, Xcel Energy takes these concerns very seriously. Section 5.3.24 of the Draft Site Permit addresses this issue and requires daily clean up of personal litter and proper disposal of other construction waste. Xcel Energy has already communicated with its construction team regarding these concerns.

DOC-EERA Response

In its Comments and Recommendations on Application Completeness, DOC-EERA requested that Xcel Energy and its noise consultant, RSG, provide documentation into the record describing their standards and documented guidance.[4] As requested, Attachment A to these reply comments contains a memo prepared by RSG describing the assumptions used in its noise modeling for Grand Meadow and the supporting standards and guidance related to those assumptions.

Conclusion

Xcel Energy appreciates the participation and comments provided by the public and agencies in this docket and believes the issues raised are adequately addressed in the Draft Site Permit efiled on June 24, 2021. Xcel Energy respectfully requests that the Commission approve its request to amend the Grand Meadow site permit with the conditions set forth in the Draft Site Permit.

Please let me know if you have any questions regarding this filing.

[4] *Id.*

Sincerely,

/s/ *Matt Langan*

Matt Langan
Principal Agent, Siting and Land Rights
Xcel Energy

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MEMO

TO:	Matthew Langan (Xcel Energy)
FROM:	Eddie Duncan, INCE Bd. Cert.
CC:	Christina Brusven Esq. (Fredrikson & Byron) Brie Anderson (Merjent)
DATE:	August 9, 2021
SUBJECT:	Grand Meadow Wind Farm Repower Sound Propagation Model – Explanation of Parameters

It is our understanding that EERA has requested additional information related to sound propagation modeling parameters that were used in the Noise Assessment of the Grand Meadow Wind Farm Repower Project ("Project"). Specifically, EERA requested:

> *[…] that the applicant and RSG provide detailed documentation into the record prior to the hearing describing their "standards" and "documented guidance". If projects' modeling does not effectively represent post-construction noise levels, there is a risk of detecting exceedances post facto. EERA notes that compliance corrections have a possibility of being rather restrictive, leading to an inefficient outcome, e.g., curtailment at certain hours or wind speeds.*

Background Information

RSG has been working to calibrate and verify sound propagation models for wind turbine noise since 2007. We are leaders in this area as evidenced by our field studies comparing modeled to measured sound levels,[1,2,3,4,5]. In addition, our staff are

[1] Kaliski, K. and Duncan, E. "Propagation modeling Parameters for Wind Power Projects," Sound & Vibration Magazine, Vol. 24 no. 12, December 2008.
[2] Duncan, E. and Kaliski, K. "Improving Sound Propagation Modeling for Wind Turbines," Acoustics 08, Paris 2008
[3] Kaliski, K., and Duncan, E. "Propagation Modeling Parameters for Wind Turbines," Proceedings of the 2007 Institute of Noise Control Engineers NOISECON 2007
[4] RSG, et al, "Massachusetts Study on Wind Turbine Acoustics," Massachusetts Clean Energy Center, Massachusetts Department of Environmental Protection, 2016
[5] Kaliski, K., Bastasch, M., and O'Neal, R., "Regulating and predicting wind turbine sound in the U.S.," Proceedings of Inter-Noise 2018, Chicago, Il, August 2018

recognized by our colleagues in the noise control engineering community as leaders in the field of wind turbine acoustics.[6]

The standard engineering methodology used for outdoor sound propagation in the United States and in much of the world, ISO 9613-2, was developed for use with "ground-based noise sources".[7] The typical hub heights for wind turbines falls outside the range of propagation heights for which the standard was intended, and as such, requires special consideration for model validation. The following sections provides a discussion of the special considerations that are needed for a variety of modeling parameters to ensure accurate, yet conservative model results.

Modeling Parameters

The selection of modeling parameters is dependent upon the sound level metric that needs to be modeled, and the sound level metric that needs to be modeled is dependent upon the applicable regulation. Pursuant to Minn. R. Ch. 7030, Minnesota regulates the hourly median sound level, $L_{50,\ 1\text{-hour}}$. To model the L_{50} due to turbines both accurately and conservatively, we used:

- the manufacturer's reported apparent sound power level of the wind turbines,
- a ground factor of G=0.7. representing 70 percent porous ground,
- a receiver height of 4 meters, and
- an added uncertainty of +2 dB to the modeled results.

Receiver Height

Use of a 4-meter receiver height is supported by post-construction monitoring at a number of projects[8], and by the Institute of Acoustics' Good Practice Guide on Wind Turbine Acoustics Noise (2013), "as it has the effect of reducing the potential oversensitivity of the calculation to the receiver region ground factor compared to lower receiver heights."

Using a receiver height of 4 meters is more conservative than a receiver height of 1.5 meters and results in a projected sound level that is 1.7 dB higher, on average, for the Project.

Ground Factor

A ground factor is used in the model to represent the impact the ground surface will have on sound propagation. A ground factor of 0.5 is more commonly used in the United

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[6] In 2020, Ken Kaliski, Senior Director in Acoustics at RSG, was awarded the William M. Lang Award for the Distinguished Noise Control Engineer in part for his "notable contributions in the field of wind turbine acoustics."

[7] ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation", 1996.

[8] Kaliski, K., Bastasch, M., and O'Neal, R., "Regulating and predicting wind turbine sound in the U.S.," Proceedings of Inter-Noise 2018, Chicago, Il, August 2018.

States when the noise standard is based on L_{eq} (i.e., the pressure-weighted mean level). In Minnesota, the noise standard is based on the L_{50} (i.e., the median level). Based on data from the Mass CEC wind turbine research study[9], **the L_{50} from wind turbines is typically 0.6 to 1.1 dB lower than the L_{eq}.**

For Grand Meadow to account for the difference between L_{eq} and L_{50} in its model and create an accurate projection of L_{50}, an adjustment of the ground factor from 0.5 to 0.7 will lower the sound level projection of the model by 0.7 dB, on average when a receptor height of 4 meters is used. Using a ground factor of 0.7 to model L_{50} is really a way of applying an adjustment or correction factor to shift from an L_{eq}-based model to an L_{50}-based model to adhere to the Minnesota L_{50} noise standard.

+2 dB Model Uncertainty Factor

A +2 dB sound uncertainty factor is added to model results to account for the combined wind turbine sound power and propagation model uncertainty. Including this sound power factor is common practice when using a ground factor greater than G=0. However, if G=0 is used, representing fully hard ground, then no uncertainty is added.[10]

Model Factor Summary

Table 1 at the end of this memorandum summarizes the purpose and average effects of the various modeling parameters.

Conclusions

The combination of a ground factor of G=0.7, a receiver height of 4 meters, and a +2 dB sound power factor to model the L_{50} metric from wind turbines is supported by the guidance and research referenced in this memorandum and RSG's expertise in this area. The combination of these parameters results in projected sound levels that are higher than many other combinations of parameters. For example, the stated parameters would result in projected sound levels that are, on average, 0.6 dB higher (e.g. more conservative) than using a combination of G=0.5, a receiver height of 1.5 meters, and +2 dB sound power factor. Given this information, we think the combination of the modeling parameters used for Grand Meadow provide an accurate projection of the turbine-only L_{50} on an hourly basis.

[9] RSG, et. al. "Massachusetts Study on Wind Turbine Acoustics", Massachusetts Clean Energy Center and Department of Environmental Projection, 2016.
[10] Kaliski, K., Bastasch, M., and O'Neal, R., "Regulating and predicting wind turbine sound in the U.S.," Proceedings of Inter-Noise 2018, Chicago, Il, August 2018

TABLE 1: SOUND MODELING PARAMETERS, METRICS AND EFFECTS

Receiver Height	Ground Factor	Uncertainty Factor	Resulting Metric	Notes
4.0 meters	0.7	+2 dB	L50 (1-hour)	Used in other PUC-permitted projects[11]
4.0 meters	0.5	+2 dB	Leq (1-hour)	Recommended for regulatory use in the U.S. for modeling Leq (1-hour) [8]
4.0 meters	0.0	+0 dB	Leq (1-hour)	Recommended for regulatory use in the U.S. for modeling Leq (1-hour)[8]
1.5 meters	0.7	+2 dB	NA	1.7 dB less than what had been modeled in the Grand Meadow Repower Noise Assessment
1.5 meters	0.5	+2 dB	NA	0.6 dB less than what has been modeled in the Grand Meadow Repower Noise Assessment

[11] Dockets 16-686, 17-700, and 09-584. for example.

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CERTIFICATE OF SERVICE

I, Breann L. Jurek, hereby certify that I have this day e-filed through www.edockets.state.mn.us on behalf of Northern States Power Company, doing business as Xcel Energy, a true and correct copy of the following documents:

1. Reply Comments, Attachment A and Certificate of Service.

A copy of this filing is also being served upon the persons as designated on the Official Service List on file with the Minnesota Public Utilities Commission and as attached hereto.

Dated this 17th day of August 2021

/s/ Breann L. Jurek

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First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1400 St. Paul, MN 55101	Electronic Service	No	OFF_SL_7-839_Official Service List
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	Yes	OFF_SL_7-839_Official Service List
Lucas	Franco	lfranco@liunagroc.com	LIUNA	81 Little Canada Rd E Little Canada, MN 55117	Electronic Service	No	OFF_SL_7-839_Official Service List
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Ian	Krygowski	Ian.Krygowski@edf-re.com	EDF Renewable Energy	10 2nd Street, Ste 107 Minneapolis, MN 55413	Electronic Service	No	OFF_SL_7-839_Official Service List
Andrea	Moffatt	amoffatt@wsbeng.com	WSB Associates	Suite 300 701 Xenia Avenue Minneapolis, MN 55416	Electronic Service	No	OFF_SL_7-839_Official Service List
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Will	Seuffert	Will.Seuffert@state.mn.us	Public Utilities Commission	121 7th Pl E Ste 350 Saint Paul, MN 55101	Electronic Service	Yes	OFF_SL_7-839_Official Service List
Lynnette	Sweet	Regulatory.records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	OFF_SL_7-839_Official Service List