

Oliver Wind III, LLC
700 Universe Blvd.
Juno Beach, FL 33408

April 29, 2016

Mr. Darrell Nitschke
Executive Director
North Dakota Public Service Commission
600 E. Boulevard Avenue, Dept. 408
Bismarck, ND 58505-0480

Dear Mr. Nitschke:

RE: Supplemental Information
Case Nos. PU-16-122, PU-16-123
Oliver Wind III, LLC
Oliver III Wind Energy Center – Oliver & Morton
Siting Application

Pursuant to the informal information request that Oliver Wind III, LLC received from North Dakota Public Service Commission Staff on April 4, 2016, Oliver Wind provides the following responses:

1. To supplement the information provided by the Company to comply with North Dakota Administrative Code § 69-06-04-01(2)(c), please review the information contained on page 2-1 and provide updates of the information from more recent publications:

2015 percent of energy provided by coal, wind, hydro and other sources in North Dakota
More recent EmPower energy related goals
Most recent MISO Transmission Expansion Plan
Most recent MAPP information

RESPONSE: According to the U.S. Energy Information Administration,¹ in 2014, 75 percent of North Dakota's net electricity generation came from coal, almost 17.5 percent came from wind energy, and about 7 percent came from conventional hydroelectric power sources. This is the most recent data available from the U.S. Energy Information Administration.

¹ U.S. Energy Information Administration. 2016. North Dakota State Energy Profile. Available online: <https://www.eia.gov/state/print.cfm?sid=ND>

Please see the following links for the requested reports:

North Dakota Department of Commerce. 2014. EmPower North Dakota 2014 Policy Updates and Recommendations. Available online at: http://www.business.nd.gov/uploads/14/empowernd_finallowres.pdf

Midcontinent Independent System Operator. 2013. MISO Transmission Expansion Plan. Available online at: <https://www.misoenergy.org/Library/Repository/Study/MTEP/MTEP13/MTEP13%20Executive%20Summary.pdf>

North American Electric Reliability Corporation. 2015. 2015 Summer Reliability Assessment. Available online at: http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/2015_Summer_Reliability_Assessment.pdf (see page 26 for MAPP information)

2. To supplement the information provided by the Company to comply with North Dakota Administrative Code § 69-06-08-01(5)(c)(5), please provide the following:

- Expand the Shadow Flicker Impact Analysis tables as provided in the appendix by adding the distance each receptor is from the closest wind turbine and whether or not the receptor is a participant or non-participant to the table.

RESPONSE: Please refer to the revised Shadow Flicker Impact Analysis filed with the Commission on April 28, 2016. The requested information can be found in Appendix A to the report.

- Describe the types of mitigation the Company provides to landowners for shadow flicker.

RESPONSE: Affiliates of Oliver Wind III have successfully mitigated shadow flicker with window treatments or shades that are selected by the landowner, or by installing screening landscaping. Oliver Wind III would pay the reasonable costs of such installations if they are related to mitigation of shadow flicker.

- Provide studies and a summary of any promising technologies the Company is aware of that could replace the blinking red lights on the top of the turbines and where the technologies are at in terms of becoming feasible and affordable.

RESPONSE: In Case PU-15-690, an affiliate of Oliver Wind III, Brady Wind provided the attached response to the Commission regarding the existence of alternatives to red blinking lights for FAA compliance. See Attachment 1. Also attached is the FAA's recent advisory circular on Aircraft Detection and Lighting Systems ("ADLS"). See Attachment 2.

As the Brady Wind response notes, the FAA only approved use of ADLS in December, 2015, and there are very limited approved commercial options for the technology. The response also notes concerns with the technology that similarly apply in the case of Oliver Wind III, in particular how ADLS would affect its insurance requirements and coverage, that the cost of ADLS is significant and has not been included in project estimates or PPA pricing because to date it has not been a requirement of the FAA or the Commission, and that installing the system at this stage of development could extend the commercial operation date, costing the project many millions of dollars as a result. Moreover, because this is new technology and there are circumstances under which the FAA will not approve the technology (as noted in the FAA circular attached), the ability to obtain FAA approval for a particular project and the timing of any such approval is not certain.

- Provide a map showing a more condensed project area now that the Company has an idea of where the turbine placements will be. Include turbine placements and color code participant versus non-participant structures on the map.

RESPONSE: Please refer to Attachment 3.

- Provide the percentage of land in the project area both before and after reconfiguration that is participating versus non-participating.

RESPONSE: The calculations requested are as follows:

	Project Boundary	Participating of Project Boundary	Non-Participating (% of Project Boundary)
Before Reconfiguration (2-3-2016)	21878 acres	16025 acres (73.25%)	5853 acres (26.75%)
After Reconfiguration	14386 acres	13263.11 acres (92.19%)	1122.89 acres (7.81%)

3. To supplement the information provided by the Company to comply with North Dakota Administrative Code § 69-06-08-01(5)(c)(6), please provide copies of and summarize the results of any studies that the Company has conducted or is aware of that discuss the impact of wind turbines on wildlife other than birds and bats as well as studies that report on the effects to cattle or horses.

RESPONSE: Oliver Wind is not aware of any studies on the effects of wind on cattle or horses. In our experience, cattle on many of our wind farms seek shade in the shadows of the turbines, particularly in warm climates during the summer. The only other interaction

between wind farms and cattle or horses we are aware of relates to potential entanglements of cattle with guy wires and associated anchor points for MET tower deployment. Out of over 500 MET tower deployments, we are aware of only 2 instances where a cow was impacted. In both of those cases, the landowner was compensated for any livestock impact or loss. NEER also routinely fences any anchor point attachments for MET tower guy wires to avoid and minimize potential cattle and MET tower interactions.

Peer-reviewed studies on the impact of wind development on wildlife other than birds and bats are generally limited, but a literature review by The Wildlife Society (2007) (Attachment 4) and the American Wind Wildlife Institute (AWWI; 2014) (Attachment 5) are two of the most comprehensive sources of impacts on wind and wildlife interactions. Oliver Wind is aware of three peer-reviewed studies that have evaluated the impact of wind development on ungulates, or the group of animals most closely related to cattle and horses. Taylor et al. (2016) (Attachment 6) evaluated the impacts of wind energy development on winter mortality of pronghorn in sagebrush stands of south central Wyoming over three winters between 2010 and 2012. The authors concluded pronghorn winter survival was not influenced by exposure to wind energy development; but that larger wind farms than they studied could have different impacts. The Dunlap wind farm studied by Taylor et al. (2016) included 74, 1.5-MW GE turbines, which is considerably fewer than the 48 GE turbines Oliver Wind has proposed to construct for this project. In 2006, Walter et al. (Attachment 7) studied the impacts of wind power development on the home range and diet quality of relocated Rocky Mountain elk in southwestern Oklahoma over two years between 2003 and 2005. The authors concluded that although some disturbance and habitat loss was observed, home range and diet quality of elk were not detected. Finally, in 2013 Webb et al. (Attachment 8) studied the impact of wind power development on resource use of female mule deer in southern Wyoming and northern Colorado during two consecutive winters between 2011 and 2012. The authors concluded their modeling approach could be used to identify areas of potential high use during winter, such as the valley ranges used for wintering in southern Wyoming and northern Colorado.

Please refer to Attachments 4-8 for the referenced studies.

4. To supplement the information provided by the Company to comply with North Dakota Administrative Code § 69-06-08-01(5)(c)(3), please provide copies of and summarize the results of any studies that the Company has conducted or is aware of that discuss the impact of wind turbines on property values.

RESPONSE: Please refer to Attachments 9 and 10 for the following:

Consultation Report: Wind Farm Survey and the Impact on Property Values, prepared for Brady Wind LLC. See Attachment 9.

Berkeley National Laboratory, 2013: Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. See Attachment 10.

5. To supplement the information provided by the Company to comply with North Dakota Administrative Code § 69-06-08-01(5)(a)(1)-(5) and (c)(7), please provide copies of and summarize the results of any studies that the Company is aware of that discuss the impact of wind turbines on localized weather conditions. That is, do wind turbines mix the air causing atmospheric warming that could affect crops?

RESPONSE: Please refer to Attachments 11 and 12 for the following articles:

“Crop Wind Energy Experiment (CWEX): Observations of Surface-Layer, Boundary Layer, and Mesoscale Interactions with a Wind Farm.” See Attachment 11.

“Changes in fluxes of heat, H₂O, and CO₂ caused by a large wind farm.” See Attachment 12.

Although numerous commentaries and peer-reviewed research papers have speculated about the impact of wind turbines on crops, only two peer-reviewed reports provide actual *in situ* measurements of crop-relevant microclimate factors taken in wind farms. These papers (Rajewski et al., 2013, 2014) both report data taken on the ground in crop fields within a utility-scale wind farm during the growing season. Attributing causality of changes of climate conditions in agricultural fields to wind turbines requires concurrent measurement inside and outside the wind farm. Confirming causality also requires data on the operational status of the turbine: were the turbines actually operating during the time the measurements were taken? Differences in terrain features, trees, farmsteads building, and soil moisture must be ruled out as influencing conditions. And land-management differences inside vs. outside the wind farm must be documented – crop and cultivar differences, use or not of irrigation, tillage differences, grazing differences, etc.

Rajewski et al. (2013) provides the initial overview of a series of measurements taken during the summers of 2010 and 2011 in an Iowa wind farm collocated with vast fields of intensively managed crops (mostly corn and soybeans). They measured meteorological differences a few feet above the corn crop at locations inside vs. outside the wind farm. They measured wind speed, temperature, heat flux, moisture flux, carbon dioxide flux and turbulence at four to six locations – one or two outside and three or four inside the wind farm (depending on year).

Rajewski et al. (2013) found that, in general, the wind farm influence the climate near crops more at night than during the daytime. At night the turbines reduce surface wind speed slightly (except in “gap” regions), increased the surface temperature by 0.5-1.0 oC, increase the turbulence near the crop, and increase the carbon respiration of the corn crop. During the daytime, turbines cause a fraction of a degree C cooling of the crop, slightly increase the moisture loss of the crop, and increase the downward carbon dioxide flux, suggesting that turbines enhance the carbon uptake by crops.

Rajewski et al. (2014), in analyses from the same 2010 and 2011 location and summer period, found that the turbines did not warm or cool the crop during the daytime but did contribute to a slight drying. Daytime CO₂ fluxes downward into the crop exhibit a small enhancement when the turbines are ON vs OFF, but noted a five-fold increase in CO₂ flux into the crop at one specific location downstream of a turbine. Conversely, at night both downward heat flux and upward CO₂ flux due to crop and soil respiration were increased 1.5–2 times compared to the reference magnitude. They did not find any major differences in evaporation or condensation of water at night. There is evidence that the daytime CO₂ uptake can be increased for fields that are within the near vicinity of a turbine, and they had strong evidence that nighttime respiration is enhanced in the lee of the turbine line. On balance, the evidence suggests that turbines may be promoting an increase in carbon uptake and hence crop growth.

Please feel free to contact me if you have any additional questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark Trumbauer". The signature is fluid and cursive, with the first name "Mark" being more prominent than the last name "Trumbauer".

Mark Trumbauer
Project Manager
Oliver Wind III, LLC