

Memorandum

To	Emmons-Logan Wind, LLC	Pages	1
Subject	Emmons-Logan Wind Energy Center Addendum to the Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility Shadow Flicker Update Emmons and Logan Counties, North Dakota		
From	AECOM		
Date	November 5, 2018		

Emmons-Logan Wind, LLC (Emmons-Logan Wind), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, submitted an application for a Certificate of Site Compatibility to construct the Emmons-Logan Wind Energy Center (Project) in July 2018. The North Dakota Public Service Commission (Commission) has deemed the application complete and scheduled a public hearing for December 7, 2018. This memorandum and the accompanying report serve as an addendum to the information presented in the application.

The application contained shadow flicker information that was based on a preliminary assessment for the Project. Since the application was submitted, there have been minor changes in the Project layout and subsequent shadow flicker assessments, as explained in further detail below. Therefore, the results of the November 2018 Shadow Flicker Assessment submitted with this memorandum differ from those specified in the application. The application indicates that shadow flicker will be above the industry accepted 30 hours per year at 15 occupied residences; whereas the November 2018 Shadow Flicker Assessment concludes that the Project could potentially exceed 30 hours per year at seven occupied residences. The seven residences in exceedance are owned by landowners that are participating in the Project and that have signed waivers of the exceedances.

In particular, as Emmons-Logan Wind has worked to finalize the design and layout of the Project, and in response to various factors, including landowner requests, geotechnical survey results, and environmental and archaeology survey results, Emmons-Logan Wind altered the Project layout and moved some turbines. As a result, turbines are now located further from the majority of the 15 residences the preliminary assessment predicted to have exceedances. The preliminary assessment was updated to account for these changes. In addition, the assessment was updated using a different software package (WindPRO instead of WindFarm). WindFarm does not allow for "greenhouse mode" as part of the shadow flicker calculations. Instead it counts shadow flicker at eight individual windows which could be affected during the same minute from a single turbine. This can lead to double-counting of impacts when more than one window can be affected by a turbine. Whereas, WindPRO assumes that a single window is perpendicular to (facing toward) the turbine at all times. The updated assessment also includes a seven percent reduction in hours turbines are operational due to instances when the wind speed is below the cut-in threshold and hours for operational maintenance.

In summary, the Project is compliant with the shadow flicker industry standard for the majority of occupied residences in the Project Area, and Emmons-Logan Wind has obtained waivers for those that were modeled for over 30 hours per year.