# **Tatanka Wind Project**

Avangrid Renewables Deuel County, South Dakota

Microwave Path Analysis

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### Summary

Capitol Airspace conducted a microwave path analysis for the Tatanka wind project in Deuel County, South Dakota. The purpose for this analysis was to identify licensed and applied coordinated non-federal microwave paths that could limit the placement of wind turbines with a 90 meter hub height and 127 meter rotor diameter. At the time of this analysis, 62 individual wind turbine locations had been identified (black points, *Figure 1*). This analysis assessed each location (including its rotor swept volume) to determine if it could obstruct Fresnel zones associated with microwave paths in proximity to the Tatanka wind project.

Point-to-point microwave transmission is a critical component of the national communications infrastructure. Microwave paths enable broadband data transmission that supports telephone, cellular, and personal communication service (PCS) networks, wireless internet providers, audio and video transmission from television studios to transmitter sites, as well as many other industry and utility applications. In order to ensure signal reliability, these paths are sited to avoid any line-of-sight obstructions. Proposed structures that create a line-of-sight obstruction can degrade signal reliability and could require revisions to the microwave system.

Four unique microwave links overlie the Tatanka wind project (blue, *Figure 1*). However, none of the proposed wind turbines (including their rotor swept volume) should obstruct the associated three-dimensional Fresnel zones.



*Figure 1: Licensed microwave paths (blue) in proximity to the Tatanka wind project* 

Capitol Airspace maintains a database obtained from the FCC which is updated on a daily basis. The results of this analysis are based on FCC data available as of the date of this report.



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## Methodology

Capitol Airspace studied the proposed project based upon location information provided by Avangrid Renewables. Using this information, Capitol Airspace used a Geographic Information System (GIS) to determine proximity to both licensed and applied coordinated non-federal microwave paths contained in the Federal Communication Commission (FCC) Universal Licensing System (ULS) database.

This analysis considers impact on microwave paths resulting from the physical blockage of the first Fresnel zone (*Figure 2*). The first Fresnel zone is a three dimensional volume whose radius at a given point is calculated using the path frequency and distance from the transmitting and receiving antennas. The Fresnel zone radius is largest at the path midpoint (where  $d_1 = d_2$ ). Lower frequencies result in larger Fresnel zone radii for a given path and are typically associated with longer paths. Higher frequencies result in smaller Fresnel zone radii for a given path and are typically associated with shorter paths.



Figure 2: Fresnel zone example

In many cases, ULS database microwave transmitter and receiver antenna locations are inaccurate (e.g. *Figure 3*). Available satellite and aerial imagery was used to improve the coordinates for locations associated with microwave paths in proximity to the defined study area.



Figure 3: Example of using aerial imagery to correct erroneous ULS database antenna location



# Findings

Frequency Licensee Call Sign Path Status Transmitter Receiver (MHz)<sup>+</sup> ALPHA 3E LICENSEE LLC **WPUI339** Licensed TEC studio 945.50 1 KDBX site **WQDT287** 2 Licensed CS11 Lake Shokatan 6226.89 Northern Border Pipeline **WQDT289** 5974.85 Company 1 Licensed Lake Shokatan CS11 NorthWestern TORONTO M/W **WPTA307** 4 Licensed BANCROFT 958.75 STATION Corporation WHI614 STATION<sup>2</sup> OTTER TAIL POWER 5 Licensed Toronto 6675.63 COMPANY TORONTO WHI615 2 Licensed GARY<sup>∠</sup> 6835.63

Six paths associated with four microwave links overlie the Tatanka wind project (*Table 1 & Figure 4*).

Table 1: Microwave paths with Fresnel zones overlying the Tatanka study area

#### Conclusion

The results of this analysis indicate that six paths associated with four unique microwave links overlie the Tatanka wind project. However, none of the proposed wind turbines (including their rotor swept volume) should obstruct licensed or applied non-federal microwave link Fresnel zones.

If micrositing is required or additional locations are planned, wind turbines should be sited outside of the lateral boundaries of the Fresnel zones (green, *Figure 4*) in order to avoid the likelihood of signal blockage. Due to the relatively narrow size of most microwave path Fresnel zones, it is likely that impact on these paths can be avoided through micrositing. However, wind turbines (including the rotor-swept area) could be sited within the lateral boundaries of Fresnel zones provided they do not penetrate the three-dimensional Fresnel zone.

If you have any questions regarding the findings of this study, please contact *Dan Underwood* or *Orlando Olivas* at (703) 256-2485.

<sup>&</sup>lt;sup>1</sup> Microwave paths may be licensed to operate using more than one frequency. For the purposes of calculating Fresnel zone radii, the lowest frequency was used to create the largest Fresnel zone.

 $<sup>^2</sup>$  This microwave link antenna location could not be associated with a single antenna structure due to the multiple antenna structures in close proximity. As a result, Capitol Airspace increased the Fresnel zone radius at this antenna location in order to encompass all of the potential antenna structure candidates.

