Wind Power GeoPlanner™

Summary of Results

High Bridge Wind Farm

Prepared on Behalf of
Calpine Corporation

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COMSEARCH®
A CommScope Company

Comsearch performed an impact assessment study for each of the following systems with respect to the proposed High Bridge Wind Farm project:

1. Microwave
2. Land Mobile & Emergency Services
3. Mobile Phone
4. Amateur Radio
5 Government Radar
6. Commercial Doppler Radar
7. New York State Mesonet
8. AM and FM Broadcast Radio
9. Off-Air TV Analysis

Microwave - Our study identified two microwave paths intersecting the High Bridge Wind Farm area of interest. The Fresnel and Consultation Zones for these microwave paths were calculated and mapped in order to assess the potential impact from the turbines. A total of twenty-five turbines were considered in the analysis, each with a blade diameter of 158 meters and a hub height of 125.4 meters. Of those turbines, none were found to have potential obstruction with the microwave systems in the area.

Land Mobile & Emergency Services - The first responder, industrial/business land mobile sites, area-wide public safety, and commercial E-911 communications as described in this report are typically unaffected by the presence of wind turbines, and we do not anticipate any significant harmful effect to these services in the High Bridge Wind Farm project area. Although each of these services operates in different frequency ranges and provides different types of service including voice, video and data applications, there is commonality among these different networks in regards to the impact of wind turbines on their service. Each of these networks is designed to operate reliably in a non-line-of-sight (NLOS) environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any signal blockage caused by the wind turbines does not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, very little, if any, change in their coverage should occur when the wind turbines are installed.

When planning the wind energy turbine locations in the area of interest, a conservative approach would dictate not locating any turbines within 77.5 meters of land mobile fixed-base stations to avoid any possible impact to the communications services provided by these stations. This distance is based on FCC interference emissions from electrical devices in the land mobile frequency bands. As long as the turbines are located more than 77.5 meters from the land mobile stations, they will meet the setback distance criteria for FCC interference emissions in the land mobile bands. As long as the separation distance meets the 77.5 meter requirement, the results of the study will not change based on turbine location adjustments.

In the event that a public safety entity believes its coverage has been compromised by the presence of the wind energy facility, it has many options to improve its signal coverage to the area through optimization of a nearby base station or even adding a repeater site. Utility towers,

meteorological towers or even the turbine towers within the wind project area can serve as the platform for a base station or repeater site.

Mobile Phone - The telephone communications in the mobile phone carrier bands are typically unaffected by the presence of the wind turbines and we do not anticipate any significant harmful effect to mobile phone services in High Bridge Project Area. Mobile phone systems are designed with multiple base transmitter stations covering a specific area. Since mobile telephone signals are designed with overlap between adjacent base transmitter sites in order to provide handoff between cells, any signal blockage caused by the wind turbines does not materially degrade the reception because the end user may be receiving from multiple transmitter locations. For example, if a particular turbine attenuates the signal reception into a mobile phone, the phone may receive an alternate signal from a different transmit location, resulting in no disruption in service. Mobile phone systems that are implemented in urban areas near large structures and buildings often have to combat even more problematic signal attenuation and reflection conditions than rural areas containing a wind energy turbine facility.

For the cellular towers located near the project area, no setback distance is required from an interference standpoint other than physical clearance of the blades. From an electromagnetic standpoint, a setback distance of 77.3 meters should be used to meet FCC emission requirements. In the unlikely event that a mobile phone carrier believes their coverage has been compromised by the presence of the wind energy facility, they have many options to improve their signal coverage to the area through optimization of a nearby base transmitter or even adding a new sector or cell site. Utility towers, meteorological towers or even the turbine towers within the wind project area can serve as the platform for a base transmit site or cell enhancer. As long as the separation distance meets the 77.3 meter requirement, the results of the study will not change based on turbine location adjustments.

Amateur Radio - The amateur radio stations as identified in this report are typically unaffected by the presence of wind turbines, and we do not anticipate any significant harmful effect to their services in the High Bridge Wind Farm project area. Amateur radio station's frequencies of operation have wave characteristics that allow their signal to propagate through wind turbines and other man-made structures with minimal attenuation. As a result, their range of operation can cover wide areas despite non-line-of-sight (NLOS) conditions. Hence very little, if any, change in their coverage should occur when the wind turbines are installed.

Government Radar - There are three types of radar systems that Comsearch examined as part of this analysis: Department of Defense (DoD) military systems, Federal Aviation Administration (FAA) long range radar systems, and National Weather Service (NWS) NEXRAD WSR-88D systems.

Comsearch used the DoD RADAR screening tool to determine whether potential coverage issues were anticipated for the above systems. The results of the screening showed that there were no potential issues with the Department of Defense (DoD) military operations. Likewise, there were no predicted impacts to FAA long range radar and National Weather Service (NWS) NEXRAD WSR-88D systems. As long as project area does not increase, the results of the study will not change based on turbine location adjustments.

Commercial Doppler Radar – The technical approach to determine the potential impact of the turbines on the Doppler radar systems in the area is to calculate whether the wind turbines are in line-of-sight (LOS) of the radar systems. The wind turbines of the High Bridge Wind Farm project have the potential to block radar coverage and produce false targets if the turbines are in line-of-sight of the radar systems' transmitted signals.

To verify the presence or absence of LOS conditions between the High Bridge Wind Farm wind energy project and the Doppler radar systems identified in Section 3, LOS coverage plots were generated for each of the radar systems. These plots identify the geographical regions that have LOS to a given radar by taking into account the height of the radar antenna, the maximum height of the wind turbine blades, the curvature of the earth, and potential refractivity in the atmosphere. According to the LOS coverage plots, the effective terrain elevations would block LOS between the antennas of all seven radars and the wind project area. Therefore, LOS conditions would not exist between the radars and the wind turbines. Based on the analysis described in this report, none of the thirteen Doppler radar systems in the vicinity of the High Bridge Wind Farm wind energy project could be impacted by the project's planned wind turbines. Based on the coverage plots, as long as project area does not increase, the results of the study will not change based on turbine location adjustments.

New York Mesonet - The New York State Mesonet is a statewide network of weather stations developed and run by the University at Albany, which currently comprises a total of 126 stations. Mesoscale networks serve to collect data on mesoscale meteorological phenomena, such as dry lines, squall lines, and sea breezes, which is used to supplement data gathered by traditional automated surface observing systems (ASOS) and helps to support decision-making in agriculture, emergency management, energy, ground transportation, and aviation. To ensure the highest quality of data, each station in the New York State Mesonet must be located at least 300 feet from any tall obstacles, such as wind turbines. The closest station to the project is more than 18.5 kilometers from the nearest proposed turbine location and well outside range of impact. Finally, it should be noted that the data from each station is transmitted via the Internet to a central ingest system located at the University of Albany and is therefore not subject to telecommunications interference from the High Bridge Wind Farm project. The New York State Mesonet system is not subject to impact due to the large separation distance between the component weather stations and the project turbines. As long as project area does not increase, the results of the study will not change based on turbine location adjustments.

AM and FM Broadcast Radio - The exclusion distance for AM broadcast stations varies as a function of the antenna type and broadcast frequency. For directional antennas, the exclusion distance is calculated by taking the lesser of 10 wavelengths or 3 kilometers. For non-directional antennas, the exclusion distance is simply equal to 1 wavelength. Potential problems with AM broadcast coverage are only anticipated when AM broadcast stations are located within their respective exclusion distance limit from wind turbine towers. The closest operational AM station to the High Bridge Wind Farm project, WCHN, is more than 5.2 kilometers from the nearest project turbine. As there were no stations found within 3 kilometers of project, which is the maximum possible exclusion distance based on a directional AM antenna broadcasting at 1000 KHz or less, the project should not impact the coverage of local AM stations. As long as the turbines remain at least 3 km meters from the identified AM transmitters, the results of the study will not change based on turbine location adjustments.

The coverage of FM stations is generally not susceptible to interference caused by wind turbines, especially when large objects, such as wind turbines, are sited in the far field region of the radiating FM antenna in order to avoid the risk of distorting the antenna's radiation pattern. However, at distances less than 450 meters, radiation pattern distortion can become a factor. Signal attenuation is also possible but is difficult to quantify without precise field measurements. The closest FM station to the High Bridge Wind Farm project, WSQN, is approximately 1.7 kilometers from the nearest turbine, which should provide adequate separation to avoid radiation pattern distortion. Since no impact on the licensed and operational AM or FM broadcast stations was identified in our analysis, no recommendations or mitigation techniques are required for this project. As long as the turbines remain at least 450 meters from the identified FM transmitters, the results of the study will not change based on turbine location adjustments.

Off-Air TV Analysis - Based on a contour analysis of the licensed stations within 150 kilometers of the High Bridge Wind Farm project, it was determined that fourteen of the full-power digital stations, identified below in Table 2, may have their reception disrupted in and around the project. These stations are listed in the table below.

ID	Call Sign	Status	Service[4]	Channel	Transmit ERP[5] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Nearest Turbine (km)
6	WIVT	LIC	DT	34	345.0	42.060833	-75.943056	56.51
8	WSKG-TV	LIC	DT	42	50.0	42.061167	-75.945611	56.62
9	WICZ-TV	LIC	DT	8	7.9	42.056111	-75.943889	56.95
11	WBNG-TV	LIC	DT	7	34.0	42.058611	-75.951389	57.15
16	WSYR-TV	LIC	DT	17	105.0	42.945000	-76.024167	70.12
21	WSTM-TV	LIC	DT	24	210.0	42.944944	-76.118389	75.11
22	WCNY-TV	LIC	DT	25	97.0	42.944944	-76.118389	75.11
23	WTVH	LIC	DT	47	500.0	42.955278	-76.109167	75.45
25	WSYT	LIC	DT	19	621.0	42.880611	-76.199639	75.02
26	WNYS-TV	LIC	DT	44	680.0	42.880611	-76.199639	75.02
33	WFXV	LIC	DT	27	1000.0	43.145278	-75.176111	77.14
34	WUTR	LIC	DT	30	50.0	43.145278	-75.176111	77.14
36	WKTV	LIC	DT	29	708.0	43.102500	-74.940556	80.31
80	WRGB	LIC	DT	6	30.2	42.625361	-74.010194	116.68

The areas primarily affected would include TV service locations within 10 kilometers of the wind energy project that have clear line-of-sight (LOS) to a proposed wind turbine but not to the respective station. After the wind turbines are installed, communities and homes in these locations may have degraded reception of these stations. This is due to multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blades and mast. On the other hand, modern digital TV receivers have undergone significant improvements to mitigate the effects of signal scattering. When used in combination with a directional antenna, it becomes even less likely that signal scattering from wind farms will cause interference to digital TV reception.

In the unlikely event that interference is observed in any of the TV service areas, it is recommended that a high-gain directional antenna be used, preferably outdoors, and oriented towards the signal origin in order to mitigate the interference.
Both cable service and direct broadcast satellite service will be unaffected by the presence of the wind turbine facility and may be offered to those residents who can show that their off-air TV reception has been disrupted by the presence of the wind turbines after they are installed. As long as project area does not increase, the results of the study will not change based on turbine location adjustments.