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The Lake Breeze

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The Effect of Wind Power Farms on the Weather Radar

Wind power is a lot more than a gentle breeze that causes trees to sway or waves to move across a lake. We all know that the power in the wind can blow a semi tractor-trailer truck off the road and flatten buildings. However, it can also be harnessed to be a non-polluting, never-ending source of energy to meet electric power needs around the world.

Wind power is converted to electricity by a wind turbine. In a typical, modern, large-scale wind turbine, the kinetic energy in the wind (the energy of moving air molecules) is converted to rotational motion by the rotor - typically a three-bladed assembly at the front of the wind turbine. The turbine eventually sends this energy to a generator that converts the rotational movement into electricity.

Parts of western and northern New York provide excellent conditions for tapping the energy of the wind. An area between Watertown and Syracuse, known as the Tug Hill is in many respects the ideal location for New York's largest wind energy project. This site consists of approximately 12,000 acres at an average elevation of 1600-1800 feet. The Tug Hill plateau experiences strong lake-effect weather patterns and has long been known not only for tremendous snowfall but for its exceptional wind resource.

The Maple Ridge Wind Farm, located on Tug Hill is the largest alternative-energy project east of the Mississippi, The project will eventually consist of nearly 200 wind turbines, each stretching over 300 feet into the sky, covering approximately 12 miles of leased, privately-owned land.

Other projects completed or underway throughout upstate New York include the western portion of the state in rural Wyoming county and the Lake Erie shoreline south of Buffalo. Studies are also being conducted for additional wind farms in Jefferson county east of Lake Ontario. This move is all part of a White House Advanced Energy Initiative to have American wind farms produce 20% of the nation's electricity consumption.

The presence of the wind farms is not just apparent to those who live in the area. The large profile that several large wind turbines clustered together provides, may actually create interference or blockage of the signals emitted by weather radars located close by. As a result, the wind farms may produce an erroneous pattern on those weather radars.

According to an article entitled Impacts of Wind Farms on WSR-88D Operations and Policy Considerations "experience has shown that when wind farms are located close to weather radar systems, the turbine towers, rotating blades, and the wake turbulence induced by the blades negatively impact data quality and so degrade the performance of radar algo-

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Maple Ridge Wind Farm on the Tug Hill

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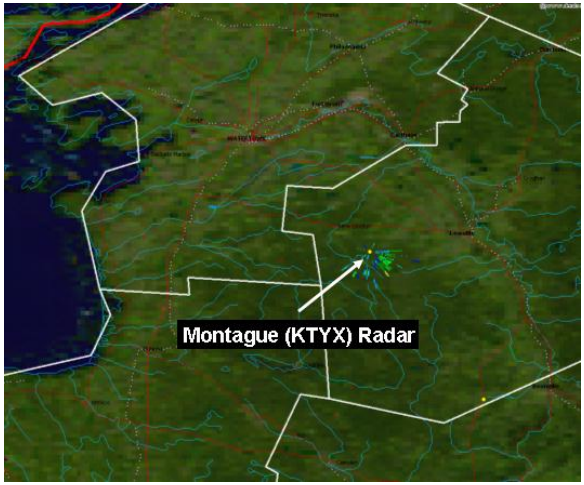

Figure 1. Montague Radar before wind farm

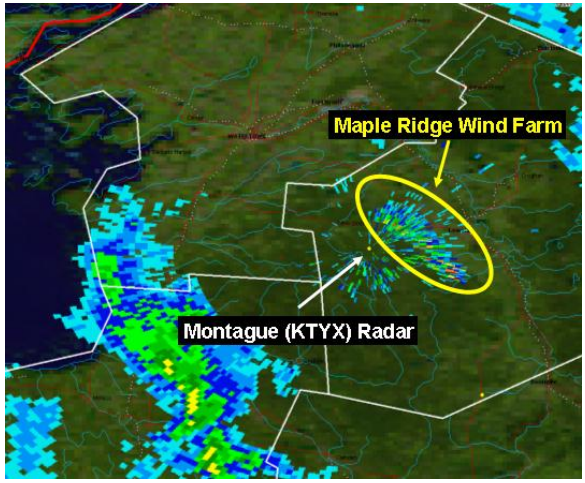

Figure 2. Montague Radar after wind farm

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rithms". One example of the effect is shown in Figures 1 and 2, which shows a radar display from the Montague WSR-88D weather radar located only about 10 miles from the Maple Ridge Wind Farm on the Tug Hill Plateau. Figure 1 shows the radar display before the wind farm was constructed in 2005. Figure 2 shows the same radar after the wind farm was partially constructed in the fall of 2006. In that image, the Maple Ridge Wind farm is readily apparent to the east of the radar as a cluster of erroneous radar echoes.

The NWS and the WSR-88D Radar Operations Center (ROC), on behalf of the Next Generation Weather Radar (NEXRAD) Program, are part of a federal interagency working group charged with finding ways to improve collaboration with the wind energy industry. This group will address wind farms impacts on federal interests, including weather radar operations and will develop criteria for wind farm siting and expansion to allow co-existence of both systems with minimal interference.

In addition, the University of Oklahoma is currently sponsoring study to develop advanced techniques to discount wind turbine signatures on the weather radars while being able to maintain those signals produced by the weather.

In summary, the rapidly increasing number of wind farms used to generate electricity is beginning to impact weather surveillance radar data. To date, the impacts appear to be minimal. However, experiences to date indicate the expected near-exponential growth in the number of such installations is cause for concern. NOAA's NWS has become involved in studying the impacts of wind farms and mitigation opportunities to ensure the network of WSR-88Ds can continue to provide mission-critical support to forecast and warning operations.

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