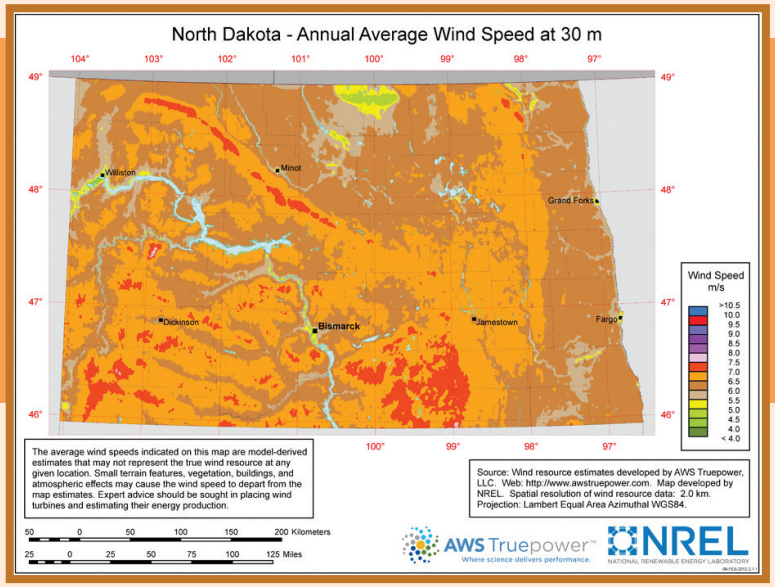
THE
ATMOSPHERICRESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

Where THE Wind Blows



By Mark D. Schneider

October 2017 went on record for being a windy month, even by North Dakota standards. There were eight or more days when Bismarck, Dickinson, Fargo, Garrison, Grand Forks, Hettinger, and Williston witnessed 40 mph wind gusts or greater. Of these reporting sites, Grand Forks received the strongest wind gust of 65 mph on October 26. It's oftentimes windy during the fall season because the jet stream is transitioning between warm and cold air masses. We see first-hand evidence of this when our daily high temperatures begin fluctuating back and forth or "yo-yoing" due to warm and cold fronts pushing north and south through the region.

If you've ever claimed that your area of the state is windier than another part of North Dakota, there might be truth to it. The U.S. Department of Energy National Renewable Energy Laboratory (NREL) has created some of the most detailed wind speed and wind potential maps available. This is accomplished by using actual surface wind observations to make model-derived estimates of the winds at various heights. Looking at the depiction of average wind speeds on a map, many locations in western and south central North Dakota stand out as high points.

There's actually a significant difference between the winds at ground level versus winds 30 meters above the surface. Surface friction is defined by the American Meteorological Society Glossary as "resistance to movement of air flowing along the surface of the earth or other surface such as an airplane wing." Drag is created as the winds near the surface encounter roughness and obstacles. The tall towers on wind generators reach high enough to avoid much of this drag and provide for more constant wind speed and direction.

In eastern North Dakota, there is a significant topographic feature called the Pembina Escarpment that enhances wind speed. This escarpment runs from South Dakota northward between Jamestown and Fargo, and then all the way into southern Manitoba. Winds around this escarpment are enhanced because of the elevation change of 300 to 400 feet (though minor in comparison to mountainous areas) that exists between it and the Red River Valley to the east. Other features to note from the map are locations on either side of river valleys (especially in western North Dakota) where the average wind speeds are noticeably stronger. Again, this has to do with the raised topography found in these areas. It's not a coincidence that North Dakota's wind farms are collocated in areas of the state where the highest average annual wind speeds occur.

According to the American Wind Energy Association (AWEA), 21.50 percent of North Dakota's in-state electricity production in 2016 came from wind energy. That's enough to power 747,000 homes and make even the snuggest fitting hats take flight!

Atmospheric Resource Board | North Dakota State Water Commission | 900 East Boulevard, Bismarck, ND 58505
(701) 328-2788 | http://swc.nd.gov

ND Weather Modification Association | PO Box 2599 | Bismarck, ND 58502 | (701) 223-4232