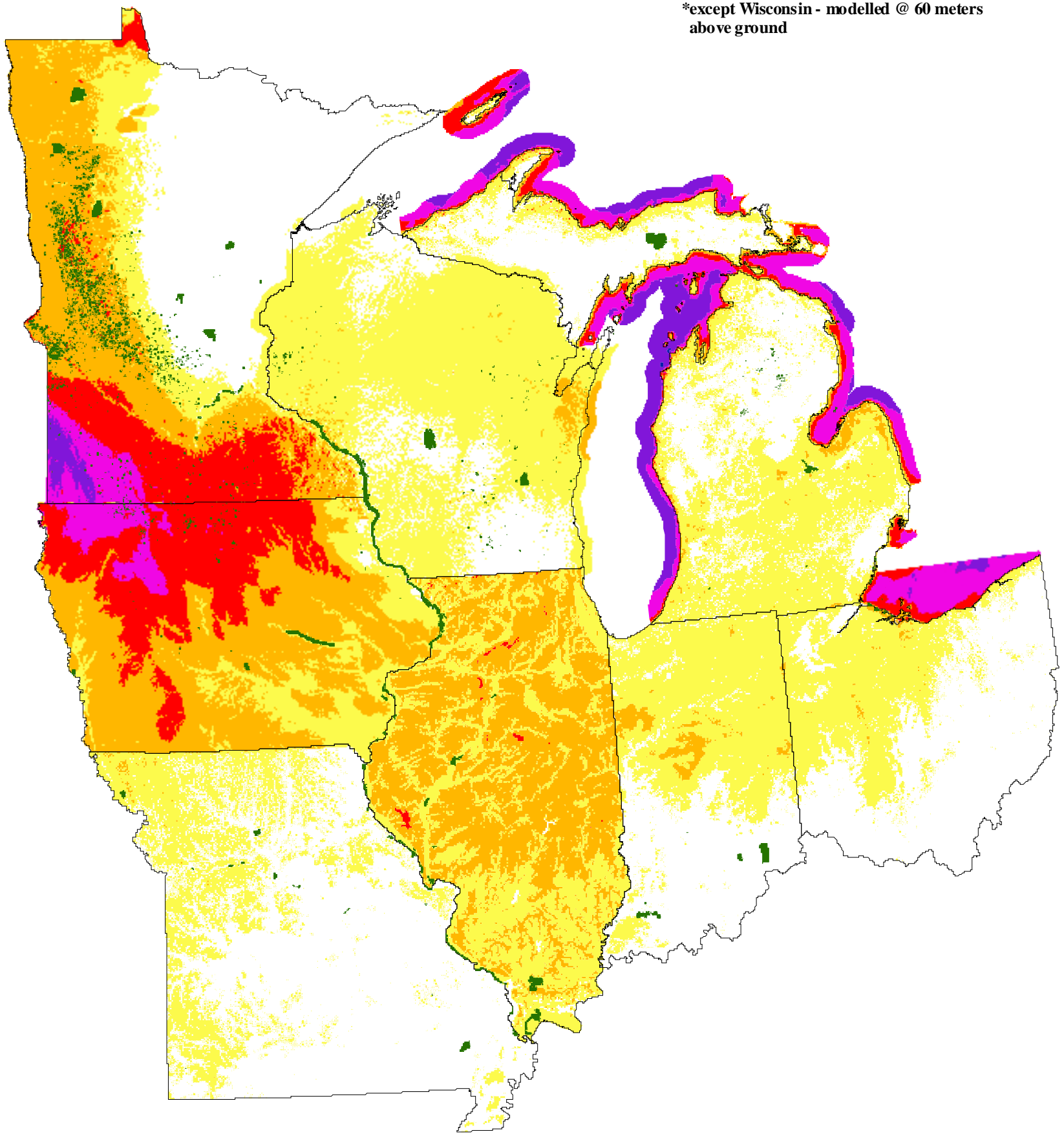


# Wind Resource Map (Wind Speed Potential Modelled @ 50 meters above ground\*)

\*except Wisconsin - modelled @ 60 meters above ground



|  |   |   |
|--|---|---|
| <p><b>NREL Wind Power Class Rating</b></p> <ul style="list-style-type: none"> <li>Poor (1)</li> <li>Marginal (2)</li> <li>Fair (3)</li> <li>Good (4)</li> <li>Excellent (5)</li> <li>Outstanding (6)</li> <li>Superb (7)</li> </ul> <p>NWRS Lands</p> <p>U.S. Fish &amp; Wildlife Service, Region 3<br/>National Wildlife Refuge System<br/>Division of Conservation Planning<br/>Twin Cities, Minnesota 55111</p> | <p><b>Wind Map Sources</b></p> <p><b>Illinois, Indiana, Ohio, Michigan and Missouri</b><br/>U.S. Department of Energy,<br/>National Renewable Energy Laboratory</p> <p><b>Minnesota</b><br/>Minnesota Department of Commerce</p> <p><b>Iowa</b><br/>AWS TrueWind<br/>Albany, NY</p> <p><b>Wisconsin</b><br/>State of Wisconsin<br/>Division of Energy</p> | <p><b>Wind Speed Maps</b><br/>Predicted mean wind speeds are modeled at heights of 30 meters, 50 meters, 70 meters, and 100 meters, respectively, above the effective ground level. As of 2005, typical tower height for the current generation of large utility-scale wind turbines of 750 KW (kilowatt) to 2 MW (megawatt) rated capacity is 70 meters. A typical height for small turbines of up to 50 KW rated capacity is 30 meters, which is consistent with on-farm or residential use.</p> <p><b>Wind Power Density Maps</b><br/>Wind power density maps show the predicted mean wind power density (amount of wind energy) at a defined height above the ground. A height of 50 meters is used in the National Renewable Energy Laboratory's (NREL) standard wind resource classes. When comparing a 100-meter wind power density to a 50-meter wind density map, you can see a substantial increase in wind energy as the distance from the ground increases.</p> <p>The mean speed and power describe different aspects of the wind resource, and both can be useful in different ways. The mean speed is the easiest for most people to relate to. Some experts regard the mean wind power, which depends on the air density and the cube of the wind speed, as a more accurate indicator of the wind resource when assessing wind project sites.</p> <p>Generally speaking, utility-scale wind power projects using large turbines that service the electrical grid require an average wind speed of at least 7 meters per second (15.7 miles per hour) or average power of at least 400 Watts per square meter (NREL class 4). Small-scale turbines such as those used by farmers and homeowners are often used in locations with lower average annual wind speeds.</p> |
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