

Wind Resource Zone May 11th



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Restriction to the Theoretical Maximum

To create a maximum build-out scenario for each region, an exclusion-based approach, similar to the approach used by the National Renewable Energy Laboratory when calculating wind energy potential for various states, was used. This approach was used because although it is possible to theoretically place turbines in regions identified by the analysis, it is unlikely that there would be a 100% build out in the region because of numerous factors. One key factor that affects wind farm development is that not all landholders will be willing to engage in a long-term lease or easement contract, precluding their land from other uses or development.

The potential of each area was reduced by 15% to account for land not being available for lease. There are multiple other factors that often deter wind farm installation such as:

- **Land fragmentation** – An commercial wind farm consists of a concentration of wind turbines because of costs of transmission and access to turbines, among other factors. If the availability of land for turbine installation is fragmented widely in an area, it is unlikely that developers will pursue a wind farm in such a location. In addition, as the competition among wind developers for land in the state has accelerated, the land available to any single developer for a project might be spread over a wide area with other interests holding land in between. Land availability can also be fragmented due to existing uses, natural features, or other considerations. Given these factors a reduction factor of 8 percent is warranted.
- **Local zoning restrictions** - Local zoning code in pertaining to wind in Michigan is highly variable. The available land in any given township could be close to zero given tower height restrictions or as high 90%. To account for this a reduction factor of 10% was used.

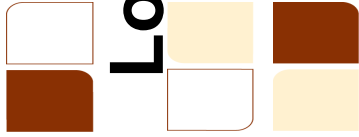




Restriction to the Theoretical Maximum

- **Competing land uses** (development for other purposes) - There are many types of development that can occur of which wind farm development is only one. Communities and land owners may have other ideas for the land identified as potentially available for wind development under the board's analysis. Speculation for land is a complex market system the assessment of which is beyond the scope of this analysis; therefore a 13% reduction was applied based on other research.
- **Environmentally sensitive areas** - There are many environmentally sensitive areas within the state with sensitive and unique species and habitats. Statewide data on all potential instances of these species is unavailable and there is very limited detailed data on migratory and bird flight paths. A percentage 15% reduction was applied.
- **Residential zoning** - The amount of land zoned as residential in the areas defined is unknown and the process for gathering such information will be lengthy and is beyond the scope of this analysis; the board used a reduction of 5% based on the ratio of residential land to other types statewide.
- In sum, these factors amount to a 66% reduction, including the 15% restriction applied for the availability of land leases.



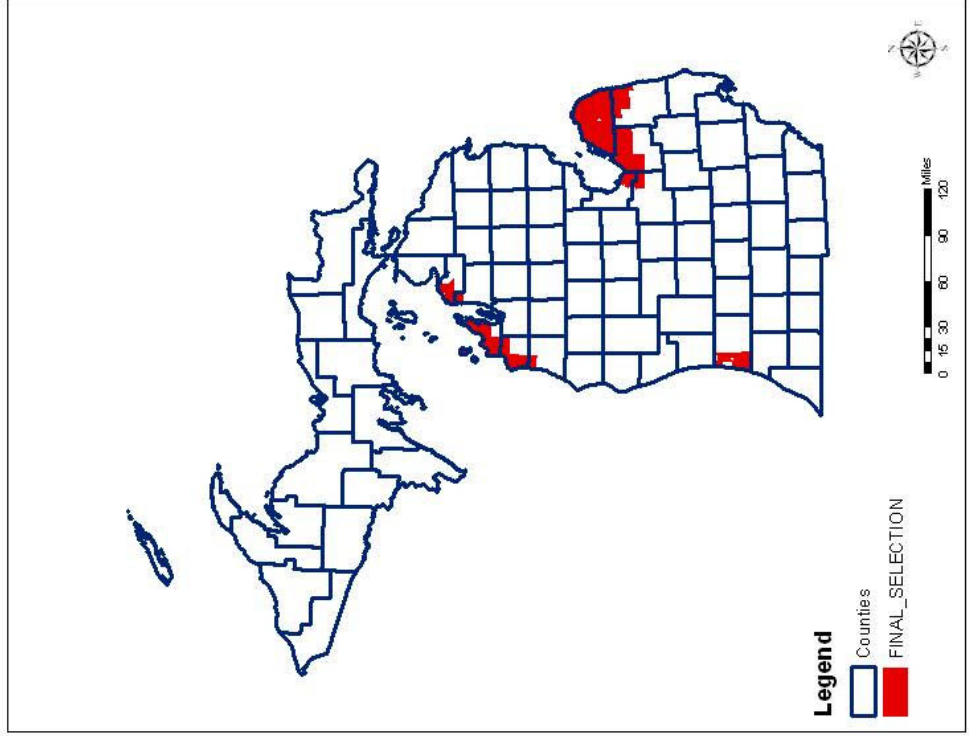


Low Sensitivity Selection (5 tier)

Totals

4,094 Turbines

6,140 MW Plate Capacity

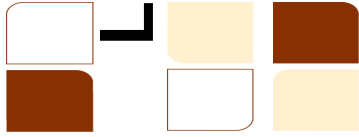


Zone	County	Number of Turbines Possible	Plate Capacity	Towers Factored Reduction	Plate Capacity Factored Reduction (MW)	Annual Estimated KWh Factored Reduction
1	Allegan	872	1,308	296	445	1,338,414,877
	Antrim					
2	Charlevoix	573	860	195	292	841,163,514
	Benzie					
3	Leellenau	2,288	3,432	778	1,167	3,564,057,892
	Manistee					
	Huron					
4	Bay					
	Saginaw					
	Sanilac					
	Tuscola	8,307	12,461	2,824	4,237	12,032,920,477



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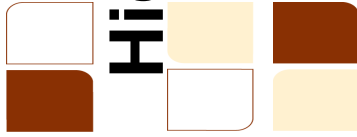
Low Sensitivity Selection (5 tier) Minor Civil Divisions 82 MCD'S

Zone	County	Townships	Zone	County	Townships	Zone	County	Townships
1	ALLEGAN	Fillmore Twp	4	HURON	Port Austin Twp	SANILAC	Minden Twp	Delaware Twp
		Laketown Twp			Dwight Twp			Austin Twp
		Manlius Twp			Huron Twp			Forester Twp
		Clyde Twp			Hume Twp			Marion Twp
		Ganges Twp			Gore Twp			Wheatland Twp
		Lee Twp			Lake Twp			Akron Twp
		Casco Twp			Bloomfield Twp			Elkland Twp
		Banks Twp			Lincoln Twp			Elmwood Twp
		Hayes Twp			Meade Twp			Columbia Twp
		Eveline Twp			Chandler Twp			Novesta Twp
2	CHARLEVOIX	Marion Twp	4	TUSCOLA	Ellington Twp		Almer Twp	
		Norwood Twp			Rubicon Twp		Wisner Twp	
		Platte Twp			McKinley Twp		Fairgrove Twp	
		Almira Twp			Sigel Twp		Gilford Twp	
		Lake Twp			Harbor Beach		Juniata Twp	
		Benzonia Twp			Verona Twp		Denmark Twp	
		Crystal Lake Twp			Colfax Twp			
		Gilmore Twp			Oliver Twp			
		Blaine Twp			Windsor Twp			
		Joyfield Twp			Fair Haven Twp			
3	LEELANAU	Leelanau Twp	4	BAY	Sand Beach Twp	SAGINAW	Buena Vista Twp	
		Leland Twp			Sherman Twp		Blumfield Twp	
		Suttons Bay Twp			Paris Twp			
		Cleveland Twp			Bingham Twp			
		Glen Arbor Twp			Sheridan Twp			
		Centerville Twp			Grant Twp			
		Bingham Twp			Brookfield Twp			
		Empire Twp			Sebewaing Twp			
		Kasson Twp			Hampton Twp			
		Arcadia Twp			Portsmouth Twp			
MANISTEE	MANISTEE	Pleasanton Twp	4	SAGINAW	Merritt Twp			
					Buena Vista Twp			
					Blumfield Twp			



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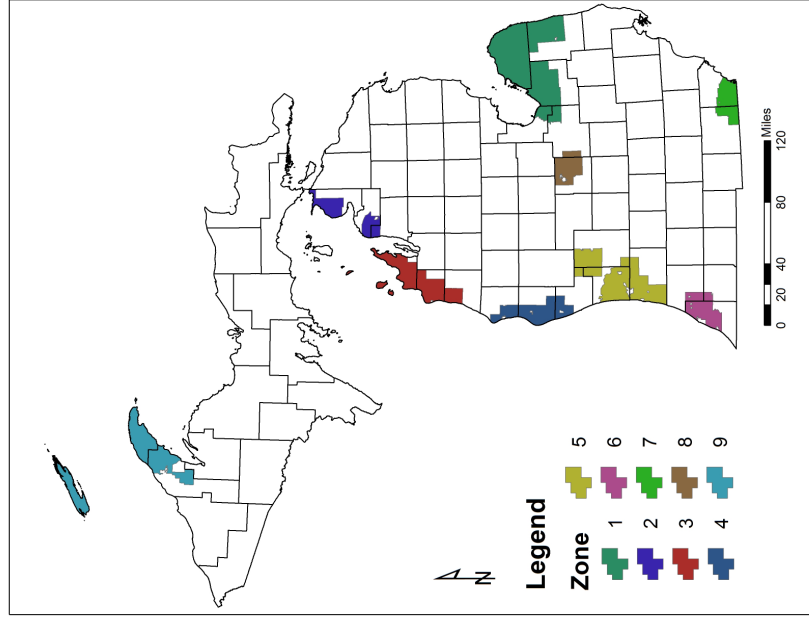


High Sensitivity Selection (15 tier)

Totals

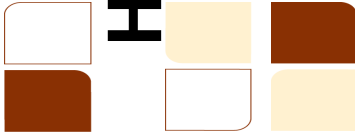
9,832 Turbines

14,748 MW Plate Capacity



Zone	County	Number of Turbines Possible	Plate Capacity	Towers Factored Reduction	Plate Capacity Factored Reduction (MW)	Annual Estimated KWh Factored Reduction
1	BAY					
	HURON					
	SAGINAW					
	SANILAC					
	TUSCOLA	9,505	14,258	3,232	4,848	13,652,804,664
2	ANTRIM					
	CHARLEVOIX					
	EMMET	1,315	1,973	447	671	2,009,262,773
	BENZIE					
3	LEELANAU					
	MANISTEE	3,035	4,553	1,032	1,548	4,509,823,406
	MASON					
	MUSKEGON					
4	OCEANA					
	ALLEGAN	2,219	3,329	754	1,132	3,229,686,351
	KENT					
	MUSKEGON					
5	OTTAWA	3,776	5,664	1,284	1,926	5,606,511,041
	BERRIEN					
	CASS					
	VAN BUREN	1,360	2,040	462	694	2,070,809,345
7	LENAWEE					
	MONROE	1,225	1,838	417	625	1,743,001,663
8	GRATIOT					
	SAGINAW	1,594	2,391	542	813	2,301,361,601
9	HOUGHTON					
	KEWEENAW	4,888	7,332	1,662	2,493	6,376,656,317



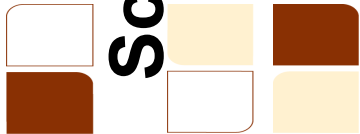


High Sensitivity Selection (15 tier) 197 MCD's

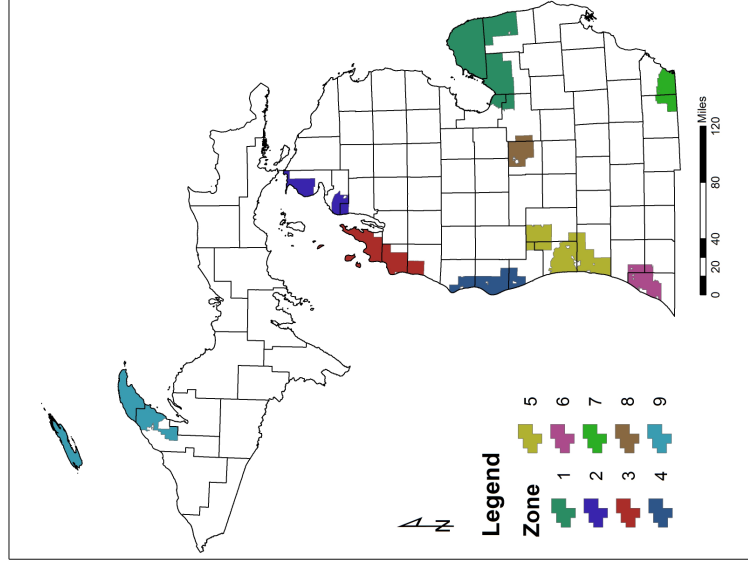
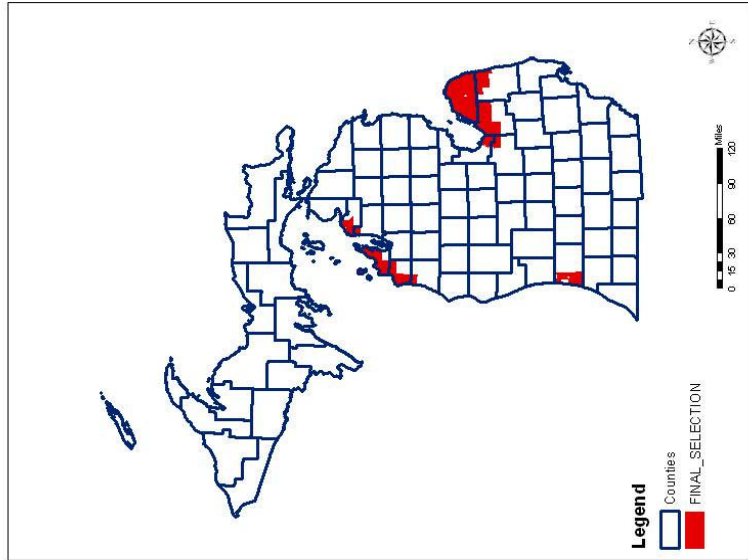
Zone	County	Township	Zone	County	Township	Zone	County	Township	Zone	County	Township	Zone	County	Township
1	BAY	Hampton Twp	2	CHARLEVOIX	Banks Twp	4	MASON	Hamlin Twp	6	BERRIEN	Coloma Twp	7	MONROE	Watervliet Twp
		Pottsmouth Twp			Eveline Twp			Amber Twp			Watervliet Twp			
		Merritt Twp			Marion Twp			Pere Marquette Twp			Hagar Twp			
		Dwight Twp			Norwood Twp			Riverton Twp			Bainbridge Twp			
		Huron Twp			South Arm Twp			Summit Twp			Benton Twp			
	Hurne Twp	Wawatam Twp	White River Twp	Royalton Twp										
	Gore Twp	Bliss Twp	Montague Twp	Sodus Twp										
	Lake Twp	Cross Village Twp	Blue Lake Twp	Pipestone Twp										
	Bloomfield Twp	Center Twp	Whitehall Twp	Lincoln Twp										
	Lincoln Twp	Readmond Twp	Whitehall Twp	Lake Twp										
	Meade Twp	Pleasant View Twp	Whitehall Twp	Oronoko Twp										
	Chandler Twp	Friendship Twp	Penwater Twp	Baroda Twp										
	Caseville Twp	Platte Twp	Weare Twp	Silver Creek Twp										
	Rubicon Twp	Almira Twp	Golden Twp	Hartford Twp										
	McKinley Twp	Lake Twp	Hart Twp	Keeler Twp										
HURON	Signal Twp	Benzonia Twp	3	BENZIE	Banona Twp	5	ALLEGAN	Deerfield Twp	8	GRATIOT	Blissfield Twp	9	KENT	Blissfield Twp
	Harbor Beach	Honestead Twp			Shelby Twp			Deerfield Twp						
	Verona Twp	Crystal Lake Twp			Clay Banks Twp			Blissfield Twp						
	Colfax Twp	Gilmore Twp			Grant Twp			Ogden Twp						
	Oliver Twp	Weldon Twp			Otto Twp			Riaa Twp						
	Windsor Twp	Blaine Twp			Fillmore Twp			Summerfield Twp						
	Fair Haven Twp	Joyfield Twp			Overisel Twp			Ida Twp						
	Bad Axe	Leelanau Twp			Dorr Twp			Lasalle Twp						
	Sand Beach Twp	Leland Twp			Salem Twp			Bedford Twp						
	Sherman Twp	Suttons Bay Twp			Laketown Twp			Whiteford Twp						
	Paris Twp	Cleveland Twp			Manlius Twp			Erle Twp						
	Bingham Twp	Glen Arbor Twp			Heath Twp			Wheeler Twp						
	Sheridan Twp	Centerville Twp			Manlius Twp			Belphany Twp						
	Grant Twp	Bingham Twp			Saugatuck Twp			Pine River Twp						
	Brookfield Twp	Empire Twp			Clyde Twp			Lafayette Twp						
Sebewaing Twp	Kasson Twp	Ganges Twp	Emerson Twp											
Buena Vista Twp	Solon Twp	Lee Twp	Arcadia Twp											
Zilwaukee Twp	Arcadia Twp	Casco Twp	Ithaca											
Blumfield Twp	Pleasanton Twp	Tyrone Twp	Hamilton Twp											
Minden Twp	Onekama Twp	Sparta Twp	North Star Twp											
Delaware Twp	Bear Lake Twp	Alpina Twp	Lakefield Twp											
Austin Twp		Alpina Twp	Marion Twp											
Forester Twp		Plainfield Twp	Osceola Twp											
Marion Twp		Byron Twp	Calumet Twp											
Wheatland Twp		Casnovia Twp	Hancock Twp											
Bridgheampton Twp		Chester Twp	Schoolcraft Twp											
Custer Twp		Wright Twp	Franklin Twp											
Sanilac Twp		Grand Haven Twp	Torch Lake Twp											
Washington Twp		Robinson Twp	Portage Twp											
Watertown Twp		Allendale Twp	Houghton Twp											
Atkron Twp		Georgetown Twp	Eagle Harbor Twp											
Elkland Twp		Blendon Twp	Grant Twp											
Elmwood Twp		Olive Twp	Alouez Twp											
Columbia Twp		Port Sheldon Twp	Sherman Twp											
Novesta Twp		Jamesstown Twp												
Ellington Twp		Zeeland Twp												
Almer Twp		Holland Twp												
Wisner Twp		Park Twp												
Fairgrove Twp														
Gifford Twp														
Wells Twp														
Indian Fields Twp														
Juniata Twp														
Denmark Twp														
Port Austin Twp														



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Scenarios and Interconnection Requests





Discussion of Minimums RPS Floor (assumes entire PA 295 requirement installed in zones)

Low Sensitivity

Zone	RPS Towers
1	143
2	155
3	323
4	1,171

High Sensitivity

Zone	RPS Turbines
1	344
2	43
3	110
4	131
5	137
6	49
7	45
8	58
9	177

