Final Report of the Michigan Wind Energy Resource Zone Board

October 15, 2009

Prepared for
Wind Energy Resource Zone Board

Submitted by
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Acknowledgments

This proposed report was prepared by Public Sector Consultants Inc. and the Michigan State University Land Policy Institute (LPI) at the direction of the Wind Energy Resource Zone Board. Public Sector Consultants was the primary author and editor. The LPI conducted the technical analyses to support the board's findings. Funding was provided by the Michigan Public Service Commission to enable the board to carry out its statutory duties. Funding from the W. K. Kellogg Foundation for the LPI's renewable energy work provided additional support.

Executive Summary

BACKGROUND

The electric industry is in a period of major flux and is transitioning from a nearly exclusive reliance on nonrenewable resources to the rapid increase in the commercial development of wind energy and other renewable energy resources spurred by state and federal policies and market forces. Michigan is among a group of states that are expected to experience significant commercial wind energy development, and is ranked 14th among the 50 states in its wind power capacity potential.[1]

The transition toward increased wind energy development in Michigan will depend on a number of factors, such as state and federal policies and incentives, community acceptance, wind resources, land availability, and economic considerations. Another factor that may affect the scope and pace of wind energy development will be the ability of the electric transmission system to support the delivery of such power to customers. A key challenge for planners has been determining where and how much transmission infrastructure is needed to ensure that wind energy projects can be interconnected to the electric system in a timely and economic manner and can reliably deliver power to customers.

Transmission system upgrades for both conventional power plants and wind energy systems[2] have typically been constructed to serve an individual project on a case-by-case basis. Given the time and cost involved in planning, siting, and constructing transmission lines, however, this incremental planning approach may be problematic in areas where a significant amount of wind energy development is expected in aggregate over multiple years.

Michigan and other states have recognized the need for a more forward-looking planning approach to the interconnection of wind energy projects. Public Act 295 of 2008 (PA 295),[3] Michigan's comprehensive energy legislation enacted in late 2008, called for the creation of the Wind Energy Resource Zone Board (WERZ Board or board) to assist with this planning process. Specifically, the board, which was created by the Michigan Public Service Commission (MPSC) in December 2008 in accordance with PA 295, was tasked with identifying a "list of regions of the state with the highest wind energy harvest potential" and conducting related studies. A copy of the MPSC's order is included as Appendix A. Although the board was appointed by the MPSC, the board exercises its

[1] See D. L. Elliot, L. L. Wendell, and G. L. Gower, *An Assessment of the Available Windy Land Area and Wind Energy Potential in the Contiguous United States* (Washington, D.C.: U.S Department of Energy, 1991) and U.S. Department of Energy, *20% Wind Energy by 2030: Increasing wind Energy's Contribution to U.S. Electricity Supply* (Washington, D.C.: U.S Department of Energy, 2008), [online, accessed 5/14/09] available: http://www1.eere.energy.gov/windandhydro/wind_2030.html.

[2] PA 295 uses the term "wind energy conversion systems," which are also called wind farms, wind energy plants, wind energy systems, and wind energy projects. This report uses the term wind energy systems.

[3] 2008 PA 295, MCL 460.1001 - 460.1195. See Part 4, Wind Energy Resource Zone, of PA 295, MCL 460.1141–460.1161.

powers, duties, and decision-making authority independently of the MPSC. The board's role is limited to commercial-scale wind energy on land in the state.[4]

Prior to the issuance of this final report, the WERZ Board submitted a proposed report to the local units of government—counties, cities, villages, and townships—in the regions identified by the board. The board received input and information related to its findings in the proposed report from local governments in the identified regions as well as other interested local governments, organizations, or individuals. After considering all the comments received, this final report presents the board's findings related to:

- A list of regions in the state with the highest level of wind energy harvest potential
- A description of the estimated maximum and minimum wind generating capacity in megawatts that can be installed in each identified region
- An estimate of the annual maximum and minimum energy production potential for each identified region
- An estimate of the maximum wind generation capacity already in service in each identified region

In addition, this report presents other information related to the board's charge, including but not limited to, land availability for potential use by wind energy systems, the viability of wind energy as a commercial source of generation, wind speeds, wind energy systems currently in service, and proposed wind energy systems in the generation interconnection queue.

A summary of the comments on the proposed report and the board's clarifications and corrections reflected in this final report is provided in the Comments section. All comments, including transcripts from the two public hearings, are available at www.michigan.gov/windboard.

KEY FINDINGS

Regions with Highest Wind Energy Harvest Potential

The board identified four regions as having the highest wind energy harvest potential. Exhibit 1 identifies the four regions, including the counties and townships located in whole or in part in these regions. These regions are not listed in any order of magnitude or importance. To calculate the minimum and maximum generating capacity and annual energy production potential for each region, the board assumed that there were no turbines placed within the boundaries of the villages and cities, as well as three townships. This was due to the limited land availability in the cities, villages, and select townships after the board applied exclusion criteria for areas that may not be suitable for wind turbines because of roads, airports, urban areas, and other man-made and natural

[4] The Great Lakes Wind Council, a 25-member council appointed by the governor, is currently examining policy and technical issues associated with potential wind energy development in Michigan's Great Lakes (see Executive Order 2009-1, February 6, 2009). The Great Lakes Wind Council provided its recommendations to the governor in a report on September 1, 2009. For more information on the council, including the executive order, see www.michiganglowcouncil.org.

features. These cities, villages, and townships are listed in the notes for Exhibit 1 because they are still technically part of the regions identified by the board.

EXHIBIT 1
Local Governments in Identified Regions

Region	County	Townships
1	Allegan	Casco, Clyde, Fillmore, Ganges, Laketown, Lee, and Manlius
2	Antrim	Banks
	Charlevoix	Eveline, Hayes, Marion, and Norwood
3	Benzie	Almira, Benzonia, Blaine, Crystal Lake, Gilmore, Joyfield, Lake, and Platte
	Leelanau	Bingham, Centerville, Cleveland, Empire, Glen Arbor, Kasson, Leelanau, Leland, and Suttons Bay
	Manistee	Arcadia and Pleasanton
4	Bay	Hampton, Merritt, Portsmouth
	Huron	Bingham, Bloomfield, Brookfield, Caseville, Chandler, Colfax, Dwight, Fairhaven, Gore, Grant, Hume, Huron, Lake, Lincoln, McKinley, Meade, Oliver, Paris, Port Austin, Rubicon, Sand Beach, Sebewaing, Sheridan, Sherman, Sigel, Verona, and Windsor
	Saginaw	Blumfield and Buena Vista
	Sanilac	Austin, Delaware, Forester, Marion, Minden, and Wheatland
	Tuscola	Akron, Almer, Columbia, Denmark, Elkland, Ellington, Elmwood, Fairgrove, Gilford, Juniata, Novesta, and Wisner

SOURCE: Research findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: The additional governments (cities, villages, and townships) within the geographic area of the four regions but not included in the calculation of the regions' wind energy potential are as follows (by county):
Allegan County (Region 1)—Douglas, Fennville, Holland, Saugatuck, Saugatuck Township, and South Haven
Antrim County (Region 2)—Ellsworth
Charlevoix County (Region 2)—Boyne City, Charlevoix, and Charlevoix Township
Benzie County (Region 3)—Benzonia, Beulah, Elberta, Frankfurt, and Lake Ann
Leelanau County (Region 3)—Empire, Northport, and Suttons Bay
Bay County (Region 4)—Bay City and Essexville
Huron County (Region 4)—Bad Axe, Caseville, Elkton, Harbor Beach, Kinde, Owendale, Pigeon, Pointe aux Barques Township, Port Austin, Port Hope, Sebewaing, and Ubly
Saginaw County (Region 4)—Saginaw and Zilwaukee
Sanilac County (Region 4)—Deckerville, Forestville, and Minden City
Tuscola County (Region 4)—Akron, Caro, Cass City, Fairgrove, Gagetown, Reese, and Unionville

Exhibit 2 shows the locations of the four regions identified by the board. Within these four regions, there are two wind energy systems currently in service: Harvest Wind Farm LLC and Michigan Wind I, both of which went into commercial operation in 2008. These two systems are both located in Region 4 (Thumb area) and represent a total of nearly 122 megawatts of capacity, or 94 percent of the total installed wind energy capacity in Michigan. The Findings section of this report includes information on all wind energy systems currently in service and proposed projects throughout the state.

EXHIBIT 2

Regions with the Highest Wind Energy Potential and Location of Existing Wind Energy Systems in the Regions

SOURCE: Public Sector Consultants Inc., 2009, using research findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.

NOTE: The four regions shaded in grey represent the total land area of that region. Within each region, the board excluded areas based on environmental and man-made features (e.g., Great Lakes shoreline, water, wetlands, airports, roads, urban areas, buildings) for the purpose of estimating generating capacity and energy production potential. There were no turbines assumed to be placed in the villages and cities and certain townships located within the four identified regions as part of the board's analysis to calculate the minimum and maximum generating capacity and annual energy production potential for each region. This is discussed further in the Methodology section and in Appendix B of this report.

Exhibit 3 displays the board's minimum and maximum estimates of the number of turbines, wind energy generating capacity, and annual energy production associated with each of the identified regions. Region 4, in the Thumb, has the highest estimated generating capacity and annual energy production potential, followed by Region 3, located in northwest Michigan.

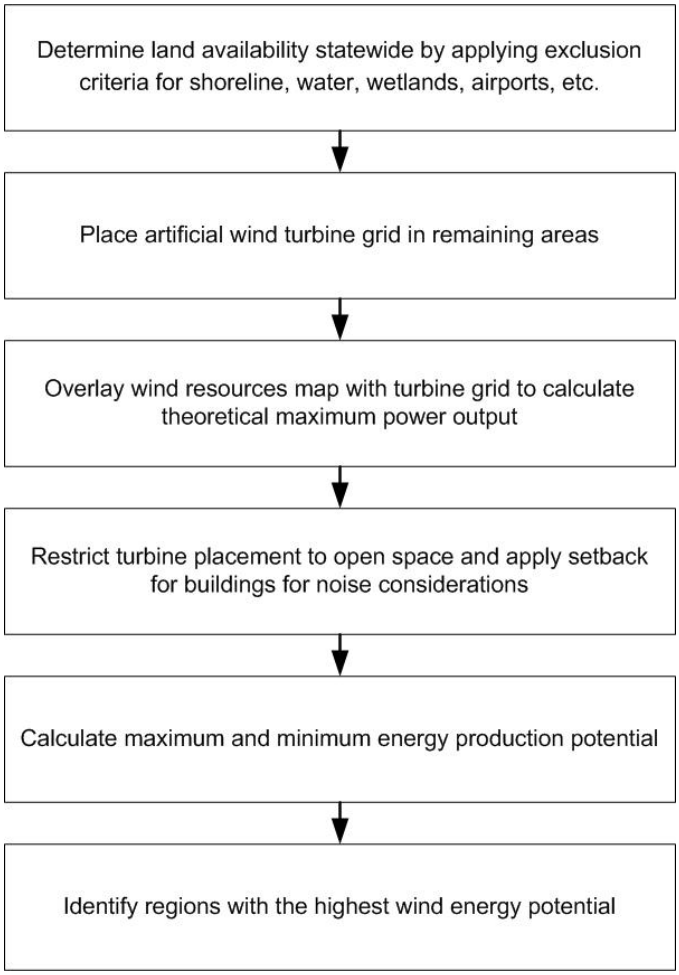
EXHIBIT 3
Estimated Minimum and Maximum Number of Turbines, Capacity, and Annual Energy Production, by Identified Region

		Minimum			Maximum		
Region	Counties	Number of turbines	Capacity (MW)	Annual energy potential (MWh)	Number of turbines	Capacity (MW)	Annual energy potential (MWh)
1	Allegan	166	249	747,938	296	445	1,338,415
2	Antrim Charlevoix	102	153	439,555	183	274	786,572
3	Benzie Leelanau Manistee	435	652	1,991,679	778	1,167	3,564,058
4	Huron Bay Saginaw Sanilac Tuscola	1,578	2,367	6,723,472	2,824	4,236	12,031,477
TOTAL		**2,281**	**3,421**	**9,902,644**	**4,081**	**6,122**	**17,720,522**

SOURCE: Research and findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: These estimates are based on the board's base-case analysis described in the Methodology section and assume a 1.5-megawatt (MW) wind turbine with a hub height of 80 meters. The MW capacity is calculated by multiplying the nameplate capacity of the wind turbine times the number of estimated turbines. The annual energy production in megawatt hours (MWh) is the amount of energy that these turbines are expected to produce over the year, taking into account variability in wind speeds and other factors.

An overview of the board's methodology used to develop these estimates is shown in Exhibit 4. The methodology is described in detail in the Methodology section and in Appendix B of this report.

EXHIBIT 4
Methodology Overview



SOURCE: Public Sector Consultants Inc., 2009, using information from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.

This methodology consists of a statewide assessment of the wind resources, land availability, and other factors that may affect the placement and overall development of wind energy systems in Michigan. To determine the land available for potential placement of wind turbines, the board began with all land areas in the state and then identified and removed from consideration those areas or natural features that would not, in the board's judgment, reasonably support the placement of wind turbines. The exclusion criteria included steep terrain, habitable and commercial structures, urban areas, airports, roads, Great Lakes shorelines, wetlands, lakes, and rivers, as discussed further in the Methodology section and in Appendix B. After applying these various exclusion criteria, the board reduced the total acres from approximately 37 million acres statewide in Michigan to approximately 19 million acres available.

This is a high-level study based on publicly available information and does **not** explicitly account for site-specific conditions and other important factors that may affect development trends statewide and at the local level, including, but not limited to:

- Specific zoning and other local requirements governing the siting and construction of wind turbines and other infrastructure
- New public policies that could fundamentally shift the demand for or cost of wind energy systems
- Site-specific information and studies related to protected species; land use; parcel size; environmental, cultural, and historical factors; etc.
- Expected community and public support for or opposition to wind energy development
- Costs of any required distribution or transmission system improvements to connect the wind systems to the electric grid and deliver power to customers
- Operational impacts associated with the integration of wind energy systems into the existing electrical system
- Economic or technological factors that may affect the timing, location, and cost of development activities

The board is not able to account for all site-specific issues that would typically be considered in any site selection and approval process to develop an actual wind energy system. Such an approach is outside the scope of the board's charge.

It is important to note that the identification of these regions does not mean that wind development will necessarily occur in these regions or other areas of the state. Conversely, areas of the state that were not selected by the board as having the highest wind energy potential may in fact provide good conditions to support commercial wind energy systems. As detailed in the Findings section of this report, there are many active interconnection requests, or proposals, by developers to connect wind energy systems in parts of the state that are not within one of the four regions identified by the board. Moreover, there are existing wind energy systems currently in operation outside these identified regions, including the Stoney Corners project that went into commercial service in 2008 near Cadillac. It is not the board's role to endorse or advocate for wind development in the identified regions or any other part of the state. The board is simply charged with identifying the regions with the *highest wind energy potential* based on its studies, which—as discussed above—do not take into consideration many factors, particularly local conditions, that would affect actual development patterns.

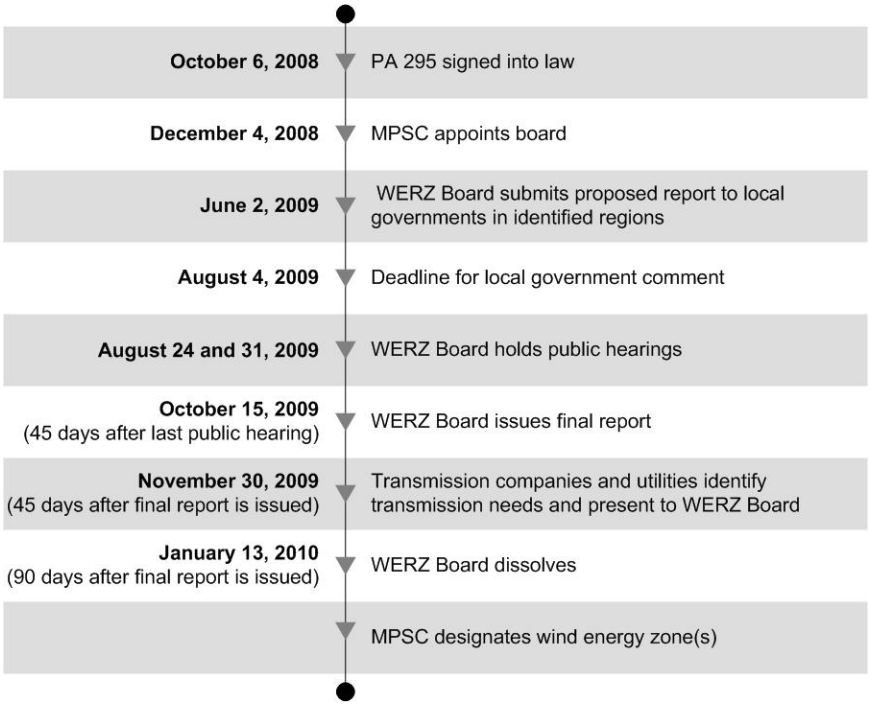
NEXT STEPS

Upon the release of this final report to the MPSC, transmission companies and electric utilities with transmission facilities in and near the four regions identified in this report will assess the transmission infrastructure that may be needed to deliver the estimated maximum and minimum energy production potential for each of the regions. The board will dissolve 90 days after it issues the final report.

Based on the board's findings and other considerations, including the projected costs and benefits of the long-term wind energy potential and transmission needs, the MPSC must designate at least one wind energy "zone." The MPSC must also ensure that the designation of a zone does not represent an unreasonable threat to the public convenience, health, or safety and that any adverse impacts on private property are minimal. A wind energy zone designation will not guarantee that wind energy projects will be constructed within the zone; decisions on where to locate wind projects will continue to be left to market forces. A zone designation will also not abrogate the authority of local governments over the siting and approval of wind energy projects. It will, however, facilitate the planning, siting, and construction of transmission lines to ensure that wind energy systems can be connected to the system and deliver power to customers in a timely manner. Having this forward-looking approach to infrastructure development for an individual zone may also make it more likely that wind energy development will move forward and succeed in the long term.

The timeline in Exhibit 5 summarizes the major required and expected activities or milestones related to the board, MPSC processes, and other next steps.

EXHIBIT 5
Wind Zone Designation Timeline



SOURCE: PA 295; MPSC Case No. U-15899, In the matter, on the Commission's own motion, to create the wind energy resource zone board and to outline its responsibilities, Order (December 4, 2008); Public Sector Consultants Inc., 2009.

Introduction

On October 6, 2008, Michigan enacted Public Act (PA) 295, known as the "Clean, Renewable and Efficient Energy Act," which created new requirements for increasing energy efficiency and renewable energy in the state. This law also called for the creation of the Wind Energy Resource Zone Board (WERZ Board or board) to conduct studies and identify regions of the state with the highest potential for wind energy production. As described further below, the 11-member board was appointed by the Michigan Public Service Commission (MPSC) in December 2008 and includes representatives from a variety of constituencies.

This report identifies the regions of the state with the highest potential for wind energy production based on the board's analysis and presents the board's other findings.

IMPETUS FOR THE BOARD AND A NEW PLANNING APPROACH

Before addressing the methodology and results of the board's studies, it is important to put the board's work into context. Several factors at the state, regional, and federal levels likely influenced—at least indirectly—the wind zone legislation in Michigan.

There has been a tremendous interest in and development of commercial or utility-scale wind energy systems in recent years, particularly since an ever-increasing number of states passed minimum renewable energy standards for electricity providers. This trend is reflected in the increase in installed wind energy systems in the U.S. as a whole and in Michigan, as well as the significant number of applications by developers to interconnect proposed wind projects to the electric grid. This shift toward increased wind energy is spurred by several factors, most notably state and federal policies (e.g., state renewable standards, federal production tax credit) and uncertainty over future restrictions on carbon emissions.

This rapid increase in installed and proposed wind energy systems has presented significant challenges for utility planners and others. Unlike traditional power plants that require several years of lead time (typically seven to ten years), wind turbines can be installed in two to five years and often faster than it takes to plan, site, and construct the associated transmission system improvements that may be needed to allow the wind turbines to operate safely as part of the power system and to transport the power to customers without overloading power lines. Not all new wind energy projects require transmission upgrades because the existing transmission system may have sufficient capability in some areas to handle the power from new generating sources. But integrating large amounts of wind power—and even small amounts in some areas—will require transmission system upgrades.

Another challenge is that the required transmission upgrades for energy systems have typically been planned and constructed on a case-by-case basis for a particular project. This approach is generally suited for large, new baseload generating facilities, but it can prove problematic when a number of wind energy systems are constructed. Because

transmission system upgrades can often take longer to plan, site, and construct than the lead time for a typical wind energy system (assuming no delays by the wind energy developer), the transmission system can be caught in a mode of perpetual catch up—responding to the needs of individual projects rather than the long-term needs of the system. And making incremental upgrades to interconnect each wind energy system may not be cost-effective in the long run, especially given the time and cost involved in siting and constructing transmission lines.

Planning for long-term system needs—as opposed to specific wind projects on a case-by-case basis—avoids some of these potential challenges. Several states, including California, Colorado, Nevada, and Texas, as well as the Western Governors' Association, have attempted to address some of these challenges by identifying long-term infrastructure needs for both wind energy and transmission in different areas or zones. Moreover, transmission owners, utilities, and others in states such as Illinois, Iowa, Michigan, Minnesota, Wisconsin, and the Dakotas, are working with the Midwest Independent Transmission System Operator (Midwest ISO) on planning transmission improvements based on long-term wind energy needs, including the expected wind power to meet state renewable energy requirements. The WERZ Board considered these various efforts, which are summarized in Exhibit 6, as it decided how to approach its responsibilities under PA 295. Like the PA 295 wind zone provisions, these approaches in other states reflect the need for a more forward-looking and efficient process to plan infrastructure for wind energy in the state.

EXHIBIT 6
Wind Zone and Related Planning Efforts

State/Area	Name
California	Renewable Energy Transmission Initiative (RETI)
Colorado	Renewable resource mapping and expedited transmission planning
Midwest ISO	Regional Generation Outlet Study*
Nevada	Renewable Energy Transmission Access Advisory Committee (RETAAC)
Texas	Competitive Renewable Energy Zones (CREZ)
Western Governors' Association	Western Renewable Energy Zone Initiative (WREZ)

SOURCE: Transmission Development Zones for Renewable Energy Resources, presentation to the Wind Energy Resource Zone Board by David Hurlbut, National Renewable Energy Laboratory, February 2, 2009 [online, accessed 5/14/09}, available: http://www.dleg.state.mi.us/mpsc/renewables/windboard/nrel.pdf.
NOTE: Efforts are also starting in Arizona, New Mexico, and Utah.
* Michigan was not included in the Regional Generation Outlet Study because the state had not passed its renewable portfolio standard when the study began. The renewable portfolio standard is included in PA 295. Michigan is included in the second Regional Generation Outlet Study, which began in May 2009. It is a regional planning study of transmission options to meet renewable energy standards and other long-term system needs.

BOARD'S CHARGE UNDER PA 295

The WERZ Board's responsibilities under PA 295 include consulting with local governments in the study of the potential for wind energy production and the viability of

wind as a source of commercial energy generation in Michigan, as well as the availability of land for potential use by wind energy systems. The board must also conduct modeling and other studies, including studying existing wind energy systems, estimates for additional wind energy development, and average annual recorded wind speeds. The studies should also examine wind energy system applications, or requests, currently in the generation interconnection queue of the pertinent regional transmission organization.

PA 295 requires the board to issue, by June 2, 2009, a proposed report detailing its findings and containing the following information:

- A list of regions in the state with the highest level of wind energy harvest potential
- A description of the estimated maximum and minimum wind generating capacity (in megawatts) that can be installed in each identified region
- An estimate of the annual maximum and minimum energy production potential for each identified region
- An estimate of the maximum wind generation capacity already in service in each identified region

The board provided the proposed report to the legislative bodies of local units of government located in whole or in part of the identified regions. After the end of the comment period for local governments, the board held two public hearings on the proposed report. In accordance with PA 295, this final report was issued 45 days after the date of the last public hearing. These duties are also summarized in the MPSC order creating the board.

MEMBERS

Following the enactment of PA 295, the MPSC solicited volunteers to serve on the board and represent one of the following organizations or interest groups as set forth in the law: cities and villages; townships; Michigan Office of the Attorney General, the MPSC, the renewable energy industry, the electric utility industry (two members), independent transmission companies, environmental organizations, alternative energy suppliers, and the public at large.[5] On December 4, 2008, the MPSC appointed the 11 board members. The list of appointed board members, including alternates, is provided in Exhibit 7. Members appointed alternates by notifying the MPSC's Executive Secretary in writing of the appointment; alternates have the same authority as the member who appointed the alternate.

[5] 2008 PA 295, section 143. See also MPSC Case No. U-15899, In the matter, on the Commission's own motion, to create the wind energy resource zone board and to outline its responsibilities, Order (December 4, 2008). A copy of the MPSC's order is provided in Appendix A.

EXHIBIT 7
Appointed Board Members and Alternates

Member	Alternate	Constituency represented on board
Julie Baldwin, Engineer, Renewable Energy Section		MPSC
Steve Brock, City Manager, Farmington Hills		Cities and villages
Robert Ianni, Division Chief, Office of Attorney General, Tobacco and Special Litigation Division		Attorney General
Gene Jorissen, Supervisor, Charter Township of Pere Marquette	David W. Bertram, Legislative Liaison, Michigan Townships Association	Townships
Rodger Kershner, Howard and Howard	Joseph M. DeVito, Vice President, RES North America Development, Inc.	Renewable energy industry
Trevor Lauer, Vice President, Retail Marketing, DTE Energy	Cindy J. Norlin, Director, Renewable Energy Construction, DTE Energy	Electric utility industry
John Miceli, Energy Market Analyst, Wolverine Power Cooperative		Alternative electric suppliers
Mary Templeton, Strategy and Sales Executive		Public at large
Thomas Vitez, Vice President, Transmission Planning, ITC Holdings Corp.	Carlo Capra, Principal Engineer, Long Term Planning, ITC Holdings Corp.	Independent transmission companies
David Walters, General Manager, Michigan Public Power Agency	Jim Weeks, Executive Director, Michigan Municipal Electric Association	Electric utility industry
David Wright, Clean Energy Program Director, Ecology Center	Susan E. Harley, Policy Associate, Clean Water Action	Statewide environmental organization

SOURCE: Michigan Public Service Commission, December 4, 2008, Order in Case No. U-15899; press release [online, accessed 5/14/09], available: http://www.michigan.gov/mpsc/0,1607,7-159-16400_17280-204553--,00.html.

The following members were elected by the board to serve as officers:

- David Walters, Chair
- Mary Templeton, Vice Chair
- Julie Baldwin, Secretary

PROCESS AND ROLES

Meetings and Operations

The WERZ Board functions as a deliberative body and must have a quorum of six or more members in attendance at its business meetings. Members attend in person or via teleconferencing devices. The board is subject to the Open Meetings Act and the Freedom of Information Act.[6] The board secretary prepares meeting minutes, which are reviewed and approved by the board.[7] The board operates independently of the MPSC.[8]

From January through May 2009, the board met approximately every two weeks to consider data, analyses, and other information related to the topics set forth in PA 295. The board's meetings were all held in Lansing, except for the March 16, 2009, meeting in Cadillac, when the board also visited the nearby Stoney Corners wind farm. Representatives from the following organizations and companies made formal presentations to the board addressing various topics, including, but not limited to, wind energy production potential, land availability for wind energy systems, generation interconnection and planning process, the role of local governments, and experiences in other states:

- American Transmission Company
- Consumers Energy Company
- DTE Energy
- Heritage Sustainable Energy
- Huron County
- ITC Holdings Corp.
- John Deere Wind Energy
- Mackinaw Power LLC
- Michigan State University Land Policy Institute
- Midwest ISO
- MPSC staff
- National Renewable Energy Laboratory
- RES North America

During its meetings, the board also received information from and provided to its consultants, the Michigan State University Land Policy Institute (LPI) and Public Sector Consultants Inc. (PSC), direction related to technical analyses, report preparation, and outreach to local governments. Working with the board, the LPI conducted studies and assembled information to assess wind speeds, land availability, wind energy harvest potential, and the viability of wind as a source of commercial energy generation. PSC is

[6] See MCL 15.261 *et seq*. and MCL 15.231 *et seq*., respectively.
[7] Copies of meeting minutes are available at http://www.michigan.gov/windboard.
[8] See PA 295, section 145(1).

serving as the board's report writer and assisting the board with the review of comments from local governments and the public hearing process.

The board met a total of 19 times, including the two public hearings held in Bad Axe and Scottville on August 24, 2009, and August 31, 2009, respectively.

Roles, Process, and Next Steps

Despite its name, the WERZ Board does not actually designate wind energy "zones." The board's work will, however, lay the foundation for critical next steps by the MPSC, transmission companies, wind developers, and local units of government to designate and plan infrastructure for one or more wind energy zones in the state. This section discusses the roles and processes of the board and other entities and includes a timeline of key activities related to the board and other next steps as contemplated under PA 295.

As discussed above, the board was charged to identify, in a proposed report and a final report, regions on land in the state with the "highest level of wind energy harvest potential." The board was also required to provide its proposed report to the legislative bodies of the local governments in the identified regions; these local governments had 63 days to comment on the proposed report. As part of its consultation with local governments, the board also accepted comments from local governments that are not located in an identified region but may have an interest in or information related to the board's charge.

The board was required to hold at least one public hearings on the proposed report, with the possibility of holding a separate public hearing in each of the identified regions.[9] As outlined in the charge, notification of any public hearing was provided through the local newspapers and directly to local governments in the region or regions that were the subject of the hearing.[10] After considering the comments from local governments and public comment at the hearings, the board issued this final report 45 days after the date of the last public hearing.

Upon the release of the board's final report, transmission companies and electric utilities with transmission facilities within or adjacent to regions identified in the board's report must identify the existing or new transmission infrastructure necessary to deliver the "maximum and minimum wind energy production potential for each of the regions." This information must be submitted to the board for its review. The board dissolves 90 days after issuing its final report, which is submitted to the MPSC.

Based on the board's findings, the MPSC must designate "the area of this state likely to be most productive of wind energy as the primary wind energy resource zone." The MPSC may also designate additional wind energy resource zones. There are several factors that the MPSC must consider, including, but not limited to, the projected costs and benefits in terms of the long-term production capacity and long-term needs for

[9] Hearings were held on August 24, 2009, in Bad Axe, Michigan, and August 31, 2009, in Scottville, Michigan. Details are available on the WERZ website, http://www.michigan.gov/windboard.
[10] See PA 295, section 145(4).

transmission. The MPSC must also ensure that the designation of a zone does not represent an unreasonable threat to the public convenience, health, or safety and that any adverse impacts on private property are minimal. Any zone designated by the MPSC must be created on land and exclude property zoned residential as of the date of this proposed report, unless land is subsequently re-zoned as nonresidential.[11] In conjunction with the issuance of an order designating the zone(s), the MPSC must submit to the legislature a report on the effect that setback requirements and noise limitations under local zoning or other ordinances may have on wind energy development in the wind energy resource zones.

After the designation of the zone(s), transmission companies and electric utilities may apply to the MPSC for an expedited siting certificate for a proposed transmission line if certain conditions are met. Additional details on the expedited siting certificate are provided in section 149 of PA 295.

The key roles of different entities and the corresponding statutory reference are summarized in Exhibit 8.

[11] PA 295, section 147(2). While the board reduced its estimated generating capacity and annual energy production estimates based on the proportion of land statewide that is zoned residential, the board's estimates did not specifically carve out land that is zoned residential. There are many different classifications of residential zoned property used by local jurisdictions and conducting a detailed inventory of all these properties was not part of the board's charge.

EXHIBIT 8
Roles Related to Wind Energy Zone Planning and Designation

Entity	Role	Reference
Wind Energy Resource Zone Board	Conduct studies and issue proposed and final reports identifying the regions in the state with highest wind potential Accept comments from local governments and hold at least one public hearing prior to issuing a final report	PA 295, Section 145
Local governments	Consult with the WERZ Board and provide comments on the board's proposed report; carry out any existing duties and authorities for local siting of wind turbines	PA 295, Section 145(4)
MPSC	Designate one or more wind zones in the state; represent the state in RTO transmission planning processes; review and approve applications for an expedited transmission siting certificate; provide report to legislature on the effect of setback requirements and noise limitations under local zoning or other ordinances after holding public hearings in various parts of the state to receive public input	PA 295, Sections 147, 149, 153, and 155
Transmission owners and electric utilities*	Identify transmission infrastructure to deliver wind energy production potential from identified regions	PA 295, Section 145(6)
Regional transmission organizations (RTOs)	Review proposed transmission facilities and facilitate related stakeholder processes under FERC-approved tariff	Midwest ISO or RTO tariffs
Public and other stakeholders	Provide comments as part of the board's public hearing(s), MPSC processes,** and RTO stakeholder processes	PA 295, Sections 145(4), 147, and 149; Midwest ISO or RTO tariffs

SOURCE: Part 4 of PA 295; Midwest ISO Transmission, Energy, and Operating Reserves Markets Tariff, Attachment FF and Appendix B to the Transmission Owners Agreement, Rate Schedule No. 01 [online, accessed 5/14/09], available: http://www.midwestiso.org/publish/Folder/2b8a32_103ef711180_-76eb0a48324a?rev=3; PJM Interconnection Open Access Transmission Tariff and Operating Agreement [online, accessed 5/14/09], available: http://www.pjm.org/documents/agreements/pjm-agreements.aspx.

* This applies only to transmission companies and electric utilities with transmission facilities within or adjacent to regions identified in the board's final report.

** The MPSC is required to conduct public hearings in various areas of the state to receive public comment prior to issuing the report to the legislature addressing local zoning and other issues. See section 147(4) of PA 295. The MPSC must also conduct any proceeding for an expedited siting certificate as a contested case; upon receiving an application, each affected municipality and landowner may be granted full intervenor status in the proceeding.

Methodology

This section discusses the methodology used by the board to assess the regions of the state with the highest wind energy potential, the availability of land for potential use by wind energy systems, and the viability of wind as a commercial source of generation. The board worked with the Michigan State University Land Policy Institute (LPI) to develop the methodology and assumptions, conduct the analyses, and interpret the results.

To determine the regions with the highest potential for wind energy production, the board began with all land areas in Michigan and then identified and removed from consideration those areas or natural features that would not, in the board's judgment, reasonably support the placement of wind turbines. The exclusion criteria included factors such as steep terrain, urban areas, airports, roads, Great Lakes shorelines, wetlands, lakes, and rivers.

After applying these various exclusion criteria—which removed approximately 18 million acres of land in Michigan—the board determined the theoretical layout and maximum number of wind turbines that could be located in the remaining areas (i.e., approximately 19 million acres). For this calculation, the board assumed that turbines would be placed within the remaining open space on a grid with spacing between turbines no closer than 450 meters, or approximately five times the rotor[12] diameter of a standard wind turbine used in the industry. Although the board recognizes that actual turbine spacing used in any future wind energy development may be quite different than that modeled in this analysis, the overall turbine density calculated using this spacing, in combination with additional exclusion criteria, setbacks for roads and structures, and other factors, represents a reasonable approximation of maximum potential over the broad area analyzed and is generally consistent with that of other wind developments in Michigan and elsewhere.

Next, the board estimated the potential generating capacity in megawatts and annual energy production in megawatt hours (MWh) associated with a full buildout of these turbines by overlaying the wind resource data statewide on this grid of turbines. As part of this exercise, the board evaluated a series of scenarios based on different combinations of the exclusion criteria or buffers (for example, distances from roads), turbine types, wind speeds, and the availability of various types of state lands for potential placement of turbines. This resulted in a total of 18 different scenarios for calculating a theoretical maximum of potential generating capacity and annual energy production based on different combinations of exclusion criteria and wind speed data. Although there were 18 possible scenarios, as shown in Exhibit 9, the board's findings to identify the regions with the highest wind potential, the corresponding wind energy production potential, and land availability for potential use by wind energy systems are based on the following base-case assumptions:

[12] The rotor consists of the blades and the hub together. For more background on wind energy systems, see http://www1.eere.energy.gov/windandhydro/wind_how.html.

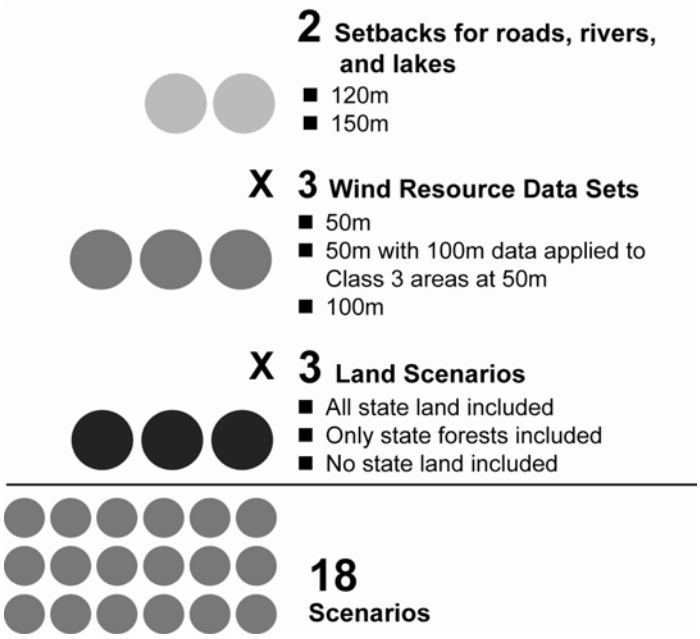
- **Wind speed:** Limited to areas with Class 3[13] or better wind at 50 meters with the 100-meter wind data set applied to those areas to calculate energy production potential, as explained in Appendix B
- **Turbine type:** 1.5 megawatt wind turbine with an 80-meter hub height
- **Setbacks for roads, rivers, and lakes:** 120 meters (1.5 times the turbine hub height)
- **Additional excluded areas:** Specific exclusions based on land uses and natural features (listed in Exhibit B-1 in Appendix B)
- **State lands:** Assumed availability of all state-owned lands, except that turbines were not modeled on certain state lands because of exclusion criteria for lakes, rivers, wetlands, shorelines, etc.[14] (listed in Exhibit B-1 in Appendix B)

These assumptions and underlying data sources are discussed further in Appendix B. This stage of the analysis did not yet account for separate minimum and maximum estimates of the generating capacity and energy production potential.

[13] The classes range from Class 1 (the lowest) to Class 7 (highest). Class 4 and above are considered "good" resources but locations with Class 3 winds may also be suitable for utility-scale wind development.

[14] In all scenarios used to estimate the theoretical number of turbines, the board modeled turbines on federal lands except in areas that were otherwise removed from consideration due to other exclusion criteria, including, but not limited to, lakes and rivers, wetlands, steep slope, and the one-mile buffer for the Great Lakes shoreline. In addition, the board did not model any turbines on Isle Royale and North and South Manitou Islands, all of which are federal lands. Moreover, to account for sensitive environmental, cultural, and historic areas as well as other factors, the board reduced the overall theoretical estimates by 66 percent and 81 percent, respectively, to obtain the maximum and minimum estimates of wind energy generating capacity and annual energy production.

EXHIBIT 9
Scenarios Evaluated to Calculate Theoretical Maximum Power Potential



SOURCE: Public Sector Consultants Inc., using research and findings from Michigan State University Land Policy Institute prepared for the WERZ Board, 2009.
NOTE: The 120-meter and 150-meter setbacks were based on 1.5 times the turbine hub height of an 80-meter and 100-meter turbine, respectively. Although 18 scenarios were evaluated as part of the board's analysis, the board's identification of the regions and estimates of the minimum and maximum wind energy potential in those regions were based on the base-case assumptions (i.e., 120-meter setbacks for roads, rivers, and lakes with a 1.5 megawatt turbine, wind at 50 meters with 100-meter wind data set applied to areas with Class 3 or better wind at 50 meters; and the availability of all state land for the placement of turbines in the model).

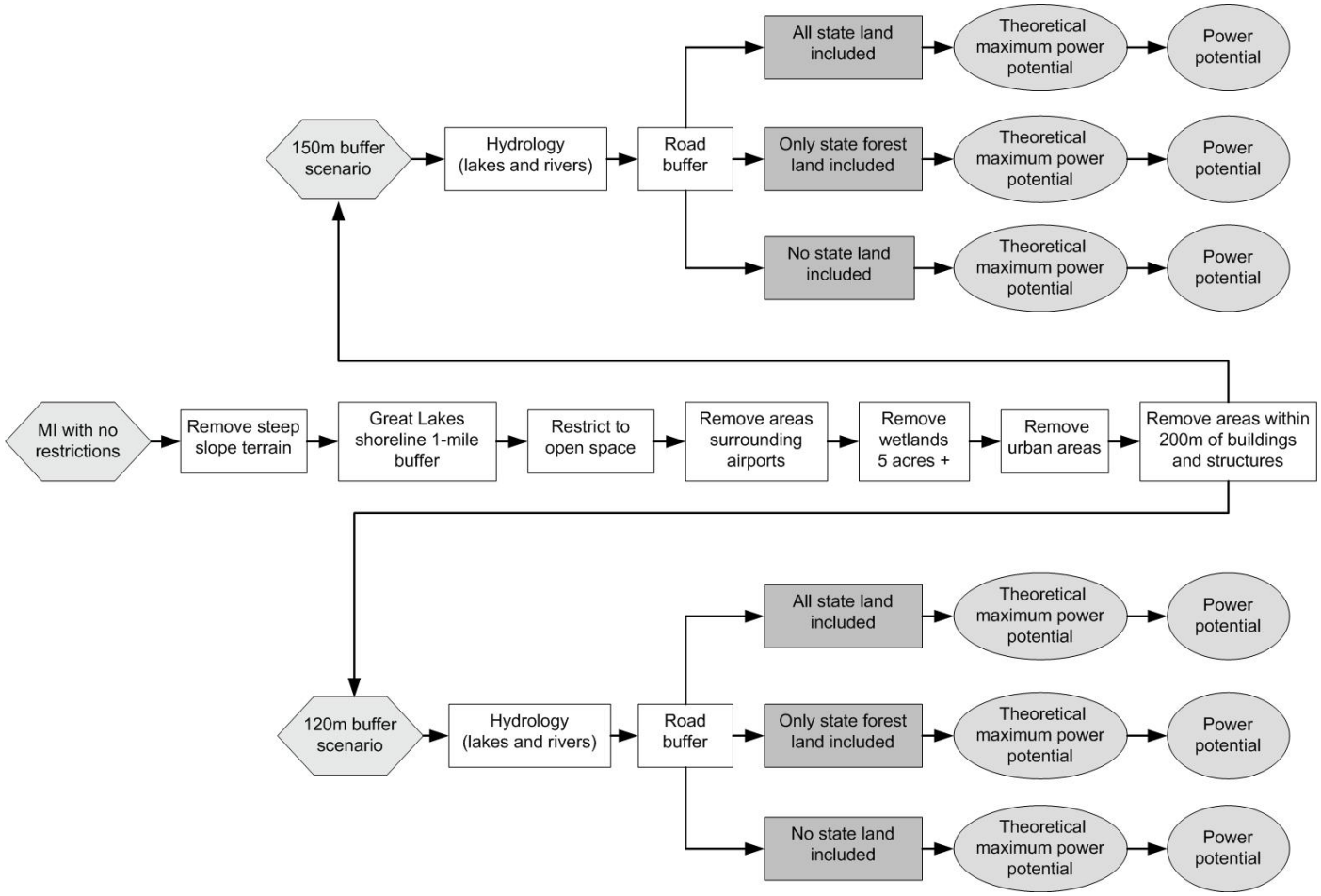
Not surprisingly, the theoretical maximum estimates of the number of turbines and power potential were very high because they did not account for any market, economic, social, and operational constraints that would restrict the actual development of wind energy systems. Therefore, to calculate more realistic estimates of the maximum and minimum wind generating capacity and energy production potential, the board reduced these theoretical estimates by 66 percent and 81 percent, respectively. The percentage reduction was applied only to the estimates using the base-case assumptions for wind, setbacks, turbine type, and exclusion areas as discussed above (i.e., wind at 50 meters with 100-meter wind data set applied to areas with Class 3 or better wind at 50 meters; 1.5 megawatt turbine with a hub height of 80 meters; 120-meter setback for roads, rivers, and lakes; and all state included). In other words, the board did not develop 18 different sets of minimum and maximum estimates to correspond with all 18 scenarios—it only applied the 66 percent and 81 percent reduction to the base-case scenario to derive the final minimum and maximum estimates of the wind generating capacity and annual energy production potential. The percentage reductions account generally for factors that may limit the placement of turbines, such as land leases or easements, competing land uses, and environmentally sensitive areas. These factors, which are detailed in Appendix

B, were based on general information and assumptions and not site-specific conditions. The National Renewable Energy Laboratory and others have also reduced by an aggregate percentage their theoretical estimates of wind energy potential in various states to account for factors that are difficult to quantify as part of a broad, high-level analysis. An overview of the board's methodology to calculate the minimum and maximum estimates of generating capacity and annual energy production is shown in Exhibit 10.

The board identified the regions of the state with the highest production potential by aggregating townships into five tiers based on estimated total annual energy production (MWh) and the per turbine power output ratio (MWh/turbine) for each township. Turbines were not placed in cities, villages, and certain townships because of the application of the exclusion criteria. To identify a "region," all townships in the top tier were selected, along with as neighboring townships within the second tier and an additional ring of townships to account for potential error in wind data. Regions 2 and 3 in the northwestern portion of the Lower Peninsula were classified as separate regions for transmission planning purposes. The regions are demarcated by political boundaries for ease in identification and mapping. As discussed further below, the board selected the resulting four regions because they clearly have the highest wind energy potential based on land availability and wind quality. The board also considered—but ultimately rejected—a set of nine candidate regions using a modified methodology that was based on the top five tiers out of a total of 15. The nine alternate regions are included in Appendix C for reference.

There are several important caveats about the board's methodology. This is **not** a site-specific assessment of where turbines could actually be placed in any area. Many site-specific restrictions, social factors (such as public acceptance), or environmental features could prohibit or make it uneconomical or infeasible to site turbines in any particular area. For example, the board's analysis does not account for individual local ordinances, zoning, or other requirements (such as building codes) that may affect whether and where turbines could be sited. Moreover, site-specific studies and monitoring of wind quality and environmental conditions (such as migratory pathways or sensitive or protected species), interconnection costs, land acquisition or easements, and permitting and siting approvals, as applicable, among other steps, would be part of determining the overall suitability of individual sites. These steps would be part the developer's due diligence in developing a wind farm. Since the WERZ Board is not a developer and is not charged with developing state or local siting policies or requirements, it is beyond its scope to account for local or site-specific considerations, especially given its broader, statewide focus. The board is also relying solely on publicly available information that can be reasonably obtained and incorporated into its analysis.

EXHIBIT 10
Overview of WERZ Board's Methodology to Calculate Wind Power Potential



SOURCE: Michigan State University Land Policy Institute, 2009.
NOTE: This exhibit illustrates the calculation of six scenarios for one set of wind data; to obtain the 18 scenarios, these six were repeated for two additional wind data sets as discussed further below. All scenarios assume inter-turbine spacing of 450 meters. The 120-meter setback assumed a 1.5 megawatt turbine and the 150-meter setback assumed a 2.5 megawatt turbine. Federal lands were included in all scenarios.

Findings

This section presents the board's findings, including the following information based on the board's studies:

- A list of regions in the state with the highest level of wind energy harvest potential
- A description of the estimated maximum and minimum wind generating capacity in megawatts that can be installed in each identified region
- An estimate of the annual maximum and minimum energy production potential for each identified region
- An estimate of the maximum wind generation capacity already in service in each identified region

In addition, this section presents other information related to the board's charge, including but not limited to, land availability for potential use by wind energy systems, the viability of wind energy as a commercial source of generation, wind speeds, wind energy systems currently in service or under construction, and proposed wind energy systems in the generation interconnection queue.

REGIONS WITH THE HIGHEST WIND ENERGY POTENTIAL

Based on its analysis, the board identified four regions of the state with the highest wind energy potential. These four regions are shown in Exhibit 11. The regions are all within the Lower Peninsula, one in the Thumb and the remaining three along the western side of the state. These regions were selected based on the board's findings related to the wind resources, land availability, and energy production potential relative to other areas of the state.

EXHIBIT 11
Regions with the Highest Wind Energy Production Potential

SOURCE: Public Sector Consultants Inc., 2009, using map from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.

For all four regions combined, the board's estimates of the minimum and maximum number of wind turbines, generating capacity in megawatts (MW), and annual energy production in megawatt-hours (MWh) are summarized in Exhibit 12.

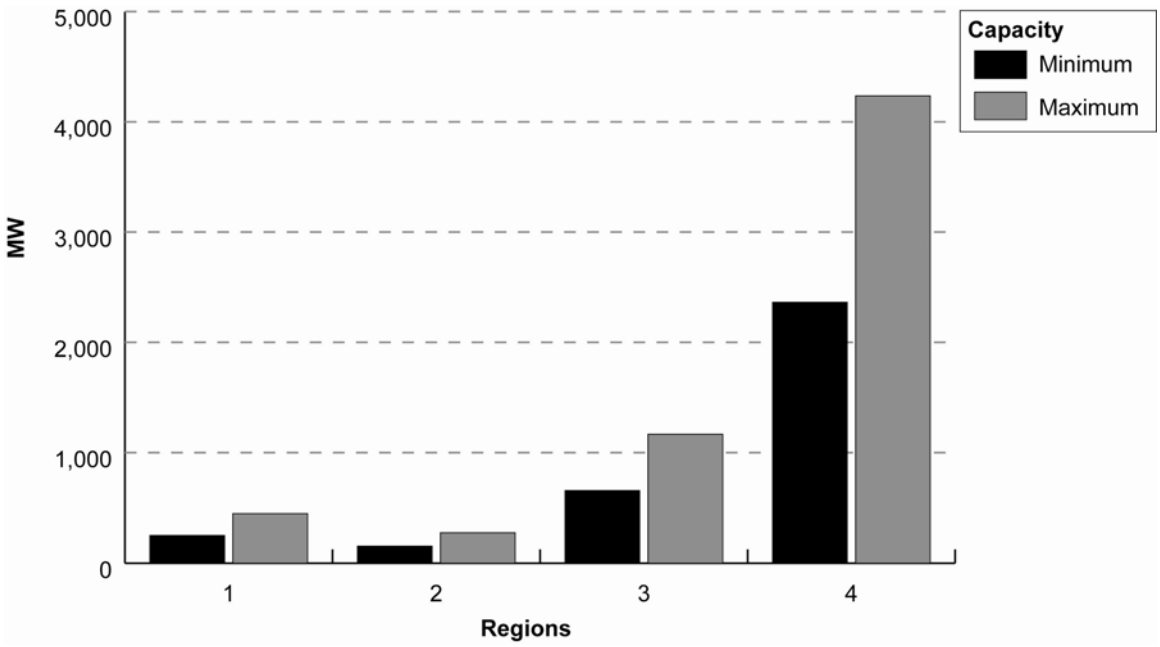
EXHIBIT 12
Total Estimated Minimum and Maximum Number of Wind Turbines, Capacity, and Annual Energy Production for Four Identified Regions

	Minimum	Maximum
Estimated number of turbines	2,281	4,081
Estimated capacity (MW)	3,421	6,122
Estimated annual energy production (MWh)	9,902,644	17,720,522

SOURCE: Research findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: These estimates are based on the board's base-case analysis described in the Methodology section and assume a 1.5-megawatt wind turbine with a hub height of 80 meters. The MW capacity is calculated by multiplying the nameplate capacity of the wind turbine times the number of estimated turbines. The annual energy production in MWh is the amount of energy that these turbines are expected to produce over the year, taking into account variability in wind speeds and other factors.

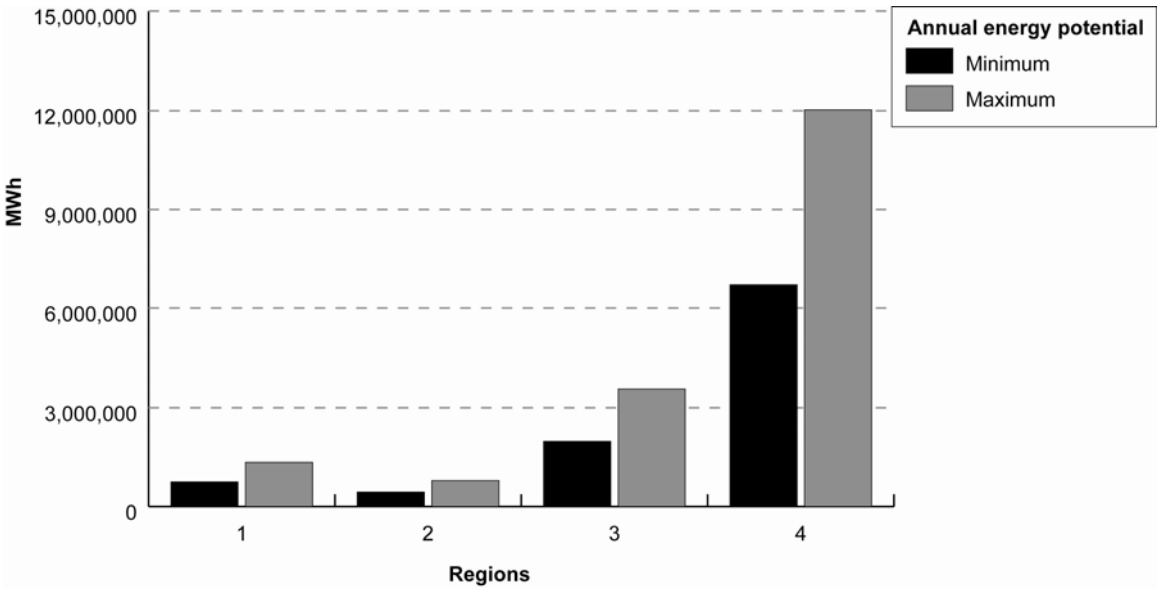
The breakdown of the estimated minimum and maximum capacity and annual energy production by region is shown in Exhibits 13 and 14. Region 4, in the Thumb, has the highest estimated generating capacity and annual energy production potential, followed by Region 3, located in northwest Michigan.

EXHIBIT 13
Estimated Minimum and Maximum Capacity (Megawatts), by Region



SOURCE: Public Sector Consultants Inc., 2009, using research findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.

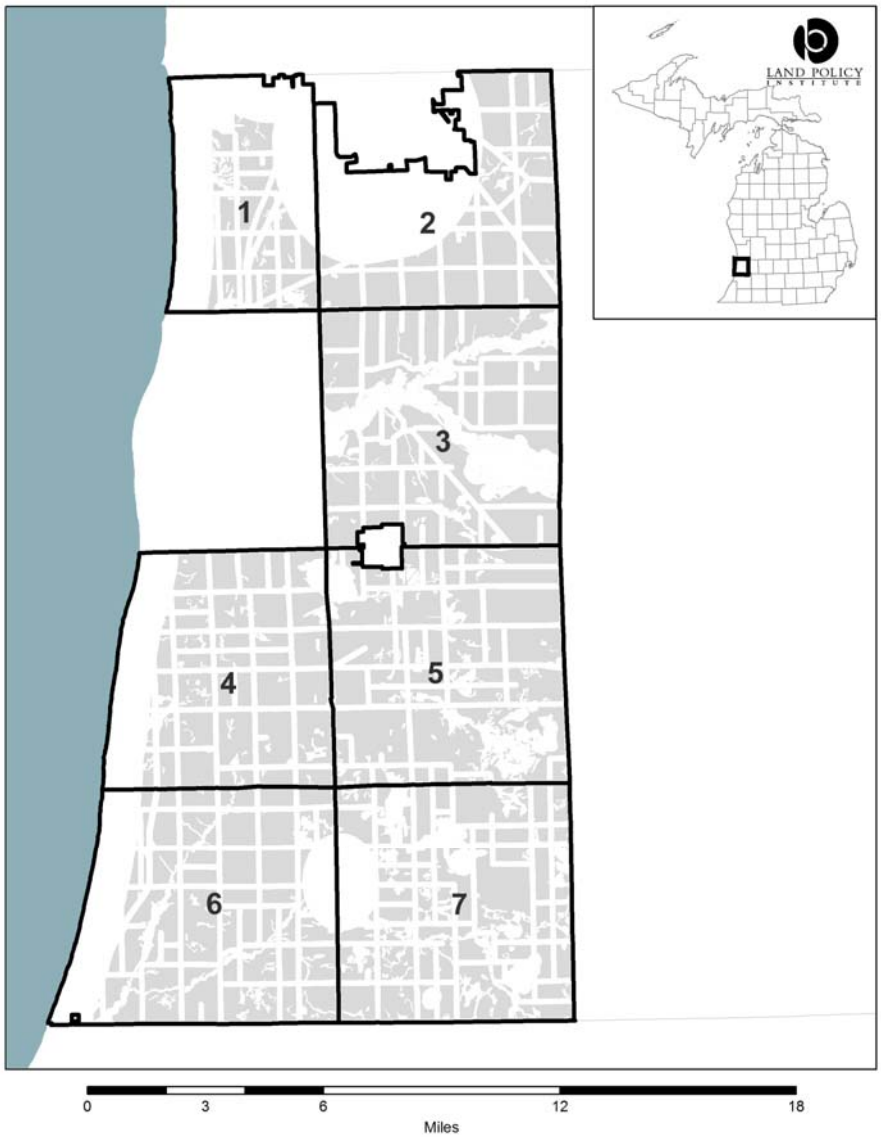
EXHIBIT 14
Estimated Minimum and Maximum Annual Energy (Megawatt-Hours) Production, by Region



SOURCE: Public Sector Consultants Inc., 2009, using research findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.

Close-up maps and a list of the corresponding local governments located in whole or in part in the region are provided in Exhibits 15–18 for each of the four identified regions. The areas in white within the region reflect where wind turbines were categorically excluded from the board's analysis (e.g., airports, roads, wetlands, etc.). The dark lines represent townships. As discussed in the Executive Summary, the cities and villages and a few select townships within the four identified regions were not included in the calculation of the generating capacity and annual energy production potential because no turbines were assumed to be placed in those jurisdictions due to the application of the board's exclusion criteria.

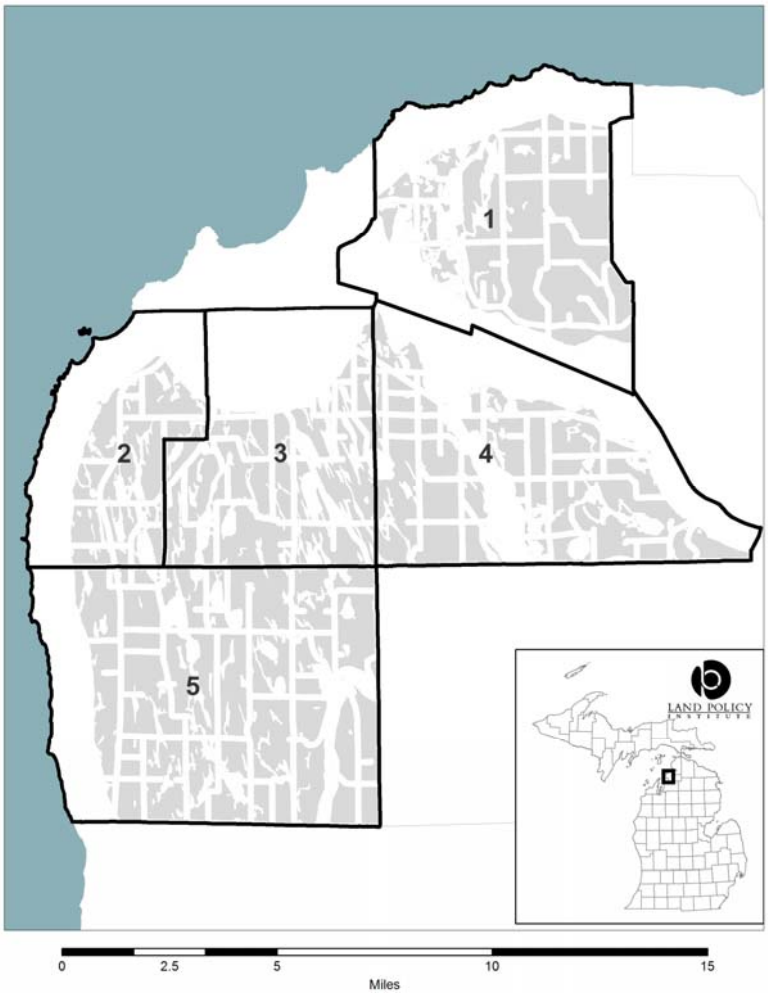
EXHIBIT 15
Region 1



County	Townships
Allegan	Casco (6), Clyde (5), Fillmore (2), Ganges (4), Laketown (1), Lee (7), and Manlius (3)

SOURCE: Public Sector Consultants Inc., 2009, using research findings and map from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: Additional local governments within Region 1 but not included in the calculation of the region's wind energy potential are Douglas, Fennville, Holland, Saugatuck, Saugatuck Township, and South Haven.

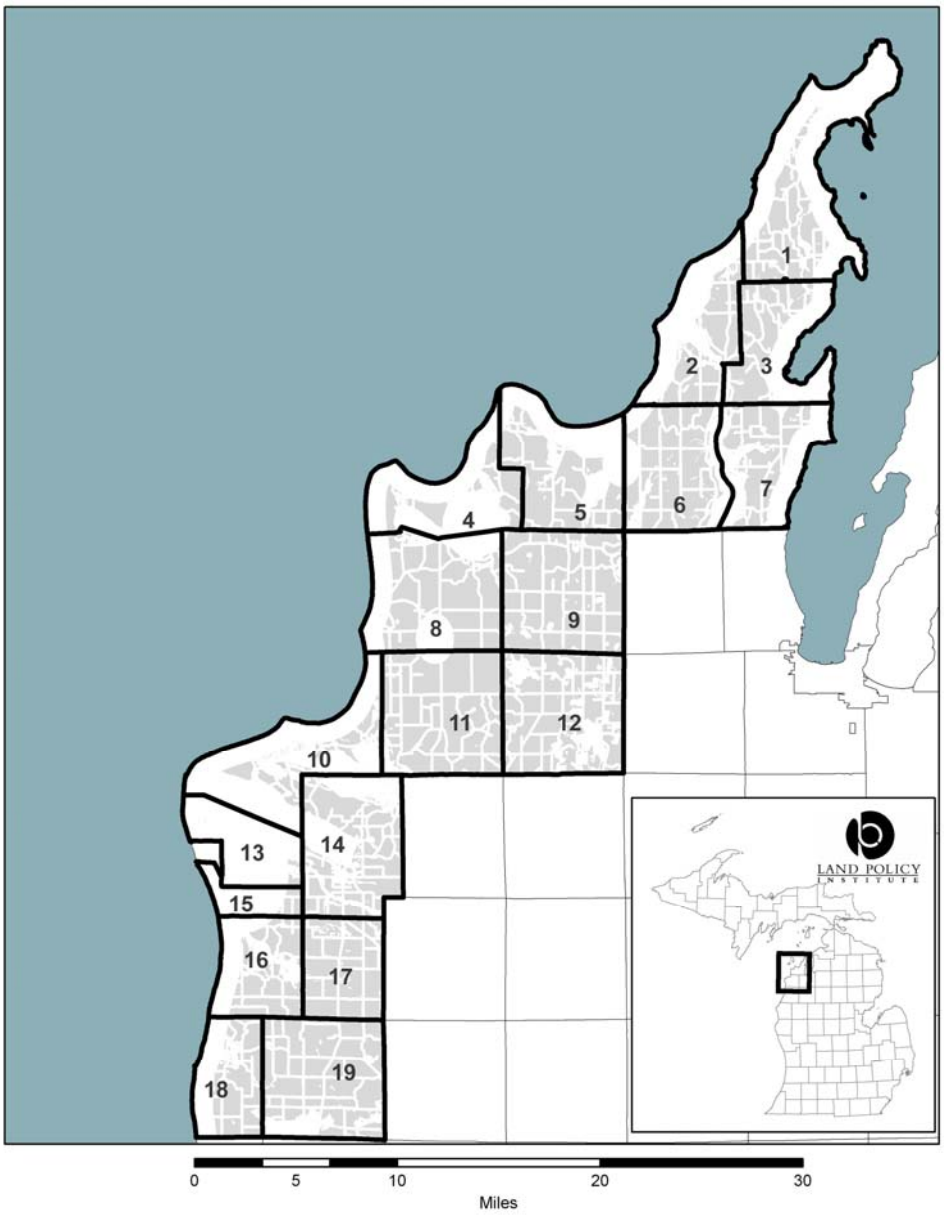
EXHIBIT 16
Region 2



County	Townships
Antrim	Banks (5)
Charlevoix	Eveline (4), Hayes (1) , Marion (3) , and Norwood (2)

SOURCE: Public Sector Consultants Inc., 2009, using research findings and map from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: Additional local governments within Region 2 but not included in the calculation of the region's wind energy potential are Ellsworth in Antrim County and Boyne City, Charlevoix, and Charlevoix Township in Charlevoix County.

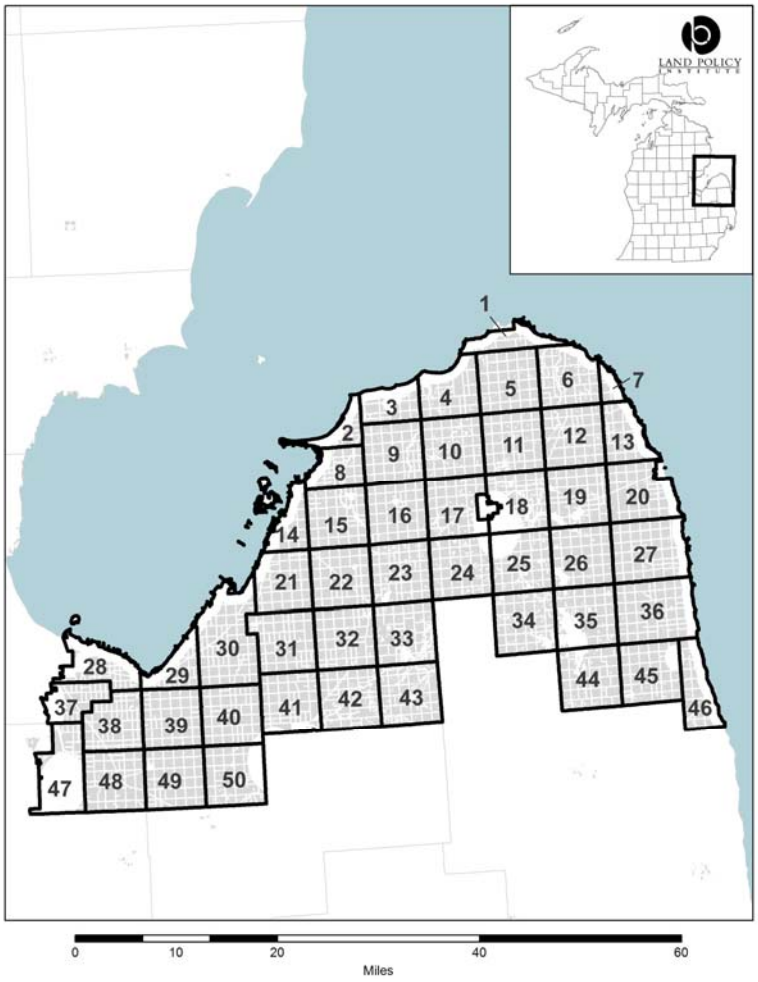
EXHIBIT 17
Region 3



County	Townships
Benzie	Almira (12), Benzonia (14), Blaine (16), Crystal Lake (13), Gilmore (15), Joyfield (17), Lake (10), and Platte (11)
Leelanau	Bingham (7), Centerville (6), Cleveland (5), Empire (8) , Glen Arbor (4) , Kasson (9), Leelanau (1), Leland (2), and Suttons Bay (3)
Manistee	Arcadia (18) and Pleasanton (19)

SOURCE: Public Sector Consultants Inc., 2009, using research findings and map from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: Additional local governments within Region 3 but not included in the calculation of the region's wind energy potential are Benzonia, Beulah, Elberta, Frankfurt, and Lake Ann in Benzie County and Empire, Northport, and Suttons Bay in Leelanau County.

EXHIBIT 18
Region 4



County	Townships
Bay	Hampton (28), Merritt (38), Portsmouth (37)
Huron	Bingham (25), Bloomfield (12) , Brookfield (22), Caseville (2), Chandler (9), Colfax (17), Dwight (5), Fairhaven (14), Gore (7), Grant (23), Hume (4), Huron (6), Lake (3), Lincoln (11), McKinley (8), Meade (10), Oliver (16), Paris (26) , Port Austin (1), Rubicon (13), Sand Beach (20), Sebewaing (21), Sheridan (24), Sherman (27), Sigel (19), Verona (18), and Windsor (15)
Saginaw	Blumfield (48) and Buena Vista (47)
Sanilac	Austin (34), Delaware (36), Forester (46), Marion (45), Minden (35), and Wheatland (44)
Tuscola	Akron (30), Almer (41), Columbia (31), Denmark (49), Elkland (33), Ellington (42), Elmwood (32), Fairgrove (40), Gilford (39), Juniata (50), Novesta (43), and Wisner (29)

SOURCE: Public Sector Consultants Inc., 2009, using research findings and map from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: Additional local governments within Region 4 but not included in the calculation of the region's wind energy potential are listed by county below:
Bay County—Bay City and Essexville
Huron County—Bad Axe, Caseville, Elkton, Harbor Beach, Kinde, Owendale, Pigeon, Pointe aux Barques Township (small township north of Port Austin Township [1] at the tip of the Thumb), Port Austin, Port Hope, Sebewaing, and Ubly
Saginaw County—Saginaw and Zilwaukee
Sanilac County—Deckerville, Forestville, and Minden City
Tuscola County—Akron, Caro, Cass City, Fairgrove, Gagetown, Reese, and Unionville

The four regions identified by the board have the highest wind energy potential in the state. At the time the board selected these four regions, it also considered a set of nine different regions based on an alternative analysis conducted by the Land Policy Institute. The alternative analysis used a different selection system that resulted in more areas being identified, including relatively small regions in terms of the expected power output and land area. The nine alternative regions and the corresponding list of local government in those regions are provided in Appendix C for reference purposes.

OTHER FINDINGS

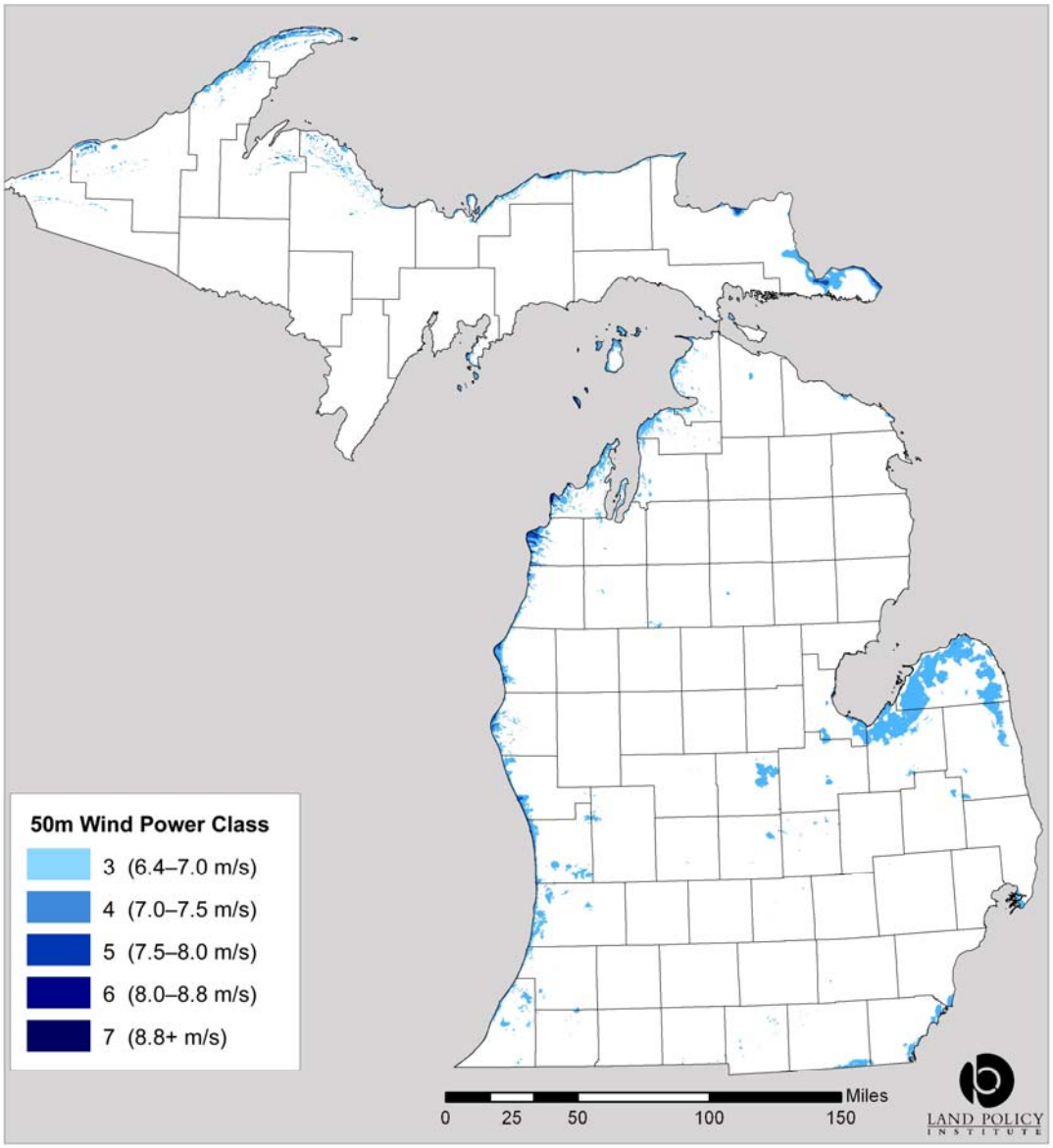
Wind Speeds on Land

Wind speeds are typically reported at different heights, including elevations of 30, 50, and 100 meters, and are generally faster at higher elevations. The 100-meter wind speed data for Michigan corresponds well with the height of commercial wind turbines used currently by industry, which typically have hub heights ranging from 80 to 100 meters. There is, however, greater confidence with the 50-meter statewide data for Michigan because it has been validated with additional measurements. Thus, the 50-meter data represents a conservative estimate of wind speeds in Michigan.

Based on both the 50-meter and 100-meter data, Michigan has land areas with wind speeds that could support utility-scale wind energy development. Wind is classified according to wind power classes, which are based on typical wind speeds.[15] The classes range from Class 1 (the lowest) to Class 7 (highest). Class 4 and above are considered "good" resources but locations with Class 3 winds may also be suitable for utility-scale wind development. Exhibit 19 shows the areas in Michigan with Class 3 or higher winds at 50 meters. These areas are expected to have even greater wind quality at 100 meters. It should be noted, however, that areas that are not identified as Class 3 at 50 meters might achieve Class 3 status at 100 meters.

[15] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Wind Powering America – Michigan Wind Resource Map [online, accessed 5/14/09], available: http://www.windpoweringamerica.gov/maps_template.asp?stateab=mi. Accessed May 8, 2009.

EXHIBIT 19
Class 3 or Higher Areas at 50 Meters



SOURCE: Map by Michigan State University Land Policy Institute, 2009, prepared for WERZ Board, using data from AWS TrueWind and the U.S. Department of Energy National Renewable Energy Laboratory (NREL).
NOTE: Legend uses wind power classification speeds specified by NREL (see http://www.michigan.gov/documents/windpower3-1-1pwr50_105253_7.pdf).

Exhibit 19 shows that Michigan's utility-scale wind resources on land are concentrated along the shores of the Great Lakes. A large portion of Michigan's Thumb area has Class 3 winds. At 50 meters, there are some places with Class 4, Class 5, and Class 6 winds, but they are smaller areas concentrated in the Upper Peninsula and along Lake Michigan.

This wind resource map is based on computer modeling and historical data as discussed further in the methodology. Although the maps are believed to be an accurate

representation of wind resources overall in the state, the values represented for any geographic location may differ from actual site conditions and wind speed estimates at any location would need to be confirmed by measurement.[16] Thus, there may be areas with higher or lower actual measured wind speeds than reflected on the maps.

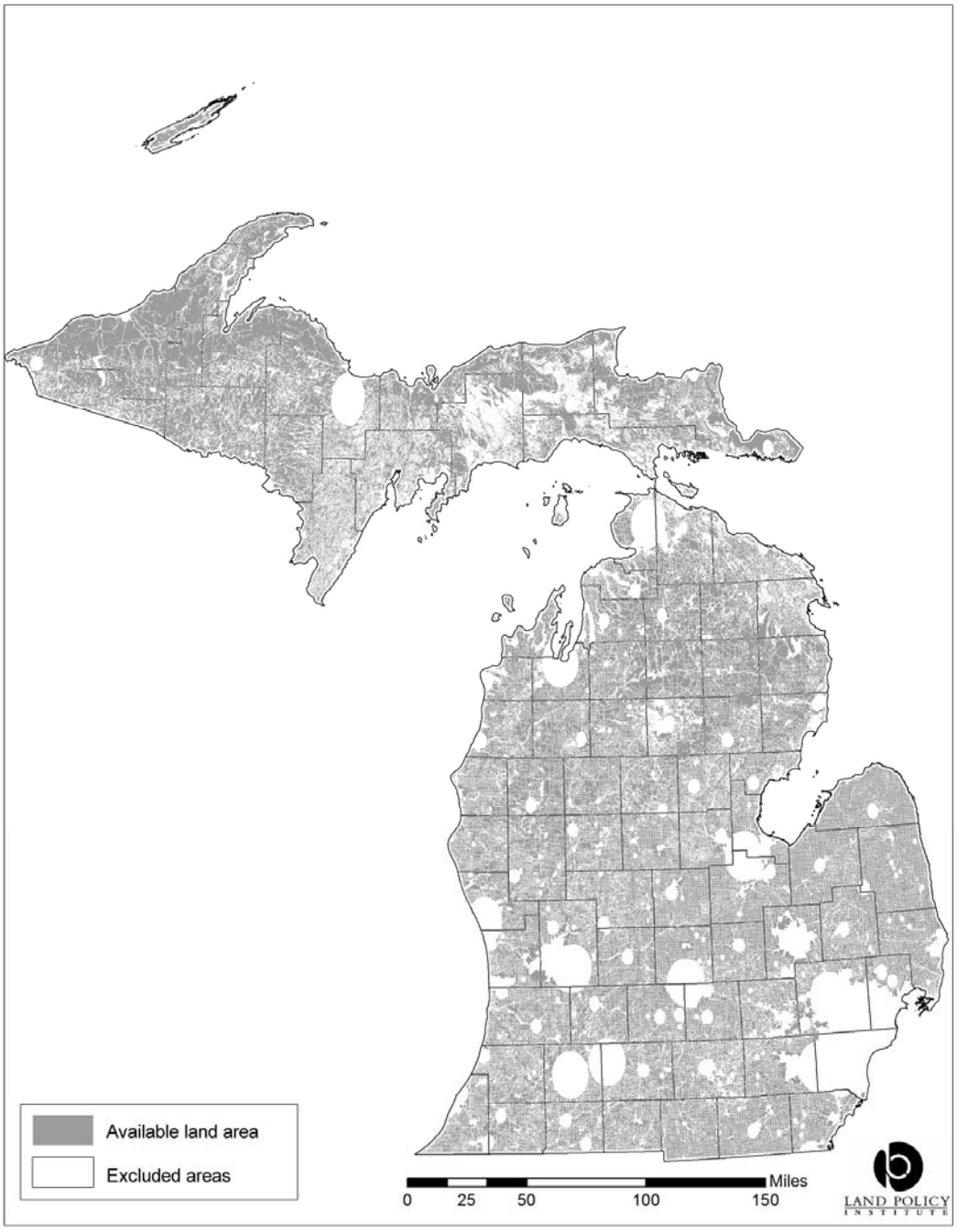
(For additional wind speed maps and information, refer to the Michigan Department of Energy, Labor & Economic Growth website for Michigan wind energy resource maps.[17])

Land Availability

As discussed in the Methodology section, the board applied on a statewide basis a number of exclusion criteria for roads, airports, wetlands, Great Lakes shoreline, and other natural and man-made features to determine the land available for potential use by wind energy systems. Exhibit 20 shows the land areas remaining after the application of all these exclusion criteria. (See Appendix D for individual maps isolating the impact of airports and urbanized areas, specifically. These are provided to illustrate the impact of individual exclusion criteria.) For its analysis, the board assumed that no turbines would be placed in the land areas shown in white in Exhibit 20.

[16] Michigan Department of Energy, Labor & Economic Growth, Michigan Wind Energy Resource Maps [online, accessed 5/14/09], available: http://www.michigan.gov/dleg/0,1607,7-154-25676_25774-101765--,00.html.
[17] Ibid.

EXHIBIT 20
Land Areas Available for Potential Use by Wind Energy Systems after Application of Exclusion Criteria

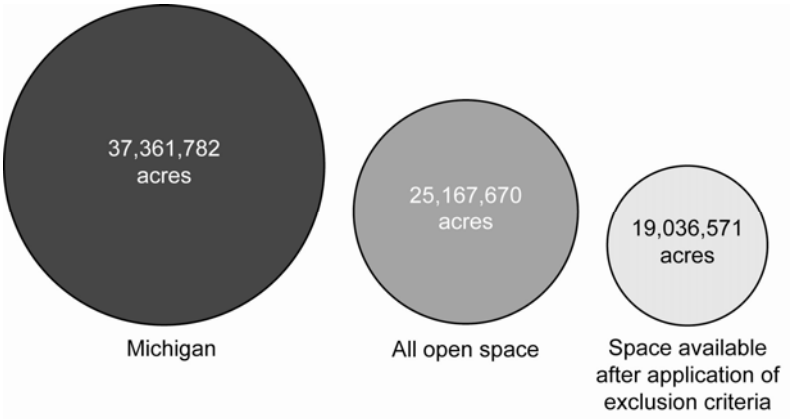


SOURCE: Map by Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: This map is based on the base-case exclusions assuming 120-meter road setbacks and no specific restrictions on state-owned land. In addition, this map does not reflect the exclusion of additional land for buildings and other structures to account for noise considerations.

Exhibit 21 shows the total number of acres statewide, the number of acres of open space statewide, and the remaining acres available for turbine placement after applying the board's exclusion criteria for roads, buildings, airports, wetlands, and other features. And as discussed above, there were no turbines modeled in the cities or villages within the four identified regions for the purpose of estimating the minimum and maximum generating capacity and energy production. The road setback and exclusion of urbanized area and airports essentially precluded any placement within those areas.

Exhibit 21 illustrates the significant reduction in land available after the application of the exclusion criteria. It does not, however, account for the exclusion of additional land for buildings and other structures to account for noise considerations. Moreover, the exhibit does not account for the fact that the board further reduced by 66 percent and 81 percent, respectively, the estimated number of turbines in the remaining areas to determine the minimum and maximum estimates of the generating capacity and annual energy production in the state. These across-the-board reductions account generally for the inevitable exclusion of additional land due to site-specific limitations such as zoning, parcel size, sensitive species or environments, or significant cultural or historical sites.

EXHIBIT 21
Land Acres Available for Potential Turbine Placement after Application of Exclusion Criteria



SOURCE: Public Sector Consultants Inc., 2009, based on research and findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: The figure for the number of available acres is based on the base-case exclusions assuming 120-meter road setbacks and no specific restrictions on state-owned land. The "space available after application of exclusion criteria" does not reflect the exclusion of additional land for buildings and other structures to account for noise considerations, or other site-specific limitations such as zoning, parcel size, sensitive species or environments, or significant cultural or historical sites. This figure does not reflect acres excluded for the Charlevoix airport.

Viability of Wind Energy as Commercial Generation Source

The viability of wind as a source of commercial energy generation depends on sufficient wind to generate power, economic and market issues, as well as social and policy considerations. The board found that there are areas of the state that could support commercial-scale wind development, including in the identified regions. This finding is

based on the board's examination of the wind resources and associated wind energy production potential across the state as part of its selection of the identified regions.

Even prior to the enactment of the state's renewable energy portfolio standard (RPS) as part of PA 295, commercial-scale wind energy systems were being developed in Michigan, including the two recent systems installed in the Thumb. There are also a number of proposed wind energy projects in the queue, as discussed further in this section. The RPS—which requires electricity providers in the state to obtain at least 10 percent of their annual energy needs from renewable energy sources by 2015—provides an additional incentive to develop wind energy systems in the state. Based on market trends and the compliance plans of electricity providers, it is expected that wind energy will make up the large majority of the new renewable energy sources deployed in Michigan to meet this standard. Although there is no requirement to use wind energy systems to meet this mandate, it is the most economic alternative on the scale that is needed. The amount of wind development that is viable and the pace at which it is developed will also be influenced by federal policies, particularly the long-term treatment of the federal renewable production tax credit and any future restrictions on carbon emissions.

Wind Energy Systems in Service

As of April 2009, there were five wind energy systems operating in Michigan, consisting of a total nearly 130 MW of installed capacity; almost all of this capacity was placed into service during 2008. Information on these systems is shown in Exhibit 22. The two largest and newest wind systems, Michigan Wind I and Harvest Wind Farm, are located in the Thumb area within Region 4 (identified by the board as having the highest estimated wind energy harvest potential in the state).

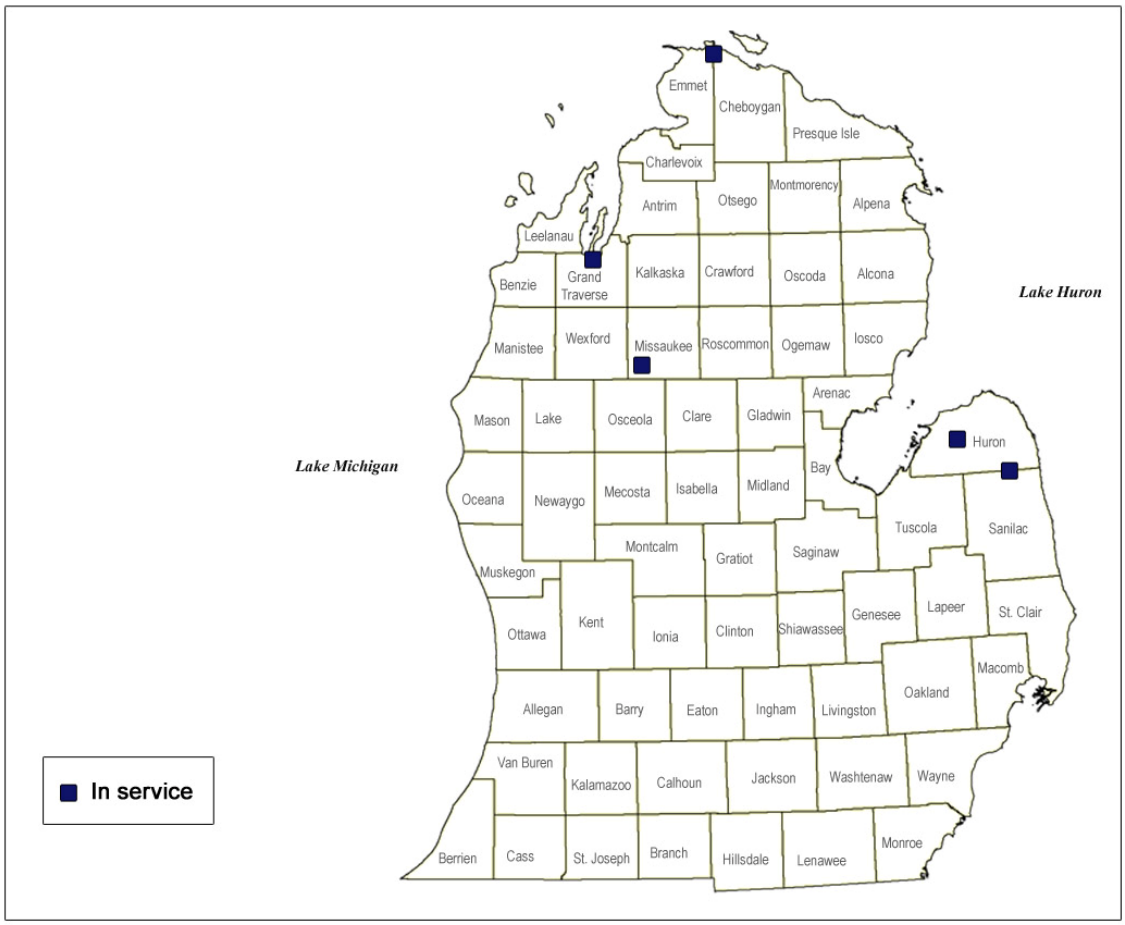
EXHIBIT 22
Wind Energy Systems in Service in Michigan, April 2009

Name	Location	Capacity (MW)	Units	Turbine manufacturer	Developer/ owner	Power purchaser	Year online
Michigan Wind I	Ubly, Huron County	69.0	46	GE Energy	Noble Environmental Power/John Deere Wind Energy*	Consumers Energy	2008
Stoney Corners Wind Farm	Richland Township, Missaukee County	5.0	2	Fuhrlander	Heritage Sustainable Energy	DTE Energy	2008
Harvest Wind Farm	Pigeon, Huron County	52.8	32	Vestas	John Deere Wind Energy	Wolverine Power Cooperative	2008
Mackinaw City	Mackinaw City	1.8	2	NEG Micon	Mackinaw Power	Consumers Energy	2001
Traverse City Light and Power	Traverse City	0.6	1	Vestas	Traverse City Light and Power	Traverse City Light and Power	1996

SOURCE: American Wind Energy Association, U.S. Wind Energy Projects – Michigan as of March 31, 2009 [online, accessed 5/14/09], available: http://www.awea.org/projects/Projects.aspx?s=Michigan.
* Michigan Wind 1 is part of the former Noble Thumb Windpark, which John Deere Renewables acquired from Noble Environmental Power in October 2008.

Exhibit 23 shows the location of the commercial wind energy systems currently in service in Michigan. There are no commercial systems in service or under construction in the Upper Peninsula.

EXHIBIT 23
Commercial Wind Energy Systems in Michigan in Service, April 2009



SOURCE: Public Sector Consultants Inc., 2009, using data from American Wind Energy Association, *U.S. Wind Energy Projects – Michigan as of March 31, 2009* [online, accessed 5/14/09], available: http://www.awea.org/projects/Projects.aspx?s=Michigan.

Proposed Wind Energy Systems in the Interconnection Queue

This section briefly describes the generation interconnection queue process and summarizes the proposed wind energy systems currently in the interconnection queue in Michigan. The interconnection queue and related procedures are in place to ensure that any new commercial generating source, including wind energy systems, can be operated safely and transport power to the grid and, ultimately, to end-use customers, without harming the existing electrical system (for example, causing overloads or voltage problems). It also allows for an independent entity, like a regional transmission organization (RTO), to study the impacts of the proposed generating facility on the system and the upgrades that may be needed.

The interconnection queue represents projects proposed by developers. The queue is a work in progress and changes as a result of actions by developers and others as well as

underlying economic, policy, and other factors. Thus, the interconnection requests presented in this report reflect a snapshot in time of projects currently in the queue. Moreover, not all projects in the queue are ultimately constructed. Although the queue is constantly changing and is not a definitive indicator of where and how much wind generation will occur, it does provide some insights on potential future development patterns. This is likely why PA 295 calls for this information in the board's report.

Unless the context clearly indicates otherwise, the term "queue" in this report refers to the collective interconnection queues of the RTOs and utilities in Michigan.

Background on Interconnection Queue Process

Developers of proposed wind energy projects (or any other type of proposed generating facility) must apply to interconnect to the electric grid to determine the facilities needed to integrate the project into the grid and ensure safe and reliable operations. The project developer submits an application, or interconnection request, to the respective RTO or utility, depending on the location of the proposed site. Once an application is submitted, the project is entered into the interconnection queue of that RTO or utility.

For projects seeking to interconnect to the transmission system,[18] the RTO manages the queue process and related technical studies pursuant to a tariff approved by the Federal Energy Regulatory Commission. Two RTOs operate in Michigan: Midwest Independent Transmission System Operator (Midwest ISO) and PJM Interconnection (PJM). The Midwest ISO covers the majority of the state; PJM operates in the far southwest corner of the state in the American Electric Power Company's service area. Pursuant to MPSC tariffs and procedures, electric utilities and cooperatives that own distribution systems such as the Detroit Edison Company, Thumb Electric, and Consumers Energy Company manage the interconnection queue process for projects seeking to interconnect to their individual distribution systems.

Once an interconnection request application is submitted, the project is studied through a phased process that may take several years. Projects that are going through this study process—including ones that are between specific studies or may be temporarily on hold—are labeled "active" in the queue. After completion of the necessary studies, which begin with a high-level feasibility assessment and conclude with detailed engineering studies of the necessary system upgrades, an interconnection agreement for the project may be executed. This agreement contains the terms and conditions for the project to be interconnected.[19] Although it is a significant milestone, an interconnection agreement does not guarantee that the project will be constructed or become operational since economic or other factors may prevent a project from moving forward. The queue, however, identifies projects that are designated as completed or "done" (that is, no longer

[18] The high-voltage facilities owned by ITC Transmission (ITC), Michigan Electric Transmission Company (METC), American Transmission Company (ATC), American Electric Power Company, Wolverine Power Supply Cooperative, and others.

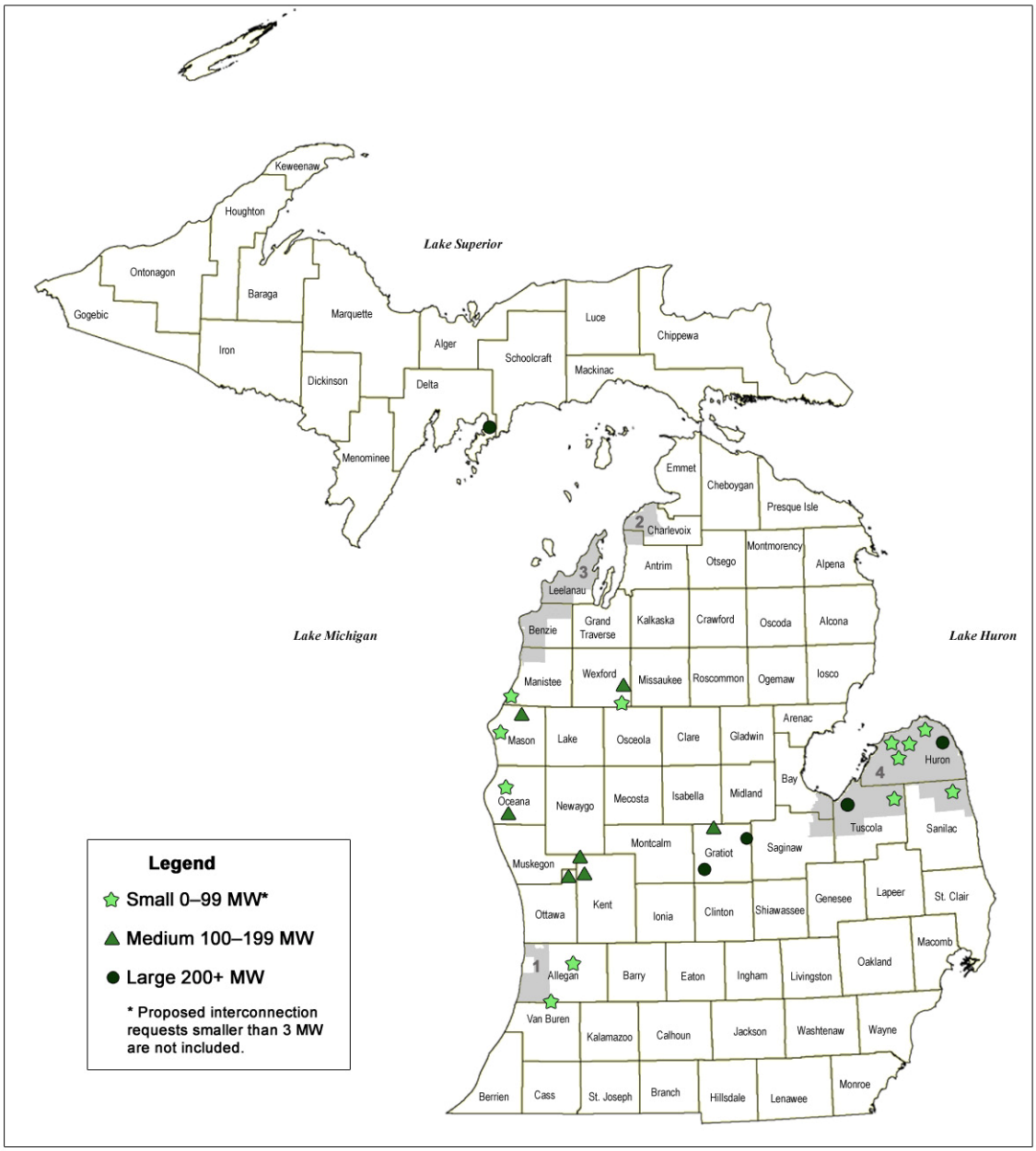
[19] For projects interconnecting to the distribution system, the agreement is called a Facility and Construction Agreement. After the construction is completed, a parallel operating agreement is executed between the project owner and the utility prior to commercial operation.

"active") because they have an interconnection agreement. In addition, interconnection requests that have been withdrawn are still listed in the queue. This proposed report summarizes only *active* interconnection requests.

Summary of Interconnection Queue Information—Active Requests

There are 24 commercial wind energy projects proposed in Michigan that are categorized as active in the interconnection queue. These projects represent a total of nearly 2,700 megawatts of capacity. Exhibit 24 shows the approximate location of these interconnection requests based on publicly available information. Projects of less than three megawatts seeking to interconnect to the distribution system are not reflected in this report.

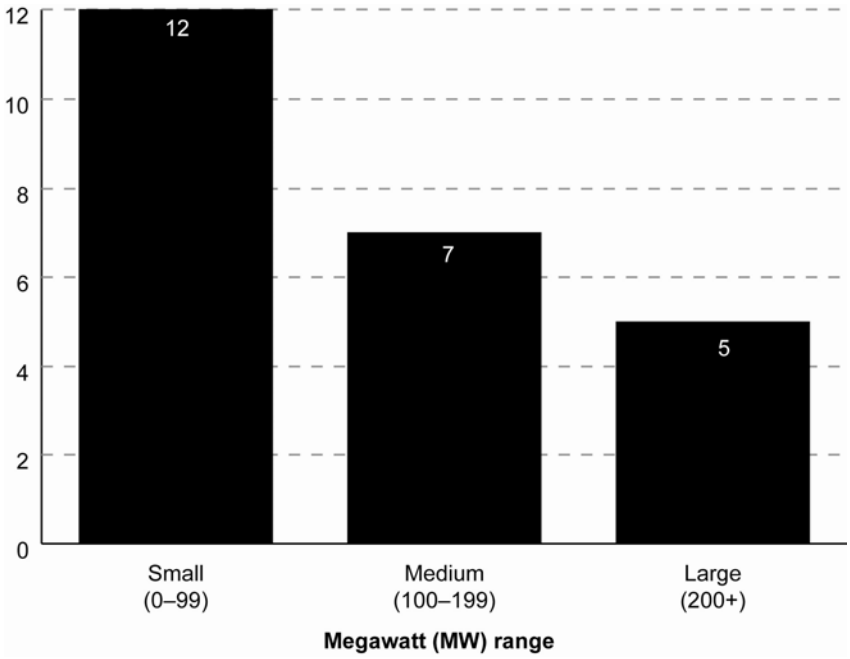
EXHIBIT 24
Active Wind Energy Projects in Interconnection Queue, April 2009



SOURCE: Public Sector Consultants Inc., 2009, based on data in Midwest ISO queue [online, accessed 4/22/09], available: http://www.midwestmarket.org/page/Generator+Interconnection+Queue+Projects; Interconnection report filings in MPSC Case No. U-15113 (2009); PSC communications with DTE Energy staff, April 22, 2009.

Half of the 24 active interconnection requests are for projects with a capacity of less than 100 MW. Exhibit 25 breaks down the number of requests by project size.

EXHIBIT 25
Number of Active Wind Interconnection Requests in Queue, April 2009, by Project Size



SOURCE: Public Sector Consultants Inc., 2009, based on data in Midwest ISO queue [online, accessed 4/22/09], available: http://www.midwestmarket.org/page/Generator+Interconnection+Queue+Projects; Interconnection report filings in MPSC Case No. U-15113 (2009); PSC communications with DTE Energy staff, April 22, 2009.
NOTE: Small projects do not include those less than 3 MW.

The majority of the interconnection requests, in terms of number and megawatt capacity, are in the Midwest ISO and are seeking to interconnect to the transmission system of ITC or METC. Six projects in the queue, representing 314 MW of capacity, are seeking to interconnect to the distribution systems of Consumers Energy Company or Detroit Edison Company. No wind interconnection requests in Michigan were in the PJM queue when the board conducted its study of the interconnection requests.[20] A summary of the interconnection requests by RTO or utility is shown in Exhibit 26.

[20] PJM generation interconnection queue [online, accessed 4/22/09], available: http://pjm.com/planning/generation-interconnection.aspx.

EXHIBIT 26
Active Wind Interconnection Requests in Queue, by RTO or Utility, April 2009

RTO/Utility	Number	Megawatt (MW)
Midwest ISO	18	2,382
Detroit Edison Company	5	234
Consumers Energy Company	1	80
PJM	0	0
Other distribution utilities/cooperatives	0	0
Total	**24**	**2,696**

SOURCE: Public Sector Consultants Inc., 2009, based on data in Midwest ISO queue [online, accessed 4/22/09], available: http://www.midwestmarket.org/page/Generator+Interconnection+Queue+Projects; Interconnection report filings in MPSC Case No. U-15113 (2009); PSC communications with DTE Energy staff, April 22, 2009.

As discussed above, the queue process involves a series of studies and milestones to determine the impact of the proposed project on the electric grid and necessary system improvements to interconnect and operate the project. A summary of the active interconnection requests based on their status in the queue is shown in Exhibit 27, followed by a brief explanation of these different phases in the queue process.

EXHIBIT 27
Active Wind Interconnection Requests in Queue, by Status, April 2009

Study status	Number	Megawatt (MW)
Feasibility	4	198
System Planning and Analysis (SPA)/System Impact Study*	2	280
Definitive Planning Phase (DPP)/Facility Study	8	798
Parked (One-Year Rule)	9	1,384
Awaiting interconnection agreement	1	36
Total	**24**	**2,696**

SOURCE: Public Sector Consultants Inc., 2009, based on data in Midwest ISO queue [online, accessed 4/22/09], available: http://www.midwestmarket.org/page/Generator+Interconnection+Queue+Projects; Interconnection report filings in MPSC Case No. U-15113 (2009); PSC communications with DTE Energy staff on April 22, 2009, and Consumers Energy staff in May 2009.
* CE08-40 is in the system impact phase of the interconnection study.

The Midwest ISO modified its interconnection queue procedures in 2008 to increase the efficiency and predictability of the process. Under the new queue procedures, the **feasibility study** is the first phase in the queue process following the application and involves a preliminary evaluation of the proposed facility's impact on the transmission system. The feasibility study is used to determine whether the project moves to the **system planning and analysis** (SPA) phase for additional impact analyses or directly to the **definitive planning phase** (DPP). System impact analyses conducted during the SPA phase are designed to further assess the transmission constraints that would result from the proposed interconnection and to identify the transmission (network) upgrades needed

to reliably and efficiently integrate the proposed facility into the transmission system, as well as preliminary estimates of the cost and time required to construct the upgrades. After completion of the SPA, projects move forward to the DPP after certain milestones and requirements are met by the developer. If the developer has not met the milestones and/or does not want to move forward to the DPP, an interconnection request can be "**parked**" for up to one year from the start of the DPP study. If the project has not made progress by that point, it will be withdrawn from the queue; if the project is withdrawn, the developer would have start over with a new application to pursue the project.

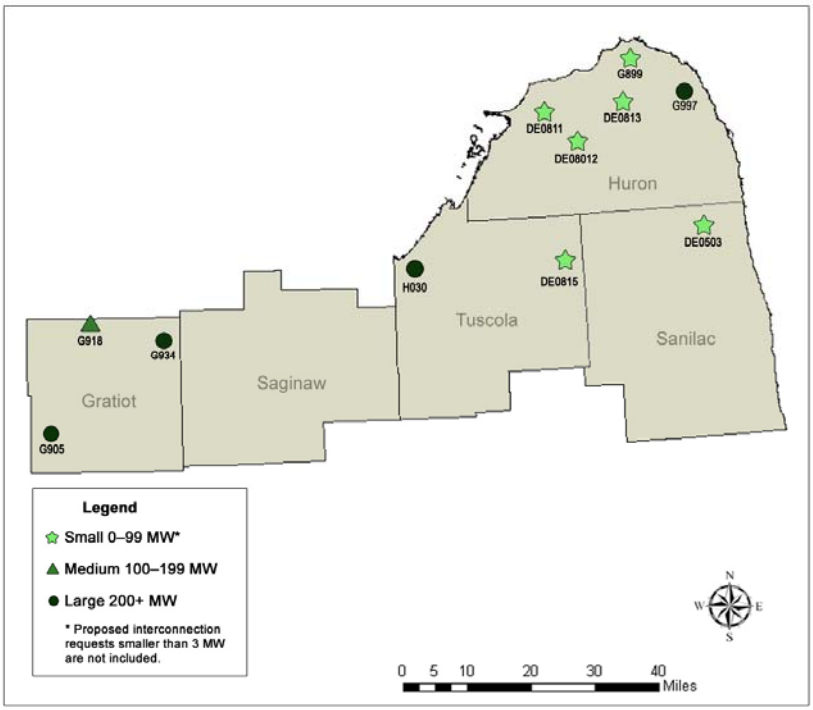
A project can move directly from the feasibility study to the DPP if there are no significant transmission constraints requiring system upgrades and the applicant meets the required milestones. The DPP includes a facility study that identifies the specific network upgrades and interconnection facilities needed for the interconnection. After the DPP, an interconnection agreement is negotiated among the Midwest ISO, transmission owner, and the developer and filed with the Federal Energy Regulatory Commission.

For projects seeking to interconnect to the distribution system, which is under state jurisdiction, the process is slightly different. It currently involves one interconnection study that combines the system impact and facility studies. Distribution utilities can also conduct feasibility studies as requested for proposed interconnection projects prior to undertaking the formal interconnection study. The existing process for interconnections to the distribution system will likely change in the future because the MPSC has pending proceedings to amend the existing interconnection rules.

More detailed information on the status of specific interconnection requests is shown in Exhibit 28, organized by region of the state.

EXHIBIT 28
Active Wind Interconnection Requests in Queue, by Area, April 2009

Central Lower Peninsula and Thumb

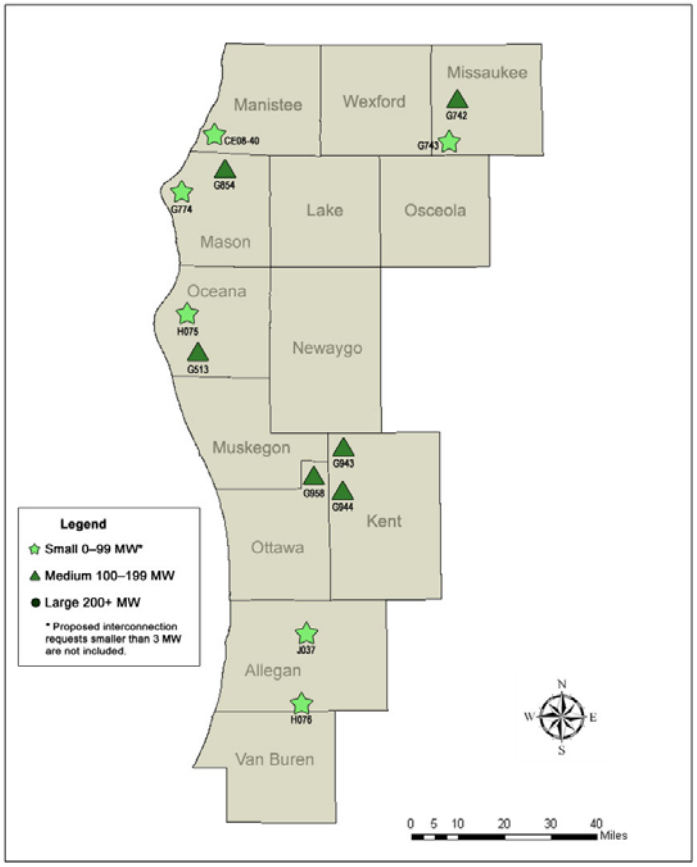


Project No.	Interconnection control area/utility	County	MW (Plate)	Status
G905	METC	Gratiot & Saginaw	200	Under study-Definitive Planning Phase (DPP) (milestones M2 and D3 required)*
G918	METC	Gratiot	120	Parked
G934	METC	Gratiot	300	Parked
G889	ITC	Huron	59	Under study-DPP (System Impact Study)
G997	ITC	Huron	200	Under study-System Planning and Analysis (SPA)
H030	ITC	Tuscola	200	Parked
DE0503	DECO	Sanilac	36	Awaiting interconnection agreement
DE0811	DECO	Huron	50	Under study: Feasibility study
DE0812	DECO	Huron	50	Under study: Feasibility study
DE0813	DECO	Huron	50	Under study: Feasibility study
DE0815	DECO	Tuscola	48	Under study: Feasibility study**
Regional Subtotal (MW)			**1,313**	

SOURCE: Public Sector Consultants Inc., based on data from the Midwest ISO queue, April 22, 2009, MPSC Case No. U-15113, and PSC communications with DTE Energy staff on April 22, 2009.
* M2 and D3 refer to the required milestones and deposit required to enter the DPP. The M2 milestones include the provision of technical information such as a stability model and definitive point of interconnection and MW capacity, as well as non-technical milestones. The non-technical milestones are proof of site control and at least two of the following: equipment on order; applications submitted for necessary permits; regulatory approval (e.g., in states requiring site approval of generating facilities); approval of project by developer's board of directors or equivalent; and deposit or letter of credit. A substitute deposit or letter of credit may be provided in lieu of these milestones. For more information, go to http://www.midwestiso.org/page/Generator+Interconnection.
**Utility awaiting system impact study agreement and fee from interconnection customer.

EXHIBIT 28 (cont.)
Active Wind Interconnection Requests in Queue, by Area, April 2009

Western Lower Peninsula

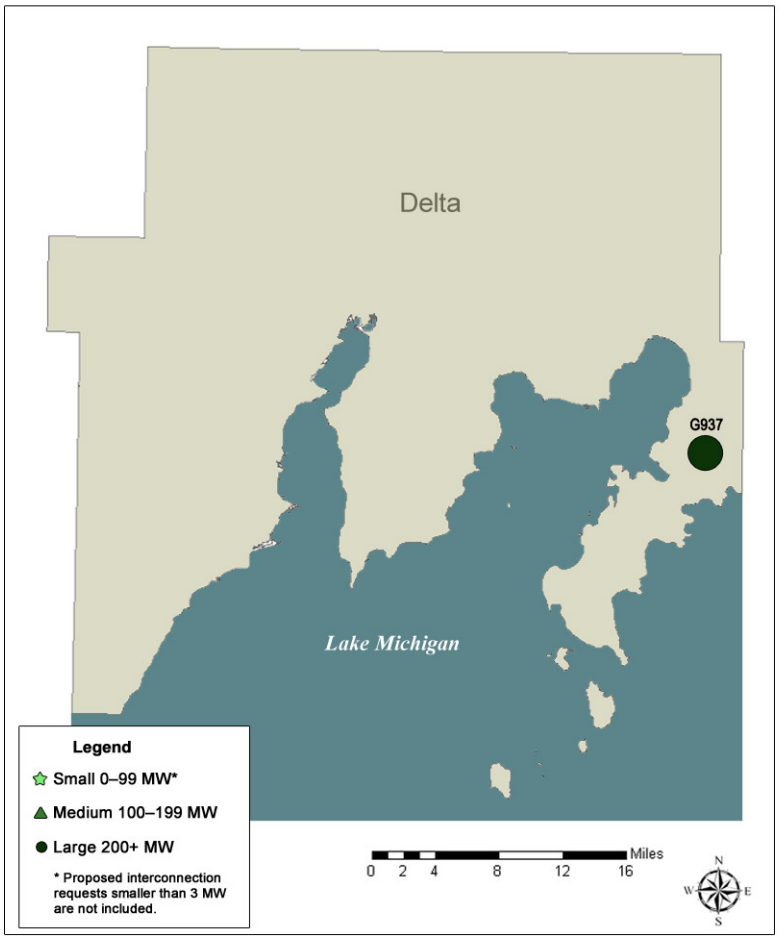


Project No.	Interconnection control area/utility	County	MW (Plate)	Status
G513	METC	Oceana	100	Under study-Facility Study
G742	METC	Missaukee	120	Parked
G743	METC	Missaukee	45	Under study-DPP (System Impact Study)
G774	METC	Mason	70	Under study-DPP (System Impact Study)
G854	METC	Mason	150	Parked
G943	METC	Kent & Ottawa	150	Parked
G944	METC	Kent & Ottawa	150	Parked
G958	METC	Kent & Ottawa	120	Parked
H075	METC	Oceana	60	Under study-DPP (System Impact Study)
H076	METC	Allegan	74	Parked
J037	METC	Allegan	64	Under study-DPP (milestones M2 & D3 required)
CE08-40	CONS	Manistee	80	Under study-System Impact Study
Regional Subtotal (MW)			**1,183**	

SOURCE: Public Sector Consultants Inc., 2009, based on data in Midwest ISO, April 22, 2009, and MPSC Case No. U-15113, 2009.

EXHIBIT 28 (cont.)
Active Wind Interconnection Requests in Queue, by Area, April 2009

Upper Peninsula



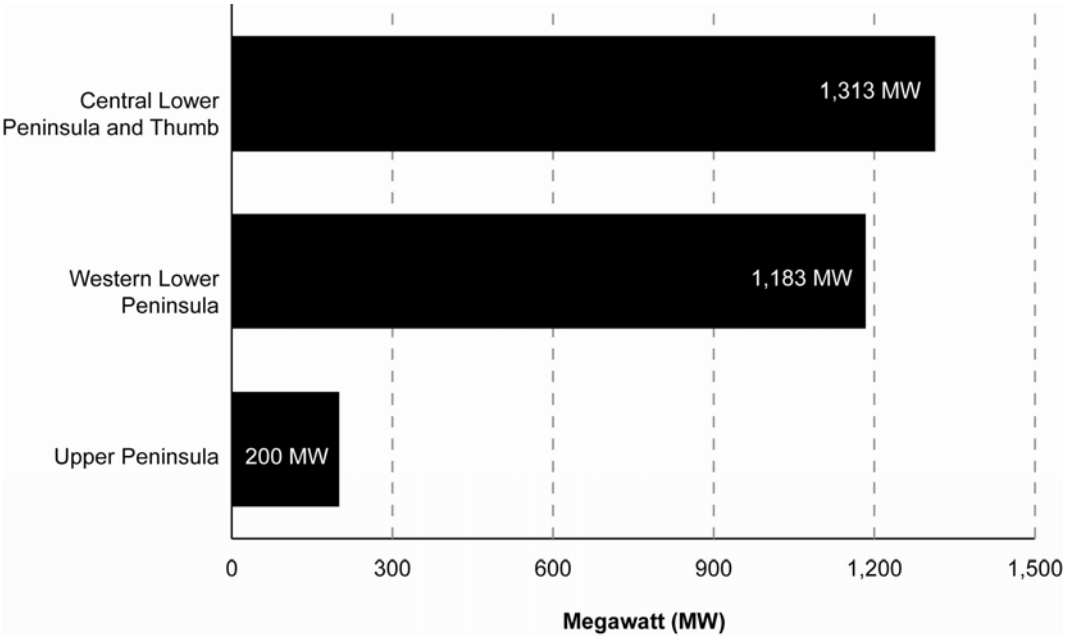
Project No.	Interconnection control area/utility	County	MW (Plate)	Status
G937	ATC	Delta	200	Under study-DPP (System Impact Study)
Regional Subtotal (MW)			**200**	

SOURCE: Public Sector Consultants Inc., 2009, based on data from the Midwest ISO queue, April 22, 2009.

Exhibit 29 summarizes the total megawatt capacity of proposed wind projects with active interconnection requests by area of the state.

EXHIBIT 29

Megawatt Capacity of Proposed Wind Projects with Active Interconnection Requests, by Area, April 2009



SOURCE: Public Sector Consultants Inc., 2009, based on data in Midwest ISO queue, April 22, 2009, and MPSC Case No. U-15113. 2009.

Comments

In the preparation of this final report, the board considered all the comments it received from local governments and individuals regarding its proposed report issued on June 2, 2009. This section summarizes the comment process, the comments received, and the board's changes to the report in response to the comments.

OVERVIEW OF COMMENT PROCESS

PA 295 requires the board to submit a proposed report to local governments in the regions with the highest wind energy potential and to hold at least one public hearing prior to issuing a final report. Comments from local governments were due on August 4, 2009. A hard copy of the proposed report and a letter explaining the comment process were mailed on June 2, 2009, to the clerk of the 136 pertinent local governments, including townships, cities, villages, and counties, in the four identified regions. In addition, the proposed report was available for download on the board's website.[21] The MPSC issued a press release about the board's report and the board's consultants worked with statewide associations representing townships, cities and villages, and counties to disseminate the information to their members.

The board held two public hearings as follows:

- Bad Axe, Huron County: August 24, 2009
- Scottville, Mason County: August 31, 2009

Bad Axe is in Region 4 in the Thumb area and Scottville is in West Michigan in between Regions 1, 2, and 3. Notice of the public hearings was provided to each of the local governments in the four regions and in newspapers of general circulation in the regions. Press releases were also issued. At the public hearings, the board provided background on the board's charge and an overview of its proposed report and then accepted comments from anyone wishing to speak, as discussed further below.

In addition to accepting comments from local governments *within* the four regions and holding the public hearings, the board solicited comments from any interested individual or organization, including local governments *outside* the four regions, from the date the proposed report was issued until one week after the last public hearing, September 8, 2009.

In summary, the board accepted comments through the following means:

- **Online comment forms**—There were two forms: one for local governments within the identified regions and a more abbreviated form for all others, including local governments outside the regions.[22] Both comment forms included specific questions

[21] www.michigan.gov/windboard

[22] Copies of the two comment forms with tallied responses are included in Appendix E. Individuals could complete the form online, or print the form and submit it to the board's consultant via facsimile or mail.

on the proposed report's clarity, information, and findings. Comments were accepted through September 8, 2009.

- **Public hearings**—Verbal comments were accepted until everyone who wanted to had spoken. The public hearings were transcribed. Comments were limited to approximately three minutes per speaker, but written comments were accepted during and after the hearings, until September 8, 2009.
- **Mail or facsimile**—Comments were also mailed or faxed to the board's consultant and the MPSC.

SUMMARY OF COMMENTS

The board received a considerable number of comments on its proposed report from local governments and individuals. In total, 122 comments were received, including statements made during the two public hearings. In addition, the board received two petitions signed by a total of 119 residents in the Thumb area. A summary of the comments follows, organized by type of entity and the method received.

Local Governments within the Four Regions

The board received comments from 31 local units of government located within the four regions identified in the proposed report as having the highest wind energy potential in the state (see Exhibit 30). Below is a breakdown of the number of comments from local governments among the four regions:

- Region 1 (portions of Allegan County): 4
- Region 2 (portions of Antrim and Charlevoix Counties): 3
- Region 3 (portions of Benzie, Leelanau, and Manistee Counties): 14
- Region 4 (Huron County and portions of Bay, Saginaw, Sanilac, and Tuscola Counties): 10

EXHIBIT 30
Breakdown of Commenting Units of Local Government, by Region

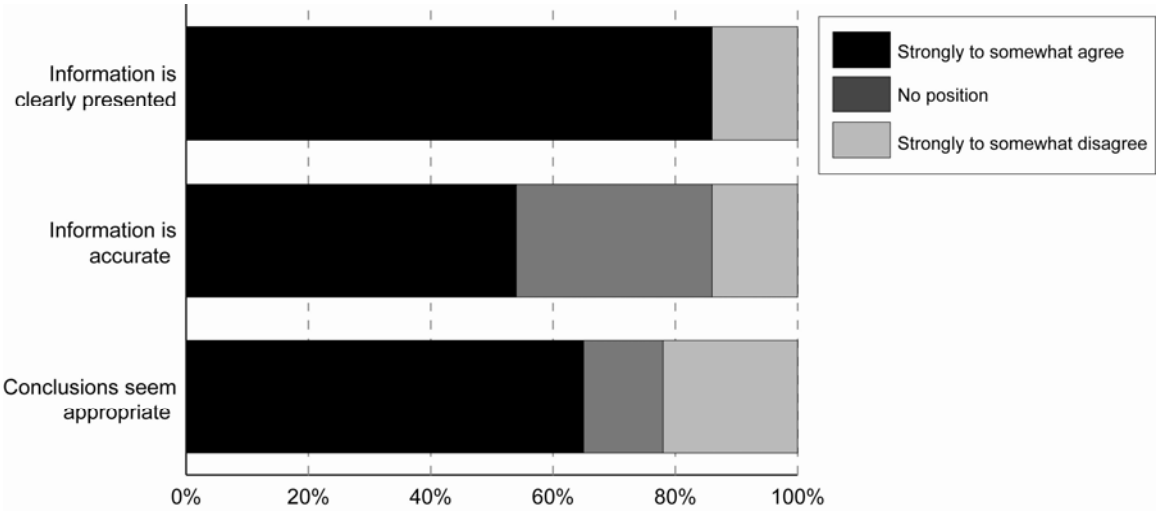
Region 1	Region 2	Region 3	Region 4
• City of Holland* • Casco Township* • Fillmore Township • Ganges Township	• Charlevoix County • Hayes Township • Norwood Township	• Benzie County • Bingham Township • Cleveland Township • Empire Township • Frankfort City Council* • Glen Arbor Township • Lake Township, Benzie County • Leelanau County • Leelanau Township • Leland Township • Platte Township	• Fairgrove Township • Hampton Chartered Township • Huron County • Lake Township, Huron County • Merritt Township • Saginaw County • Township of Caseville* • Township of

Region 1	Region 2	Region 3	Region 4
		• Pleasanton Township* • Suttons Bay Township • Village of Northport	Forester • Tuscola County* • Village of Sebewaing*

SOURCE: Public Sector Consultants, Inc, prepared on behalf of the WERZ Board, 2009.
* NOTE: These local governments provided written comments in the form of a letter but did not complete the comment form. Therefore, the quantitative data on the questions in the comment form do not reflect input from these local governments.

The comment form asked respondents to express their opinion about the quality and conclusions of each section of the report. Exhibit 31 shows the breakdown of responses from the local governments regarding the proposed report's executive summary. The breakdown of responses for each section of the report, as well as for the other questions included in the comment form, is provided in tabular form in Appendix E.

EXHIBIT 31
Local Government Comments on Executive Summary

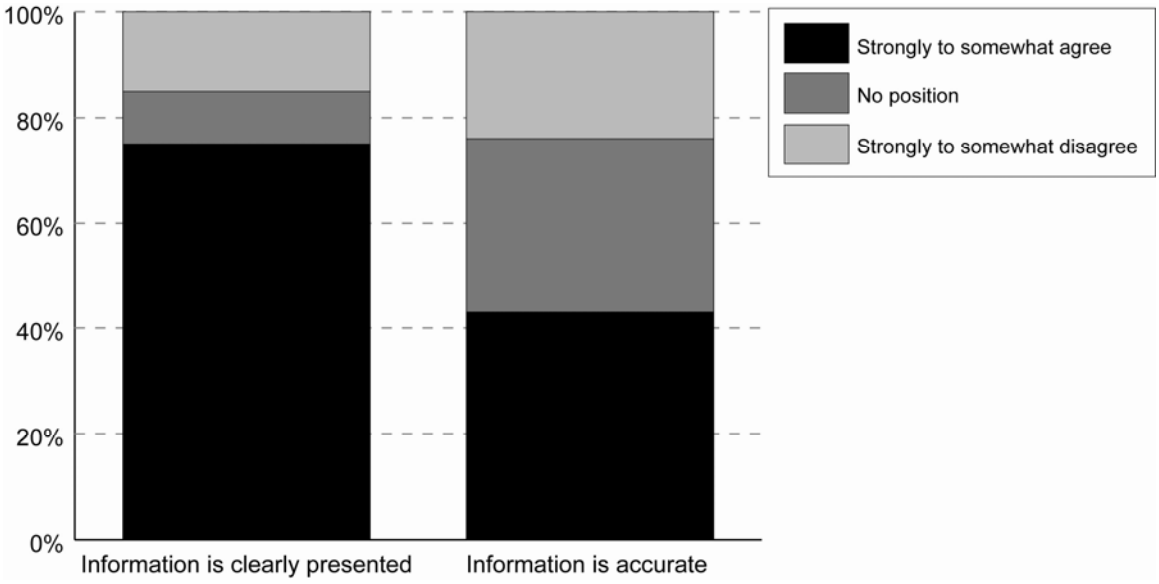


SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.

As shown in Exhibit 32, nearly 80 percent of the respondents agreed or strongly agreed that the information in the methodology section was clearly presented and 43 percent thought the information was accurate. Empire Township in Region 3 questioned whether the board excluded certain areas, such as areas with steep slope, all wetlands greater than five acres, critical dune areas, all non-open space areas, National Park property, and land within 150 meters from inland lakes and rivers. Several local governments in the Northwest Lower Peninsula (Regions 2 and 3), including Empire Township, generally stated that without more detailed maps, it was difficult to assess the accuracy, and in

particular, the board's application of exclusion criteria.[23] A specific issue regarding the accuracy of information used in the analysis related to the treatment of the Charlevoix airport (i.e., whether the airport and surrounding buffer were excluded from the areas where turbines were modeled in the analysis). Additional comments regarding the board's methodology and conclusions are summarized by region below.

EXHIBIT 32
Local Government Comments on Methodology



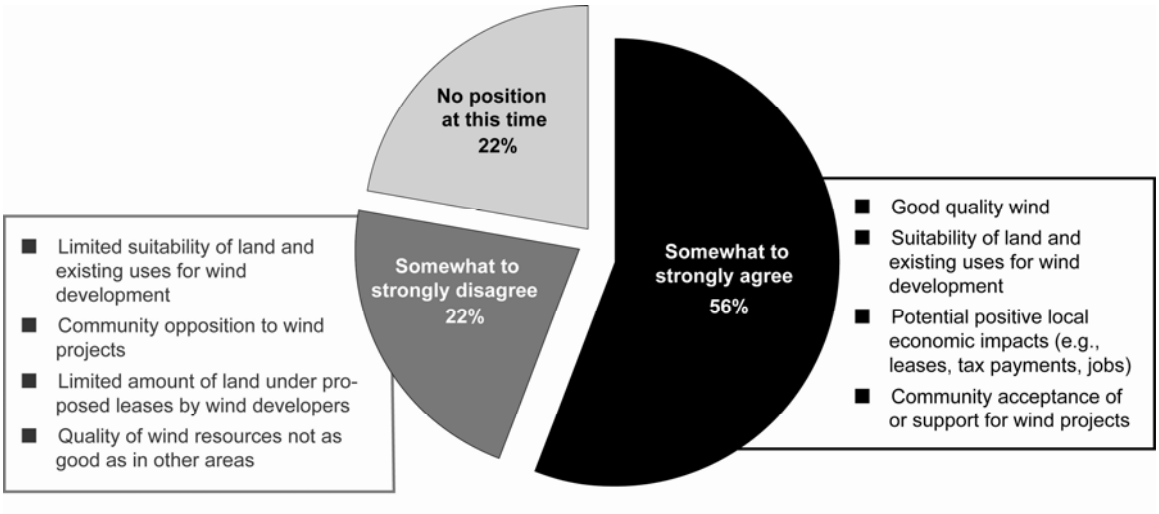
SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.

Inclusion in Identified Regions

The board asked the pertinent local governments whether they agreed with the board's assessment that *their* local unit of government should be included in one of the identified regions with the highest wind energy potential. Fifty-six percent of the respondents strongly agreed or agreed with the board's assessment that their local unit of government should be included within one of the identified regions. Twenty-one percent strongly disagreed or disagreed with this assessment. Exhibit 33 breaks down the responses to this question and identifies the most common reasons for agreement or disagreement with the board's assessment.

[23] Empire Township specifically questioned whether the board excluded certain areas, such as steep slope areas, all wetlands greater than five acres, critical dune areas, all non-open space areas, National Park areas, land within 150 meters from inland lakes and rivers.

EXHIBIT 33
Level of Agreement with Inclusion of Local Government in High Wind Energy Potential Regions



SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.

The breakdown of opinion by local government and region is shown in Exhibit 34. Note that this distribution only includes the local governments that responded to this specific question using the comment form. Through a letter, the following additional local governments addressed, directly or indirectly, this issue of whether they agreed with the inclusion of their local government in a region:

- Region 1: Casco Township and City of Holland (both supportive)
- Region 3: Pleasanton Township (concerns expressed, as discussed below)
- Region 4: Tuscola County (supportive)

EXHIBIT 34
Level of Agreement with Inclusion in a High Wind Energy Potential Region, by Local Government and Region

Level of agreement	**Region 1** (Allegan)	**Region 2** (Antrim and Charlevoix)	**Region 3** (Benzie, Leelanau, and Manistee)	**Region 4** (Bay, Huron, Saginaw, Sanilac and Tuscola)
Somewhat or strongly agree	• Fillmore Twp • Ganges Twp	• Charlevoix County • Hayes Twp	• Empire Twp • Lake Twp (Benzie County) • Platte Twp • Village of Northport	• Fairgrove Twp • Hampton Twp • Huron County • Saginaw County • Twp of Caseville
No opinion			• Cleveland Twp • Leelanau County • Leland Twp	• Lake Twp (Huron County) • Twp of Forester

Level of agreement	Region 1 (Allegan)	Region 2 (Antrim and Charlevoix)	Region 3 (Benzie, Leelanau, and Manistee)	Region 4 (Bay, Huron, Saginaw, Sanilac and Tuscola)
Somewhat or strongly disagree		● Norwood Twp	● Bingham Twp ● Leelanau Twp ● Glen Arbor Twp	● Merritt Twp

SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.

Several local governments that either agreed that their local government should be included in a region or responded "no position," including Cleveland Township, Lake Township (Benzie County), and Northport in Region 3 and Forester Township in the Thumb area (Region 4) questioned the likelihood or viability of such development in their respective jurisdictions given existing land uses, costs, and other considerations. Cleveland Township added that before a reasoned decision can be made and before local government officials can embrace or reject the designation of an actual wind energy resource zone by the MPSC and associated transmission planning, additional site specific information (such as site-specific wind and wildlife assessments, information on local economic impacts, and land availability surveys) would be needed to help the community assess the associated costs and benefits.

Glen Arbor Township, Leland Township, Norwood Township, and Northport generally suggested that commercial-scale wind development in their area may be met with resistance by landowners. The local government respondents described public sentiment related to wind energy development on land in their county, city, village, or township as shown in Exhibit 35. Thirty-six percent of respondents described public sentiment as positive, while 9 percent described it as negative. However, 55 percent either did not know or believed that public sentiment was "undecided or neutral."

EXHIBIT 35
Public Sentiment Related to Wind Energy in Community

Opinion	Percentage
Very positive	9%
Positive	27
Undecided or neutral	32
Negative	9
Very negative	0
Do not know	23

SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.

In addition to the responses to specific questions posed by the board regarding the report and its findings, the board received explanations and other written comments from local governments. A high-level summary of the comments by region is provided below.

Region 1: Allegan County

All four local governments who provided comments from this region—the City of Holland and Townships of Fillmore, Ganges, and Casco—supported the board's report and wind energy systems. Fillmore Township stated that the township is supplying the needed tools for the landowners and developers to make this concept a reality. The City of Holland also highlighted its efforts to promote wind energy development.

Ganges Township noted that the installation of structures of this size and type are not currently permitted in the township, but it is working on an amendment to the township zoning ordinance, which would identify the zones where wind turbines would be permitted and siting requirements.

Region 2: Upper Northwest Lower Peninsula (Portions of Charlevoix and Antrim Counties)

A key issue raised by local governments in this region involved the treatment of the Charlevoix airport. They believe that the wind potential for this region would not be as great had the airport been excluded consistent with other airports in the analysis (i.e., no turbines modeled within a six mile buffer of the airport as discussed in the Methodology section). Norwood Township noted that if the airport had been excluded, Hayes, Marion, Norwood, and the majority of Eveline Township would not have been considered, nor would a substantial portion of Banks Township in Antrim County.

Norwood Township also stated that commercial wind farms are not compatible with its newly revised master plan and that a recent survey, according to the township, revealed that a majority of residents do not want any industrial development in the township.

Charlevoix County recommended excluding turbines from national parks, specifically Pictured Rocks and Sleeping Bear Dunes, as well as state parks and the Lake Charlevoix shoreline. According to Charlevoix County, the board's data sets could reflect the designated areas under the Coastal Zone Management program instead of just the Great Lakes shoreline.

Charlevoix County and Hayes Township emphasized, however, that the Big Rock property along the shoreline is a prime area for commercial wind generators, noting that the infrastructure is in place and there is available wind. (Big Rock is within the one-mile shoreline buffer used in the board's analysis.) Hayes Township also suggested that there are more wind areas in the township than indicated on the map.

The local governments urged the board to hold a hearing within the region to provide opportunities for additional input since the travel time to the other hearings was so great.

Region 3: Northwest Lower Peninsula (portions of Benzie, Leelanau, and Manistee Counties)

Several local governments within Region 3, including the Townships of Cleveland, Glen Arbor, Leelanau, Leland, and Pleasanton, as well as Leelanau County and Northport,

generally expressed concern regarding commercial-scale wind development in their area and related impacts on existing or future uses of land, wildlife, scenic landscape and sensitive areas, and their tourist-dependent economy. Leland Township stressed that the high land values, limited land availability, and topography would deter wind development and that prized views exist throughout the township, not just along Lake Michigan.

Cleveland, Empire, and Glen Arbor Townships and Leelanau County argued that not excluding all properties within Sleeping Bear Dunes National Lakeshore was a significant oversight in the board's report. Cleveland, Glen Arbor, and Lake Townships suggested that the wind potential estimates are overstated considering their position that Sleeping Bear Dunes should be excluded and other factors (such as topology, land values, and sensitive areas). Cleveland Township pointed out that roughly the northern half of the township would be inappropriate for development because of Sleeping Bear Dunes, as well as residential zoning and additional wetland areas that were not considered in the board's methodology. Glen Arbor Township stated that homes and structures may have been overlooked, and that a number of environmental questions would need to be addressed. Pleasanton Township raised general concerns about noise and shadow flicker issues as well as transmission lines associated with wind development and suggested that the board encourage maximum mitigation of impacts.

Leelanau County recommended excluding from wind resource zones any private roads, mineral extraction zones, and state lands. Leelanau County and Leland Township requested additional time for comments and several local governments in this region suggested the creation of higher quality maps to view the exclusion areas.

Region 4: Thumb (Huron County and portions of Bay, Saginaw, Sanilac, and Tuscola Counties)

As discussed above, several local governments in the Thumb region expressed support for the board's report and/or wind energy development, including Huron, Saginaw, and Tuscola Counties and Fairgrove and Hampton Townships. The Village of Sebewaing was also supportive as long there is no unreasonable threat to health or safety and adverse impacts on property are minimal.

Caseville, Lake, and Merritt Townships expressed caution about the siting of wind turbines within their communities primarily because of human health and environmental considerations. The specific issues include: setbacks for homes,[24] land availability,[25] and the Great Lakes shoreline buffer. Merritt Township stated that the development expectations were too high if concentrated in the four regions instead of spread across all nine of the alternative set of regions.

[24] Caseville and Merritt Townships recommended further study and setbacks of at least one mile. Lake Township stated that the Michigan Siting Guidelines for noise (55dBA) are not scientifically based.

[25] Forester Township suggested that development may not be feasible in the township given available land, airport, and local ordinance requirements. Lake Township (Huron County) also pointed out that its planning commission is suggesting significant limitations on wind energy development.

Caseville questioned the board's representation and process, noting that the board does not include any representatives from the Thumb area and did not visit the area prior to designating the area as having the highest wind energy potential in the state.

Local Governments outside Four Regions

Representatives from the following local governments outside the identified regions recommended that the board include their jurisdiction in a high-wind energy potential region in the final report:

- Chassell Township, Houghton County
- Friendship Township, Emmet County (Wind Committee)
- Houghton County
- Harrison Township, Macomb County
- Oceana County

These local governments pointed out that their areas have significant wind energy potential, even in relation to the four identified regions. Houghton County emphasized that at least one site in the Upper Peninsula should be included. According to Houghton County, the Upper Peninsula should have high wind energy potential areas based on the board's criteria due to land availability and wind levels. Oceana County stressed that wind developers are pursuing land for wind development in the county, noting that land leases are in place and a project has already gone through the interconnection process.

Public Hearings and Additional Comments

The board accepted verbal and written comments during and after the two public hearings as well as comments from any interested person or organization through an online comment form. The comments are divided into three groups:

- Bad Axe hearing and written follow-up comments[26]: Twenty-nine persons spoke at the public hearing in Bad Axe on August 24, 2009, and 18 individuals provided written comments at or after the hearing. In addition, the board received two petitions signed by residents in the Thumb area.
- Scottville hearing and written follow-up comments: Fourteen persons spoke at the August 31, 2009, public hearing in Scottville. Four sets of written comments were also received.
- Additional comments submitted using online form: Twenty-four persons or organizations other than local governments within the four identified regions submitted comments via the online form addressing the quality and conclusions of the board's report. Nine of these comments came from individuals affiliated with an

[26] Refers to the written follow-up comments related to region 4 (Thumb area) that were received after the hearing. This does not include the responses to the online form; in cases where statements addressing the same issue were made by the same individual at the hearing and in a follow-up letter and/or the online form, the comment is only counted once under the respective hearing category. This was handled in the same way for the Scottville hearing.

organization;[27] the remaining comments were submitted by individuals who did not list an affiliation and resided both inside and outside of the four regions, including Cedar, Empire, Hayes Township, Kalamazoo, Ludington, Oliver Township, Romeo, and Ubly. Some respondents did not provide an address.

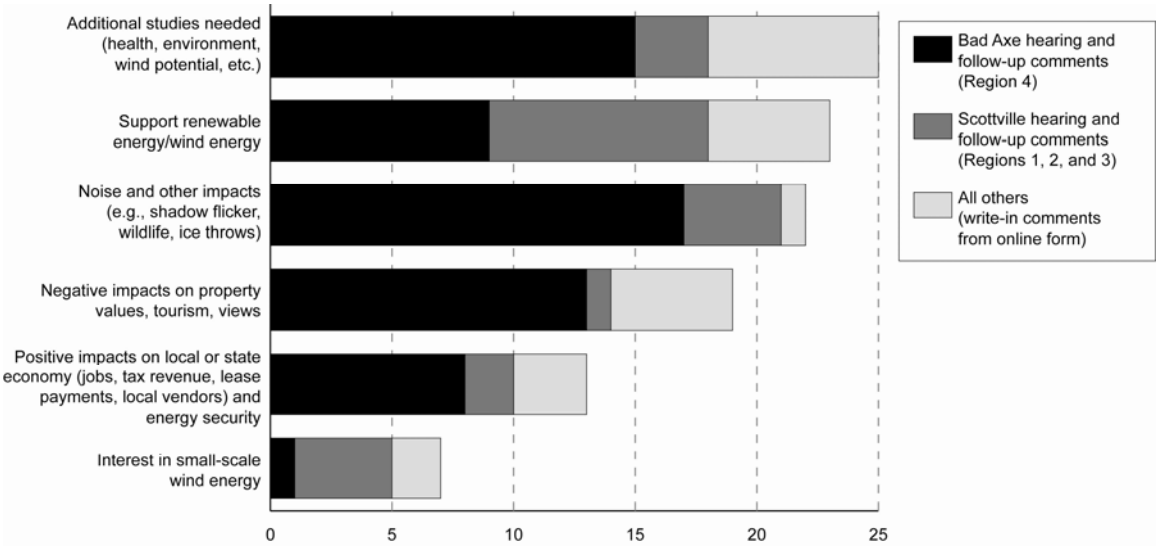
Two major groupings, or categories, of issues were raised through this comment process: (1) wind energy in general, including both negative and positive impacts; and (2) comments specific to the board's proposed report (including methodology) and process. Exhibits 36 and 37 summarize the most frequently raised issues within these two general categories and show the number of people or organizations who raised these issues during and after the public hearings and in response to the board's online comment form. This data does *not* include: (1) the comments from *local governments* within the four regions, which are summarized above; and (2) a total of 119 individuals from the Thumb area who signed petitions, which are summarized below:

- Forty-one people signed a petition stating that they were residents and/or property owners in Huron County and were "against any identification of a wind energy zone until such time as comprehensive, scientific and medical studies are completed to determine appropriate setback guidelines that will protect the health of our residents."
- Seventy-eight people signed a petition stating that they were property owners in Lake Township, Huron County, and requested that Lake Township be excluded from Region 4 because of possible negative impacts on the local economy and tourist industry, their desire for larger setbacks for homes, and sensitive areas.[28]

[27] These nine comments were from: Chassell Township, Houghton County (local government outside four regions), Leelanau Heritage Route (M-22) Committee, Leelanau Township Planning Commission (additional comments from two planning commission representatives); Michigan Alternative Energy Project; Northport Energy Action Task Force; Oceana County Board of Commissioners (local government outside four regions); Sleeping Bear Dunes National Lakeshore; and Theut Products Inc.

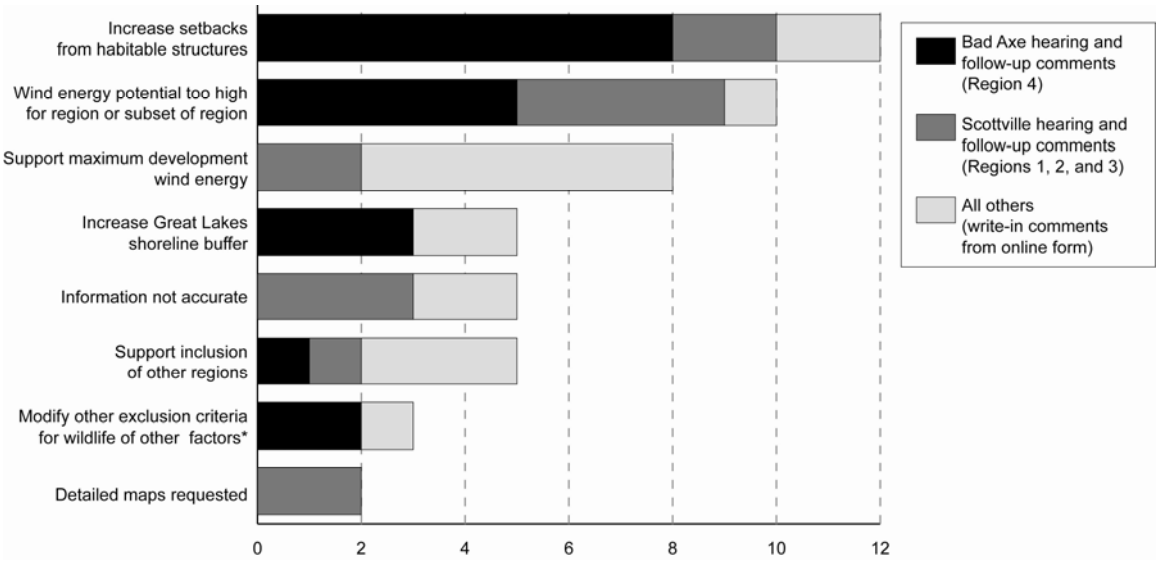
[28] The Lake Township resident petition references guidelines or recommendations on the placement of wind turbines from a 2007 letter from the U.S. Fish and Wildlife Service (USFWS) to a Lake Township official. Although the petition does not specifically request that these USFWS recommendations should be the basis for new or revised exclusion criteria in the board's methodology for determining the regions with the highest wind energy potential, it suggests that the township would have been excluded if these guidelines had been applied. Copies of the petitions and referenced USFWS letter are included as part of the board's public comment records available at www.michigan.gov/windboard.

EXHIBIT 36
General Wind Energy Issues Most Frequently Mentioned through Comment Process



SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.

EXHIBIT 37
Frequently Mentioned Comments on WERZ Board's Proposed Report



SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.
* Includes proposed buffers or guidelines for addressing wildlife (e.g., migratory pathways, protected species), restored wetlands, inland lakes, and other environmental considerations as part of board's analysis to identify the highest wind energy potential regions.

Exhibits 36 and 37, and the additional discussion below, generally convey statements made during the comment process. Individual comments regarding particular issues may have been phrased slightly differently and may differ somewhat from the characterization of issues presented in this report.

As shown in Exhibit 36 and 37, the comments generally fall into two broad categories: (1) the potential impacts (negative and positive) of wind energy, such as noise, shadow flicker, health impacts, quality of life, and economic impacts; and (2) siting-related issues, including the proximity of wind turbines to habitable structures and sensitive environmental areas. Within this second category of comments, certain individuals or organizations recommended, either directly or indirectly, that the board include in its analysis new or modified exclusion criteria to limit where turbines were modeled. Such recommendations included, but were not limited to, the following:

- Increase setback from habitable structures from 200 meters to at least one mile
- Increase buffer from Great Lakes shoreline to three miles
- Exclude state and/or national parks
- Exclude wildlife refuges or feeding areas of sensitive species
- Exclude other areas, including restored or smaller wetlands and additional land around inland lakes

Appendix E includes the tallied responses from all individuals and organizations that completed the online comment form. Exhibit 38 summarizes the responses related to clarity and accuracy of information presented in specific sections of the board's report. (These data do not reflect the responses from local governments within the four regions, which are summarized above.)

EXHIBIT 38
Summary of Comments on Quality of Key Sections of Board's Report, "All Other" Group

	Executive Summary		Methodology		Findings	
	Information is clearly presented	Information is accurate	Information is clearly presented	Information is accurate	Information is clearly presented	Information is accurate
Somewhat or strongly agree	74%	57%	79%	55%	82%	51%
Somewhat or strongly disagree	18	18	11	17	12	26
No opinion	9	26	11	28	6	25

SOURCE: Public Sector Consultants Inc., prepared on behalf of the WERZ Board, 2009.
NOTE: No local governments within the identified regions are included in this group.

Overall, these responses were consistent with the responses from local governments within the regions, with the majority of respondents agreeing that the information is accurate and a greater percentage agreeing that the information is clearly presented. In addition, the two groups had very similar responses regarding the appropriateness of

conclusions in the report: 67 percent of local governments within regions who responded and 69 percent of the other respondents either strongly somewhat agreed that the conclusions in the finding section seem appropriate.

The majority of respondents (nearly 72 percent) either strongly or somewhat agreed with the board's assessment of the four regions in the board's report.

All of the comments, including transcripts from the two public hearings, are available at www.michigan.gov/windboard.

SUMMARY OF BOARD'S CHANGES TO REPORT

The board reviewed all of the comments received and appreciates the insights and information on its proposed report, as well as potential issues related to the siting of wind energy systems in the state. Based on the comments received, it appears that clarification on the intent and effect of the board's report is warranted. In addition, this final report includes a few corrections, which are explained below.

Clarification

Many comments focused on potential impacts—both positive and negative—of wind energy development in general and within the four identified regions. In addition, the board received comments suggesting that more site-specific information should be considered and that the board should apply new or more stringent criteria in its analysis to limit where turbines could be located, either across the state or in specific locations.

The comments get to the heart of issues that communities, developers, and others will grapple with as wind energy proposals move forward in the state. Issues related to siting of wind turbines, including noise, safety, health, wildlife, and economic impacts, are complicated and site specific. Although the board expects that appropriate mitigation of impacts would occur as part of siting and operations of commercial wind energy systems, it is not the board's role to set policy or provide recommendations related to the siting or operational requirements of wind energy systems. Siting of such facilities is currently under the jurisdiction of local governments. Landowners—both public and private—will also have a critical role in affecting where wind energy development will occur.

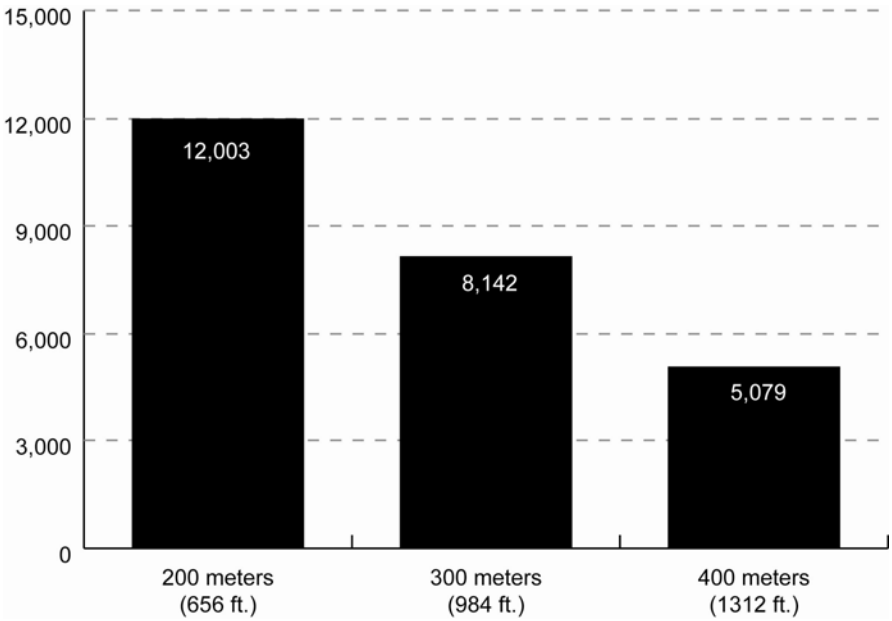
Many factors such as siting requirements, community acceptance, environmental issues, and economics will influence whether the wind energy potential in individual regions or MPSC-designated zones is realized. The board used "exclusion criteria" as one of the initial steps in estimating the potential to determine where turbines should not be modeled. Perhaps equally important—but not addressed by *any* of the comments—was the board's decision to apply significant percentage reductions (81 percent and 66 percent) to calculate its final minimum and maximum wind energy production estimates for the four regions in the belief that these across-the-board percentage reductions would effectively account for many of the site-specific considerations or issues raised by the comments received that would exclude particular areas. Therefore, the board has not

changed the exclusion criteria in this final report, except to correct the application of the criteria in a specific instance as noted below.

Nonetheless, the board analyzed the impacts that different setbacks from habitable structures would have on the theoretical number of turbines in each of the four regions. Specifically, as shown in Exhibit 39, the board compared the 200-meter setback used in its analysis with alternative setbacks of 300 and 400 meters. Like the other exclusion criteria used by the board, the 200-meter setback is not intended to serve as a recommended siting guideline. The theoretical number of turbines at 200 meters shown in Exhibit 39 differs from the estimated number of turbines included in the board's findings as shown in Exhibit 12 because it does not account for the final step in the board's analysis, which reduced the theoretical number by 81 percent and 66 percent to account for account for, among other factors, different local zoning ordinances and other constraints that would affect the actual placement of turbines such as noise and other considerations. Had the board used a more restrictive setback than the 200-meter setback for all areas, the percentage reductions would not have been as high.

EXHIBIT 39

Number of Theoretical Wind Turbines Using Different Setbacks from Structures



Setback from structures	Original Theoretical Number of Turbines	Turbine Reduction	New Number of Turbines	% Reduction
Total - All Four Regions	**12,003**			
300 Meters (984 ft.)		3,861	8,142	32%
400 Meters (1312 ft.)		6,924	5,079	58%
Region 1	**872**			
300 Meters (984 ft.)		288	584	33%
400 Meters (1312 ft.)		511	361	59%

Setback from structures	Original Theoretical Number of Turbines	Turbine Reduction	New Number of Turbines	% Reduction
Region 2	**537**			
300 Meters (984 ft.)		142	395	26%
400 Meters (1312 ft.)		254	283	47%
Region 3	**2,288**			
300 Meters (984 ft.)		567	1,721	25%
400 Meters (1312 ft.)		1,074	1,214	47%
Region 4	**8,306**			
300 Meters (984 ft.)		2,864	5,442	34%
400 Meters (1312 ft.)		5,085	3,221	61%

SOURCE: Public Sector Consultants Inc., using data compiled and analyzed by Michigan State University Land Policy Institute, 2009.
NOTE: The estimates do not reflect the 81 percent and 66 percent reductions to determine the minimum and maximum number of turbines.

Limits

Both the duration and scope of the board's charge set by PA 295 are limited. The board is charged only with estimating the regions of the state with the highest wind energy potential and providing its report to MPSC, which will designate one or more wind energy zones. The board dissolves 90 days after the issuance of this final report. It is important to note, that, in making its decision to designate one or more zones, PA 295 requires the MPSC to ensure that the designation of a zone does not represent an unreasonable threat to the public convenience, health, or safety and that any adverse impacts on private property are minimal. The law also states that any zone designated by the MPSC must also exclude property zoned residential as of the date of the board's proposed report, unless land is subsequently re-zoned as nonresidential.[29] Finally, the MPSC is required by PA 295 to consider the projected costs and benefits in terms of long-term production capacity and long-term needs for transmission.

In conclusion, the board finds that many of the issues raised by the comments, including health and safety impacts, economic considerations, setback requirements, and other siting issues, are beyond the scope of the board. The board expects, however, that these issues will be addressed through the MPSC process or as part of siting individual wind energy systems at the local level.

Corrections and Other Changes to Report

Charlevoix Airport

Based on the comments received and further inquiry by the board's consultants, the board found that due to a data error, the proposed report did not exclude the land around the Charlevoix airport from the areas where turbines were modeled in the board's analysis.[30] This final report corrects the error and the corresponding minimum and maximum

[29] PA 295, section 147(2).
[30] Specifically, there was a data-entry error in the Federal Aviation Administration Airport database and subsequently in the Earth Science Research Institute Maps of airports in Michigan.

estimates of wind energy production potential for Region 2. To make the correction, the board first reduced the theoretical number of turbines by a total of 36 to account for the airport buffer. The two townships affected were Norwood (8 turbines removed) and Marion (28 turbines removed).[31] The board then recalculated and revised the minimum and maximum wind energy capacity and annual energy production for Region 2. With the correction, both of these townships remain part of Region 2.

Other Changes

The board also made a few non-substantive corrections and updated the report to reflect events since the issuance of the proposed report.

[31] Norwood remains a tier-one township and part of the core of Region 2 after the removal of these turbines. Marion Township is still included in the region as it was tier two township that is adjacent to the tier-one townships.

Conclusions

After considerable analysis, the board identified a total of four regions of the state with the highest wind energy harvest potential. These four regions are all located in the Lower Peninsula—along the western side of the state and in the Thumb. Among all of the identified regions, Region 4 (covering the Thumb area), clearly has the highest wind energy production potential.

The board conducted a high-level statewide assessment of the best wind resource areas based on the wind resources, land availability, and expected power production. The board also found that there is the potential for wind energy to be a commercial source of generation in the state, and particularly in these regions. The board's assessment does **not** consider, however, site-specific issues that may affect the viability of any particular location to support the commercial wind systems. For example, local zoning, social factors (such as public acceptance), or site-specific environmental features could prohibit wind energy development or make it uneconomical or infeasible to site turbines in any particular area.

The board also found a significant number of active interconnection requests for wind energy systems under study in the interconnection queue of the Midwest ISO and distribution utilities. Many of these requests are located in Region 4. The queue is one indicator of potential development patterns.

Future wind energy development activity in the identified regions or any other parts of the state will be driven largely by market forces, local government decisions, and other factors. The board's identification of the four regions and any subsequent wind zone designation by the MPSC may, however, facilitate the planning and development of wind energy and transmission infrastructure.

Appendix A:
MPSC Order Creating WERZ Board

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

* * * * *

In the matter, on the Commission's own motion, to create the wind energy resource zone board and to outline its responsibilities.	))))	Case No. U-15899

At the December 4, 2008 meeting of the Michigan Public Service Commission in Lansing, Michigan.

PRESENT: Hon. Orjiakor N. Isiogu, Chairman
Hon. Monica Martinez, Commissioner
Hon. Steven A. Transeth, Commissioner

ORDER

On October 6, 2008, Governor Jennifer M. Granholm signed Public Act 295 of 2008 (Act 295) into law. Section 143 of Act 295, which is also known as the "Clean, Renewable, and Efficient Energy Act", provides that "[w]ithin 60 days after the effective date of this act, the commission shall create the wind energy resource zone board." The Commission was directed by the Legislature to appoint persons to the wind energy resource zone board from the following organizations and interest groups: one member representing the Commission, two members representing the electric utility industry, one member representing alternative electric suppliers, one member representing the Attorney General, one member representing the renewable energy industry, one member representing cities and villages, one member representing townships, one member representing independent transmission companies, one member representing a statewide environmental organization, and one member representing the public at large.

After due consideration, the Commission appoints the following individuals to the wind energy resource zone board:

Trevor Lauer – representing the electric utility industry.
David Walters – representing the electric utility industry.
Robert Ianni – representing the Attorney General.
John Miceli – representing alternative electric suppliers.
Steve Brock – representing cities and villages.
Gene Jorissen – representing townships.
Roger Kershner – representing the renewable energy industry.
David Wright – representing a statewide environmental organization.
Thomas Vitez – representing independent transmission companies.
Mary Templeton – representing the public at large.
Julie Baldwin – representing the Commission.

To function as a deliberative body, the wind energy resource zone board shall have a quorum of 6 or more members in attendance at its business meetings. Members may attend in person or via teleconferencing devices. Members may appoint a delegate to represent them in their absence by notifying the Commission's Executive Secretary in writing of the appointment. A duly appointed delegate shall have the same authority as the member who appointed the delegate. The wind energy resource zone board shall be subject to the provisions of the Open Meetings Act, MCL 15.261 *et seq*., and the Freedom of Information Act, 15.231 *et seq*.

The board's statutorily-enumerated responsibilities include consulting with local units of government in the study of wind energy production potential and the viability of wind as a source of commercial energy generation in this state and the availability of land in this state for potential utilization by wind energy conversion systems. Act 295, Section 145(2)(a)(i)-(ii). The board is also required to "[c]onduct modeling and other studies related to wind energy, including studying existing wind energy conversion systems, estimates for additional wind energy conversion system development, and average annual recorded wind velocity levels." Act 295, Section 145(2)(b). In this regard, the Legislature has provided that the board's studies "should include examination of

wind energy conversion system requests currently in the applicable regional transmission organization's generator interconnection queue." Act 295, Section 145(2)(b).

By 240 days after enactment of Act 295 (no later than June 2, 2009), the wind energy resource zone board is required to issue a proposed report detailing its findings. The board's proposed report shall include a list of regions in the state with the highest level of wind energy harvest potential, a description of the estimated maximum and minimum wind generating capacity in megawatts that can be installed in each identified region of this state, an estimate of the annual maximum and minimum energy production potential for each identified region of this state, and an estimate of the maximum wind generation capacity already in service in each identified region of this state. Act 295, Section 145(3)(a)-(d).

Copies of the wind energy resource zone board's proposed report shall be submitted to the legislative body of each local unit of government located in whole or part within regions in the state with the highest level of wind energy harvest potential. Such legislative bodies may submit comments to the board on the proposed report within 63 days after submission of the proposed report to the legislative body. After expiration of the deadline for comments, the board shall hold a public hearing on the proposed report. Additionally, the board may hold a separate public hearing in each region listed under Section 145(3)(a) of Act 295 that has the highest level of wind energy harvest potential. The board shall give written notice of a public hearing under Section 145(4) to the legislative body of each local unit of government located in whole or part within the region or regions that are the subject of the hearing and shall publish the notice in a newspaper of general circulation within the region or regions.

Within 45 days after satisfying the requirements of Section 145(4), the board shall issue a final report as described in Section 145(5).

After the board issues its final report, the Commission's Executive Secretary shall post the report in this docket and serve a copy of the report on all electric utilities, affiliated transmission companies, and independent transmission companies with transmission facilities within or adjacent to regions of this state identified in the board's report. Thereafter, these electric utilities, affiliated transmission companies, and independent transmission companies shall have 45 days to identify existing or new transmission infrastructure necessary to deliver maximum and minimum wind energy production potential for each of those regions and to submit such information to the board for its review. The board then has 45 days to wrap up its assignments because, by Section 145(7), the board is to be dissolved 90 days after it issues its report.

THEREFORE, IT IS ORDERED that:

A. The wind energy resource zone board is created as described in this order.

B. The persons listed in this order are appointed to the wind energy resource zone board created by this order.

The Commission reserves jurisdiction and may issue further orders as necessary.

Any party desiring to appeal this order must do so in the appropriate court within 30 days after issuance and notice of this order, under MCL 462.26.

MICHIGAN PUBLIC SERVICE COMMISSION

_____

Orjiakor N. Isiogu, Chairman

_____

Monica Martinez, Commissioner

_____

Steven A. Transeth, Commissioner

By its action of December 4, 2008.

_____

Mary Jo Kunkle, Executive Secretary

Appendix B:
Detailed Methodology and Assumptions

This appendix discusses in detail the methodology and assumptions used by the board to assess the regions of the state with the highest wind energy potential, the availability of land for potential use by wind energy systems, and the viability of wind as a commercial source of generation. The WERZ Board worked with the Michigan State University Land Policy Institute (LPI) to develop the methodology and assumptions, conduct the analyses, and interpret the results.

Wind Resources

At the beginning of its analysis, the board determined the appropriate wind data to be used. There are two potential data sources for wind resources in Michigan, each with its own drawbacks. The first option is the wind resource map produced by AWS TrueWind in conjunction with the National Renewable Energy Laboratory and the State of Michigan (2005) showing wind speeds at an elevation of 50 meters. This wind resource map is based primarily on computer modeling but has been validated with actual wind measurements at various sites in Michigan. Although the 50-meter map is generally accepted as the best validated wind resource map available for Michigan, using it exclusively for this analysis is impractical because wind turbines currently used in the industry typically have hub heights ranging from 80 to 100 meters. The 50-meter map would, therefore, be unrealistically conservative, since wind speeds are generally faster at higher elevations.

The second resource map is the 100-meter wind speed map, which is also produced by AWS TrueWind (2004). The 100-meter map corresponds better with the typical turbine height, but there are limited actual wind measurements at 100 meters to validate the data. Using this data as a basis for estimated power potential could result in error, since actual wind speeds may be higher or lower than represented by the modeling for that location.

In view of these data limitations, the board used a hybrid approach to obtain a reasonable wind resource data set, recognizing the limitations of exclusively using the 50-meter or 100-meter data. That is, the board used the 50-meter wind resource map but then populated the areas rated Class 3 or higher at 50 meters with the 100-meter wind resource data set. Potential error was thus limited by using the 100-meter data set only in areas that had good-quality wind based on the more conservative 50-meter data. For comparison, the board also ran scenarios using the 50-meter data and the 100-meter data exclusively.[1]

[1] The 100-meter data was used statewide with a lower average speed cutoff of 6.5 meters per second. Areas below Class 3 on the 50-meter map were not included.

Standard Turbine Type

The board used two sample turbines in its analysis: a 1.5-megawatt turbine with a hub height of 80 meters and a 2.5-megawatt turbine with a hub height of 100 meters.[2] These two turbines represent standard turbines used by industry. The 1.5-megawatt turbine was ultimately used to calculate the estimates of the generating capacity and annual energy production for the identified regions.

Land Availability

To determine the land available for use by potential wind energy systems, the board started with the whole state and then excluded areas that were not suitable based on their wind speeds, existing uses, terrain, and other natural features. The exclusion criteria are summarized in Exhibit B-1. The exclusion criteria were based primarily on Michigan State Guidelines for wind turbine siting, as well as input from wind energy developers and other experts.

EXHIBIT B-1
Summary of Exclusion Criteria

Excluded area or buffer	Description	Data source
Great Lakes shoreline	A one-mile buffer inland from each of the Great Lakes was removed to minimize considerations related to disruption of the view, tourism, and potentially ecologically sensitive areas close to shore, i.e., sensitive dune habitat	Michigan Center for Geographic Information (2008b)
Areas not defined as "open space"	Limited turbine placement to areas with open space classification, which consists of six land cover types: agricultural land, shrub scrub, forest land, barren land, pasture, and grassland	U.S. Geological Survey 2001 National Land Cover Database (2003)
Airports	Excluded areas within 10 miles of commercial airports, 6.32 miles of local airports, and 1.25 miles of small airports (See Note 1)	Environmental Systems Research Institute (2001)
Wetlands	Excluded emergent, forested, and shrub-scrub wetlands, from the National Wetland Inventory, greater than 5 acres (See Note 2)	U.S. Fish & Wildlife Service, National Wetlands Inventory (1994–1997)
Lakes and rivers	Excluded areas within specified distance based on turbine height (i.e., 120 meters or 150 meters)	Michigan Center for Geographic Information (2008c)
Housing and other structures	Excluded areas within 200 meters of built areas, as defined by National Oceanic and Atmospheric Administration (See Note 3)	NOAA, *Land Cover Classification of Michigan* (2001)

[2] To calculate the power output in the model, the board assumed the 1.5 megawatt turbine was a GE XLE and the 2.5 megawatt turbine was a Clipper Liberty. The board is not endorsing the use of these turbines or the manufacturers.

Excluded area or buffer	Description	Data source
Roads	Excluded areas within specified distance of all public roads (i.e., 120 meters or 150 meters) (See Note 4)	Michigan Center for Geographic Information (2008a)
State land	Examined three options based on state land availability: (1) State lands were not excluded (that is, state lands were treated like non-state land and turbines were modeled in state lands, including parks, forests, and management areas); (2) All state land excluded; and (3) Turbines limited to state forest management areas only	Ducks Unlimited and the Nature Conservancy in Michigan, Conservation and Recreation Lands (CARL) (2008)
Slope	Land with slope greater than 20% excluded	U.S. Geological Survey (1994)
Urban areas	Excluded all urbanized areas	U.S. Census Bureau (2000)

SOURCE: Michigan State University Land Policy Institute, 2009.
NOTES: (1) Airport exclusions are based on expert input from wind developers in Michigan.
(2) Wetlands greater than 5 acres require permitting and mitigation for construction of turbines and represent additional engineering challenges and material costs for the installation of wind turbines.
(3) This was to account for the state siting guidelines related to turbine noise (i.e., turbine noise at property lines should be less than 55DBa). Both turbine types used in the board's analysis show a noise signature of 55DBa or less at 150 meters; the added 50 meters accounts for lack of information on the location of property lines.
(4) The state siting guidelines require road setbacks of 1.5 times tower height. Because two different turbines (80 meter and 100 meter) were used in the analysis, two sets of setbacks were developed: 120 and 150 meters for the smaller and larger turbines, respectively.

In all scenarios, the board assumed that federal lands were available for potential placement of wind turbines except in areas that were otherwise removed from consideration due to the exclusion criteria shown in Exhibit B-1, including, but not limited to, lakes and rivers, wetlands, steep slope, and the one-mile buffer for the Great Lakes shoreline. In addition, the board did not model any turbines on Isle Royale and North and South Manitou Islands, all of which are federal lands.

Turbine Spacing and Layout

After identifying the areas of the state that may be available for potential use by wind energy systems based on the application of the exclusion criteria, the remaining areas were overlaid with a grid of wind turbines spaced 450 meters apart based on the inter-turbine spacing required to minimize interference between turbines, known as wind robbing.[3] This results in the theoretical maximum number of turbines that can be placed in a particular area. Because the theoretical maximum is unrealistic, a series of factored reductions was applied to develop a more reasonable estimate of the number of turbines, as detailed later in this section.

[3] This happens when an upwind turbine is placed too close to a downwind turbine and thereby reduces the wind resource available to the downwind turbine.

Estimates of Generating Capacity and Annual Energy Production

The total generating capacity in megawatts (MW) was calculated by multiplying the nameplate capacity of each turbine by the total number of turbines in the township.[4] The annual energy production potential in megawatt-hours (MWh) was calculated for each turbine based on average wind speed, the power curves of the specified turbines, variability of wind speeds, interconnection efficiency, and other factors.[5] The total annual energy production within each township of the state was then calculated by summing the potential of all wind turbines that were placed within the township for this analysis. This resulted in theoretical estimate of capacity and energy production potential by township based on the hypothetical placement of the turbines.

It is unlikely, however, that there would ever be a full buildout in any region because of numerous factors. Therefore, the board reduced by an aggregate percentage the theoretical calculations in its base-case scenario (i.e., 120-meter setbacks for roads, rivers, and lakes assuming a 1.5-megawatt turbine with all state land available) to account for a variety of factors that would likely affect the placement and number of turbines. Specifically the board reduced the theoretical calculations by 81 percent and 66 percent, respectively, to estimate the minimum and maximum wind generating capacity and annual energy potential for each region. These percentages were based on available information and general trends related to the factors listed below, not individual site-specific conditions, which may differ significantly. The National Renewable Energy Laboratory and others have also reduced estimates of wind energy potential for various states using an aggregate percentage to account for these types of factors.

- **Land leases or easements:** One key factor that affects wind farm development is that not all landholders are willing to engage in a long-term lease or easement contract, thus precluding their land from other uses or development.
- **Land fragmentation:** A commercial wind farm consists of a concentration of wind turbines. 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.
- **Local zoning restrictions:** Local zoning coded addressing wind facilities in Michigan are highly variable. Given tower height restrictions, the available land in any given township could be close to zero or as high 9 percent.
- **Competing land uses (development for other purposes):** There are many types of development, among which wind farm development is only one. Communities and landowners may have other ideas for the land identified as potentially available for

[4] Because turbines were not placed in cities and villages in the regions due to the application of exclusion criteria (e.g., road setbacks, etc.), this discussion refers to townships only.

[5] This calculation was performed with a Wiebull-shape parameter of 2, standard temperature and pressure, and 285-meter elevation. This elevation is the average height above sea level for Michigan and relates to the air density, which can affect the power output.

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. (Lark 2007, Elliot et al. 1991).

- **Sensitive areas:** There are many environmentally sensitive areas within the state with unique species and habitats. Statewide data on all potential instances of these sensitive species and habitats is unavailable and there is very limited detailed data on migratory and bird flight paths. There are also cultural or historic sites that may need to be evaluated and avoided as part of the siting process. The percentage reduction was intended to account for these sensitive environmental, cultural, and historic sites, which may include wildlife refuges, feeding areas of protected species, and sensitive federal, state, and private lands.
- **Residential zoning:** The amount of land zoned as residential in the identified regions is unknown and gathering such information is beyond the scope of this analysis. The board assumed some reduction for residential zoning based on the ratio of residential land to other types statewide (USGS 2003a).

Selection of Regions

All of the townships were classified into tiers based on the estimates of per turbine energy production (MWh/turbine) and total annual energy production (MWh) for the township. These tiers were established using a statistical method to group together townships with similar characteristics in terms of the wind potential.[6] In the analysis used to select the four regions identified in this report, the board selected only those clusters of townships that were in the top tier out of five tiers total (those with the very best wind energy potential). The board also included within the region the adjacent townships that were in the second tier (i.e., next highest) and an additional ring of adjacent townships beyond that (to account for potential error in the wind speed data).

Because there are other areas of the state with wind quality that would support utility-scale wind development, the board also considered an alternative classification model based on 15 tiers, with the townships in the top five tiers selected as the core of the region. In this alternative approach, the immediately adjacent townships were included to derive a region. This approach identified nine candidate regions. However, the board did not use this alternative approach because it believed only the regions with the highest wind potential should be selected. The nine regions based on this alternative approach are shown in Appendix C for reference.

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[6] Specifically, the Jenks' natural breaks classification scheme was used. It determines the best arrangement of values.

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Appendix C:
Nine Alternative Regions

SOURCE: Public Sector Consultants Inc., 2009, using research findings from Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.

Region	County	Township
1	Bay	Hampton, Merritt, and Portsmouth
	Huron	Bingham, Bloomfield, Brookfield, Caseville, Chandler, Colfax, Dwight, Fair Haven, Gore, Grant, Hume, Huron, Lake, Lincoln, McKinley, Meade, Oliver, Paris, Rubicon, Sand Beach, Sebewaing, Sheridan, Sherman, Sigel, Verona, and Windsor
	Saginaw	Blumfield, Buena Vista, Zilwaukee
	Sanilac	Austin, Bridgehampton, Custer, Delaware, Forester, Marion, Minden, Sanilac, Washington, Watertown, and Wheatland
	Tuscola	Akron, Almer, Columbia, Denmark, Elkland, Ellington, Elmwood, Fairgrove, Gilford, Indian Fields, Juniata, Novesta, Port Austin, Wells, and Wisner
2	Antrim	Banks
	Charlevoix	Eveline, Marion, Norwood, and South Arm
	Emmet	Bliss, Center, Cross Village, Friendship, Pleasant View, Readmond, and Wawatam
3	Benzie	Almira, Benzonia, Blaine, Crystal Lake, Gilmore, Homestead, Joyfield, Lake, Platte, and Weldon
	Leelanau	Bingham, Centerville, Cleveland, Empire, Glen Arbor, Kasson, Leelanau, Leland, Solon, and Suttons Bay
	Manistee	Arcadia, Bear Lake, Onekama, and Pleasanton
4	Mason	Amber, Hamlin, Pere Marquette, Riverton, Summit
	Muskegon	Blue Lake, Fruitland, Montague, Whitehall, and White River
	Oceana	Benona, Clay Banks, Golden, Grant, Hart, Otto, Pentwater, Shelby, and Weare
5	Allegan	Casco, Clyde, Dorr, Fillmore, Ganges, Heath, Laketown, Lee, Manlius, Overisel, Salem, and Saugatuck
	Kent	Algoma, Alpine, Byron, Plainfield, Solon, Sparta, and Tyrone
	Muskegon	Casnovia
	Ottawa	Allendale, Blendon, Chester, Georgetown, Grand Haven, Holland, Jamestown, Olive, Park, Port Sheldon, Robinson, Wright, and Zeeland
6	Berrien	Bainbridge, Baroda, Benton, Coloma, Hagar, Lake, Lincoln, Oronoko, Pipestone, Royalton, Sodus, and Watervliet
	Cass	Silver Creek
	Van Buren	Hartford and Keeler
7	Lenawee	Blissfield, Deerfield, Ogden, and Riga
	Monroe	Bedford, Erie, Ida, Lasalle, Summerfield, and Whiteford
8	Gratiot	Arcadia, Bethany, Emerson, Hamilton, Lafayette, North Star, Pine River, and Wheeler
	Saginaw	Lakefield and Marion
9	Houghton	Calumet, Franklin, Hancock, Osceola, Portage, Schoolcraft, and Torch Lake
	Keweenaw	Allouez, Eagle Harbor, Grant, Houghton, and Sherman

SOURCE: Michigan State University Land Policy Institute, 2009, prepared for WERZ Board.
NOTE: The additional governments within the geographic area of the nine regions but not included in the calculation of the regions' wind energy potential are as follows (by county):
Bay County (Region 1)—Bay City and Essexville
Huron County (Region 1)—Bad Axe, Caseville, Elkton, Harbor Beach, Kinde, Owendale, Pigeon, Pointe aux Barques Township, Port Austin, Port Hope, Sebewaing, and Ubly
Saginaw County (Region 1)—Saginaw and Zilwaukee
Sanilac County (Region 1)—Applegate, Carsonville, Deckerville, Forestville, Minden City, Port Sanilac, and Sandusky
Tuscola County (Region 1)—Akron, Caro, Cass City, Fairgrove, Gagetown, Reese, and Unionville
Antrim County (Region 2)—Ellsworth
Charlevoix County (Region 2)—Boyne City, Charlevoix Township, and East Jordan
Emmet County (Region 2)—Mackinaw City
Benzie County (Region 3)—Benzonia, Beulah, Elberta, Frankfurt, Honor, Lake Ann, Thompsonville
Leelanau County (Region 3) —Empire, Northport, and Suttons Bay
Manistee County (Region 3)—Bear Lake and Onekama
Mason County (Region 4)—Ludington and Scottville
Muskegon County (Region 4)—Lakewood Club, Montague, and Whitehall
Oceana County (Region 4)—Hart, New Era, Pentwater, Rothbury, and Shelby
Allegan County (Region 5)—Douglas, Fennville, Holland, Saugatuck, Saugatuck Township, and South Haven
Kent County (Region 5)—Casnovia, Cedar Springs, Kent City, Rockford, Sparta, and Walker
Muskegon County (Region 5)—Casnovia
Ottawa County (region 5)—Coopersville, Grand Haven, Holland, Hudsonville, Spring Lake, and Zeeland
Berrien County (Region 6)— Baroda, Benton Harbor, Berrien Springs, Bridgman, Coloma, Eau Claire, Shoreham, Stevensville, and Watervliet
Cass County (Region 6)—Dowagiac
Van Buren County (Region 6)—Hartford and South Haven
Lenawee County (Region 7)—Blissfield and Deerfield
Monroe County (Region 7)—Luna Pier and Petersburg
Gratiot County (Region 8)—Alma, Breckenridge, Ithaca, and St. Louis
Houghton County (Region 9)—Calumet, Copper City, Hancock, Houghton, Lake Linden, and Laurium
Keweenaw County (Region 9)—Ahmeek

Appendix D:
Airport and Urbanized Area Exclusion Criteria

This appendix depicts on statewide maps the impact of two exclusion criteria (airports and urbanized areas) used by the board to determine land availability for potential use by wind energy systems. The exclusion criteria defined where turbines should not be modeled as part of the analysis to calculate the wind energy potential. The board selected the maps for airports and urbanized areas as examples to include in the report because the excluded areas for airports and urbanized areas are more distinct on statewide maps than some of the other exclusion criteria, such as rivers and roads.

Exhibit D-1 depicts the effect of excluding land within the following distances of airports as determined by the Wind Energy Resource Zone Board, in consultation with wind energy developers and the Michigan State University Land Policy Institute:

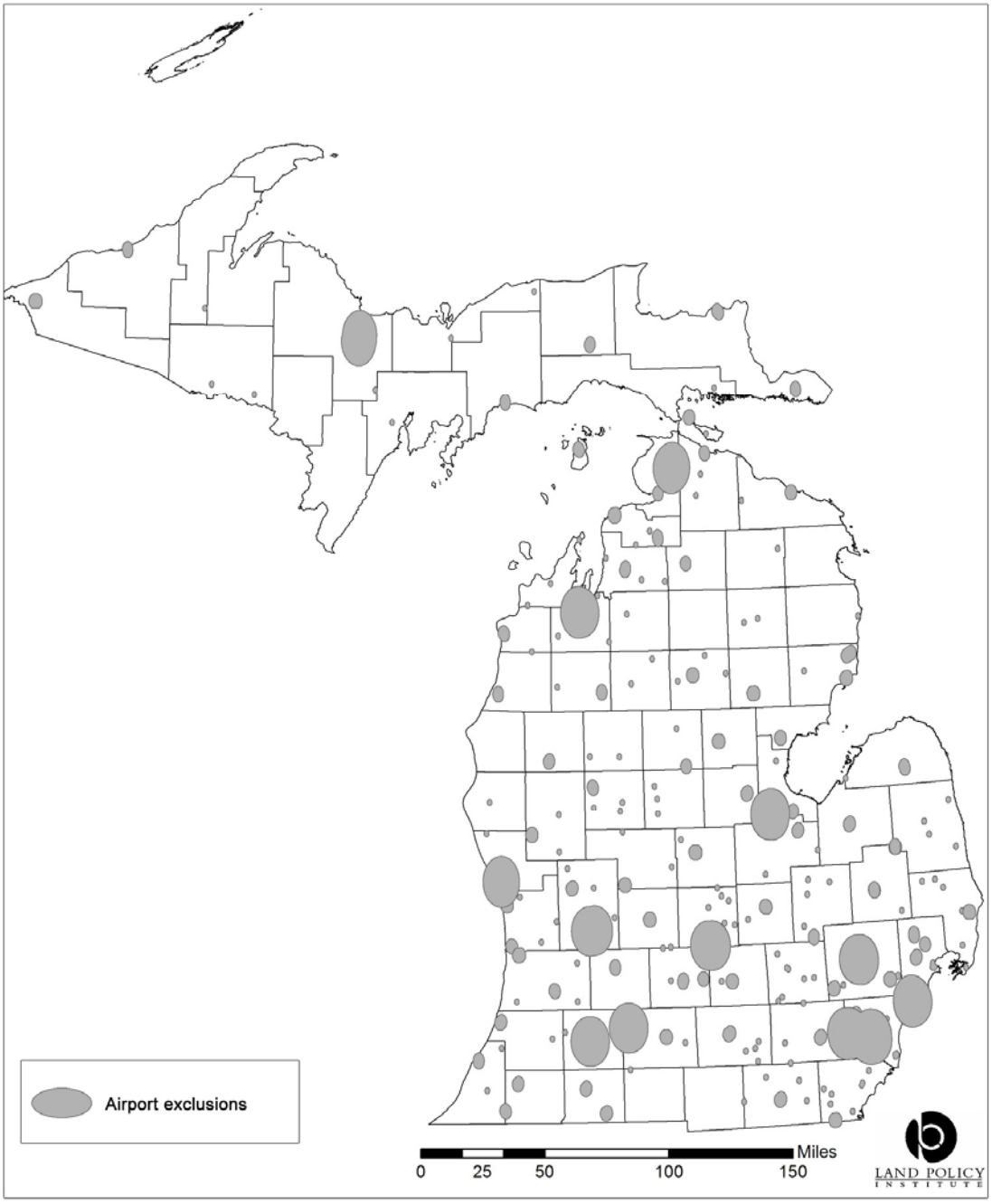
- 10.00 miles of commercial airports
- 6.32 miles of local airports
- 1.25 miles of small airports

Airport service levels are based on the Environmental Systems research Institute (ESRI) Metadata classification as defined by the National Plan of Integrated Airport Systems (NPIAS).[1] Military airports were also excluded.

Exhibit D-2 shows the excluded urban areas based on the United States Census definitions.

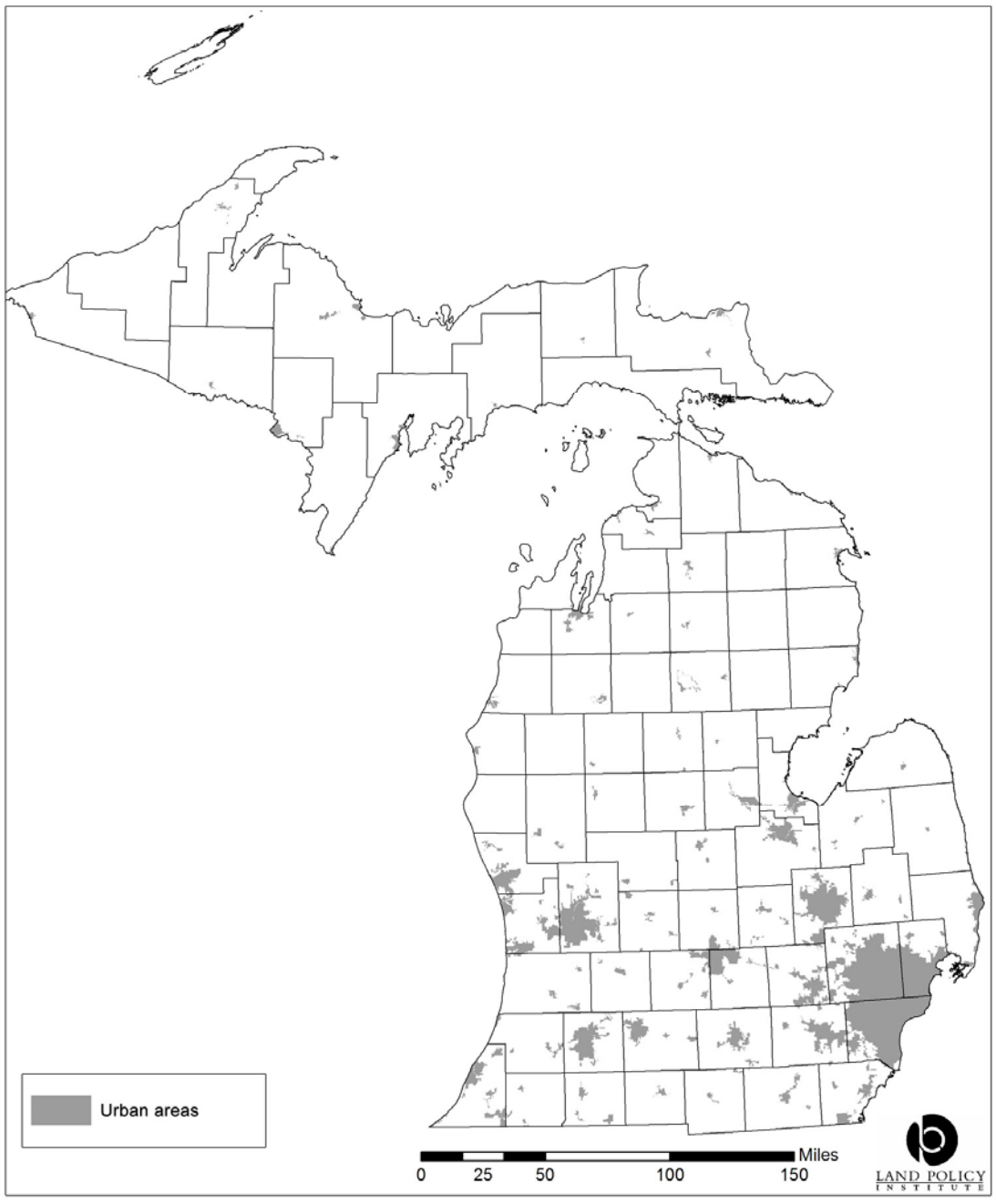
[1] More information on the NPIAS is available on the Federal Aviation Administration website, http://www.faa.gov/airports_airtraffic/airports/planning_capacity/npias/.

EXHIBIT D-1
Areas Excluded because of Airports



SOURCE: Michigan State University Land Policy Institute, using data from the Environmental Systems Research Institute (ESRI), *U.S. GDT Airports*, November 1, 2001.

EXHIBIT D-2
Areas Excluded because of Urbanization



SOURCE: Michigan State University Land Policy Institute, using data from U.S. Census Bureau, 2000, *Urbanized Areas*, ESRI Shapefile, [Online, accessed 5/14/09], available: http://www.census.gov/geo/www/cob/ua2000.html.

Appendix E:
Response Frequencies for Comment Forms on Proposed Report

COMMENTS FROM LOCAL GOVERNMENTS WITHIN THE FOUR REGIONS

Comments on Proposed Report

1. For each section of the proposed report listed below, please indicate your level of agreement with each of the following statements related to the clarity, accuracy, and conclusions of the report. If desired, you may explain your opinion in the space provided.

Report section	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	No position
Executive summary					
a. Information is clearly presented	41%	46%	0%	14%	0%
b. Information is accurate	23	32	9	5	32
c. Conclusions seem appropriate	26	39	9	13	13
Introduction					
a. Information is clearly presented	38	48	0	10	5
b. Information is accurate	20	45	0	5	30
Methodology					
a. Information is clearly presented	29	48	10	5	10
b. Information is accurate	10	33	5	19	33
Findings					
a. Information is clearly presented	38	48	5	5	5
b. Information is accurate	14	38	5	14	29
c. Conclusions seem appropriate	19	48	5	14	14
Conclusion					
a. Information is clearly presented	45	45	0	5	5
b. Information is accurate	25	25	5	20	25
c. Conclusions seem appropriate	19	38	5	29	10

This next series of questions (2A–2F) focuses more specifically on the different parts of the Findings Section

2. Please indicate your level of agreement with each of the following statements. If desired, you may explain your opinion in the space provided.

Findings Subsection	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	No position
Regions with the Highest Wind Energy Potential					
a. Information is clearly presented	50%	35%	0%	10%	5%
b. Information is accurate	20	30	5	15	30
c. Conclusions seem appropriate	24	38	5	19	14
Other Findings					
Wind Speeds on Land					
a. Information is clearly presented	43	43	0	5	10
b. Information is accurate	24	24	10	0	43
c. Conclusions seem appropriate	24	43	10	0	24
Land Availability					
a. Information is clearly presented	24	48	10	14	5
b. Information is accurate	10	29	10	14	38
c. Conclusions seem appropriate	14	41	5	23	18
Viability of Wind as Commercial Generation Source					
a. Information is clearly presented	43	29	14	5	10
b. Information is accurate	29	29	0	0	43
c. Conclusions seem appropriate	24	38	5	5	29
Wind Energy Systems in Service					
a. Information is clearly presented	36	36	14	5	9
b. Information is accurate	32	32	0	0	36
c. Conclusions seem appropriate	32	36	9	0	23
Proposed Wind Energy Systems in Interconnection Queue					
a. Information is clearly presented	33	43	0	5	19
b. Information is accurate	33	14	0	0	52
c. Conclusions seem appropriate	35	25	0	0	40

3. Public Act 295 requires the board to identify regions of the state with the "highest level of wind energy harvest potential." Your county, city, village, or township is included in one of these regions in the board's proposed report. Please indicate your level of agreement with the board's assessment that your county, city, village, or township should be included in one of these regions.

a. Strongly agree	26%
b. Somewhat agree	30
c. Somewhat disagree	9
d. Strongly disagree	13
e. No position at this time	22

4**. A)** If you answered "strongly **agree**" or "somewhat **agree**" to question 3, please select the factor(s) listed below that influence your local government's position on whether your area should be included in the regions with the highest wind energy harvest potential. (Check ***all*** that apply.)

a. Good quality wind	69%
b. High level of developer interest (i.e., contacts with landowners or local government, public announcements)	23
c. Number of requests by developers to interconnect to the grid	8
d. Potential positive local economic impacts (e.g., leases, tax payments, jobs)	54
e. Amount of land under existing leases by wind developers	8
f. Amount of land under proposed leases by wind developers	8
g. Community acceptance of or support for wind projects	46
h. Suitability of land and existing uses for wind development	62
i. Local government incentives (e.g., tax treatment)	0
j. Local ordinances that streamline or clarify the requirements for siting of wind turbines	31

4. **B)** If you answered "strongly **disagree**" or "somewhat **disagree**" to question 3, please select the factor(s) listed below that influence your local government's position on whether your area should be included in the regions with the highest wind energy harvest potential. (Check ***all*** that apply.)

a. Quality of wind resources not as good as other areas	20%
b. Lack of developer interest to date	0
c. Few or no requests by developers to interconnect to the grid in the area	20
d. Limited amount of land under existing leases by wind developers	20
e. Limited amount of land under proposed leases by wind developers	40
f. Community opposition to wind projects	40
g. Limited suitability of land and existing uses for wind development	80
h. Local government ordinances or policies (e.g., zoning) that may significantly limit or restrict wind farm development	0

5. Public sentiment may affect the viability of wind as a commercial source of energy generation. How would you generally describe public sentiment related to wind energy development on land in your county, city, town, or village?

a. Very positive	9%
b. Positive	27
c. Undecided or neutral	32
d. Negative	9
e. Very negative	0
f. Do not know	23

6. Any wind energy resource zone that is designated by the MPSC must exclude land that is zoned residential when the board issues its proposed report, unless the land is subsequently zoned for nonresidential use. Please indicate the approximate percentage of land in your local unit of government that is zoned for residential use only.

a. 0–25%	74%
b. 26–50%	16
c. 51–75%	5
d. 76–100%	0
e. Do not know	5

7. Does your local unit of government have ordinances or requirements that may affect the land available for potential use by wind energy systems and the estimates of wind energy production potential in your area?

a.	Yes (please explain):	53%
b.	No	42
c.	Do not know	5

8. In the space below, please provide any additional comments on the proposed report.

Write-in comments are available with the comment record, which can be accessed at *www.michigan.gov/windboard*. The write-in comments are not included in the above statistics, but all comments are summarized in the Comments section of the report.

COMMENT FROM ALL OTHERS, INCLUDING LOCAL GOVERNMENTS OUTSIDE THE IDENTIFIED REGIONS

Comments on Proposed Report

1. For each section of the proposed report listed below, please indicate your level of agreement with each of the following statements related to the clarity, accuracy, and conclusions of the report. If desired, you may explain your opinion in the space provided.

Report section	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	No position
Executive summary					
a. Information is clearly presented	26%	48%	9%	9%	9%
b. Information is accurate	13	44	9	9	26
c. Conclusions seem appropriate	22	39	18	18	4
Introduction					
a. Information is clearly presented	42	37	5	5	11
b. Information is accurate	17	44	6	11	22
Methodology					
a. Information is clearly presented	32	47	11	0	11
b. Information is accurate	11	44	6	11	28
Findings					
a. Information is clearly presented	41	41	6	6	6
b. Information is accurate	13	38	13	13	25
c. Conclusions seem appropriate	13	56	13	13	6
Conclusion					
a. Information is clearly presented	50	38	0	6	6
b. Information is accurate	25	19	13	13	31
c. Conclusions seem appropriate	31	31	13	13	13

This next series of questions (2A–2F) focuses more specifically on the different parts of the Findings Section

2. Please indicate your level of agreement with each of the following statements. If desired, you may explain your opinion in the space provided.

Findings Subsection	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	No position
Regions with the Highest Wind Energy Potential					
a. Information is clearly presented	57%	29%	0%	14%	0%
b. Information is accurate	29	43	0	14	14
c. Conclusions seem appropriate	43	29	0	29	0
Other Findings					
Wind Speeds on Land					
a. Information is clearly presented	57	29	14	0	0
b. Information is accurate	43	14	14	14	14
c. Conclusions seem appropriate	43	43	0	14	0
Land Availability					
a. Information is clearly presented	57	29	0	14	0
b. Information is accurate	43	0	14	29	14
c. Conclusions seem appropriate	43	14	14	29	0
Viability of Wind as Commercial Generation Source					
a. Information is clearly presented	57	14	0	29	0
b. Information is accurate	43	0	14	29	14
c. Conclusions seem appropriate	43	14	14	29	0
Wind Energy Systems in Service					
a. Information is clearly presented	57	14	14	0	14
b. Information is accurate	43	14	0	14	29
c. Conclusions seem appropriate	43	29	0	14	14
Proposed Wind Energy Systems in Interconnection Queue					
a. Information is clearly presented	71	0	0	29	0
b. Information is accurate	43	14	0	29	14
c. Conclusions seem appropriate	57	14	0	29	0

3. Public Act 295 requires the board to identify regions of the state with the "highest level of wind energy harvest potential." Please indicate your level of agreement with the board's assessment of these regions identified in the proposed report. If desired, explain your opinion in the space provided below.

a. Strongly agree	29%
b. Somewhat agree	43
c. Somewhat disagree	0
d. Strongly disagree	29
e. No position at this time	0

a. _____

4. Public sentiment may affect the viability of wind as a commercial source of energy generation. How would you generally describe public sentiment related to wind energy development on land in your county, city, town, or village?

a. Very positive	0%
b. Positive	22
c. Undecided or neutral	22
d. Negative	0
e. Very negative	56
f. Do not know	0

5. In the space below, please provide any additional comments on the proposed report.

Write-in comments are available with the comment record, which can be accessed at *www.michigan.gov/windboard*. The write-in comments are not included in the above statistics, but all comments are summarized in the Comments section of the report.