Wind Energy Deployment

GLOBAL LESSONS FOR WEST MICHIGAN

WEST MICHIGAN WIND ASSESSMENT ISSUE BRIEF #1

- *West Michigan coastal communities, like other communities worldwide, are in the midst of assessing the benefits and challenges of locating wind energy farms.*

Wind energy projects have been proposed all over the world. West Michigan coastal communities, like other communities worldwide, are in the midst of assessing the benefits and challenges of siting wind energy farms. These wind energy projects reflect Michigan's changing mix of potential energy sources; changes that are requiring the attention of all West Michigan communities.

Michigan's electricity providers consider wind energy to be the most cost-effective, scalable means of meeting the state's 10 percent renewable energy standard [1]. Wind energy enjoys broad support in general, but specific projects can draw opposition [2]. Understanding the factors that influence wind energy deployment can help citizens, communities, and wind energy companies make informed choices about appropriately developing wind energy in coastal West Michigan.

In this issue brief, we summarize the factors that have influenced wind energy deployment around the world, and apply them to the West Michigan coastal zone. Europe has more extensive experience with wind energy than the United States. Most of the case studies on factors affecting wind energy deployment come from Europe, but a few United States-based studies are included here.

The Wind Resource

- *Research shows that the amount of wind energy development in an area is more closely tied to the human factors of permitting and infrastructure than to wind conditions.*

Coastal West Michigan has substantial wind energy potential. However, a region's potentially developable wind energy is not the principal driver of wind energy development. Researchers at Southern Illinois University found a state's wind energy potential – the physical resource – was not strongly associated with the amount of installed wind energy capacity [3]. States have tapped only a tiny fraction of the potential wind energy. The geography of wind energy development is more closely tied to the human factors of permitting and infrastructure than to the physical potential.

Electricity Transmission

Existing electricity transmission infrastructure is a critical component for wind energy deployment in West Michigan. The Southern Illinois University researchers found that state population, a surrogate for electricity demand and transmission infrastructure had the strongest association with developed wind energy capacity [3]. A report from the think tank Resources for the Future described the renewable energy transmission challenge as a chicken and egg problem:

The West Michigan Wind Assessment is a Michigan Sea Grant-funded project which is analyzing the benefits and challenges of wind energy development in coastal West Michigan. This issue brief series explores the causes and consequences of the wind energy challenge for the region. More information about the project can be found at the project web site, www.gvsu.edu/wind.

"Without adequate and accessible transmission capacity, renewable projects are unlikely to cross the threshold of economic viability, and without adequate generation capacity to justify new transmission construction, investment in new lines is also unlikely to occur." [4, p. 6]

- *The combination of adequate winds and proximity to the electric grid makes West Michigan an attractive place for utility-scale development.*

Wind development in Michigan could be drawn to areas close to the transmission infrastructure. The network of high voltage (345 kv) transmission lines runs right through the four-county study area in West Michigan (Figure 1). The combination of adequate winds and proximity to the electric grid makes the region an attractive place for utility-scale development. At least one proposal, the Aegir Offshore Wind Project, has cited grid access as one of the primary reasons for choosing the location offshore from the Ludington Pumped Storage Facility [11]. The Michigan Wind Energy Resource Zone Board designated four regions of the state as having the highest wind energy harvest potential. One of the four regions was a seven-township area in western Allegan County. The designation of the Allegan County zone will facilitate the planning, siting and construction of electricity transmission lines in order to facilitate wind energy development in the area [12].

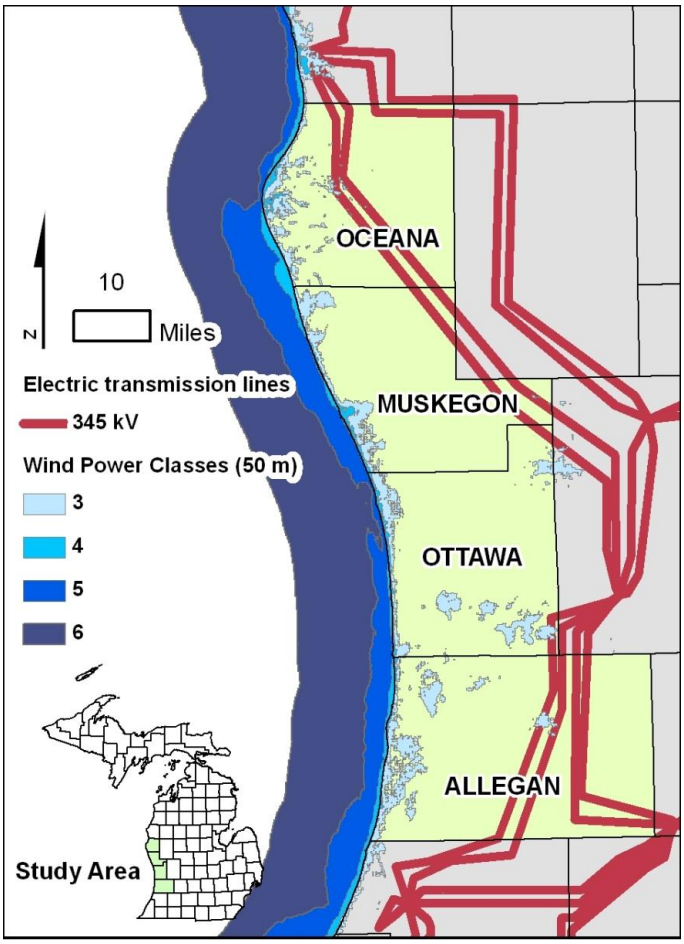

Figure 1. Wind power potential and high voltage transmission lines in the four-county study area in West Michigan. Higher wind power classes represent higher potential for wind energy generation.

The Policy Environment

- *Most states have the "standard" permitting process for wind energy development: local units of government control wind energy siting through zoning ordinances.*

A region's permitting policy, at both the state and local government levels, plays a crucial role in wind energy development. This role illustrates the tension between direct democracy and administrative efficiency. Most states have the "standard" permitting process for wind energy development: local units of government control wind energy siting through zoning ordinances. A streamlined or minimal permitting process was strongly associated with the amount of installed wind energy capacity [3]. Washington and Oregon [3], and recently Wisconsin [5], have adopted a streamlined permitting process that gives state government more control of wind energy siting. Texas has adopted a minimal permitting process which has contributed to its status as the wind energy leader in the U.S. [3].

- *States and countries with a more streamlined, top-down permitting process have more wind energy deployment. planning.*

The European experience presents a wind policy paradox. Countries with more top-down permitting processes had more wind energy deployment. Yet successful and accepted projects also depended on high levels of participatory planning. Denmark and Germany have high levels of wind deployment and both nations' governments require local units of government to designate suitable areas for wind energy development. In Spain, which also has a substantial wind energy infrastructure, regional government units do most of the renewable energy planning with municipalities giving consent. The Netherlands and the United Kingdom (UK) have substantially less wind energy development than Denmark, Germany and Spain. The Netherlands and the UK leave wind energy siting authority to local government units [6].

- *The Michigan Public Service Commission recently reaffirmed the state's interest in maintaining local control of wind energy permitting.*

Michigan follows the standard permitting process, and the Michigan Public Service Commission has recently reaffirmed the state's interest in maintaining local control of wind energy permitting [13]. Local control also fosters greater opportunity for public participation in the planning phase. The four counties in the West Michigan study area have a diversity of local wind zoning ordinances. Some townships have chosen not to regulate wind energy development through zoning, while others have adopted or modified the model ordinance developed by the Ottawa County Planning Board and Michigan State University Extension. Still others have developed their own ordinances. The patchwork of regulations poses a challenge to wind energy development in the area [1]. A single wind project could span multiple townships. The developer would have to comply with many different regulations. Projects that are welcomed by the West Michigan community, rather than imposed upon it, will likely be more readily accepted and successful in the long run.

Michigan adopted a renewable energy standard in 2008. The standard requires electricity providers to produce 10 percent of their electricity from renewable sources by 2015. As of March 2010, four wind projects were in the planning stages in West Michigan. The four projects total 420 MW or 12 percent of the currently planned wind capacity for the state. The currently planned projects are in Oceana and Ottawa counties [1]. Michigan will need about 2,000 MW of additional renewable energy capacity to reach its target and most of this is expected to come from wind [14]

Public Participation and Advocacy Groups

- *Studies show that projects with high levels of participatory planning are more likely to be publicly accepted and successful.*

As recent experiences in West Michigan demonstrate, varieties of groups organize and become involved in the process of reviewing a wind energy project. An analysis of wind energy projects in England, Wales, and Denmark found that projects "with high levels of participatory planning are more likely to be publicly accepted and successful" [7, p. 2658]. High levels of information and public participation were also associated with successful projects in France and Germany [8]. Stable supporting networks are more likely to form when public participation is high. However the presence of these groups is not mandatory for project acceptance and deployment. More important to deployment was the presence of opposition groups. The absence of a stable network of opponents was linked to project acceptance and deployment [7]. The knowledge, attitudes, and values that West Michigan residents hold about energy development, quality of life, and the community engagement process may similarly influence public participation.

- *The presence or absence of opposition groups helped determine a wind project's success in Europe.*

Figure 2. One of two 50 kW turbines in near Zeeland, Michigan. Each tower is 125 feet tall (Photo: J. VanderMolen).

- *In the relatively flat terrain of West Michigan, utility-scale turbines could be visible over large areas.*

- *In West Michigan, two prominent citizen groups have emerged through social networking web sites, one supporting the economic development perspective, the other supporting the landscape preservation perspective.*

Researchers analyzing wind projects in six European countries also found that advocacy groups played a key role in deployment [6]. German, Danish and Dutch advocacy groups were largely organized around broad environmental issues. These advocacy groups were generally in favor of wind energy, though local chapters sometimes oppose specific wind projects. In the UK however, the most prominent advocacy groups focused on preserving rural landscapes. Rural advocacy groups in the UK often opposed wind power projects to the extent that they affect the rural landscape [7]. Place-based landscape values should not be confused with or dismissed simply as a "not in my backyard" (NIMBY) attitude. These differing values clearly affect wind energy deployment.

The opportunity for wind energy development in coastal West Michigan presents a tradeoff. Utility-scale turbines are tall structures and will be visible for miles around. However there are considerable environmental and economic development benefits associated with them. West Michigan citizens are organizing around wind energy development from differing perspectives. A proposal has been put forth to develop a 1000 MW wind farm offshore from Mason, Oceana, Muskegon, and Ottawa counties in Lake Michigan [11]. Two prominent citizen groups have emerged through social networking web sites, one supporting the economic development perspective, the other supporting the landscape preservation perspective. The landscape preservation group's focus is similar to that of the UK's rural landscape advocacy groups. The findings from Europe suggest that the size and organization of the landscape preservation group poses a substantial challenge to the implementation of the offshore project, despite the presence of the large supportive group [7].

- *Local ownership and financing of wind projects resulted in more money remaining in the local economy.*

Ownership

Ownership of the wind energy infrastructure can affect deployment and public acceptance. Researchers at the US National Renewable Energy Laboratory compared the local economic impact of wind projects under corporate (non-local) and local (landowner) ownership scenarios. Local ownership and financing of wind projects resulted in more money remaining in the local economy, as compared with similar projects with corporate (non-local) ownership [9]. "Local" ownership can involve different forms, such as direct municipal ownership, co-operatives, multiple local investors, and limited liability companies (LLC) [10].

- *Currently, most of Michigan's existing wind development is corporately owned.*

The study of German and French wind energy projects also found that community-owned sites allowed the local residents to capture more of the project's benefits [8]. Another European study [6] showed that the countries with mostly local, co-operative ownership of the wind projects had higher deployment rates. Conversely, the UK had mostly corporate ownership and was associated with lower deployment rates. The issue was not clear cut though. Spain has high wind energy deployment levels with mostly corporate ownership, and the Netherlands has relatively little wind development with co-operative ownership. The nature of ownership in future wind energy projects may be an issue for West Michigan communities.

- *The public may be more accepting of wind energy projects if they perceive more direct benefits in the form of community ownership*

- *Studies show that less visible projects were more readily accepted, especially where tourism was a sizable component of the local economy.*

Local ownership structures may offer a greater share of financial benefits to the local community, as compared to corporate structures. While most of Michigan's existing wind development is corporately owned, Traverse City is home to one municipally owned, utility-scale wind turbine. The West Michigan area already has a number of municipal and cooperative electric providers. The public may be more accepting of wind energy projects if they perceive more direct benefits in the form of community ownership. For example, the Zeeland Board of Public Works installed two 50 kW turbines in 2009 (Figure 2). At 125' in height, these are smaller than utility-scale turbines but still visible on the landscape [16]. The Holland Board of Public Works is considering utility scale wind projects to meet their renewable energy standard obligations [1].

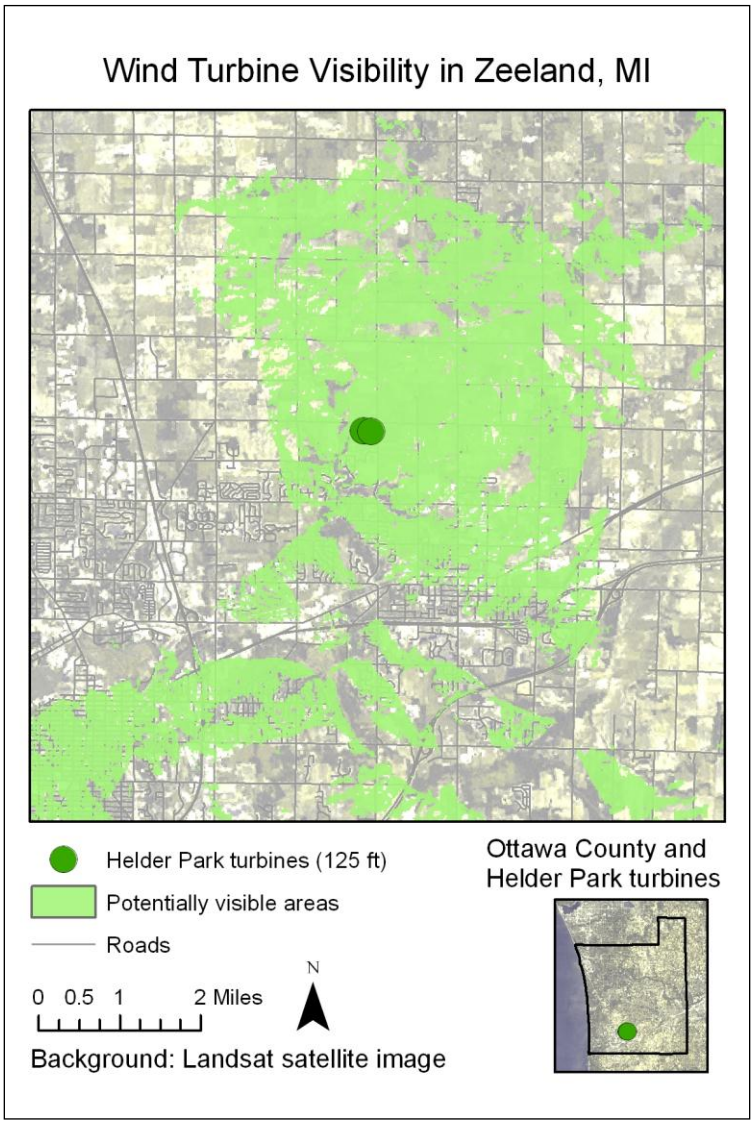

Figure 3. A viewshed of the two 125 ft. wind turbines in Zeeland. The turbines could potentially be viewed from a distance of three miles or more if there were no obstructions.

Visibility

- *In France and Germany, wind projects were eventually integrated into the tourist infrastructure, such as wine and bird-watching tours.*

Aesthetics and visibility are key concerns in wind energy development, as recent West Michigan projects have illustrated. For example a review of five completed wind projects in France and Germany showed that visibility was a major concern especially where tourism was a sizable component of the local economy [8]. Less visible projects were more readily accepted. Development in the tourist communities was more challenging, but the projects were eventually integrated into the tourist infrastructure, such as wine and bird-watching tours. The specific challenge of integrating tourism and wind energy development will be analyzed in a separate issue brief.

Tourism is a major industry in West Michigan. West Michigan citizens are concerned that wind energy development could negatively affect tourism in the area [15]. In the relatively flat terrain of West Michigan, utility-scale turbines could be visible over large areas. While there are no utility-scale turbines currently in West Michigan, the two smaller turbines in Zeeland can illustrate the potential visibility. Figure 3 shows the areas from which the 125-foot tall wind turbines could potentially be viewed, known as the "viewshed". This analysis is based only on topography and does not take into account obstructions such as buildings and trees. Zeeland's turbines could potentially be viewed from a distance of three miles or more if there were no obstructions.

- *Permitting, transmission infrastructure, participation, ownership and competing landscape values drive the complexity of wind energy development.*

There is also concern from the charter fishing community that offshore wind development could interfere with their operations. It is unclear if tourists would steer away from areas where wind farms are visible. The lessons from France and Germany suggest that while tourism-dependent communities may be initially less accepting of wind farms, tourism and wind energy development are not necessarily incompatible. The challenge of integrating tourism and wind energy development will be explored in other issue briefs.

Conclusions

- *Michigan's commitment to a bottom-up approach may lead to wind development that is ultimately environmentally, economically, and socially sustainable.*

Wind energy development is moving at a fast pace in West Michigan. Local townships, counties and the state itself are grappling with the planning challenges that wind energy development brings. Experiences in other US states and Europe have shown that fully-deployed wind energy projects have some attributes in common. The community factors involving permitting, transmission infrastructure, participation, ownership and competing landscape values drive the complexity. A Texas-style top down approach may be administratively efficient, but may not be appropriate for West Michigan's coastal landscapes. Michigan's commitment to a bottom-up approach may be more challenging, but it may lead to wind development that is ultimately environmentally, economically, and socially sustainable.

Acknowledgements

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