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The Vertical Patterns of Wind Energy: The effects of wind farm ownership on rural communities in the Prairie Pothole Region of the United States

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Abstract

North America has experienced rapid growth in the construction of utility-scale wind farms, with over 65,000 wind turbines constructed in the past 25 years. While wind farms are located almost exclusively in rural areas, ownership of the wind energy industry is largely a mix of multinational corporate energy conglomerates along with some smaller private energy firms. Despite the growth of the wind industry, little research has examined how the ownership structure of wind farms may affect host communities, even though research on other types of energy projects demonstrates local ownership tends to have more public support and positive benefits to the community. This exploratory research involves 36 in-depth interviews with leaders and residents in three case study communities located in the U.S. states of South Dakota and Minnesota: three communities impacted by wind farms variously owned by a regional electrical cooperative, municipalities, multinational corporations, and a local-resident group. The interviews describe the types of impacts perceived to have occurred in local communities, the role that wind farm ownership appears to play in shaping these impacts and reveal broader structural attributes of the U.S. wind industry. In doing so, this research describes the unique case of Community Wind North, a 12-turbine wind farm in southwestern Minnesota that is owned by 120 local member investors. Our findings from this exploratory research in wind farm host communities suggest that it is the local context of these rural communities that shapes the effects of wind farm development far more than if the wind farm is cooperatively, cooperatively, or municipally owned. We additionally employ Roland Warren's concepts of vertical and horizontal patterns of community to contextualize our findings, with findings that suggest the structure of the wind industry contributes to the continued advancement of the vertical patterns or linkages between rural areas and metropolitan regions.

Keywords: wind energy; renewable energy; community development; Roland Warren

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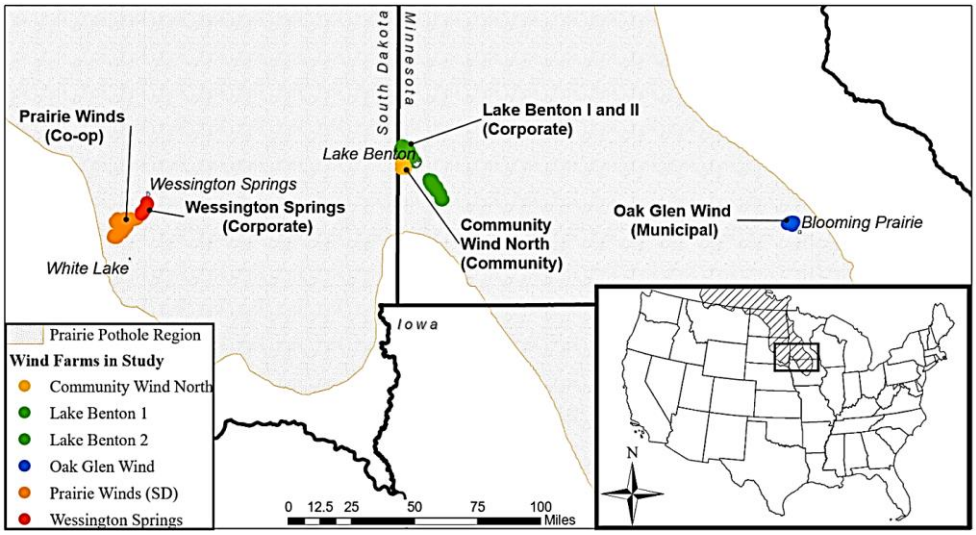
1.0 Introduction

North America has experienced rapid growth in the construction of utility-scale wind farms, with over 65,000 wind turbines constructed onshore in the past 20 years, with approximately 57,000 in the United States, over 6,000 in Canada, and approximately 2,000 in Mexico (United States Geological Survey, 2018; Canadian Wind Energy Association, n.d.; Hurtado Sandoval, 2015). While wind farm facilities are located almost exclusively in rural areas, ownership of the wind energy industry is largely a mix of multinational corporate energy conglomerates along with some smaller private energy firms (Wiener & Koontz, 2010). In the United States, federal and state tax subsidies incentivize development for corporate entities instead of tax-exempt organizations (Bohn & Lant, 2009; Beck & Martinot, 2004). Nonetheless, examples are emerging of large scale wind farms owned by electrical cooperatives and municipalities, along with smaller wind farms owned by community members (Lillian, 2017; Morris, 2017; Warren & McFadyen, 2010).

Despite the growth of wind energy, little research has examined how the ownership structure of wind farms may affect host communities (Warren & McFadyen, 2010). Research on energy projects more broadly, while also limited, demonstrates local ownership tends to have more public support and positive benefits to the community (Warren & McFadyen, 2010; Curti & Goetz, 2008). As wind energy continues to expand across communities in North America, the nature of ownership can affect how the energy developer, provider, and community interact with each other and the degree to which community members have a voice in their landscape changes (Michie & Lobao, 2012; Warren & McFadyen, 2010).

This exploratory research involves 36 in-depth interviews with leaders and residents in three case study communities located in the Prairie Pothole Region of South Dakota and Minnesota: three communities impacted by wind farms variously owned by regional electrical cooperatives, municipalities, multinational corporations, and local-resident groups (see Figure 1). The interviews describe the types of impacts perceived to have occurred in local communities, the role that wind farm ownership appears to play in shaping these impacts and reveal broader structural attributes of the U.S. wind farm industry. In doing so, this research describes the unique case of Community Wind North, a 12-turbine wind farm in southwestern Minnesota that is owned by 120 local member investors. We additionally employ Roland Warren's (1978) concepts of vertical and horizontal patterns of community to contextualize our findings. Our results suggest the structure of the wind energy industry contributes to the continued advancement of the vertical patterns or linkages between rural areas and metropolitan regions, as well as shaping the existing horizontal patterns within these communities.

Figure 1. Research locations.



2.0 Literature Review

2.1 Vertical and Horizontal Patterns

In his magnus opus *The Community in America*, first published in 1963 by Rand McNally, the rural sociologist Roland Warren chronicled the 'great change' of modernization in the communities of rural America during the mid-20th century. Describing an "increasing orientation of local community units towards extra-community systems," Warren (1978, pg. 243) outlined the effects of advanced transportation and communication systems that linked previously-isolated communities to urban centers. Warren (1978) termed these growing linkages to urban centers and the associated influences on communities 'vertical patterns', characterized by a rational and bureaucratically-structured system designed to link the differentiated units within a community—such as churches, businesses, schools, and local government offices—each to its associated nonlocal system—diocese, corporate or regional headquarters, state government offices, respectively. Comparatively, Warren's 'horizontal pattern' describes the symbiotic relationships among localized units within the community that give rise to a cohesive structure. After Warren's 'great change', most community institutions offer a blend of vertical and horizontal patterns: For example, schools serve local human capital needs for rural communities while simultaneously linking the school to the outside world through standardized curriculums, state and federal funding, teachers unions and parent-teacher organizations (Warren, 1978).

For Warren (1978), the emergence of stronger vertical ties occurs through various mechanisms, including influential community members connected to extra-community systems and local investment by international corporations and large nongovernment organizations. Vertically integrated units of a community are not new in rural communities: many of these places were based on symbiotic relations of frontier towns and larger city markets (Summers, 1986; Kraenzel, 1955); however, the advent of telecommunications and modern transportation infrastructure combined with the increasingly corporate ownership of agriculture and manufacturing have exacerbated these vertical trends (Warren, 1978).

Wind energy development makes an interesting application of this theoretical framework. Energy systems are an embodiment of vertical linkages between rural and urban communities as the geography of energy systems consists of multiple locations of production, processing, and consumption (Bridge, Bouzarovski, Bradshaw & Eyre, 2013). As Bridge and colleagues explain, "energy systems are constituted spatially: the components of the system are embedded in particular settings and the networked nature of the system itself produces geographies of connection, dependency and control." (2013, p. 333)

2.2 Community Impacts of Wind Energy Development

Most types of energy and industrial development exhibit several distinct phases as projects are planned, constructed, remain in production for long periods of time and are ultimately decommissioned (Burdge, 2015). While an energy project may produce energy for 30 years or more, it is the initial 'construction phase' that often produces some of the largest impacts to communities and residents, and wind energy is no exception (Valentine, 2011; Devine-Wright, 2009).

Wind energy research has consistently shown attitudes towards wind energy projects as being generally positive once a project is announced, then becoming more negative during the construction phase, and eventually becoming the most positive after the project is built and has been producing energy for several years (Jacquet, 2012; Bohn & Lant, 2009; Wolsink, 2007; Bell, Gray, & Haggett, 2005). The dominating physical nature of the 100m towers contrasted with the rural landscape can generate mixed reviews: the turbines can symbolize everything from resource extraction, environmental degradation, industrialization, and exploitation to economic production, social progress, environmental conservation, and a sustainable future (Firestone, Bates, & Knapp, 2015; Hirsch & Sovacool, 2013; Bidwell, 2013; Devine-Wright & Howes, 2010: Phadke, 2011). While motion of the turbines has become especially important with critics of wind energy as a cause of visual and auditory disturbance (Bolin, Bluhm, Eriksson, & Nilsson, 2011), motion can also serve as a measurement of production, and a signifier of economic production and take on more positive aesthetic values (Fergen & Jacquet, 2016; Gipe, 1993).

2.3 Economic Impacts

The research on wind energy development in the Great Plains and Midwest demonstrates the importance of economic opportunity for local residents who are less concerned with reduced greenhouse gas emissions, energy security, or broader environmental values (Fergen & Jacquet, 2016; Morris & Blekkenhorst, 2017; Mulvaney, Woodson, & Prokopy, 2013; Brannstrom, Jepson, & Persons, 2011; Junod, Jacquet, Fernando, & Flage, 2018; Slattery, Johnson, Swofford, & Pasqualetti, 2012). Communities often expect increased employment activity, along with lease payments and royalties to landowners, and tax revenues to local schools and municipalities. (Fergen & Jacquet, 2016; Slattery et al., 2012). However, employment due to wind farm development does not produce many full-time jobs for locals, an issue of concern for many depopulating rural communities who perceive wind farms as a tool for community development (Munday, Bristow, & Cowell, 2011). While residents have expectations for financial and economic stimulus, recent research suggests that the economic benefits that do accrue don't meet the initial expectations of residents. Yet, attitudes towards the wind farms in

this region still remain positive for most people, driven by a perception that any rural investment is positive (Fergen & Jacquet, 2016; Black, Holley, Solan, & Bergloff, 2014).

2.4 Ownership and Energy Projects

Community owned wind farms are becoming more common around the world, although most examples remain small scale and the definition for what qualifies as 'community owned' remains undefined (Lillian, 2017; Morris, 2017; Walker, Devine-Wright, Hunter, High, & Evans, 2010). The degree to which local community members feel involved in the process or receive some form of benefit from the outcomes has been associated with more positive attitudes and acceptance of the energy technology (Jacquet, 2015; Warren & McFadyen, 2010; Walker & Devine-Wright, 2008; Wolsink, 2007). Ownership of public utilities has important implications for issues of community autonomy and control (Curti & Goetz, 2008). Warren & McFadyen (2010) identify a key feature of community-owned wind farms in the opportunity for direct involvement from a bottom-up approach, instilling a sense of community pride with the project. Several studies show that local ownership of energy utilities generate more positive attitudes towards the project and locals perceive higher rates of community benefits including local employment, extra revenue, and increased private development (Pollin, 2012; Warren & McFadyen, 2010; Blevins, 1976). Locally-owned energy cooperatives played a foundational role in electrification of the rural United States, and the cooperative ownership model—including electrical, telephone, agricultural, financial, and purchaser co-ops—has a strong history in the rural United States (Knapp, 1973).

While community-owned energy projects have the potential to expand benefits to local communities, local ownership does not always equate with local support (Doci, Vasileiadou, & Petersen, 2015; U.S. Department of Energy, 2012; Valentine, 2011). Bain, Prokos, and Liu (2012) chronicle how locally-owned ethanol plants in Iowa and Kansas are perceived more negatively than corporate or absentee-owned plants, with locally-owned plants viewed as having fewer resources to address operational issues or manage market volatility (Bain et al., 2012).

2.5 Tax Subsidies and Ownership of Wind Energy

In the United States, wind energy has been primarily subsidized at the federal level through the Production Tax Credit, a system started originally in 1992 that provides a tax break to the owners of wind energy based on the number of kilowatts produced. A number of states have additional, similarly designed tax credits available at the state level. Unlike the federal Rural Electrification Act (REA) of 1936, which encouraged the formation of cooperatives through a subsidized loan program, the Production Tax Credit is only allocable to tax paying entities. It is a regressive system with the largest taxpayers receiving the greatest potential benefit, as the potential tax savings for individuals or businesses are small relative to the expenditures needed to develop a multi-million dollar wind energy installation. Totally left out of this scheme are tax-exempt organizations, such as non-profit organizations, cooperatives, universities, churches, and municipalities or other governmental entities.

3.0 Research Questions

Given that little or no research has examined how the ownership structure of U.S. wind farms may impact local communities, despite research on other types of energy

projects that demonstrates the importance of local ownership, the main questions driving this exploratory research are as follows:

- What are the types of impacts to communities perceived from the construction of wind farm development?
- What perceived role, if any, has the ownership type of the wind farm had on impacts to these communities?
- What role, if any, has the ownership type of the wind farm had on shaping the attitudes of residents towards the wind farm?

4.0 Methods

The Prairie Pothole Region of eastern South Dakota and western Minnesota exhibits a mix of community, electric cooperative, municipal, and corporation-owned wind farm facilities, as well areas with relatively high demographic homogeneity, allowing for comparative analysis of impacts across ownership structures. The Prairie Pothole Region is characterized as a tallgrass prairie with shallow glacial lakes and wetlands among rolling hills dominated by industrial agriculture (Johnston, 2013). Like many parts of the Great Plains, many communities in this region have long experienced steady out-migration (Jacquet, Guthrie, & Jackson., 2017). (See Figure 2.)

Figure 2. Sign welcoming visitors to Lake Benton, MN.

Photo by Joshua T. Fergen.

4.1 Data Collection

Three cases—detailed below—that reflect one or more of these ownership structures were selected to examine the impacts that ownership structures on wind energy may have on rural communities. A total of 36 individuals from these communities were subjected to semi-structured interviews in 2013 and 2014 about the impacts from the wind farm construction and operation, knowledge of and effects from wind farm ownership, and other attitudes towards wind energy locally and generally. A purposive snowball sampling technique among key informants (Marshall, 1996) was utilized. Key informants from civil, market and state society were identified by accessing public records and websites for elected officials and local government employees, university extension agents, local business owners, leaders of religious

and other community organizations, and landowners near the wind farm site. This initial pool of subjects provided names and contact information for additional interview subjects, including three wind farm officials or employees that were interviewed for this project. Interviews were audio-recorded and transcribed and personally identifying information was removed from the transcriptions. The semi-structured interview questions probed ownership effects outlined by Bain et al. (2012) and include knowledge of and interaction with the wind farm owners and employees, and perceived economic, social, and municipal effects from the construction process up to current day operations. Additional questions explored how well the wind farm fits in with the community, desired changes to the project, perceived wildlife conflicts, and aesthetic impacts.

Table 1: *Wind Farms in Study*

Case Study	Wind Farm (Year)	Ownership	Turbines	Capacity (MW)	Community
#1 N=13	Prairie Winds SD 1 (2011)	Cooperative	108	162	White Lake and Wessington Springs, SD
	Wessington Springs Energy Center (2009)	Corporate	34	51	
#2 N= 13	Lake Benton I & II (1994–99)	Corporate	280	210	Lake Benton, MN
	Community Wind North (2012)	Community	12	30	
#3 N=10	Oak Glen Wind (2011)	Municipal	24	44	Blooming Prairie, MN

4.1.1 Case 1—White Lake and Wessington Springs, South Dakota (13 Interviews). Located in central South Dakota, the towns of Wessington Springs—population 963—and White Lake—population 372—lie directly to the north and south, respectively, of two adjacent wind farms: the 34-turbine Wessington Springs Wind Energy Center constructed in 2009 and owned by corporation NextEra, and the much larger 108-turbine Prairie Winds Wind Farm built in 2010–2011 and owned by the North Dakota-based Basin Electric Power Cooperative. Wessington Springs is the county seat of Jerauld County and contains numerous businesses and government offices, a museum, bank, and a small hospital. White Lake is small city in Aurora County, located on U.S. Interstate 90, and contains small businesses, a library, and school district. Both communities had direct experiences relating to both wind farms, and we asked respondents about each wind farm separately and respondents from both communities appeared able to differentiate between experiences with both farms. Residents within Wessington springs receive their electricity from the municipality-owned utility, while residents outside the city boundary—including White Lake—receive electricity from Central Electric Cooperative, based in nearby Mitchell, S.D.

4.1.2 Case 2—Lake Benton, Minnesota (13 Interviews). Lake Benton—population 658—has a storied history in the development of wind energy. It is small town with an economy primarily based on agriculture and lake-based recreation, along with several local businesses, a bank, and historic opera house. Lake Benton is home to the Lake Benton I and II wind farms, two of the earliest 'modern' monopole wind farms ever constructed, and the first wind farm built in the Midwest. The wind farm began as 73 turbines constructed in 1994 by the Enron Corporation. After the pioneering project was shown successful, Enron constructed another 148 turbines in 1998 which, at the time, broke records as the largest single wind farm installation in the world. Enron built yet another 143 turbines a year later in 1999. Since the fall of Enron in 2001, the two wind farms have been owned by a series of corporations and are currently owned by American Electric Power, headquartered in Columbus, Ohio and NextEra, headquartered in Juno Beach, Florida. Several other large-scale wind farms have been constructed in the area by a multitude of corporate owners.

During the 1990s, Lake Benton was a destination for those wishing to view cutting-edge energy technology, including high-ranking officials from Enron and other energy corporations, researchers, government regulators, politicians, journalists, and other 'energy tourists'. The town's motto remains 'The Original Wind Power Capital of the Midwest' with wind turbines prominently adorning town signage, brochures, and websites (see Figure 2). Throughout the late 90's and 2000's, an annual 'Wind Days' festival would occur with food, games, and music sponsored by the owning entity; although the festival has not taken place in several years. The city of Lake Benton still has a wind farm museum located in City Hall with several exhibits depicting the construction of the Lake Benton I and II and displaying information about wind energy technology.

Amidst the established corporately-owned wind farms around Lake Benton is 'Community Wind North LLC.', a 12-turbine wind farm constructed in 2012 that is collectively owned by 120 local residents. In 2002, siting regulations for a transmission line in the area dictated that 60 megawatts of capacity be reserved for a community wind project. In 2009 a small group of residents began raising funds for the project, starting a limited liability corporation with a president and board of directors, and eventually garnering 120 local residents to each invest $23,000 to partially fund the construction of the 12 turbines in 2012. The project partnered with Edison Renewable Energy, a corporation which provided additional funding in exchange for the ability to claim the Production Tax Credit. Additionally, project organizers applied for and received $3.75M in grants from the U.S. Department of Agriculture's Renewable Energy Grant Program. The 120 resident-investors receive royalty checks based on production, with the royalty rate set to escalate when Edison transitions to a minority partner in 2022.

4.1.3 Case—Blooming Prairie, MN (10 Interviews). Blooming Prairie—population 1,994—is located in south-central Minnesota and is adjacent to the nearby the Oak Glen Wind Farm, a 22-turbine facility owned by the Minnesota Municipal Power Agency (MMPA) and constructed in 2011. The MMPA is a political subdivision of the State of Minnesota, tasked with producing or otherwise purchasing electricity for its 12 municipal utility members (Minnesota Municipal Power Agency [MMPA], 2014). The agency owns several wind farms and natural gas fired electrical generators, however the Oak Glen Wind Farm is largest, and indeed, Oak Glen is one of the largest municipally-owned wind farms in the United States (MMPA,

2014). The MMPA is headquartered in Minneapolis, Minnesota, an 80-minute drive north of the Oak Glen Wind Farm; ironically, the municipality of Blooming Prairie is not a member of the MMPA.

5.0 Results

5.1 Case 1—Wessington Springs and White Lake, South Dakota

Interviews from Case 1 reveal community disruptions during the construction phase. Of the two wind farms (corporate and cooperative) in the area—negative construction impacts from the corporately-owned wind farms were mentioned by four respondents, while a more disruptive picture emerged regarding cooperatively-owned wind farm with negative impacts mentioned by nine respondents. Negative impacts from wind farm construction included traffic disruption (2,6), bar fights (2,5), and damaged rental housing (4); for the cooperative wind farm, respondents described traffic disruption that impacted harvest season (2, 7, 11), bar fights (2, 3, 6), and a resulting death due to a frantic construction process (2, 3, 5, 6, 8). In the words of Wessington Springs respondent #2, "It was like all hell broke loose overnight."

Respondents perceived an economic boost to service industries (1, 2, 4, 5) while others described a limited capture of this activity due to its lack of service options (9, 10, 11). Road damage was also mentioned for both projects, but in all cases, respondents indicated that energy companies paid to fix the roads and put them in better condition than when they started construction (1, 2, 3, 9, 10). Perceived impacts on local governments during the construction process was mentioned for both wind projects, although this impact was relatively minor: extra meetings (1, 2), extra emergency management training (1, 6), and more challenges regarding Native American artifacts and wildlife impacts (1, 5, 6) discovered during the environmental impact assessment process (U.S. Department of Energy, 2010).

Two school districts exist in this vicinity, where Wessington Springs collects revenue on the 34-turbine corporate project and seven of the 108 turbines of the cooperative wind farm, with White Lake collecting on the remaining 101 turbines. The benefits to the schools were frequently mentioned for both White Lake (2, 6, 7, 8, 11) and Wessington Springs (1, 2, 4, 7). Local employment impacts were perceived to be minor, providing only a few contract jobs relating to snow removal and security during construction (1, 2, 3, 4, 5, 9) and only one full-time local employee was identified among all the respondents (2, 3, 5). Respondents blamed the small boost in employment due to out-of-state construction crews and technical specialization of the industry (1, 2, 5, 6), and that many of the full-time employees commute to work from larger communities (3, 5, 7).

Aesthetic impacts were mentioned by 10 respondents and attitudes were overwhelmingly positive. Four respondents indicated that turbines *enhanced* the natural landscape. Five respondents (1, 2, 3, 6, 7) noted that there were several community members upset with the visual disturbance but that they represented a small percentage of the community. Two individuals identified as having these negative attitudes were contacted for an interview but declined. Three respondents (4, 7, 10) believe that the potential negative aesthetic impact has gone away with time. The concern for wildlife was frequently dismissed, with one landowner (2) suggesting that turbine construction has provided a protective habitat from raptors, noting studies have shown an increase in several wildlife species (see Shaffer &

Buhl, 2016). On acceptance of wind energy into the landscape, respondent 6 notes: "People like to look at and see those things turning."

In terms of ownership, 8 respondents were aware that a North Dakota-based electrical cooperative owned the large wind farm. Meanwhile, more than half of the respondents indicated they were not sure what entity owned the other wind farm outside of Wessington Springs. Although all respondents knew the location of maintenance facilities for both wind farms, none of the respondents knew any employees who worked there at the time of interviews. When asked whether the wind farm was part of the community, two respondents stated, "There is no real feeling that they are part of the community because it's just like, do you feel like the interstate is part of your community? Well no. It's the same type of thing." (11), and "Whoever is working out there, they don't have a lot of ties to the community. I don't see them at Chamber events or anything like that." (1)

Despite the perceived limited interaction between the communities and the owners of these wind projects, six respondents indicated that the wind farm does belong here, citing the availability of the wind resource (1, 2, 6 ,8), population sparsity (6, 8), and an expressed community identity with a wind farm (1, 4, 6, 8). Additionally, when asked the best attribute of having wind energy in their community, nine responses indicated that school district money was important (1, 2, 4, 5, 7, 8, 9, 10, 11) if not critical. Interestingly, all the respondents indicated that they perceived accessible lines of communication to the owners of each wind project. Two of the respondents reported having contacted the wind farm owners in the past, with both indicating the contact was successful and both iterating the wind farm representatives were "just a phone call away" (2, 5).

5.2 Case 2—Lake Benton, MN

The construction of corporate wind farms surrounding Lake Benton has been ongoing since the late 1990s. Some respondents remember the boom days during initial construction, citing financial benefits to service industries (22, 23, 26), constant development of new wind projects (25), and a "weird era of excitement" (26) when corporate elites from Enron and other companies would come and stay in the community along with other energy tourists (23, 26). Respondents also indicated a positive disposition to see wind energy development in the area. As more wind projects have filtered into the area, residents have grown accustomed to the process of turbine construction (24, 25).

The operational phase of the wind farms has brought benefits to the Lake Benton community, many of which have emerged over time. Healthy stipends for landowners with turbines was perceived to recirculate through the local economy (26, 27) and a steady stream of tax revenue to the state (21, 22).

Respondents from Lake Benton refer to a strong sense of identity around wind energy development (22, 23, 25, 26, 27) which can be observed on the city's website and signage (see Figure 2). Local school curriculums began incorporating facts regarding wind energy in the classroom while highlighting potential career paths in the industry (27). The presence of technical schools in the area, the higher density of turbines in the region and a relatively long history of development around Lake Benton has contributed to higher perceptions of local employment. Unlike the other case study communities, almost all respondents in Lake Benton indicated they could easily identify numerous wind-farm employees by name. Three respondents

interviewed for this research were employed locally in the wind energy industry, with two respondents indicating gratitude they were able to find employment near their hometown.

Residents seemed aware, in a general sense, of changes in corporate ownership, including a change in ownership that occurred mere days before the interviews were performed. Yet, the sudden changes in ownership over the years did not appear to drive opinions regarding the wind farms. One respondent (26) stated "I don't really pay attention to it. None of it concerns me", while another respondent likened the repeated change in ownership to simply changing the magnetic logos on the side of maintenance trucks (22).

It was clear the community-owned wind farm delivered benefits to local residents not noticed from the other ownership models. An obvious direct benefit are the profits that accrue to the owner-investors. While the 12 landowners that own the land where the community-owned wind farm is sited receive lease and royalty payments similar to other wind farms, the 120 local owner-investors in the project are receiving about $5,000 per year (or $600,000 total) in profit not realized from the other ownership models. Other benefits include a perceived increase in local accountability, governance, and access when compared to the other ownership models. In the case of the community-owned wind farm, decisions are made by a local board of directors at public meetings and detailed in an annual newsletter. Nearly all respondents in the Lake Benton area could name members of the board of directors and some knew where some of the board members lived.

Multiple respondents relayed anecdotes that illustrated increased responsiveness. In one case (34), a local vendor was having difficulty collecting payment from electrical contractors who had worked on the community owned wind farm, and the situation was quickly resolved after a phone call was made to a wind farm board member. In another case (33), a landowner who had turbines on his property from both a corporately owned wind farm and the community owned wind farm noted that the community owned wind farm was much more responsive to requests for reimbursement from crop damages due to maintenance and issues such as ice throws.

5.3 Case 3—Blooming Prairie, MN

Construction of the municipally-owned wind farm on the outskirts of Blooming Prairie was perceived to be a smooth process (13, 14, 17, 19, 20). The positive economic impact during the construction period was perceived as limited in Blooming Prairie (15, 16, 17, 18, 19), and several respondents indicated the construction crews were staying in the larger city of Owatonna (Population 25,546) 18 miles away. There appeared to be mixed perceptions about the use of local contractors during this period, with some believing there was local use of various services during construction (14, 18) and a majority of respondents perceiving that there was no local employment whatsoever (12,15, 16, 17,19). One respondent involved with the companies stated that much of the contract work during construction came from the larger communities outside of Blooming Prairie. There was no extra burden on the local government of Blooming Prairie except for training for emergency response management (13), while the siting regulations and permits were controlled at the state level and the only local involvement was from landowners under lease (20). While there were several traffic disruptions and minor road damage (15, 20), respondents reported the company was quick to compensate townships and individual farmers for road damage and disruption to harvest and farming activities.

Respondents indicated a general indifference towards the project and the overall impact it has had on Blooming Prairie. Three respondents (12, 17, 18) indicated that the perception has always been positive but qualified their statements by adding other residents might feel differently. More of the respondents expressed prosaic to negative perceptions, some citing an indifference towards the project (13, 15, 16), adding that the community may be in a "wait and see" stage with the project (16). Additionally, respondents 13 and 18 aired other grievances regarding the production tax credit and how investments like wind farms are a "waste of tax money" (18) and only for wealthy individuals. Respondent 13 articulated this by stating:

> If the subsidies were not making some fat cat richer off my dollar from the middle income class, then I get salty. You know somebody is making big money out there from what they are doing, and whose big money are they making? Yours and mine!

The aesthetic impact of this case study was perceived to be extremely negative, despite its small size. Eight of the nine respondents indicated a negative aesthetic impact, although many included qualifiers such as wind being preferred over other types of development (20) and the perception becoming more positive with distance (15, 16). Several others (16, 17, 19) suggested that this project was no different in its aesthetic impacts than the many other wind projects in the state, and Oak Glen is just a continuation of what was perceived as a larger, state-led plan to increase renewable energy.

The Oak Glen Wind Farm and the municipalities that own it do not seem to have much presence in Blooming Prairie. Most respondents were not sure who owned the wind farm. Seven respondents stated that the owner is not involved with the community, except for one community event held celebrating the completion of the project. Only two respondents indicated the wind farm belongs in the community, noting the wind farm owners "are our neighbors by default" (15) and "after something goes up, it becomes part of the community whether you like it or not" (16). Respondent 20 made a clear distinction between the turbines being part of the community, while the owner and managers of the project are not. Respondent 18 echoed this sentiment, stating "it's recognized, but I don't consider it part of the *community* [emphasis added]." Another respondent commented that the wind project technically falls just outside the boundaries of the municipality, and therefore viewed the project as a "county thing" rather than a Blooming Prairie project (17). This theme of connecting the wind project with extra-local entities was echoed by respondent 12, adding "If they [Minnesota] want them up, they will put them up."

6.0 Discussion

6.1 Community Impacts

While research in other areas has chronicled opposition to wind energy (Devine-Wright, 2009; Pasqualetti, 2011), our findings echo research on the Great Plains and Midwest regions of the United States that have found general acceptance of wind energy amid long term declines in population and economic activity (Fergen & Jacquet, 2016; Mulvaney et al., 2013; Slattery et al., 2012; Sowers, 2006). Although several respondents indicated the importance of energy that is renewable, it is the economic values associated with wind energy development that are the main drivers of support. While benefits to local employment and local business might be small, many

rural residents place importance on the increased tax revenues to local schools and governments and the lease and royalty payments to landowners.

Wind farms also appeared to give communities a shared sense of identity, with respondents indicating the wind farm "put us on the map" (1) as leaders in the renewable energy transition, evident with White Lake's town motto of 'powering the future'. Lake Benton proudly identifies as the original wind capital of the Midwest, a moniker that is embraced and advertised on highway signs and the city website. Respondents in Blooming Prairie generally indicated a reluctant acceptance or indifference, but also indicated a preference for wind farms over large confined animal feeding operations, a popular industry in this area.

Regarding Freudenberg's (2000) call for the need to examine the 'nonproblems' of resource development, the relative non-problematic nature of wind energy in the Prairie Pothole Region appears closely linked to the idea that 'any development is good development' (Ashley & Alm, 2016). The dominant industry in the communities under study is agriculture, where farmers are critical players in the local economy and have privileged access to alter the landscape surrounding rural communities. In this context, wind energy development does not conflict with the productionist land ethics of farmers and is perceived as one solution to maintain community affairs.

6.2 The Effects of Ownership

With the exception of the 12-turbine community-owned wind farm, the cooperative, corporate or municipally-owned nature of the wind farms examined in this study do not seem to have discernable community impacts perceived by respondents. Variability in perceived impacts instead seem to emerge from specific local contextual factors, including the pace and scale of development, state fiscal and siting policies, and prior community experience with the technology. Similar to Bain et al.'s (2012) research on locally-owned ethanol plants, the ownership structure may have subtle effects on levels of support, but do not appear to play a significant role in overall support for the energy project.

In fact, most of our community leader respondents could not even identify the owning entity of the wind farms in their communities. At least one participant in each case study noted that the community connects to the dominating physical infrastructure of the turbines much more than the owning entity or its employees. All of our respondents from our sites viewed the owners to be outsiders with little connection to the community; nearly all viewed the industry employees as outsiders as well, the exception being Lake Benton, a community with a 20-year development history and a high density of turbines.

In obvious contrast, however, is Lake Benton's Community Wind North initiative, which was borne from a locally-driven group of individuals able to utilize the area's extended historical knowledge of wind energy. Although small, residents viewed this wind farm as local and provided examples (as noted earlier) of how they perceived the community-owned organization as being more responsive to local concerns than the neighboring corporately owned facilities.

6.3 Vertical Patterns

In many ways, these findings are illustrative of how the larger wind energy industry in the United States is organized and operated. Most wind farm facilities in the United States are new, with management activities occurring over large regional or

even national scales, and the facilities owned by large organizations not headquartered locally. The relatively small workforces required during the operational phase are often regionally or nationally based, and not necessarily residents of the places that they are assigned to work.

Warren (1978, p. 217) notes that an outcome of strengthening vertical ties is a weakening local authority and control over decision making, and this has been demonstrated in our cases. The siting and construction of wind farms involved large and external state and federal bureaucratic government agencies managing the siting process and assessing the environmental and cultural impacts of development (Ramanathan, 2001; U.S. Department of Energy, 2010). In Minnesota (Cases 2 and 3), siting is controlled by the state which gives the local counties very little autonomy in the decisions regarding wind energy development. The lack of a company office within most of the communities studied appeared to keep people disconnected from activities associated with the wind farm for the municipal, cooperative, and corporate structures. This absence of a human face further restricted opportunities for the types of informational exchange that would occur in local, physical settings. In the first case, a corporate wind farm in Wessington Springs is owned and operated by NextEra out of Juno Beach, Florida, while the cooperative wind project is collectively owned by a utility company hundreds of miles away in Bismarck, North Dakota. In the second case, wind energy development in Lake Benton, Minnesota started in the mid-1990s with the Texas-based energy company Enron installing the first wind project and has been owned by a litany of national and international corporations since. The third case demonstrates how even municipally-owned projects can be geographically distant; Blooming Prairie is the host municipality, but not among the municipal owners, with the project headquarters located about 80 miles away.

6.4 Horizontal Patterns

The Wind farms also seemed to strengthen some horizontal patterns in the community, a finding not necessarily tied to ownership. Given that the school is a vital institution and viewed as an indicator of community health in rural areas (Warren, 1978; Summers, 1986), there is a strong association with the arrival of wind energy development and schools ‘keeping their doors open’, especially in the South Dakota case. Increased funding to local government, lease payments and royalties to landowners and road repair all provided stimulus to local entities.

The Lake Benton case highlights how the now decades-long development of wind energy gave local landowners the knowledge and experience to pursue legislation that ultimately gave rise to Community Wind North. Residents were able to obtain new skills and knowledge from the vertically linked extra-local system and spread those skills and knowledge horizontally across the community to develop the community-owned wind farm.

While wind farms are likely to increase vertical ties of host communities to extra-local systems, it is unclear if this is necessarily a negative outcome for local community development. Rural sociologists have long noted increasing ties between rural and urban societies and the “enormous scale of rural-urban interdependence and boundary crossing, shifting, and blurring—along many dimensions of community life—over the past several decades” (Lichter & Brown, 2011, p. 565). These growing vertical patterns have long become a part of life in many parts of Rural America, ranging from corporately and internationally owned agribusiness, the rise of satellite television, and consumer and cultural experiences found at stores

like Walmart or online retailers. Indeed, it is noted that rural communities with linkages to urban areas tend to have better potential for economic diversity and resilience in the face of the population declines common across more isolated communities (Lichter & Brown, 2011).

6.5 Limitations

The results of this exploratory research are limited in a number of important ways. Using a snowball sampling technique among key informants (i.e., community leaders) is common in exploratory research, but may have led to individuals with a similar and more positive perspective on wind energy development. These community leaders are arguably in the best position to comment on wind energy ownership and community interaction with owners and employees but may not have been representative of the entire community's attitudes towards wind energy, especially given community leaders may have a vested interest to expand economic activity in the area. However, outside of occasional reports of specific dissatisfied individuals, we did not discover any widespread or organized opposition to wind energy in these communities. Further, these interviews are a snapshot in time—often towards the beginning of the wind project—and it is quite possible that attitudes will change with experience and various project successes or failures. And finally, our respondents are from the largely rural Great Plains region of the United States and are likely not representative of other communities in other regions or contexts. As we have discussed, our cases feature wind farms that are sited in areas away from where the owner is located and away from the service area of the owning utility or municipality. While this appears to be the norm in the wind energy industry, the effects of ownership may be different in cases where the owning utility actually services the area nearby; if such wind farms do exist, they offer an excellent opportunity for future research.

7.0 Conclusion

North America and the world is poised to continue in the growth of the wind energy industry, with a wider array of municipalities, organizations, and corporate entities becoming owners of wind installations in rural areas. Our findings from exploratory research in wind farm host communities suggest that it is the local context of these rural communities that shapes the effects of wind farm development far more than if the wind farm is cooperatively or municipally owned. The vertical nature of the wind energy industry tends to place the infrastructure in one location, but employment workforces and corporate headquarters are located in distant cities. Communities close to wind energy development may recognize the turbines as part of the community, but these results demonstrate a lack of connection to the owning entity. Despite the disconnect between communities and owning entities of wind farm development, the wind farms themselves become part of the community through tax dollar contributions, enhancing rural roads after construction, and making permanent changes to the landscape that has given some places a renewed rural identity.

The exception to this was the community-owned wind farm, a small and unique project that was planned and executed by a highly organized group of local residents. Key informants found the owners of this wind farm highly responsive to local concerns and felt a sense of ownership over the project, even if they were not among the group of owner-investors. However, community wind projects still remain rare and are typically of very small scale. The huge investment required, regressive tax

incentives, bottlenecks in transmission line capacity, and detailed technical and legal knowledge required to start a wind farm serve to disincentivize community owned wind projects in the United States.

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