Issues in
Energy and Environmental Policy
Number 8 | April 2014

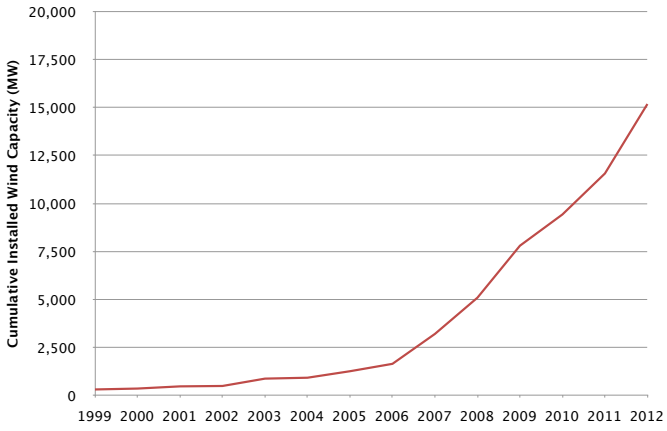
Wind Energy Development in the Great Lakes Region: Current Issues and Public Opinion

a report from the Energy and Environmental Policy Initiative

Introduction

In the last decade, both Canada and the United States have seen exponential growth in the percentage of electricity that comes from wind energy. The Great Lakes Region is no exception.[a] The Region had just over 344 megawatts (MW) of wind energy in 2000[1]; by late 2013[b], that number had risen forty-fivefold to 15,505MW (see *Figure 1*).

Figure 1
Wind energy growth in the Great Lakes Region



Sources: See Note 1

a For definitional purposes, the Great Lakes Region includes the eight US states surrounding the Great Lakes (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin), plus the Canadian province of Ontario.

b There will undoubtedly be some discrepancy on the exact amount of installed capacity, as it changes frequently as new projects come online. This includes the projects in Ontario through December 2013, and those in the eight US Great Lakes states through September 2013.

Author

WITH

Sarah Banas Mills
Policy Analyst, Center for Local, State, and Urban Policy
Gerald R. Ford School of Public Policy
University of Michigan
sbmills@umich.edu

Christopher Borick
Professor of Political Science
Director, Muhlenberg Institute of Public Opinion
Muhlenberg College
cborick@muhlenberg.edu

Christopher Gore
Associate Professor, Department of Politics and Public Administration
Ryerson University
Chief-Editor, Review of Policy Research: The Politics and Policy of Science and Technology
chris.gore@ryerson.ca

Barry G. Rabe
J. Ira and Nicki Harris Professor of Public Policy
Director, Center for Local, State, and Urban Policy
Gerald R. Ford School of Public Policy
University of Michigan
brabe@umich.edu

CLOSUP
Center for Local, State, and Urban Policy
Gerald R. Ford School of Public Policy

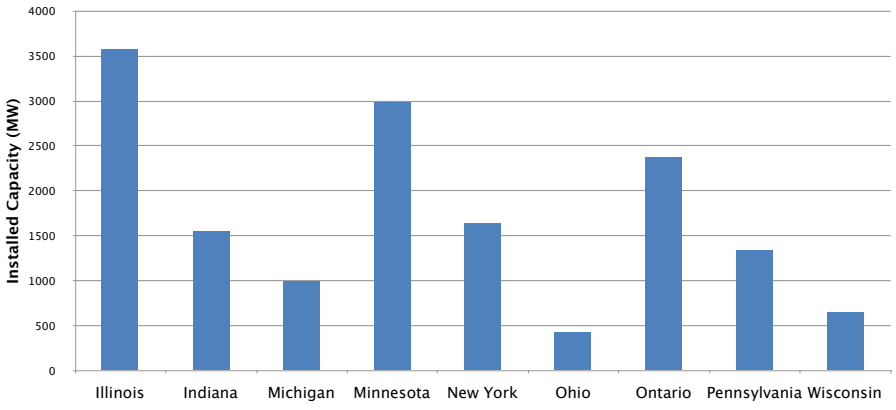
GREAT LAKES POLICY RESEARCH NETWORK

INSTITUTE OF PUBLIC OPINION
MUHLENBERG COLLEGE

RYERSON UNIVERSITY

Wind turbines, though, are not spread evenly across the Region. Nearly a quarter (23%) of the wind energy around the Great Lakes comes from Illinois, while Ohio produces less than 3% of the Region's wind energy (see *Figure 2*). Ontario accounts for 15% of the Region's total, and leads Canada in provincial wind energy production. Further, even within a state or province, windfarms tend to be concentrated in specific rural areas where there are ample wind resources and proximity to transmission lines, but low enough population densities to safely site turbines. As a result, residents across the Great Lakes Region may have widely varying familiarity and experiences with wind development.

Figure 2
Installed wind energy, end of 2013



Sources: See Note 1

While as a group, residents of the Great Lakes Basin[c] overwhelmingly support additional wind power development within the Region and see the beneficial rather than harmful impacts of wind energy, there remain a number of skeptics. Specifically, residents in Ontario tend to be less supportive of additional wind development and more believing of the potential negative consequences of wind energy than their American counterparts. There are a number of possible explanations for this difference that we hope to further explore. It could be due to more first-hand experience with wind turbines, it could be a result of increased exposure to controversy surrounding windfarms as a result of the rapid expansion of wind development in the province, or it could be backlash against the provincial government taking windfarm siting authority away from local municipalities. Alternatively, Ontarians' skepticism of wind could be the result of more peripheral energy issues: increasing electricity prices in Ontario in recent years, or general dislike with provincial energy policy given its many shifts over the past decade.

Figure 3
Map of the Great Lakes Basin

Source: Great Lakes Information Network. (2014). The Great Lakes. Retrieved from http://www.greatlakes.net/lakes/

In order to set the stage for understanding the differing levels of support for wind energy throughout the Great Lakes Region, this report first describes the renewable energy policy environment in each of the states and provinces, and how that has translated into additional wind energy development in the last decade. It then looks at the results of the Great Lakes Region Public Opinion Survey, the specifics of which are discussed in greater detail in sections to follow.

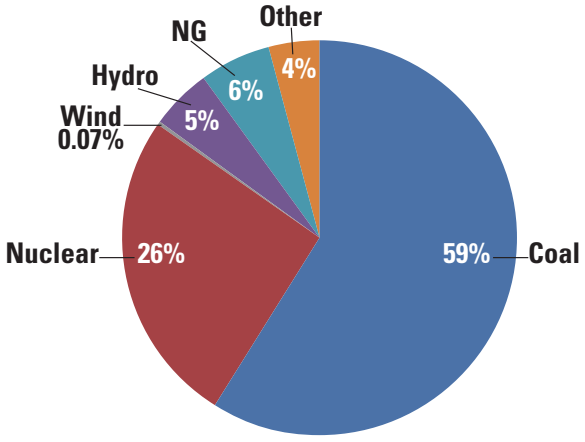
c Throughout this report, we intentionally distinguish between the Great Lakes Basin and Great Lakes Region, primarily because our survey was limited to the former while energy statistics and energy policy refer only to the latter. The Great Lakes Basin, in a geological sense, is the land area over which surface water drains into one of the five Great Lakes. Thus, it encompasses the watersheds of all rivers that flow into the Lakes. As seen in Figure 3, it is substantially smaller than the Great Lakes Region, which includes the eight US states and one Canadian province (Ontario) which touch at least one of the Lakes.

Key Findings

1. Residents of the Great Lakes Basin overwhelmingly support increasing the use of both onshore (84%) and offshore (80%) wind power.
2. A majority of residents believe that windfarms bring more good than harm to the Region including economic benefits in the form of job creation and revenue for land owners (79%) and by helping to limit climate change (58%).
3. Residents of Ontario are more guarded in their endorsement of wind than their counterparts in the United States, being less supportive of additional wind development and more concerned about the potential negative impacts of wind energy.
4. Residents within the Basin in Illinois and Minnesota—the only two states in the Region with more wind power than Ontario—do not show the same caution toward wind as Ontarians.
5. A majority (54%) of residents in rural areas believe that wind energy produces visual impacts that reduce property values, while only 38% of residents that live in more urban areas believe the same.
6. Residents of the Region would like all levels of government—federal, state/provincial, and local—to have some role in regulating the siting of wind projects, though they see a more limited role for their federal government. There are no differences in this opinion between Ontarians and Americans, though self-reported liberals see a larger role for the federal government than conservatives, or those with "middle of the road" political views.
7. Public opinion is divided on topics that are also still being debated within the scientific community: whether wind turbines disrupt bird migration and local weather patterns, whether they reduce property values, and whether they preserve rural land.

Renewable Energy Policy in the Great Lakes Region

Figure 4
Electricity Supply in the Great Lakes Region, 2000



Sources: See Note 2

At the turn of the 21st Century, less than 0.1% of the electricity generated in the Great Lakes Region came from wind and solar energy (see *Figure 4*). In contrast, 59% of the Region's electric power came from coal-fired power plants and 26% came from nuclear energy. Though scientists and policymakers have been concerned for decades about the environmental impacts of coal and nuclear power,[d] until recently there were few cost-competitive alternatives. As a result, electric utilities had very little impetus to invest in anything other than the status quo.

In the early 2000s, governments concerned about the environmental risks posed by these traditional energy sources began to adopt policies to encourage utilities to shift to renewable technologies. In the United States, the policy of choice is the renewable portfolio standard (RPS), adopted by 29 states and the District of Columbia. In general terms, this policy tool requires electric utilities operating within the state to increase the proportion of electricity that comes from renewable sources. The specifics, however, vary from place to place, not only in which technologies are considered "renewable," but also in the overall required proportion of energy that must come from renewable sources and deadline for meeting the goal.

d The smokestacks of coal-fired power plants emit airborne mercury, a byproduct of coal burning, which accumulates in the flesh of fish. For decades, residents in the Great Lakes have been cautioned to limit their intake of certain fish species caught in the Lakes to avoid the health risks associated with mercury. Risks posed by nuclear power include generation of radioactive wastes. While only a small amount of waste is generated by each plant, it remains radioactive for hundreds of thousands of years. While neither the US nor Canada yet have a permanent storage facility for the material, there has been recent controversy over a Canadian proposal to build an underground storage facility within a mile of Lake Huron.

The RPS, though, is not the only way to compel utilities to adopt more renewable energy. The standard in Europe, which has significantly influenced energy policy in Ontario, is the feed-in tariff (FIT). This policy approach mandates that utilities buy the electricity produced by eligible privately-owned renewable energy generation facilities, and further sets the per kilowatt-hour price that utilities must pay for that electricity, thereby guaranteeing renewable energy developers a price for projects added to the grid. Again, the specifics vary from place to place, both in eligible technologies and the specific rates.

Within the Great Lakes Region, seven US states have pursued an RPS and Ontario has a FIT system. Indiana is the only state without a compulsory renewable energy policy, although it does have a voluntary clean energy portfolio standard and also offers tax incentives to wind developers. Each state/province has a unique energy and policy configuration relating to wind, detailed here and summarized in *Appendix A*.

Ontario

Ontario leads Canada in installed wind energy, and is a comfortable third (behind Illinois and Minnesota) among the states/provinces in the Great Lakes Region. Currently, 3% of all energy produced in Ontario comes from wind energy, though this number is expected to rise to 11% by 2025.[3] Unlike states in the Great Lakes Region, Ontario's installed wind capacity is not the result of a RPS but, instead, due to incremental changes in its renewable energy policy over the past decade.[4]

Since 2003, Ontario has sought to phase out coal-fired power plants, a strategy aimed at addressing both climate change and air pollution. To date, 17 of Ontario's 19 coal plants have been closed, and the last two are expected to be offline by the end of 2014. To fill the supply gap left by the closing of these coal plants, the provincial government has turned to renewable energy sources, and increased its reliance on nuclear energy and natural gas. While an RPS was originally announced in 2003, it never materialized, as provincial elections put a new government in place before it could be enacted.[5] Instead, the new government launched a bidding system in which developers proposed renewables projects, and those with the least cost would be funded and built. This program, which led to roughly 150MW of new wind capacity each year, continued until 2006 when it was replaced with a feed-in-tariff (FIT), the first of its kind in North America. Though the FIT originally funded only medium-scale community wind projects (<10MW), the Green Energy and Green Economy Act (GEGEA) of 2009 expanded the program to large-scale projects.

At the same time that the FIT program was expanded, Ontario also changed the siting and approval process for windfarms. Prior to 2009, municipalities in Ontario had the authority for siting wind turbines, though some review also occurred at the provincial level. Wind developers complained that the system was too onerous and that municipalities frequently blocked proposals. Upon passing of the GEGEA, to this end Ontario also enacted the Renewable Energy Approvals legislation, which moved all regulatory authority to a single province-level agency, and set into law province-wide siting rules including minimum setbacks.

As a result of these changes to the siting and approval process, as well as very generous tariffs for large-scale wind energy, the last five years have seen a rapid expansion of windfarms in Ontario, allowing for the successful phase-out of coal-fired power plants in the province. This boom in wind energy, though, also increased tension between citizens, municipal governments, wind developers, and the provincial government, and led to greater media attention to wind issues in the province. Much of this criticism has centered on the lack of authority given to local government to regulate wind energy. As a result, the provincial Ministry of Energy announced that municipal cooperation will be added to the criteria used to evaluate wind energy proposals, and further, that a competitive bidding system will replace the FIT program for large-scale wind projects.[6]

Illinois

Illinois currently leads the Great Lakes Region in its amount of installed wind capacity with 3,568MW. It also ranks as the fourth largest producer of wind energy in the US.[7] Most of the state's large wind farms are in the northeast portion of the state, near Peoria, roughly 100 miles outside of Chicago. In 2012, 3.9% of Illinois' electricity came from wind energy,[8] though this percentage should increase greatly in the next decade as a result of the state's Renewable Portfolio Standard (RPS). In Illinois, state law requires most

utilities to have at least 25% of their energy to come from renewable sources by 2025.[9] In contrast to other governments in the Region, the Illinois RPS mandates that wind energy is the primary technology within the renewable portfolio. State law requires that at least 75% of the renewable portfolio for the state's two large investor-owned utilities, for example, come from wind.[10]

Siting authority and land-use regulations for commercial-scale wind turbines rest with the 2,700+ local government units in the state of Illinois.[11] By contrast, the state controls how property taxes are assessed on wind equipment, though the revenues from these taxes largely go to fund local government. Specifically, the state standardizes valuation of each utility-scale turbine at a set rate of $360,000 for each megawatt of installed capacity,[e] and fixes a depreciation schedule that slowly reduces the taxable rate over the course of 25 years.[12]

Indiana

Indiana is the only state in the Great Lakes Region which does not have a compulsory RPS. Instead, in 2011, the state enacted a voluntary "Clean Energy Portfolio Standard" (CPS) which provides publicly-owned utilities with financial incentives to increase their clean energy production to 10% of their total 2010 electricity sales by the year 2025.[13] The program is very generous in which technologies may be used to meet the voluntary goal. These include not only the traditional wind, solar, hydropower, and dedicated energy crops, but also up to 30% of the goal can be met through clean coal, nuclear energy, combined heat and power, and natural gas, among other technologies.

Even without a compulsory RPS, however, in 2012, 2.8% of Indiana's electricity came from wind energy,[14] and it had more wind turbines than four of the seven other Great Lakes states. The proliferation of windfarms in the state, in spite of the voluntary CPS, could be attributed to two factors: easier siting and property tax exemption. In Indiana, only cities, towns, and counties have been granted planning and zoning authority. As a result, wind turbine rule-making rests with the 92 Indiana counties, greatly simplifying the permitting process for wind developers, especially for windfarms that cross city/township borders. To further encourage wind development, the Indiana state legislature exempts installed wind equipment from local and state property taxes,[15] constituting a significant cost savings to wind operators given the multi-million dollar price tag on utility-scale turbines.

Michigan

Michigan passed the Clean, Renewal, and Efficient Energy Act in 2008, which requires all utilities in the state to generate 10% of their electricity from renewable sources by 2015.[16] This RPS requires energy projects to be physically located either in Michigan or within the utility's service territory (i.e., northeastern Indiana) to count toward the target. While wind is one of the standard suite of technologies that count toward the goal, the Michigan RPS gives bonus credits to solar photovoltaic projects, rather than wind energy. Even so, given the comparative cost effectiveness of wind, wind energy is expected to make up 98% of the state's renewables portfolio by 2015.[17]

Much like Illinois, land-use regulation of wind turbines in Michigan is left to the state's 1,700+ local units of government. As a result, local municipalities have considerable say in where windfarms are sited. While the majority of the wind turbines in Michigan are in "the Thumb"—the agricultural region north of metro Detroit which boasts the state's greatest onshore wind potential—the state's largest windfarm is in Gratiot County in mid-Michigan, where wind resources are more modest, but local officials and landowners proactively sought wind development.

Minnesota

Minnesota's RPS was signed in 2007 and requires all utilities in the state to increase the proportion of retail electricity sales from renewables in coming years.[18] This builds on a 1994 law that required Xcel Energy, the state's largest utility, to install 825MW of wind energy and 110MW of biomass-based generation by 2002, and set voluntary goals for each of the other utilities.[19] As a result of this uneven starting point, the 2007 RPS law lays out different rules for Xcel and the rest of the utilities in the state; Xcel is required to get

e Currently, it is $360,000 for each megawatt of installed capacity, so a 1.8MW turbine would be assessed at 1.8 x $360000 = $648,000.

30% of its energy from renewables by 2020, with at least 80% of that (or 24% of its total electricity) coming from wind energy. All other utilities must meet a 25% standard by 2025, with no stipulation on the mix of renewables.

Minnesota's wind development is substantially impacted by the state-mandated Renewable Development Fund (RDF), which was established in 1999.[20] In exchange for allowing Xcel Energy to store waste from its nuclear power plants within the state, the company must annually invest in the fund. In 2012 alone, Xcel paid $19.5 million, $9.4 million of which is specifically earmarked for wind energy investments.[21] As a result, Minnesota ranks fifth in the US in installed wind capacity (just behind Illinois), and fourth in the proportion of electricity that comes from wind.[22]

Since 1995, the state, not local, government, is responsible for all land-use regulation and siting of wind energy projects over 5MW.[23] On medium-scale windfarms between five and 25MW, counties may request to assume siting responsibilities, but currently only one of the state's 87 counties does so. Minnesota exempts wind energy equipment from property taxes, and instructs that the tax assessment of windfarm property should be based on the value of similar property without wind equipment.[24] In lieu of a property tax, the state has a production tax that sets a maximum tax rate and distribution of revenues between county and local governments.[25] However, the state also gives county governments discretion to waive or negotiate this production rate with wind developers.[26]

New York

New York first enacted an RPS in 2004 with a target of 25% renewables by 2013.[27] This goal was subsequently revised in 2010 to increase the target to 30% by 2015.[28] The law exempts municipal utilities, including the New York Power Authority and the Long Island Power Authority, two of the largest utilities in the state. As a result of these exemptions and a comparatively large preexisting renewables base as a result of hydroelectric power, the law is expected to increase the state's overall share of renewable energy by only six to eight percentage points.[29]

Unique to New York, a single agency—the New York State Energy Research and Development Authority—collects a surcharge from the utility (passed onto consumers) for each kilowatt-hour sold, which it uses to fund renewables projects to meet the RPS targets. The New York RPS specifies that 94% of the state's new renewable energy should come from large-scale generation facilities (e.g., utility-scale wind farms or solar arrays), with the remainder coming from small on-site generation (e.g., roof-mounted solar panels or small wind turbines), and with wind as one of only a few specified eligible sources.

Much like Minnesota, New York sets land-use regulations and approves site plans for commercial-scale windfarms at the state level. The original law reserving energy project siting decisions to the state level was enacted in 1992 and expired in 2003, placing siting decisions back in the hands of local municipalities.[30] For the rest of that decade (2003-2010), electric utility companies complained that it was nearly impossible to get any type of power plant—renewable or otherwise—through the local land-use regulation process. As a result, in 2011 New York reinstated the 1992 law for all energy infrastructure projects that exceed 25MW.[31] The law requires that the state take into consideration local regulations, and sets up a fund for local stakeholders to participate in the state process.

New York State exempts property taxes on wind energy generation equipment, though this regulation is set to expire at the end of 2014.[32] While originally drafted as a mandatory exemption, a 2002 revision to the law allows counties, towns, villages, and school districts to opt-out of the exemption—effectively allowing property taxes to still be levied on windfarms. To date, five counties, 38 towns/villages, and numerous school districts have opted out of the exemption.[33]

Ohio

Ohio's RPS was enacted in 2008 and covers both renewables and more-efficient fossil-fuel generation.[34] The renewables component requires each utility to have 12.5% renewable energy within their portfolio by 2024. At least half of the energy projects each utility uses to meet this target must be sited in Ohio. Much like the Michigan RPS, solar energy, rather than wind, receives special treatment in Ohio. Specifically, the law sets yearly targets for energy derived from solar photovoltaic systems, requiring 0.5% of each utility's power (or 4% of their total renewables) to come from solar by 2024. As a result of a comparatively lower RPS goal and specific targets for solar energy, Ohio currently has the least amount of installed wind energy of all eight Great Lakes states.

Land-use regulation for wind turbines in Ohio, much like in New York and Minnesota, is based upon the size of the proposed project. Windfarms greater than 5MW are regulated at the state level by the Ohio Power Siting Board.[35] Ohio offers wind developers a property tax exemption for "qualified" wind energy projects, though instead they must pay an annual fee to the county.[36] Qualification is approved by the county government and is based upon job creation, plans to repair roads damaged during construction, training of emergency personnel, establishing a workforce training relationship with an Ohio university, and allowing Ohio-based utilities the right of first refusal to buy renewable energy credits (RECs) from the power generated.[37]

Pennsylvania

Pennsylvania passed the Alternative Energy Portfolio Standards Act in 2004, and much like the Ohio RPS, the law covers both renewables and more-efficient fossil-fuel generation.[38] The Pennsylvania law requires electric generation and distribution utilities to produce at least 8% of their energy from renewables by 2020. To encourage local production, renewable projects must be either sited within Pennsylvania or be met with RECs purchased from projects in the Region. Much like Michigan and Ohio, Pennsylvania's RPS carves out a special niche for solar photovoltaic systems within the renewables portfolio. Specifically, it requires that 0.5% of each utility's sales (or 6.25% of their total renewables) come from solar by 2020. As a result, of the eight Great Lakes states, only Michigan and Ohio produced a smaller percentage of their total electricity from wind energy as of 2011.

All wind turbines in the state are regulated by one of the state's 2,500+ local governments. While the state, in collaboration with electric utilities, developed a model wind zoning ordinance as guidance, localities are welcome to adopt alternate regulations.[39] Wind energy generation equipment is exempt from property tax in Pennsylvania.[40] However, state law requires county assessors to consider the value of wind-lease agreements when determining the value of the underlying land. This approach, therefore, is distinctly different from that in Minnesota, where the assessed value assumes that there is no wind development.

Wisconsin

Wisconsin enacted its first RPS in 1999, setting a statewide standard of 2.2% of all electricity from renewables by 2012. This was revised in 2006 to increase the standard to 10% by the end of 2015.[41] All utilities in Wisconsin must participate in achieving the goal, but, unique to Wisconsin, the individual targets for each utility are based on their 2001 portfolio. Fundamentally, the law says that each year, all utilities must maintain their renewable energy portfolio percentage from the previous year. Further, in 2010 and 2015, utilities must increase their percentage by two and six percentage points, respectively, from the 2001 baseline.

As of March 2012, land-use regulations for wind energy developments have been largely returned to the state after a number of years of local government control.[42] The state's siting rules apply not only to setbacks, but also to noise thresholds and public hearing notice requirements. All projects greater than 100MW are automatically sited at the state level. Local governments may choose to regulate projects between 0.3MW and 100MW, but they cannot adopt rules that are more restrictive than the state's rules. Like Indiana, Wisconsin provides a blanket tax exemption to the property tax on renewable energy generation equipment, though many local governments instead assess a fee from the wind developer.[43]

Offshore Wind Energy in the Great Lakes

Though offshore wind energy is expanding quickly in Europe, currently all windfarms in North America are on land. Offshore windfarms are appealing because they are able to take advantage of more consistent and higher quality winds that blow over water bodies, but also come with a range of challenges, from the technical (i.e., connecting turbines to the grid and performing maintenance) and economic to the social (i.e., public acceptance). There are additional challenges for siting turbines in the Great Lakes. Specifically, wintertime ice cover and ice heaving that may damage wind turbines and towers are a concern in freshwater but do not pose issues in saltwater. These challenges, though, have not stopped proposals to construct windfarms in the Great Lakes. In 2011, a 450MW Canadian windfarm was proposed for Lake Ontario before being stopped by a provincial moratorium on offshore wind development.[44] In the US, a nine-turbine, 27MW project has been proposed for Lake Erie near Cleveland, Ohio,[45] though an earlier project along the eastern shore of Lake Michigan failed to move ahead in the face of political resistance.[46]

Public Opinion on Wind Energy

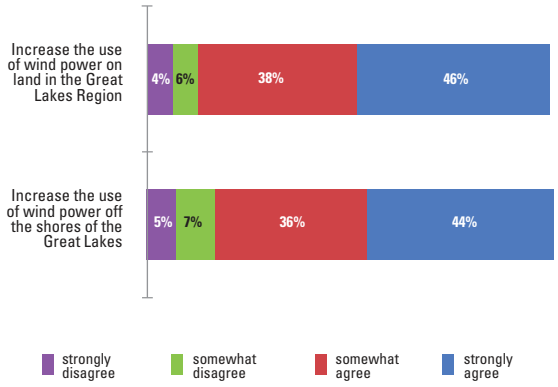
In November and December 2013, a telephone survey was conducted with randomly selected households in the Great Lakes Basin.[f] All 1,247 respondents were asked questions about their perceptions of the health of the Great Lakes and major policy issues facing the Region. The survey was part of a larger research effort funded by the Social Sciences and Humanities Research Council of Canada under the auspices of the Great Lakes Policy Research Network centered at Ryerson University in Toronto, with additional funding from the Center for Local, State, and Urban Policy (CLOSUP) at the University of Michigan and the Muhlenberg Institute of Public Opinion.

To limit the overall length of the survey and allow for comparisons between varied types of energy sources, roughly half (n=633) of the survey respondents were randomly assigned to a survey that included ten questions about wind energy, the other half (n=614) were given ten questions about hydraulic fracturing ("fracking"). In addition, the survey also included questions about more general environmental policy. These latter topics are discussed at length in two companion reports.[g] These reports, along with additional research on energy and environmental policy in the Great Lakes Region, are available on the CLOSUP website through the Energy and Environmental Policy Initiative (EEPI).

The survey data shows that residents of the Great Lakes Basin overwhelmingly support (84%) increasing the use of onshore wind power, with nearly half of all residents (46%) strongly favoring additional land-based windfarms (see *Figure 5*). Even offshore wind energy, which received much criticism when proposed for both Lake Michigan and Lake Ontario, is only slightly less popular, being favored by 80% of residents in the Basin.

Figure 5
Support for increases in onshore and offshore wind power use

"As I read some possible government policies relating to [America's/Canada's] energy supply in the Great Lakes Region, please tell me whether you would 'strongly favor,' 'somewhat favor,' 'somewhat oppose,' or 'strongly oppose' the implementation of each in the Great Lakes region."



Note: "Not sure" responses not shown.
Margin of error ±3%

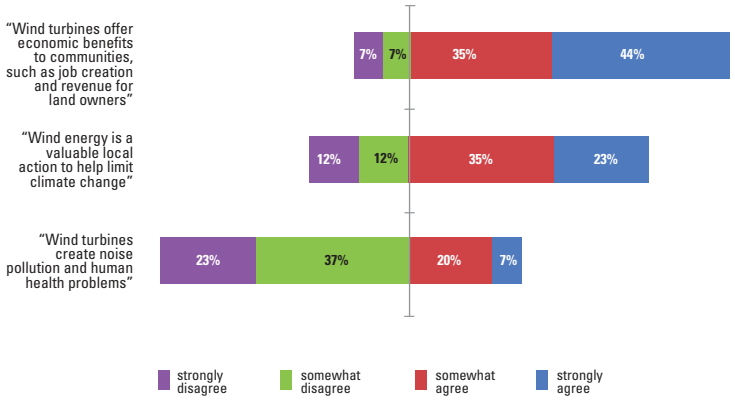
f The survey sample included all households in Ontario (where the vast majority of the population lives within the Basin) and households in U.S. counties that were at least partially within the Basin.

g Maack, E., et al. (2014). *Environmental policy in the Great Lakes Region: Current issues and public opinion.* Ann Arbor, MI: The Center for Local, State, and Urban Policy at the Gerald R. Ford School of Public Policy, University of Michigan. Retrieved from http://closup.umich.edu/issues-in-energy-and-environmental-policy/10/; Brown, C., et al. (2014). *Shale Gas and Hydraulic Fracturing in the Great Lakes Region: Current Issues and Public Opinion.* Ann Arbor, MI: The Center for Local, State, and Urban Policy at the Gerald R. Ford School of Public Policy, University of Michigan. Retrieved from http://closup.umich.edu/issues-in-energy-and-environmental-policy/9/

These high rates of support for additional wind energy may be tied to a majority of residents believing that windfarms bring more good than harm to the Region (see *Figure 6*). There is wide agreement among the public that wind turbines provide economic benefits in the form of job creation and revenue for land owners (79%), and that they offer communities a tangible way to help limit climate change (58%). Further, most residents in the Basin disagree that wind turbines create noise pollution and human health problems (60%). Significantly, these are issues where the scientific community is largely in agreement, though the issue of a potential connection between wind power and negative noise/health externalities often surfaces when windfarms are being sited and continues to be studied.[47]

Figure 6
Perceptions of positive and negative effects of wind power

"To what extent do you agree with each of the following statements about wind energy?"



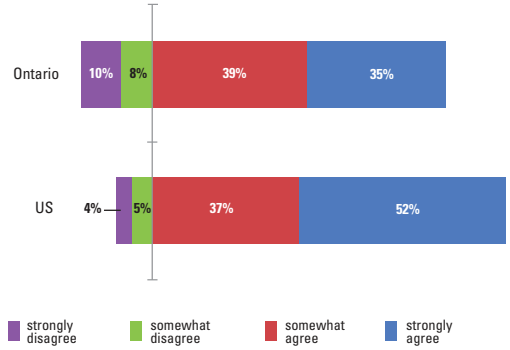
Note: "Not sure" responses not shown.
Margin of error ±4%

Ontario Exceptionalism in Public Opinion

While overall there is great enthusiasm for wind power, the sentiment is not evenly distributed throughout the Region. As *Figure 7* shows, while a majority (74%) of Ontarians express some degree of support for additional onshore development, when compared to their American counterparts, for example, significantly fewer strongly favor the idea (35% to 52%), and significantly more are opposed overall (18% to 9%).

Figure 7
Ontario and US support for additional onshore wind energy

"Increase the use of wind power on land in the Great Lakes Region"

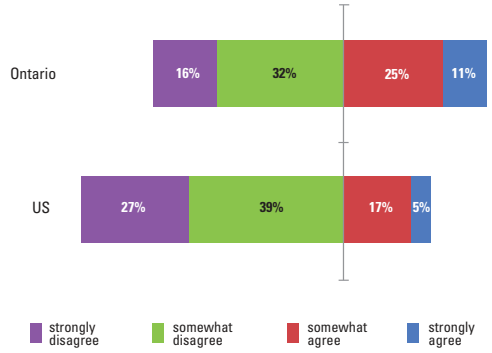


Note: "Not sure" responses not shown.
Margin of error ± 5% for Ontario and ± 3.5% for US

Ontarians also tend to have more negative perceptions about local impacts of wind (see *Figure 8*). Significantly more Ontarians than Americans either strongly or somewhat agree that wind turbines create noise pollution and human health problems (36% to 22%), while overall disagreement with this view is higher among Americans (66%) than Ontarians (48%). As *Figure 9* shows, Ontarians are also more likely than Americans to report that they believe turbines reduce nearby property values (50% to 36%); similarly, more Americans (56%) are likely to disagree with this sentiment than are Ontarians (41%).

Figure 8
Comparative perceptions of noise and human health impacts

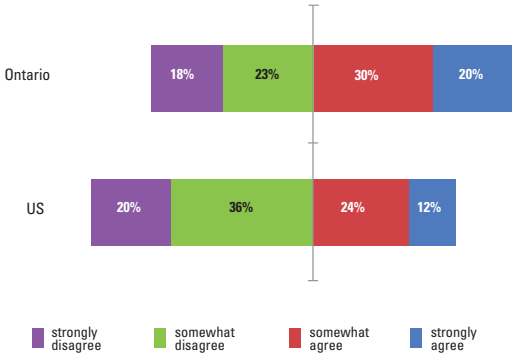
"Wind turbines create noise pollution and human health problems"



Note: "Not sure" responses not shown.
Margin of error ±7% for Ontario and ±5% for US

Figure 9
Comparative perceptions of visual and property value impacts

"Wind turbines produce visual and aesthetic problems that reduce property values"

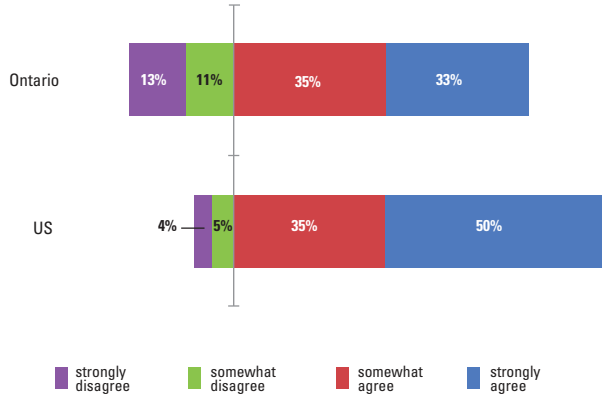


Note: "Not sure" responses not shown.
Margin of error ±7% for Ontario and ±5% for US

Conversely, Americans are more convinced of the economic benefits of turbines. While 85% of Americans within the Great Lakes Basin believe that wind energy projects create jobs and revenue for land owners, only 68% of Ontarians agree (see *Figure 10*).

Figure 10
Comparative perceptions of economic benefits of wind energy

"Wind turbines offer economic benefits to communities, such as job creation and revenue for land owners"



Note: "Not sure" responses not shown.
Margin of error ±7% for Ontario and ±5% for US

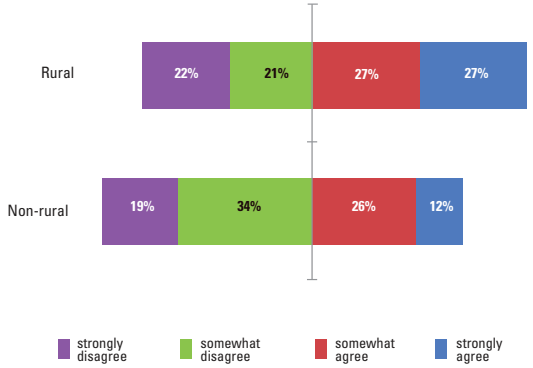
It is unclear what is causing Ontario residents to be more cautious toward wind energy. Knowing that Ontario has much more wind development than other states in the Region, one might contend that the high penetration of wind technology in the province might be putting more residents in contact with turbines, and souring their perceptions of the technology. Or further, that the rapid implementation and approval of new large windfarms in Ontario, combined with the lack of opportunity to appeal these decisions, has led to heightened criticism and media attention. Such a finding would be contrary to previous research finding that opinion toward wind energy actually tends to improve once turbines are built in an area.[48] And indeed, residents in Illinois and Minnesota, the two Great Lakes states with even more wind turbines than Ontario, were just as keen on increasing onshore development and acknowledging the benefits of wind as the states in the Region with less wind development. Based on the findings from this survey, therefore, it is unlikely that simply increasing the amount of wind energy sours public sentiment.

Another hypothesis that could account for Ontarians seeming less enthusiastic toward wind could be that it isn't the amount of installed wind energy, but rather the likelihood that wind energy might be coming to one's own municipality. In contrast to Illinois and Minnesota, all of the current and future wind development in Ontario is expected to be within the hydrologic boundaries of the Great Lakes Basin. The only portion of Illinois within the Basin (and therefore, the survey sample) is the Chicago metro area, where high population densities are wholly unsuitable for wind development. The portion of Minnesota within the Basin—along Lake Superior—while not densely populated, has some of the poorest wind resources in the state.

Because utility-scale wind projects are almost exclusively sited in rural areas, to test what impact living in an area potentially suitable for wind development has on attitudes toward wind, we compared the answers for those that reported that they lived "in a rural area" to those who self-reported living in some other type of community. The data shows that Basin residents who live in a rural area are more likely to agree that wind turbines produce visual or aesthetic problems that reduce nearby property values (see *Figure 11*).

Figure 11
Rural vs. non-rural perceptions of visual and property value impacts

"Wind turbines produce visual and aesthetic problems that reduce property values"



Note: "Not sure" responses not shown.
Margin of error ±10% for rural and ±4.5% for non-rural

This is the same result as we saw among Ontarians more generally, and indicates a more guarded stance by these residents toward wind energy. Because the sample included only a small number of people who live in rural areas (n=105; see *Table 1*), it is possible that there are additional differences between rural and non-rural residents that just aren't showing up given the high margin of error associated with looking at small populations. Prior research shows that local resistance to wind is highest once a project has been proposed (but before construction),[49] yet little public opinion research has been done to see whether rural residents are generally more opposed to wind energy than non-rural residents. Additional research would be warranted here, as resistance toward wind in communities more likely to be asked to host wind turbines could derail renewable energy policies, even if strongly supported by urbanites.

Table 1
Type of location for respondents asked questions about wind energy, by state/province

"Which of the following best describes the place where you live"

	Large City	Small City	Suburb	Town	Rural Area	Total
Illinois	27 (33%)	5 (6%)	39 (47%)	6 (7%)	6 (7%)	**83**
Indiana	5 (19%)	4 (15%)	3 (12%)	10 (39%)	4 (15%)	**26**
Michigan	11 (9%)	28 (23%)	33 (27%)	33 (27%)	19 (15%)	**124**
Minnesota	2 (13%)	3 (19%)	3 (19%)	8 (50%)	0	**16**
New York	7 (16%)	8 (18%)	9 (20%)	7 (16%)	14 (31%)	**45**
Ohio	16 (25%)	14 (22%)	18 (29%)	9 (14%)	6 (10%)	**63**
Ontario	54 (26%)	55 (26%)	20 (10%)	40 (19%)	40 (19%)	**210**
Pennsylvania	1 (20%)	2 (40%)	0	1 (20%)	1 (20%)	**5**
Wisconsin	8 (12%)	19 (29%)	13 (19%)	11 (17%)	15 (23%)	**66**
Total	**131 (21%)**	**138 (22%)**	**138 (22%)**	**125 (20%)**	**105 (16%)**	**638**

Note: Cells show number of respondents and (% within state/province)

Regulating Wind: Not as Local as One Might Expect

In addition to gauging support for additional wind energy development and the level of agreement with commonly discussed impacts of wind energy, the Great Lakes Region Public Opinion Survey also asked a series of questions about who should be responsible for making decisions about where wind turbines will be built. As the state profiles indicated, regulatory authority varies across the Basin. Some states (Illinois, Michigan, and Pennsylvania) grant local government the power to set land-use regulations for wind energy projects. In others (Minnesota, New York, Ohio, Wisconsin, and Ontario), such decisions are made centrally at the state/province level. Federal governments in both the US and Canada, though involved in land-use decisions for other types of energy development (e.g., siting pipelines and transmission lines), largely leave wind regulation up to states/provinces.

The case for more centralized state or federal regulation is two-fold. First, local regulation may be particularly onerous on wind developments given the geographic scale required for economic viability. While a traditional power plant might be sited on a single parcel of perhaps a couple thousand acres, modern windfarms often spread over hundreds of parcels and tens of thousands of acres, increasing the likelihood that they would extend beyond the confines of a local municipality. When turbine siting rules are set at the local level, developers on a single wind project may need to comply with land-use regulations of multiple jurisdictions. Second, economically-viable sites for wind development are already greatly limited by the availability of wind resources, large tracts of open land, and proximity to transmission lines. In some states, this may mean that there are only a few dozen sites for viable wind projects, and successful local opposition could completely derail the state's ability to include wind energy into its energy mix, seriously jeopardizing the achievement of RPS targets without greatly increasing the use of more costly renewable technologies.

This, however, stands in sharp contrast to a tradition of local land-use control in the US and a widely perceived public preference for local control among both Americans and Canadians. Rather than being an exception to the rule, local governments proliferate in the Great Lakes Region: Illinois leads the US in total number of local governments, Pennsylvania ranks third, and Indiana, the Great Lakes state with the fewest local government units, ranks thirteenth in the nation.[50] This might suggest strong public support for locally-based wind siting governance. To the contrary, our survey found that nearly everyone in the Basin believes that all levels of government should have some authority to regulate where wind turbines are located (see *Table 2*). Residents believe that landowners should be given the most authority (92%), and federal government the least (72%), but even so, a comfortable majority of residents think that the federal government should have some authority in siting regulations.

Table 2
Support for wind regulation authority at different levels of the federal system

"Wind turbines are sometimes regulated in terms of their location, height, setbacks, and so on. For each of the following entities, how much authority do you think they should have for such decisions regarding wind turbines?"

	Great Deal of Authority	Some Authority	No Authority	Not Sure
The Federal Government	25%	47%	23%	5%
Provincial/State Governments	40%	50%	6%	3%
Local Governments	36%	55%	7%	3%
Land Owners	50%	42%	4%	4%

Note: Margin of error ±4%

These sentiments are ubiquitous across subpopulations. There are no statistically discernible differences between Americans or Canadians in the Basin, between rural and non-rural residents, or between people in states that currently regulate at a local level versus those where regulation is done at the state/provincial level. The only difference is between self-reported liberals, conservatives, and those whose politics are "middle of the road" (see *Table 3*). When splitting the responses this way, liberals are significantly more likely (41%) to want federal government to have "a great deal of authority" in wind siting decisions than middle-of-the-roaders (23%) or conservatives (17%). Nevertheless, our findings indicate considerable support for multi-level governmental engagement on this issue.

Table 3
Degree to which the federal government should have authority to regulate wind, by self-reported political ideology

"Wind turbines are sometimes regulated in terms of their location, height, setbacks, and so on. How much authority do you think the federal government should have for such decisions regarding wind turbines?"
And
"In terms of your political outlook, do you usually think of yourself as very liberal, somewhat liberal, middle of the road, somewhat conservative, or very conservative?"

	Great Deal of Authority	Some Authority	No Authority	Not Sure
Liberal	41%	38%	16%	5%
Middle of the Road	23%	50%	22%	6%
Conservative	17%	50%	29%	4%
Total	**25%**	**47%**	**23%**	**5%**

Note: Margin of error ±8%
Very liberal and somewhat liberal were combined in this table, as were somewhat conservative and very conservative.

Mixed Public Opinion Mirrors Uncertainty in Science

The survey also found that in areas where there is still a debate among the scientific community on the impact of wind energy, public opinion is similarly divided (see *Table 4*). Slightly more than half of residents (51%) believe that wind turbines do not reduce nearby property values. This very closely mirrors research studies that have been largely divided; some show modest reductions in home values while others show no effect.[51]

Table 4
Opinion on issues wherein there is debate among the scientific community on the impacts of wind energy

"To what extent do you agree with each of the following statements about wind energy?"

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree	Not Sure
"Wind turbines produce visual or aesthetic problems that reduce nearby property values"	14%	26%	32%	19%	9%
"Wind turbines create problems such as disruption of bird migration and local weather patterns"	10%	29%	31%	16%	14%
"Wind turbines preserve rural land"	13%	41%	17%	11%	19%

Note: Margin of error ±4%

More residents disagree than agree (47% to 39%) that wind turbines disrupt bird migration and local weather patterns, with 14% uncertain about these environmental impacts. Here, the research is also mixed. Most studies have indicated that wind turbines can harm migrating birds, but perhaps not to the extent originally thought, and not when care is taken during siting.[52] Further, new research is suggesting that wind turbines do have an impact on air temperatures and wind speed within their vicinity, suggesting the potential to alter weather patterns.[53]

Over half of Basin residents (54%) agree that wind turbines preserve agricultural land (i.e., from suburban development or, alternately, from abandonment), but a large number (19%) were not sure about the connection between wind energy and agricultural land preservation. While many proponents of wind energy have made vague claims of windfarms helping to prevent farmland loss, this connection is only beginning to be studied.

Conclusions

This report outlines the status of wind energy policy and development in the Great Lakes Region, and compares this to public opinion on wind energy within the context of existing literature. The vast majority of residents within the Basin would like to see additional onshore and offshore wind energy projects, and generally see these projects as economically and environmentally beneficial to the Region. Residents of Ontario, which has seen rapid expansion of wind energy projects, while still supporting additional wind energy, are more cautious about the negative impacts of wind energy. This reserve is not shared by residents of Illinois and Minnesota, where there is even more wind development than in Ontario, but there are some indications that residents of rural areas echo the concern. Additional research that expands the number of rural residents in the response pool would allow for verification of this potential trend.

While tradition and a perceived public preference for local land-use regulation have left wind energy siting decisions in the hands of local governments in half of the states/provinces in the Region, the survey indicated wide support for both the state and federal government playing a role in siting decisions. On this question, there was no difference between Americans or Canadians in the Basin, between rural and non-rural residents, or between people in states that currently regulate at a local level versus those who live in areas where regulation is done at the state/provincial level. The only difference is between self-reported liberals, who saw a larger role for the federal government, than conservatives and those whose politics are "middle of the road."

These same questions about wind energy used in the Great Lakes Region Public Opinion Survey have been used in two subsequent surveys—one with Michigan local government policymakers and another targeted at rural residents in areas with and without wind energy development. Future reports will expand upon these findings and compare this dataset to those of the other surveys.

Acknowledgements

The author is grateful to Ian Rowlands, Carolyn Johns, and Cassie Brown for their insightful comments on earlier drafts of this paper. Valerie Benka, Lisa Kingsmore, and Adam Thorn provided essential input in developing the survey instrument. Finally, many thanks to Roxanne Balmas and Bonnie Roberts for their thorough editing.

Appendix A.
Summary of Great Lakes Basin RPS and Wind Statistics

State/Province	Renewable Energy Policy	Treatment of Wind in RE Policy	Installed Wind Capacity (MW)[54] as of 2013	Number of Wind Projects as of 2013	2011 % Electricity from Wind (%)[55,h]	Level of Regulatory Authority for Wind
Ontario	Feed-in-tariff	Generous price for wind	2366	50	3	Province
Illinois	RPS: 25% by 2025	75% of RPS from wind	3568	46	3.9	Local
Indiana	Voluntary CPS	wind 1 of many eligible sources	1543	17	2.8	County
Michigan	RPS: 10% by 2015	Solar given bonus credit	988	19	1	Local
Minnesota	RPS: 25% by 2025	80% of RPS from wind, and funding earmarks	2986	98	14.3	State for >5MW[i]
New York	RPS: 30% by 2015	Wind 1 of few eligible sources	1638	25	2.2	State for >25MW
Ohio	RPS: 12.5% by 2024	Solar given bonus credit	428	30	0.8	State for >5MW
Pennsylvania	RPS: 8% by 2020	Solar given bonus credit	1340	25	1	Local
Wisconsin	RPS: 10% by 2016	Wind 1 of few eligible sources	648	17	2.4	State[j]

h This is the most recent year available for the US at the time of publication.

i Counties may request siting responsibilities for wind farms 5 – 25MW.

j Local allowed for <100MW, but cannot be more restrictive than state.

Notes

1. United States Department of Energy. (2013). *Installed wind capacity.* Retrieved from http://www.windpoweringamerica.gov/wind_installed_capacity.asp; Canadian Wind Energy Association. (2013). List of wind farms. Retrieved from http://www.canwea.ca/farms/wind-farms_e.php
2. US Energy Information Administration. (2013). Annual data 1990-2012: Net generation by state by type of producer by energy source. Retrieved from: www.eia.gov/electricity/data/state; Ontario Ministry of the Environment. (2001). Coal-fired electricity generation in Ontario. Toronto: Ontario Ministry of the Environment. Retrieved from http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079060.pdf
3. Ontario Power Authority. (2014). *Long-term energy plan 2013: Generation and conservation tabulations and supply/demand balance.* Retrieved from http://powerauthority.on.ca/sites/default/files/planning/LTEP-2013-Module-3-Supply-Demand-Balance.pdf
4. Ferguson-Martin, C. J., & Hill, S. D. (2011). Accounting for variation in wind deployment between Canadian provinces. *Energy Policy, 39*(3), 1647–1658. http://dx.doi.org/10.1016/j.enpol.2010.12.040
5. Rowlands, I. H. (2007). The development of renewable electricity policy in the province of Ontario: The influence of ideas and timing. *Review of Policy Research, 24*(3), 185–207. http://dx.doi.org/10.1111/j.1541-1338.2007.00277.x
6. Ontario Ministry of Energy. (2013). *Achieving balance: Ontario's long-term energy plan.* Toronto: Ontario Ministry of Energy. Retrieved from http://www.energy.gov.on.ca/en/ltep/#.UzGn4fldWSo
7. American Wind Energy Association. (2012). *Wind energy fact sheet: Illinois.* Washington, DC: American Wind Energy Association.
8. Illinois Wind Working Group. (2011). *Illinois: Wind farms and growth.* Normal, IL: Center for Renewable Energy at Illinois State University.
9. Illinois Power Agency Act of 2007, 20 ILCS 3855
10. Database of State Incentives for Renewables and Efficiency. (2012). *Illinois: Incentives/policies for renewables & efficiency.* Retrieved from http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=IL04R&re=0&ee=0
11. Illinois Municipal Code § 11-13-26. Wind Farms. 65 ILCS 5/11-13-26
12. Illinois Property Tax Code. Division 18. Wind Energy Property Assessment. 35 ILCS 200/10-600
13. Indiana Senate Act 251 of 2011. 117th Gen. Assembly, Reg. Sess. 117. Retrieved from http://www.in.gov/legislative/bills/2011/SE/SE0251.1.html
14. SNL Energy. (2011). *Renewable electricity: Tracking projects and progress in U.S. renewable portfolio standards March 2011.* Charlottesville, VA: SNL Financial, LC. Retrieved from http://ww1.prweb.com/prfiles/2011/04/18/8320252/RPS%20SNL%20Energy%20white%20paper%20032011.pdf
15. Indiana Legislative Code, Chapter 12. Assessed Value Deductions and Deduction Procedures § IC 6-1.1-12-26 - IC 6-1.1-12-35.5. Retrieved from http://www.in.gov/legislative/ic/code/title6/ar1.1/ch12.html
16. Michigan Act 295 of 2008. 94th Legislature, Reg. Sess.
17. SNL Energy, 2011.
18. Minnesota Statute § 216B.1691. Renewable Energy Objectives
19. Minnesota Statute § 216B.2423. Wind Power Mandate
20. Minnesota Statute § 116C.779. Funding for Renewable Development
21. Database of State Incentives for Renewables and Efficiency. (2013). *Minnesota: Incentives/policies for renewables & efficiency.* Retrieved from http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MN09R&re=0&ee=0
22. American Wind Energy Association. (2012). *Wind energy fact sheet: Minnesota.* Washington, DC: American Wind Energy Association.
23. Minnesota Statute § 216F.03. Siting of Large Wind Energy Conversion Systems
24. Minnesota Statute § 272.02. Subd. 22. Wind Energy Conversion Systems
25. Minnesota Statute § 272.029. Wind Energy Production Tax
26. Minnesota Statute § 272.028. Payment in Lieu of Production Tax; Wind Generation Facilities
27. New York Public Service Commission. (2004, September 24). Case 03-E-0188. Proceeding on motion of the Commission regarding a retail renewable portfolio standard. Retrieved from http://www3.dps.ny.gov/pscweb/WebFileRoom.nsf/Web/85D8CCC6A42DB86F85256F1900533518/$File/301.03e0188.RPS.pdf?OpenElement
28. New York Public Service Commission. (2010, January 8). Case 03-E-0188. Proceeding on motion of the Commission regarding a retail renewable portfolio standard. Retrieved from http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={30CFE590-E7E1-473B-A648-450A39E80F48}
29. SNL Energy, 2011.
30. State of New York Board on Electric Generation Siting and the Environment. (1997). Case 97-F-0809. In the matter of the rules and regulations of the Board on Electric Generation Siting and the Environment, contained in 16 NYCRR – Addition of a new Chapter X, Subchapter A, to implement Article X of the public service law. Available at: http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B5D0E1E1F-34C2-4EF2-B1B6-621889C724FA%7D
31. New York Power Act of 2011. S 5844 of 2011 / A. 8510; Kass, S. L., Fazio, C. A., Strell, E. I., & Gallo, V. J. (2011). *New York Legislature passes Article X bill for siting of major electric generating facilities.* Client advisory. Retrieved from http://www.clm.com/publication.cfm?ID=337
32. New York Consolidated Laws Real Property Tax Title 2 § 487. Exemption from Taxation for Certain Solar or Wind Energy Systems or Farm Waste Energy Systems
33. New York State Department of Taxation and Finance. (2013). *RPTL section 487: Solar or wind energy systems exemption.* Retrieved from: http://www.tax.ny.gov/research/property/legal/localop/487opt.htm
34. Ohio Revised Code 4928.64. Electric Distribution Utility to Provide Electricity from Alternative Energy Resources. ORC 4928.64 et seq.
35. Ohio Revised Code 4906.01. Power Siting. ORC 4906.01 et seq.
36. Ohio Revised Code 5727.75. Exemption on Tangible Personal Property and Real Property of Certain Qualified Energy Projects

37. Ohio Administrative Code 122:23. Certification of Qualified Energy Projects

38. Pennsylvania Statute 73 P.S. § 1648.1 et seq. Alternative Energy Portfolio Standards Act

39. Pennsylvania Department of Environmental Protection. (2006). *Model wind ordinance for local governments*. Harrisburg: Pennsylvania Department of Environmental Protection.

40. Pennsylvania Consolidated Statutes. 53 Pa. C.S. § 8811 & 8842. Valuation of Property

41. Wisconsin Statute § 196.374. Energy Efficiency and Renewable Resource Programs

42. Wisconsin Statute § 66.0401. Regulation Relating to Solar and Wind Energy Systems

43. Wisconsin Statute § 70.111. Personal Property Exempted from Taxation

44. Miller, B. (2013, November 14).Trillium wins right to $2.25 billion Lake Ontario claim. *Windpower Offshore*. Retrieved from www.windpoweroffshore.com/canada

45. Lake Erie Energy Development Corporation. (n.d.). Retrieved from www.leedco.org

46. Gaertner, E. (2010, January 19). Ludington meeting on offshore wind farm brings out opponents, proponents. *MLive*. Retrieved from http://www.mlive.com

47. Brown, J. P., Pender, J., Wiser, R., Lantz, E., & Hoen, B. (2012). Ex post analysis of economic impacts from wind power development in U.S. counties. *Energy Economics, 34*(6), 1743–1754. http://dx.doi.org/10.1016/j.eneco.2012.07.010; Wiser, R., Yang, Z., Hand, M. M., Hohmeyer, O., Infield, D., Jensen, P. H., Nikolaev, V. G., O'Malley, M. J., Sinden, G., & Zervos, A. (2011). Wind energy. In O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, & C. von Stechow (Eds.), *Intergovernmental Panel on Climate Change special report: Renewable energy sources and climate change mitigation*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press; Pedersen, E., & Waye, K. P. (2004). Perception and annoyance due to wind turbine noise—a dose–response relationship. *The Journal of the Acoustical Society of America*, 116(6), 3460-3470.

48. Warren, C. R., Lumsden, C., O'Dowd, S., & Birnie, R. V. (2005). "Green on green": Public perceptions of wind power in Scotland and Ireland. *Journal of Environmental Planning and Management, 48*(6), 853-875. http://dx.doi.org/10.1080/09640560500294376

49. Warren, C., Lumsden, S., O'Dowd, S., & Birnie, R. (2005). 'Green on Green': Perceptions of wind power in Scotland and Ireland. *Journal of Environmental Planning and Management, 48*(6), 853-875.

50. United States Census Bureau. (2013). *2012 Census of Governments*. Retrieved from www.census.gov/govs/cog2012/

51. Hoen, B., Brown, J. P., Jackson, T., Wiser, R., Thayer, M., & Cappers, P. (2013). *A spatial hedonic analysis of the effects of wind energy facilities on surrounding property values in the United States*. Washington, DC: US Department of Energy. Retrieved from http://emp.lbl.gov/sites/all/files/lbnl-6362e.pdf

52. Drewitt, A. L., & Langston, R. H. W. (2006). Assessing the impacts of wind farms on birds. *Ibis*, 148, 29-42. http://dx.doi.org/10.1111/j.1474-919X.2006.00516.x

53. Baidya Roy, S., & Traiteur, J. J. (2010). Impacts of wind farms on surface air temperatures. *Proceedings of the National Academy of Sciences of the United States of America, 107*(42), 17899-17904. http://dx.doi.org/10.1073/pnas.1000493107; Zhang, W., Markfort, C. D., & Porté-Agel, F. (2013). Experimental study of the impact of large-scale wind farms on land–atmosphere exchanges. *Environmental Research Letters, 8*(1), 015002. http://dx.doi.org/10.1088/1748-9326/8/1/015002

54. Canadian Wind Energy Association. (2013). *List of wind farms*. Retrieved from http://www.canwea.ca/farms/wind-farms_e.php

55. American Wind Energy Association. (2014). *U.S. Wind energy: State maps and rankings*. Retrieved from http://awea.rd.net/resources/statefactsheets.aspx?itemnumber=890&navItemNumber=5067; Ontario Power Authority, 2014

Reports from Issues in Energy and Environmental Policy

The Decline of Public Support for State Climate Change Policies: 2008-2013 (March 2014)

Using Information Disclosure to Achieve Policy Goals: How Experience with the Toxics Release Inventory Can Inform Action on Natural Gas Fracturing (March 2014)

State of the Debate: Natural Gas Fracking in New York's Marcellus Shale (January 2014)

The Chilling Effect of Winter 2013 on American Acceptance of Global Warming (June 2013)

Public Opinion on Fracking: Perspectives from Michigan and Pennsylvania (May 2013)

NSEE Findings Report for Belief-Related Questions (March 2013)

NSEE Public Opinion on Climate Policy Options (December 2012)

All IEEP reports are available online at: http://closup.umich.edu/ieep.php

University of Michigan
Center for Local, State, and Urban Policy
Gerald R. Ford School of Public Policy
Joan and Sanford Weill Hall
735 S. State Street, Suite 5310
Ann Arbor, MI 48109-3091

The **Center for Local, State, and Urban Policy (CLOSUP)**, housed at the University of Michigan's Gerald R. Ford School of Public Policy, conducts and supports applied policy research designed to inform state, local, and urban policy issues. Through integrated research, teaching, and outreach involving academic researchers, students, policymakers and practitioners, CLOSUP seeks to foster understanding of today's state and local policy problems, and to find effective solutions to those problems.

web: www.closup.umich.edu
email: closup@umich.edu
twitter: @closup
phone: 734-647-4091