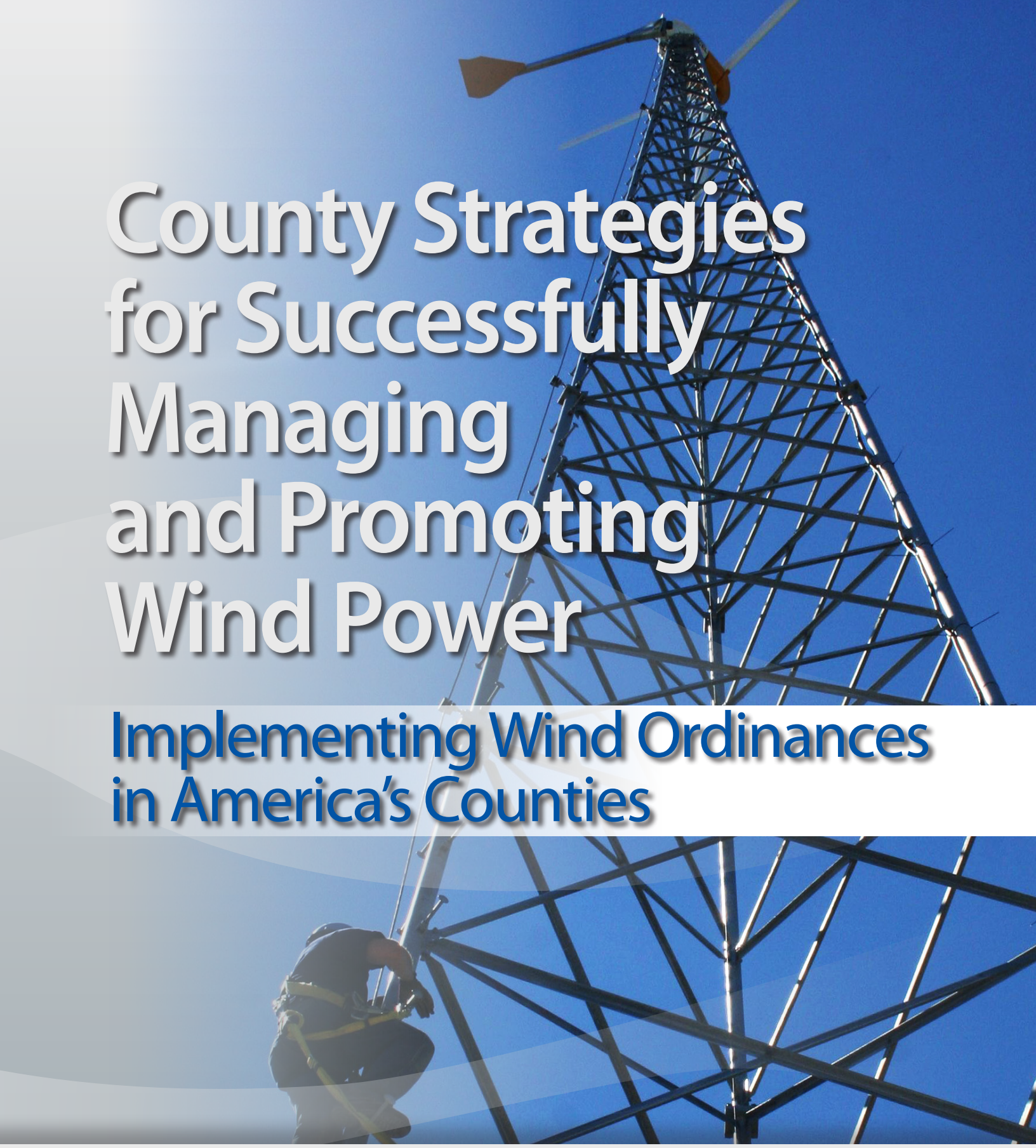

County Strategies for Successfully Managing and Promoting Wind Power

Implementing Wind Ordinances in America's Counties

DWEA DISTRIBUTED WIND ENERGY ASSOCIATION

NACo National Association of Counties

County Strategies for Successfully Managing and Promoting Wind Power

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About the Partnership

The National Association of Counties (NACo) is the only national organization that represents county governments in the United States. Founded in 1935, NACo provides essential services to the nation's 3,068 counties. NACo advances issues with a unified voice before the federal government, improves the public's understanding of county government, assists counties in finding and sharing innovative solutions through education and research, and provides value-added services to save counties and taxpayers money.

The Distributed Wind Energy Association (DWEA) is a collaborative group comprised of manufacturers, distributors, project developers, dealers, installers, and advocates, whose primary mission is to promote and foster all aspects of the American distributed wind energy industry. Distributed wind, commonly referred to as small and community wind, is the use of typically smaller wind turbines at homes, farms, businesses, and public facilities to off-set all or a portion of on-site energy consumption.

NACo and DWEA have formed a partnership to assist county leaders and the wind industry in working better together to protect public safety and property rights, while at the same time minimizing the cost and increasing the efficiency of implementing wind energy projects. This publication is one of several efforts to share best practices that work for both local communities and the wind industry. Over the next decade NACo and DWEA will produce numerous events and publications exploring the various challenges and opportunities associated with developing wind projects in America's counties.

Executive Summary

People have been generating electricity from wind energy for centuries. Yet, until recently, wind power has not been efficient or consistent enough to become a dominant power source. Today, more advanced technology and global circumstances are making wind power more competitive with other power supply options. As a result, many people across the country are becoming interested in installing their own small wind systems and accessing renewable energy from utility-scale wind farms for their businesses and residences.

Without question, supplying energy to a high-tech nation requires coordination among the private sector and all levels of government—federal, state, and local. Local governments, who are responsible for protecting the health, safety, and property rights of their community residents and businesses, play a crucial role in the implementation of wind power across the United States.

Local governments use zoning, building permitting, and public safety regulations to protect their community residents and businesses. These decisions have direct impacts on the cost, efficiency, and eventual success of wind energy projects. Local government decisions to delay or increase compliance requirements for wind energy projects can interfere with community demand for wind power and raise project costs. As a result, many county leaders interested in fostering wind power in their communities are thoughtfully considering how to protect community residents and businesses, while at the same time promoting wind power and reducing implementation costs.

In order to successfully regulate wind power, it is essential for local leaders to understand the different types of wind power technologies and the various ways in which the technologies can be regulated. The most significant difference in wind power technology exists between small-scale, distributed wind turbines designed for on-site energy generation; and large, utility-scale turbines designed for wind farms and generating energy to supply the power grid. There are many other differences in wind technology. Yet, scale is one that has the most significance to local leaders regulating wind energy.

Utility-scale and distributed wind energy have very different regulation requirements. Over the past several decades, much more attention has been given to utility-scale regulations. This is largely due to technology differences. Until recently, distributed wind did not make sense for many communities. Today, many more people are interested in installing wind energy.

Many counties have not yet included small wind systems in their zoning codes to allow their use. The permitting process can be the single most daunting obstacle for would-be consumers and wind developers. In some places, unfamiliarity with wind technology has kept county leaders from addressing wind development. And, in some places, unfamiliarity has resulted in a complete restriction of wind development to avoid setting a controversial precedent. Making the permitting process affordable, streamlined, and accountable is in the best interest of consumers, potential energy providers, the environment, and the community.

Modern Wind Turbines versus Windmills

Since the earliest recorded history, people have been harnessing energy from wind to propel boats, pump water, and much more. When the American West was settled, windmills were used to pump groundwater to communities and farms. Windmills transferred wind to mechanical energy for grinding grain and pumping water.[1]

Today, modern wind turbines are similar to windmills, but modern wind turbines operate by different physical principles. While windmills "scoop" large volumes of air to generate the physical forces needed for pumping water or turning millstones, wind turbines convert the mechanical energy of wind into electricity by turning a generator, and then use that electricity to operate other things. Informed county leaders recognize these differences and do not confuse modern wind turbines with windmills.

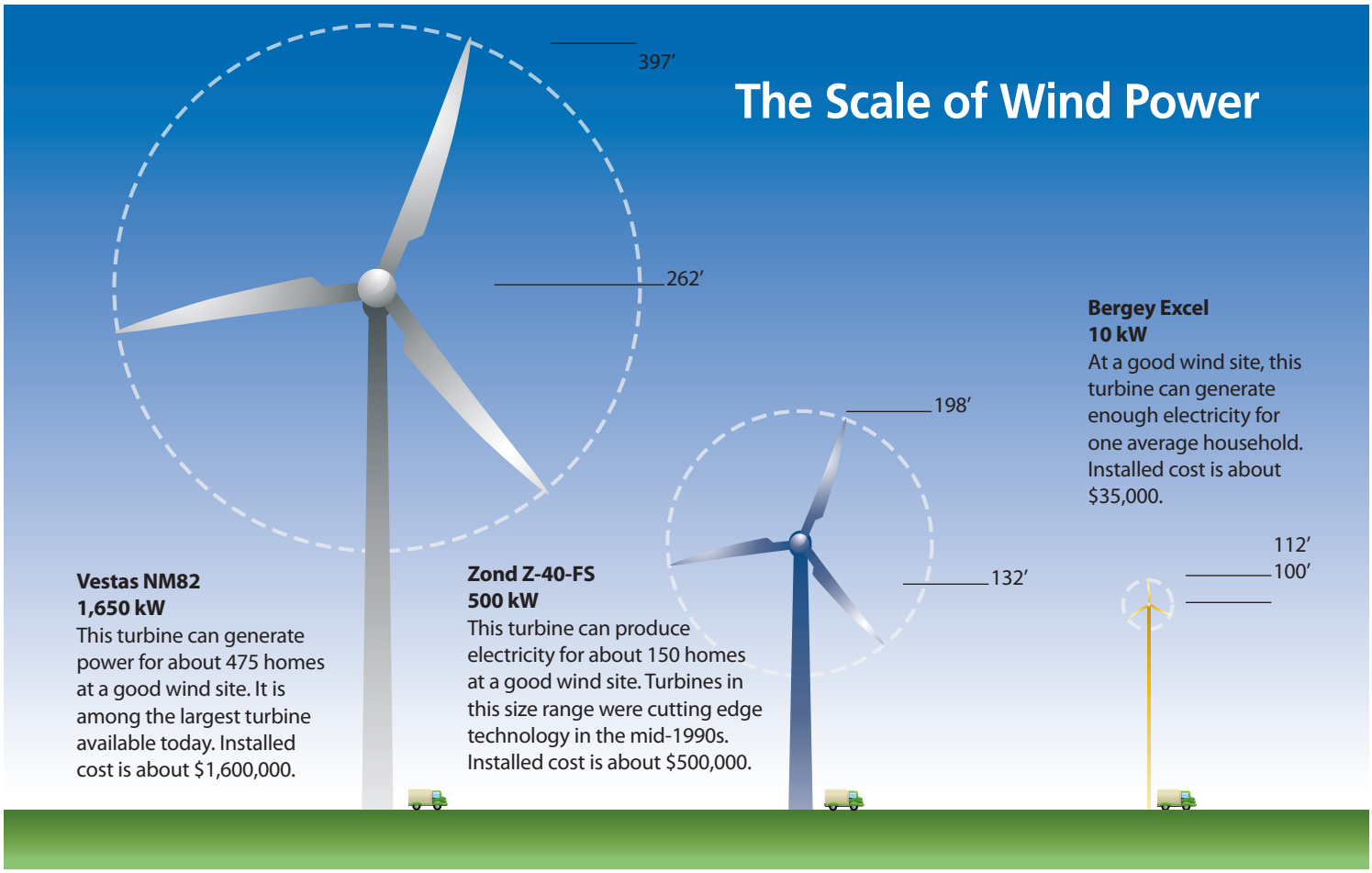
Modern Wind Turbines

Modern wind turbines can capture wind energy at a variety of different scales. They range in rotor size and generator capacity—from a few feet to over 125 feet in blade length, and from less than one

Community Benefits of Wind Technology

Whether the power generated by a wind system is used by a single residence or purchased by a large utility, the benefits of wind power extend to the entire community, including:

- Reduced pressure on the local electricity grid;
- Reduced fossil fuel burned by the local utility;
- Increased local energy independence;
- Increased property values of the wind turbine hosts;
- Local jobs in manufacturing and distribution, design, installation, and system maintenance;
- Revenue payments to the host community or landowners circulate in that community;
- Reduced air and water pollution from fossil fuel electricity generating facilities;
- Enhanced reliability and power quality of the power grid; and
- Increased security (small wind systems can provide back-up power to strategic police stations or hospitals for "hazard mitigation" purposes).



Graphic showing scale of different wind turbine sizes. Source: Windustry.

kilowatt to several megawatts of generating capacity.[2] Wind turbines can be used to power local homes or facilities, and multiple wind turbines can be clustered in wind farms, forming wind power plants that feed electricity into the utility grid.[3]

Wind System Scale

Wind turbine systems vary based on a number of factors—including size, generating capacity, and tower height.

Small Turbines

Small wind turbines are typically defined as turbine systems with a maximum name plate rating of 100kW. Small wind turbine towers are up to 160 feet tall. To help understand scale, a 100kW wind turbine produces enough energy to power 5-10 homes.[4] It is often viewed as the right amount of power for schools and university campuses, local government facilities, farms, and a variety of business applications. To power individual homes and small farms, wind turbines are typically between 1kW and 20kW.

Mid-sized Turbines

Mid-sized wind systems are commonly considered to have a capacity between 100kW and 1 MW and stand at 120 to 300 feet tall.[5] These turbines are most commonly used to power on-site facilities such as schools, farms, factories or local communities.

Large Turbines

Large wind systems typically have capacity over 1 MW and stand from 300 to 450 feet tall. These wind turbines are commonly clustered in wind farms and utilized to supply power to the grid.

Wind System Application

Different sizes of wind systems are appropriate for different applications.

Distributed Generation (DG)

Distributed Generation systems generate electricity near where energy is being consumed. The technology is called "distributed" because the wind turbine is placed at or near the point of energy consumption and the electricity is used on-site to off-set electric usage. In contrast, "centralized" power systems generate electricity remotely at large-scale power plants and then transmit the electricity down power lines to the consumer via the utility grid.[6]

Depending on location, excess energy produced by DG systems, beyond what is consumed on site, may be credited by the local utility through net metering. DG turbines (small and mid-sized) are typically smaller compared to utility-scale clusters of wind turbines. Yet, they carry significant benefits, including reduced energy loss by avoiding power transmission over long distances, reduced load on America's aging and overtaxed utility transmission lines and reduced dependence on fossil and nuclear fuels. Additionally, local communities benefit when residents and small businesses save money on utility bills and then spend that money within the community; distributed generation is good for the local economy.

Utility-Scale Generation

Utility-Scale Wind Generation systems do not directly provide energy for on-site or local facilities. Rather, they feed power to a sub-station and supply the large-scale utility electric grid. Utility-scale generation is not defined by any number of wind turbines. Economics typically encourages the development of multi-turbine wind farms—in interconnected groups of large turbines, sometimes even several hundred turbines in one location. Wind farms are built in locations with consistently high-quality wind resources, but can also be developed in locations with a load that needs powering.[7]

Community Wind

Community wind refers to small utility-scale generation projects with a specific ownership model. They must be locally owned and optimize local economic benefits. Locally owned means one or more members of the local community has a significant direct financial stake in the wind project other than through land lease payments, tax revenue, or other payments in lieu of taxes. Community wind project owners can include individuals, groups of farmers, cooperatives, municipal utilities, Native American tribes, schools, or local governments. By taking on project ownership, community wind is more risky than simply leasing land to developers. However, the economic rewards can also be proportionately greater.[8]

Governing Wind Development

Local governments use zoning, building permitting, and public safety regulations to protect their community residents and businesses. These decisions have direct impacts on the cost, efficiency, and eventual success of wind energy projects. For instance, local government decisions to delay or increase compliance requirements for wind energy projects can interfere with community demand for wind power and raise project costs. As a result, many county leaders interested in fostering wind power in their communities are thoughtfully considering how to consider the interests of community residents and businesses, while at the same time promoting wind power, reducing implementation costs and streamlining the permitting process.

Utility-scale and distributed wind energy have very different regulation requirements; this is largely due to size and technology differences. Over the past several decades, much more attention has been given to utility-scale regulations and, until recently, distributed wind often did not make sense for many individuals and communities. Today, however, energy costs, environmental concerns, advances in technology and other factors are driving an increased interest in -- and more installations of -- distributed wind energy systems.

Many counties have not yet included small wind systems in their zoning codes to allow for their use. The permitting process can be the single most daunting obstacle for would-be consumers and wind developers. In some places, unfamiliarity with wind technology has kept county leaders from addressing wind development. And, in some places, unfamiliarity has resulted in a complete restriction of wind development to avoid "setting a precedent". Making the permitting process affordable, streamlined, and accountable is in the best interest of consumers, potential energy providers, the environment and the community.

Limits to Local Governance

Local government authority over wind facility siting varies by state. Some local governments have complete authority over wind system siting, some share authority with state decision-makers, and others give up full authority to state-level decision-makers.

In 48 states, local governments exercise some authority over commercial wind facility siting, and in 34 states, local governments have substantial autonomy to regulate the siting of commercial-scale wind facilities. To learn more about how wind facility siting is governed in your state, visit www.elistore.org/data/products/d21-02.pdf.

By researching wind technology and adopting a wind energy engagement strategy prior to receiving public inquiries, counties can ensure that wind development projects move through government processes quickly and adhere to planning objectives. County governments have several options to manage the development of wind energy facilities in their communities.

Special/Conditional Use Permits

Special/Conditional Use Permits require each wind system project application to be reviewed on a case-by-case basis. Installations are permitted, provided certain conditions identified by statute or the local zoning ordinance are met. Until recently, wind development has been considered new and most local governments have found it difficult to regulate. For this reason, Special/Conditional Use Permits have been the most common permit type identified by the National Association of Counties. The special use permit typically requires detailed project descriptions from applicants and multiple public hearings—putting a significant burden on consumers and project developers. However, reasonable ordinances that also provide conditional use language can be developed, as was done in the state of Wisconsin.

Permitted Use Permits

Permitted Use Permits allow wind systems by default, provided that the installation meets design standards specified by statute. It indicates that justification has been established for the structures' eligibility, and, as such, no public hearings are required, and permits are issued quickly. Permitted use permits are clear and straight-forward for wind consumers and developers. They are typically enacted in rural areas where neighbors are far apart, reducing potential negative impacts and consequently neighbor concerns.[9] Download the following for more information:

- **DWEA Small Wind Model Zoning Ordinance**
http://distributedwind.org/assets/docs/PandZDocs/dwea-model-zoning-ordinance-passed-01-07-12.pdf

- **Linn County Small Wind Innovation Zone designation**
https://efs.iowa.gov/efiling/groups/external/documents/docket/105873.pdf

While both Distributed Generation and Utility-scale wind projects are most typically regulated through Special Use permit, an emerging trend for local governments over the past decade has been to allow Distributed Generation wind projects "by-right," or as a permitted uses. As small wind systems become more commonplace and community residents' demand increases, local governments are learning to be more proactive about managing wind development projects. Permitted use permits are proving invaluable for promoting wind projects because they reduce the costly time and legal fees associated with project review.[10]

Accessory Uses

Labeling something an Accessory Use allows it "by right" through zoning law, but only in connection with principal uses established by zoning regulations. Establishing wind projects as Accessory Uses functions much like a permitted use, yet projects must be attached to specific zones enabled by statute. Labeling wind projects as Accessory Uses enables local governments to allow them "by right" in specific areas of communities. Wind projects are most commonly labeled an accessory use in agricultural, commercial, and industrial zones. Labeling wind projects as Accessory Uses, such as Pitt County (see page 36, Table 5-1) enables consumers and developers a significant amount of flexibility in specific areas.

For example, view Pitt County, NC's Zoning Ordinance at www.pittcountync.gov.

Overlay Zones

Overlay Zones indicate that specific areas within communities are appropriate for certain activities. They enable small wind systems essentially "by right," superseding prevailing zoning requirements. Often some basic project review is required, but minimal relative to communities that review wind systems under special use permits. Overlay Zones are effective in that they expedite the permitting process and reduce costs to consumers and developers.

For example, visit St. Lawrence County's Wind Farm Model Ordinance at www.co.st-lawrence.ny.us.

Master/Comprehensive Plans

Master/Comprehensive Plans are communities' most significant comprehensive land use regulatory tool. Their scale and influence make them challenging to revise. Incorporating guidelines for wind systems into Comprehensive Plans ensures the utmost consistency and "by right" opportunity of all the options available.

Incentivizing Renewable Energy

Beyond regulating wind energy projects, counties can offer incentives to promote renewable energy. Incentives include: property tax exemption for wind turbines (For example, Wisconsin does this with residential turbines by state statute 70.111 (18)) reducing, or waiving, permit and development impact fees; expedited review and permitting; and awarding density bonuses for developments that generate a portion of their energy demand on-site.

Counties can also provide support with the soft costs associated with wind project development—including ideal siting information, providing measurements of wind resources, and community education on wind projects. To learn more about local government incentives, see NACo's Green Incentives Handbook at www.naco.org/greencounties.

A recent trend has been to develop a Community Energy Plan and recognize wind energy systems and guidelines within it.

Developing Wind Ordinances

The National Association of Counties undertook an extensive research process, including numerous interviews with local government leaders, to learn and share the best practices from county governments on regulating wind energy systems. This publication was vetted by NACo and DWEA leadership for consistency with the recommendations that follow.

For counties, NACo finds that the most common method for regulating something new, such as wind energy systems, is to develop ordinances. County ordinances clearly establish specific standards and processes for developing wind energy systems. Depending on wind project size and application, ordinances will focus on different sizes. For example, Rockingham County, Virginia adopted separate Small and Large-Scale Wind Ordinances.

Many state agencies, university research centers, and wind energy trade associations have model ordinances available, which can be adapted by counties as needed. Here are several downloadable model wind ordinances of interest:

- Model Wind Ordinance - Distributed Wind Energy Association
http://distributedwind.org

- Wisconsin Small Wind Model Ordinance
View the Small Wind System Model Ordinance available on the RenewWisconsin website http://renewwisconsin.org/wind.

Key Wind Ordinance Elements

No matter whether the ordinance is focused on small or large wind systems, all ordinances reviewed by the National Association of Counties addressed the following elements:

Setback distances and height

Setback distances are mandated distances that a wind turbine must be "set back" from a property line in a given zone. This mandated distance is designed to address concerns from abutting neighbors. Setbacks vary by community, but setback distances are typically equal to a tower's height plus the length of one blade.

Lot size

Some zoning rules limit turbines and/or their heights to a corresponding property size, such as limiting lot size to one acre or larger. Because lot sizes vary by area due to shape, requiring minimum lot sizes may essentially limit particular zones from developing wind projects.

A residential 10 kW turbine on 140-foot freestanding lattice tower.

Aesthetics

The NACo research finds that most of the controversy surrounding wind systems is related to aesthetics. To function best, wind turbines must be tall and unobstructed, well above the prevailing tree line and buildings. This means that they will likely be visible at some distance. Some residents object to their appearance. As a result, some communities will regulate the appearance of wind towers by prohibiting the use of commercial markings, messages or banners on turbines or towers. Regulating aesthetics by dictating which tower types are acceptable in order to ensure that only the most visually appealing designs are implemented, and dictating that towers "blend in" with their surroundings are not suggested. These restrictions invariably increase the cost of the system with little to no benefit, and in some cases can actually have a negative effect on the functionality of the wind turbine.

Sound

Sound is often also a concern for community residents. Yet, compared to their historic counterparts, modern wind turbines have better insulation, lower rotation speeds, fewer moving parts, and more efficient blades, making them much quieter. Typically, turbines emit sound that is barely discernible from ambient noise. Sound from traffic, rustling trees, air conditioning, and people often mask the low "white noise" of small turbines. During severe storms and utility outages, turbines make distinctive sounds, but in these instances, ambient sound levels increase as well. Of course, larger turbines have the potential to emit higher levels of sound and require stricter standards.

Best Practices:

Small/Mid-Sized Wind System

Height

Best practices for wind turbine siting dictate that turbine rotors should be at least 30 feet higher than any obstacle within 500 feet. Tower height is the most important aspect of a wind turbine installation as it affects productivity, sound, life-span of the equipment and project economics. Taller wind turbines have access to higher wind speeds and wind quality, allowing for greater energy production and longer equipment life. Therefore, it is important to consider how height restrictions will impact proposed wind projects' economics. Small wind turbines are commonly placed on towers 80 – 160 feet tall; even in ideal conditions (flat, coastline, etc.), towers under 60 feet tall are not typically recommended. Instead of implementing height restrictions, require that siting and minimum height best practices be followed. For example, view Nicollet County, MN's Wind Energy Conversion System Ordinance at www.co.nicollet.mn.us.

Setbacks

The goal of setbacks is to regulate the placement and spacing of structures on properties. Since wind turbines and towers are engineered structures, the standard setbacks used to regulate other structures on properties could be applied. Rather than specifying set-backs for wind systems that do not require specific height limits or minimum lot sizes, instead place restrictions on the proximity of turbines from neighboring occupied buildings, property lines, overhead utility lines, and public roads. Example: the North Carolina Model Wind Ordinance specifies setbacks for what it considers small (20kW or less), medium (20 kW-100kW), and large (100kW or more) turbines, based on tower heights. Under this type of ordinance, taller towers are allowed on larger parcels of land.

Lighting

Small wind turbines typically do not surpass the height requirements that require lighting towers according to Federal Aviation Agency (FAA) regulations. Beyond the FAA regulations, most counties find it unnecessary to impose stricter local regulations to ensure flight safety. For example, view Clinton County, IN's Wind Ordinance at www.in.gov.

Safety

In some counties, community residents have voiced concerns that wind systems could pose a temptation to unauthorized climbers and should be fenced off to prevent potential climbing-related injuries. Research indicates that this is not a valid issue. Of the hundreds of thousands of wind turbines installed in the US, only one civilian has ever been reported as injured or killed by their unauthorized climbing of a tower.[12] Requiring small wind owners to install fences is costly and can restrict emergency or utility personnel from accessing the tower should a need arise. Rather than require a fence, counties are requiring that owners remove climbing foot rungs on the lower 10-12 feet of a freestanding tower and/or display "Danger-High Voltage" or "Caution-Electrical Shock Hazard" signs on the sides of towers.[13]

Aesthetics

Some counties argue that concessions can be made to limit the visibility of wind systems. Many counties find that requiring wind systems to "blend in" with surroundings is subjective and can significantly burden small wind developers in terms of project development guidelines and cost. Many counties already accept water towers, buildings, billboards, cell phone towers, and grain silos in their communities.14 Counties should consider allowing any wind tower type, permitting the structure is installed safety and is free from advertising. A request for "original manufacturer's paint" is commonly used in ordinances to reduce visual eye-sores.[15] For example, view Section 431 — Wind Energy Systems of Wasco County, OR's Zoning Code at http://co.wasco.or.us.

Fees

Permit costs vary by region, but are typically influenced by population density. Predominantly rural states have substantially lower permitting costs than those with large urban centers.[16] This is because evaluating project impact is more complex in more compact communities. Regardless, large permitting fees can be prohibitive for small wind installers. The Distributed Wind Energy Association (DWEA) recommends that the building permit fee for a small wind system follow the existing fee structure for permits required of other structures. Charges for inspections would apply at the standard rate used for other structures. For example, view Polk County, WI's Small Wind Energy System Ordinance at www.co.polk.wi.us.

Utility-Scale Wind System

Map Wind Resources

Counties can identify preferred siting areas for wind projects prior to receiving permit applications. In doing so, county planners can guide development of these initial wind projects toward the least environmentally sensitive areas. Keep in mind that utility scale projects are accountable to a number of federal agencies, including the EPA (Clean Water Act relative to surface water resources) and US Fish and Wildlife Service requirements. For example, download Cascade County, MT's Wind Resource Maps at http://www.cascadecountymt.gov/doc/WindPowerMap.pdf.

Ensure Coordinated Permitting Processes

Permitting can be one of the most significant costs associated with developing wind projects. To reduce the time and expense, county leaders can do the groundwork to accept wind system projects "by right," or consider them as Accessory Uses or allow them in Overlays in specific zones. For example, view St. Lawrence County, NY's Wind Farm Model Ordinance at www.co.st-lawrence.ny.us.

Focus on the Issues

Good information is key to assessing proposed wind systems projects objectively and in a timely manner. As such, counties can be clear about information requirements and require all appropriate information from developers early in the permitting process. Often, issues arise that are not based in factual evidence—such as the perceived public health effects associated with magnetic fields, fear of possible changes in property values, so-called "wind turbine syndrome," and visual and sound impacts. A fact-based approach can help focus the conversation, educate the public, and ensure a fair basis for decision-making. For more factful information about wind, visit www.nationalwind.com/files/NationalWindTurbineFacts.pdf.

De-commissioning

Permit compliance extends throughout wind projects' lifetimes. Especially with privately operated wind farms, closure and decommissioning are critical elements of application review. To ensure that a non-operating project does not represent a health or safety risk once it is no longer in use and/or to ensure that it is disposed of properly, permitting agencies can (1) require wind developers to post bonds after permitting to ensure that decommissioning costs are covered; (2) rely on the project developer to contribute to a decommissioning fund as the project generates revenue; or (3) rely on the salvage value of the abandoned project.[17] Note that bonding and decommissioning requirements are considerably different for utility scale projects compared to individually-owned small turbines or community owned projects. For example, view Rockingham County, VA's Wind Ordinance at www.rockinghamcountyva.gov.

Sound

The operating sound produced by wind farms is considerably different in level than that generated by other types of energy facilities. Wind farms are typically located in rural or remote areas with low population densities and low ambient sound levels. Due to the nature of these windy locations and quiet modern wind turbines, sound generated naturally by the wind can be sufficient to mask sounds generated by wind systems. County agencies address potential sound concerns by requiring developers to predict and measure sound levels, establishing sound standards, requiring sound setbacks (based on dB, not distance) and restricting development to certain zoning districts. For example, visit www.dsireusa.org/documents/Incentives/NC22R.htm.

Aesthetics

With large wind turbines, aesthetics are often a more significant issue for utility-scale projects than for small/mid-sized projects. Utility-scale wind farms often occupy large open areas, mountaintops, or cleared ridgelines to access higher wind speeds for greater energy production. Other elements that influence the visual impact of wind farms include the spacing, design and uniformity of the turbines, markings or lighting, roads built on slopes, and service buildings.

When wind turbines are arranged along a ridgeline to capture wind that flows over the ridges, the turbines are visible from greater distances. Newly exposed surfaces from construction of access roads may contrast sharply with existing soils and vegetation. To mitigate impacts, county staff can ensure that the public clearly understands the costs and benefits of developing wind systems. Staff can require developers to complete visual impact and environmental studies. Effective use of wind resources requires maintaining adequate spacing between individual turbines as well as between rows, banks, or tiers of turbines. Counties find that fewer and wider-spaced turbines present a more pleasing appearance than tightly-packed arrays. For example, download Tompkin County, NY's at www.tompkins-co.org/emc/docs/FINAL-windordinance2005.pdf.

Interconnection

Large arrays of wind turbines require an extensive power collection and electric interconnection system to transport the generated electricity to the utility power grid. Counties should review developer plans to ensure placement of transmission equipment is safe and complies with local planning goals. For example, view Fillmore County, MN's Wind Energy Conversion System Ordinance at www.co.fillmore.mn.us.

Lighting

When towers reach 200 feet or higher, they move into regulated airspace and must adhere to Federal Aviation Agency (FAA) regulations by installing lighting and other markings. More lights and markings are often required for installations near airports, where projects extend into flight paths. For example, view Clinton County, IN's County Wind Ordinance at www.in.gov.

Biological Resources

Wind turbine collision with birds has been the most controversial biological consideration affecting wind farm siting. However, through extensive study and observation, measures can be put in place to minimize or avoid collisions. The US Fish and Wildlife Service now requires mitigation plans to protect plants, animals and habitats. Counties can ask developers to share with them these mitigation plans.[18] For example, view Vermilion County, CA's Wind Energy Structure Ordinance at www.vercounty.org.

Clean Water Act

Like other construction projects, wind projects are subject to the Clean Water Act. If projects disturb more than five acres, developers must prepare Storm Water Pollution Prevention Plans in order to obtain a National Pollutant Discharge Elimination System (NPDES) compliance permit, which is issued by the state's environmental quality agency. Example: www.epa.gov/owow/NPS/ordinance/mol2.htm

If a wind system is installed and operating properly, its operating sound level is not expected to exceed a zoning policy's established "nuisance noise" level, except during short-term storms and/or utility outages. Rather than singling out wind turbines in sound regulations, some counties are finding that it's fairer and administratively easier to apply existing sound/noise regulations to wind turbines.

Shadow Flicker

Under certain circumstances, low sunlight passing through turbines' rotors can cast visible shadows on the ground and nearby structures. The phenomenon, known as "shadow flicker", occurs only a few hours per year, usually at sunrise or sunset. This issue pertains almost exclusively to large, utility-scale turbines, as their blades are much larger and move more slowly than small/mid-sized turbines. Wind developers include shadow flicker diagrams in their project proposals, minimizing shadows as requested by the neighbors. For small turbines, normal setback distances mitigate or eliminate this potential nuisance, so modeling is should not be a requirement as with large-scale turbines.

De-Commissioning

Counties typically require assurance that any non-functioning turbine be removed after a period of time to prevent unwanted clutter in a community. Although abandonment of wind systems is rare, due to today's improved technology, a community should be entitled to recourse if an abandoned turbine presents a nuisance.

Insurance bonds or security bonds may be required for large, utility-scale turbines, especially those that are installed by wind farm developers and situated on leased land from third-party property owners. Funding for bonds can be made possible through public financing, but this recourse is inappropriate, burdensome, and unnecessary for owners of small systems. If the owners fail to maintain wind systems properly, systems can be removed for safety reasons and managed under the community's Public Nuisance language in the zoning code.11

Ordinance Considerations for Different Applications

Beyond what is included in the previous section, elements included in ordinances vary depending on the different applications of wind systems. This section illustrates the best practices in promoting wind energy, while remaining cognizant of public safety and property rights. Depending on site location, system size, and design, wind ordinances can incorporate a variety of different elements.

Wind System Classification

Wind system classification during permitting process sets the stage for proper implementation of projects by impacting their feasibility and economics. Misclassification during permitting can result in prohibitive costs and unnecessary hoop-jumping for applicants and permitting authorities. For example, a small wind turbine should not be re-classified as a utility/commercial wind turbine simply because the utility service to the building it serves is listed in the "commercial utility service" categorized by a utility company. The classification of electric utility service does not affect the classification of wind turbine sizes. Misclassification of this nature can result in unnecessarily burdensome requirements for hearings, studies, reviews, and engineering services. In addition, eligibility for funding and net metering can be affected.

Small/Mid-Sized Wind Systems

NACo research finds that counties most commonly allow small and mid-sized wind systems "by-right" or through Conditional/Special Use Permits. Often consumers and small developers are the ones implementing small and medium-sized wind projects. These parties often have less funding, relative to large wind developers, for complex applications processes and extensive permitting fees. As a result, those counties interested in allowing small and medium-sized wind projects should be cognizant of small and medium-sized wind developer limitations.

Utility-Scale

The scope of utility-scale investment warrants unique regulatory considerations. Utility-scale wind farms can span several miles, often across multiple private properties through lease agreements, and include significantly larger turbines. Therefore, NACo research finds that the county permitting process for utility-scale regulation is stricter and more thorough, including multiple public hearings and environmental reviews. Most often, state agencies get involved in projects large enough.

County Case Studies: Implementing Wind Ordinances

The following section includes a series of case studies to help county leaders get started developing policies that safely facilitate wind development. These case studies have been identified by county leaders as highly effective at promoting wind development, while at the same time protecting the public from any unintended consequences of wind development.

County leaders recognize that regulating industry is challenging, and as industry changes, regulations need to keep up. As such, leaders from the Distributed Wind Energy Association were invited to comment on the case studies. The comments, included at the end of each case study, highlight the positive steps taken by each county, while also suggesting how the ordinances can be improved to continue to promote public safety and responsible installation and utilization of wind power.

"DWEA recognizes great potential in working cooperatively with counties to promote responsible wind development across the US. Together, DWEA and Counties – like those highlighted here – have the ability to streamline the bumpy and unpredictable permitting and zoning landscape that often accompanies distributed wind applications. DWEA thanks each County, and NACo, for their efforts."

- Lisa DiFrancisco
Distributed Wind Energy Association

✻ Linn County, Iowa

Establises a Small Wind Innovation Zone

County:	Linn County, Iowa
Population Size:	211,226
Adoption Date:	2006, with amendments in 2007 and 2012
Use Type:	Large wind regulated by Special Use Permit, Small Wind is Accessory Use in Most Districts
Link to Ordinance:	www.linncounty.org
Contact:	Bill Micheel, Planner Bill.Micheel@linncounty.org

History

Linn County, IA adopted regulations for large and small wind energy conversion systems in 2006. In 2009, by adopting Iowa Code Section 476.48, the Iowa State legislature directed the Iowa Utilities Board to establish and administer a Small Wind Innovation Zone program to optimize local, regional, and state benefits from wind energy and to expedite interconnection of small wind energy conversion systems (100 kilowatts or less) with electric utilities throughout the state. Around that time, the Iowa Utility Board worked with the Iowa State Association of Counties, the Iowa League of Cities, and utility representatives to release a model small wind ordinance for adoption by all levels of local government, including cities, counties, and school districts.

The county is currently working on amendments to the county's small wind ordinance, which would align the county's policy with a state model ordinance in order to receive designation as a Small Wind Innovation Zone (SWIZ). In doing so, the county would accomplish the following:

- ✻ Increase benefits from wind energy
- ✻ Facilitate and expedite interconnection with electric utilities
- ✻ Increase energy independence of Linn County
- ✻ Encourage small wind installation through incentives

Key Criteria

Setbacks

The original ordinance referred to set-back distances as the "Fall Zone" (area where the turbine would fall, given a natural disaster or other event). Realizing that this terminology subtly suggests that turbines are unsafe, the 2012 ordinance amendments will use the term "setback distance."

Maximum Tower Height

Ordinance amendments also increase the allowable height of the wind turbines to meet industry standards, an allowable 120 foot tower on a property greater than one acre.

Interconnection Policy

As part of Iowa's Small Wind Innovation Zone Program, the Iowa Utilities Board put out an interconnection policy, which regulated utilities are required to adopt to streamline the interconnection process for wind operators looking to set up net-metering or sell back unused energy to a utility. Although the interconnection policy will not be required until Linn County receives SWIZ designation, some utilities in Linn County have adopted the policy voluntarily.

Financial Incentives

By receiving the Small Wind Innovation Zone designation, small wind operators in Linn County are eligible to receive a State of Iowa Production Tax Credit through the state's Renewable Energy Tax Credit Program. The incentive, a 1.5 cent per kilowatt hour, is calculated as part of the property owner's state taxes. This incentive is additional to incentives offered by utilities.

Engaging Elected Officials and Industry Leaders in Policy Review

When the Planning staff first started pursuing ordinance amendments, they took a proposal to the County Board of Supervisors, who responded enthusiastically to the opportunity to provide incentives to residents.

As the amendment language was being crafted, Planning staff engaged wind system installers, the Executive Director of the Iowa Wind Energy Association, and local consultants for input. The industry leaders helped to ensure that the ordinance would truly encourage small wind installation. For example, Planning staff had considered including a requirement for a Shadow Flicker Analysis with permit application, but decided it was an insignificant issue and an undue burden on small wind installers.

Permitting Costs

For small wind, the Linn County Dept. of Planning & Development charges a $15.00 fee for the site plan to ensure that the towers meets all of the setback, height, and other requirements in the zoning code. The fee schedule for building permits is based on a percentage of the valuation of the tower.

Outcome

Linn County issued a total of three permits for small wind towers since 2005. County staff hopes that the available financial incentive will increase the number of permit applications in the near future.

Future

County planners anticipate the amendments to be adopted by the County's Board of Supervisors in late February 2012. At that time, Linn County will submit an application for designation to the state's utility board. Linn County anticipates being 1 of 3 counties receiving the Small Wind Innovation Zone designation.

After receiving designation, county staff will release information through multiple media outlets. People who come in to apply for zoning and building permits for small wind will be made aware that the county has done the work to receive the Innovation Zone designation and their eligibility to receive financial benefits and streamlined interconnection approval.

Bill Micheel, County Planner, said that the incentive program may not be enough to compel people to install, but will certainly help offset costs for those who are already pursuing small wind installation.

DWEA Comments

While DWEA was not able to review the actual ordinance for Linn County, Iowa, we found the summary of their amendments (and the process by which they arrived at those amendments) to be impressive and progressive. Of particular note was the County's effort to involve all stakeholders, including industry and community leaders, in the ordinance language amendments.

The County also went the extra mile to receive a designation that would allow Small Wind operators to qualify for certain State incentives that are often reserved for Utility Wind operators. Linn County is demonstrating tremendous leadership through its actions and through its continued efforts to develop and improve their own permitting and zoning policies as they learn more about wind technology and its benefits. DWEA looks forward to hearing more about the progress Linn County makes in the coming months and years.

✻ Tippecanoe County, Indiana

Prepares for Future Development

County:	Tippecanoe County, Indiana
Population Size:	172,780
Adoption Date:	2007
Use Type:	Overlay District
Link to Ordinance:	www.tippecanoe.in.gov
Contact:	John Burns Planner, Area Plan Commission of Tippecanoe County jburns@tippecanoe.in.gov

History

Tippecanoe County adopted the first version of its Wind ordinance in 2007. A neighboring county to the west, Benton, was establishing a large wind farm at that time, which spurred Tippecanoe to prepare a plan for future development. At that same time, 4 neighboring counties were also preparing ordinances.

The Area Plan Commission took the lead on drafting a wind ordinance for the county. Staff realized that very little could be adapted from Benton County's ordinance, which was tailored for a specific development. John Burns, Planner, researched examples from other parts of the country and prepared the ordinance with elements from other Midwestern states, particularly Wisconsin, Illinois, and Minnesota.

In 2010, the County updated the ordinance to collect Construction and Operating fees from large wind collection facilities and modified set-back and noise restrictions to address resident concerns.

A small group of residents also expressed concern about the possible effects of low-frequency sound waves emitted by the wind systems. When the ordinance was revised in 2010, the set-back requirement and noise restrictions were change slightly.

Policy Elements

The policy regulates 3 different types of wind installations:

- "Micro" installations are roof-mounted systems. Micro systems are allowed by right throughout the county.
- "Small" installations are free-standing turbines up to 140' tall with a nameplate capacity of less than or equal to 50kW and a swept area of 40' or less. These installations are only permitted in industrial, rural, and commercial zones through Special Exception/Conditional Use.
- "Large" installations are all other projects. There is no maximum height for these projects.

Key Criteria

By establishing a difference between roof-mounted micro-wind systems and wind energy conversion systems, Tippecanoe County allows greater flexibility for homeowners seeking to install a roof-mounted system.

Micro-wind Systems

Micro-wind systems are building-mounted wind systems that have nameplate capacity (manufacturer's ratings) of 10 kilowatts or less and projects no more than 15' above the highest point of the roof; such building-mounted wind systems shall not be considered wind energy conversion systems. Micro wind systems are subject to UZO section 4-11-11 but only numbers (1), (11), (17) and (18).

Wind Energy Conversion Systems (WECS)

Wind Energy Conversion Systems (WECS) convert and store or transfer energy from the wind into usable forms of energy. They include any base, blade, foundation, generator, nacelle, rotor, wind tower, transformer, turbine, vane, wind farm collection system, wire, or other component used in the system.

Fees

Applicants are required to pay a filing fee ($20), a minimum deposit for the permit application, and fees for the inspection certificate. If the costs of reviewing the processing the application exceed the minimum fee, the applicant will receive a bill for the additional amount.

Construction Permit Application Fee Deposits

Commercial:	$2,500, plus $200 per tower
Non-Commercial:	$2,500, plus $200 per tower
Micro:	$100
Meteorological Tower:	$500 per tower

Inspection Certificate Fees

Commercial:	$1,250, plus $100 per tower
Non-Commercial:	$1,250, plus $100 per tower
Meteorological Tower:	$500 per tower

Outcome

Mid-west regional wind energy companies have been active in the county's public hearing pertaining to the ordinance's adoption and have provided comments. Tippecanoe County has benefitted from having Purdue University as a local

resource. Purdue faculty members have helped the county develop the ordinance and educate residents and business owners about the opportunity in benefit from wind energy.

Currently, large wind turbines are being used to power the City of Lafayette's downtown bus station and each of the public schools. At this time, meteorological towers have been installed to measure the capacity for utility-scale wind farms, and some landowners in the southern part of the county have begun signing leases with utility wind developers, although no wind systems have been permitted to date.

Future

The county's three county commissioners, as well as leadership on Lafayette's City Board and other municipal boards, are very supportive of wind and clean energy options. As Tippecanoe's county leaders have embraced clean energy, it is assumed that Wind Resources would be incorporated into the next Master Plan update.

DWEA Comments

Tippecanoe County, Indiana, has taken an important first step toward the development of a good wind ordinance by recognizing that there are different size categories that require their own unique permitting and zoning guidelines. However, DWEA leadership recognizes several opportunities to make the ordinance more accurate in its designations and open toward wind development. The definition of the wind categories could be more clearly identified, and significant changes could be made to the recommendations and permitting allowances for roof-mounted systems. Other topics would include setbacks, tower requirements and fee structures.

For more technical information on building integrated wind and the recommended permitting & zoning requirements, see the Building Code section of DWEA's Small Wind Model Zoning Ordinance, section 4.7.2, and other fact sheets. DWEA does not recommend nor condone building integrated or building mounted wind turbines.

* St. Lawrence County, New York

Develops Model Ordinance for Local Townships

County:	St. Lawrence County, New York
Population Size:	111,994
Adoption Date:	2007
Use Type:	Special Use Permit, Overlay District
Link to Ordinance:	www.co.st-lawrence.ny.us/Departments/Planning/ModelWindEnergyFacility
Contact:	Keith Zimmerman, Director, Planning kzimmerman@stlawco.org
Contact:	Jason Pfotenhauer, Deputy Director, Planning jpfotenhauer@co.st-lawrence.ny.us

History

In 2005, Hammond, a township situated in St. Lawrence County's western corner, was approached by a utility-scale wind developer with a plan to develop a 75-turbine wind farm. At the time, the county's agricultural landscape was untouched by wind turbines.

Recognizing that the county could provide a regulatory framework for townships like Hammond, St. Lawrence County's Planning Board and Environmental Council researched and developed a Model Wind Ordinance between 2005 and 2007.

The Role of Federalism

In New York State, counties do not have direct authority over land use decisions. Especially in rural areas, counties serve an essential advisory role to the local townships that may have small or no formal staff.

St. Lawrence County recognized that the county, as a neutral third-party, could provide a fair regulatory framework, which could be utilized by the local municipalities. Keith Zimmerman, Planning Director, described that the county "had no horse in the race" and wouldn't neglect critical aspects of the wind ordinance out of spite or favoritism.

Members of St. Lawrence County's Planning Board and Environmental Commission met monthly for nearly two years to perform the research needed for the Model Ordinance. The committee examined numerous ordinances adopted by local governments in New York, and created regulations similar to those adopted in neighboring Clinton and Jefferson Counties. The committee felt that wind farm developers would benefit from a relative uniformity of development regulations.

The Model Ordinance outlines two different "tracks" for adoption by a municipality, and the county encourages customization of the law.

Key Criteria

The Model Ordinance outlines criteria and a procedure for permitting small and large wind turbines through a Special Use permit process with one public hearing.

Wind Overlay Zones

The Model Ordinance establishes Wind Overlay Zones, areas of a community where wind towers would be permitted to be built. Most often, these Zones would often correspond to areas of the community's existing zoning. If a community has not establishes zoning, the Model Ordinances outlines a step-by-step procedure for creating the Wind Overlay District.

Noise Regulations

The Model Ordinance requires that wind turbine noise not exceed 50dbA when measured from the nearest off-site building.

Setback Requirements

Setbacks include:

- 500 feet from nearest site boundary/roads
- 500 feet from nearest wetland/water body
- 1.5 times its height from any structure
- 1,000 feet from nearest existing residence

Outcome

About 10 townships have utilized the Model Law in some form. Since the majority land area of St. Lawrence County is not suitable for large wind, most municipalities have adopted the small wind component. A least three have adopted the regulations for large-scale wind. None of the townships that have adopted the ordinance are actively pursuing wind development as an economic development strategy, but all recognize its potential impact on future development and wanted to have a regulatory framework in place.

While public financing for large wind farm development may involve the county's Economic Development Administration (EDA), the county does not play a formal role in economic development or workforce training.

Future of Wind in New York

Recently, the New York State Assembly passed "The Power NY Act of 2011," which resurrected a public service law of 2008 which reduces the permitting power of local governments. Essentially, the legislation dictates that power plants, wind facilities included, greater than 25 megawatts, will be permitted through a 7-member multi-agency siting panel rather than local siting processes. Further, the Governor of New York has indicated that the state wants to move forward with improvements and expansion of the state power grid.

Future Changes to the Ordinance

St. Lawrence County will likely revise their Model Ordinance in their future to incorporate new information about wind turbines.

Since the adoption of the Model Ordinance, wind companies are beginning to see the need for greater set-backs. St. Lawrence may revise the current set-back standard, which is pretty conservative and small.

After conducting research for Hammond Township, county Planning staff recognized the need for stricter noise standards, as well to incorporate terms related to the measurement of sounds into the Model Ordinance.

DWEA Comments

St. Lawrence County recognized that they can play an important role as a neutral third-party for local municipalities and that there is benefit to having consistent permitting requirements in neighboring towns and counties. Their regular meetings and information-gathering efforts over a two-year period clearly demonstrate their dedication to promoting responsible wind installations.

The recommended fee structure and their clearly-outlined review procedures allow for a more predictable and affordable permitting process. Additionally, they have accurately differentiated between the size categories of wind turbines, lending to more clarity for the permitting authority and applicant throughout the permitting process.

The inclusion of a minimum tower height requirement (30' higher than obstacles within 250') was an excellent addition to this ordinance. DWEA believes that with a small tweak to reflect the current industry standard (the accepted industry standard is 30' higher than any obstacle within 500' or the area's tree height, whichever is higher) the ordinance would provide a stellar example regarding proper tower height.

There are a few key areas where minor changes to the existing recommendations could result in significant community benefits. These include modification of the setback requirement to reflect the industry standard 1 x system height; minor changes to the screening and access requirements (for example, access roads need to remain in place in order to facilitate proper maintenance of the system); and modification to the sound requirements to reflect levels over ambient instead of a flat dBA (which is difficult to both measure and enforce).

✻ Fillmore County, Minnesota

Reviews Permit Applications for Large Projects with State Input

County:	Fillmore County, Minnesota
Population Size:	20,866
Adoption Date:	2007
Use Type:	Conditional Use
Link to Ordinance:	www.co.fillmore.mn.us/zoning/documents/2010wind_energy_conversion_systems_ord.pdf
Contact:	Chris Graves, Zoning Administrator cgraves@co.fillmore.mn.us

History

Fillmore County established its Wind Energy Conversion Systems Ordinance in 2007 to address inquiries and concerns from residents about potential future developments.

Wind is a plentiful resource in southern Minnesota (especially below Interstate-90). In 2007, private companies had begun obtaining conditional use permits to establish meteorological towers to measure wind capacity for potential future developments. In addition, the State of Minnesota was heavily advocating for wind energy development.

Around the same time, neighboring counties had begun working on establishing similar ordinances. Within a six-month period, the majority of neighboring counties all adopted a wind ordinance.

Policy Elements

The Minnesota County Intergovernmental Trust (MCIT), a joint-power agency which provides Minnesota county governments and related organizations with risk management and loss control services, had developed a wind ordinance template. Fillmore County's wind ordinance is very similar to the ordinance template created by MCIT.

The wind ordinance is a conditional use permit. For installations generating up to 500kW, a county-led public input process is coordinated to ensure proper siting of the project.

As Minnesota state law dictates, applicants expecting to generate over 500kW must undergo state review of the siting permit. The state review ensures that residents with concerns have adequate time to participate in public hearings, and the process saves local staff time.

Key Criteria

Dwelling Set-Back

Installations must be at least 750' from neighbors' homes, not the owners.

Set-Back to Property Line

Towers must be set back 1.1 times the tower height from property lines.

Fees

The county's Conditional Use Permit is $450 per site for small wind towers. As small towers do not usually use a lot of concrete, building permits are typically $8 per site.

Large towers, which are permitted through the state, will have permit application fees that vary based on the size and type of the construction. Building permits for large wind towers will range between $100-200 per site.

Outcome

A few private homeowners have installed small, on-site turbines. As Minnesota offers significant tax incentives for renewable energy installations, the county sees a small rush of residents submitting applications for wind permits at the end of the calendar year.

About 10 mid-sized projects have been permitted over the last several years, the majority around 2009. On average, the towers are under 200' and generate approximately 39.9 kW.

Recently, Eco-Energy, a regional clean energy utility, began applying to install a large spread-out development across 3-5 townships in Fillmore County. Depending on turbine size, the several hundred towers will be installed. While the energy will be "fed" back into the grid for purchase and direct consumer energy costs will not be reduced, residents can receive rental income from leasing their land to Eco-Energy. The county estimates annual tax revenue from Eco-Energy to be approximately $680,000.

Future

Chris Graves, Zoning Administrator, said that if the county's ordinance were to be updated, the dwelling set-back condition may be extended. Graves occasionally hears complaints from residents about the distance between installations and residences. The county does not currently have any plans to incorporate wind resources in the county's Master Plan.

✻ Rockingham County, Virginia

Embraces Small Wind Technology, Later Expands to Invite Utility-Scale Wind Development

County:	Rockingham County, Virginia
Population Size:	76,314
Adoption Date:	2004
Use Type:	Small Wind was conditional, now "by right." Large wind is Special Use permit.
Link to Ordinance:	http://library.municode.com/index.aspx?clientId=12196
Contact:	John Meck Development Review Manager jmeck@rockinghamcountyva.gov

History

In 2004, residents of Rockingham County expressed interest in installing wind turbines in working farms. Rockingham County is home to James Madison University and the Virginia Wind Energy Collaborative, which had provided ample information about on-site wind options to local residents. Since Virginia is a "Dillon Rule" state, local zoning does not allow anything that is not expressly noted in the statutes, and the county was required to establish an ordinance specific to small, on-site wind installations.

Due to geography, Rockingham County is one of a few counties within Virginia that can support utility-scale wind developments. Around 2010, interest grew from clean energy providers to develop large wind systems on the county's ridgelines.

Policy Elements

With the support of James Madison University staff, Rockingham County organized a Wind Energy Working Group in 2004 to work through the community issues surrounding the introduction of wind installations of various scales. The county hosted various industry representatives to meet with county leadership, staff, and residents. John Meck, the county's Development Review Manager, said that the Supervisors' open-mindedness and willingness to explore issues contributed to a robust process.

The 2004 ordinance established a Special Use provision for small, on-site wind installations.

In 2010, Rockingham updated the ordinance to ease the permitting of small wind and address utility-scale wind. Now, small wind installations are allowed by-right. Meck explained that the review process for small wind permits was cumbersome for the citizens and was restricting the county from truly bringing wind resources into the county.

Similarly, a provision was added to allow energy sharing between property lines with an agreement between property owners. The ordinance's original language required energy to be used on-site, but residents expressed interest in distributed wind. No plans for energy-sharing have been seen by the county thus far.

Rockingham County now allows large wind developments through Special Use permitting. Rockingham decided to go back and address large wind after a wind developer in neighboring county, Highland, went through a state agency for permits when the county did not have an applicable statute in place. Rockingham leadership did not want to lose control of local siting decisions by neglecting to establish policy in a timely manner.

While large, utility-scale wind is an option to developers in the county, the county s geography and national forest land will limit wind from over-saturating the landscape, said Meck.

Key Criteria

Key Restrictions on Small Wind

- The applicant shall provide information demonstrating that the system will be used primarily to reduce on-site consumption of electricity.
- The wind energy tower height shall not exceed a maximum height of sixty-five (65) feet on a parcel of less than five (5) acres, or a maximum height of eighty (80) feet on a parcel of five acres or more.

Review Process for Small Wind

- The installation of a small wind energy system in prime agricultural district A-1, general agricultural A-2, and public service zoning district S-1, shall be considered provided that all requirements of these standards are met.
- Applications shall be permitted by-right and be reviewed and considered for approval by the director of community development or his designee.
- Upon receipt of an application for small wind energy systems, the county shall send written notification to all adjoining landowners. A decision on the application shall be made within thirty (30) days of the receipt of the application. Applications requiring a special use permit shall meet all state code requirements for public notification.

Key Restrictions on Large Wind Systems

- The applicant shall provide photo-simulations of proposed wind energy conversion system from at least three (3) different locations. The simulations shall show view of such simulated wind energy structures from such locations a property

lines, roadways, as deemed necessary by the county in order to assess the visual impact of the wind energy system.

- The county shall provide written notification to the office of a national or state forest, national or state park, wildlife management area, or known historic or cultural resource site, if a proposed wind energy conversion system is within five (5) miles of the boundary of said entity.
- The applicant shall conduct two (2) public information meetings to discuss their development plans and obtain community feedback. The first meeting shall be held prior to application submission. The second meeting shall be held after the application submission but prior to the special use permit public hearing. Both meetings shall be advertised in the local paper of record.

Rockingham County outlines much more extensive set-back distances and environmental criteria for the large wind systems, including:

- The wind energy conversion system shall be set back a distance at least equal to one hundred twenty-five (125) percent of the structure height from all adjoining non-participating property lines and a distance equal to one hundred sixty (160) percent of the structure height or eight hundred (800) feet, whichever is greater, from any residential or public use structure or neighboring property and any public use areas as determined by the board of supervisors. These setbacks may be reduced by notarized consent of the owner of the property on which the requested wind energy conversion system is to be erected and the adjoining landowner whose property line or dwelling falls within the specified distance.
- Noise: The wind energy conversion systems shall not exceed sixty (60) decibels, as measured at the closest nonparticipating property line. An analysis, prepared by a qualified acoustical engineer, shall be provided to demonstrate compliance with the standard for sound emission.
- Shadowing/flicker: Wind energy conversion system shall be sited in a manner that does not result in significant shadowing or flicker impacts. The applicant has the burden of proving that this effect does not have significant adverse impact on habitable structures through siting or mitigation.

Review Process for Large Wind Systems:

- The board of supervisors shall require a public hearing under the special use permit process for all applications for wind energy conversion systems regulated under this section.
- All state and federal requirements shall be met prior to application for construction of the wind energy structures with the exception of state approved pre-construction activity. Approval letters must be included with application.

Fees

Wind systems are assessed as any other building project within Rockingham.

Where the valuation of the total cost of the building or structure, including plumbing, electrical, and mechanical equipment is less than $19,000:

- For new construction and additions: $95
- Alterations, additions, and repairs: $0.19 per square foot and a minimum fee of $25

Where the valuation is between $19,000 and $30,000:

- Base fee of $95, plus $4.40 for every additional $1,000 over $19,000

Where the valuation is between $30,000 and $100,000:

- Base fee of $146, plus $3.80 for every $1,000 over $30,000

Where the valuation is between $100,000 and $500,000:

- Base fee of $412.75, plus $3.00 for every $1,000 over $30,000

Outcome

Since the 2010 policy update, 12 residents, mostly farmers, have installed on-site wind technology to their properties.

There are two potential utility-scale wind projects are being considered for the western side of the county, where a cleared ridgeline makes wind particularly attractive. A group of adjoining landowners have formed a land corporation to obtain permits and manage the planned wind installation. No information is available yet related to project benefits.

DWEA Comments

Rockingham County did an excellent job of recognizing and defining the different categories of wind turbines, and by allowing certain equipment that meets clearly outlined criteria to be installed by right . Additionally, the clearly defined review process, time line and fee structure provide a predictable, fair permitting environment for would-be system owners and for the local businesses that provide installation services.

Rockingham County could further improve their ordinance by modifying height restrictions. Wind is the turbine s fuel and the fuel (clean, laminar wind) is found up high. Small increases in wind speed (and decreases in turbulence) yield exponential increases in productivity and can improve system reliability. Higher productivity facilitates the economic viability of the system.

From DWEA's perspective, the golden rule for determining minimum appropriate tower height is that the bottom tip of the turbine's rotor, when fully extended downward, should

be at least 30 higher than any obstacle within 500 , or the tree line in the area, whichever is higher. This establishes the minimum tower height; any increases from there will further improve functionality of the system.

DWEA Tower Height Calculation Example

Using a common 10kW wind turbine with a 23 rotor diameter, at a site with 60 trees, and considering the 30/500 rule mentioned above, the bottom tip of the blade would need to be at a minimum height of 90 (60 tree height + 30 clearance to bottom tip of blade). The blade is approximately 11.5 long, so the height to the center of the rotor (hub height) would be a minimum of 101.5 (this is the approximate attachment point of the turbine to the tower). Most towers come in 10 or 20 sections, so this tower would need to be a minimum of 110 tall. The rotor on this turbine will top out at approximately 122 tall (different turbines have different rotor diameters, so one tower size does not fit all) and most ordinances consider total system height in their height restrictions.

It is reasonable to expect wind turbine towers to be 140 or even 160 tall, with total system heights of 125 to 180 . A total system height restriction of 65 or even 80 does not allow for proper function of the technology; but a total system height restriction consistent with FAA standards (max height less than 200) does facilitate proper function of the equipment and also allows for responsible installation. Additionally, when combined with reasonable setbacks equal to 1 X system height, counties can still achieve the desired level of control over wind turbine siting.

For more technical information on tower height, sound, productivity and other topics, visit www.distributedwind.org Under the Zoning Resource Center, click on Fact Sheets.

A 10 kW, 140 ft. freestanding lattice tower at a state park.

Additional Resources

Distributed Wind Energy Association
www.distributedwind.org

American Wind Energy Association
www.awea.org

Permitting of Wind Energy Facilities
www.nationalwind.org/assets/publications/permitting2002.pdf

Permitting Small Wind Turbines: A Handbook
www.rpd-mohesr.com/uploads/custompages/awea_permitting_small_wind%2012.pdf

RENEW Wisconsin's Small Wind Toolbox
http://renewwisconsin.org/wind/windtoolbox.htm

State Enabling Legislation for Commercial-Scale Wind Power Siting and the Local Government Role (publication includes links to all state model ordinances)
www.elistore.org/data/products/d21-02.pdf

Wind Powering America Ordinance Database
www.windpoweringamerica.gov/policy/ordinances.asp

U.S. DOE Wind and Water Program - Wind Energy Ordinances
www.windpoweringamerica.gov/pdfs/policy/2010/wind_energy_ordinances.pdf

Appendix

Appendix A: State of Wisconsin Small Wind Ordinance

In the State of Wisconsin, a full Small Wind ordinance was developed for permitted use applications. However, the ordinance was also designed to provide a conditional use permit function if needed. Listed below are the sections that can be inserted into a conditional use permit when such permitting is desired. For more information, the ordinance can be found at: http://renewwisconsin.org/wind/Toolbox-Zoning/Small%20Wind%20System%20Model%20Ordinance%2012-06.pdf.

Standards

A small wind energy system shall be a permitted use in all zoning districts subject to the following requirements:

(1) Setbacks. A wind tower for a small wind system shall be set back a distance equal to its total height from:
(a) any public road right of way, unless written permission is granted by the governmental entity with jurisdiction over the road;
(b) any overhead utility lines, unless written permission is granted by the affected utility;
(c) all property lines, unless written permission is granted from the affected land owner or neighbor.

(2) Access.
(a) All ground mounted electrical and control equipment shall be labeled or secured to prevent unauthorized access.
(b) The tower shall be designed and installed so as to not provide step bolts or a ladder readily accessible to the public for a minimum height of 8 feet above the ground.

(3) Electrical Wires. All electrical wires associated with a small wind energy system, other than wires necessary to connect the wind generator to the tower wiring, the tower wiring to the disconnect junction box, and the grounding wires shall be located underground.

(4) Lighting. A wind tower and generator shall not be artificially lighted unless such lighting is required by the Federal Aviation Administration.

(5) Appearance, Color, and Finish. The wind generator and tower shall remain painted or finished approved in the building permit.

(6) Signs. All signs, other than the manufacturer s or installer s identification, appropriate warning signs, or owner identification on a wind generator, tower, building, or other structure associated with a small wind energy system visible from any public road shall be prohibited.

(7) Code Compliance. A small wind energy system including tower shall comply with all applicable state construction and electrical codes, and the National Electrical Code.

(8) Utility notification and interconnection. Small wind energy systems that connect to the electric utility shall comply with the Public Service Commission of Wisconsin s Rule 119, Rules for Interconnecting Distributed Generation Facilities.

(9) Met towers shall be permitted under the same standards, permit requirements, restoration requirements and permit procedures as a small wind energy system.

Permit Requirements

(1) Building Permit. A building permit shall be required for the installation of a small wind energy system.
(2) Documents: The building permit application shall be accompanied by a plot plan which includes the following:
(a) Property lines and physical dimensions of the property
(b) Location, dimensions, and types of existing major structures on the property
(c) Location of the proposed wind system tower
(d) The right-of-way of any public road that is contiguous with the property;
(e) Any overhead utility lines;
(f) Wind system specifications, including manufacturer and model, rotor diameter, tower height, tower type (freestanding or guyed)
(g) Tower foundation blueprints or drawings
(h) Tower blueprint or drawing

(3) Fees. The application for a building permit for a small wind energy system must be accompanied by the fee required for a building permit for a Permitted Accessory Use.

(4) Expiration. A permit issued pursuant to this ordinance shall expire if:
(a) The small wind energy system is not installed and functioning within 24-months from the date the permit is issued; or,
(b) The small wind energy system is out of service or otherwise unused for a continuous 12-month period.

Abandonment

(1) A small wind energy system that is out-of-service for a continuous 12-month period will be deemed to have been abandoned. The Administrator may issue a Notice of Abandonment to the owner of a small wind energy system that is deemed to have been abandoned. The Owner shall have the right to respond to the Notice of Abandonment within 30 days from Notice receipt date. The Administrator shall withdraw the Notice of Abandonment and notify the owner that the Notice has been withdrawn if the owner provides information that demonstrates the small wind energy system has not been abandoned.

(2) If the small wind energy system is determined to be abandoned, the owner of a small wind energy system shall remove the wind generator from the tower at the Owner s sole expense within 3 months of receipt of Notice of Abandonment. If the owner fails to remove the wind generator from the tower, the Administrator may pursue a legal action to have the wind generator removed at the Owner s expense.

Endnotes

1 Wikipedia Entry Wind Turbine http://en.wikipedia.org/wiki/Wind_turbine
2 Virginia Renewables Siting Scoring System http://vrs3.cisat.jmu.edu/VRS3%20FINAL%20REPORT%20APRIL%2024%202009.pdf
3 Wikipedia Entry Wind Turbine http://en.wikipedia.org/wiki/Wind_turbine
4 www.northernpower.com/wind-power-basics/faq.php
5 DWEA Briefing Paper: What is Distributed Wind? http://www.distributedwind.org/assets/docs/PandZDocs/what%20is%20distributed%20wind%20v.1%20submitted%2007%2012%2011.pdf
6 NREL Distributed Energy Basics - http://www.nrel.gov/learning/eds_distributed_energy.html
7 Permitting of Wind Energy Facilities - http://www.nationalwind.org/assets/publications/permitting2002.pdf
8 Windustry Decisions Tool - http://www.windustry.org/wind-basics/learn-about-wind-energy/wind-basics-know-your-options/know-your-options
9 In the Public Interest: How and Why to Permit for Small Wind Systems, A Guide for State and Local Governments http://www.awea.org/learnabout/smallwind/upload/InThePublicINterest.pdf
10 Interview with Lisa DiFrancisco, Co-chair, DWEA Permitting and Zoning Committee
11 In the Public Interest: How and Why to Permit for Small Wind Systems, A Guide for State and Local Governments http://www.awea.org/learnabout/smallwind/upload/InThePublicINterest.pdf
12 Interview with Lisa DiFrancisco, Co-chair, DWEA Permitting and Zoning Committee
13 www.awea.org/learnabout/smallwind/upload/inthepublicinterest.pdf
14 NACo webinar www.naco.org/meetings/webinars/Pages/webinars.aspx
15 Interview with Lisa DiFrancisco, co-chair, DWEA Permitting and Zoning Committee
16 Permitting of Wind Energy Facilities http://www.nationalwind.org/assets/publications/permitting2002.pdf
17 Ibid
18 Ibid

In this Issue Brief…

This Issue Brief is designed to assist local leaders in better understanding wind technology and share best practices for developing local wind regulations. Inside you will find:

- The different types of wind installations and infrastructure requirements
- Specific aspects of county government that impact wind development
- Strategies for effectively regulating wind development with Wind Ordinances
- Criteria for managing on-site, distributed, and utility-scale wind developments
- Opportunities to incorporate wind resources into a county Master Plan
- Model policies and case studies from counties across the nation

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