SMALL WIND PERMITTING CONSIDERATIONS

INFORMATION FOR LOCAL GOVERNMENTS AND COMMUNITIES

Small wind systems are an excellent renewable energy option for rural homeowners, farmers, ranchers and municipalities who want to generate their own clean, reliable energy for on-site use. With the growing popularity of wind power, local government regulations concerning small wind systems in Oregon vary widely and are in a state of flux. This document offers some basic information about small wind system benefits and common misconceptions, while showcasing examples of recent small wind system installations in Oregon. By examining and establishing best practices for small wind system permitting and zoning, local governments can help to protect the best interests of the community and property owner, while furthering the community's sustainability goals.

What is a small wind system?

A small wind system converts the energy in the wind into electricity and is scaled to generate just enough power to meet the average on-site power demands of a home, farm or small business. Most small wind systems are net metered, which means when the system generates more power than needed, the excess is sent to the utility grid and the owner receives a credit from the electric utility; and when the system is not producing enough power to meet demand, the electric utility supplies the remaining power.[1]

1 There is no single, universally-accepted definition of small or community wind. Although some definitions make reference to the small size of a project (e.g. up to two megawatts), other definitions refer to "net metering with some excess sold back to the grid," "noncommercial" or "not large utility-scale." For the purpose of this document, we are considering a small wind system to be a system, with a capacity of 100 kilowatts or less and a total extended height not exceeding 180 feet, that is compliant with all federal, state and local laws, codes and regulations.

Small wind systems are significantly different in height and scale than large utility-scale turbines that are common on "wind farms." A small wind turbine is technologically advanced, but mechanically simple, with only two or three moving parts. The turbine is mounted on a steel tower, usually less than 140 feet tall, which can be designed as a freestanding monopole (like a street light), a lattice tower (like a radio tower) or a guyed monopole (like a street light with support cables from the tower to the ground). Most small wind turbines feature blades that are two to 35 feet in length. See Figure A.

The technology has advanced considerably in recent years, making many of the current small wind turbines quieter, more reliable and better able to blend in with surrounding aesthetics than their predecessors.

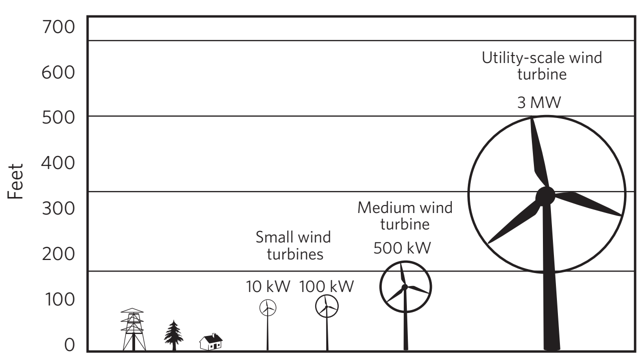


Figure A

HOOD RIVER VALLEY HIGH SCHOOL, HOOD RIVER

During home games, students at Hood River Valley High School have more to cheer about thanks to a 1.8-kW wind system that helps power the stadium lights. Spearheaded by students in the school's Earth Club, the system includes a 60-foot monopole tower adjacent to the athletic fields. "Students, neighbors, school board members and county officials all recognize this as a positive educational resource for our campus," said Ted Cramer, science teacher and Earth Club advisor. "We're very appreciative of Energy Trust's financial support in helping to make this system possible."

SMALL WIND IN COMMUNITIES

What can neighbors and the community expect?

Oregon communities and residents generally embrace renewable energy, including wind, particularly when owners exercise good judgment and courtesy toward their neighbors. Visual assimilation of the wind system is similar to becoming accustomed to a building addition. And, when properly sited and installed, sound is usually insignificant.

The best way to assess the impact of a small wind system is to visit an actual installation. As of mid-year 2010, Oregon has approximately 20 small wind installations, and the number is growing. Contact an Energy Trust of Oregon trade ally contractor to see whether they can arrange for you to visit an installation first-hand. (See www.energytrust.org/findacontractor for a list of trade allies.)

Why do communities zone for small wind systems?

Across the U.S., thousands of townships, counties and cities have implemented stand-alone zoning regulations to address small wind, including several Oregon communities. These communities have listed small wind systems as an allowed use, such as a permitted, accessory or conditional use. By zoning for small wind, communities can:

- Remove impediments to developing clean, renewable energy
- Prepare for and accommodate increased requests, particularly because Oregonians can access tax credits and incentives for small wind systems
- Conserve public resources, saving considerable time and avoiding confusion when addressing small wind systems on a case-by-case basis
- Open opportunities to strengthen the regional economy

Small wind benefits your community

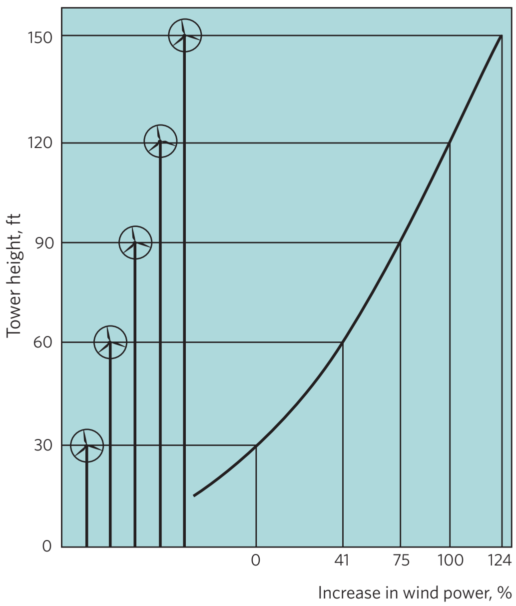
Small wind systems generate power to be used by a single residence or facility, but the benefits of small wind can extend to the whole community. Here's how your community can benefit:

- Improve energy independence
- Reduce energy costs
- Reduce loads on local electricity grid
- Increase regional economic growth and the opportunity for jobs
- Visible indicator of community support for clean energy

TOWER HEIGHT, SOUND AND SETBACK ARE INTERRELATED

Tower height, sound and setback are important factors to understand when zoning for small wind systems. Tower height is typically the single most important factor in the economic success of a small wind system. As shown in Figure B, tall towers that are 80 to 140 feet tall are more cost-effective because they enable turbines to access faster and less turbulent winds, and even small increases in wind speed translate to exponential increases in energy generated. Because of the fixed cost of tower construction, a single, taller tower is far superior to two shorter installations.

The best sites are those where the wind is least obstructed, which is often the highest point on a property. The bottom of the turbine rotor should clear, by at least 30 feet, the highest wind obstacle (rooftop, mature tree, etc.) within a 300 foot radius. Doing so allows the turbine to reach consistent, fast wind speeds and prolongs turbine life by avoiding damage from turbulent air conditions.



Graph courtesy of American Wind Energy Association

Figure B

Sound as a factor

Today's wind turbines have high-quality acoustic insulation, low rotation speeds, few moving parts and highly efficient blades. They emit sound that is barely discernible from ambient sound, even with a decibel, or dB, meter. In addition, height and distance dilute sound. Sound decreases four-fold with every doubling of distance from the turbine (including distance above the ground). For example, sound level readings at 25 feet from the top of the tower drop by a factor of four at 50 feet, and by a factor of 16 at 100 feet. From an acoustic standpoint, this means that taller towers are usually better for owners and neighbors. See Figure C.

Setting the setback distance

To balance the need for tall towers, turbines are typically "set back" a given distance from property lines, inhabited structures, utility lines and road rights-of-way. Many local governments establish the setback as the tower height plus the length of one blade, a distance that is defined as the turbine's "total extended height," and include a provision for neighbors to consent to a setback less than the defined setback distance.

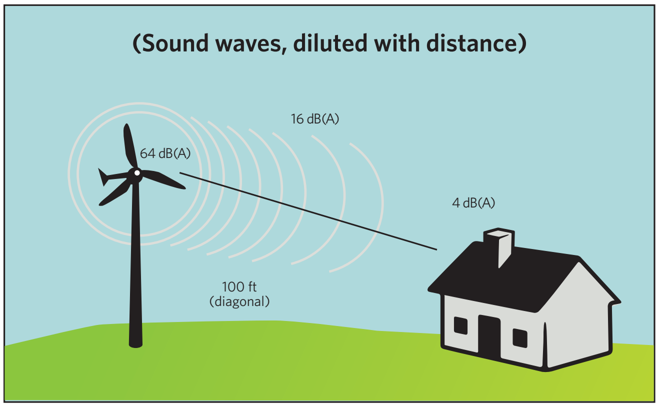


Figure C

POLK COUNTY RENEWABLE ENERGY ORDINANCE

In December 2009, Polk County amended its county zoning ordinance to specifically allow noncommercial small wind and solar electric power systems. "Polk County wants to encourage and make it easier for residents to take advantage of wind and solar energy," said Jerry Sorte, planning supervisor, Polk County. "The ordinance also benefits the county because it streamlines the application process. Application and variance fees rarely cover the full cost of a land use review. By simplifying the process for systems that are straightforward, we expect to save money in the long run."

BJORNSON VINEYARD POLK COUNTY

As part of their commitment to sustainable farming practices, Mark and Pattie Bjornson installed a 10-kW wind turbine on their vineyard in the Eola-Amity Hills, northwest of Salem. The 120-foot lattice-tower system supplies about 75 percent of the power needed to grow and harvest 15 acres of premium grapes for top-quality Pinot Noir wine. The Bjornsons successfully obtained a variance through a hearing to install a wind system with a height taller than the maximum height limits in place at the time. This process prompted Polk County to amend its zoning ordinance to ease permitting for small wind systems. "We're very pleased with the output of our wind turbine," said Mark Bjornson. "As a small business, we couldn't have made this investment without financial help from Energy Trust and government agencies."

THE POLK COUNTY ORDINANCE'S SMALL WIND PROVISIONS AS DRAFTED INCLUDED:

DEFINITIONS

Noncommercial: A system that is net metered under Oregon law. In contrast, a system is commercial if it is a net seller of power.

Permitted use: Noncommercial wind systems that are outside of an adopted urban growth boundary, do not require tower lighting and meet height and other outlined standards.

Administrative use: Noncommercial wind energy systems that are outside of an adopted UGB but require tower lighting.

Conditional use: Noncommercial wind energy systems that are within an adopted UGB and are 100 feet or less in height.

SELECT REQUIREMENTS

Tower height: 150 feet or less for towers that are outside of the UGB; 100 feet or less for towers that are inside the UGB.

Setback: The wind tower base must be set back the height of the wind energy system from all property lines.

Construction and electrical codes: Compliance with state construction and electrical codes, the National Electrical Code, as well as necessary building and electrical permits from Polk County Building Division.

Tower color: Gray unless another color is required by state or federal law.

MODEL ZONING ORDINANCES

Communities that want to make small wind a permitted, accessory or conditional use do not need to start from scratch. Several model ordinances are available, including those from Polk County, Oregon, the State of Wisconsin and the American Wind Energy Association. Online links to these examples can be found at www.energytrust.org/smallwind.

A common way for applicants to determine if a small wind project is allowed under local government regulations is to hold a pre-application conference with the planning department; which provides an opportunity to discuss the specific nature of the project and the regulations that will apply. The applicant and the planning department can work together to address any issues. The pre-application also presents an opportunity to identify areas in the local regulations that might be unintentionally impeding small wind system installations and to identify potential amendments that could be adopted before or simultaneously with a permit application.

CONSIDERATIONS RELATED TO PERMITTING FOR SMALL WIND

The following list identifies some of the issues that communities enacting small wind zoning regulations have encountered and considered:

ISSUE	CONSIDERATIONS	ADDITIONAL COMMENTS
Setback distance	Typically equals tower height plus the length of one blade (known as total extended height). Setback is from property lines, inhabited structures, utility lines and road rights-of-way. Allow for neighbor consent to place system closer than setback distance.	Greater setback should generally be unnecessary if system meets Oregon Environmental Quality Commission's noise regulations.
Height	Maximum total extended height of 140 feet.	Low tower height severely impacts system cost-effectiveness and can increase sound levels.
Noise	Use Oregon Environmental Quality Commission noise regulations (OAR 340-035-0035).	Certified noise tests are most likely unnecessary. Today's turbines have lower sound levels, and sound data are available from manufacturers.
Aesthetics and color	Regulate for aesthetics only in historic districts where aesthetics are critical to the area's long-established character. Use the factory default color.	Avoid specifying turbine colors. Factory-default gray has been designed to blend with the sky. Other colors will probably stand out.
Lot size	No set minimum. However, to qualify for Energy Trust incentives, systems must be on a minimum of one acre.	Avoid tying lot size to tower height. Sound and setback requirements are typically more restrictive.
Engineering, tower and turbine safety	Installer should provide manufacturer's engineered plans of the tower or the tower should be professionally engineered.	Independent structural analyses of tower and foundation are available from manufacturers; additional studies are costly and may be redundant.
Soil studies/ foundation	For turbines 20 kW or less, allow systems with foundations that are based on the manufacturer's "worst case" soil conditions. For turbines greater than 20 kW, require an engineer's wet stamp and a soil analysis.	Soil analyses and custom foundations are usually not needed if the installer confirms with the manufacturer or an independent professional engineer that soil conditions meet worst case standards.
Multiple turbines	Zoning allows for additional turbines according to the considerations given to the first.	Two shorter installations do not substitute for a single, taller tower; height is critical to wind speed and energy.
Electrical safety	Require line drawings of electrical components, supplied by the manufacturer, in enough detail to determine that the installation conforms to the National Electrical Code.	Anything more may be redundant. Wind turbines are typically designed to shut down automatically during power outages and should not energize a dead power line.
Insurance	Small wind systems could likely be added as an appurtenant structure to existing homeowner, farm or business policy.	Separate policies may not be needed.
Fences/ attractive nuisance	To prevent unauthorized climbing: • Remove climbing rungs on lower 10 – 12 feet of freestanding towers. • For lattice or guyed towers, fasten sheets of metal or wood to the lower part to cover hand and foot-holds. • Display "Danger—High Voltage" or "Caution—Electrical Shock Hazard" signs on the sides of the tower.	Fences can become their own climbing, attractive nuisance and can prevent access to the turbine during emergencies.
Abandonment	If equipment is inoperable for six months, zoning authority gives owner six months to restore system to operating condition. If not, turbine is removed and tower managed under Public Nuisance zoning language.	Security bonds are probably unnecessary since most small wind systems are installed on the owner's land.

COMMON QUESTIONS AND MISCONCEPTIONS ABOUT SMALL WIND SYSTEMS

ISSUE	COMMENTS
Shadow "flicker"	Today's small wind system turbines are short, have narrow blade profiles and spin rapidly so that any shadows should essentially be invisible at operating speeds. Normal setbacks in Oregon latitudes should make this a non-issue.
Birds and bats	A common misconception due to issues encountered with large utility-scale wind projects, the risk with individual small wind systems is typically considered to be nominal. It is estimated that house cats and window glass cause 10,000 times more bird deaths than all wind turbines.
Electrical interference	Blade materials are designed to be "invisible" to radio frequency transmissions and shouldn't cause interference.
Lightning	Small wind turbines should be grounded so any static electricity is dispersed into the ground, preventing a build-up that could invite lightning strikes.
Stray voltage	Stray voltage results from inadequate wiring or grounding, or deteriorated wire insulation that is inside the property line. Small wind turbine inverters that are IEEE 1547 or UL1741 compliant are designed to detect faulty grounding and automatically shut down current flow. Small wind systems also include ground-fault circuit interrupters.
Ice or excessive wind	Blades cannot rotate at significant speed when iced, so ice cannot be thrown. Melting ice falls down. Manufacturers equip their wind turbines with manual and automatic over-speed protection devices that keep the turbine operating in a controlled range of speeds.

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By making the permitting process for small wind systems more affordable, streamlined and accountable, a community can better support increased local renewable energy development.

For more information on small wind systems, Energy Trust cash incentives and to find the resources listed in this guide, visit us online at **www.energytrust.org/smallwind** or call **1.866.368.7878**.

TAYLOR FARMS MARION COUNTY

This 20-kW wind system, which includes a 120-foot lattice tower, provides an estimated 66 percent of the power needed to operate Taylor Farms, a 1,800-acre grass seed farm. "Although our system required a variance from the county and additional foundation analysis, our Energy Trust trade ally contractor, Kardon Construction, handled everything," said Zach Taylor. Nearly all of Taylor's system cost was paid for through a U.S. Department of Agriculture grant, Energy Trust cash incentive and state and federal tax credits. "I expect wind systems to become prevalent in Oregon as more local governments become comfortable with how to permit to encourage their use, while protecting the community's interest."

FACT

More than 9,800 small wind turbines were sold in the U.S. during the year 2009 alone—a 15 percent increase over 2008. About 95 percent were manufactured by U.S. companies.

Source: American Wind Energy Association

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