

Cumberland County Planning Department
Alternative Energy Series

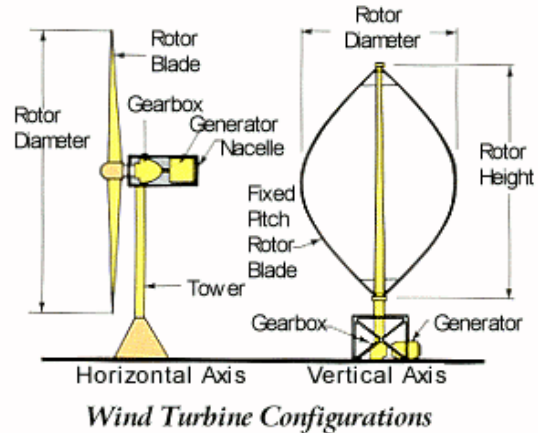
WIND ENERGY FACILITIES (WEF)

INTRODUCTION

Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetative cover. This wind flow, when "harvested" by modern wind turbines, can be used to generate electricity.¹

The term wind energy describes the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or can convert this mechanical power into electricity to power homes, businesses, schools, and the like.²

Modern wind turbines fall into two basic groups; the horizontal axis variety, like the traditional farm windmills used for pumping water, and the vertical axis design, like the eggbeater style Darrieus model, named after its French inventor. Most large modern wind turbines are horizontal axis turbines.³ In limited instances turbines are installed directly onto building rooftops or designed as part of the building itself. These installations appear mostly in urban areas where small property sizes may prevent the use of towers elsewhere on the property.⁴



ORDINANCE CONSIDERATIONS

When regulating WEF the distinction should be made between principal wind energy facilities and accessory wind energy facilities.

- A principal WEF (PWEF) is an electric generation facility comprised of a group of wind turbines and associated control/conversion/distribution equipment and structures whose main purpose is to supply electricity for commercial use.
- An accessory WEF (AWEF) is an electric generation facility comprised of a wind turbine, tower, and associated control/conversion/distribution equipment and structures constructed primarily for generation of electricity for on-site use.



¹ US Department of Energy, Energy Efficiency and Renewable Energy http://www1.eere.energy.gov/windandhydro/wind_technologies.html

² US Department of Energy, Energy Efficiency and Renewable Energy http://www1.eere.energy.gov/windandhydro/wind_technologies.html

³ US Department of the Interior Bureau of Land Management, Wind Energy Development Programmatic Environmental Impact Statement (EIS) <http://winds.blm.gov/guide/basics/index.cfm>

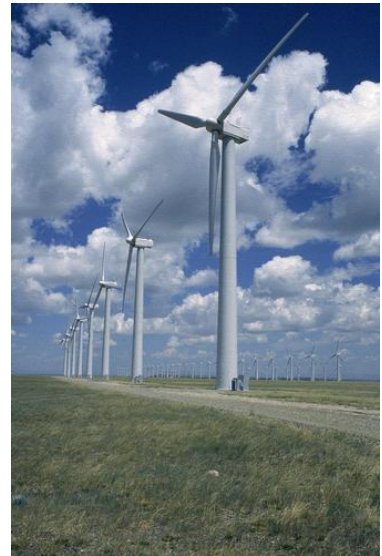
⁴ Lancaster County Planning Commission, Municipal Guide to Planning for and Regulating Alternative Energy Systems, October 2010.

Both types of WEF should be defined and regulations developed for each type of use. Only providing for AWEF could be construed as exclusionary. Further, regulating all WEF with a one-size fits all approach will result in inconsistent and inappropriate regulation.

It is also critical to examine industry standards when developing ordinances for WEF. Technology is changing at a rapid pace and failure to seek advice from industry professionals may result in an ordinance that may not reflect the requirements and capabilities of the industry.

PRINCIPAL WIND ENERGY FACILITY (PWEF)

In 2006, the Pennsylvania Wind Working Group developed a model ordinance for PWEF. The PA Wind Working Group included representatives from both the public and private sector. The complete model can be found online at www.pawindenergynow.org. Following is a summary of the model ordinance considerations for PWEF:



- **Zoning Districts/Use Standards:** Consideration should be given to the appropriate zoning districts for PWEF and whether PWEF should be permitted by right, conditional use or special exception. PWEF should be considered a principal use and should be restricted to agricultural, rural, commercial, industrial and light industrial districts. They are generally not permitted by right, but are permitted by conditional use or special exception. Use of an overlay district that permits PWEF where wind resources are most prominent is also a consideration.
- **Lot size** – Conformance with required setbacks generally guides determination of minimum lot size.
- **Setbacks** – Setbacks should be established for occupied buildings, property lines, public right-of-ways and public buildings. The height of the PWEF should be related to the minimum setbacks with higher structures being permitted with larger setbacks.
- **Height** –The Federal Aviation Administration (FAA) has oversight over any object that could have an impact on communications in navigable airspace. The FAA requires that a Notice of Proposed Construction or Alteration be filed for any project that would extend more than 200 feet above the ground.⁵
- **Design and Installation** – The layout, design, and installation of principal wind energy facilities should conform to applicable industry standards, including those of the American National Standards Institute (ANSI), Underwriters Laboratories (UL), Det Norske Veritas, Germanischer Lloyd Wind Energies, the American Society of Testing and Materials (ASTM), or other pertinent certifying organizations and comply with all applicable building and electrical codes. As technology evolves, municipalities developing design and installation regulations should consult these organizations and other industry associations such as the American Wind Energy Association to research current standards.
- **Visual Appearance** – PWEF should be a non-obtrusive color, should not be artificially lighted (except as required by FAA), should not display advertising, and have all transmission and power lines placed underground.
- **Use of Public Roads** – Due to the size and weight of the equipment, the applicant should identify how the equipment will be transported to the site and demonstrate how any damage to the transportation system will be repaired.
- **Local Emergency Services** – Applicant should coordinate with local emergency services.

⁵ Lancaster County Planning Commission, Municipal Guide to Planning for and Regulating Alternative Energy Systems, October 2010.

- **Noise** – Sound from the PWEF should not exceed 55 dBA, as measured from the property line and at the rated wind speed.
- **Shadow Flicker** – Applicant should compute and minimize shadow flicker on adjoining inhabited buildings.
- **Warnings and Safety Measures** - Warning signs concerning voltage and safety should be displayed. Wind turbines should not be climbable and access doors to wind turbines and equipment should be locked and fenced.
- **Liability Insurance** – Applicant shall maintain general liability insurance.
- **Decommissioning** – Applicant shall have a plan for decommissioning of the PWEF.
- **Public Inquiries** – Applicant shall identify a responsible person and full contact information for public inquiries.

ACCESSORY WIND ENERGY FACILITY (AWEF)

In 2008, the American Wind Energy Association developed model ordinance considerations for small wind systems. The document, [*In The Public Interest: How and Why to Permit for Small Wind Systems*](#)⁶, provides an overview of issues to be considered when regulating accessory wind energy facilities. Following are ordinance considerations for regulating AWEF taken from that document and other models throughout Pennsylvania and surrounding states:



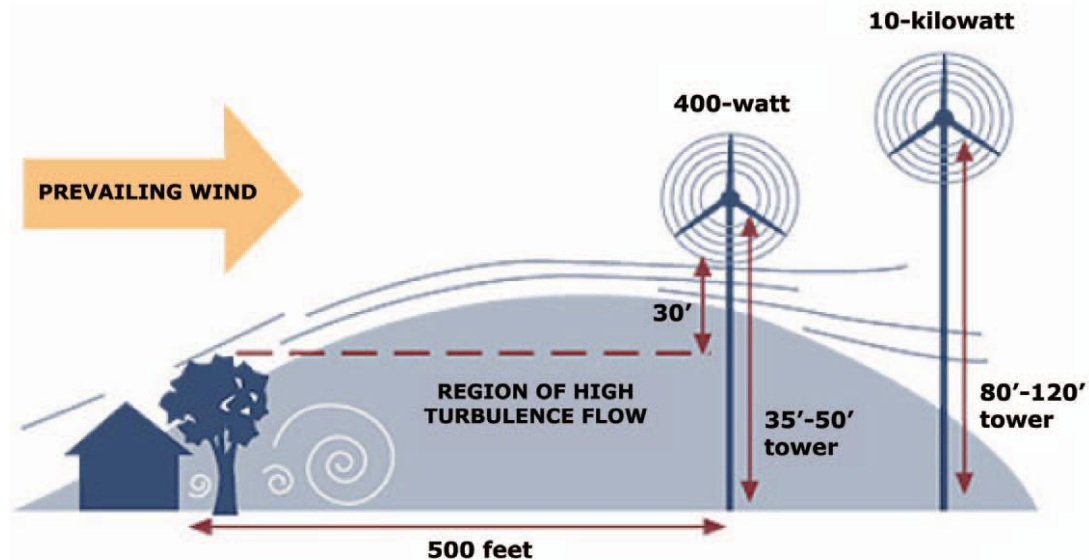
- **Zoning Districts/Use Standards** – The zoning districts that allow AWEF vary by municipality depending on the nature of the community. In more rural municipalities, AWEFs may be permitted in all zoning districts as larger lot sizes easily accommodate setbacks required by AWEF. In more urbanized areas, the use of AWEFs may be limited to certain zoning districts such as agricultural, commercial or industrial as smaller, densely populated lots may not have the land area required to support AWEF related setbacks.

In addition, some municipalities have allowed AWEFs as a permitted accessory use and others have regulated AWEFs as a conditional use or special exception. Conditional uses and special exceptions may be more appropriate in urbanized areas while permitted accessory uses are more appropriate to rural areas. Municipalities need to determine the level of review appropriate for their community and the cost and time of the review on the applicant.

- **Number of AWEFs** – Generally, the number of free standing AWEFs should be limited to one per lot.
- **Location** – The municipality should also consider where on the property the AWEF should or should not be located (i.e. front or rear yard, in or out of setbacks, etc.)
- **Lot Size** – Minimum lot requirements vary by municipality and range from approximately 1-5 acres. Conformance with setbacks should guide determination of minimum lot size.
- **Setbacks** – Setbacks should be established from property lines, public right-of-ways, public utility lines and occupied buildings. *Minimum* setback shall be the distance equal to the total extended height of the tower, but greater setbacks are common.

⁶ American Wind Energy Association, <http://www.windenergy.com/documents/guides/InThePublicInterest.pdf>, September 2008.

- **Height** – Tower height is the most important factor in the viability of a small wind energy system. Taller towers allow for access to faster, unobstructed winds. The average height of a small wind turbine is about 80 feet; with a range of 30-140 feet. The bottom of the turbine should clear the highest wind obstacles (trees, rooftops, etc.) within a 500 foot radius by at least 30 feet. Most commonly height is limited to the tower height plus the length of one blade (the turbine's "total extended height") from the property line, inhabited neighboring structures, utility lines, and/or road right-of-ways⁷. In some instances, there are no maximums placed on tower height, except those required by the FAA, as long as noise limits and setback requirements are met.



Source: American Wind Energy Association

- **Sound** - Modern AWEF generally emit sound that is barely discernable from ambient noise. If municipalities choose to regulate sound, the sound produced by the turbine under normal operating conditions, as measured at the property line, should not exceed the definition of nuisance noise for that municipality. Fluctuations in sound that exceed nuisance are to be expected but are associated with short-term events generating excessive wind.
- **Design and Installation** – The layout, design, and installation of AWEF should conform to applicable industry standards, including those of the American National Standards Institute (ANSI), Underwriters Laboratories (UL), Det Norske Veritas, Germanischer Lloyd Wind Energies, the American Society of Testing and Materials (ASTM), or other pertinent certifying organizations and comply with all applicable building and electrical codes. As technology evolves, municipalities developing design and installation regulations should consult these organizations and other industry associations such as the American Wind Energy Association to research current standards.
- **Structures** – When an accessory building is necessary for storage cells or related mechanical equipment, the accessory building shall comply with the accessory building requirements within the underlying zoning district.

⁷ American Wind Energy Association, <http://www.windenergy.com/documents/guides/InThePublicInterest.pdf>, September 2008.

- **Soil studies** – Soil studies should be required only for installations of 20kW systems or greater as manufacturer’s specifications typically consider the full realm of operating conditions and associated foundation needs.
- **Compliance with FAA Regulations** - FAA coordination is required for towers over 200 feet tall. Municipalities with Airport Hazard Overlay Zoning may be required to have further coordination with PennDOT’s Bureau of Aviation and the FAA.
- **Utility Notification** – Applicants installing AWEF should be required to apply for and have the approval of the public utility for the interconnection of the AWEF with the utility grid. Off-grid systems shall be exempt from this requirement.
- **Abandonment/Decommissioning** – The municipality should consider requiring owners to decommission AWEF that are inoperable for a period of time (6-12 months) for safety reasons.
- **Signage** - AWEF should not be permitted to display any advertising.
- **Lighting** - No illumination of the turbine or tower shall be allowed unless required by the FAA.
- **Warnings and Safety Measures** - The owner should post hazard warning signs on or near the AWEF. AWEF owners should propose mechanisms such as removing climbing rungs or blocking lattice towers to discourage unauthorized climbing. Some municipalities require fencing of AWEF sites which can increase project costs.
- **Permit Requirements/Registration** – Zoning and/or building permit applications for AWEF should be accompanied by a site plan, standard drawings of the wind turbine structure and stamped engineered drawings of the tower, base, footings, and/or foundation as provided by the manufacturer.