



DEPARTMENT OF COMMUNITY DEVELOPMENT SERVICES

Planning Division

m e m o r a n d u m

TO: Urbana Plan Commission

FROM: Lisa Karcher, AICP, Planner II

DATE: August 12, 2010

SUBJECT: Update to Plan Case 2115-T-09: Wind Energy Systems Text Amendment to the Urbana Zoning Ordinance

Attached please find the staff memorandum for Plan Case 2115-T-09 dated August 2, 2010, along with the proposed text amendment concerning wind energy systems. The information was distributed to Plan Commission members at the August 5, 2010 Plan Commission Meeting. In addition, staff made a presentation on wind energy systems at the meeting. At the Plan Commission Meeting on August 19, 2010, the public hearing concerning Plan Case 2115-T-09 will be continued along with further discussion concerning the proposed text amendment.

Attachments: Staff Memorandum dated August 2, 2010 for Plan Case 2115-T-09

cc: John Hall, Champaign County Department of Planning and Zoning



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TO: Urbana Plan Commission

FROM: Lisa Karcher, AICP, Planner II

DATE: August 2, 2010

SUBJECT: Plan Case 2115-T-09: Wind Energy Systems Text Amendment to the Urbana Zoning Ordinance

Introduction

The Zoning Administrator is requesting an amendment to the Urbana Zoning Ordinance to add regulations for the siting, installation and operation of wind energy systems within the corporate boundaries and the mile-and-a-half extraterritorial jurisdictional (ETJ) of the City of Urbana. The purpose of the proposed text amendment is to allow for the effective and efficient use of wind resources while protecting the public health, safety and welfare. The regulations are being proposed in response to the 2005 Urbana Comprehensive Plan Objective 33.5 – “promote the use of alternative energy sources such as wind and solar”, and increased public interest in installing wind turbines on their properties for energy production including, the University of Illinois proposed wind turbine development south of Urbana.

Background

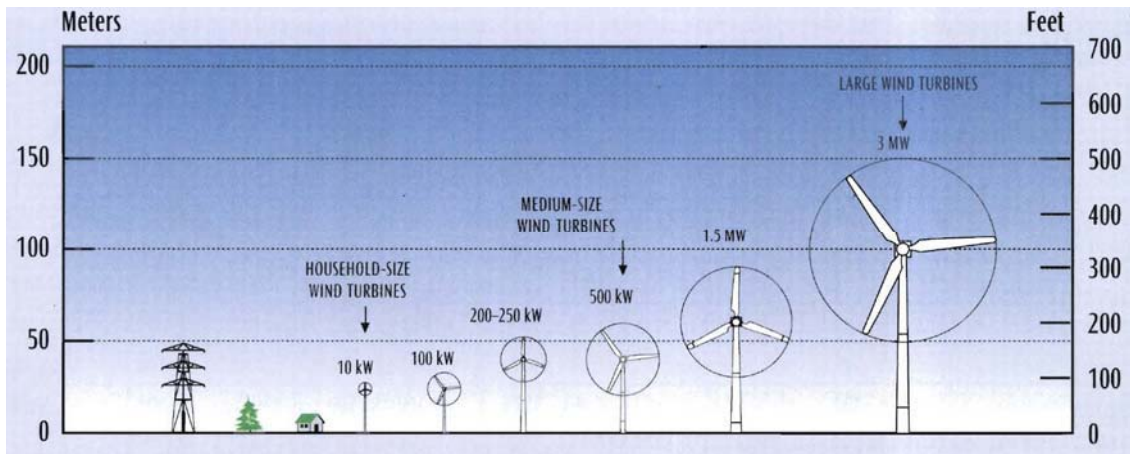
Illinois State law (65 ILCS 5/11-13-26) allows municipalities to regulate wind farms and electric-generating wind devices within their zoning jurisdiction and within the ETJ surrounding their zoning jurisdiction. Additionally, State Law (55 ILCS 5/5-12020) does not grant counties zoning authority over wind farms and wind-generating devices within municipal ETJ’s. Therefore, the County does not have authority to regulate wind farms and electric-generating wind devices in the ETJ even though they would normally have zoning authority in this area.

Both Champaign County and the City of Champaign have adopted regulations pertaining to wind energy systems. In May 2009, the County Board adopted Ordinance No. 848 amending the Champaign County Zoning Ordinance to establish requirements for wind farm developments. Subsequent amendments have been made to the regulations. In addition the County Board adopted Ordinance No. 863 amending the Champaign County Zoning Ordinance in June 2010, to establish requirements for what the County has defined as small and big wind turbine towers. The County regulations comply with state law and exclude the area within Urbana’s ETJ. In December 2009, the City of Champaign adopted Council Bill No. 2009-236 to establish regulations for wind energy conversion systems in the City of Champaign and their ETJ.

In preparing Urbana’s wind energy system regulations, staff reviewed wind regulations from Champaign County, the City of Champaign and a number of other communities as well as technical sources pertaining to wind energy. To better analyze the proposed standards a brief summary of basic information concerning wind energy follows.

Wind Turbine Size

Wind turbines vary in size from very small wind turbines that are 200-watt with a rotor diameter of 2.8 feet to extremely large scale wind turbines that are 2.5-megawatt with a rotor diameter of 305 feet. There is no industry standard pertaining to size classifications for wind turbines other than the distinction that is made between “small wind” and “big wind”. “Small wind” refers to turbines that are rated 100 kilowatts (kW) or less. Small wind is suited for urban type development and is effective in offsetting energy consumption for a variety of uses such as residences, small businesses, schools and farms. The following illustration compares the relative size of wind turbines. Examples and descriptions of different wind turbines are also provided.



Source: Paul Gipe, *Wind Energy Basics*, 2nd Edition

Building-Mounted Wind Turbines

Building-Mounted wind turbines are relatively small wind turbines (typically less than 1 kW) that are mounted on a roof or the side of a building. The need for a tower is eliminated with a building-mounted wind turbine; however, the building upon which the turbine is to be mounted must be able to support the system at rest and when operating. Following are examples of building-mounted turbines in different types of settings.





Small Wind Turbines

As noted above, small wind refers to turbines that are rated 100 kW or less. Small wind turbines are generally used to generate power to be used on-site. Wind turbines from only a few watts to 10-20 kW are suited for providing power for residential applications. Depending on wind resources available, a 10 kW turbine could generate enough electricity for an average household. Small wind turbines rated from 20 kW to 100 kW have rotor diameters ranging from 30 – 70 feet. These turbines are suited for providing power for farms, schools, small businesses and similar small scale uses. Following are examples of small wind turbines:



2.4 kW/12 foot rotor diameter/60 foot system height



5.0 kW/21 foot rotor diameter/115.5 foot system height



20 kW/100 foot system height



100 kW/70 foot rotor diameter/159 foot system height

Large Wind Turbines

Large wind turbines are turbines rated over 100 kW (70 plus feet in rotor diameter). With advances in technology being made every day, the largest size of turbines available is ever changing. Turbine models of 1.5 to 2.5 megawatts (MW) (250-300 plus feet in rotor diameter) are typical size wind turbines that are used in large scale wind farms to produce power for distribution to customers. Depending on wind resources available, a 1.5 MW wind turbine could generate enough electricity for approximately 450 households. Wind turbines on the lower end of the large wind turbine spectrum are suited to produce power for on-site use for large farms, businesses and industries.



225 kW/88.6 foot rotor diameter/150 foot system height



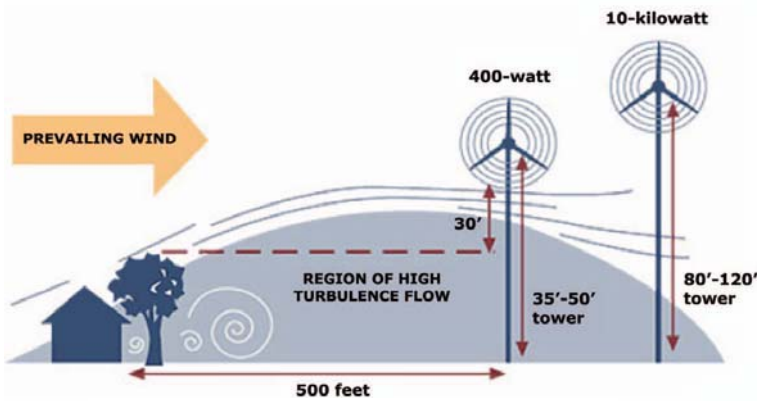
1.65 MW/269 foot rotor diameter/214 foot system height

Wind Turbine Energy Production

The amount of power that a wind turbine produces is dependent upon a number of factors. These factors include the engineering design of the wind turbine, the size of the turbine rotor and the speed and consistency of wind. The swept area, or the area of the circle delineated by the rotating blades of a wind turbine, determines how much power a turbine can produce. The larger the swept area, the more

wind is intercepted and therefore more power produced. For example, if the rotor diameter is doubled, the resulting area is four times larger, which means four times as much power may be produced.

It is important to note that the height of a tower on which a wind turbine is mounted is not related to the size of the rotor. The height of the tower is dependent upon surrounding obstructions (building and trees) and wind resources. It is an industry rule of thumb that a turbine be sited such that the bottom of the rotor is 30 feet above obstacles within 500 feet as depicted to the left. The further from obstructions the turbine is, the less turbulence there will be and therefore the more efficient the wind turbine will be.



Source: American Wind Energy Association

The speed of wind increases with height, and the power in the wind varies with the cube of wind speed (velocity³). A minimal increase in wind speed will result in a larger comparative increase in power. Therefore, the taller the tower the more power a wind turbine can produce. For example, as illustrated in the graph to the right, an increase from a 30 foot tower height to a 120 foot tower height translates into a 100% increase in wind power.

Common Concerns

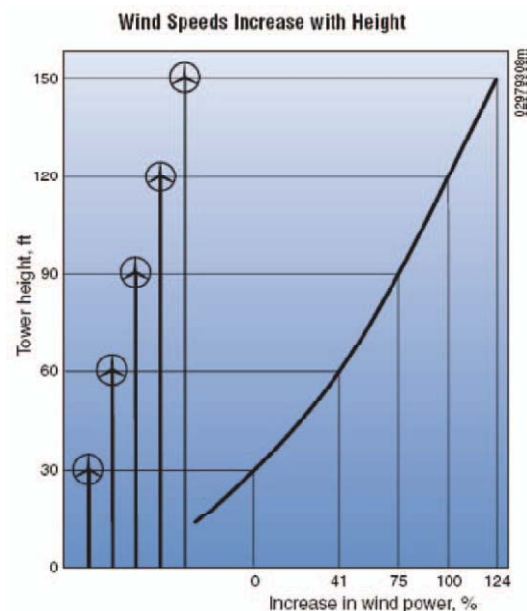
Proper siting of a wind turbine in terms of system efficiency can conflict with adjacent land uses. The importance of wind energy system regulations is to seek to balance our need for alternative energy sources with impacts on adjacent properties. Following is a discussion of common concerns with wind energy systems and how regulations can address these concerns.

Safety

To ensure safety of a proposed wind turbine, regulations may include the requirement to comply with specific building, safety or other relevant codes. Many regulations also require that a wind turbine be setback from property lines at least equal to the height of the system. This ensures that, in the case of structural failure, a wind turbine would only fall on the subject property. Provisions may be included to limit unauthorized access to towers and associated equipment. Most wind turbines are also designed with manual and automatic overspeed controls to prevent uncontrolled rotation or overspeeding.

Noise

The intensity of noise is measured in decibels. The following chart illustrates the decibel level for different noise. Wind turbines are noted as having a decibel level between 50-70 decibels. Since noise decreases with increased distance from the source, regulation of noise can be achieved by providing an

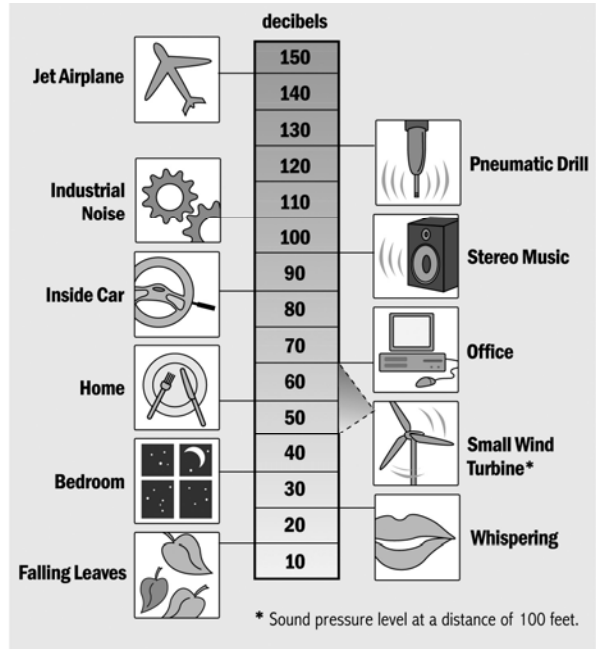


Source: U.S. Department of Energy

appropriate setback from a neighboring property. Most regulations stipulate a maximum decibel level at the subject property line. Other regulations note that noise must meet Illinois Pollution Control Board Standards. The Illinois Pollution Control Board regulates noise-emitting devices.

Shadow Flicker

Shadow flicker is the moving shadow cast on the ground and stationary objects, created by the sun shining through moving blades of a wind turbine. The American Wind Energy Association notes that “small turbines are shorter, have narrower blade profiles, and spin much faster than utility-scale turbines so that any shadows become essentially invisible at operating speeds.” Wind turbine regulations vary the most in how shadow flicker is addressed. They range from not addressing shadow flicker at all, setting a maximum number of hours that shadow flicker impacts adjacent properties, to requiring that no shadow flicker be produced on any residential dwelling.



Source: American Wind Energy Association

Aesthetics/Appearance

The aesthetic impact of wind turbines on the visual landscape is subjective. While some may perceive wind turbines as an obstruction, others may find them an interesting addition. The impact of the appearance of a wind turbine may be minimized by providing standards that address tower type, color, lighting, signs/commercial markings and maintenance. Most regulations also provide provisions by which a system that is determined to be abandoned must be removed.

Discussion

The proposed wind energy systems text amendment can be found in EXHIBIT A. The proposed wind regulations are to be added as a new section to Article XIII of the Zoning Ordinance. The purpose of the proposed wind energy systems regulations are to allow for the effective and efficient use of wind resources while protecting the health, safety and welfare of nearby residents and the general public. The proposed text amendment introduces definitions pertinent to wind energy systems. Since the definitions are specific to wind energy systems, they are proposed to be placed within the wind energy systems section. This is consistent with other sections of the Zoning Ordinance, such as sign regulations, lighting regulations and telecommunications facility provisions. The proposed regulations will be applicable to properties within Urbana’s corporate boundaries and ETJ. A building permit is required for all wind energy systems.

The proposed regulations are structured such that the wind turbines allowed are generally defined by the use they are intended to serve. The following five turbine classifications are proposed:

1) Anemometer Tower

An anemometer tower provides wind speed data for a specific site to determine the site’s potential for a wind energy system. An anemometer tower is permitted in all zoning districts

as a temporary use and must meet the requirements for the type of wind energy system proposed for the site.

2) Building-Mounted Wind Energy System

A building-mounted wind energy system is a small wind generating facility that is mounted on a building and generates power for on-site use. A building-mounted wind energy system will be permitted in all zoning districts as an accessory use.

3) On-Site Tower-Mounted Wind Energy System

An on-site tower-mounted wind energy system provides electric power on-site to a principal use to which it is subordinate. An on-site tower-mounted wind energy system will be permitted in all zoning districts as an accessory use but is limited in size.

4) Utility Tower-Mounted Wind Energy System

A utility tower-mounted wind energy system may either be an accessory use that generates electric power for on-site use, or a principal use that generates electric power for primarily off-site use. A system may be considered a utility tower-mounted system if it exceeds the standards of an on-site tower-mounted system or is a grouping of systems, maintained by one entity, which is intended to generate power to be transferred to a transmission system for distribution to consumers. A utility tower-mounted wind energy system will only be allowed in agricultural, industrial and CRE (University) zoning districts and only as a special use.

5) Residential Service Area Wind Energy System

A residential service area wind energy system is intended to provide power to a residential subdivision or small grouping of residential dwellings. A residential service area wind energy system will be a permitted in all residential zoning districts as a special use.

For each of the above defined wind energy systems specific standards concerning minimum setback, maximum system height, maximum rotor diameter and maximum quantity have been established. The following table outlines these requirements.

TURBINE TYPE	USE STANDARD		MINIMUM SETBACK	MAXIMUM SYSTEM HEIGHT	MAXIMUM ROTOR DIAMETER	MAXIMUM QUANTITY
	Permitted Use (Accessory Use Only)	Special Use (Accessory or Principal Use)				
Building Mounted	All Zoning Districts		Shall be equal to the required minimum yard (front, rear, side) for the zoning district in which it is located.	10 feet as measured from the highest point of the roof for all uses in residential zoning districts; and 15 feet as measured from the highest point of the roof for all uses in non-residential zoning districts	10 feet	No more than one building-mounted wind energy system shall be allowed per zoning lot in residential zoning districts. For all uses in non-residential zoning districts the number of systems shall be based on required setbacks and separation as set forth in this section.
On-Site Tower-Mounted	Residential Zoning Districts		A distance equal to the system height from all property lines, public street right-of-way lines and overhead utility lines.	120 feet	30 feet	One per zoning lot.
	Non-residential Zoning Districts			175 feet, except that the maximum system height shall be limited to 120 feet if located within 500 feet of an existing residence, the boundary of a residentially zoned property, or an area in Urbana's ETJ that is designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).	70 feet, except that the maximum rotor diameter shall be limited to 30 feet if located within 500 feet of an existing residence, the boundary of a residentially zoned property, or an area in Urbana's ETJ that is designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).	
Residential Service Area Tower-Mounted		All Residential Districts	A distance equal to the system height from property lines of those properties which are not a part of the service area, public street right-of-way lines and overhead utility lines.	175 feet	70 feet	As determined by the SUP.
Utility Tower-Mounted		All agricultural and industrial zoning districts in both the City of Urbana and in Urbana's ETJ and in the CRE and University zoning districts in the City of Urbana.	A distance equal to the total height of the system from all property lines, public street right-of-way lines and overhead utility lines. In addition said system shall be located a minimum of 1,200 feet from an existing residence, the boundary of a residentially zoned property, or an area in Urbana's ETJ that is designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).	400 feet	300 feet	Two per development in the City of Urbana and five per development in Urbana's ETJ.

The minimum required setback for all wind energy systems is equal to the system height. The system height is the vertical distance measured from the ground to the outer-most tip of the rotor when the tip is at its highest point. In an urban setting like Urbana, the maximum system height will effectively be limited by lot size since the minimum setback for a wind energy system must equal the system height. As an example, per the Urbana Zoning Ordinance, all residential zoning districts, with the exception of the R-1 zoning district, require a minimum lot width of 60 feet and a minimum lot size of 6,000 square feet. Therefore if a residential lot was 60 feet by 100 feet (6,000 square feet), the maximum system height for a wind energy system would be 30 feet.

To ensure compatibility with residential uses, the maximum system height and maximum rotor diameter for on-site tower-mounted systems depends on its proximity to existing residences or residentially zoned properties. If the proposed wind energy system is within 500 feet of a residence or

residentially zoned property, then the maximum system height and maximum rotor diameter is limited to 120 feet and 30 feet, respectively. On-site tower-mounted wind energy systems of this height and rotor diameter are permitted as accessory uses in all zoning districts. On-site tower-mounted wind energy systems with a maximum system height of 175 feet and maximum rotor diameter of 70 feet are permitted as accessory uses in all nonresidential districts provided the system is more than 500 feet from a residence, the boundary of a residentially zoned property, or an area in Urbana's ETJ that is designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).

In the proposed ordinance, wind energy systems with a system height over 175 feet and/or a rotor diameter greater than 70 feet are classified as utility tower-mounted wind energy systems. Because of the potential size of utility systems, the systems are allowed only as a special use. The procedure for approving a wind energy system as a special use will be the same as other special uses. The proposed regulations outline specific criteria by which the systems are to be evaluated. Residential service area wind energy systems must also be approved as a special use. These systems are intended to allow for an alternative means for either a residential subdivision or grouping of residential dwellings to utilize a wind turbine(s) collectively.

In addition to minimum setback, maximum system height, maximum rotor diameter and maximum quantity, the proposed ordinance sets forth minimum design standards for all wind energy systems. A brief summary of the design standards follows:

- 1) Aesthetics/Appearance – these standards include such items as tower type, color, lighting and signage. A monopole tower type is required in all zoning districts except City of Urbana industrial districts and Champaign County agricultural and industrial districts. In addition, the color of the system must be non-reflective, non-obtrusive color such as off white, light grey or other neutral color, or the color supplied by the manufacturer; no artificial lighting is permitted unless required by the Federal Aviation Administration; and signs are limited to a four square foot warning sign.
- 2) Safety – these standards include such items as limiting the ability to climb turbine towers, securing equipment to prevent unauthorized access, establishing a minimum distance between the ground and the rotor, required overspeed controls and force wind standards.
- 3) Electromagnetic Interference – requires that a wind energy system be designed and sited so that the system does not cause electromagnetic interference to communication systems.
- 4) Vibration – requires that a wind energy system not produce vibrations that are perceptible beyond the property the system is located.
- 5) Sound Level Limitations – sets maximum sound levels at which wind energy systems can operate as measured at the property line.
- 6) Shadow Flicker – sets limitations on the amount of shadow flicker from a wind energy system that can fall on an adjacent property.
- 7) Federal Aviation Administration (FAA) Compliance – requires that all wind energy systems comply with applicable FAA regulations
- 8) Industry Standards – requires that all wind energy systems conform to applicable industry standards.

The proposed regulations also require that all wind energy systems be maintained in good condition and safe working order. A process for which a wind energy system must be removed is proposed for systems that are considered abandoned, or not functioning for a period of 180 days. In addition the regulations outline standards by which pre-existing wind energy systems may continue, be altered and/or rebuilt if damaged or destroyed.

Summary of Staff Findings

1. Wind energy systems are not currently explicitly permitted by the Urbana Zoning Ordinance. The proposed text amendment will establish standards for the siting, installation and operation of wind energy systems that will allow for the effective and efficient use of wind resources while protecting the public health, safety and welfare.
2. Illinois State law (65 ILCS 5/11-13-26) allows municipalities to regulate wind farms and wind turbines within the ETJ surrounding their zoning jurisdiction. The proposed wind energy systems regulations will be applicable to the property within the City of Urbana and Urbana's ETJ.
3. The wind energy systems regulations are being proposed in response to both Urbana Comprehensive Plan Objective 33.5 and increased public interest in installing wind turbines on their properties for energy production including the University of Illinois proposed wind turbine development south of Urbana.
4. The proposed text amendment defines five classifications of wind energy systems allowed including anemometer towers, building-mounted wind energy systems, tower-mounted wind energy systems, utility tower-mounted wind energy systems and residential service area wind energy systems.
5. The proposed text amendment defines minimum setback, maximum system height, maximum rotor diameter and maximum quantity of systems allowed for each classification of wind energy system to ensure compatibility with surrounding land uses.
6. The proposed text amendment includes minimum design standards that all wind energy systems must comply with in order to minimize impact on surrounding uses. These include such items as visual appearance, safety, electromagnetic interference, vibration, sound level limitations, shadow flicker, FAA compliance, and applicable industry standards.

Options

The Plan Commission has the following options for recommendations to the City Council regarding the proposed text amendment in Plan Case No. 2115-T-09:

1. Recommend approval as presented; or
2. Recommend approval as modified by specific suggested changes; or
3. Recommend disapproval as presented.

Staff Recommendation

Based on the analysis and findings presented herein, and without the benefit of considering additional evidence that may be presented at the public hearing, staff recommends that the Plan Commission recommend **APPROVAL** of the proposed wind energy conversion systems text amendment to the Zoning Ordinance in its entirety, as presented herein.

Attachments: Exhibit A: Proposed Wind Energy Systems Text Amendment

cc: John Hall, Champaign County Department of Planning and Zoning

Section XIII-7. Wind Energy Systems

A. Purpose

The purpose of this section is to further the goals and objectives of the Urbana Zoning Ordinance in promoting the use of wind as an alternative energy source. This section regulates the siting, installation and operation of wind turbines to allow the effective and efficient use of wind resources while protecting the health, safety, and welfare of nearby residents and the general public.

B. Wind Energy System Definitions

Ambient Sound: The all-encompassing sound at a given location, usually a composite of sounds from many sources near and far. For the purpose of this section, the “ambient sound level” shall mean the quiescent background level, that is, the quietest of 10-second average sound levels measured when there are no nearby or distinctly audible sound sources. Daytime ambient measurements should be made during mid-morning, weekday hours while nighttime measurements should be made after midnight.

Anemometer Tower: A temporary wind speed indicator constructed for the purpose of analyzing the potential for utilizing a wind energy system at a given site. This includes the tower, base plate, anchors, cables and hardware, wind direction vanes, booms to hold equipment, data logger, instrument wiring, and any telemetry devices that are used to monitor or transmit wind characteristics over a period of time for either instantaneous wind information or to characterize the wind resource at a given location.

Horizontal-Axis Wind Turbine: A tower-mounted turbine in which the rotor is mounted horizontally.

Rotor: The rotating part of a wind turbine, including the blades and blade assembly or the rotating portion of the generator.

Rotor Diameter: The diameter of the circle swept by the rotor. For measurement purposes this means the distance from the outer-most tip of the blade to the center of the turbine rotor multiplied by two.

Shadow Flicker: The moving shadow cast on the ground and stationary objects, created by the sun shining through the moving blades of a wind energy system.

Sound Level: The A-weighted sound pressure level in decibels (dB) (or the C-weighted level if specified) as measured using a sound level meter that meets the requirements of a Type 2 or better precision instrument according to the American National Standards Institute (ANSI) S1.4. The “average” sound level is time-averaged over a suitable period using an integrating sound level meter that meets the requirements of ANSI S12.43.

System Height: The vertical distance measured from the finished grade of the parcel to the outer-most tip of the rotor when the tip is at its highest point.

Tower-Mounted Wind Turbine: A wind turbine mounted on a structure that is designed and constructed primarily for the purpose of elevating and supporting a wind generator, including freestanding lattice towers, monopole towers or guyed towers.

Urbana Extraterritorial Jurisdiction: The unincorporated territory lying within one and one-half (1½) miles of the corporate limits of the City of Urbana, excluding the areas located within the subdivision jurisdiction of another city or village.

Vertical-Axis Wind Turbine: A wind turbine in which the rotor is mounted vertically.

Wind Energy System: A rotary device that extracts energy from the wind. This device includes any base, blade, foundation, generator, nacelle, rotor, tower, transformer, vane, wire, inverter, batteries or other components used in the system.

Wind Energy System, Building-Mounted: A relatively small wind generating facility, mounted on a building, which generates power for on-site use.

Wind Energy System, On-Site: A system that is incidental and subordinate to and is designed to generate power for the principal use of the zoning lot on which it is situated. A wind energy system is considered on-site even if excess electric power, generated by the system, and not presently needed for on-site use, is used by the utility company in exchange for a reduction in the cost of electrical power supplied by that company.

Wind Energy System, Pre-Existing: Any wind energy system which is operational on the effective date of this section.

Wind Energy System, Residential Service Area: A wind energy system intended to provide power to a residential subdivision or small grouping of residential dwellings.

Wind Energy System, Utility:

- a) A wind energy system that exceeds the maximum system height, maximum rotor diameter, or maximum quantity standards provided by this Section for an on-site tower-mounted wind energy system; or
- b) Groupings of wind energy systems, often maintained by one entity, which generate original power on-site to be transferred to a transmission system for distribution to customers.

C. Applicability

1. The provisions of this section shall apply to wind energy systems erected and operated within the corporate limits of the City of Urbana and within the unincorporated territory lying within one and one-half (1½) miles of those corporate limits (Urbana Extraterritorial Jurisdiction) per statutory authority granted in Chapter 65 ILCS 5/11-13-26.
2. All zoning districts and zoning regulations cited are as set by the City of Urbana or Champaign County, whichever is applicable to the subject property.
3. All wind energy systems shall be erected, constructed, installed or modified in conformance with the provisions of this section, and all other applicable regulations, as evidenced by the issuance of a Building Permit, and any other necessary zoning or development approvals.
4. Pre-existing wind energy systems shall be exempt from the provisions of this section with the exception of maintenance, removal of abandoned systems and those which specifically apply to pre-existing systems. Pre-existing wind energy systems shall be permitted to continue per Section XIII-7.N.

D. Temporary Wind Turbines

1. Anemometer Tower

An anemometer tower is permitted in all zoning districts as a temporary use.

- a) An anemometer tower shall not be erected, constructed, installed or modified unless a building permit has been issued by the City of Urbana.
- b) An anemometer tower shall be permitted for no more than eighteen (18) months. An extension of this time period, not to exceed an additional eighteen (18) months, may be granted at the discretion of the Zoning Administrator upon submittal and review of sufficient evidence to support the requested extension.

E. Wind Turbines Permitted by Right

1. Building-Mounted Wind Energy System

Within all zoning districts, a building-mounted wind energy system is permitted as an accessory use to any permitted principal use other than common-lot-line dwellings. A building-mounted wind energy system shall only be permitted within a condominium development if authorized by the condominium association board, and if provisions are made for the maintenance of said system in the condominium development bylaws or other applicable legal document, subject to the review and approval of the City of Urbana. A building-mounted wind energy system shall not be erected, constructed, installed or modified unless a building permit has been issued by the City of Urbana.

All building-mounted wind energy systems shall be subject to the following requirements:

- a) Design Standards as set forth in Section XIII-7.I.
- b) Maximum Height: 10 feet as measured from the highest point of the roof for all uses in residential zoning districts; and 15 feet as measured from the highest point of the roof for all uses in non-residential zoning districts.
- c) Maximum Rotor Diameter: 10 feet.
- d) Minimum Setback: Shall be equal to the required minimum yard (front, rear, side) for the zoning district in which it is located. The setback shall be measured horizontally from the furthest outward extension of all moving parts.
- e) Minimum Separation: If more than one building-mounted wind energy system is installed, a minimum distance equal to the height of the highest system must be maintained between the bases of each system.
- f) Maximum Quantity: No more than one building-mounted wind energy system shall be allowed per zoning lot in residential zoning districts. For all uses in non-residential zoning districts the number of systems shall be based on setback and separation requirements as set forth in this section.
- g) Building Support: The building upon which the system is to be mounted shall be able to safely support operation of the wind energy system. Certification by a structural engineer licensed in the State of Illinois shall be required as part of the building permit process by the City of Urbana.

2. On-Site Tower-Mounted Wind Energy System

An on-site tower-mounted wind energy system is a permitted accessory use within all zoning districts. An on-site tower-mounted wind energy system shall only be permitted on the commons area within a condominium development if authorized by the condominium association board, and if provisions are made for the maintenance of said system in the condominium development bylaws or other applicable legal document, subject to the review and approval of the City of Urbana. An on-site tower-mounted wind energy system shall not be erected, constructed, installed or modified unless a building permit has been issued by the City of Urbana.

All on-site tower-mounted wind energy systems shall be subject to the following requirements:

- a) Design Standards as set forth in Section XIII-7.I.
- b) Maximum System Height:
 - i. Residential Zoning Districts: 120 feet.
 - ii. Non-Residential Zoning Districts: 175 feet, except that the maximum system height shall be limited to 120 feet if located within 500 feet of an existing residence, the boundary of a residentially zoned property, or the boundary of a property that is in Urbana's ETJ and designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s). Maximum Rotor Diameter:
 - i. Residential Zoning Districts: 30 feet.
 - ii. Non-Residential Zoning Districts: 70 feet, except that maximum rotor diameter shall be limited to 30 feet if located within 500 feet of an existing residence, the boundary of a residentially zoned property, or the boundary of a property that is in Urbana's ETJ and

designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s). Lot Size: No minimum lot size.

- c) Location: Entirely behind the principal building in residential and commercial zoning districts. Wind energy systems shall not be constructed on any public easement.
- d) Minimum Setback: A distance equal to the system height from all property lines, public street right-of-way lines and overhead utility lines. The setback shall be measured from the center of the tower's base. No guy wire anchors may extend closer than ten feet to the property line, or the distance of the required setback in the respective zoning district, whichever results in a greater setback.
- e) Maximum Quantity: One per zoning lot.

F. Wind Turbines Permitted by a Special Use Permit

1. Residential Service Area Tower-Mounted Wind Energy System

A residential service area tower-mounted wind energy system may be erected in all residential zoning districts with the issuance of a special use permit. A special use permit for a proposed residential service area tower-mounted wind energy system shall be evaluated in consideration of the factors set forth in Section XIII-7.G and along with compliance to the design standards of Section XIII-7.I. A special use permit application shall be submitted in accordance with Article VII of this Ordinance. Said system shall not be erected, constructed, installed or modified unless a building permit has been issued by the City of Urbana. If the owner of a system is not the owner of land on which the system is located, the City may require that a bond be posted, at time of approval of a special use permit, for the removal of the system.

All residential service area tower-mounted wind energy conversion systems permitted as a special use shall be subject to the following requirements:

- a) Design Standards as set forth in Section XIII-7.I.
- b) Maximum System Height: 175 feet.
- c) Maximum Rotor Diameter: 70 feet.
- d) Minimum Setback: A distance equal to the system height from property lines of those properties which are not a part of the service area, public street right-of-way lines and overhead utility lines. The setback shall be measured from the center of the tower's base.
- e) Maximum Quantity: As determined by the special use permit.

2. Utility Tower-Mounted Wind Energy System

A utility tower-mounted wind energy system may be erected in all agricultural and industrial zoning districts as established by either the City of Urbana or by Champaign County within Urbana's ETJ and in the CRE and University zoning districts as established by the City of Urbana with the issuance of a special use permit. A special use permit for a proposed utility tower-mounted wind energy system shall be evaluated in consideration of the factors set forth in Section XIII-7.G and along with compliance to the design standards of Section XIII-7.I. A special use permit application shall be submitted in accordance with Article VII of this Ordinance. Said system shall not be erected, constructed, installed or modified unless a building permit has been issued by the City of Urbana. If the owner of a system is not the owner of land on which the system is located, the City may require that a bond be posted, at time of approval of a special use permit, for the removal of the system.

All utility tower-mounted wind energy conversion systems permitted as a special use shall be subject to the following requirements:

- a) Design Standards as set forth in Section XIII-7.I.
- b) Maximum System Height: 400 feet.
- c) Maximum Rotor Diameter: 300 feet.
- d) Lot Size: The minimum lot size shall be equal to the minimum lot size for the zoning district in which the system is located.

- e) Minimum Setback: A distance equal to the total height of the system from all property lines, public street right-of-way lines and overhead utility lines. In addition said system shall be located a minimum of 1,200 feet from an existing residence, the boundary of a residentially zoned property, or the boundary of a property that is in Urbana’s ETJ and designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s). The setback shall be measured from the center of the tower’s base.
- f) Maximum Quantity:
- i. City of Urbana: Two per development.
 - ii. Urbana’s ETJ: Five per development.

TABLE XIII-1 SUMMARY OF WIND ENERGY SYSTEMS ALLOWED

TURBINE TYPE	USE STANDARD		MINIMUM SETBACK	MAXIMUM SYSTEM HEIGHT	MAXIMUM ROTOR DIAMETER	MAXIMUM QUANTITY
	Permitted Use (Accessory Use Only)	Special Use (Accessory or Principal Use)				
Building Mounted	All Zoning Districts		Shall be equal to the required minimum yard (front, rear, side) for the zoning district in which it is located.	10 feet as measured from the highest point of the roof for all uses in residential zoning districts; and 15 feet as measured from the highest point of the roof for all uses in non-residential zoning districts	10 feet	No more than one building-mounted wind energy system shall be allowed per zoning lot in residential zoning districts. For all uses in non-residential zoning districts the number of systems shall be based on setback and separation requirements as set forth in this section.
On-Site Tower-Mounted	Residential Zoning Districts		A distance equal to the system height from all property lines, public street right-of-way lines and overhead utility lines.	120 feet	30 feet	One per zoning lot.
	Non-residential Zoning Districts			175 feet, except that the maximum system height shall be limited to 120 feet if located within 500 feet of an existing residence, the boundary of a residentially zoned property, or the boundary of a property that is in Urbana’s ETJ and designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).	70 feet, except that the maximum rotor diameter shall be limited to 30 feet if located within 500 feet of an existing residence, the boundary of a residentially zoned property, or the boundary of a property that is in Urbana’s ETJ and designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).	
Residential Service Area Tower-Mounted		All Residential Districts	A distance equal to the system height from property lines of those properties which are not a part of the service area, public street right-of-way lines and overhead utility lines.	175 feet	70 feet	As determined by the SUP.
Utility Tower-Mounted		All agricultural and industrial zoning districts as established by either the City of Urbana or by Champaign County within Urbana’s ETJ and in the CRE and University zoning districts as established by the City of Urbana	A distance equal to the total height of the system from all property lines, public street right-of-way lines and overhead utility lines. In addition said system shall be located a minimum of 1,200 feet from an existing residence, the boundary of a residentially zoned property, or the boundary of a property that is in Urbana’s ETJ and designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).	400 feet	300 feet	Two per development in the City of Urbana and five per development in Urbana’s ETJ.

G. Evaluation of a Wind Energy System Special Use Permit

Following the procedures established in Article VII, the Plan Commission, in evaluating a Special Use for a utility or residential service area tower-mounted wind energy system, shall consider the following factors in addition to the requirements identified in Section VII-4.A:

- 1) Number of systems and their location;
- 2) The number of systems relative to the size of the parcel on which the systems are proposed to be located;
- 3) The height of the system relative to the size of the parcel on which the system is proposed to be located;
- 4) The need for the proposed height of the system in order to allow the system to operate efficiently;
- 5) The need for the rotor diameter and/or number of systems in order to serve the site effectively;
- 6) The uniformity of design, including tower type, color, number of blades, and direction of blade rotation for multiple system proposals.
- 7) The building density of the general area in which the system is proposed to be located;
- 8) The nature of existing and planned future land use on adjacent and nearby properties;
- 9) Proximity to an existing residence, the boundary of a residentially zoned property, or the boundary of a property that is in Urbana's ETJ and designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s);
- 10) Land use compatibility and impact on orderly development;
- 11) Location of other wind energy systems in the surrounding area;
- 12) Proximity to transmission lines to link the systems to the electric power grid;
- 13) Surrounding topography;
- 14) Proximity to environmentally sensitive areas and the environmental impact of the system;
- 15) Whether the design of the proposed system reflects compliance with the design standards of Section XIII-7.I;
- 16) Whether a substantial adverse effect on public safety will result from the height or rotor diameter of the system or some other aspect of the system's design or proposed construction;
- 17) Consistency with the Urbana Comprehensive Plan; and
- 18) Any other factors relevant to the proposed system.

H. Wind Energy System Special Use Expiration

A special use permit issued pursuant to this section expires if:

- a) A building permit for the wind energy system has not been requested by means of a complete application within two years of approval of the special use permit.
- b) The wind energy system is abandoned and removed per Section XIII-7.M.

I. Design Standards

In addition to all other applicable requirements of this Section, wind energy systems shall be constructed in conformance with the following design standards:

1. Visual Appearance

- a) Tower Type: Monopole type tower is required in all zoning districts with the exception of all City of Urbana industrial districts and in all Champaign County agricultural and industrial zoning districts in Urbana's ETJ, where other tower types may be permitted.
- b) Color: Non-reflective, non-obtrusive color such as off white, light gray, or other neutral color, or the color supplied by the manufacturer. The required coloration and finish shall be maintained throughout the life of the system.
- c) Lighting: No artificial lighting is allowed unless required by the Federal Aviation Administration (FAA) or other applicable authority. If lighting is required, the lighting alternatives and design chosen must cause the least disturbance to surrounding land uses.

- d) Signs: All signs, both temporary and permanent, are prohibited on a wind energy system with the exception of warning signs. One warning sign no more than four square feet in area is permitted per system.
- e) No telecommunications dishes, antennas, cellular telephone repeaters or other similar devices shall be attached to wind energy systems.
- f) Electrical System: All on-site electrical transmission lines connecting a wind energy system to a building or public utility electricity distribution system shall be located underground. As-built plans shall be submitted showing the location of underground conduit and cable located within the public right-of-way.

2. Safety

- a) Tower Access: Towers shall be designed to prevent climbing within the first 12 feet from the ground. Access to the tower shall be limited by locating all climbing apparatus to no lower than 12 feet from the ground and by providing any other applicable anti-climbing measures.
- b) Equipment Access: All ground-mounted electrical and control equipment shall be labeled and secured to prevent unauthorized access.
- c) Ground Clearance: The minimum distance between the ground and any part of the rotor blade system of a tower-mounted horizontal-axis wind energy system shall be 20 feet. For a tower-mounted vertical-axis wind energy system, no moving portions of the turbine shall be located any closer than 10 feet above the adjacent finished grade.
- d) Overspeed Controls: All on-site tower-mounted wind energy systems shall be equipped with automatic and manual braking systems. Utility tower-mounted wind energy systems shall be equipped with a redundant braking system, including both aerodynamic over-speed controls and mechanical brakes.
- e) Force Wind Standard: At a minimum, a wind energy system shall be engineered to withstand a wind velocity 110 miles per hour.

3. Electromagnetic Interference

All wind energy systems shall be designed and sited such that no disruptive electromagnetic interference is caused to communication systems, contrary to Federal Communication Commission requirements for electromagnetic interference and/or other State or local laws. All turbines shall utilize nonmetallic rotor blades unless the applicant can supply documentation from an independent testing laboratory certifying that any proposed metallic blade rotor will not cause electromagnetic interference.

4. Vibration

All wind energy systems shall not produce vibrations which are humanly perceptible beyond the property on which a wind energy system is situated.

5. Sound Level Limitations

- a) The sound level limits identified below shall apply. Established Sound Level Measurement Procedures shall be used that account for ambient sound contributions.

Receiving Property	Hours of Operation	Sound Level Limits
Residential	10:00 pm – 7:00 am	45 dB(A)
Residential	7:00 am – 10:00 pm	55 dB(A)
Non-Residential	24 hours	60 dB(A)
Industrial	24 hours	65 dB(A)

- b) No system shall operate with an average sound level more than 5 dB (A) above the non-operational ambient level, as measured at the property line.
- c) To limit the level of low frequency sound, the average C-weighted sound level during system operation shall not exceed the A-weighted ambient sound level by more than 20 dB.
- d) Applications for wind energy systems requiring a special use permit shall include an environmental sound impact study that gives:

- i. Certified manufacturer's specification of the sound emissions from similar turbines that specifically state that the overall sound level as well as the 1/3-octave band levels measured in accordance with IEC 61400-11.
 - ii. The expected maximum one minute averaged A- and C-weighted sound level at the property line with all turbines operating.
 - iii. The daytime and night time quiescent ambient sound levels at the property line as measured by an environmental acoustics expert (board certified by the Institute of Noise Control Engineering).
6. Shadow Flicker
 - a) Applications for wind energy systems requiring a special use permit shall include a shadow flicker study. Using available software, the applicant shall show calculated locations of shadow flicker caused by a wind energy system and the expected duration in total number of hours per year of the flicker on adjacent residences, residentially zoned properties or areas in Urbana's ETJ that are designated for future residential use by the Urbana Comprehensive Plan Future Land Use Map(s).
 - b) Wind energy systems requiring a special use permit shall be sited in a manner that does not result in significant shadow flicker impacts on adjacent properties. Significant shadow flicker is defined as more than 30 hours per year on any residential structure. The applicant has the burden of providing evidence that the shadow flicker will not have significant adverse impact. Potential shadow flicker shall be addressed either through siting or other approved mitigation measures.
7. Federal Aviation Administration (FAA) Compliance

All wind energy systems shall comply with all applicable regulations of the FAA, including required FAA permits for installation closer than two miles to an airport. The applicant shall be responsible for determining the applicable FAA regulations and securing the necessary approvals.
8. Industry Standards

All wind energy systems shall conform to applicable industry standards, including those of the American National Standards Institute (ANSI). Owners shall submit certificates of design compliance that equipment manufacturers have obtained from Underwriters Laboratories (UL), National Renewable Energy Laboratories (NREL), Det Norske Veritas (DNV), Germanischer Lloyd Wind Energie (GL), or an equivalent third party.
- J. Code Compliance

All wind energy systems shall meet the City of Urbana Building Code, Erosion Control Ordinance, Subdivision and Land Development Code and all other applicable codes and ordinances of the City of Urbana.
- K. Maintenance

All wind energy systems shall be maintained in good condition and in safe working order throughout the life of the system. If the system is not maintained in operational condition and/or poses a potential safety hazard, the owner shall immediately correct the situation at their expense. Any wind energy system found to be unsafe by the Zoning Administrator or appointed designee, must stop operation immediately upon notification. If the owner fails to correct the unsafe condition, the Zoning Administrator may remove or cause to be removed, altered or repaired an unsafe wind energy system immediately and without notice, if, in his/her opinion, the condition of the system is such as to present an immediate threat to the safety of the public. If a wind energy system remains inoperable for a period of 180 days, it shall be deemed abandoned and the procedures under Section XIII-7.M applied.
- L. Violation

Should a wind energy system or any part thereof violate the requirements of this Section, the owner shall cease operations immediately. Upon receipt of a complaint or the notice of a complaint from the owner, the Zoning Administrator shall make a determination as to whether there is a violation requiring

the immediate cessation of operation. The system may resume operation once the violation(s) have been remedied.

M. Abandonment and Removal

A wind energy system shall be deemed abandoned if not functioning for a continuous period of 180 days, and there is no demonstrated plan to restore the equipment to operating condition. The City will issue a Notice of Abandonment for the removal of an abandoned wind energy system as follows:

- a) The Zoning Administrator is authorized to issue a Notice of Abandonment to the owner of a wind energy system that is deemed to be abandoned, and in cases where immediate safety is not of concern, the owner shall have 30 days from Notice receipt date to respond.
- b) Following the 30-day response period, and if the Zoning Administrator determines that the system has been abandoned, the owner of the system shall remove the abandoned system at their expense within 180 days of the original Notice of Abandonment. A demolition permit shall be obtained for the removal of the abandoned system.
- c) Failure to remove the abandoned system within said 180 days constitutes a violation of this Section. Following said 180 days, the City, or a contractor hired by the City, shall have the authority to enter the subject property and cause removal of the system at the owner's expense. In the case of such removal the City has the right to file a lien for reimbursement, of any and all expenses incurred by the City without limitation, including attorney fees and accrued interest. For those cases in which the owner of a wind energy system is not the owner of land on which the system is located, the City may execute the bond posted at the time of approval of the system.

N. Pre-Existing Wind Energy Systems

1. Pre-existing wind energy systems shall be allowed to continue. Routine maintenance shall be permitted on such pre-existing systems.
2. A building permit and any other necessary zoning and development approvals shall be obtained to alter, enlarge, extend, replace or relocate a pre-existing wind energy system.
3. If a pre-existing wind energy system is nonconforming with this Section, it shall not be altered, enlarged, extended or relocated such that the nonconformity of the system is increased.
4. Pre-existing wind energy systems that are substantially damaged or destroyed must be rebuilt to conform with this Section.