

**Model As-of-Right Zoning Ordinance or Bylaw:  
Allowing Use of Wind Energy Facilities**

Prepared by:  
Department of Energy Resources  
Massachusetts Executive Office of Environmental Affairs

*This Model By-Law was prepared to assist cities and towns in establishing reasonable standards for wind power development. The by-law is developed as a model and not intended for adoption without specific review by municipal counsel.*

**1.0 Purpose**

The purpose of this bylaw is to provide standards for the placement, design, construction, operation, monitoring, modification and removal of wind facilities that address public safety, minimize impacts on scenic, natural and historic resources and to provide adequate financial assurance for the eventual decommissioning of such facilities.

The provisions set forth in this bylaw shall take precedence over all other bylaws when considering applications related to the construction, operation, and/or repair of land-based wind energy facilities.

**1.1 Applicability**

This section applies to all utility-scale and on-site wind facilities proposed to be constructed after the effective date of this section. This section also pertains to physical modifications to existing wind facilities that materially alter the type, configuration, location or size of such facilities or related equipment.

This section does not apply to off-shore wind systems.

**2.0 Definitions**

**As-of-Right Siting:** As-of-Right Siting shall mean that development may proceed without the need for a special permit, variance, amendment, waiver, or other discretionary approval. As-of-right development may be subject to non-discretionary site plan review to determine conformance with local zoning bylaws as well as state and federal law. As-of-right development projects that are consistent with zoning bylaws and with state and federal law cannot be prohibited.

**Building Inspector:** the inspector of buildings, building commissioner, or local inspector charged with the enforcement of the state building code.

**Building Permit:** The permit issued in accordance with all applicable requirements of the Massachusetts State Building Code (780 CMR).

**Critical Electric Infrastructure (CEI):** electric utility transmission and distribution infrastructure, including but not limited to substations, transmission towers, transmission and distribution poles, supporting structures, guy-wires, cables, lines and conductors operating at voltages of 13.8 kV and above and associated telecommunications infrastructure. CEI also includes all infrastructure defined by any federal regulatory agency or body as transmission facilities on which faults or disturbances can have a significant adverse impact outside of the local area, and transmission lines and associated equipment generally operated at voltages of 100 kV or higher, and transmission facilities which are deemed critical for nuclear generating facilities.

**Designated Location:** The location[s] designated by [the community’s local legislative body] in accordance with M.G.L. c. 40A, section 5, where wind energy facilities may be sited as-of-right. Said location[s] [is/are] shown on a Zoning Map [insert title of map]. This map is hereby made a part of this Zoning Bylaw and is on file in the Office of the [Town/City] Clerk.

***Note:** The “designated location” refers to the location within a community where wind power generation is permitted as-of-right. Establishment of a designated location for wind power generation is an integral part of the process of adopting an As-of-Right Wind Energy Facility Bylaw.*

***Legal Requirements:** The process of designating the location must comport with the requirements of Section 5 of Chapter 40A of the Massachusetts General Laws which sets out the requirements for adopting and amending zoning bylaws.*

*Communities should keep in mind the requirements of the Green Communities Program. To qualify for designation as a Green Community, the designated area must provide a realistic and practical opportunity for development of wind power generation. An average wind speed of six meters per second at 50 meters elevation is considered the minimum wind speed for commercial scale wind generation, however, the potential for power generation increases exponentially with increased average wind speeds.*

*To satisfy the as-of-right zoning requirement contained in the Green Communities Act, the as-of-right bylaw must allow for wind energy facilities that utilize at least one turbine with a rated nameplate capacity of 600 kW or more.*

***Methods of Designating a Location:** Communities may designate locations by reference to geographically specific zoning districts. In the alternative, communities may create an overlay district consisting of all or portions of multiple preexisting zoning districts, where wind power generation is permitted by right. In designating a location, it is important for the community implementing the zoning bylaw to consider the availability of wind and particular characteristics of the local community.*

**Height:** The height of a wind turbine measured from natural grade to the tip of the rotor blade at its highest point, or blade-tip height. This measure is also commonly referred to as the maximum tip height (MTH).

**Note:** *The height of the wind energy facility will have a direct impact on the amount of power it generates. While actual outputs vary, a wind turbine that is 250 feet tall will have an average nameplate capacity of roughly 660 kW, whereas a turbine that is 450 feet will have an average nameplate capacity of roughly 1.5 to 2.0 MW.*

*As previously mentioned, to satisfy the as-of-right zoning requirement contained in the Green Communities Act, the as-of-right bylaw must allow for the construction and operation of wind generation facilities that utilize at least one turbine with a rated nameplate capacity of 600 kW or more.*

*Actual generating capacity must be considered not only in terms of tower height, but also in light of average wind speeds at a given location.*

**Rated Nameplate Capacity:** The maximum rated output of electric power production equipment. This output is typically specified by the manufacturer with a “nameplate” on the equipment.

**Site Plan Review Authority:** Refers to the body of local government designated by the municipality to review site plans.

**Utility-Scale Wind Energy Facility:** A commercial wind energy facility, where the primary use of the facility is electrical generation to be sold to the wholesale electricity markets.

**Wind Energy Facility:** All of the equipment, machinery and structures together utilized to convert wind to electricity. This includes, but is not limited to, developer-owned electrical equipment, storage, collection and supply equipment, service and access roads, and one or more wind turbines.

**Wind Monitoring or Meteorological Tower:** A temporary tower equipped with devices to measure wind speed and direction, to determine how much electricity a wind energy facility can be expected to generate.

**Wind Turbine:** A device that converts kinetic wind energy into rotational energy to drive an electrical generator. A wind turbine typically consists of a tower, nacelle body, and a rotor with two or more blades.

**Zoning Enforcement Authority:** The person or board charged with enforcing the zoning bylaws.

**Note:** *By state statute, this may be the “inspector of buildings, building commissioner or local inspector, or if there are none, in a town, the board of selectmen, or person or board designated by local ordinance or by-law”. MGL 40A § 7. In many communities, the building inspector is the person charged with enforcing both the state’s building code and local zoning bylaws.*

### **3.0 General Requirements for all Wind Energy Facilities**

The following requirements are common to all wind energy facilities to be sited in designated locations.

#### **3.1 Compliance with Laws, Ordinances and Regulations**

The construction and operation of all such proposed wind energy facilities shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, environmental, electrical, communications and aviation requirements.

#### **3.2 Building Permit and Building Inspection**

No wind energy system shall be erected, constructed, installed or modified as provided in this section without first obtaining a building permit.

***Note:** Under the state building code, work must commence within six (6) months from the date a building permit is issued, however, a project proponent may request an extension of the permit and more than one extension may be granted.*

#### **3.3 Fees**

The application for a building permit for a wind energy system must be accompanied by the fee required for a building permit.

#### **3.4 Site Plan Review**

No wind energy facility shall be erected, constructed, installed or modified as provided in this section without first undergoing site plan review by the Site Plan Review Authority.

***Purpose:** The purpose of the site plan review is to determine that the use complies with all requirements set forth in this zoning by-law and that the site design conforms to established standards regarding landscaping, access, noise and other zoning provisions.*

***Additional Considerations:** As part of the implementation of an as-of-right wind energy bylaw, communities should consider amending their existing site plan review provisions in order to incorporate site plan review conditions that apply specifically to wind energy facilities.*

##### **3.4.1 General**

All plans and maps shall be prepared, stamped and signed by a professional engineer licensed to practice in Massachusetts.

##### **3.4.2 Required Documents**

Pursuant to the site plan review process, the project proponent shall provide the following documents:

(a) A site plan showing:

- i. Property lines and physical dimensions of the site parcel and adjacent parcels within 500 feet of the site parcel;

- ii.** Outline of all existing buildings, including purpose (e.g. residence, garage, etc.) on site parcel and all adjacent parcels within 500 feet of the site parcel, including distances from the wind facility to each building shown;
  - iii.** Location of the proposed tower, foundations, guy anchors, access roads, and associated equipment;
  - iv.** Location of all existing and proposed roads, both public and private, and including temporary roads or driveways, on the site parcel and adjacent parcels within 500 feet of the site parcel;
  - v.** Location of all existing above ground or overhead gas or electric infrastructure, including Critical Electric Infrastructure, and utility rights of way (ROW) and easements, whether fully cleared of vegetation or only partially cleared, within 500 feet of the site parcel;
  - vi.** Existing areas of tree cover, including average height of trees, on the site parcel and any adjacent parcels within a distance, measured from the wind turbine foundation, of 3.0 times the MTH.;
  - vii.** Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting (other than FAA lights), screening vegetation or structures;
  - viii.** Tower foundation blueprints or drawings signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts;
  - ix.** Tower blueprints or drawings signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts;
  - x.** One or three line electrical diagram detailing wind turbine, associated components, and electrical interconnection methods, with all National Electrical Code and National Electrical Safety Code compliant disconnects and overcurrent devices;
  - xi.** Documentation of the wind energy facility's manufacturer and model, rotor diameter, tower height, tower type (freestanding or guyed), and foundation type/dimensions;
  - xii.** Name, address, phone number and signature of the applicant, as well as all co- applicants or property owners, if any;
  - xiii.** The name, contact information and signature of any agents representing the applicant; and
  - xiv.** A maintenance plan for the wind energy facility;
- (b)** Documentation of actual or prospective access and control of the project site (see also Section 3.5), together with documentation of all applicable title encumbrances (e.g. utility ROW easements);
- (c)** An operation and maintenance plan (see also Section 3.6);
- (d)** A location map consisting of a copy of a portion of the most recent USGS Quadrangle Map, at a scale of 1:25,000, showing the proposed facility site, including turbine sites, and the area within at least two miles from the facility. Zoning district designation for the subject parcel should be included; submission of a copy of a zoning map with the parcel identified is suitable for this purpose;
- (e)** Proof of liability insurance, in amounts commensurate with the risks;
- (f)** Certification of height approval from the FAA;
- (g)** A statement that evidences the wind energy facility's conformance with Section 3.10.6, listing existing ambient sound levels at the site and maximum projected sound levels from the wind energy facility; and

**(h) Description of financial surety that satisfies Section 3.12.3.**

The Site Plan Review Authority may waive documentary requirements for good cause shown.

***Additional Consideration (expedited site plan review for smaller wind energy facilities):***  
*The extensive site plan review documentation set forth in Section 3.4.2 of this model bylaw may not be appropriate for smaller wind energy facilities, such as those utilizing turbines under 150 feet in height. Accordingly, communities should consider incorporating a provision in their bylaw that allows smaller wind energy projects to undergo a site plan review with fewer required documents. One of the key goals underpinning the Green Communities Program is the development of renewable and alternative energy capacity. Communities should shape their bylaws to enable both large and small wind energy projects to proceed without undue delay.*

**3.5 Site Control**

The applicant shall submit documentation of actual or prospective access and control of the project site sufficient to allow for installation and operation of the proposed wind energy facility. Control shall include the legal authority to prevent the use or construction of any structure for human habitation, or inconsistent or interfering use, within the setback areas.

**3.6 Operation & Maintenance Plan**

The applicant shall submit a plan for maintenance of access roads and storm water controls, as well as detailed procedures for operational maintenance of the wind facility that are in accordance with manufacturer's recommendations for the period of expected operation of such facility. A facility that is not being maintained in accordance with the submitted plan and manufacturer's recommendations shall cease operation until such time as the facility is brought into compliance with the maintenance plan and manufacturer's recommendations.

**3.7 Utility Notification**

No site plan for the installation of a wind energy facility shall be approved until evidence has been given that the electric utility company that operates the electrical grid where the facility is to be located has been informed of the customer's intent to install an interconnected customer-owned generator, and copies of site plans showing the proposed location have been submitted to the utility for review. No installation of a wind energy facility should commence and no interconnection shall take place until an "Interconnection Agreement" pursuant to applicable tariff and consistent with the requirements for other generation has been executed with the utility. Off-grid systems shall be exempt from this requirement, unless they are proposed to be located within setback distance from the sideline of an existing utility ROW.

**3.8 Temporary Meteorological Towers (Met Towers)**

A building permit shall be required for stand-alone temporary met towers. No site plan review shall be required for met towers. Met towers shall not be located within setback distance from the sideline of any utility ROW.

*Note: Under the state building code, work must commence within six (6) months from the date a building permit is issued, however, a project proponent may request an extension of the permit and more than one extension may be granted.*

### **3.9 Design Standards**

#### **3.9.1 Appearance, Color and Finish**

Color and appearance shall comply with Federal Aviation Administration (FAA) safety requirements.

#### **3.9.2 Lighting**

Wind turbines shall be lighted only if required by the FAA. Lighting of other parts of the wind energy facility, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Except as required by the FAA, lighting of the wind energy facility shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

#### **3.9.3 Signage**

Signs on wind energy facilities shall comply with the Town's sign by-law. The following signs shall be required:

- (a) Those necessary to identify the owner, provide a 24-hour emergency contact phone number, and warn of any danger.
- (b) Educational signs providing information about the facility and the benefits of renewable energy.

Wind turbines shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the wind energy facility.

#### **3.9.4 Utility Connections**

Reasonable efforts, as determined by the Site Plan Review Authority, shall be made to place all developer-owned utility connections from the wind energy facility underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Utility owned electrical equipment required for utility interconnections may be above ground, if required by the utility provider.

#### **3.9.5 Appurtenant Structures**

All appurtenant structures to wind energy facilities shall be subject to applicable regulations concerning the bulk and height of structures, lot area, setbacks, open space, parking and building coverage requirements. All such appurtenant structures, including but not limited to, equipment shelters, storage facilities, transformers, and substations, shall be architecturally compatible with each other and contained within the turbine tower whenever technically and economically feasible. Whenever reasonable, structures should be shaded from view by vegetation and/or located in an underground vault and joined or clustered to avoid adverse visual impacts.

*Note: Regulations governing appurtenant structures are typically contained in a town's zoning bylaw.*

### **3.9.6 Height**

The height (MTH) of wind energy facilities shall not exceed 450 feet in height.

*Note: A turbine height of 450 feet is used for illustration purposes only. Communities may set a height limit that is less than 450 feet, provided that the limit selected allows for the as-of-right construction and operation of turbines with a rated nameplate capacity of 600 kW or more.*

*Currently, a land-based turbine that is 450 feet in height is considered a large turbine. Periodically, communities may wish to revisit their siting criteria to ensure that they reflect industry standards as well as Green Communities Act requirements.*

## **3.10 Safety and Environmental Standards**

### **3.10.1 Emergency Services**

The applicant shall provide a copy of the project summary, electrical schematic, and site plan to the police and fire departments, and/or the local emergency services entity designated by the local government, as well as the local electrical utility company.

Upon request the applicant shall cooperate with local emergency services in developing an emergency response plan. All means of disconnecting the wind energy facility shall be clearly marked. The applicant or facility owner shall identify a responsible person for public inquiries or complaints throughout the life of the project.

### **3.10.2 Unauthorized Access**

Wind energy facilities shall be designed to prevent unauthorized access. For instance, the towers of wind turbines shall be designed and installed so that step bolts or other climbing features are not readily accessible to the public and so that step bolts or other climbing features are not installed below the level of 8 feet above the ground. Electrical equipment shall be locked where possible.

### **3.10.3 Setbacks**

A wind turbine may not be sited within:

- (a) a distance equal to one and one-half (1.5) times the maximum tip height (MTH) of the wind turbine from buildings, critical infrastructure—including Critical Electric Infrastructure and above-ground natural gas distribution infrastructure—or private or public ways that are not part of the wind energy facility;
- (b) a distance equal to three (3.0) times the maximum tip height (MTH) of the turbine from the nearest existing residential or commercial structure; or
- (c) a distance equal to one and one-half (1.5) times the maximum tip height (MTH) of the turbine from the nearest property line, and private or public way.

### 3.10.5 Shadow/Flicker

Wind energy facilities shall be sited in a manner that minimizes shadowing or flicker impacts. The applicant has the burden of proving that this effect does not have significant adverse impact on neighboring or adjacent uses.

**Educational Note:** Shadow flicker is caused by sunlight passing through the swept area of the wind turbine's blades. As sunlight passes through the spinning blades, it is possible to have a stroboscopic effect that can, under the right conditions, affect persons prone to epilepsy. In general, these conditions require varying light intensity at frequencies of 2.5-3 Hz. Large commercial turbines are typically limited to a frequency of less than 1.75 Hz. Furthermore, the impacts of shadow flicker diminish rapidly with distance and should be minimal at 10 or more rotor diameters. Though the RPM for smaller turbines is generally higher (up to 350 RPM, for some turbines), the small size of the rotor swept area, combined with the shorter tower heights, support a negligible shadow flicker impact from these types of facilities. In any case, the effects of shadow flicker are a seasonal and/or diurnal impact, requiring that the sun be at the right position in the sky to generate a line of sight with the affected building and the wind turbine rotor. As such, the impacts of shadow flicker will generally only be felt for a few hours per year.

### 3.10.6 Sound

The operation of the wind energy facility shall conform with the provisions of the Department of Environmental Protection's, Division of Air Quality Noise Regulations (310 CMR 7.10).

**Educational Note:** According to the Division of Air Quality Control Policy, a source of sound will be considered to be violating 310 CMR 7.10 if the source:

- (a) Increases the broadband sound level by more than 10 dB(A) above ambient, or
- (b) Produces a "pure tone" condition – when an octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited structure. Ambient is defined as the background A-weighted sound level that is exceeded 90% of the time measured during equipment hours. The ambient may also be established by other means with consent from the DEP.

### 3.10.7 Land Clearing, Soil Erosion and Habitat Impacts

Clearing of natural vegetation shall be limited to that which is necessary for the construction, operation and maintenance of the wind energy facility or otherwise prescribed by applicable laws, regulations, and bylaws, and subject to existing easements, restrictions and conditions of record.

### **3.11 Monitoring and Maintenance**

#### **3.11.1 Wind Energy Facility Conditions**

The applicant shall maintain the wind energy facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, emergency braking (stopping) and integrity of security measures. Site access shall be maintained to a level acceptable to the local Fire Chief and Emergency Medical Services. The project owner shall be responsible for the cost of maintaining the wind energy facility and any access road(s), unless accepted as a public way.

#### **3.11.2 Modifications**

All material modifications to a wind energy facility made after issuance of the required building permit shall require approval by the Site Plan Review Authority.

### **3.12 Abandonment or Decommissioning**

#### **3.12.1 Removal Requirements**

Any wind energy facility which has reached the end of its useful life or has been abandoned shall be removed. The owner/operator shall physically remove the facility no more than 150 days after the date of discontinued operations. The applicant shall notify the Site Plan Review Authority by certified mail of the proposed date of discontinued operations and plans for removal. Decommissioning shall consist of:

- (a) Physical removal of all wind turbines, structures, equipment, security barriers and transmission lines from the site.
- (b) Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.
- (c) Stabilization or re-vegetation of the site as necessary to minimize erosion. The Site Plan Review Authority may allow the owner to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.

#### **3.12.2 Abandonment**

Absent notice of a proposed date of decommissioning or written note of extenuating circumstances, the wind energy facility shall be considered abandoned when the facility fails to operate for more than one year without the written consent of the Site Plan Review Authority. If the applicant fails to remove the facility in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the town may enter the property and physically remove the facility

#### **3.12.3 Financial Surety**

Applicants for utility-scale wind energy facilities shall provide a form of surety, either through escrow account, bond or otherwise, to cover the cost of removal or failure to maintain, in the event the town must maintain or remove the facility and remediate the landscape, in an amount and form determined to be reasonable by the Site Plan Review Authority, but in no event to exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as

determined by the applicant. Such surety will not be required for municipally or state-owned facilities. The applicant shall submit a fully inclusive estimate of the costs associated with removal, prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.