Kim DelNigro

From: Christopher Schaffner [chris@greenengineer.com]

Sent: Sunday, February 04, 2007 10:23 PM

To: Planning Board; Roland Bartl

Subject: Model Zoning By-Law for Wind Facilities

The State of Mass has put together a model zoning by-law for wind turbines. It can be found at:

http://www.mass.gov/?pageID=ocaterminal&L=4&L0=Home&L1=Consumer&L2=Energy%2c+Fuel+%26+Utilities&L3=Renewable+Energy+Programs&sid=Eoca&b=terminalcontent&f=doer_programs_renew_wind-model-zoning&csid=Eoca

I'd like to put a discussion of this topic on the agenda for a future planning board meeting, hopefully on an otherwise slow night.

Christopher Schaffner

Model Zoning By-Law for Wind Facilities

As interest in wind energy spreads throughout the Commonwealth, it becomes clear that there is a need within the cities and towns of Massachusetts for suitable zoning by-laws that accommodate wind projects. To help address this need, the Massachusetts Division of Energy Resources and Executive Office of Environmental Affairs developed this *Model Amendment to a Zoning Ordinance or By-Law* 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 review by municipal counsel:

- **Model Amendment to a Zoning Ordinance or By-law: Allowing Wind Facilities by Special Permit** PDF
- ***Companion Document* to Model Amendment to a Zoning Ordinance or By-law: Allowing Wind Facilities by Special Permit** PDF

Useful Resources

- Wind Energy Guide for County Commissioners PDF
- MTC Community Wind Collaborative
- MTC Large Onsite Renewables Initiative (MTC Renewable Energy Trust)
- Community Wind Fact Sheets
- Massachusetts Wind Working Group
- Information on Small Wind Projects

Content provided by the Division of Energy Resources.

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Model Amendment to a Zoning Ordinance or By-law: Allowing Wind Facilities by Special Permit

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

1.0 Purpose

The purpose of this by-law is to provide by special permit for the construction and operation of wind facilities and to provide standards for the placement, design, construction, monitoring, modification and removal of wind facilities that address public safety, minimize impacts on scenic, natural and historic resources of the city or town and provide adequate financial assurance for decommissioning.

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. It does not apply to single stand-alone turbines under 60 kilowatts of rated nameplate capacity.

Any physical modifications to existing wind facilities that materially alters the type or increases the size of such facilities or other equipment shall require a special permit.

2.0 Definitions

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

On-Site Wind Facility: A wind project, which is located at a commercial, industrial, agricultural, institutional, or public facility that will consume more than 50% of the electricity generated by the project on-site.

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.

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.

Special Permit Granting Authority: The special permit granting authority shall be the board of selectmen, city council, board of appeals, planning board, or zoning administrator as designated by zoning ordinance or by-law for the issuance of special permits, or by this section for the issuance of special permits to construct and operate wind facilities.

Substantial Evidence: Such evidence as a reasonable mind might accept as adequate to support a conclusion.

Wind Facility: All equipment, machinery and structures utilized in connection with the conversion of wind to electricity. This includes, but is not limited to, transmission, storage, collection and supply equipment, substations, transformers, service and access roads, and one or more wind turbines.

Wind Monitoring or Meteorological Tower: A temporary tower equipped with devices to measure wind speeds and direction, used to determine how much wind power a site can be expected to generate.

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

3.0 General Requirements

3.1 Special Permit Granting Authority

No wind facility over 60 kilowatts of rated nameplate capacity shall be erected, constructed, installed or modified as provided in this section without first obtaining a permit from the special permit granting authority. The construction of a wind facility shall be permitted in any zoning district subject to the issuance of a Special Permit and provided that the use complies with all requirements set forth in sections 3, 4, 5 and 6. All such wind energy facilities shall be constructed and operated in a manner that minimizes any adverse visual, safety, and environmental impacts. No special permit shall be granted unless the special permit granting authority finds in writing that:

(a) the specific site is an appropriate location for such use;
(b) the use is not expected to adversely affect the neighborhood;
(c) there is not expected to be any serious hazard to pedestrians or vehicles from the use;
(d) no nuisance is expected to be created by the use; and
(e) adequate and appropriate facilities will be provided for the proper operation of the use.

Such permits may also impose reasonable conditions, safeguards and limitations on time and use and may require the applicant to implement all reasonable measures to mitigate unforeseen adverse impacts of the wind facility, should they occur.

Wind monitoring or meteorological towers shall be permitted in all zoning districts subject to issuance of a building permit for a temporary structure and subject to reasonable regulations concerning the bulk and height of structures and determining yard-size, lot area, setbacks, open space, parking, and building coverage requirements

3.2 Compliance with Laws, Ordinances and Regulations

The construction and operation of all such proposed wind 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.

3.3 Proof of Liability Insurance

The applicant shall be required to provide evidence of liability insurance in an amount and for a duration sufficient to cover loss or damage to persons and structures occasioned by the failure of the facility.

3.4 Site Control

At the time of its application for a special permit, the applicant shall submit documentation of actual or prospective control of the project site sufficient to allow for installation and use of the proposed facility. Documentation shall also include proof of control over setback areas and access roads, if required. Control shall mean the legal authority to prevent the use or construction of any structure for human habitation within the setback areas.

4.0 General Siting Standards

4.1 Height

Wind facilities shall be no higher than 400 feet above the current grade of the land, provided that wind facilities may exceed 400 feet if:

(a) the applicant demonstrates by substantial evidence that such height reflects industry standards for a similarly sited wind facility;
(b) such excess height is necessary to prevent financial hardship to the applicant, and
(c) the facility satisfies all other criteria for the granting of a special permit under the provisions of this section.

4.2 Setbacks

Wind turbines shall be set back a distance equal to 1.5 times the overall blade tip height of the wind turbine from the nearest existing residential or commercial structure and 100 feet from the nearest property line and private or public way.

4.2.1 Setback Waiver

The special permit granting authority may reduce the minimum setback distance as appropriate based on site-specific considerations, if the project satisfies all other criteria for the granting of a special permit under the provisions of this section.

5.0 Design Standards

5.1 Color and Finish

The special permit granting authority shall have discretion over the turbine color, although a neutral, non-reflective exterior color designed to blend with the surrounding environment is encouraged.

5.2 Lighting and Signage

5.2.1 Lighting

Wind turbines shall be lighted only if required by the Federal Aviation Administration. Lighting of other parts of the wind facility, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties.

5.2.2 Signage

Signs on the wind facility shall comply with the requirements of the town's sign regulations, and shall be limited to:

(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.

5.2.3 Advertising

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

5.2.4 Utility Connections

Reasonable efforts shall be made to locate utility connections from the wind facility underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

5.3 Appurtenant Structures

All appurtenant structures to such wind facilities shall be subject to reasonable regulations concerning the bulk and height of structures and determining yard sizes, 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 shall be contained within the turbine tower whenever technically and economically feasible. Structures shall only be used for housing of equipment for this particular site. 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.

5.4 Support Towers

Monopole towers are the preferred type of support for the Wind Facilities.

6.0 Safety, Aesthetic and Environmental Standards

6.1 Emergency Services

The applicant shall provide a copy of the project summary and site plan to the local emergency services entity, as designated by the special permit granting authority. Upon

request the applicant shall cooperate with local emergency services in developing an emergency response plan.

6.1.1 Unauthorized Access

Wind turbines or other structures part of a wind facility shall be designed to prevent unauthorized access.

6.2 Shadow/Flicker

Wind 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 through either siting or mitigation.

6.3 Noise

The wind facility and associated equipment shall conform with the provisions of the Department of Environmental Protection's, Division of Air Quality Noise Regulations (310 CMR 7.10), unless the Department and the Special Permit Granting Authority agree that those provisions shall not be applicable. A source of sound will be considered to be violating these regulations 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 residence. 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 DEP. An analysis prepared by a qualified engineer shall be presented to demonstrate compliance with these noise standards.

The special permit granting authority, in consultation with the Department, shall determine whether such violations shall be measured at the property line or at the nearest inhabited residence.

6.4 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 facility and is otherwise prescribed by applicable laws, regulations, and ordinances.

7.0 Monitoring and Maintenance

7.1 Facility Conditions

The applicant shall maintain the wind facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, 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 facility and any access road, unless accepted as a public way, and the cost of repairing any damage occurring as a result of operation and construction.

7.2 Modifications

All material modifications to a wind facility made after issuance of the special permit shall require approval by the special permit granting authority as provided in this section.

8.0 Abandonment or Decommissioning

8.1 Removal Requirements

Any wind facility which has reached the end of its useful life or has been abandoned shall be removed. When the wind facility is scheduled to be decommissioned, the applicant shall notify the town by certified mail of the proposed date of discontinued operations and plans for removal. The owner/operator shall physically remove the wind facility no more than 150 days after the date of discontinued operations. At the time of removal, the wind facility site shall be restored to the state it was in before the facility was constructed or any other legally authorized use. More specifically, 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 and state waste disposal regulations.

(c) Stabilization or re-vegetation of the site as necessary to minimize erosion. The special permit granting authority may allow the owner to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.

8.2 Abandonment

Absent notice of a proposed date of decommissioning, the facility shall be considered abandoned when the facility fails to operate for more than one year without the written consent of the special permit granting authority. The special permit granting authority shall determine in its decision what proportion of the facility is inoperable for the facility to be considered abandoned. If the applicant fails to remove the wind facility in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the town shall have the authority to enter the property and physically remove the facility.

8.3 Financial Surety

The special permit granting authority may require the applicant for utility scale wind facilities to provide a form of surety, either through escrow account, bond or otherwise, to cover the cost of removal in the event the town must remove the facility, of an amount and form determined to be reasonable by the special permit granting 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 Cost of Living Adjustment.

9.0 Term of Special Permit

A special permit issued for a wind facility shall be valid for 25 years, unless extended or renewed. The time period may be extended or the permit renewed by the special permit granting authority upon satisfactory operation of the facility. Request for renewal must be submitted at least 180 days prior to expiration of the special permit. Submitting a renewal request shall allow for continued operation of the facility until the special permit granting authority acts. At the end of that period (including extensions and renewals), the wind facility shall be removed as required by this section.

The applicant or facility owner shall maintain a phone number and identify a responsible person for the public to contact with inquiries and complaints throughout the life of the project.

10.0 Application Process & Requirements

10.1 Application Procedures

10.1.1 General

The application for a wind facility shall be filed in accordance with the rules and regulations of the special permit granting authority concerning special permits.

10.1.2 Application

Each application for a special permit shall be filed by the applicant with the city or town clerk pursuant to section 9 of chapter 40A of the Massachusetts General Laws.

10.2 Required Documents

10.2.1 General

The applicant shall provide the special permit granting authority with ___ copies of the application. All plans and maps shall be prepared, stamped and signed by a professional engineer licensed to practice in Massachusetts. Included in the application shall be:

10.2.2 Name, address, phone number and signature of the applicant, as well as all co-applicants or property owners, if any.

10.2.3 The name, contact information and signature of any agents representing the applicant.

10.2.4 Documentation of the legal right to use the wind facility site, including the requirements set forth in 10.3.2(a) of this section

10.3 Siting and Design

The applicant shall provide the special permit granting authority with a description of the property which shall include:

10.3.1 Location Map ***(Modify for On-Site Wind Facilities)***

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; however a copy of a zoning map with the parcel identified is suitable.

10.3.2 Site Plan
A one inch equals 200 feet plan of the proposed wind facility site, with contour intervals of no more than 10 feet, showing the following:

(a) Property lines for the site parcel and adjacent parcels within 300 feet.
(b) Outline of all existing buildings, including purpose (e.g. residence, garage, etc.) on site parcel and all adjacent parcels within 500 feet. Include distances from the wind facility to each building shown.
(c) Location of all roads, public and private on the site parcel and adjacent parcels within 300 feet, and proposed roads or driveways, either temporary or permanent.
(d) Existing areas of tree cover, including average height of trees, on the site parcel and adjacent parcels within 300 feet.
(e) Proposed location and design of wind facility, including all turbines, ground equipment, appurtenant structures, transmission infrastructure, access, fencing, exterior lighting, etc.
(f) Location of viewpoints referenced below in 10.3.3 of this section.

10.3.3 Visualizations *(Modify for On-Site Wind Facilities)*
The special permit granting authority shall select between three and six sight lines, including from the nearest building with a view of the wind facility, for pre- and post-construction view representations. Sites for the view representations shall be selected from populated areas or public ways within a 2-mile radius of the wind facility. View representations shall have the following characteristics:

(a) View representations shall be in color and shall include actual pre-construction photographs and accurate post-construction simulations of the height and breadth of the wind facility (e.g. superimpositions of the wind facility onto photographs of existing views).
(b) All view representations will include existing, or proposed, buildings or tree coverage.
(c) Include description of the technical procedures followed in producing the visualization (distances, angles, lens, etc…).

10.4 Landscape Plan (*Utility-Scale Wind Facilities Only)*
A plan indicating all proposed changes to the landscape of the site, including temporary or permanent roads or driveways, grading, vegetation clearing and planting, exterior lighting, other than FAA lights, screening vegetation or structures. Lighting shall be designed to minimize glare on abutting properties and except as required by the FAA be directed downward with full cut-off fixtures to reduce light pollution.

10.5 Operation & Maintenance Plan
The applicant shall submit a plan for maintenance of access roads and storm water controls, as well as general procedures for operational maintenance of the wind facility.

10.6 Compliance Documents

If required under previous sections of this by-law, the applicant will provide with the application:

(a) a description of financial surety that satisfies 8.3 of this section,
(b) proof of liability insurance that satisfies Section 3.3 of this section,
(c) certification of height approval from the FAA,
(d) a statement that satisfies Section 6.3, listing existing and maximum projected noise levels from the wind facility.

10.7 Independent Consultants – (*Utility-Scale Wind Facilities Only)*

Upon submission of an application for a special permit, the special permit granting authority will be authorized to hire outside consultants, pursuant to section 53G of chapter 44 of the Massachusetts General Laws. As necessary, the applicant may be required to pay not more than 50% of the consultant's costs.

Companion Document to

Model Amendment to a Zoning Ordinance or By-law: Allowing Wind Facilities by Special Permit

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

Background on Model By-law Development: The Massachusetts Executive Office of Environmental Affairs [EOEA] and The Division of Energy Resources [DOER] determined that creating model by-laws for wind power development was an important step in advancing wind development across the Commonwealth. These agencies, acting on behalf of the Commonwealth were particularly motivated to create these by-laws for the following reasons:

- Massachusetts law and policies, such as the Renewable Portfolio Standards and the Climate Protection Plan establish the need for renewable energy, such as wind to ensure the long-term health, prosperity, and security of the people and environment of the Commonwealth.

- EOEA and DOER have repeatedly endorsed the importance of wind energy in helping to meet the Commonwealth's renewable energy goals and to improve the reliability of electricity supply in the region through diversification of generation resources. These endorsements have been made by the Secretary of EOEA and the Commissioner of DOER and have been reflected through the Massachusetts Environmental Policy Act [MEPA] process.

- DOER and EOEA want to ensure that wind power projects are sited in an environmentally sensitive manner, and believe that siting criteria can help achieve this objective.

- Numerous towns have contacted DOER and EOEA seeking information and guidance for amending their by-laws to allow for wind development.

- DOER and EOEA believe that comprehensive, proactive public involvement in the wind power development process will not only help ensure a democratic outcome, but will ultimately result in a more expeditious and environmentally sensitive outcome.

The experience of wind development in Massachusetts indicates that municipal by-laws are one of the most significant barriers to wind projects. This is due not so much to municipal governments being expressly opposed to wind facility development, but because wind power, as a newly-emergent land use, is not typically included in existing zoning by-laws. In turn, numerous towns are attempting to change their by-laws to allow for appropriate wind development. These model by-laws enable municipalities to evaluate and if appropriate allow for wind power projects on a case by case basis. Further, the specific requirements imposed by these by-laws on the project proponent should allow for responsible siting of wind power projects.

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.

Model Amendment to a Zoning Ordinance or By-law

1.0 Purpose

The purpose of this by-law is to provide by special permit for the construction and operation of wind facilities and to provide standards for the placement, design, construction, monitoring, modification and removal of wind facilities that address public safety, minimize impacts on scenic, natural and historic resources of the city or town and provide adequate financial assurance for decommissioning.

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. It does not apply to single stand-alone turbines under 60 kilowatts of rated nameplate capacity.

Any physical modifications to existing wind facilities that materially alters the type or increases the size of such facilities or other equipment shall require a special permit.

2.0 Definitions

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

On-Site Wind Facility: A wind project, which is located at a commercial, industrial, agricultural, institutional, or public facility that will consume more than 50% of the electricity generated by the project on-site.

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.

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.

Special Permit Granting Authority: The special permit granting authority shall be the board of selectmen, city council, board of appeals, planning board, or zoning administrator as designated by zoning ordinance or by-law for the issuance of special permits, or by this section for the issuance of special permits to construct and operate wind facilities.

Substantial Evidence: Such evidence as a reasonable mind might accept as adequate to support a conclusion.

Wind Facility: All equipment, machinery and structures utilized in connection with the conversion of wind to electricity. This includes, but is not limited to, transmission, storage, collection and supply equipment, substations, transformers, service and access roads, and one or more wind turbines.

Wind Monitoring or Meteorological Tower: A temporary tower equipped with devices to measure wind speeds and direction, used to determine how much wind power a site can be expected to generate.

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

3.0 General Requirements

3.1 Special Permit Granting Authority

No wind facility over 60 kilowatts of rated nameplate capacity shall be erected, constructed, installed or modified as provided in this section without first obtaining a permit from the special permit granting authority. The construction of a wind facility shall be permitted in any zoning district subject to the issuance of a Special Permit and provided that the use complies with all requirements set forth in sections 3, 4, 5 and 6. All such wind energy facilities shall be constructed and operated in a manner that minimizes any adverse visual, safety, and environmental impacts. No special permit shall be granted unless the special permit granting authority finds in writing that:

(a) the specific site is an appropriate location for such use;
(b) the use is not expected to adversely affect the neighborhood;
(c) there is not expected to be any serious hazard to pedestrians or vehicles from the use;
(d) no nuisance is expected to be created by the use; and
(e) adequate and appropriate facilities will be provided for the proper operation of the use.

This by-law recommends not limiting wind facilities to specific districts; instead it emphasizes performance standards that all proposals must meet. Some municipalities may choose to limit the zoning districts in which commercial wind facilities will be permitted. For example, residential or protected open space districts might be excluded. However upon careful consideration, wind facilities may be found to be compatible with many uses, including residential, recreational or open spaces. An alternative approach is to designate an overlay district that identifies those areas of the town potentially suitable for wind facilities.

Such permits may also impose reasonable conditions, safeguards and limitations on time and use and may require the applicant to implement all reasonable measures to mitigate unforeseen adverse impacts of the wind facility, should they occur.

Most zoning by-laws establish specific criteria for the granting of Special Permits, such as the proposed use is not detrimental to the neighborhood or derogate from the intent or purpose of the by-law, and may include other issues, such as traffic, noise, visual character. The special permit granting authority would have the authority to waive certain requirements where appropriate. Waiving certain requirements would not be considered a variance, but the special permit granting authority would have to make a finding that the waiver was appropriate and consistent with the Special Permit granting criteria.

Wind monitoring or meteorological towers shall be permitted in all zoning districts subject to issuance of a building permit for a temporary structure and subject to reasonable regulations concerning the bulk and height of structures and determining yard-size, lot area, setbacks, open space, parking, and building coverage requirements

Wind resources vary considerably from site to site, and according to the height above the ground. Wind speeds (and thus height above ground) can play a dramatic role in the economic viability of a wind facility or wind turbine. The most common and effective method for measuring wind resources is with a meteorological ("met") tower. Met towers are usually temporary structures, ranging from 130-200 feet, supported by guy wires. While met towers usually do not require any foundation, they sometimes require clearing to allow for erecting the tower and anchoring guy wires. For large towers, clearing of 0.5-1.5 acres might be required, which could be a concern in some sensitive areas. Requirements for restoring vegetation after the met tower is removed should only be established if they would likewise be required for other types of construction or clearing.

Proponents will typically require at least 12 months of wind data. If the town's regulations for temporary structures require removal after 12 months, it may be necessary to allow the special permit granting authority to grant permission for 18-36 months.

3.2 Compliance with Laws, Ordinances and Regulations

The construction and operation of all such proposed wind 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.

3.3 Proof of Liability Insurance

The applicant shall be required to provide evidence of liability insurance in an amount and for a duration sufficient to cover loss or damage to persons and structures occasioned by the failure of the facility.

3.4 Site Control

At the time of its application for a special permit, the applicant shall submit documentation of actual or prospective control of the project site sufficient to allow for installation and use of the proposed facility. Documentation shall also include proof of control over setback areas and access roads, if required. Control shall mean the legal

authority to prevent the use or construction of any structure for human habitation within the setback areas.

4.0 General Siting Standards

4.1 Height

Wind facilities shall be no higher than 400 feet above the current grade of the land, provided that wind facilities may exceed 400 feet if:

(a) the applicant demonstrates by substantial evidence that such height reflects industry standards for a similarly sited wind facility;
(b) such excess height is necessary to prevent financial hardship to the applicant, and
(c) the facility satisfies all other criteria for the granting of a special permit under the provisions of this section.

The height of wind turbines used for commercial generation is likely to vary considerably, making it difficult to develop a height requirement for this model by-law. Most turbines are likely to be greater than 200 feet, with many newer models reaching 400 feet. Because height of the turbine could significantly affect the economic viability of the project, proponents may be able to present a case for extensions. Allowance of heights in excess of the stated limit should not require a variance, but a finding by the special permit granting authority that benefits of the higher turbine outweigh any adverse effects.

4.2 Setbacks

Wind turbines shall be set back a distance equal to 1.5 times the overall blade tip height of the wind turbine from the nearest existing residential or commercial structure and 100 feet from the nearest property line and private or public way.

4.2.1 Setback Waiver

The special permit granting authority may reduce the minimum setback distance as appropriate based on site-specific considerations, if the project satisfies all other criteria for the granting of a special permit under the provisions of this section.

This model by-law recommends that minimum setbacks are established to protect public health and safety, and adjacent property interests in the unlikely event of turbine collapse, broken rotor blades, etc. However it should be emphasized that modern wind turbines are engineered so that risk of collapse is minimal. Telephone poles, silos and other tall structures are typically tolerated in proximity to homes and other uses because the risk of collapse is likewise small. Detailed engineering reports or product certification—in addition to the liability insurance required in Section 3.3—could be provided by the applicant to demonstrate limited risk of collapse in support of a reduction of this requirement. It may be appropriate to waive this requirement upon mutual agreement among property owners or if adjacent public recreation area or agricultural areas are deemed to be appropriate uses within the setback area.

In extreme weather conditions and usually at higher elevations, ice can accumulate on rotor blades. Because modern turbines are designed to detect imbalance and shut down, the risk of ice being thrown from blades is typically very minimal. Ice can fall from blades which have stopped spinning and care should be taken to warn of this danger or prevent unauthorized access to the area immediately below wind turbines. See Section 6.1.1.

5.0 Design Standards

5.1 Color and Finish

The special permit granting authority shall have discretion over the turbine color, although a neutral, non-reflective exterior color designed to blend with the surrounding environment is encouraged.

The special permit granting authority should determine whether the color selected is appropriate on a site-specific basis. The color of surrounding tall structures, such as water towers, might be considered in determining the most appropriate color to reduce adverse visual impacts.

Visual impacts are subjective. Viewers might consider the impact negative or positive, depending on their opinions of wind turbines. Generally when turbines are operating they are perceived as useful and therefore beneficial by some, while others consider them a blight on the natural landscape. As mentioned in Section 3.2, many towns' specific criteria for granting Special Permits include consideration of impact on visual character of the community.

Depending on the site, developers can consider a number of approaches to minimizing adverse visual impacts as plans are developed. In some circumstances, screening or buffering can be achieved, especially through the planting of vegetation close to viewers along key lines-of-sight. However the bottom of turbine rotors must generally be at least 10 feet above surrounding vegetation within 300 feet to avoid wind turbulence that would decrease the effectiveness of the wind facility. It is therefore unlikely that wind facilities can be completely screened from surrounding viewers. If the town has identified specific distinctive or important viewsheds, locating wind turbines at the periphery of these areas may reduce adverse impacts.

5.2 Lighting and Signage

5.2.1 Lighting

Wind turbines shall be lighted only if required by the Federal Aviation Administration. Lighting of other parts of the wind facility, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties.

In general, the FAA only requires lighting for structures above 200 feet, but this will depend on topography and relation to airfields or flight paths. Current research indicates that solid (non-blinking) red lights on turbines, as well as white flood lights, may attract

birds and bats, particularly in stormy conditions. In all cases, the FAA determinations will be made on a case-by-case basis and must be strictly adhered to by developers.

5.2.2 Signage
Signs on the wind facility shall comply with the requirements of the town's sign regulations, and shall be limited to:

(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.

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

5.2.4 Utility Connections
Reasonable efforts shall be made to locate utility connections from the wind facility underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

5.3 Appurtenant Structures
All appurtenant structures to such wind facilities shall be subject to reasonable regulations concerning the bulk and height of structures and determining yard sizes, 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 shall be contained within the turbine tower whenever technically and economically feasible. Structures shall only be used for housing of equipment for this particular site. 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.

5.4 Support Towers
Monopole towers are the preferred type of support for the Wind Facilities.

6.0 Safety, Aesthetic and Environmental Standards

6.1 Emergency Services
The applicant shall provide a copy of the project summary and site plan to the local emergency services entity, as designated by the special permit granting authority. Upon request the applicant shall cooperate with local emergency services in developing an emergency response plan.

6.1.1 Unauthorized Access

Wind turbines or other structures part of a wind facility shall be designed to prevent unauthorized access.

For purposes of limiting liability, proponents will likely seek to prevent unauthorized access. The danger of falling parts or ice is minimal on modern turbines (see section 4.2). In some cases, wind facilities may be deemed compatible with adjacent recreational usage and/or visits from the public.

6.2 Shadow/Flicker

Wind 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 through either siting or mitigation.

Wind turbines and their rotors cast shadows like any other tall structure, usually within close proximity of the turbine. Flicker can occur when the sun shines through moving rotor blades, typically when the sun is low in the sky at certain times of year, depending on latitude and topography. Concerns about temporary shadow flicker are usually perceived as a nuisance rather than a safety concern. With computer software, it is possible to accurately predict the times and maximum duration that flicker may impact neighboring homes or other uses (for example, 30 hours of annual exposure occurring between 7-8 am throughout January). When possible, turbines may be moved to reduce significant impacts on neighbors, or the effects may be mitigated with plantings.

6.3 Noise

The wind facility and associated equipment shall conform with the provisions of the Department of Environmental Protection's, Division of Air Quality Noise Regulations (310 CMR 7.10), unless the Department and the Special Permit Granting Authority agree that those provisions shall not be applicable. A source of sound will be considered to be violating these regulations 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 residence. 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 DEP. An analysis prepared by a qualified engineer shall be presented to demonstrate compliance with these noise standards.

The special permit granting authority, in consultation with the Department, shall determine whether such violations shall be measured at the property line or at the nearest inhabited residence.

The Department of Environmental Protection defines noise as "a type of air pollution that results from sounds that cause a nuisance, are or could injure public health, or unreasonably interfere with the comfortable enjoyment of life, property, or the conduct of

business. At higher wind speeds, the ambient noise level will likely mask the noise of wind facilities, but at lower wind speeds the noise may be detectable in proximity to the turbine. The turbine manufacturer typically has data regarding the noise levels associated with various turbine sizes and models. This data can be used to suggest appropriate buffer zones between the turbine and residences.

This regulation includes both the property line and the nearest inhabited residence in its language. Though in practice since 1990, the DEP regulations have been enforced from the nearest inhabited residence existing on the property. Property line noise levels have typically not created violations or conditions of air pollution under DEP regulations and have not been the deciding factor in all cases under DEP review. The goal of DEP and the end result has been a protection of the affected inhabitants of nearby residences, not the uninhabited property and its borders.

6.4 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 facility and is otherwise prescribed by applicable laws, regulations, and ordinances.

If there are specific natural resource areas within the town where wind facilities are not well suited those could be noted here. Land clearing associated with wind facilities can potentially impact open space or wildlife habitat. Land may need to be cleared for installation of towers or transmission lines, for construction access, or to minimize air turbulence immediately around each turbine. In some cases, clearing may be limited and temporary disturbance for installation may be the principle impact. In other cases, clearing for access roads and the area around the turbines may be permanent and may have adverse impacts to the natural resources.

7.0 Monitoring and Maintenance

7.1 Facility Conditions

The applicant shall maintain the wind facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, 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 facility and any access road, unless accepted as a public way, and the cost of repairing any damage occurring as a result of operation and construction.

7.2 Modifications

All material modifications to a wind facility made after issuance of the special permit shall require approval by the special permit granting authority as provided in this section.

8.0 Abandonment or Decommissioning

8.1 Removal Requirements

Any wind facility which has reached the end of its useful life or has been abandoned shall be removed. When the wind facility is scheduled to be decommissioned, the applicant shall notify the town by certified mail of the proposed date of discontinued operations and plans for removal. The owner/operator shall physically remove the wind facility no more than 150 days after the date of discontinued operations. At the time of removal, the wind facility site shall be restored to the state it was in before the facility was constructed or any other legally authorized use. More specifically, 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 and state waste disposal regulations.

(c) Stabilization or re-vegetation of the site as necessary to minimize erosion. The special permit granting authority may allow the owner to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.

8.2 Abandonment

Absent notice of a proposed date of decommissioning, the facility shall be considered abandoned when the facility fails to operate for more than one year without the written consent of the special permit granting authority. The special permit granting authority shall determine in its decision what proportion of the facility is inoperable for the facility to be considered abandoned. If the applicant fails to remove the wind facility in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the town shall have the authority to enter the property and physically remove the facility.

8.3 Financial Surety

The special permit granting authority may require the applicant for utility scale wind facilities to provide a form of surety, either through escrow account, bond or otherwise, to cover the cost of removal in the event the town must remove the facility, of an amount and form determined to be reasonable by the special permit granting 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 Cost of Living Adjustment.

It is conceivable that a wind facility could become abandoned if operated by an entity that is no longer solvent. However, given the value of wind turbines and associated infrastructure, it is likely they would be salvaged even in this case. Because it is impossible for wind facilities to be reused for other purposes (unlike buildings, for example), and because of their visual impact if unused, this model by-law recommends that they be removed when decommissioned or abandoned. Like any large power generation plant, the removal of a large wind facility is likely to be very expensive, thus some kind of financial surety is recommended. The cost of removing a residential-scale wind facility will be much smaller in proportion to the significant expense of bonding, etc. The financial surety obligation could effectively prevent the development of small-

scale wind facilities; therefore this by-law recommends that these facilities be exempt from this requirement.

9.0 Term of Special Permit

A special permit issued for a wind facility shall be valid for 25 years, unless extended or renewed. The time period may be extended or the permit renewed by the special permit granting authority upon satisfactory operation of the facility. Request for renewal must be submitted at least 180 days prior to expiration of the special permit. Submitting a renewal request shall allow for continued operation of the facility until the special permit granting authority acts. At the end of that period (including extensions and renewals), the wind facility shall be removed as required by this section.

The applicant or facility owner shall maintain a phone number and identify a responsible person for the public to contact with inquiries and complaints throughout the life of the project.

Modern turbines are designed to last at least 20 years, and wind turbine technology is changing rapidly. Newer turbines or parts may improve efficiency or other performance qualities. This by-law allows the review and extension of the permit after 25 years. Minor modifications or major upgrades, may extend the expected lifetime of the project significantly.

10.0 Application Process & Requirements

10.1 Application Procedures

10.1.1 General

The application for a wind facility shall be filed in accordance with the rules and regulations of the special permit granting authority concerning special permits.

10.1.2 Application

Each application for a special permit shall be filed by the applicant with the city or town clerk pursuant to section 9 of chapter 40A of the Massachusetts General Laws.

10.2 Required Documents

10.2.1 General

The applicant shall provide the special permit granting authority with ___ copies of the application. All plans and maps shall be prepared, stamped and signed by a professional engineer licensed to practice in Massachusetts. Included in the application shall be:

10.2.2 Name, address, phone number and signature of the applicant, as well as all co-applicants or property owners, if any.

10.2.3 The name, contact information and signature of any agents representing the applicant.

10.2.4 Documentation of the legal right to use the wind facility site, including the requirements set forth in 10.3.2(a) of this section

10.3 Siting and Design

The applicant shall provide the special permit granting authority with a description of the property which shall include:

10.3.1 Location Map ***(Modify for On-Site Wind Facilities)***

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; however a copy of a zoning map with the parcel identified is suitable.

10.3.2 Site Plan

A one inch equals 200 feet plan of the proposed wind facility site, with contour intervals of no more than 10 feet, showing the following:

(a) Property lines for the site parcel and adjacent parcels within 300 feet.

(b) Outline of all existing buildings, including purpose (e.g. residence, garage, etc.) on site parcel and all adjacent parcels within 500 feet. Include distances from the wind facility to each building shown.

(c) Location of all roads, public and private on the site parcel and adjacent parcels within 300 feet, and proposed roads or driveways, either temporary or permanent.

(d) Existing areas of tree cover, including average height of trees, on the site parcel and adjacent parcels within 300 feet.

(e) Proposed location and design of wind facility, including all turbines, ground equipment, appurtenant structures, transmission infrastructure, access, fencing, exterior lighting, etc.

(f) Location of viewpoints referenced below in 10.3.3 of this section.

10.3.3 Visualizations ***(Modify for On-Site Wind Facilities)***

The special permit granting authority shall select between three and six sight lines, including from the nearest building with a view of the wind facility, for pre- and post-construction view representations. Sites for the view representations shall be selected from populated areas or public ways within a 2-mile radius of the wind facility. View representations shall have the following characteristics:

(a) View representations shall be in color and shall include actual pre-construction photographs and accurate post-construction simulations of the height and breadth of the wind facility (e.g. superimpositions of the wind facility onto photographs of existing views).

(b) All view representations will include existing, or proposed, buildings or tree coverage.

(c) Include description of the technical procedures followed in producing the visualization (distances, angles, lens, etc…).

Simulations that provide the special permit granting authority and the public with a good understanding of the visual impact of the wind facility are important for a successful

permitting process. Wind developers should strive for view representations that simulate actual views simply and accurately. This model by-law recommends that the special permit granting authority select limited sites for view representations on a case-by-case basis, rather than requiring a pre-determined distance or direction.

10.4 Landscape Plan (*Utility-Scale Wind Facilities Only)*

A plan indicating all proposed changes to the landscape of the site, including temporary or permanent roads or driveways, grading, vegetation clearing and planting, exterior lighting, other than FAA lights, screening vegetation or structures. Lighting shall be designed to minimize glare on abutting properties and except as required by the FAA be directed downward with full cut-off fixtures to reduce light pollution.

10.5 Operation & Maintenance Plan

The applicant shall submit a plan for maintenance of access roads and storm water controls, as well as general procedures for operational maintenance of the wind facility.

10.6 Compliance Documents

If required under previous sections of this by-law, the applicant will provide with the application:

(a) a description of financial surety that satisfies 8.3 of this section,
(b) proof of liability insurance that satisfies Section 3.3 of this section,
(c) certification of height approval from the FAA,
(d) a statement that satisfies Section 6.3, listing existing and maximum projected noise levels from the wind facility.

10.7 Independent Consultants – (*Utility-Scale Wind Facilities Only)*

Upon submission of an application for a special permit, the special permit granting authority will be authorized to hire outside consultants, pursuant to section 53G of chapter 44 of the Massachusetts General Laws. As necessary, the applicant may be required to pay not more than 50% of the consultant's costs.