

For April 25, 2011 meeting-DRAFT- KEEP WORKING ON

To: Planning Board
Mark Boyer, Chair

From: Jennifer Paquet
Town Planner

Re: Policy Questions for Wind Power Turbines
Memo 1.

Since the method we used of deciding on policy questions worked so well in designing the Conservation Design Development, I thought the same process would work for you for the turbines. From my previous memos to you on this topic, you know that I have researched several sources, and we should all have a good understanding of the issues. We should be able to use the framework from the previously proposed wind ordinance to insert the criteria you develop through this process. I expect exploring all the options and questions will take no more than a few Planning Board meetings, for a recommendation to the Town Council within the near future.

The Board should also think about wind energy in the big-picture. We know that it would provide electricity. Currently, the major fuels for electricity are coal, nuclear, and natural gas—relatively domestic (or friendly foreign neighbors) resources. This is important to note when we are factoring in the big picture, because wind power does not supplant foreign oil since oil is barely used for our electricity, however wind power can help with reducing emissions by reducing the need for coal burning. There are also other forms of renewable energy available (solar, wood, biomass, etc.). We need to consider the availability of and need for wind energy in West Greenwich, particularly for the three levels of wind energy production: on-site supplemental power to residential, on-site supplemental power to commercial, and utility-scale industrial production to the market.

But first, before we get into the policy questions, I want to hear from each of you about what your assumptions and expectations are about wind turbines. What do you envision when you think of wind turbines in West Greenwich?

I have also created another chart comparing the parameters of ordinances from different states, and I also found another chart that is similar that was put together by the Appalachian State University.

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Here is an idea of sizes and power (power depends on wind speeds which are faster higher up):
(Pay attention to the “M’s” and “k’s”—a Megawatt is 1,000 times greater than a kilowatt)
(source for the below capacities: www.house-energy.com)

Single Family Home (uses between 4,500 kWh and 11,000 kWh per year): needs 1 kW to 6 kW capacity turbines which would be around 80 to 120 feet tall. Available turbines for homes are around 1 to 50 kW capacity.

A 1.5 kW capacity turbine produces around 3,950 kWh per year.

A 5 kW capacity turbine produces around 13,000 kWh per year.

A 15 kW capacity turbine produces around 39,500 kWh per year.

Farm and small community: would need around 10 kW to 50 kW capacity

Small Commercial and Industrial uses: would need around 20 kW or larger

Utility: 1.5 MW and larger (total heights around ***

Example, the 2.5 MW turbines being proposed in Johnston were 496 feet tall.

A 1.5 MW capacity turbine may produce around 3,900,000 kWh per year.

A 2 MW capacity turbine can produce enough power for 1,000 homes.

A 5 MW turbine may produce around 13,000,000 kWh per year.

Regarding turbines sized 1.5 MW and larger (if we consider allowing them in Town), we can use the document entitled, “Final Report RIWINDS Phase I: Wind Energy Siting Study,” prepared for the RIEDC, as a starting point for determining suitable locations in Town. This report has prescreened initial suitable areas based on certain criteria. The Town can further refine and add criteria and standards that we determine at the local level. I’ve enclosed a copy of this report for you.

I have summarized my literature review for you in a separate memo. However, before we get started on the policy questions, please read the following enclosed reports/documents:

Small Wind:

1. In the Public Interest: How and Why to Permit for Small Wind Systems, A Guide for State and Local Governments, by the American Wind Energy Association, 2008

Large and Medium Wind:

2. Final Report RIWINDS Phase I: Wind Energy Siting Study, prepared by Applied Technology & Management, prepared for the Rhode Island Economic Development Corporation, 2007
3. ***Fish and Wildlife?
4. Commercial Wind Energy Facility & Wind Access Model Ordinance Town of Barton by Catharine Lawton, 2002 (already copied)
5. New York State Toolbox** the long one (did not copy- get off the internet at <http://www.powernaturally.org/programs/wind/toolkit.asp>

Other Info:

6. Rhode Island 2010 State Profile- ISO New England fact sheet
7. etc.. need to screen what would be best for the Board to read—what is the most informative?

Please also read, if you have not already, the RIDEM Terrestrial Wind Siting Report, 2009, which I had previously provided to you.

Please keep in mind who authored/commissioned each report to put any potential bias into perspective.

Zoning Policy questions


1. What zoning districts will turbines be allowed in/ or prohibited from? We need to differentiate between ‘residential on-site accessory power,’ ‘commercial on-site accessory power,’ and ‘utility-scale power’ (50% or more generation intended for sale to grid*) for each district.
 - a. Should turbines for residential supplemental power be allowed in Town? In what zoning districts? (Differentiate roof mounted and free standing)
 - b. Should turbines for commercial supplemental power be allowed in Town? In what zoning districts?
 - c. Should utility scale turbines be allowed in Town? In what zoning districts?

*The Town can define ‘utility-scale power,’ which can be a certain percentage of any excess power generated beyond the actual need of the site. The turbine may be operating at times when the site is using low power, or the site may need power at times when the turbine is not producing. This is why the site stays connected to the grid—to average out this mismatched use/generation to provide a steady flow of as-needed power to the site, and net-metering is supposed to help average the costs to the site. An alternative to this mis-match and need to feed or draw from the grid would be the use of battery storage.

2. Turbines, if allowed in Town, should be allowed only by Special Use Permit in order to ensure that the special criteria, unique to the special use, are met. Do you see any reason why a turbine should be allowed by right (ie, as a Permitted Use)?
3. Currently, the required notification radius for Zoning Board applications is 200 feet from the property. Is this an appropriate radius for a turbine SUP application, considering the turbine may be larger than this? How should the radius for the required notification area for an SUP for a turbine be determined?
4. Does the Town want to designate certain areas of Town where this is / is not allowed? (for instance, in areas where we know have rare, threatened, or endangered birds and/or bat habitat and locations of migration patterns, etc.) See attached NJ report recommending a 1 kilometer buffer for Bald Eagles. Ground nesting birds are known to avoid areas within 600 feet from turbines for nesting and feeding (Minnesota Model Ord. Companion). This means that this habitat is lost to those birds. I’ve attached a map of the Natural Heritage Areas for the Town. Again, consider differentiating between the different scale turbines. Visual impact has been a reason to prohibit turbines within, and within certain distances from, historic districts/ structures.
5. What are the maximum heights the Town will consider for the three types of turbines? This is especially important if you designate certain turbines to certain zoning districts. The height that will trigger FAA review (and lighting) is 199/200 feet. For comparison of heights, see below table:

Structure	Height	Notes
Wind Turbine- Portsmouth Abbey Rated Nameplate Capacity 660 kW	240 feet total (164 feet to rotor hub, 77 foot long blades (154 diameter))	750 feet away from nearest neighbor; supplies 39.35% of school's electricity;
Wind Turbine- Portsmouth Town Rated Nameplate Capacity 1.5 MW	336 feet total (213 feet to rotor hub, 123 foot blades (246 foot diameter blades))	(set up for revenue; does not provide power directly to the Town, it all goes to the grid) estimated to produce 3 million kWh/year, Town uses 4 million kWh/year total, including schools, town buildings, and street lights
Wind Turbine- New England Tech Automotive Rated Nameplate Capacity 100 kW	156 feet total (121 feet to rotor hub, 69 foot diameter blades)	Blades are black to help with melting ice; supplies 30% of building's electricity;
Water Tower- Exit 6A	165 feet	(amgen plan says +160)
Pylon Sign- Center of New England	**	The Home Depot/ WalMart sign
Cell Tower- (which one?)		
Oak Tree (red or white)	80-100 feet	Typical height

6. What is an appropriate setback from property lines? Consider noise, 'fall zone,' ice throw, environmentally sensitive areas.

7. Should there be a separate setback from nearest occupied buildings on abutting properties? (some ordinances, PA, have a distance of 5 times the hub height) (We can assume that on-site structures are covered by their own property insurance, though some ordinances even regulate setbacks from other structures on the same property.)
8. What zoning dimensions would the Town consider a variance for? Currently, uses allowed by Special Use Permit are not eligible to apply for a variance, unless the Town specifically allows such, and specifies for what. Once you set any height limits or setbacks, would you provide for these to be increased by Variance in certain situations, or should the dimensions be firm?
9. Should there be a requirement for a bond or escrow for removal of these structures should they cease to operate for any reason? (We currently have such a requirement for cell towers.) To go along with this would be a decommissioning plan submitted as part of the application.
10. Considering turbines operate at all times (for the most part, as compared to a 40 hour work week), is a typical noise limit at the property line sufficient, or should the noise limit be lower? There is a difference between OSHA standards for hearing impairment, and annoyance. This is a significant quality of life issue. We can describe the sound from a turbine as rhythmic, not random—think about this. How can we ensure that there won't be a negative affect on abutters or anyone within the vicinity? Should we ensure that there won't be a constant sound annoyance affect to anyone within the vicinity? How is this different than say, a shooting range (hours of operation, duration of sound events, etc.)? Also, how is this different than more random white noise, such as car flow from the highway in the distance?
11. The Zoning Board has the power to restrict hours of operation and impose other conditions on a project. Should the zoning board require that a turbine be turned off during projected flicker impact to an abutting property (as opposed to other forms of mitigation)? Should the Zoning Board *** (find that one ordinance where the town had the power to make it stop for other things????)
12. Should there be a requirement that the facility owner must have a point of contact responsible for taking public inquiries and complaints and must make reasonable efforts to respond and address such?
13. Should we require that any establishment proposing a wind turbine first conduct an energy efficiency audit of the buildings in order to maximize efficient use of all forms of energy at the site? (this would also help determine the size of the turbine actually needed- may need smaller turbine if less energy needed. This is a logical first step that anyone interested in renewable energy would consider—conservation of energy first.)
14. Should we ask, in the application, whether solar energy (heat, hot water, and/or electricity) has been considered and why or why not pursuing.
15. Should we require lightning  protection?

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Land Development and Subdivision Regulation Policy Questions

1. ?????I don't think there are any- this would need to follow Development Plan Review by PB, and SUP for ZB, and meet all the SUP criteria and DPR plan requirements. However, the notification area for abutters should be increased larger than 200 feet.

Town/ State Model	Definitions	Height limit and Ground Clearance	Minimum setback from property line or structure	Public Inquiries and Complaints	Noise limit	Special Considerations	Zoning Districts Permitted	Demolition/ Bond
Iowa (2009)	Small Wind Energy Systems, incidental and subordinate to a principal use on same parcel: up to 15kW residential; up to 100kW commercial	65 feet for 1 to 3 acre lots; 80 feet for 3 to 7 acres; 100 feet for lots over 7 acres; Ground clearance: 30 feet	Property line: 150% of total height; Shall be located entirely within rear yard; no blades over parking lots, sidewalks, driveways, or easements for drainage or other utilities. Not blade closer than 20 feet to a tree		Per local code	Monopoles towers only (lattice, guyed, or other towers not allowed); the SWECS shall not result in net loss of required parking spaces; Restricted electricity generation to on-site consumption; shadow flicker allowed on or in any residential structure; required automatic and manual breaking; requires an accessible shut-off for Fire Marshall;		Removal required within 6 months, if cease for 6 months.
Michigan (2009)	Large: 250 kW and over Medium: not over 250 kW, total height not over 150 feet; Small: not over 30 kW, total height not over 120 feet	Small and medium: clearance 15 ft; Large: clearance 50 feet	Small: must be located in rear yard, setback equal to height Medium and Large: setback equal to height Large: 1.5 x height to property line, 1,000 feet to any occupied structure Large: 2 x height to edge of Overlay	Small- Noise Complaint process; Medium / Large-Noise complaint and Shadow Flicker complaint processes	All: shall not exceed, at any time, the lowest ambient sound level present between 9 p.m. and 9 a.m. at any residential use property line; Shall not exceed ambient noise	Upwind turbines required (wind hits blades before tower to avoid thumping noise); Vibrations shall not be produced which are humanly perceptible beyond the turbine property; Guy wires shall not be permitted; Automatic breaking required on small; Large- emergency access required	Small- all; Medium-SUP in agricultural, commercial, industrial; Large-SUP in Wind Overlay	All: required removal by 12 months after 12 months of cease (bond);

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			1.5 x height or 400 ft, which ever greater to public road		level plus 5 dBA present between 9a.m. and 9p.m at property line. (Vibration- see next column) Required for Large: Sound Pressure Level Analysis by 3 rd party within 90 days of operation	Bond required for damage to public roads used for construction and delivery; Impact to Natural Environment Study required- conform to state and federal wildlife agency recommendations		
Minnesota (2005)	Commercial: choice > = 40 kW (or 100 kW) Non- Commercial: Choice: < 40 kW (or 100kW) Micro: <= 1 kW and short tower (<40 feet)	>40 kW: No height limit given; Ground clearance min. 12 feet <40 kW	Commercial: 750 feet from house, 1.1 to 1.25 times height to property line, 1x height to ROW, 600 feet from conservation land and wetlands, 500 to 1,340 feet away from scenic bluffs Non-commercial:		Assumed with required setbacks, but also, at a minimum, must Comply with State noise rule (50 decibels at nearest farm house)	Requires: <ul style="list-style-type: none"> • tubular (monopole) towers • power lines buried • Road damage and drainage damage mitigation- preconstruction study of existing conditions on all roads used to transport materials and parts • Minimize or mitigate interference with 	Commercial size turbines not allowed in Residential, Commercial, or protected land zones; allowed by SUP in Industrial and agricultural zones;	Decommissioning plan including cost estimate and financial resources required w/ application. Considered a discontinued use after 1 year, given 90 days to remove to ground level or 4 feet below ground.

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		(or 100kW): max 200 ft	1.1 x ht, ROW's, 1 x ht (or fall zone- plus 10 ft)			electromagnetic telecommunications (must notify all tower operators within (2 or 5) miles • Solid and Hazardous wastes shall be removed from site and properly disposed • Engineer certifications	Non-commercial turbines allowed by SUP in Residential and Highway Commercial; Not allowed in General Business or Rural Town site districts.	
New York (2005)	Note: the NY model ordinance provides many choices to pick and choose from based on various ordinances in use in the State of NY. More useful would be the discussion points raised in their companion documents, "Wind Turbine Technology Overview"(Oct. 2005), and "Wind Energy Toolkit" (May 2009). Highlights from the NY Model Ordinance include requirements for: landscaping and screening on accessory structures for roads and adjacent residences; a completed Environmental Assessment Form; a project Visibility Map based on digital elevation model showing impact for three-mile radius, and minimum of 7 computer-enhanced as-built simulations showing views from within the 3-mile radius; automatic braking; insurance; underground wires; all choices for setbacks are greater than the height of the tower, ex: 1,500 feet from a residence, other ratios vary from 1.1 to 1.5 to 2 times the height, or no less than 1000 feet, which ever is greater); Noise not to exceed 55 dBA at property line, or not to exceed 50 dBA at residence; minimize or mitigate interference with electromagnetic communications, or no tower installed along axis of microwave communications, and no tower allowed in location where it would interfere with radio, television, or wireless phone; towers shall not be located in areas where they will substantially detract from scenic vistas; avoid creating artificial habitat for raptors or raptor prey; turbines shall be set back at least 2,500 feet from important bird areas identified by Audubon, and at least 1,500 feet from wetlands							
North Carolina (2008)	Small: rated capacity of 20 kW or less, and used primarily for on-site consumption as supplemental electricity as accessory to existing	(none given, assumes setbacks govern); Measured tip of blade	(Model Ord. stresses these are MINIMUM requirements) Small: 1.5 x height to occupied buildings and public roads, 1.1 x height to property line Medium: 1.5 x height to property line and		Small and Med: addressed by setback or existing noise ordinance; Large: shall not exceed 55 dBA	Environmental Assessment required on Large. Large: Shadow/flicker shall not exceed 30 hours per year on any occupied building within 2,500 feet. Collector system shall be underground to maximum extent possible	Small: Permitted in Ag, Res, Comm, and Industrial Medium: Permitted in Ag and Industrial, SUP in Res and Comm. Large: SUP in Ag,	Decommissioning Plan required, including costs and guarantee. Owner given 6 months to complete decommissioning if no electricity is generated for period

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	<p>buildings</p> <p>Medium: rated capacity over 20 kW but not greater than 100 kW</p> <p>Large: one or more turbines with total rated capacity of more than 100 kW</p>		<p>public roads, 2 x height to occupied building;</p> <p>Large: 1.5 x height to property line and public road, 2.5 x height to occupied building;</p> <p>Med and Large: 1.1 x height to occupied buildings on participating landowner property.</p>		measured at occupied building		Res, Comm, and Indus.	of 12 months.
Pennsylvania (2006)	Ordinance applies to Wind Energy Facilities (not for residential or farm use)		From nearest occupied building on a Non-participating property: 5 times the hub height; Nearest occupied building: 1.1 x total height, or zoning setback, which ever is greater; Property lines: 1.1 x total height or zoning setback, which ever is greater. Public road: 1.1	The facility owner shall maintain a phone number and responsible person for the public to contact with inquiries and complaints throughout the life of the project, and shall make reasonable	55 dBA at exterior of any non-participating landowner's occupied building*;	Requires applicant to pay for engineer evaluation to document conditions of public roads prior to and 30 days after construction, and may bond the road. Applicant needs to repair any damage to town roads ; Requires automatic and manual breaking	Up to locality	Decommissioning required within 12 months (after 12 months of cease use); Bond required

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				efforts to respond to such				
Utah (2010)	Large: rated capacity greater than 100 kW Small: rated capacity of 100 kW or less	Measured from natural grade to tip of blade at highest point; Clearance: small- 15 feet Large-30 feet Small: shall not exceed 200 feet Large: shall not exceed 600 feet	Small: 110% of the height from all inhabited structures, utility lines, and public roads; Large: 110% of the height from all inhabited structures, overhead utility lines, and public roads;	(no process given)	Small: existing ordinance or 60 dBA from inhabited structure Large: existing noise ordinance	Projects recommended to be reviewed by Utah Division of Wildlife prior to groundbreaking. Small system allowed on one acre or smaller if less than 80 feet tall; if over 80 feet tall, must be on lot greater than one acre; Met towers require site plan, limit of 3 years.	(locality to decide)	Considered abandoned if does not operate for 24 consecutive months; Decommissioning required, 60 days to act; after removal, owner responsible to fully reclaim the land

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<p>Wisconsin (Town of Barton, Washington County) (2002)</p>	<p>(Ordinance designed for commercial wind)</p>		<p>Gives various examples of typical setbacks: <i>From Zoning Districts and Structures:</i> 20 rotor diameters or 1,320 feet (1/4 mile); 3 times the total height but in no case less than 500 feet; Minimum of 4 times the total height or 1,000 feet, whichever is greater; <i>From Property Lines:</i> 3 times height or 500 feet, whichever greater; 4 times height or 500 feet, whichever greater if site is adjacent to parcels less than 40 acres, and 1.5 times height if adjacent parcels are 40 acres or greater; 1.25 to 3 times total height, and 3 times total height from property line if abutting lot contains a dwelling. <i>From Public Roads:</i> (running out of room, see attached document.)</p>	<p>Proposed Noise Complaint Resolution required of the Project Developer</p>	<p>Extensive description of what shall be included in a required Noise Report (including report on consideration for individuals that use hearing aids); Extensive section on Noise Performance Standards (see attached document)</p>	<p>“It is highly recommended that any community that adopts commercial wind energy regulations also develop a plan for siting commercial wind energy facilities”- such as in Comprehensive Plan, or a Wind Energy Facilities Plan. (this is proactive rather than reactive)</p> <p>Sensitive Environmental Resources Map required</p> <p>Geotechnical report for soils required</p> <p>Reports on ice throw, blade throw and catastrophic failure required</p> <p>Microwave communications-written notification required to all operators within 2 miles</p> <p>For turbines in 100-year floodzone, a flood mitigation plan required</p> <p>Fire Control and Prevention Program required</p>		<p>Removal and Site Restoration Plan required</p>

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Wyoming (2008) (Natrona County)	Ordinance applies to projects with greater than 10 kW (yes, 10 kW)	Height- to tip of blade	<p>¼ mile from any primary structure (on the owners property- and in no case closer than 1.1 x height);</p> <p>1.1 x height from third party transmission lines and communication towers</p> <p>1.1 x height from property lines</p> <p>½ mile from any primary structure in ag district (abutting properties?)</p> <p>1 mile from any incorporated municipality</p> <p>¼ mile from Interstate and State Highways; 1.1 x height from other public roads</p>	<p>If complaint after construction on interference with communications or broadcast, shall be resolved in timely manner.</p> <p>Developer must mitigate light impact on existing residences while still meeting FAA requirements.</p>	(none stated- conservative setbacks must be assumed to cover this)	<p>Met towers require site plan, limit of 3 years; requires cattle fencing around base and guy wires to prevent cattle entanglement;</p> <p>Environmental Analysis and Visual Resource Analysis required: assess impact of project on wildlife, natural resources, water, habitat, topography and viewshed;</p> <p>Use of Public Roads- need to identify all roads and obtain weight permits and may need mitigation plan or long term road maintenance agreement, conduct pre-construction baseline of existing road conditions for assessing potential future damage, and secure bonding, etc.</p> <p>Facility owner required to submit yearly statement of maintenance with manufacturer's instructions; requires weed control; required maintenance;</p> <p>Required to submit plans to all microwave transmission providers</p>	SUP in Ag (ranching, mining, urban ag) (ie, remote areas)	Decommissioning Plan required (18 months of non- operation) removal and restoration of site, estimation of costs, financial assurance updated every 5 years. Also, financial assurance to start in year 15 to adequately perform decommissioning

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			¼ mile from state and county parks; 1 mile from Federal or State facilities;			<p>and local emergency service providers- any likely interference applicant shall take measures to mitigate;</p> <p>Need to submit plan to Fire Department and coordinate for an Emergency Response Plan;</p> <p>Application can get routed for review to numerous County and State agencies;</p> <p>Stringent evidence required during duration of the permit, requiring reports and demonstrated compliance with all Federal, State, and Local requirements that site is being maintained in accordance with such.</p>		

* uses AWEA Standard 2.1 (1989) *Procedures for the Measurement and Reporting of Acoustic Emissions from Wind Turbine Generation Systems Volume I: First Tier.*

Notes: Liability Insurance required on all towers,

In general, all of the ordinances require industry standards on structural, electrical, and mechanical (and other ANSI), with certificates to demonstrate so. Also, all require standard visual appearance: non-reflective, non-obtrusive color, no lighting except as required by FAA, and no advertising.

Decommissioning plans require cost estimates, financial guarantee of some sort, and restoration of the site including how it will be done.

Some setbacks are to prevent interference from one turbine for the potential development of another turbine on an abutting site. These setbacks would not apply to us unless we want to encourage windfarm development and prevent a project on one property from ruining the opportunity for wind development on an abutting property. I did not include these setbacks in the above table.

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NOTES :

Get copy of RI Energy Coordinating Council's Policy Statement, "Rhode Island's Options for Electric Generation," dated August 1989 (RIPUC's Energy Facility Siting Board)

How to design a local environmental review- scope and need professional to review. (we already have authority in the LDSR's under Development Impact Statement

Any disaster or other public safety situation, the turbines should be shut down to ensure that they will not interfere with any radio transmissions (particularly ham radio- not microwave band). (or TV, and microwave)

Comment: turbine height is often given in meters. For reference, 1 Meter = 3.28 feet. (So a 60 meter turbine is 197 feet.)