

# Jean E. Vissering Landscape Architecture

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## SITING WIND TURBINES

### Introduction

First, I want to discuss utility scale wind farms and then smaller scale wind turbines designed for individual properties which present a quite different set of issues.

I am working on siting guidelines for wind turbines which were out by the registration table. I would very much appreciate any feedback you can give me on these.

### Visual Characteristics of Wind Turbines

Let me briefly explain some of the visual characteristics of wind turbines which make them challenging to integrate into many landscapes.

All vertical elements tend to draw your eye, and to become strong focal points in the landscape. They also produce a high degree of contrast in a landscape, especially when they are taller than the surrounding trees.

The traditional patterns in the NE landscape are for human development to occur in the valleys. Ridgelines generally form the backdrop but they become most noticeable when something on them begins to alter the uniform pattern of vegetation. Then our eyes tend to be drawn to them.

Wind farms not only result in a large number of vertical elements, often on ridgelines or at least high points of land, but we add something that makes them even more noticeable: movement, the turning blades. I should note here that the turning blades also tend to make them more visually appealing.

However, the point I am trying to make is that **THEY WILL BE VERY NOTICABLE, AND THEY WILL DRAW THE EYE.** What does this mean for finding a suitable site for a wind farm, clearly the most difficult and important decision; then for the design of the site, and of the turbine itself.

### Finding a Suitable Site for a Wind Farm

We need to know

- How much will the facility be visible
- To Whom
- From What Areas

A computer viewshed analysis can determine how visible any particular ridgeline or site will be. But it won't answer the question of how sensitive the viewers will be to seeing turbines in the landscape. Sensitive sites will include, natural areas, historic sites, some recreation areas, and scenic areas.

Lets look at designated scenic areas. They are sensitive partly due to viewer expectations, but also to some inherent characteristics of those landscapes: they are often characterized by distinct natural or cultural focal points, such as distinctly shaped mountain peaks, water bodies, or certain historic or cultural features. Wind turbines, especially on ridge tops will become competing focal points which detract from the scenic and natural attributes. It doesn't mean that a wind farm must necessarily be invisible, but it certainly can't be a dominant element in these landscapes.

How do you know what areas are considered scenic? There are a number of well established methodologies for inventorying scenic resources and for evaluating visual impacts. One of the first was developed by the US Forest Service, The Visual Management System (Big Eye Book). All Forest Service holdings are classified according to scenic or variety classes and viewer sensitivity levels.

Both Massachusetts and Rhode Island have completed statewide scenic inventories. Most states now identify scenic roads. And at the local level, some towns have identified parts of towns that are considered scenic. These are extremely useful guidelines for developers when they exist.

Its important to note that there are plenty of ordinary or common landscapes with undistinguished ridges. The Rhode Island inventory for example lists 8% of the land area in the state as Distinctive, 7% as Noteworthy, and the remaining 85% is Common and they could include developed as well as undeveloped landscapes.

### **Scale**

An important siting question is that of scale: is better to look at numerous smaller scaled projects of say around 20 turbines located around New England closer to population centers, or should we be looking at very large scale wind farms of 700 turbines in remote areas like the one proposed in northern Maine?

### **Research**

I don't have an answer for that yet, but I want to mention another valuable tool: research. Jim Palmer at the University of Syracuse has been studying public reactions to the Searsburg site in Vermont, both before and after the construction. He's found that public approval actually went up after the project was completed. This kind of research is essential for determining appropriate sites, and for questions of actual site and turbine design which I'd like to turn to.

### **Site Design**

Searsburg offers good example of a site design that minimized the visibility of the turbines and the associated development, but which also makes what is visible as visually appealing as possible. It is by no means the only right answer, but here are a few considerations for site design.

- **Organization of Turbines on the Site:** groupings rather than rigid rows.
- **Unity of Turbine Design especially within groupings:** avoid visual clutter; simplicity of array of turbines
- **Screening and Design of Associated Facilities:** substation, roads, transmission line corridors

### **Turbine Design**

The turbines are and should be the most visible part of the project. We need to make them as visually appealing as possible. Give us a Miata instead of a Ford Escort. I think these work very well. They are simple and elegant functional expressions (and look even better when you see the blades moving). We can probably do even better, and probably need to design turbine sites as if we are creating temples to the winds.

### **Small Scale Individual Wind Turbines**

Now a quick look at small scale wind turbines. These have the advantage of being located in landscapes which are already developed, and generally below ridgelines.

Even so, turbines range from about 80 to 120 feet, and are very different from traditional development forms. However, if we accept the presence of wind turbines in certain landscapes, we need to be less afraid of their height and focus on other more important ways to mitigate their impacts. These include:

- Position in the view: avoid placing turbines in the center of important public or private views. The degree of prominence: is it seen above below the horizon line
- Proximity to the viewer: small scale wind turbines diminish very quickly in prominence with distance, but close proximity exacerbates impacts, especially closer than 500 feet.
- Degree of existing or potential screening. Do existing trees screen the view or could plantings screen the view without interfering with a neighbors existing views.
- Prominence: seen against a backdrop of hills, the impacts are substantially less.

There can be issues of cumulative impacts however, and I think as turbines become more common in the landscape, we need to question whether a few larger scaled turbines or wind farms would be a better solution.

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## **DRAFT**

### **Siting Criteria for Wind Turbines**

#### **Utility Scale (over 500kw)**

##### **Site Selection**

###### **Ideal**

- Common and indistinct landscapes: lack of variety in topography and vegetative cover
- Sparsely settled area; but not unsettled or wild
- Working landscape characterized by logging practices, or earth resources extraction
- Out of viewshed of scenic corridors, and natural areas
- In or adjacent to a major industrial area.

###### **Possible**

- Lower ridgelines in moderately settled area
- In or adjacent to an area characterized by strip development
- Housing subdivision on lot designated for wind turbine use

###### **Difficult**

- Ridgelines near distinct or very high peaks
- Ridgelines visible to areas heavily dependent on tourism
- Ridgelines in the middleground (3-5 miles) of a scenic road corridor, heavily used recreation areas, natural areas, historic districts, or hiking trails of national or statewide significance.

##### **Site Design**

- Minimize site disturbance, clearing, and cut and fill
- Design access roads to be unseen off site
- Screen substations with existing vegetation or with planted native vegetation, avoid straight rows unless appropriate to the context
- Minimize overhead power lines especially on steep hillsides; use buried cable to substation, avoid straight swathes of cut vegetation especially on hillsides.
- Set new power lines back from forested public roads to retain existing roadside vegetation.
- Group turbines in uneven numbers
- Use a uniform turbine design throughout the site
- Use dark colors for anything seen against vegetation such as concrete footings, transformer boxes, or storage sheds.

## **Turbine Design**

- Keep the design as simple and functional as possible.
- Avoid distracting or bright colors or graphics.

## **Small Scale Turbines (50kv and less)**

### **Site Selection**

Note: the following should be used as guidelines only. It does not mean that significant visual problems could not occur on an ideal site; or that difficult sites could be very suitable.

#### **Ideal**

- Rural Landscape, especially a working landscape where farming, logging, or earth resources extraction are integral to the landscape
- Industrial or Commercial landscape, especially large scale buildings, automobile oriented development.
- Area that is characterized by woodlands rather than open fields.
- Sparsely settled areas.
- Areas where the location of the turbine will not occur directly in a neighbor's primary view at close range (see below).

#### **Possible**

- Housing Subdivision on a lot designated for wind turbine use
- Rural areas primarily residential in use where turbine will not occur directly in a neighbors view at close range.
- Park land associated with rangers quarters or other developed uses.
- Highway rest areas
- Periphery of towns and villages

#### **Difficult**

- In or visible from designated scenic areas
- Along or visible from designated scenic roads
- In or visible from designated Natural Areas
- Visible to designated hiking trails (unless over 3 miles away)
- Historic villages or sites
- Residential neighborhoods on lots smaller than 10 acres.
- Visible from or across water bodies primarily used by non-motorized craft, or along pristine shoreline.

## **Mitigation**

In selecting a site, it is necessary to demonstrate that the site itself and the design of the turbine have been selected to mitigate the impacts of the turbine.

### **Turbine Design**

- Color reduces visibility, neutral colors best, darker against land, lighter against sky, avoid bright graphics
- Simplest design with smallest overall profile (without unreasonably reducing functional inefficiency)
- Quiet machine, especially if within 500 feet of neighbors

**Turbine Location**

- Use land forms and vegetation to reduce visibility from roads and neighbors
- Keep at the periphery of important views (distant roadside views, meadows, or views of neighbors from primary outdoor use areas (e.g. living room, deck)
- If within view corridor, maximize distance from viewers.
- Avoid visual proximity with important scenic focal points (distinct mountain, church steeple, water feature).
- Plantings can in some cases reduce visibility; planting close to the viewer is more effective than planting close to the turbine.