FACT SHEET 5

Wind Farm Siting Issues

What Do Wind Farm Developers Look For?

Wind developers favour sites with the following attributes:

- Strong and consistent winds
- Winds that blow at times of the day when the electricity is most needed
- Proximity to a suitable electrical grid
- Land where wind farm development is appropriate, away from areas of high conservation value or areas with endangered flora or fauna species [eg. National Parks and wetlands are not considered]
- Identifiable and manageable cultural heritage issues
- Open land without obstacles to the wind flow, and where such obstacles are unlikely
- Broad community support and acceptance
- Low population density
- Good access for wind farm construction and maintenance
- Suitable geology for access track base and foundations

Often a compromise needs to be found amongst these factors.

Land Use

Wind farming is compatible with many land uses ranging from cropping and grazing properties, to industrial estates, port break-waters and sometimes even forestry. In Australia, wind farms have been built on, or construction is currently proposed for most of these types of land.

Impact on local amenities such as airports, must also be considered when siting a wind farm. The long life span (20-25 years) of a wind farm means that it is also important to consider the future uses of adjacent land.

How Far Away From Houses Are They Built?

Although wind farms are not noisy in operation they still need to comply with very strict noise standards. It is therefore normally noise criteria that determines their set backs from residences. Setback distances range from about 400m to 1km or more, according to a variety of factors. These include the noise standard prescribed, local topography, prevailing wind conditions and the wind farm layout.

Why So Much Emphasis On Wind Speed?

The commercial success of a wind farm depends upon its electricity output and the selling price. Wind power in Australia has to compete with some of the cheapest electricity prices in the world, largely due to our extensive reserves of fossil fuel.

The output of a wind farm is extremely sensitive to wind speed. A 15% percent increase in wind speed adds 50% to the energy available. Only a 20% reduction in wind speed halves the wind energy produced. Wind farm developers must therefore, seek out the very best wind resources in order to develop commercial projects.

In Europe where electricity prices are much higher, wind farms can and are built in areas with considerably lower wind resources.

Where Are The Windy Sites?

Generally it gets windier away from the equator. The southern latitudes of Western Australia, South Australia, Victoria and Tasmania have excellent wind resources. However regional effects such as land/sea interactions, hills, ridges and mountains can enhance wind speeds making an otherwise uneconomic area suitable for wind farm development.

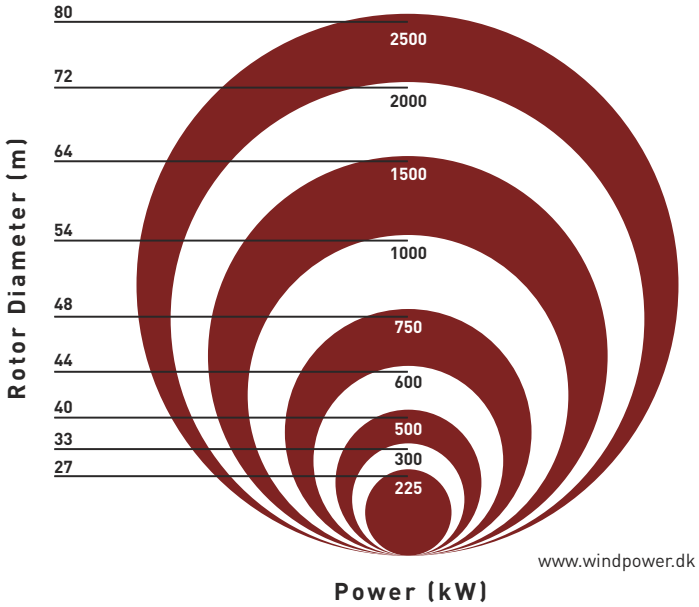
What Do Developers Avoid?

Wind developers will avoid any site with features that might slow down the wind. The impact of an obstacle will be determined by its height, its width and its porosity to the wind. Obstacles can be natural; ranging from dense forests to scattered trees, or human-made; such as wind rows or buildings. They can not only slow wind down, but induce turbulence which has a negative impact on energy yield and blade wear.

"Surface roughness" is another factor to be considered. Rougher surfaces slow the wind and introduce turbulence into the flow of air. Even a mature wheat crop will slow the wind down more than a closely grazed pasture. Scattered trees will have an even greater effect and big cities have the worst impact. The further the wind travels over rough surfaces, the more the wind slows down. This is one reason why inland sites have lower wind speeds.

Why Are Wind Turbines So Tall?

Wind speed increases with distance above ground level. In addition, towers must be tall enough to accommodate the rotor which normally sweeps past the tower at about half its height. Power output dramatically increases with rotor diameter as shown below.



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Why Are Wind Farms Put On Top Of Hills?

Due to speed up effects, wind speed is significantly higher at the top of a hill or ridgeline.

Why Aren't More Wind Farms Built Inland?

Wind farms can be built inland where wind speeds are sufficient and the electricity grid is nearby. Inland sites do however, generally need to be in elevated terrain to be acceptable. Many coastal areas have stronger winds because of their exposure and proximity to the ocean where sea breeze effects are the greatest.

Why Aren't More Wind Farms Built Offshore?

In Europe there are several offshore developments underway, however they are very expensive to build and cannot be supported by Australia's low electricity prices. In Australia, there is still plenty of room for development onshore.

How Far Apart Are The Turbines

In general, wind generators will be separated by 3 to 5 rotor diameters across the prevailing wind energy direction and 5 to 7 rotor diameters with the prevailing wind energy direction.

What Other Issues Impact Wind Farm Layout?

Layout issues are very complex with several factors coming into play in varying degrees according to site conditions. Major factors include local terrain, noise constraints, aesthetic appearance, and avoidance of areas of important native vegetation and sites of cultural or archaeological significance.

Sophisticated three dimensional computer models help developers plot the many complex and often competing issues involved in designing a wind farm. The layout of most wind farms will normally need to go through many iterations before the final design is reached.

What Influences The Wind Farm Size?

Australian wind farms tend to be larger than European facilities as greater economy of scale is required to make them economically viable. In Australia, wind farms of between 10 and 50 wind turbines are usually pursued.

How Much Land Is Needed?

Although spread out, less than 1% of the land is used by the wind farm. Theoretically a 50 turbine wind farm could be squeezed into just 100 hectares, but local terrain and other factors usually means a much larger area is required and more than one landholder may be involved. For example, an attractive ridge may take in several land holdings, particularly where the ridgeline constitutes a property boundary.

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