



Wind Energy

Frequently Asked Questions

Question 1: How big are wind turbines?

Large modern wind turbines have blades up to 56m in length, giving rotor diameters up to 112m. Smaller turbines, with blades around 15-30m in length are more typical in developing countries. Towers range in height from 25m to 100m, giving a maximum turbine height to blade tip of up to 156m for a modern wind turbine. In recent years, typical turbine heights for Australian wind farms have been around 125m. Prototype turbines exist in Europe today with tower heights up to 130m and blades 63m in length.

Question 2: What are wind turbines made of?

The towers are predominantly tubular and made of steel, generally painted light grey. The blades are made of glass-fibre reinforced polyester or wood-epoxy and also light grey in colour. They are light grey because this is the colour which is most inconspicuous under most lighting conditions. The finish is matt, to reduce reflected light.

Question 3: How long do wind turbines last?

A wind turbine typically lasts 20 to 25 years. During this time, as with a car or other large machine, some parts may need replacing, but regular servicing and maintenance ensures this is kept to a minimum. At the end of the design life of a wind turbine the wind farm may either be decommissioned or refurbished if economically viable to do so and planning consent is obtained.

Question 4: How strong does the wind have to blow for the wind turbines to work?

Wind turbines start operating at wind speeds of 4 to 5 metres per second (around 10 knots) and reach maximum power output at around 15 metres per second (around 30 knots). Very high wind speeds, i.e. gale force winds, (25+ metres per second, 50+ knots) are at the end of a wind turbine's operational range and so they will shut down during these wind speeds.

Question 5: Are wind turbines noisy?

Wind farms have a unique characteristic in that the noise level from each wind turbine rises as the wind speed at the wind farm increases. However, as an

offset the background noise also generally increases with increasing wind speed, and this can balance the noise made by the wind turbines. Although wind turbines do make noise, they are usually much quieter than people expect. For example, it is possible to stand directly under a turbine and hold a conversation without having to raise your voice.

The evolution of wind farm technology over the past decade has greatly reduced mechanical noise from turbines to levels often undetectable to people. The main sound created by modern turbines is the aerodynamic swoosh of the blades as they rotate past the tower.

There are strict guidelines on wind turbines and noise emissions (issued by the Environmental Protection Agency or other government agencies) to ensure the protection of residential amenity. Whilst a wind farm will be compliant with noise guidelines it may be possible for residents living close to a wind farm to hear the turbines from time to time. However, the noise level heard should not be higher than the permitted noise level.

Question 6: Do wind turbines produce low frequency noise?

Low frequency noise is always present in any ambient quiet background and it can be produced by a variety of sources, including machinery, transport vehicles and natural sources such as the sea, wind and thunder. It has been repeatedly shown by measurements of wind turbine noise undertaken in the UK, Denmark, Germany and the USA over the past decade, and accepted by experienced noise professionals, that the levels of low frequency noise and vibration radiated from modern, upwind configuration wind turbines are at a very low level; so low that they can lie below the threshold of perception. As such they do not pose a health problem for nearby residents. For more information visit www.bcse.org.au.

Question 7: What happens when the wind stops blowing?

When the wind stops blowing wind turbines will cease operating until the wind speed pickups up. However, electricity continues to be provided by other forms of power generation, The installed

capacity of our electricity system is much greater than the actual requirement, because our system is mostly made up of large power stations, and the system has to be able to cope if one of these large plants goes out of action. Therefore, pauses in wind energy generation, or any other form of generation, are covered by the additional installed capacity. Variations in the output from wind farms can be forecasted and managed in a similar way to the normal fluctuation in supply and demand, as is seen when the nation's workforce goes home (peak energy usage).



Hallett Wind Farm, South Australia

Question 8: How efficient are wind turbines and how often do they produce electricity?

There are a number of definitions to use around these two questions:

- Efficiency - The theoretical maximum energy which a wind turbine can extract is 59% of the potential energy of the wind. Blade designs are improving all the time, with modern blades now being able to extract up to 50% of this potential. This can be compared to a coal fired power station which is able to extract between 35-42% of the potential energy stored within coal.
- Availability - The primary factor that improves productivity is ensuring the wind turbine is "available" to generate electricity, ie in full working order. Most turbine manufacturers will warrant their machines to be available at least 95% of the time. Wind Prospect is proud of our track record of 98.5% availability in the wind turbines that we operate worldwide.
- Load Factor – If the wind was blowing at the optimum wind speed, causing the maximum output 100% of the time, the load factor (also known as

Capacity Factor) for a wind farm would be 100%. However, wind speeds vary over time, and so over the course of a year, an Australian wind farm can be expected to have a load factor of around 30-40%. This is not to be confused with Generation (see below).

- Generation time – The wind at a wind farm site in Australia can be expected to be strong enough to allow a wind turbine to generate electricity 70-90% of the time, depending on the wind farm location. The outputs will vary over this time depending on the wind speed.

Question 9: How much does it cost to make electricity from the wind?

Wind energy is one of the cheapest of the renewable energy technologies. It is competitive with new clean coal fired power stations and cheaper than new nuclear power. The cost of wind energy varies according to many factors.

Over the past 25 years, the cost of producing a unit of electricity from wind has reduced by 80%. Current energy from wind costs around twice as much as from existing coal fired generators in Australia. However pricing will become more comparable than the future cost of fossil fuel alternatives, with wind energy being more favourable due to zero carbon emissions. The introduction of carbon pricing mechanisms, and a requirement for new cleaner coal technology, will deliver comparable prices in the marketplace.

Question 10: Isn't it cheaper to save electricity?

It is cheaper to save electricity than to generate it, by whatever method. However, to combat climate change Australia will need a mix of both renewable energy technologies and energy efficiency measures to help us meet changing demands.

Question 11: How many wind farms/turbines are there in Australia?

In 2009 there were 962 turbines operating in 49 wind farms around Australia, with the majority in South Australia, Western Australia and Victoria. For more information visit the Clean Energy Council: www.cleanenergycouncil.org.au

Question 12: How much electricity does one wind turbine produce?

One 2 MW wind turbine installed at a site with a

capacity factor of 30% would produce over 5 million units (kWh) of electricity each year, enough to meet the annual needs of over 850 average Australian households.

Question 13: How much energy is used to construct a wind farm?

The average wind farm will pay back the energy used to manufacture and transport the turbines within 3-5 months of operation. This compares favourably with coal or nuclear power stations, which take approximately 6 months. A modern wind turbine is designed to operate for more than 20 years. At the end of its working life the area can be restored at low financial and environmental cost. Wind energy is a form of development which is essentially reversible – in contrast to fossil fuel, nuclear power or hydro stations which can leave a legacy of emissions, waste or significant physical disturbance.

Question 14: Does wind energy need a back-up to work properly?

All forms of power generation require back up and no energy technology can be relied upon 100%. Australia's transmission system already operates with enough back-up to manage the instantaneous loss of a large power station. Variations in the output from wind farms are barely noticeable over and above the normal fluctuation in supply and demand, seen when the nation's workforce goes home, or if lightning brings down a high-voltage transmission line. Therefore, at present there is no need for additional back-up because of wind energy.

Question 15: Why doesn't Australia invest in other renewable energy technology?

Wind energy's role in combating climate change is not a matter of either/or. Australia will need a mix of new and existing renewable energy technologies and

energy efficiency measures, and as quickly as possible. Solar and geothermal energy will have an important role in Australia's future energy mix. However, wind energy is the most cost effective renewable energy technology available to generate clean electricity and help combat climate change right now. Furthermore, developing a strong wind industry will facilitate other renewable technologies which have not yet reached commercialisation. Building wind farms is helping us all accumulate valuable experience in dealing with issues such as grid connection, supply chain and finance.

Question 16: Why do some people think wind farms are 'ugly' and unpopular?

The old saying "beauty is in the eye of the beholder" is true in this case. The debate as to whether a wind farm is attractive or not, has no end. However, ongoing studies continue to show that the majority of people find wind turbines an interesting feature in our landscape, whilst the support for wind energy and renewable energy in general remains strong. A Nielsen poll in October 2006 found that 77% of Australians supported the installation of wind farms whilst a Newspoll survey in 2009 found that 80% of Australians thought that the Australian government should give priority to establishing renewable energy over nuclear.

Question 17: Do wind farms negatively affect local tourism?

There is no evidence to suggest that wind farms affects tourism. Thousands of people visit Australian wind farms each year, including wind farms at Codrington, Esperance and Ararat and Woolnorth. The UK's first commercial wind farm at Delabole received 350,000 visitors in its first ten years of operation, while 10,000 visitors a year come to take the turbine tour at the EcoTech Centre in Swaffham, UK. Based on these examples wind farms have the potential to create a



new tourism market.

Question 18: Do wind farms harm property prices and land values?

There is currently no evidence in Australia showing that wind farms negatively impact house prices. A study commissioned by the NSW Valuer General in 2009 found that wind farms do not appear to have negatively affected property values, with 40 out of the 45 sales investigated showing no reduction in value and inconclusive reasons for the reduction in the remaining 5 sales. Similar results were found in a study by the Berkley National Laboratory (2009) in the US which looked at 7,500 sales around 24 wind farms and found that there was no conclusive evidence of the existence of any widespread property value impacts that might be present in communities surrounding wind energy facilities.

Question 19: Do wind farms kill birds?

Bird strike has been recorded at wind farms all around the world, including in Australia, and as such the assessment of the potential impact on birds forms an important part of a wind farm proposal. When developing a wind farm site, Wind Prospect conducts detailed ecological assessments of the sites chosen for projects, and works in-conjunction with relevant agencies and consulting ecologists to ensure that any risks to significant species are minimised to acceptable levels. As part of this, all developments are accountable under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC).

Wind monitoring will usually occur at a wind farm site as part of the project's mitigation strategy, the data

from which helps the industry and wildlife managers better understand the interaction between wind farms and Australian birds, allowing more informed assessments into the future.

Through the thoughtful siting of wind farms and use of modern turbines we believe wind farms can have a negligible effect on local and regional bird communities.

A study from the USA puts this subject into perspective by comparing recorded wind turbine collisions against bird collisions with other structures:

Type of structure	Recorded bird collisions
Vehicles	60 - 80 million
Buildings & Windows	980 million
Power Lines	174 million
Communications Towers	40 - 50 million
Wind Generation Facilities	10,000 - 40,000

Question 20: Do wind turbines frighten livestock?

Wind farms are popular amongst farmers, because their land can continue to be used for growing crops or grazing livestock. Sheep, cows and horses are not disturbed by wind turbines and often use them as rubbing posts or for shade.

HOW TO CONTACT US & FURTHER INFORMATION



Wind Prospect CWP Pty Ltd
PO Box 1708
45 Hunter Street
Newcastle NSW 2300
T: 02 4013 4640
F: 02 4926 2154
E: newcastle@windprospect.com.au

Wind Prospect
www.windprospect.com

Clean Energy Council
www.cleanenergycouncil.org.au

Yes to Wind
www.yes2wind.com