

A man wearing a tan hat and a blue long-sleeved shirt is smiling and standing in a dry, open landscape. In the background, there are trees and a large wind turbine under a clear blue sky.

Wind Farms

A Guide for Communities

What you can expect
Who you can talk to

visit cleanenergycouncil.org.au



Clean Energy Council



Hon Tom Koutsantonis MP
Minister for Mineral
Resources and Energy



Rob Stokes MP
NSW Parliamentary Secretary
for Renewable Energy



Kirsty Kelly
MPIA CPP

South Australian is the Commonwealth's leading renewable energy state.

Over the past decade South Australia has attracted \$3 billion worth of investment in wind power which has lead to the creation of 842 direct jobs.

South Australia currently maintains 1203 MW of operational wind capacity which constitutes over 48% of the nation's levels.

In addition the Australian Energy Market Operator has noted a further 2200-2600 MW of wind projects in South Australia are under development.

Community support for wind energy is essential, especially when ensuring that local communities are well informed about what these projects mean for them, and what their rights and options are.

I'm pleased to see the wind industry, through its peak body the Clean Energy Council, is taking concrete actions such as this guide to ensure the public are educated and engaged in new wind projects.

I commend this initiative and I strongly encourage all South Australians to read the guide, ask questions and be well informed.

The NSW Government is committed to increasing renewable energy generation and reducing our dependence on fossil fuels.

We understand that effectively delivering a more diverse energy mix requires genuine consultation with local communities in those areas across the state where our energy resources are located.

It is simply not possible to develop renewable energy projects cheaply and efficiently without having a planning process that hears and responds to the concerns and desires of local residents.

I am delighted that the Clean Energy Council understands the importance of demonstrating effective and genuine community engagement in the development of wind energy projects, and welcome this guide as an incredibly useful tool for explaining the impacts and the benefits of using wind energy.

All energy generation projects will have environmental consequences. But this guide demonstrates that with careful siting, open dialogue and a willingness to listen to local wisdom, wind energy can be harnessed with the support of local communities, at a fraction of the environmental costs of using coal or gas.

I commend this guide to residents, proponents and local councils as a great way to engage in discussion on wind energy projects.

The Planning Institute of Australia welcomes the efforts of the Clean Energy Council to improve how the wind energy industry engages with communities before, during and after a development proposal is assessed.

We hope this ensures better access to information for all project stakeholders and encourage the industry to get on board.



David Green
Chief Executive
Clean Energy Council

The benefits of wind energy to Australia are many

The aim of this guide is to provide an educational tool for communities, councils and landholders about what happens in the development of a wind farm and what they can expect from the developers throughout that process.

Wind energy is the least expensive form of large-scale renewable energy generation capable of meeting our national target of sourcing 20 per cent of our energy from renewable sources by 2020. Wind farming can help farmers generate vital extra income, make better use of land, and insure against market downturns. Wind farms also provide jobs for local communities and contractors, as well as an economic boost for struggling regional areas.

To deliver on all this, the wind industry must work co-operatively and productively with the local communities it aims to partner with.

These guidelines are designed to provide insight into how a wind developer will engage with communities throughout the lifecycle of a wind farm.

On behalf of the Clean Energy Council, I invite all wind companies to commit to positively engaging with regional Australian communities to secure our clean energy future.

A handwritten signature in white ink that reads "David Green". The signature is fluid and cursive, written over a blurred background of dry grass and a field.



Clean Energy Council

About us

The Clean Energy Council is the peak body representing Australia's clean energy sector. It is an industry association made up of almost 600 member companies operating in the fields of renewable energy and energy efficiency.

The Clean Energy Council's primary role is to develop and advocate effective policy to accelerate the development and deployment of all clean energy technologies.

Member companies represent technologies such as bioenergy, cogeneration, energy efficiency, geothermal, hydro, solar, solar hot water, marine energy and wind.

visit cleanenergycouncil.org.au



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How to develop and build a wind farm. What you can expect.

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How a wind farm is developed and

Before a wind farm can be built, it must prove to be technically feasible, commercially viable and support the local community.

What you can expect

The process of developing a wind farm requires consideration of a range of factors, including the quality of the wind resource, negotiations with landowners, the cost of connecting to the electricity network, the impact of a proposed wind farm on local amenity, environment and heritage, and the benefits of the wind farm to a region.

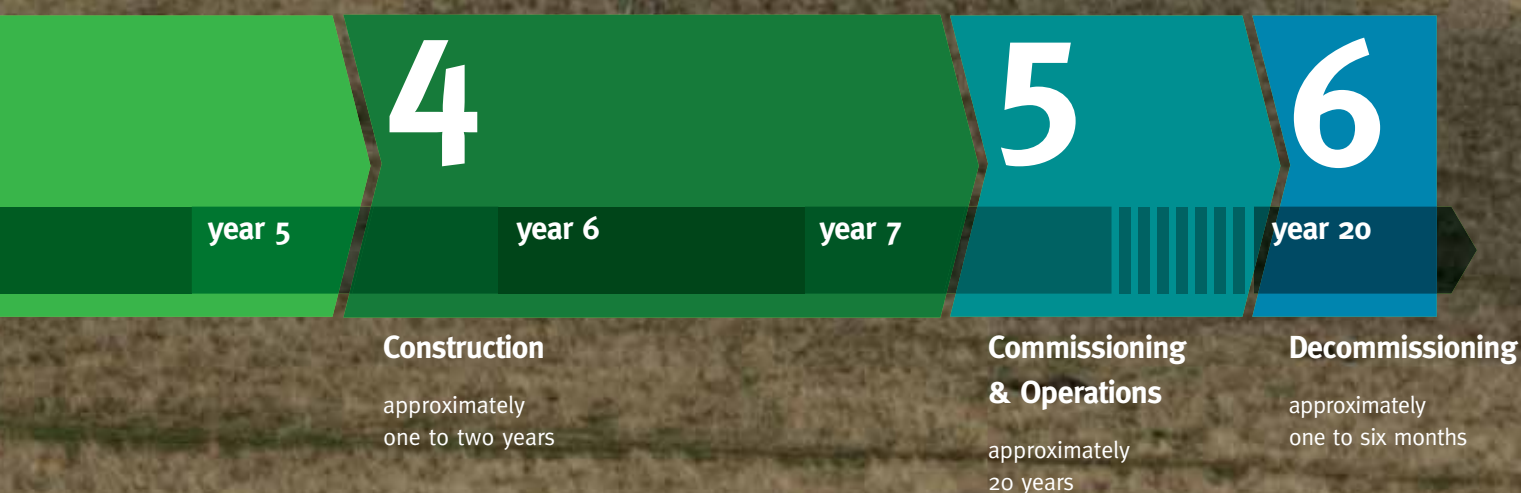
Once development approval is granted by the planning authority a wind farm may be constructed, after which it will usually operate for around 20 years before being decommissioned, and the site returned to its previous state.

This section describes each of these stages, how long they may take, and what to expect if you're living near a wind farm development.

The stages of wind farm development and operation include:



Built



A topographic map of a river valley, likely in the UK, showing the Jack River and its tributaries: Stacey's Bridge Creek, Stony Creek, and Albert River. The map features contour lines with elevations such as 40, 60, 80, 120, 140, 160, 180, and 200. A green shaded area highlights a specific region within the valley. A large, bold white number '1' is superimposed on a green rectangular background in the lower-left corner. The text 'Site selection' is written in white to the right of the number. Below this, smaller white text reads 'Time frame - approximately one to six months'. Various locations are labeled, including 'Stacey's Bridge', 'Jack River', 'Stony Creek', 'Albert River', 'Tool', 'Alberton West', 'Sportsground', 'Gelliondale', and 'BOLG'.

1 Site selection

Time frame - approximately
one to six months



The first stage of site selection is to identify a potential wind farm site (or sites) for further investigation.

The three most important factors for a potential site are:

- 1 the distance to the electrical grid
- 2 the wind resource
- 3 the population density of the surrounding community

Once a potential site is identified, the developer will need to discuss the concept of a wind farm with landowners to find willing participants in the project. They will also undertake some initial research to identify any constraints that make a site unviable, such as the presence of endangered species, cultural heritage sites, or nearby airports

What you can expect

The developer may approach some members of the community to speak about the possibility of a wind farm in the area, or even approach landowners to discuss specific sites. Depending on the specific nature of the project they may also approach the local council or planning authority. At this point it is best to seek information about your concerns and the potential benefits to the community. Contact the developer's Community Liaison and it's also worth reading this handbook carefully.

During this phase of the project the community will not experience any disturbance and there may not be very much information about the wind farm plan. This is because it is too early for the developer to know if the project will go ahead or not, and they will not want to create unnecessary expectations or stress in the community.

If the developer decides that a site is suitable for further investigation they may need to secure access to the land. The developer will not attempt to sign contracts with landowners without first providing impartial legal advice, so that everyone can make informed decisions.



2

Project Feasibility

Time frame - approximately one to two years with ongoing wind monitoring



To work out whether a project is feasible, a developer needs to build an initial business case based on an understanding of site factors such as the strength of the wind resource.

Before the project developer can commit serious resources to the project, they must secure the right to use the land for wind farm development. This involves meeting and liaising with landowners, and signing contracts with landowners for access; usually with an option for wind farm development should the project eventually go ahead.

Before a wind farm can be developed, it's important to monitor the wind resources at the proposed site. Wind speed is the single most important factor in how much energy a wind farm can produce and therefore determines a project's viability. It's important to start wind monitoring early in the development process, as the developer will need data for a minimum of one year in order to capture the wind speeds that will be available at different times of the year.

If the wind speed is found to be too slow then the project may be abandoned.

What you can expect

Like the site selection phase, the developer may not be engaged in community-wide conversations about the wind farm project, simply because it is too early to know if the project will go ahead or not.

If the wind speed data looks good then the developer may begin to hold their first public introductions of the project to the community. This is when they'll explain what the project is about, the potential benefits, integration with existing land use and what the future might hold for the community if the project moves forward.

The developer may also sign contracts with landowners. In areas where consent is required from neighbours, the developer will begin these conversations at this point.

The wind monitoring mast will be completely silent and will have a low visual impact. However, it may be visible from certain vantage points in the community.

The background of the slide is a photograph of the facade of a building, identified by the text as Town Hall. The building features classical architectural elements, including a prominent arched entrance with a pediment and decorative columns. The word "TOWN HALL" is displayed in large, dark red, block letters across the upper part of the facade, preceded by a small red wreath-like emblem. The overall tone of the image is slightly muted, with a focus on the architectural details and the central entrance.

TOWN HALL

3 Planning and approvals

Time frame - approximately one to two years

A range of studies are undertaken to assess the benefits and impacts of the wind farm. These studies become part of a development application where the developer will request the right to construct the wind farm.

The findings of each assessment introduce constraints that will influence the number of wind turbines, the type of turbines and the location of the turbines. The detailed assessments will consider:

- **environmental impacts**
- **grid connection feasibility and cost**
- **local amenity like noise and visual impacts**
- **cultural heritage**
- **electromagnetic interference**
- **impact on aviation**

Detailed wind farm design is an ongoing and iterative process — layouts are revised, and energy yields are modelled as new site constraints become apparent.

The result of the detailed assessment is to put together enough information about site impacts to satisfy the authorities that the wind farm meets relevant planning requirements.

The developer will lodge a planning application with the relevant statutory decision-maker (the local council, state or federal government) for the change of land use. The decision maker will then review the application and decide whether to grant development approval.

The timing and process for making this decision varies greatly between different levels and regions of government. A local council can approve some applications in only a couple of months while others can take years, if appeals are heard in court.

For example, in New South Wales major project applications must go on public exhibition for a minimum period of 30 days, and the Department of Planning and Infrastructure has a period of 90 days to make a decision.

Once the developer has been granted a planning permit for the wind farm, there may in some cases be a long wait before construction begins. Developers may choose to wait for better economic conditions. In some cases they will sell the rights to develop the wind farm to a different company who will move forward with construction.

What you can expect

The planning and approvals phase includes the design of the project layout, an issue that is generally important to members of the local community.

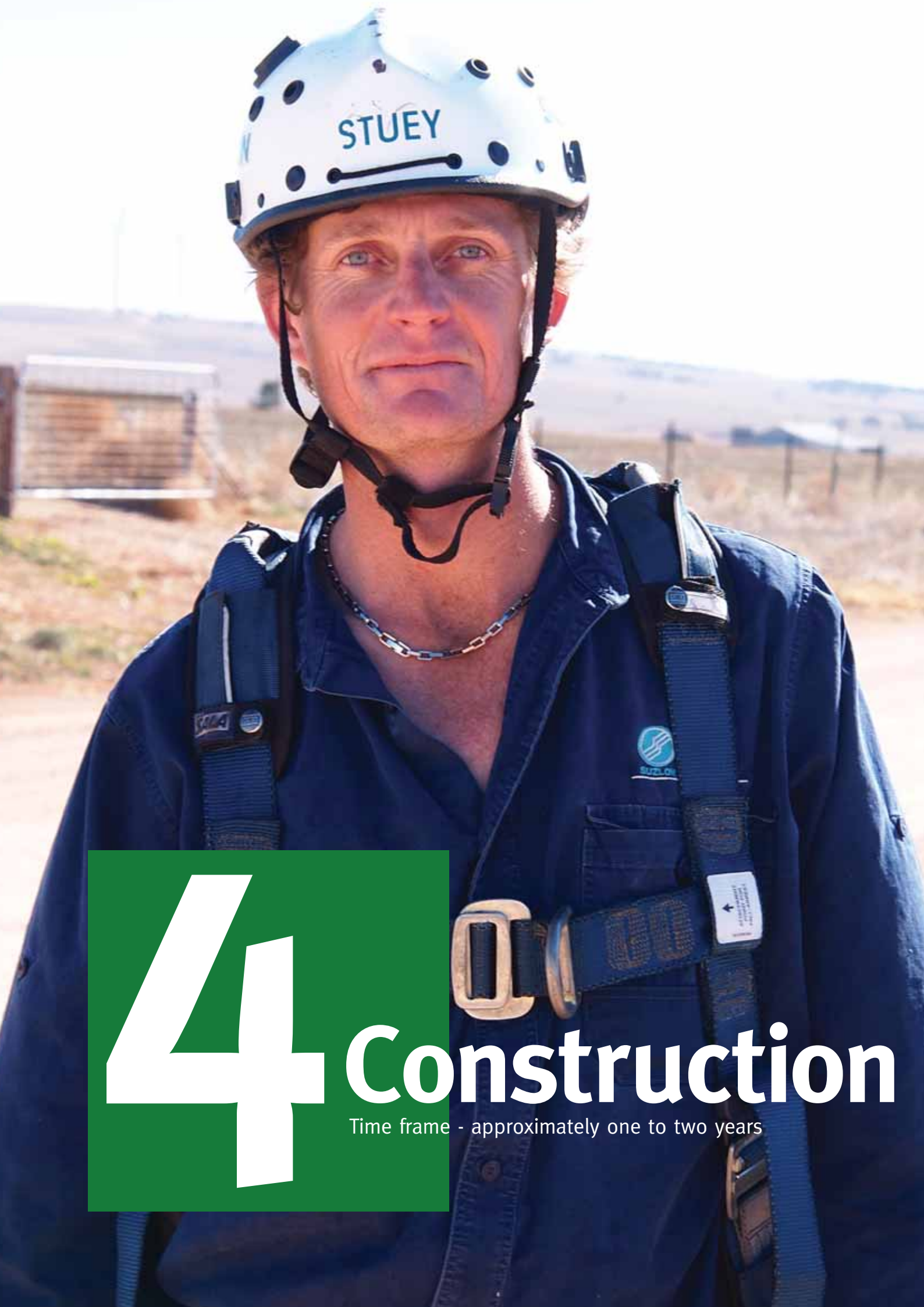
In order to include the community in the design, the developer will create opportunities to receive input by providing communication channels. This can include methods such as telephone lines, project websites, or establishing drop-in centres, but also more proactive mechanisms such as a community reference group.

The planning and approvals phase will involve various experts visiting the area; usually only for a short period and in small teams. Bird and bat experts may place monitoring devices in the region being considered for the wind farm, in order to count bird and bat populations.

People may visit surrounding houses and key vantage points in the community to take photographs of the wind farm area in order to create “photomontages”. These are images where turbines are photo shopped into the landscape (using extremely accurate software programs). These images can be used to show the community, the council and other authorities what the wind farm will look like.

As these experts gather their data on the various impacts and benefits of the wind farm, they will publish a series of reports. These reports may be made public on the wind farm website, and the community consultation committee may be able to share the findings with the local community.

The development approval process can be a good time to get in touch with the wind farm developer and ask detailed questions about who will be making the decision on the development application and how to get in touch with them.



4

Construction

Time frame - approximately one to two years



Once a project has planning approval the developer will go out to market to negotiate turbine supply contracts, as well as contracts for roads, turbine foundations and electrical connections.

The development approval will not allow for major changes to the layout, however some allow for 'micrositing' which means the developer can shuffle the turbines slightly around the approved locations.

The developer will also negotiate a power purchase agreement (PPA) with an energy company to sell the electricity at a price that makes the project profitable.

Wind farm construction includes civil and electrical works, turbine construction, and finally wind farm commissioning and connection to the grid. Civil works involves the construction of roads, pads for the cranes, site office facilities, and wind turbine foundations. Electrical works involves the construction of a substation and trenches for the electrical cables that connect each turbine to the substation.

Wind turbine construction generally starts with the towers, which come in three to four separate sections that are lifted by cranes and bolted on top of one another. After the towers are up, the nacelles, the housing that includes the main shaft and generator are lifted on top. Finally, the three turbine blades are fixed to the hub on the ground, and the whole rotor is lifted and attached to the front of the nacelle.

After the turbines are all up, everything is extensively tested and quality assured, and finally the wind farm is connected into the electrical grid to begin exporting energy.

What you can expect

The final design and contract signing part of the project development can take a long time and is mostly a technical process undertaken by wind farm experts including various turbine suppliers, electricity retailers and others. During this time there will not be any visible progress on the project.

This stage can create some temporary issues for the community because of the disruption in the area, the increased traffic, influx of workers, etc. The developer will provide information to the community about the changes that will take place such as construction timelines, locations or specific actions.

There will also be benefits for the community during the construction stage and afterwards – such as opportunities for local employment, local businesses or tourism in the area.

The major impact to the community during construction is that large trucks will bring construction materials to the site. Initially this will be concrete and large electrical cabling and substation equipment like transformers. During turbine construction, enormous trucks bring tower sections (there are three to four tower sections per turbine), blades and nacelles.

The wind farm developer will have a traffic management plan outlining the number of trucks expected and the route that they will take in order to minimise impact on the region. In addition, it will be a requirement that they repair any damaged roads back to their original state, following the completion of construction.

The developer will maintain all of the engagement methods like websites or telephone lines in order to provide updates to the community on the project development. There may also be more regular meetings of the community reference group for gathering feedback and communicating with locals, and site visits.



5

Commissioning and Operations

Time frame - approximately one to two years



Wind farms generally operate for around 20 years, and employ onsite staff for maintenance works.

Typical maintenance includes the greasing of bearings and servicing of parts. At any time one or more wind turbines may not be operating because work is being performed.

What you can expect

The wind turbines will operate automatically for the majority of the time, and will have very little impact on the community. The developer will have a phone number and other contact avenues in order to share publicly available information on the progress of the wind farm. There will also be systems in place to get feedback so they can do things better, and they will continue to respond promptly to inquiries and requests.





6

Decommissioning

Time frame - approximately six months



When a wind farm reaches the end of its life it may be taken down or decommissioned. Although no wind farm has been decommissioned in Australia yet, it's important to note that decommissioning is always the responsibility of the wind farm owner. Typical landowner contracts require that the turbine is removed from its concrete foundation, and that the turbine site is covered in topsoil so that farming activities can continue.

Like the construction period, the decommissioning process will involve a lot of trucks carrying turbine parts away from the site. There will be a traffic management plan describing the routes taken and the expected number of trucks. Roads will be repaired to their former state after the decommissioning is completed.

What you can expect

The developer will communicate with the community about the process of decommissioning, its steps and the potential impacts. They will also create opportunities for members of the community to comment on the approach to decommissioning.

Questions most people ask about wind energy & wind farms



This section of the guide provides answers to those questions most commonly asked about wind farms. If you've got a question email us at info@cleanenergycouncil.org.au and we'll answer it and include it in the list below.

Why build wind farms?

Australia needs wind energy:

- to secure billions of dollars of investment and tens of thousands of jobs for regional and rural Australian communities
- to protect against the rising cost of fossil fuels
- to help meet our commitments for reducing carbon emissions without buying overseas permits

Wind energy is the least expensive form of large-scale renewable energy generation capable of being rolled out on a large scale.

Australia stands to gain some \$17 billion of investment and 10,000 jobs from wind energy projects that are currently proposed or approved. Much of this would flow to regional and rural Australia.

Wind energy can also protect against inevitable price hikes in the cost of fossil fuels such as coal and gas. Few Australians realise we are now in competition with the rest of the world for gas – and higher demand has already doubled wholesale prices in the last year.

While gas power stations are cheaper to build today than wind, the cost of wind energy is coming down fast thanks to advances in technology and larger-scale component production. As gas prices continue to rise into the future, so will the cost of running gas power stations. Meanwhile, the fuel cost of the wind is free – and Australia has it in abundance.

Australia's 20 per cent Renewable Energy Target will help build the Australian wind industry, assisting us to meet our national targets for reducing carbon emissions domestically. This will in turn reduce our need to buy overseas carbon emissions permits, keeping billions of dollars of investment within Australia.

Is wind energy popular?

A survey commissioned by Pacific Hydro in 2011, found that more than 80 per cent of people surveyed across Victoria, South Australia and New South Wales support wind farms – including many people from regional areas where wind farms are located.



Is wind energy expensive?

As the world moves to reduce greenhouse gas emissions to respond to the threat of climate change, polluting technologies will become more expensive and clean technologies will become cheaper.

Large-scale renewable energy projects like wind farms and hydro-electricity contribute only 2 to 3 per cent to household power bills.

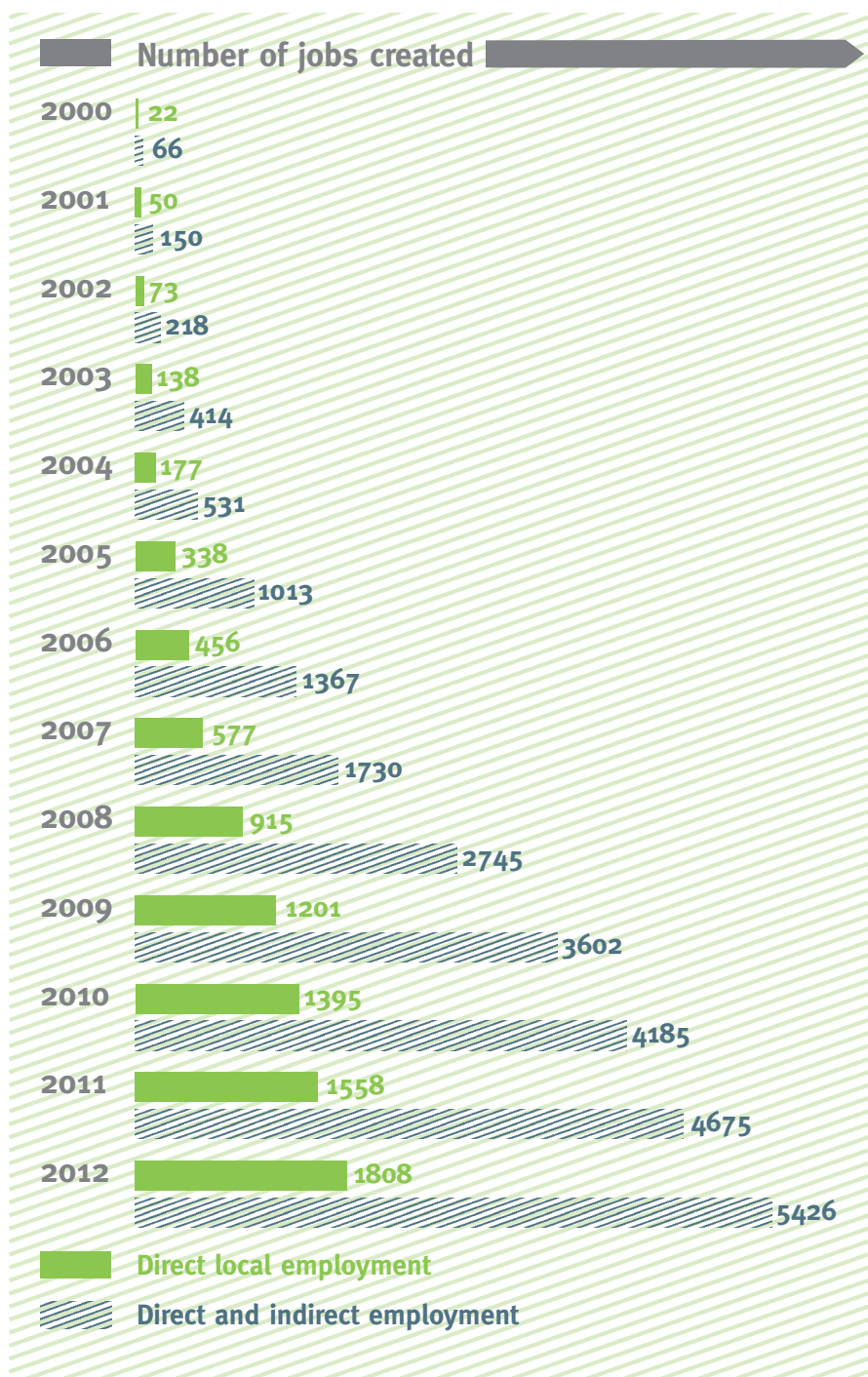
In total federal support for renewable energy makes up around 5.4 per cent of household energy bills. This will reduce to just over 2 per cent by 2020 as support for small-scale renewables such as solar PV and solar hot water is reduced.

By far the biggest contributor to household power bills is the cost of maintaining the electricity network that contributes 40 to 50 per cent to household power bills. Analysis commissioned by the Clean Energy Council shows that current trends in network costs will continue to increase over time and by 2020 may constitute as much as 55 per cent of an average household power bill.

Does wind energy create jobs for Australians?

Wind energy projects create lots of jobs during the construction period, and then fewer ongoing jobs for the lifetime of the wind farm. The Gunning Wind Farm, in New South Wales, employs eight permanent staff who are responsible for overseeing the operation and maintenance of the wind farm throughout its expected 25-year life.

A table illustrating wind farm jobs from 2000 to 2010 is below



What will a wind farm do for my community?

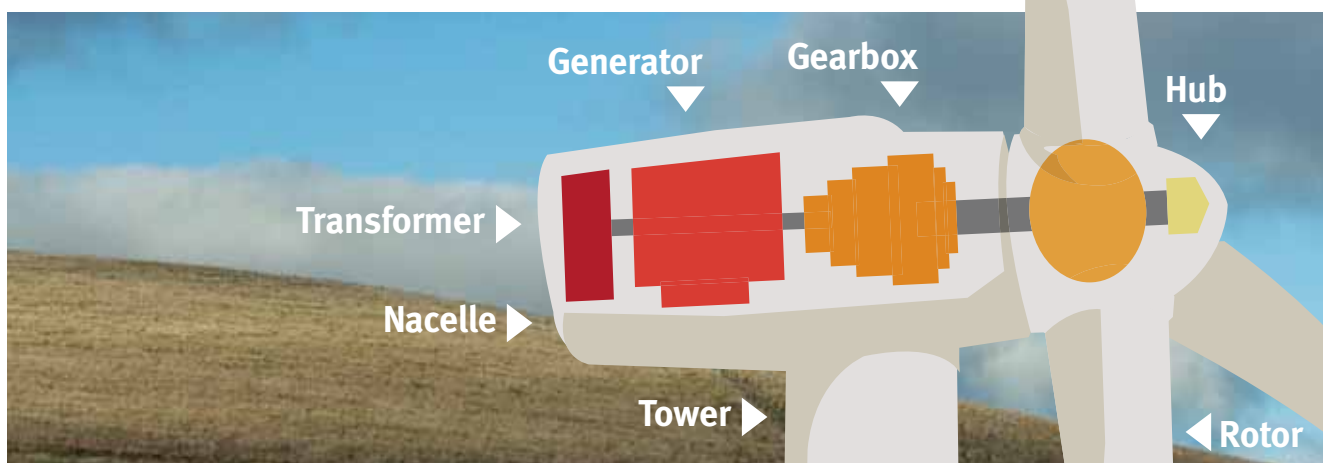
Wind farms provide jobs for local communities and contractors, as well as an economic boost for struggling regional areas. At the Capital Wind Farm near Canberra, about \$10 million went directly into the pockets of locals during construction - the corner store, the local restaurant, motels and more.

Wind farms can also help farmers drought-proof their properties, make better use of marginal farming land, and insure against market downturns. Hosting five wind turbines for the Capital Wind Farm near Lake George in New South Wales has made it possible for Peter and Bev Keatley to stay on their property and make it viable to one day pass on to their son. Peter is proud of his role in providing clean energy, and calls the wind farm income – \$10,000 per turbine a year – ‘my super’.

Community-owned wind farms

A number of wind farm developments are offering local residents a chance to invest in a wind project. While community-owned wind farms are relatively new in Australia, they have become popular across Europe and in the USA.





How do wind farms generate electricity?

Each wind turbine consists of three propeller-like blades called the rotor, which are attached to the top of a tower. As the wind blows, this spins the rotor, which is connected by a steel shaft to a generator that makes electricity.

Commercial turbine towers are typically between 70 and 100 metres in height. The generator is housed in a structure called the nacelle, which sits on top of the tower. Automatically controlled motors in the nacelle ensure the rotor is always pointed into the oncoming wind direction. In addition, each blade is tilted to catch the optimal wind.

The energy produced by a wind turbine significantly increases with the wind speed. For this reason, wind farms are generally located in areas with strong, consistent winds. In Australia, the best sites are usually found in southern and coastal regions.

Generally, wind speed increases with height above ground. Therefore, increasing the height of a wind turbine, as well as the length of its blades, can make a significant difference to a wind farm's energy output.

How much electricity can a wind turbine produce?

A single wind turbine can produce enough energy to supply up to 2000 average households every year.

The Waubra Wind Farm generated 594 gigawatts (1 gigawatt = 1,000,000 kilowatts) of renewable electricity in 2011. This is enough to power approximately 99,000 households for a year – roughly equivalent to the city of Ballarat and surrounds.

What happens when there is no wind?

The demand and supply of energy fluctuates all the time and the energy network is designed to cope with this. Energy created by wind turbines is just one of a range of energy types feeding into the power system to provide households with electricity. The network needs back-up power for a range of reasons – demand spikes, power station failure – and there is no evidence that we have had to build a new power station solely to back-up wind.

As wind capacity in South Australia has increased, the use of other energy sources (and the energy imported from Victoria) has decreased.

When does a wind farm make enough energy to offset the energy used to build it?

The energy payback period refers to the length of time required for a wind farm to generate sufficient electricity to offset the energy associated with the manufacturing, construction, operation and decommissioning of the project.

A typical wind farm will generate this amount of energy within six months of operation.

Can wind farms be installed anywhere?

Deciding where to put a wind farm is a long and involved process that requires a wind farm developer to prepare detailed reports with the help of experts on potential impacts, including noise, visual amenity, traffic, cultural heritage, birds and bats, and various other considerations.

Of course appropriate regulations and community consultation should apply to any wind farm, as they do to any new infrastructure – be it a new piggery or dairy, a tourist development, a road, a dam or a mine.

Wind farms in Australia currently face among the toughest planning guidelines in the world in relation to their location, operation and permissible noise levels.

What makes a good wind farm site?

Typically, a good site for a wind farm is somewhere windy, elevated, clear of obstacles, and away from environmentally sensitive areas. Here are some of the main things that wind farm developers look for:

- areas close to the electricity grid
- higher ground (hills and ridges)
- clear land (for example, farming land rather than forest areas)
- areas that aren't too densely populated to minimize the impact on a local community

Do wind farms harm wildlife?

There have been some alarming claims about wind farms contributing to the death of a large number of birds. Most of these can be traced to a single wind farm built in the United States around 30 years ago that was poorly located in the flight path of migratory birds.

In Australia, planning conditions require extensive research on local bird life before and after construction, and as a result, bird deaths are rare. In Victoria, a study of the population of the Brolga in south-west Victoria found declining numbers were the result of loss and degradation of habitat and predation of foxes, not wind farms in the region.

Compared to bird deaths from collisions with buildings, electricity lines, cars, pesticides, communication towers and cats, the effect of wind farms on birdlife is minimal.

Are wind farms reliable?

It's true that wind farms don't generate electricity if the wind isn't blowing. However, it's not true that we need to build additional back-up power plants in order to compensate for the times when wind farms aren't generating power.

There is already enough back-up in our energy system to be able to supply power when wind farms aren't producing much power, when demand rises unexpectedly, or when there is an outage at a coal- or gas-fired power station.



Are wind turbines noisy?

Like almost anything in motion – the ocean, tractors, cars, the wind itself – wind turbines do create sound. Wind turbines in Australia face some of the toughest guidelines in the world in relation to their permissible noise levels.

Can wind farms impact health?

In the NHMRC Public Statement, *Wind Turbines and Health, A Rapid Review of the Evidence*, (July 2010) it states that ‘there is currently no published scientific evidence to positively link wind turbines with adverse health effects.’

What is infrasound?

Sound with a frequency of less than 20Hz can’t be heard by humans and is known as ‘infrasound’. This type of sound is very common both in natural and man-made environments. Cars, buildings, the waves of the ocean and even playground equipment all produce infrasound as well as most household goods, including TVs, fridges and washing machines.

It goes on to say that ‘this review of the available evidence, including journal articles, surveys, literature reviews and government reports, supports the statement that: *There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines.*’



Do wind turbines cause fires?

As all high-voltage connections for turbines are run underground, the risk of electricity-related fire is extremely low. The fire control methods for wind farms are the same as those used for all other high-voltage electrical assets.

Each turbine is also fitted with a comprehensive lightning protection system that safely transfers any high voltages or currents directly to the earth without affecting turbine performance.

There is no recorded instance of lightning strikes to wind turbines or monitoring masts causing a bushfire in Australia. Australia's country fire authorities are always consulted in the development of wind farms to ensure there is adequate access to the site via road, in case of emergency.

Do wind farms affect tourism?

Yes! Wind farms have had a positive effect on tourism in Australia. For example, Pacific Hydro's Codrington Wind Farm in southwest Victoria attracts 50,000 visitors each year through its successful tour operator business.

How can I buy wind energy for my home?

GreenPower is a government accreditation program that enables energy providers to purchase renewable energy on behalf of consumers. The aim of the program is to facilitate the installation of new Renewable Energy generators across Australia beyond mandatory renewable requirements. To learn more, you can ask your electricity retailer or go to www.greenpower.gov.au.

visit cleanenergycouncil.org.au



Clean Energy Council