Wind Farm Frequently Asked Questions

This guide provides general information about how Tilt Renewables develops, builds and operates wind farms.

About Tilt Renewables

Tilt Renewables is an experienced owner, operator and developer of wind and solar farms in Australia and New Zealand.

We own and operate eight wind farms which generate enough clean energy to power around 320,000 homes and save the emission of around 870,000 tonnes of carbon annually.

We also have two wind farms under construction. When complete they are expected to generate enough clean energy to power around 315,000 homes and save the emission of 1.65 million tonnes of carbon annually.

Our team of around 40 people is based in Melbourne, but you will find many of us out in the locations where our projects are proposed or operating. We have a strong commitment to the towns and regions where we work.

Wind energy

Wind farms generate electricity from the naturally occurring power of the wind. Wind is an inexhaustible resource that is clean, reliable and affordable. Wind power is the cheapest source of large-scale renewable energy.

Turbines capture wind energy within the area swept by their blades. The spinning blades drive an electrical generator that produces electricity.

Most Australian states and territories are transitioning from traditional, emissions-intensive forms of energy generation to new, diverse renewable sources – including wind.

In 2018, wind farms produced around 34 per cent of Australia's clean energy. Australia is getting 21 per cent of its total power generation from renewables, which is more than enough to power every Australian household.

How wind energy works

1. The turbine captures energy from the wind

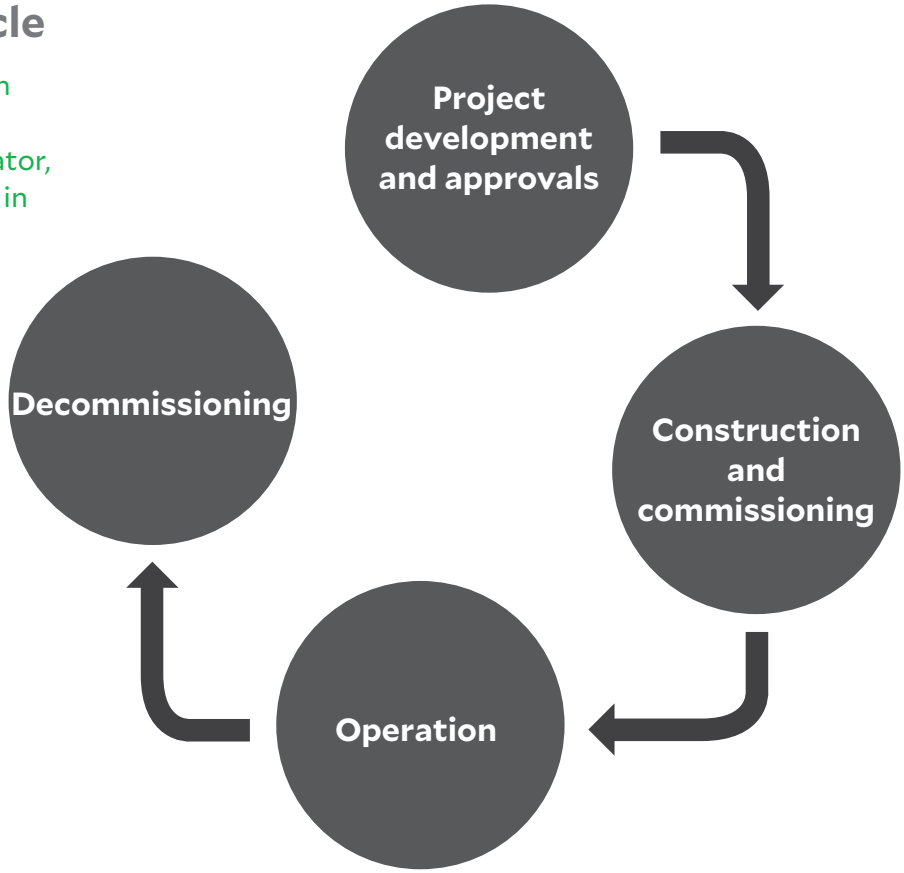
2. The onsite substation collects the energy and sends it to an offsite substation down a transmission line

3. The energy, along with all other forms of energy, is added to the electricity grid

4. It then travels through transmission lines that distribute the power to your home

Wind farm lifecycle

There are four key phases in a wind farm's lifecycle. As a developer, owner and operator, Tilt Renewables is involved in all phases.



How do wind farms benefit the environment?

Environmental benefits of wind farms include:

- no greenhouse gas emissions during operation
- renewable energy source – no mining, extraction or burning of fossil fuels required
- limited environmental impacts from construction compared to traditional energy generation, with emissions generated from a turbine's manufacture, installation, operation, maintenance and decommissioning offset within the first year of operation.

Project development and approvals

From finding the right location to obtaining planning approvals and finalising a design – a lot of work goes into developing a wind farm. This can take around five to ten years.

Key activities in wind farm development include:

- wind monitoring
- energy modelling
- feasibility studies
- grid connection impact study
- site investigations
- consultation with government, communities and industry
- establishing agreements with landowners
- planning and environmental studies and approvals
- design of wind farm and ancillary infrastructure
- design of road upgrades
- transport route planning
- investment decision and raising equity to fund the project
- procurement of contractors and turbines.

What's involved in designing a wind farm?

Designs are developed iteratively and refined over time as more information becomes available, such as from site investigations and confirmation of planning requirements.

We look at a wide range of technical, community and environmental considerations, including:

- local topography
- geotechnical (ground) conditions
- proximity and connectivity to the grid
- safety
- relevant standards, guidelines and legislation
- stakeholder and community feedback
- constructability – whether the design is practical to build
- connections to local roads
- transport routes and access to the site
- potential environmental and heritage impacts
- operations and maintenance requirements
- ongoing productivity of the land
- project cost and value for money.

What planning and environmental approval process is used for a wind farm project?

Depending on the wind farm size and location, local, state and/or federal government approvals may be required.

What environmental studies do you undertake to ensure impacts are identified and avoided or minimised?

Environmental studies are undertaken by independent experts to identify possible project impacts. We use these studies to inform decisions about design, planning and construction management.

Studies typically undertaken for a wind farm project include:

- electromagnetic interference (EMI)
- shadow flicker
- traffic
- noise
- biodiversity
- heritage
- landscape and visual.

Construction and commissioning

Major project construction can be disruptive at times. At Tilt Renewables, we work closely with our contractors, neighbours, local councils and communities to plan and manage construction responsibly.

We are committed to reducing construction impacts on communities and the environment, and keeping people safe while we work. Some of the ways we do this include:

- working during standard construction hours wherever possible
- scheduling disruptive or noisy work at times when it will have the least impact
- monitoring and actively managing construction activities
- using well-maintained equipment and facility
- meeting requirements set out in planning conditions, legislation, industry standards and guidelines
- regular communication with neighbours and the community
- listening to feedback about how impacts could be minimised
- a strong safety culture and clear procedures.

How long does it take to build a wind farm?

Depending on the size of the wind farm and weather conditions, construction can take up to three years.

How do you make sure construction is undertaken responsibly?

There are a range of requirements, standards and guidelines in place to ensure construction is well planned and effectively managed. Requirements are set by government authorities, developed as part of the planning process and built into the construction contract that Tilt Renewables has with the construction contractor.

Management plans are developed to ensure all requirements are understood and addressed.

A ***Construction Management Plan*** (CMP) provides a 'guidebook' for workers on site. It sets out the approach to managing all aspects of construction including working hours, safety and security, water and dust management, noise and vibration controls and traffic.

An ***Environment Management Plan*** (EMP) identifies all potential impacts and the strategies and plans in place to manage impacts and meet requirements. It ensures that appropriate environmental management practices are followed.

We also listen to feedback and suggestions for how local impacts could be managed and minimised during construction. Input from communities and other stakeholders during a project's development can help inform construction and environmental requirements and mitigation measures.

What should I expect during construction?

Traffic and roads

Wind farm construction generates a lot of traffic when materials, machinery and turbines are being delivered to site. A ***Traffic Management Plan*** (TMP) is developed in consultation with road authorities to ensure that construction traffic is appropriately managed and uses approved roads only.

We use major highways and main roads where possible and local roads where necessary to access the construction site. Local roads may be upgraded before works begin so they are fit to carry trucks and oversize vehicles.

We work closely with our contractors to plan deliveries, coordinate with other road users and provide advance notice of any disruption. Oversize items are often moved at night to reduce traffic disruption.

Working hours
The Environment Protection Agency (EPA) in each state recommends standard construction hours. This is generally around 7am to 6pm Monday to Friday and 8am to 1pm on Saturdays.

On occasions when we need to work outside these standard hours, we provide as much advance notice as possible and put measures in place to minimise disruption.

Noise
Construction noise targets are set out in project planning approvals and guided by state or territory legislation.

If construction activities on one of our projects is expected to exceed the noise targets at any time, we put mitigation measures in place to limit the impact on local residents as much as possible. This may include scheduling works so that noisier activities occur at times when they will have the least impact.

Using well maintained equipment and machinery, minimising noise from vehicle reversing beepers, turning off machinery that is not in use and putting speed limits in place to minimise engine noise, are some other measures used to reduce noise from our sites.

Dust
The most common way to keep dust down during construction is by spraying water. Water trucks are used to wet down work areas and unsealed roads.

Social and economic
During construction, you may find more people and vehicles around town and on the road. Temporary accommodation such as motels and pubs may be fuller than normal. We work with local communities, councils and our contractors to reduce any inconvenience this causes and to ensure local towns get an economic boost through spending on accommodation, food and local goods and services.

Safety
Safety is our first priority. We work closely with our construction contractors and ***Safety Management Plans*** (SMP) are developed to drive safe construction practices and ensure that potential risks are identified, mitigated and communicated to workers. All staff and contractors undertake mandatory training in safety and emergency procedures before starting work on site.

Construction – step by step

1. Site preparation

On the wind farm site, construction access tracks are built to connect turbine sites to internal and external access roads and supporting infrastructure. Offsite, some local roads, highways or intersections may be upgraded for use by construction vehicles. Some wind farms also have an onsite quarry, concrete batching plant or other temporary construction facilities which are set up at the start of construction to supply the project.

2. Turbine foundations

A foundation is built to provide a secure footing for each wind turbine. On average, these are around 20 metres across and three metres deep. A temporary crane pad and assembly area, called a hardstand, are located next to each foundation.

3. Turbine assembly

A wind turbine consists of a tower, three blades and a hub (also called a nacelle). These parts are delivered separately, laid out in the assembly area, then lifted into place with a tall crane. Each turbine takes around two to three days to erect.

4. Supporting infrastructure

Supporting infrastructure such as sub-stations, buildings and transmission lines are built, ready to be connected with the turbines.

5. Electrical connections

A combination of underground transmission cables and overhead lines are installed to connect the turbines with an onsite substation. Overhead transmission lines are connected to carry electricity from the wind farm to the grid.

6. Commissioning

After all supporting infrastructure has been built and tested, wind turbines are gradually tested, commissioned and start supplying electricity to the grid. Temporary construction buildings, tracks and facilities are removed and reinstated.

Operation

Wind farms have an operational life of around 20-30 years. A small team based on site or in the region undertakes regular maintenance and monitoring.

Does Tilt Renewables operate wind farms?

Yes, we develop, build, own and operate wind farms – so we have a long-term presence and strong interest in the local community.

Will I be able to hear the turbines?

Like almost anything that moves – the ocean, tractors, cars, the wind itself – wind turbines do create sound. The sound they make can be described as a cyclic whooshing or swishing sound. In most cases, it is possible to carry on a conversation at the base of a wind turbine without having to raise your voice.

Noise can vary depending on the shape of the land, the position of the listener and the speed and direction of the wind.

Detailed noise studies are undertaken during project development to ensure that noise will not negatively impact on local residents. We are required to meet strict noise requirements which are put in place through the planning process. We also monitor noise to ensure we are meeting our requirements during operation of the wind farm.

Will the electromagnetic interference (EMI) affect my TV reception?

All television broadcasts in Australia are now digital. Digital TV signals are generally much less susceptible to interference from wind farms than analogue signals, however, it is possible in areas of low signal strength.

Before construction, we study the existing television and radio reception strength in the area so that if a concern is raised, we can assess whether the wind farm is causing any issues.

We are happy to help any residents who experience TV reception issues after construction of the wind farm. There are solutions available to resolve any issues.

What if there is no wind or extreme weather?

Our wind farms connect into the National Electricity Grid. This is an interconnected system that covers Queensland, New South Wales, Australian Capital Territory, Victoria, Tasmania and South Australia. The grid is supplied by electricity from a large number of geographically and technologically diverse generators.

The Australian Energy Market Operator (AEMO) manages the system to ensure that a mix of generators and storage technologies are available to meet demand. If the wind is not blowing at one wind farm, generators in other regions or using other technologies will be available to meet demand.

Decommissioning

When a wind farm reaches the end of its life the site can be decommissioned, restoring the area to its previous land use, or we may look to work with government and landowners to repower or upgrade the equipment and continue operating.

What is involved in the decommissioning phase?

Decommissioning a wind farm involves:
- dismantling and removing the wind turbines
- removing related infrastructure, such as buildings and overhead power lines
- covering and revegetating roads and foundations.

Landowners can request that parts of the wind farm that continue to serve a purpose, such as buildings or access tracks, remain in place.

Repowering (or upgrading the equipment) usually requires new planning and environmental approvals and new agreements with landowners.

Who is responsible for decommissioning?

The wind farm owner is responsible for decommissioning. Requirements for decommissioning – such as reinstating the land – are set out in contracts with landowners and in planning approvals.

Decommissioning is accounted for during the wind farm's planning to ensure sufficient funding is available to cover the costs.

Transmission line

Transmission lines carry electricity from the wind farm to the National Electricity Grid.

What influences the design of a transmission line?

There are many considerations which influence the design of a transmission line, including the size and location of the poles. Key factors include:

- voltage (e.g. 66kV, 132kV, 220kV), number of circuits, conductor (the wires) type/size, security level and design life requirements
- line length, spans between poles, changes in direction
- topography
- structural loads due to the weight, wind, earthquake risk, ground water and other environmental factors
- electrical safety requirements
- communication and earthing requirements
- temperature limits and fluctuations
- existing infrastructure constraints
- land ownership and access (both public and private)
- native vegetation
- planning requirements
- areas of cultural heritage significance
- property configurations and dwelling locations
- road and traffic safety
- drainage
- fire safety.

During the project development and approval phase, several transmission line routes may be investigated. This includes reviewing each option against potential environmental, planning, safety and social impacts, and consultation with landowners who could be affected by the routes.

What do the transmission towers and power poles look like?

There are different types of poles and towers on a wind farm site to connect the wind farm with the electricity grid. The type and size of the structure used depends on the powerline's voltage and the location of the wind farm in the electrical network.

Transmission towers are large steel structures used to carry high voltage power lines. Power poles are single steel-reinforced concrete poles used to carry lower voltage power lines.

Can the transmission line go underground?

Transmission lines are usually located above ground due to:

- *cost* – it is usually cost prohibitive to install lines underground for long distances
- *environmental impact* – placing lines underground can have a far greater environmental impact because it involves digging a trench over a long distance
- *functionality* – above ground lines allow multiple projects to share a line and can be easily accessed for maintenance.

Can more than one wind farm share the same transmission line?

This is possible, however, there are many commercial, technical and regulatory considerations to enable this to happen. It requires both wind farm operators to be fully committed to construction of the projects at or around the same time to allow full coordination and agreement on the transmission line contractor, design, construction and operational contracts.

Who builds, owns and maintains the transmission lines?

Transmission Network Service Providers (e.g. AusNet Services in Victoria and TransGrid in NewSouth Wales) are usually responsible for transmission lines. In some instances, the transmission lines can be privately owned and operated.

Can transmission lines pose a safety risk?

All transmission lines are designed to meet or exceed design and safety standards.

Bushfires from powerlines and other incidents causing the lines to fall are major concerns and critical risks for network operators. While these risks cannot be eliminated entirely, the powerlines are equipped with fast-acting protection systems designed to prevent injury to people, damage to property and grass or bush fire.

The transmission network service provider will apply electricity industry best practice to the maintenance of the transmission line (e.g. clearing vegetation under the transmission line) and ensure all electricity safety and bushfire mitigation regulations are met.

Once the transmission line is built, it will be managed in accordance with the relevant electricity safety standards.

Employment

Wind farm construction brings a boost in local jobs and new opportunities for local businesses.

How many jobs do wind farms create during construction?

Wind farm construction creates hundreds of direct jobs on site and thousands of jobs in businesses that supply the project. The types of jobs created include:

- electricians
- transport operators
- machine operators
- general labourers
- quarry and material suppliers
- concrete businesses.

Construction also provides an economic boost for regional communities by increasing demand for local goods and services, such as accommodation, hotels, restaurants and cafes. We are committed to employing local people and buying local wherever possible.

How many jobs will there be during operation?

This varies by the size and location of the wind farm. There is usually a small team based on site or in the region who are responsible for day-to-day management of the site and regular maintenance.

Is there work for local people and businesses?

Yes, we are committed to employing local people and buying local wherever possible.

How can I get work on or supply the project?

You can register your interest to supply local services or work on one of our projects using the Goods and Services Register on the project website.

Tilt Renewables, as the owner of the wind farm, will not typically be directly employing workers, this will be done by our delivery partners and contractors (and their sub-contractors).

You can contact them directly, or we are happy to pass details onto the appropriate delivery partner or contractor.

Working with communities

As the ultimate owner and operator of our development projects we have a long-term vision for every project and work hard to build strong relationships with residents, businesses and orgnaisations.

What benefits can a wind farm create for the local community?

Local community benefits can include:
- boost to the local and regional economy and local businesses
- jobs during construction and operation
- training, skills development and education programs
- creation of community funds for local initiatives
- direct payments to landowners and neighbours
- provision of a drought-proof and post-retirement income stream for farmers.

How do you share benefits with local communities?

We are committed to being a positive contributor to the communities where we work and are proud of our record of providing support to communities that makes a real difference.

Through partnerships with councils and local groups, and consultation with the community, we develop benefit sharing programs that address important social, economic and environmental needs in the region. Some of our current benefit programs include:
- training and skills development programs
- scholarships and other education programs
- community funds to support social and environmental initiatives
- employee volunteering
- neighbour benefit programs
- local jobs and procurement of local goods and services.

How do you involve communities in planning for, and decisions about, the wind farm?

We are committed to positive engagement practices and ongoing engagement throughout all stages of a project's life – from site selection through to decommissioning.

We engage with local councils, landowners, neighbours and surrounding communities as early as possible, keeping people informed and involving people in decisions that they are able to influence.

How do you keep people informed about construction activities?

Depending on the wind farm location, community and community preferences, we use a range of different tools to keep people up to date. These include:
- website
- email updates
- regular newsletters
- information displays in nearby towns
- phone calls, emails and/or letters to anyone directly affected
- presentations to community groups and organisations.

How do I raise concerns or ideas about the wind farm?

Feedback is always welcome. If you have any concerns or local knowledge that could help, please get in contact. We have a dedicated 1800 number and email addresses so you can get in touch with us anytime.

You can find our Complaints Handling Procedure on our website, or we can send you a copy on request.

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Email: info@tiltrenewables.com | **Phone**: 1800 WE TILT (1800 938 458)
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