

Wind power on your farm

Wind – an abundant resource

New Zealand has one of the best wind resources in the world. Depending on the site, small wind turbine schemes (generally between 10kW and 1MW) may be a cost effective way of generating energy on your farm.

Small wind turbines can generate electricity for use on the farm, business and home, and in some cases can also export electricity back into the local network. Farms and businesses which export may be able to sell the electricity to a power retailer or, for larger projects, on the wholesale market.

As well as benefiting individual farms, a large number of small to medium wind farms throughout the country can help make the national electricity supply more secure and reliable, as our power generation becomes more diverse and geographically distributed. There is also less power lost through transmission and distribution over long distances.

Wind energy on farmland

Turbines and wind farms can coexist with day-to-day farming – for example, animals can graze under and around wind turbines, once construction is complete. The footprint of wind turbines is usually very small, so little productive land is lost.

Using one or several small turbines to generate electricity is not a new concept. European farmers have been using these systems for over 20 years to power farms and neighbourhoods.

There are now a number of small wind turbine manufacturers, suppliers, and developers producing systems suitable for the New Zealand market. There are over 300 manufacturers of small-scale wind turbines globally.

Size matters

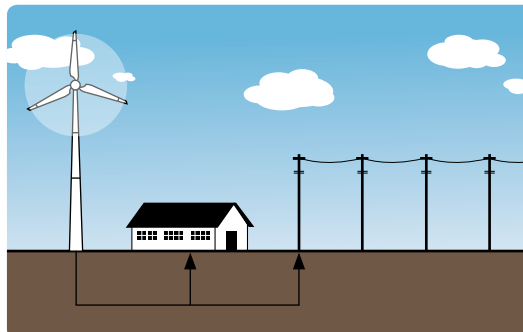
There is a wide range of wind turbine types and sizes suitable for use in rural parts of New Zealand. Micro-scale wind turbines are usually less than 5kW in size; suitable for powering part of your farm or house, or charging batteries. Mini-scale wind energy systems between 5kW and 20kW can provide electricity for a large house or farm, while larger commercial-scale systems using multiple turbines in the 20kW to 500kW range are able to generate large amounts of electricity to be sold to a retailer, end user, or into the electricity market.



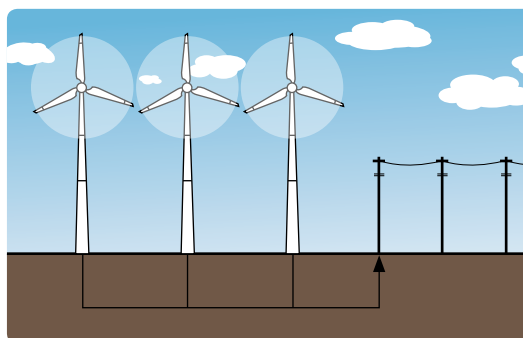
The turbine at Southbridge, Canterbury generates 200,000kWh per year.

“Farmers are ideally placed to gain from wind energy because they have the land”

Different types of network connection



Generation is on the consumer's side of their meter and meets on-site electricity demand first. Any excess is then exported back into the network



All generation is exported into the network and sold to a retailer, another user, or into the electricity market.

Weld Cone wind farm, Marlborough

Farmers Nick and Carole Webby have formed a partnership with Energy3 to construct a 1.5MW three-turbine wind farm on their property near Ward.

The near-coastal site has an elevation of 330m and strong winds. It is less than 500m to the nearest power lines and has good access – the road is less than 5km away, meaning only 500m of new track needs to be built.

Importantly, the project has received strong local backing, with eight supportive submissions from the community during the resource consent stage.

The project gained consent in May 2009 and earth works started in July. It is expected to be operational by December 2009, and will export 2.5GWh of electricity per year back to the local network owned by Marlborough Lines.

Southbridge wind turbine, Canterbury

Southbridge wind turbine was installed in 2005 on a farm near Leeston, south of Christchurch. It has a 100kW capacity and produces 200,000 kWh of electricity a year – enough to meet the annual electricity needs of around 30 average New Zealand homes.

The turbine is owned and operated by Energy3 on land leased from a local farmer. The turbine was bought second-hand from Europe and was installed initially as a pilot. Sourcing second-hand turbines may be one way to lower installation costs and improve the financial appeal of wind energy. Electricity produced at Southbridge is sold back to Meridian, and is connected to the local Orion network.

“Farmers are ideally placed to gain from wind energy because they have the land – they can harness the resource to generate income”, says Energy3 director Ken Humphrey. “The barriers will break down as rural communities see these operating, realise it can be done on a relatively small scale, and seize the opportunity.”

Duelling Banjos Vineyard, Marlborough

Duelling Banjos Ltd owns 158ha at Seddon in Marlborough, used for an organic vineyard and cattle farming. The owners aim to set up a small winery on site, and want to power the operation using wind energy. A feasibility study was carried out in March 2009.

Two types of wind farm were looked at: a large one (capacity 4.2MW) that would maximise power output from the site, and a smaller one (0.9MW) that would cost less to install and service only Duelling Banjos' needs.

Wind measurement showed an average annual wind speed at 30m height, of 7.5 m/s to 8.5 m/s – sufficient for either the large or small option. There were also several options for connecting to the local electricity network. The study looked at the effect on landscape, noise, and interference with communication masts – all potential resource consent issues – and found that a wind farm was viable at the site.



The Weld Cone site in Marlborough, where three turbines are planned. Photo montage courtesy Energy3.

Duelling Banjos is currently working through the resource consent process for a six turbine wind farm. Although the final decision on size has yet to be taken, the project's calculations are based on the use of six larger Vestas V47 turbines. This would give a capacity of 4.2MW providing an annual yield of more than 12GWh – enough to meet the annual electricity needs of over 1,000 average New Zealand homes.

Assessing your farm for wind energy

The technical issues – can it work?

- **The wind.** Wind speed is the most important factor, determining how much electricity your turbine will generate. It is usually measured in average meters per second (m/s). The amount of electricity produced is in proportion to the cube of the wind speed – for example a 8 m/s wind speed will produce eight times as much electricity as a 4 m/s wind speed. This shows why it is important to identify the windiest sites available. Generally an average wind speed of 5 m/s or more is needed to generate electricity on a micro and mini-scale, while larger commercial-scale turbines usually need average wind speeds of 7 m/s or more to work efficiently. Commercial-scale wind developments will usually require long term wind monitoring to establish viability, although for small-scale projects this is not usually necessary.

- **The electrical connection to your property and its maximum import/export capacity.** Wind power systems that meet the safety and technical requirements of the local network are able to connect to export electricity. You should talk to your local lines company as early as possible. There will likely be a charge for the connection. For larger wind systems it will be important to work out whether any additional investment is needed to upgrade or extend the electricity lines or transformers – and how this affects the economics of the project.
- **The track record of the company that is supplying, installing and maintaining your turbine(s).** Look at what skills the staff have and their understanding of the factors that go into making a wind energy system economically viable. What monitoring and maintenance will the supplier offer? You also need to assess the track record of the turbine manufacturer, including how their turbines have performed to date, and what guarantees and warranty support they offer.
- **Consents that may be required.** Depending on the size of your development, you will most likely require resource and building consent from your local council.

Cost and benefits – do the numbers add up?

- **Assessing your power needs.** To determine what sort of system would suit you, first understand your power demand. Talk to your electricity retailer and review your power bills. As a first step, try to reduce your consumption through energy efficiency. Review what your electricity cost is now and also how this may change in the future.
- **The installed price of a turbine system and ongoing maintenance costs.** These can vary depending upon a number of factors, including what type of turbine you install, and how far away the site is from the network connection and for access for maintenance.
- **What price you will be paid for exported electricity and what limits there may be on the amount that can be exported.** It is important to remember that generating electricity for your own use is quite different to generating electricity for financial gain. With the former you are offsetting your own consumption so the value of the electricity is the price you pay for it. Generating electricity for profit means competing on the wholesale market where prices are significantly lower as they don't include the costs of transmission or administration. (Be aware that any electricity you generate will usually be considered taxable. You should clarify your potential tax liability and include this in your calculations. Also consider how your business treats depreciation of capital assets.)

Ideally, a suitable site for wind generation needs:

- an average annual wind speed of at least 5-6 m/s (more for larger turbines)
- reasonable access to the site
- power lines close by
- no difficult resource consent issues.

I'm interested, what do I do next?

If you are interested in generating electricity from wind on your farm, check out the following resources:

- For small-scale wind turbines, the Sustainable Electricity Association of New Zealand (SEANZ) includes a list of companies that may be able to assist you investigate the potential of generating electricity on your farm – www.seanz.org.nz
- For larger commercial-scale wind turbines, the New Zealand Wind Energy Association has useful information at www.nzwea.org.nz
- EECA's websites – www.eeca.govt.nz and www.energywise.govt.nz provide a wide range of advice on energy efficiency and renewable energy.
- The Ministry of Agriculture and Forestry has more information on farming practices and the Sustainable Farming Fund at www.maf.govt.nz

EECA enables organisations to increase their domestic and international competitiveness by adopting energy efficiency and renewable energy practices.

We work with businesses to identify the opportunities for energy management that are available to them and help them develop energy management action plans to make the most of these opportunities.

Good energy management has many benefits for businesses, including lower costs, increased productivity, reduced greenhouse gas emissions and a positive effect on the brand.

We have a particular interest in:

- encouraging new or under-used technology that can make processes more efficient
- projects that reduce greenhouse gas emissions, and
- developing the wood fuel industry.

 For more information contact The Energy Efficiency and Conservation Authority:

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