

Wind Turbine guide

Wind turbines are a fantastic option for you if you have the wind resource, here is a guide to making good decisions for you around wind. We will use products which we sell to show the different options as we have a comprehensive range in wind.

Key

1. Reasons for installing wind
2. Types of wind turbine technology
3. Guide to the components used in wind turbine installations
4. Councils, Lines companies and Power companies
5. Site information
6. Economics
7. Summary



1. Reasons for installing wind

There are three reasons people install wind turbines

1. They want to reduce their existing power bill
2. They want to use it as supplementary generation on their house or vessel
3. They want to use it as a marketing tool for their business stating that they are committed to green technology

Offsetting your existing load is done by installing a wind turbine which produces enough energy to send any excess electricity back to the power grid. You use a grid tie inverter “converts wind energy to Mains power” to produce power credits on your energy meter. There are no batteries in grid connect systems normally so the system will shut-down when the mains power is disconnected

Supplementary generation is a small low voltage generator which charges battery packs. These normally supplement power generated from solar panels.

Using wind as a marketing tool or a point of difference means there are other financial benefits to the installation of a system. Commercially the site might not stack up as a generator on its own but the turbine may add a point of difference for the business.

2. Types of wind turbine technology

Vertical Axis wind turbine



Leading edge wind



Horizontal wind turbines



Wind Direction →



← Wind Direction



Vertical axis wind turbines rotate on the vertical up and down plane like an egg beater. Our range for this type of turbine is 600watt, 1KW and 4KW

Our Turbines rotate at a maximum of 120 revolutions per minute. This type of design is extremely quiet as they spin slow, have six tips where the noise is generated also reducing noise levels VAWT because of the low noise levels are ideal for all types of wind generation.

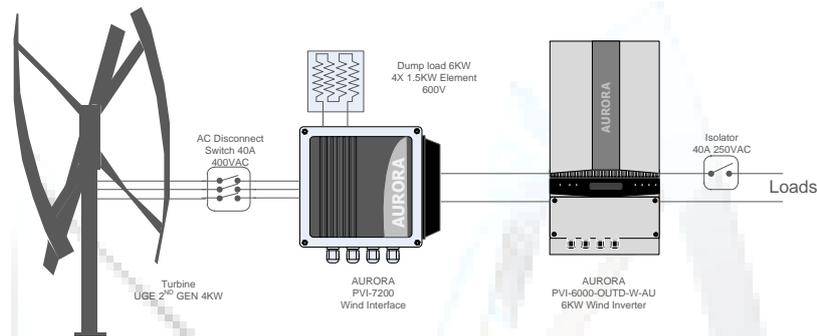
Leading edge wind turbines have the blades downwind from the Pole. This makes the design and maintenance simple and leads to some innovative designs. We supply units from 600watt to 2KW

They are great for rural systems and some commercial sites. The 600watt units are ideal for marine use

Standard **Horizontal Axis Wind turbines** are the main wind turbines used historically. They come in sizes from 200watts-10KW and up to utility sizes 1-5Megawatts. They are efficient collectors of wind energy and are ideal for rural and marine use.

We have turbines for our customers from 200watts to the 10KW turbine pictured left

3. System components



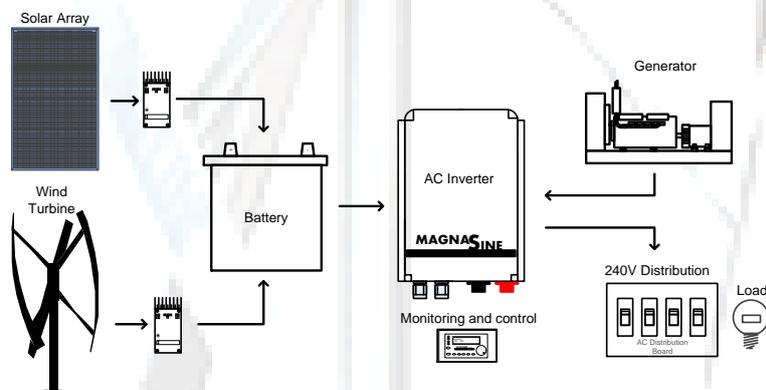
Electrical system

Grid tie system components consist of

1. Wind Turbine normally 400 or 600V wild AC
2. Wind controller box (converts the wild wind energy to useful DC energy) It also controls the wind turbine from spinning apart via an interconnected element load
3. Inverter which converts the DC energy from the wind control box to mains energy. It monitors the mains voltage and inputs it efficiently to optimise the output
4. Cables switches and fuses, Lightning arrestors and other cabling accessories

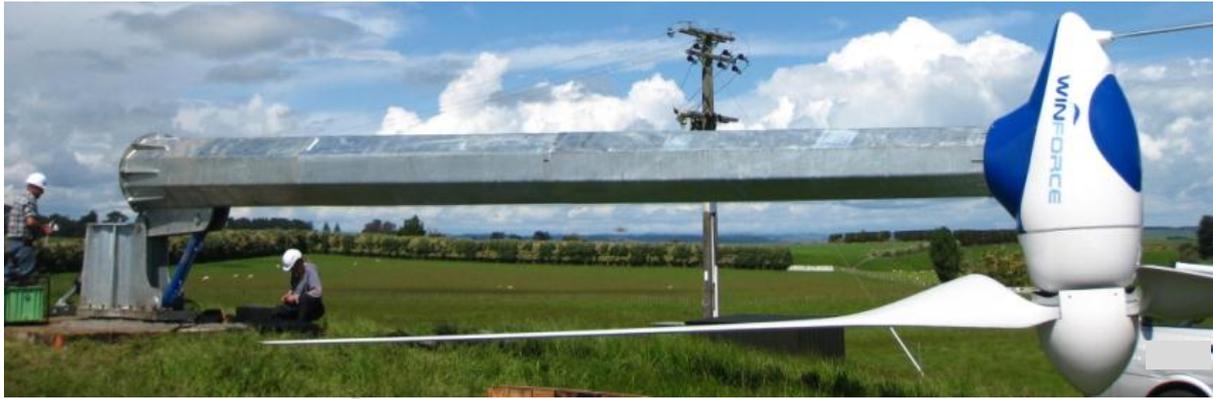
Off grid low voltage systems

Typical Basic Off grid Hybrid power system overview



Off grid low voltage components consist of

1. Wind turbine low voltage either 12,24 or 48Volts DC
2. Either or a
 - a. charge controller is connected across the battery controlling a dumping load element
 - b. Wind control box. Controls the input voltage inline of the turbine and also uses a dumping load element
3. Batteries and or off grid inverter



Mechanical components

1. Pole
 - a. Mono poles are large poles without any support wires
 - b. Guyed poles have a thinner centre pole and a number of supporting wires connected for smaller turbines
2. Foundations are designed to support the pole, guyed poles will have four or five supporting bases either drilled or poured foundations. Each foundation is engineered to meet local wind loadings and must meet NZ standards. These generally need a building permit
3. Pole lifts. Some poles can have mechanical lifting mechanisms as seen above

4 Councils Lines companies Power companies

Every council has different rules interpretations and guides within their district plan. Putting up a wind turbine in some areas may need resource consent if your pole is over 7 metres, some areas that's 11 or 13 metres.

A building permit will be needed for the foundation. Involved in this will be engineer's drawings for the foundation specifically for your soil type and wind Zone.

Lines companies will need information drawings and connection information on the inverters. They will need the certificate of compliance from the electrician and declarations of conformity.

Power retail companies need the compliance number from the lines company. They then send out someone to install a meter for you.

AES has systems in place so all these details are handled simply and easily

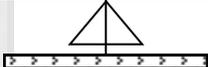
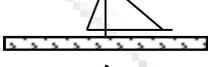
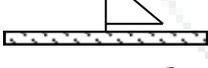
5. Site information

This is the critical part of the whole wind process. The amount of wind determines the overall system budget, it also determines if the whole process is worthwhile. We have in a lot of cases change potential wind jobs to solar as they haven't the wind resource to cope with the potential load.

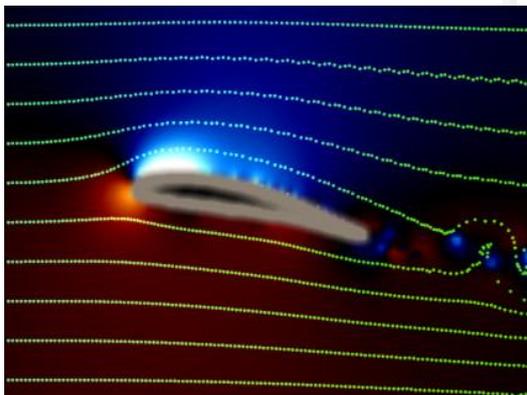
Step 1 How much wind do I have?

We use three systems to determine the potential wind energy at your site.

1. Measure (recommended) we use power predictor wind monitors on site at a cost of \$310 a unit plus GST to measure and record your wind energy for a month to a year. If we do a month we analyse data from other local wind stations to give us a guide on the amount of likely wind we will get over the course of a year
2. Trees (Griggs Putnam index attached) determines the average wind by the deformity of the trees locally

locally	Index	Top View of	Side View of Plant	Description of Deformity	Wind Speed
	O			No Deformity	No Significant
	I			Brushing and Slight Flagging	7-9 Miles per ..
	II			Slight Flagging	9-11 MPH
	III			Moderate Flagging	11-13 MPH
	IV			Complete Flagging	13-16 MPH
	V			Partial Throwing	15-18 MPH
	VI			Complete Throwing	16-21 MPH
	VII			Carpeting	22+ MPH

3. Where do we site the turbine? We use some simple mapping tools to see the effect of placing turbines on site, its useful for trees structures and terrain info



Step 2 How Much energy do you use?

We also determine the amount of energy you use on site, either by your power accounts or a determination of what potential appliances and energy loads you have on site. We have an evaluation spread sheet to make this process easy

Step 3 Match the load wind speed and turbine

Match the load, wind speed to a turbine and price the system. We have a good idea of what areas are suitable for wind. We however cannot right off any site because there is significant wind in places from the top to bottom of New Zealand. Using simple analysis is the easiest option.

6. Economics

The amount of wind you have determines the amount of energy produced by the wind turbine.

A 4kw wind turbine in 5m/s wind for grid tie will produce less than 500 watts on average whereas at 7m/s it could be closer to 1KW or 24kwhrs of energy a day.

The associated costs of wind turbines, the foundations, Electrics, Poles, Wind Turbine, Consents, Assembly and installation can add up to a significant sum.

Factors that contribute to the take-up of wind turbines verses other generation

- High wind area 8m/s wind and above
- Supplementary to other generation
- Some infrastructure already available
- Use of larger wind turbines 10KW plus
- Look and aesthetic of the turbine as well as what the turbine represents

Wind Turbines add to some people the appeal of independence and in some areas reasonable generation, if the numbers and wind speed line up we have the wind solutions to meet your budget.

7. Summary

Wind turbines are a fantastic source of energy if the resource is available. Arguably they can look great as well and gives you the independence of relying less on the power utilities

If the costs seem prohibitive we have cost effective solar solutions for most applications

Please contact Advanced Eco Solutions for more information