

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P)

This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance. Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.



Wind Turbines

If you are thinking about having a wind turbine, and connecting it to the electricity grid, the following pages will offer you some guidance and information to make your choice an informed one. Central West Solar possesses the necessary equipment and experience to offer a solution from concept to completion. Our in house installation service means you will receive excellent service before, during and after your installation.

Grid connecting a wind turbine is not as simple as one might think. Careful attention to detail and planning is required to achieve the best results. It is just not enough to suggest our place is "always windy". Not all wind turbines are suitable for grid connection. The output of the machine should be considered with regards to keeping it connected to the grid via the controller and inverter. Lots of potential energy can be lost by not observing this design parameter

Position of the tower and the towers height is also an important consideration. Typically a block of land in excess of 1 acre would be considered necessary to have the clean wind required for best results. Turbulent air will lead to unsatisfactory production of energy and place excessive wear on the components due to the fluctuating speed of the blades and inconsistent output of the alternator. The power of the wind increases by a factor of 8 when the wind speed is doubled. The opposite is also true when the wind speed decreases. The practical implications of this are that the typical tower height is a minimum of 12 m. If a decision to install a wind turbine is made then the additional cost of additional height will be offset by an increase in energy production.

The question of noise needs to be taken in context of the actual location of the turbine tower and its height. If the basic guidelines of positioning the tower are followed, then the level of noise at that height and distance from a residence will not be a problem. In high wind areas, the noise of the wind is often louder than that of the turbine.

N.B

It is necessary to obtain permission from your utility company before connecting a small scale generator to the electricity grid. Also it is advisable to discuss with your local council any planning permits that may be required. Central west Solar will assist in these matters

Estimating Your Wind Resource

110 summer st Orange NSW. 2800

Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au

Email: info@centralwestsolar.com.au

Licensed Electrical Contractor: 62790C

Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
F1293

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P) This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance .Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.

To help determine the suitability of your site for a small electric wind system, you need to estimate your site's wind resource. The wind resource can vary significantly over an area of just a few miles because of local terrain influences on the wind flow. You can use the following methods for estimating your wind resource.

Consult Wind Resource Maps

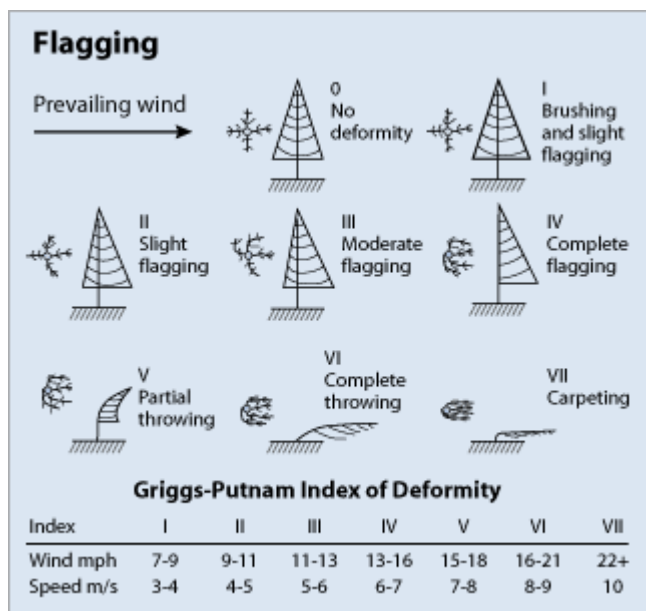
As a first step, you can consult a wind resource map, which is used to estimate the wind resource in your area. The NSW Dept of Water and Energy has a wind atlas available at www.dwe.nsw.gov.au

Obtain Airport Wind Speed Data

Another way to indirectly quantify the wind resource is to obtain average wind speed information from a nearby airport. However, local terrain influences and other factors may cause the wind speed recorded at an airport to be different from your particular location. Airport wind data are generally measured at heights about (6–10 meters) aboveground. Average wind speeds increase with height and may be 15–25% greater at a typical wind turbine hub-height of (12-19) meters than those measured at airport anemometer heights.

Observe Vegetation Flagging

Flagging—the effect of strong winds on area vegetation—can help determine area wind speeds. Trees, especially conifers or evergreens, can be permanently deformed by strong winds. See flagging illustration on this page for more information



Use a Measurement System

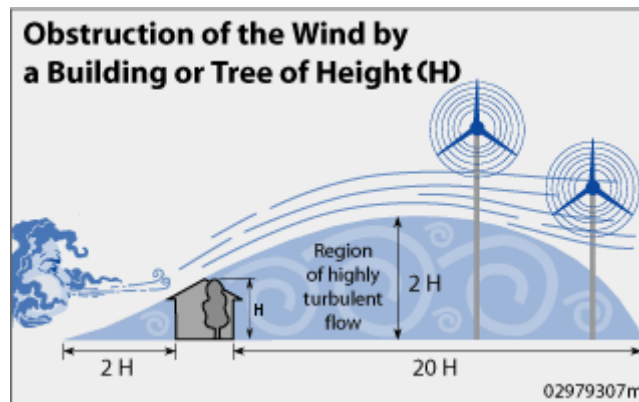
110 summer st Orange NSW. 2800
 Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au
 Email: info@centralwestsolar.com.au
 Licensed Electrical Contractor: 62790C
 Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
 F1293

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P)

This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance. Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.

Direct monitoring by a wind resource measurement system at a site provides the clearest picture of the available resource. Wind measurement systems are available for costs as low as \$600–\$1,200. Central West Solar has this equipment and provides wind assessment reports from \$275

The measurement equipment must be set high enough to avoid turbulence created by trees, buildings, and other obstructions. The most useful readings are those taken at hub-height, the elevation at the top of the tower where the wind turbine is going to be installed.



Obtain Data from a Local Small Wind System

If there is a small wind turbine system in your area, you may be able to obtain information on the annual output of the system and also wind speed data if available.

Wind speeds in most of the world can be modeled using the **Weibull Distribution**. This statistical tool tells us how often winds of different speeds will be seen at a location with a certain average (mean) wind speed. Knowing this helps us to choose a wind turbine with the optimal *cut-in speed* (the wind speed at which the turbine starts to generate usable power), and the *cut-out speed* (the speed at which the turbine hits the limit of its alternator and can no longer put out increased power output with further increases in wind speed).

Weibull Distribution and Wind Speeds

110 summer st Orange NSW. 2800

Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au

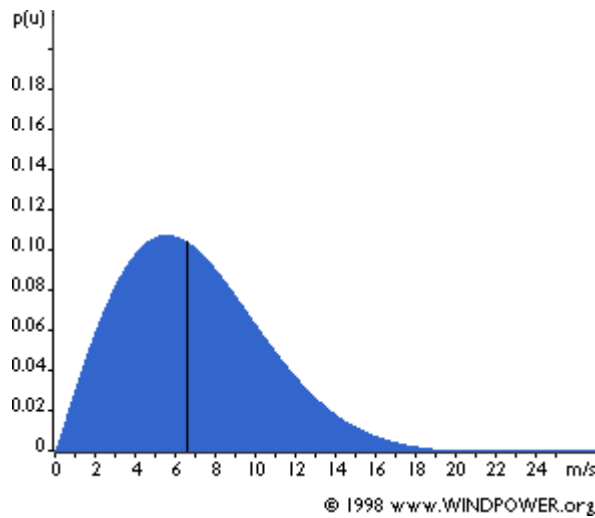
Email: info@centralwestsolar.com.au

Licensed Electrical Contractor: 62790C

Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
F1293

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P)

This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance. Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.



Example Electricity Generation Calculation

We can calculate the power generated by a wind turbine at different wind speeds as long as we know the diameter of the turbine rotors, and the overall efficiency of the turbine generator (below the [Betz Limit](#) of 59%). Then we simply multiply the number of hours at each wind speed by the power generated at that wind speed to give us the number of Watt Hours of power generated

Looking at the **TECO 2500**- this domestic wind turbine has a rotor diameter of 2.70m, a *cut-in speed* of 3.5m/s, and a *cut-out speed* of 14m/s. Assuming an efficiency of around 35% and an average wind speed of 6 m/s the total electricity output is given by the **Weibull Distribution** is around **4300 kWh** per year.

Power-measured in watts (W) is the rating of how much electricity the wind turbine can produce at a given wind speed

Energy- measured in Kilowatt-Hours (Kwh) is the rating of how much electricity the wind turbine can produce over time. This is the unit that the utilities use to bill you with

System Design

110 summer st Orange NSW. 2800

Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au

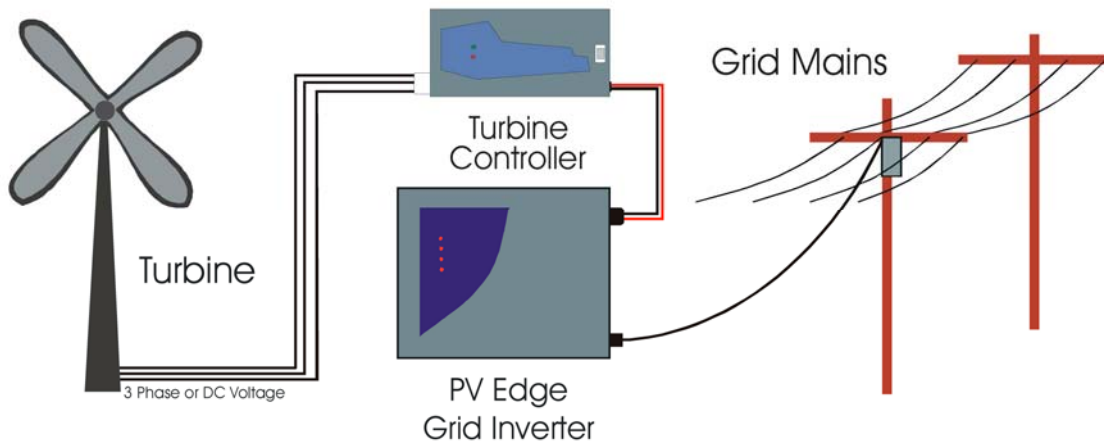
Email: info@centralwestsolar.com.au

Licensed Electrical Contractor: 62790C

Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
F1293

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P) This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance .Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.

The components of a typical Grid Connected Wind Turbine



110 summer st Orange NSW. 2800

Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au

Email: info@centralwestsolar.com.au

Licensed Electrical Contractor: 62790C

Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
F1293

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P) This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance .Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.

Wind Turbine Towers

Lattice



Guyed



Mono



Lattice

Lattice towers are made by welded steel profiles. It is usually used for 2kw to 20kw wind turbines. The height of lattice tower is usually from 12m to 36m.

Guyed

Guyed tower was made by narrow steel pipe and supported by guy wires. It is usually used for 500w to 5kw wind turbines. The height of guyed tower is usually from 6m to 18m. Can be lowered and raised with a winch and gin pole arrangement

Mono

Mono pole tower also named free standing tower. It is made by steel pipe with a free standing design. It is used for 2kw to 50kw wind turbines. The height of mono tower is usually from 12m to 36m. It is lowered and raised using a hydraulic ram arrangement

110 summer st Orange NSW. 2800

Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au

Email: info@centralwestsolar.com.au

Licensed Electrical Contractor: 62790C

Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
F1293

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P)

This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance .Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.

What does it cost?

There are many factors to consider when pricing a system incl tower type and height wind turbine power(size),civil and planning costs, equipment(inverter and controller)and installation labour . A basic <1kw turbine connected within 100m of the grid could be supplied and installed from \$12,000

Rebates/ incentives

Small scale wind turbines are eligible items under the new Solar Credits scheme. More information can be found by visiting www.centralwestsolar.com.au

As an example a turbine rated at 2500watts installed between now and 2011 would create 80 R.E.C.S. The value of these (Renewable Energy Certificates) fluctuates but at \$40 each (average value over the last 2 years). the owner of the system would be eligible for a discount of \$3,200.

Feed in Tariffs

Solar/Wind Bonus Scheme for NSW announced

The NSW Government announced details of a new Solar Bonus Scheme for NSW, to commence from 1 st January 2010 The Scheme is a Gross feed-in tariff model. A feed-in tariff provides payments for electricity produced by small scale distributed sources like solar photovoltaic (PV) and wind systems when their output is fed back into the electricity grid. The NSW Solar Bonus Scheme is the most generous of any of the State schemes currently on offer. The Scheme will pay the owners of eligible solar PV systems 60 cents per kilowatt hour for the renewable energy they feed into the national electricity grid. In other words, PV and Wind system owners will get paid for all the energy that their PV/Wind system generates . Key details of the NSW Solar Bonus Scheme:

Key details of the NSW Solar Bonus Scheme:

- It will operate for 7 years
- It will pay 60 c/KWh for electricity that is generated (equivalent to around 3 times the standard NSW electricity price)
- It will be payable to energy customers with solar PV systems up to 10 kW in size and with a maximum of 160 megawatt-hours of electricity consumed per annum
- It will commence 1 January 2010

110 summer st Orange NSW. 2800

Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au

Email: info@centralwestsolar.com.au

Licensed Electrical Contractor: 62790C

Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
F1293

Central West Solar is proud to announce their recent elevation to BP solar certified installer status (C.I.P)

This process took many months to complete and recognises our promise to provide superior workmanship with a strong focus on safety and legislative compliance .Our commitment to on-going training and superior product knowledge, combined with BP solar quality and performance ensures that our systems and customer service meet the highest standards.

Reference List

1. New South Wales Government, Water and Energy 2009, Renewable Energy: Wind Power, Anyone who has struggled to stay upright. Available from <http://www.dwe.nsw.gov.au/energy/sustain_renew_wind.shtml> . [14 October 2009]
2. AEOLUS Wind Turbine 2009, Types Of Towers, Aeolos provided three types of towers for different model wind turbines. Available from <<http://www.windturbinestar.com/wind-turbine-tower.html>> . [14 October 2009]
3. U.S. Department of Energy: Energy Efficiency & Renewable Energy 2009. Estimating Your Wind Resource To help determine the suitability of your site for a small electric wind system. Available from <http://www.energysavers.gov/your_home/electricity/index.cfm/mytopic=10920> . [14 October 2009]
4. REUK.co.uk 2009. Wind Speed Distribution Weibull, Learn about the Weibull Distribution which models wind speeds. Available from <<http://www.reuk.co.uk/Wind-Speed-Distribution-Weibull.htm>> . [14 October 2009]
5. Latronics 2009, Turbine Controller 'Wind & Water Power'The Latronics® Turbine Controller. Available from <<http://www.latronics.com/turbinecon.html>> . [14 October 2009]

110 summer st Orange NSW. 2800

Ph: 02 63631527 Fax: 02 63628065 Mobile: 0414 986 830 Internet: www.centralwestsolar.com.au

Email: info@centralwestsolar.com.au

Licensed Electrical Contractor: 62790C

Fully Accredited by Clean Energy Council to Design and Install Grid connected and Stand Alone Solar Power systems:
F1293