



HOME

D.I.Y. Wind-Solar "Off Grid" ARTICLE

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This page URL: <http://windsolarhybridaustralia.x10.mx/windgridtied.html>

## (D.I.Y. Article)

### Wind turbine Grid tied - pros cons

First, a domestic home "wind" grid tied is an extremely "green" concept...although a little heavy and awkward to set into place...

The type of social and talking point for a party...

If you erect a wind turbine you must locate it at least 80 meters away from any neighboring residence because wind turbines are noisy!!!, It's when they get near the rated wind speed(12 mps) though most people will have closed their windows because of wind.

A similar to stack-able system is using 3 plug-able wind inverters with three small AC wind turbines totaling a 1.2Kw-1.8Kw max wind input that will perform nominally(aberratively) at the value of a 3Kw solar grid tie (and around half the cost DIY - it also does not involve electrician wiring).

The 12v AC 3-phase turbine to use is the only one able for price and output and quiet enough for suburbia (5 rotor blades and a rigid tail system) particularly if mounted 15 meters up as it should/must be. A stick arc welder is often better but may require a 10Kva portable generator(domestic supply pole mains inverter boxes do not handle welding well particularly in summer and require a high amp outlet plug if such wiring is supplied in the house wiring - happy burning).

Always use 6mm<sup>2</sup> wire (12v insulator type) or it cannot carry charge well enough or safely.(for the plug-able inverters you must purchase a "separate" but rated dump resistor kit(costs nothing much)).

**Remember, inverters with turbines and their systems such as AC(and phase type) or DC and voltage and amperage/wattage must match!**

The only trouble i had with the turbine was the bolt holes were exactly the same diameter as the bolts so it required honing the hub bolt holes a little.

A low RPM horizontal 2Kw wind turbine(or high production down low speed) has the same production as a 4Kw solar grid tied system, and twice the economic savings because all tariff periods are covered regardless seasonal differences!!! Remember a wind turbine must be located "at least 12 meters high" free of wind path obstructions, but "the proper height for higher faster moving air percentile is up at 15 meters"!!!

...If there is one thing as "must know" a DIY person should learn! It is Arc welding and MIG welding mild steel!...

Note:The joining weld type to use is a "root gap bevel" with "penetration run" amperage, it should also be a "double layer triple run".

A stick arc welder is often better but may require a 10Kva portable generator(domestic supply pole mains inverter boxes do not handle welding well particularly in summer and require a high amp outlet plug if such wiring is supplied in the house wiring - happy burning).

note: 8m of steel at the required size SHS 65 x 65 x 5.0 ( weighing approx. 64 Kg ) or ( "NB 40 EH" - Extra Heavy pipe ) is around 140AUD local merchant.

Here is a commercial "mild steel pipe data sheet" well laid out for understanding project steel selection, Kg/m, size, wall thickness mm ... . The complete tower would vaguely weigh around 1000 - 1200 Kg and have around 5 m<sup>3</sup> of cement("n20 mpa" ordinary post hole cement) and fill mix ("half" a square ended box shape calculates mildly more than an equilateral with two sides of 180cm(1.8m) and is approximately 4.86 m<sup>3</sup> as half). You only need around 1.5 m<sup>3</sup> (over 1 tonne of cement) of cement to weigh down the tower.

Getting concrete is a problem of cost. 1 tonne (Metric) (tonne of concrete) Equals : 0.42 cubic meters (m<sup>3</sup> / concrete).

Some "internet sites" are better than others for summing DIY concrete for DIY projects, this one is helpful(Australia - as this article is directed at) Concrete types and pumping and sizes. 1 m<sup>3</sup> is anything around 250 - 300 AUD at least from a truck so a mini concrete pump is a good idea. Ignore the other m<sup>3</sup> recommendations in this document and place at least "1 tonne of cement" around the base tip 3 meters down in the hole, then when it has dried, pack earth down hard until it reaches to 30cm from the 3 base bars(horizontal) of the tower level with the top of the hole. Bring the pump truck in again and cover the base bars and surround with approx. another tonne.

In the "tower diagram"(showing only two struts of the three) at left or below(whatever it got to on the page), the pink strapping struts are an underground part of the tower and welded on the tower before erection.

There are more of these connecting to the base of each strut of the tower tripod and the strapping and tower corners(total of six strap struts) are later encased by cement fill after tripod tower erection, making the sides of the triangular hole for cement fill and tower base strapping at least 180cm - 1800mm length.

The added bright green stripe is an extra strengthening length of SHS box steel(same SHS dimensions) around 5 meters long stretching from the "tower tripod(lower 2.5 meters worth beside this)" tower section to the upper "parallel-uprights-tripod(the other 2.5 meters worth beside it)" second section on each of the three tripods' main upright struts(3 pieces). The added struts are to prevent excess strain on the jointer welds between the two tower sections, it is particularly required with a 150Kg top seated object generating vibrant leverage on a 5 meter lever against those upper and lower tower, levels', jointer welds in hurricane or typhoon force or high winds.

All welds on the tower can be considered to require being double layer root gap welds.

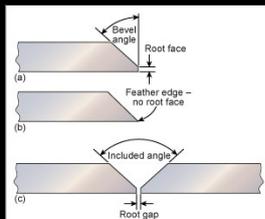
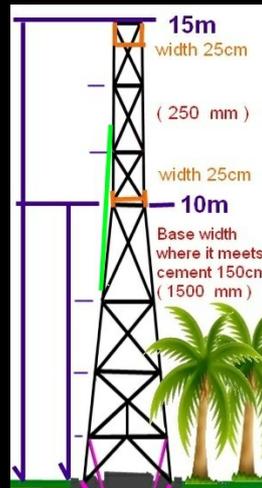
To erect the tower after construction will mean some minor damage to the edges of the triangular hole, and keeping it in place using three temporary guy cable or chains (during and after cement pouring to encase its base) after adjustment of the guys for plumb bobbing the tower for vertical balance accuracy down its center.

To hold the tower in place you should have the area space to drive pin stakes in around it to fasten 10 - 15m tensioned replacement-boat-winch-cables(cheap trick) to hold the tower directly in gravity line while the cement dries in the base.

There are usually two types of turbine connection base on 5Kw wind turbines. 1. a piece of pipe socket requiring a 20cm - 40cm (200 mm - 400mm) long piece of vertical pipe (10mm wall minimum) properly attached to the top of the tower, or, 2. a flat faced circular seat directly centered under and part of the swivel seat of the main body of the turbine surrounding where the two high voltage/amperage output wires are to be fastened, this requires making a set of steel plates (at least 30 mm thickness) to fit above and below the top triangle bars of the tower top. This is to seat, clamp and adjust the horizontal plane of the turbine base where it is bolted to the pair of steel plates clamping the top triangle bars of the tower tip. Such a steel plate is best designed from the tower top bars and turbine bases' shape and size after both are actually available to measure. Also beware of where the wires leave the turbine swivel system and any custom objects must be cleanly finished to prevent abrasive damage to cable insulators, whether at installation or over time by vibration.

Getting holes cut in thick steel plate and plate cut to a specific shape can be done at a metal engineering shop by experts with Oxy-acetylene or Oxy-LPG cutter, after, you will need to clean the cut edges with either or both a large coarse file and angle-grinder.

note: Oxy-Acetylene welding is not practical for the purpose of tower building and unnecessary danger and expense.



If there is one thing as "must know" a DIY person should learn! It is Arc welding and MIG welding mild steel!

This is because a tripod tower of Eiffel type of 15M height(18 meters long - 3 meters below ground in fill cement) can be welded with 4mm box(square tube) or round tube steel from a local steel merchant for around 2000 AUD or less, and to acquire the skill means TAFE or adult learning center out of hours course.

Here is an EXAMPLE of a MIG welder supplied on market in Australia can be used. Usually it requires a "8Kva" power petrol generator because the current draw during use is too much for a house electrical supply!!!!

130Amp MIG Gasless Welder Welding Machine Tool 10Amp Plug DYNAMIC POWER

And perhaps a helmet ???

Here is ebay.com.au search for welders

### Pros and Cons

5Kw wind turbines grid tied(they are 24/7-365), why people grid tie solar except a little with a wind turbine hybrid system e.g. 1Kw solar i do not understand!

When i finally learned the limitation of solar panels i found winter sunlight and temperature in a moderate climate as Australia panels only produce for 4 hours at 50%-60% of max rating e.g. and down to 30% when obscured by clouds. Then people get up and all leave before light in winter and get back after its dark.It leaves summer.

In summer its 80% power for 8 hours and down to 60% in white cloud and 50% grey.

5Kw panels grid tie can produce the same old pre-tie grid bills as a shock and everyone thought that would leave!

Answer is nothing after dark when people are finally home, i'd say half the recipients of grid-tie in Australia are ripped off by that point of night time alone.

Another is they need at least a 5Kw max-rated PV system or its ritually too little. And a final 10%, their roofs have no good position in suburbia and almost all installations except these bad positions are lying flat not to equator for latitude!!!

If you have at least 5 acres on the edge of town(up to 3Km out of town) and can locate the turbine 80 meters from neighbours dwelling, a matching 5kw wind-grid-tie-inverter and 5k turbine (240v / 380v Australia) (110v/120v US UK) at 4-6m/s wind will often trickle 500w to 1Kw. A minimal of 1-1.5Kw panels on hybrid grid tie inverter assists.NOTE!: For meteorological reasons a wind turbine must be up "12 meters high MINIMUM"(much better 15m), nominally for cost 15 meters correctly!

(best would be 5Kw wind AND 1.5Kw solar hybrid grid tie).

It is because a hot water heater is 2.5Kw(usually, some domestic can be 1.5kw), cooking is between 4-6Kw(sometimes 12kw), washing machine is 4kw loaded surge, air-con is 3-5Kw current draw.



A big feature of the problem of fitting a grid tie inverter is the national laws regarding specifications of devices imported (around 50% of its market), one such being "islanding" "anti-islanding" and meter reading and correct wiring(grid tie and hot wire e.t.c. are complex and require an electrician!). With wind turbines it is important to understand "dump load" regarding anti islanding law in Australia, and understand input device matching parameters of voltage, Kw, Kva and by process and metering.

This article does not beat the "Achilles Heel of grid tied" anyhow, its not enough or costs too much in batteries.  
Article: [Beating the Achilles Heel of Grid-Tied Solar Electric Systems](#)

Below are some links to some products by companies that specialise in these types of system.  
Understand that at 4 meters per second a 5Kw wind turbine produces only 500w approx. and at 6 meters per second wind only around 1Kw but it is often reasonably constant at 12 meters tripod "Eiffel type" lower height(wind does stop and is spasmodic but not severely)  
It is 24/7-365!!!  
A 5Kw wind turbine generally weighs around 150Kg.

## Easy 2Kw wind grid tied

Remember, to use a grid tie inverter requires your meter to be changed(to a unidirectional or SMART meter) to allow produced energy to be measured also as it is outgoing as excess!  
Any inverter if connected into a house circuit by electricians modifications is "between the meter and the fuse box fuses", i.e. if you wanted to use a 3Kw wind turbine you could get an electrician to simply wire in a short 1m of 15 amp wire and "15 amp socket(3.7Kw - 3700w)"(and by law a 15 amp fuse to the box) so you could unplug at will your 4Kw inverter if it were on a normal house-industrial 15 amp extension cord.  
The easiest method of covering 24/7 365 costs of implementing a grid tied system is understanding a house normally has 10 amp circuits @ 240v.  
10 amp @ 240v = 2.5Kw (2500w).  
This means it is not a good idea to plug an inverter into a 10 amp extension socket board if it will get to 2500w , and disastrous if the wind turbine can reach beyond it!

Here is an example of a 2Kw rated wind turbine that can be plugged to house circuit because it is only 2300w maximum!  
NE-2000 2Kw wind turbine 48v(don't forget to match input voltage to wind turbine inverter and use a recommended dump load resistor)  
note: ALWAYS read feedback information on these online store sites, some traders are genuine but do have their share of trouble.

**WARNING!** the above turbine is a "48v". This means that at 5% loss on 30 meters of cable(x2 a red , a black is 60 meters) it will require 35mm<sup>2</sup> copper electric cable to carry 3Kw. Translated, around 1000 AUD of cable.

THAT is why you should use a minimum of 96v rated wind turbine, it only requires 60 meters total of 16mm<sup>2</sup> cable "6 AWG" from the turbine to carry 3Kw at 3% loss!  
Again, a 96v 4Kw turbine can carry at 5% loss for 30 meters on 16mm<sup>2</sup> cable "6 AWG" (note: 96vdc turbines operate in a 90v to 150v range).

Consider this is only at the rating speed and output very top amperage that loss occurs, and 90% of time of the operation of a wind turbine, the current can be carried by this cable size.  
It is expensive, but worth it (96v on 16mm<sup>2</sup> or above Kw and voltage size with appropriate 3-5% loss max cable), and not to worry, most manufacturers have variants of their models at a number of different voltages available.  
Cable size to volts, amps, watts

Cable must be "XLPE type" with size choice minimum of (120V 2% loss 4#AWG) 25mm<sup>2</sup> for 30 meters to a bare-bones size at 30 meters of (120V 4% loss 7#AWG) 16mm<sup>2</sup>  
REMEMBER, a wind turbine is an AC generator more often than not including when its final output to its sender terminals is DC, the output is first rectified from AC to DC. That DC is "oscillating DC" because AC electric generators oscillate voltage-current.

Another point about wind turbines is they are usually three phase AC generator inside but are listed as DC or out-putting DC current finally. This because there is a rectifier inside the housing(basically alike diode set). The type of rectifier is more of a selenium industrial type to handle high voltage and amperage.  
Hence it will be advertised as DC, and only two wires or terminals protruding their +plus and -minus(if ever a third it would be the generator earth).

The more common life of wind turbines

Remember, any turbine used should be on the higher side of wattage closer to 1000w(above 500w) production at a minimum wind speed of 6 mps(meters per second) on its chart where much of the benefit is (at fifteen meters tower height that translates to 8 mps roughly - environment and idiosyncrasy of practical meteorology - wind stations "published" measurements are usually only at 6m height - others(in data sheets) are next one up e.t.c. in increments known as "percentiles").

And the wind turbine should not reach more than 2300w for a 2kw(can then use 3000w inverter and 10 amp house plug) and no more than 3500w(use 4000w inverter) for a 15 amp wired solution.  
example: 3000W grid tie inverter, on grid inverter, grid connected inverter, according to UL1741, IEEE-2000 standards, for wind, solar system

This establishes the point that on the end of a grid tie inverter cord is simply as good as household plug!  
All it is about it, is a. whether the circuit can take the input, b. whether the inverter is stackable(at 1500w rated turbine for input and above NO, it is not stackable generally).

All in all, stackable - pluggable grid tie inverters only go to 2000w. And the annoyance is fitting inverter to turbine at price and acquirability. Than building a suitable tower.  
If it can be done, do not dip below 2000w wind turbine size! It requires to make the savings back!

NOTE: The above tower diagram for the 5Kw tower only require 50mm x 50mm x 4mm(wall) SHS for 2 and 3Kw wind turbines.

Of Kw hour production, a 2Kw wind turbine at 15m tower height should match the savings and production of a 4-5Kw solar. This would probably require 5000 AUD to implement D.I.Y.(DIY) - and y'oll sweat!!!

For this(not required except in strange cases), ask about stepping power into the input voltage and current bracket for an Australian approved solar inverter.  
3kw wind power controller with dumpload, used for 2kw wind energy system

60-550V DC input, 190-260V AC output, top quality grid tied 5kw wind power inverter for wind system only

variable pitch wind turbine 5kw 48v, 56v, 120v, 240v, 360v working voltage

240v 5kw wind turbine

[demingpower.en.alibaba.com](http://demingpower.en.alibaba.com) - This company makes grid tied Hybrid inverters

To understand "DIY, Do It Yourself" importation process with no middle man refer to the index page article of [windsolarhybridaustralia.x10.mx](http://windsolarhybridaustralia.x10.mx) relating ACBPS customs "Cargo Support" ICS internet site VPN, and IE browser wallets for personal digital certificates from a registered CA(certification authority).

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