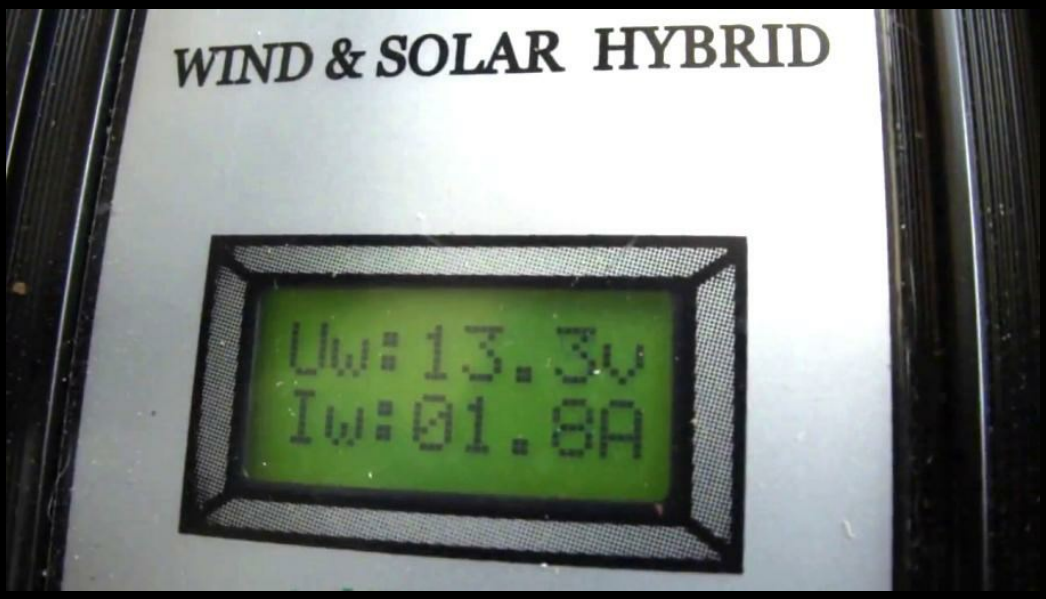


Wind Grid Tied (Domestic) DIY

page URL: http://windsolarhybridaustralia.x10.mx/12voltwindsolarhybridaustralia.html

DOWNLOAD This web Page DIY 12v Wind Solar Hybrids as a PDF document
http://www.pdfspot.com/

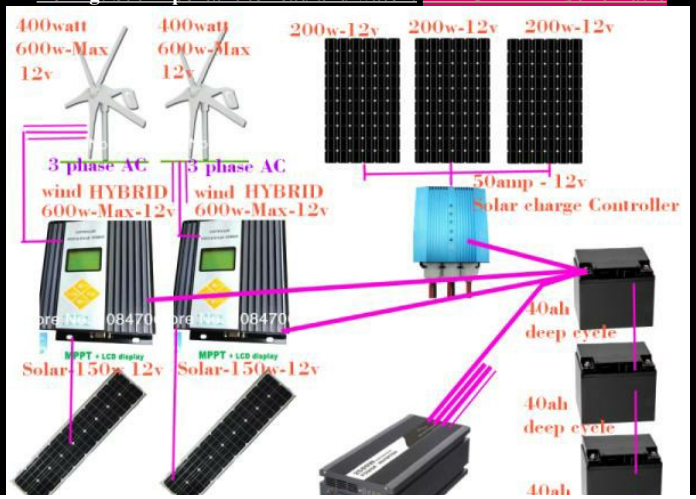
Battery Bank Size AH-Kwh (Amprere hour - Kilowatt hours) Caculator

PICTURE: A "2500w 12v-DC to 240v AC inverter" can operate a "700w microwave oven" to reheat food and boil a kettle under 2000 watts safely for 5 minutes using a small 4 battery bank of 40ah each in parallel

A simple Example of a wind hybrid parts in 12v system

:: Back to Home Page ::

Boring! but important to read and watch! DIAGRAM - schematic



The "bright blue solar controller In The Diagram above has been changed to a 60amp LCD for panel debugging safety for DIY" (All controllers whether wind or solar should be "programmable" LCD that allow "customised control of the float voltage setting at least")

Note: One technique is stackable parallel inverter systems , these inverters can be put together scaled to produce a large output off grid system but are hard to find available and also often 48vDC input systems.

Link: Queenslands' story of price regulation and "FIT pay back" reliability

The Queensland Competition Authority will today recommend a 13.5 per cent increase to prices in its draft determination for 2014-15.

.....

About 70 per cent of the power price increase has been caused by green energy schemes; prices would have risen by 5.6 per cent without them.

.....

Households will be slugged $240 annually to pay for the power produced by rooftop solar systems by 2015-16, almost 15 per cent of the total price.

The Government has cut the feed-in tariff available to new solar households from 44Â¢ a kilowatt hour to just 8Â¢.

LINK (PDF): 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)** paricularly if mounted 15 meters up as it should/must be, (top turbine of the three), the lowest of the three will sit at (approx. only) 11.5 meters on the tower with around 11 meters the lowests horizontal mount support bar(around 90cm long). (Remember, this is all DIY). Always use 6mm^2 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 near eqivalent(slightly bigger) in "48 volt system" **(can use more batteries tuned to custom size with 1Kw output p/series line of four)** would be this:
1200W-Wind-Power-Generator 48v
Wind Turbine 1Kw(1.5Kw abs. Max input)LCD Hybrid 48v wind controller (with 300w solar max input)
LCD 30amp Solar Charge controller 1.5Kw solar (1600w Max)
and solar panels you obtain by building or online delivery.

Next , a possible separated use.
You would want for no more than a 1.6Kw element, and probably for energy consumption calculations(to suit no more than 15% - 30% discharge battery drop) no more than 80L hot water system and would require a 3500w inverter(you can find on ebay.com.au).
Also a standard size pair of upright fridge and freezer can be run together on it too.
1.5Kw element is 120 amps @ 12v approx for an hour, and, to prevent overdischarge beyond 30% DOD = 120 x 3 = 360amp/hour of batteries = (4 x 40ah battery = 160ah) x 3 lines of 4(a line makes 48v) accumulators = 480ah total @ 12v storage and the extra is for fridge and freezer and perhaps sundrie item work.

**** NOTE: The above 12v system with "four batteries connected in parallel" puts a heavy load on the four, of as much as 500w output each battery(only a violence 12v system specific!), this action is unfavorable in higher voltage but small battery bank systems such as 48v mentioned here, so each battery in a line for life-cycle preservation should only output 1Kw per "series line of 4 batteries in 48v" = 250w output maximum p/accumulator.
(PDF) Rheem Hot water guide
(PDF) Rinnai Hot water Systems info

Note: (1Kw = 80 amps @ 12 volts) (1Kw = 40amps @ 24 volts) (1Kw = 4.1 amps @ 240 volts) (6mm^2 carries 50amps @ 12v and can carry 4.1 amps @ 240v - but insulators may not have good enough rating on 12v wire!)
watts / volts = amperes
EXAMPLE: 1000w / 240v = 4.16666666666666666666666666666667 amperes
EXAMPLE: 1000w / 12v = 83.333333333333333333333333333333 amperes

This article is for a small 1Kw 12v system to do minimalised size critical lifestyle activities once a day such as cooking and operate a fridge 24hr's plus a little extra, nothing more!!!
During winter the 920w of solar panels will produce in good weather 750w for 4 hours a day between 10am - to - 2pm,
in summer 750w for 10 hour a day from 8.30am - to - 6pm
In bad weather in the same hours, around only 400w from the solar panels.
The 2 wind turbines will normally produce usable from MPPT a total of 100w - 200w in the spasmodic light breezes for around 8 - hours worth a day.
Because on a dark overcast day(during before mentioned hours) only 500w is nominally generated by the wind solar hybrid system, a device such as a 1.5Kw grill cooler would draw 20 amps from each of the four batteries to make up the missing one Kw. With only 4 x 40ah sealed lead acid accumulators this means it has used its daily ration to 30% DOD.

It would require 12x deep cycle 40ah batteries **(correct name is "accumulators")** for three separate sets of this system to operate a seriously slimmed down house life-style and only quite produce enough electricity. Also 12v can only output 2000w (2Kw) at absolute maximum safely because it can only use a maximum of four batteries(because they must be in parallel NOTE! WARNING! this does not change because of 6v deep cycle batteries because it 6v batteries use 3 cells not 6 in a 6volt deep cycle battery)!

Note: Because 12v 250ah deep cycle batteries are much larger they have a larger output allowance (as a set of 4 maximum in parallel) and can put out 3Kw, 60 amps each @ 12v safely. It's just not considered good practice for heavy current draw usage for life-cycle time of the battery. This why large "2v" single cell deep cycle batteries in series set and lines requires to be used for more normal household lifestyle operation.
Because of cost , transport and handling, these massive "2v" are really only applicable almost to "12v" off grid power systems, they have a much higher amp through-put for usage and charging.

NOTE: There is such a thing as 2v deep cycle single cell batteries, these are placed in "a row of six in series(for 12v)" not parallel and have ampere hour ratings of as much as 3000ah the biggest. If this system used 2v deep cycles it would be best to have 12 batteries = 2 series rows of 6, the two rows joined in parallel (around 500ah each 2v battery appears cost effective and can use a 5Kw inverter).
It costs approximately 2500-3000 AUD for 12 x of these at around 500ah size, and weighs approximately 500Kg which happens to be transportable in an ordinary utility vehicle , Import at such a low price is only possible DIY(Do It Yourself), and also around 500AUD to setup a VPN online account with the ACBPS Customs Cargo Support system to fill out an import N10 declaration and pay duty+GST (all filed and payed electronically). The annoyance is using bank TT(Tele Transfer) rules and rates. [SEE THE MAIN PAGE].

!!! Items below 1000 AUD do not get charged a tariff by ACBPS customs dept. and is why they can be bought online easily from overseas.
Items mildly over 1000 AUD require filling out a SAC declaration for ACBPS customs dept. to pay GST and tariff.
Unless you are successfully declared crippled and a charity organisation the same as the governement you do not have any hope of tariff exemption or discount although this may not be available in the future because recently the government has said it is considering collecting from the dead post mortem for tax and other duties, so the government may be paying these too in future (article:Christopher Pyne suggests collecting HECS debts from dead students as way to help budget).

With reference to cost and import in an Australian perspective, there are two sites useful for parts, bit and pieces although nothing replaces local steel and aluminium merchants for pipe truthfully because it is fundamentally a job beyond hardware stores for pipe and metals (engineerig / formwork).
"ebay.com.au" is well known to most people and likes to use a VISA payment system on line. However, for "single piece" electrical technology import alike ebay, there is a Chinese technologies site operated and based through Singapore's economic zone called **"aliexpress.com"**. Initially currency is in USD but it has a web interface in its search engine to convert to costing in AUD of which there are also separate schemes for postage and freight, but all can be added together and payed online by VISA such as a pre-paid VISA card. Its search engine results return allows settings "single piece offer" , "national currency to trade in" , "postage and freight type" , "pricing lowest to highest". It requires setting up a login account with them by simply email, residential(postal address must be residential) address and country.
Panels and batteries are too bulky and costly to import in small quantity. However, wind turbines, controllers and some other items such as inverters are at least better if not no worse through the foreign import site.
On ebay, panels can be matched with freight for cost for best scenario of cost.

For practical purpose here only 4 standard 12v six cell deep cycle lead acid batteries are used because of cost.

One final important note, wiring! 600w - (12v)50amps is the maximum for 6mm^2 copper wire. 5mm^2 takes around 450w - (12v)37amp maximum. 4mm^2 takes around 300w - (12v)30amp maximum.

200 meters of 6mm^2 copper wire is required.
6 x lengths of 20 meters for both turbines (3 wires out of each for these 3 phase generators - NOTE: no particular connection point , just one of these three symbols ~ ~ ~
WARNING: if your turbine is DC it requires a DC controller, !!!always specify voltage, wattage and phase type AC or DC to the sales people when buying online, you can pay by a pre-paid visa and if you are sure the product is correctly advertised so you understand the shown parameters of the product).

6 x lengths of 20 meters for the three panel sets(1 to each of both hybrid controllers for the 150w panels, and the 600w panels to the solar controller).
Around 2 meters of 12mm^2 battery wire is required to join the 4 batteries.

About the system being put together below
The system below will have two programmable hybrid wind controllers and one solar controller all operating with a float charge of 13.7v.
It uses 4 x 40ah deep cycle batteries in parallel to be capable of 2Kw output alone without chargers.
The idea behind it is to be able to operate most household appliances one after the other, but with solar as the main input. After sunset starts, the wind system will probably only be producing 100w - 200w input with breezes so it will only be capable of one light bulb, a TV or radio , boiling the kettle and re-heat of food(only 5 minutes) with a small 700w microwave (because it is only using a 2500w standard pure sine inverter).Because the battery bank is so small it only lasts a short period of time such as 2 hours max.
An economy size desktop PC and LCD screen with a television tuner card for television.
Use of 1.5v AA, C, D, size NiCad rechargeable (can be 3000mAh on ebay, reasonably cheap) batteries in LED lamps rather than normal throughput mains light bulbs can achieve better cost management, and when nothing is occurring with the inverter it can charge sets of these 1.5v NiCad rechargeable batteries.
4 star energy rated fridges to 200L can be operated along side other jobs 24 hours, so a fridge and a freezer is possible whether you cook or not using anything up to 1500w, although if this causes inverter shutdown an extra inverter will not cause excessive fast drain with these temporary operating devices(fridge freezer).

The proper tactic of using it is that it can run a normal sized (100w - 200w) refrigerator 24hr's after it has reached its cooling temperature, and more important, the use of small cooking appliances with current consumption around 1Kw to 2Kw during daylight with near 1Kw solar supplying the bulk of charge to the batteries and inverter.
To do this sensibly requires buying 2 weeks of food, and cooking all of it in one day while the sun is shining between 9am and 3.30pm to ensure the last hour or so of sunlight is used to recharge the batteries before sunset.
After cooling the food it is then placed in the fridge, and taken out for meals to be re-heated only 3 to 5 minutes in the microwave (after dark cooking is too much - too hot water may need to be kept in a thermos flask). Microwaves are spurious to their wattage size, the wattage quoted is only the "microwaving power output" not the actual consumption, hence, a 700w microwave is as large can be used on a 2500w inverter!

In summary, to the effect only a 2500w inverter is the maximum current draw can be obtained from such a small battery bank(4x 40ah), but to prevent inverter power outage collision during usage 2x 2500w inverters should be employed because fridges only operate for 5 - 10 minutes, then off for up to 10 minutes but consume a large quantity of power by surge when starting. This would shut down the inverter if the microwave were in use, Again, the same scenario if a grill or hot plate were in use.

Finally, for rated power usage, washing machines and dryers are the one of the most "spurious" of devices (apart the most spurious "the microwave oven") e.g. a 480w 7kG top loader i do not believe could be operated from a 2500w inverter because of surge to re-power the motion. Maybe on a 3500w inverter.

I have no way of testing this.
There are 4Kg top loader washing machine types around and for reasons later stated a proper system should have two inverters, and perhaps much larger battery bank (e.g. 100ah more added to design size of battery bank per large plug-in item) if also operating a hot water system such as a 1.5Kw plug in 50L Dux.
On a flip side to this, a 1.5Kw domestic hot water system would be able to be controlled against low generator input of the solar and wind by a master power switch. This can be employed by switching it off by the master switch when the hot water is ready for use as if in an off peak system. This will prevent automatic current draw for re-heat. It can then be switched on to heat up over an hour or so when conditions are optimum(when the batteries are fully charged and sun is fully on the panels). Alike all hot water systems, never switch the water off, only the user outlet tap, and fill it first before ever switching it on. NOTE: Hot water systems do not boil, they heat to 68^{o}C - 75^{o}C thermostat setting, factory set by the manufacturer.

Because a cooking device such as a mini grill is often between 1000w and 1500w it requires near to 1Kw of panels to put as much as possible into the appliances directly but not too much to overload the small battery bank. The 12v hybrid wind controllers mostly only take 150w of solar each. I will use 2x 80w panels on a single hybrid 12v controller(160w solar but not too serious), the controller is for a 12v rated 600w wind turbine, LCD programmable.
This makes a set of three controllers in use simultaneously, 2 x wind hybrid and 1 x solar together (my solar controller is 50a 12v 560w(600w max - shorter working life) rated).
An 80a (80amp) 12v solar controller would be a good idea with 3 x 250w (total 750w) solar panels is a cheap solution because with many suppliers in country they are closer to dollar for dollar p/watt and can be found with free freight sometimes.(750w plus 300w = 1050w , 1.05Kw)
The batteries will probably last for a couple of years with my minimal setup, the controllers probably 5 years not overloaded.

It's a very sensible idea to shop around for the the best panel wattage to price, and supply quantity of panels ensured, to produce as cheap a system as possible.
NOTE: Some solar controllers for 12v systems only use 12v "rated" panels(18v - 22v) , but others have maximum panel voltage for the array of 50v, what they will output will be the float voltage it either has or if programmable, you set it to. Best to be sure by only using a panel with a VOC voltage as close as possible but not exceeding the input voltage allowance of the controller, too, the same point applys to putting panels in series , add the VOC voltage together per panel and do not exceed the stated controller maximum input volts.

The final point to remember is that in summer after panels have heated in the sunlight to 70^{o} degrees Celsius , they will only output around 80% of their rated watts during the day e.g. 1000w rated becomes 800w generated output, or 700w rated becomes 580w output!
It's a good idea to have 4 x 200w panels on the solar controller and the full 150w on each turbine controller to keep it all up near 800w during the heat of the day.
Winter is a heavy inverse in environments where it does not snow, there are usually only 4 good hours a day in good weather but the wattage rating relies on the panels reaching around 25^{o} degrees Celsius.
"Always normally" the solar is only operating at 80% output total. Wind is often only a breeze and 20% of its total rated output.
NOTE: Wind Turbines are usually rated at their "power output rating wattage" when wind is at 12m/s (mps meters per second), their controllers should be MPPT adjustable and wiring should never be less than 6mm^{2} to 25 meters length and 8mm^{2} size longer than 25 meters.
NOTE: The most annoying problem of small wind turbines below 1.5Kw is the cost of heavy wiring whether they are as little as 300w or a 1.5Kw rated. In Australia, Usually for "3 x 25 meter wires" for a 3 phase AC wind turbine is around 240 AUD cost in 6mm^{2} but unavoidable because smaller wire cannot carry low charge (e.g. 50w or 100w = @12v 4 amps and 8 amps)long distance or it burns up as resistance!

It's possible for a fridge and freezer to be negligible if good job management on current draw and charge usage and recharge are observed, but what must be remembered of 4x 40ah batteries is use of a 1500w device with around 800w(64amps @ 12v) of solar being produced and around 100w(8amps @ 12v) of wind can only last 50 minutes when it takes the battery capacity down to the max. discharge 25% - 30% DOD. This is because around 500w(40amps @12v) has to be drawn from the battery bank set.
Cooking usually requires 1 hour worth a day, so everything else must operate under the power level of production by the generator system. For usage with a hot water system, a battery bank such as 4x 200ah(800ah total) would just be sufficient if properly managed as mentioned above.(once again, 2x inverters will prevent collision with other jobs for small automated spontaneous jobs such as refridgerators).

A guy wire tower per turbine
This requires:

2x "6 meter" pieces of NB 40 "Med" or "extra" pipe (is approximately 50mm diameter the same as the shank for the "turbine swivel mounts"), either a gal pair or Aluminium pair.

100 meters of stainless steel Balustrade cable for the 3x guy wire system.

1 meter section of pipe with a 50mm(3mm wall at least) "inner diameter" as a pair joiner wrap, this is to cut down its middle(longways) to clamp 0.5 over the lower pipe top and 0.5 meter over the bottom of the top pipe, using(see next) 6x "evenly spaced" holes "drilled through the vertical mid line".(A lower end of each guy wire will connect below this 1 meter piece of joiner clamp pipe).
Near the base of one of the two pipes, and after joining them with the clamping pipe, drill 3 holes through both a pipe end and the joiner clamp pipe to allow the 6mm^{2} wires through(better from a height of 6 meters).

6x 6mm coarse thread "high tensile" bolts 65mm long, and, 12x high tensile nuts to fit(6x are thread lock nuts)

A single guy wire should connect at near the top at 10.5 meters up (assuming 12 meters by the two pipes joined),
and, should be connected at the other end to 5.5 meters up (to brace the middle). [see the main page about equilateral triangles]

3x 60cm long 30mm diameter steel gal pipe to use as guy wire elbow point "ground pin(peg) stakes".

A piece or hardwood plank section an 1" thick at least, and 5" x 5". In the center, chisel out a 55mm diameter depression to place the base of the pipe tower into for solid non slip footing.

WARNING! LIGHTNING EARTH!
To prevent lightning strike, paint the stand base block of wood with plastic paint of a few thick coats, and also paint the base pole up to a few meters with it heavily also. Also place a hard piece of fitting plastic into the pole depression in the wood stand base.
At the two points each of the guy wires connect to the tower wrap some old tyre inner tube rubber tightly around the tower pole then clamp it on at the top and bottom of the rubber to hold it in place. You can probably use a heavy duty set of adjustable screw down pipe clamp to also hold the guy wires in place on the tower pipe with the rubber between the pipe and the guy wire and clamps.
This is to prevent electrical conductivity and massively reduce the risk of lightning strike.

Items to Google for or search ebay (keep it 1500w or below, preferred at or below 1000w, some ads mention watts others don't)
"electric grill"
"refridgerator in refridgerators freezers" (note: less than 500"Kwh per annum") (note: watch out for advertisements like ..."you'll love the effortless temperature control"... , i mean, what the hell does that mean???, what if it wasn't effortless in what you were trying to sell someone!!!)
"freezer in refridgerators freezers" (note: less than 500"Kwh per annum")
"electric kettle"
"mini bake grill"
"toaster"
"microwave oven" (note: A 700w rated microwave draws around 2Kw-2.5Kw to cook)

"oil heater" (note: 700w - 1000w heats a room slowly so start it before dark an hour only ever use on 700w)
"LED lamp"
"led torch lantern" (note: look for long bulb life)
"battery rechargeable mah" (note: NiCad only e.g. 4500mah or 3000mah e.t.c.)
"nicad charger 1.5v"
"hot plate" (or "dual hot plate" or "hot top")
"mini desktop pc"
"air conditioner 2kw" (NOTE: "2Kw refers to" cooling action the same as "BTU", the electric input for such an air conditioner is usually around 1.3Kw to 1.5Kw at that size)

If you want to run a *"12v generator system"* off grid effectively, oddly you should use the 2v deep cycle battery method because 12v system deep cycle batteries are too light build, and "can only have a safe absolute max of four in parallel" (regardless whether some 12 volt deep cycle accumulators are better built for bias retention). Requires DIY import dealing and handling customs documentation yourself(see main site page, it take some time to learn and read the necessary material but can cut your costs to 50% to do all of it yourself!).
All DIY Import of 2v heavy duty deep cycle accumulators(1 MOQ - should use CIF to Sydney NSW port, 2000 USD, N10 customs declaration 150 AUD , tariff+GST 250 AUD)
"2"volt 500ah deep cycle long life batteries. (Use 2 x strings of 6 batteries for 6Kw constant discharge max. short job or 4Kw continuous)
(a single battery) Type: Sealed, Maintenance Free, Size: 241*171*330*365MM, Weight: 31.5kg
This is its Data Specification sheet (PDF) 2v 500ah deep cycle sealed lead acid

Another 2v deep cycle accumulator, but higher quality life span... OPzV battery 2v500ah
Data Specification sheet (PDF) OPzV battery 2v500ah

For more ambitious people (who want more than bare-bones functionality), this system could be repeated alike above but advice is to use a 3000w or 3500LF inverter and 2.5v battery sets.(next set of links)

1500w 12v wind Turbine [requires N10 import declaration and clearance - possibly to Port only CIF - see main page how-to import tutorial - However , use of Sea Mail could be possible but requires a "SAC (Self Assessed Clearance)" declaration after arrival - see ACBPS site - note: for heavy items do not use air freight!]

1500w(2kw Max)Wind 12v Wind Hybrid Controller - 300w Solar (Only one i have ever found so far)

2014 New 2000W 2KW 12V Wind PV Solar Hybrid Charge Controller, 1000w Wind +1000W Solar, Three-Phase Dump Load,Big LCD&PWM function (recent lookup has found this one)

(a)programmable 12v 80a Solar Controller (960w)

(b)programmable 12v 80a Solar Controller (960w)

2.5v deep cycle accumulator 500ah [requires N10 import declaration and clearance - to Port only CIF - see main page how-to import tutorial]

And if you want to build your own solar panels to voltage and wattage (and for DIY purpose "SHAPE - SIZE"), there are solar cells can be found wholesale. The better deal is "usually"(however) the Mono Crystalline.
4.23 W 17.40% High Efficiency Polycrystalline Solar Cell
There are plenty of youtube.com videos with "how to" for building solar panels and using solar cell "tabbing wire" and "busbar wire" and "flux pens".

(Youtube Video) DIY SOLAR PHOTOVOLTAIC 1buck a watt DIY Solar Panel Part 2 Make your own solar cell panel Bus Wire

(Youtube Video) SOLAR PANEL DIY MAKE YOUR OWN SOLAR POWER PV

(Youtube Video) MidNite Solar's Surge Protection Comparison Test

Parallel battery usage rules
It is possible to put 5 x 200ah batteries together in parallel to produce a practical and reasonable time of up to 2kwh current draw, however it must be done carefully and perfectly and obey the rules.

In short , it is considered dangerous to put batteries together in parallel. But ultimately not much more than series. The problem arises that when a bad battery is induced to give or take charge during usage it will overheat and potentially explode. This situation is less prevalent in series because a bad battery tend to jam and shut off the circuit.

To use in parallel with safety, two rule-sets need to be used.

The batterys.
1. must all be exactly identical of (ah) rating and voltage,
2. AND exactly the same manufacturer and model (totally identical).
3. Exactly the same age of manufacture and "usage"(after sale)
4. NEVER, put unalike batteries into the array inclusive of during an emergency!Connecting the parallel array,

1. The batterys must all be charged to exactly the same level before connecting them.

2. Use a voltage test meter to within 1/10 of a volt all must be within a 1/10th of a volt of each other.

3. When connecting the batterys together after the first set of terminals (+ or -) , put all terminal sets connected as fast as physically possible(don't answer the phone during this action , complete it first). Always remember that the same applies to removing them all for disconnection too!

4. Always test run your batteries after they are charged(takes two or three days for first time with a hybrid charge system) , use a pair of 3 amp draw(240 volt rating!!! 3 amp) each appliances at full power for five minutes, then cease usage and check with the palm of your hand that all batteries are the same temperature and not particularly hot, and at worst only a little warm. If you find a hot battery compared to the others then most likely there is something wrong with that battery and you must remove it. Also, check once a week for the first 2 months while it is under load to find if a subtle problem could be developing then once a month thereafter if everything is OK.

5. With wiring and connector terminals , they all must be a good conductor material, either brass or pure copper sets only. All wiring must be in perfect conditions at all times, no frayed ends in joints and no severs. The terminals must also be secured firmly with a large contact area from the connector to the terminals. To prevent corrosion on the terminals and connectors, always coat them with grease before connection and when squeezing them together give them a small wriggle to morse them into good direct contact.

About appliance usage One of the biggest problems is a device called a washing machine. Larger ones have a problem of always requiring surging power to stir the clothing , 4 things can go into many washing machines , a pump motor , stirrer motor , spinning motor, and hot water. At most the largest is 0.5 Kw motor and

would be trying to use from a single 12v battery or two an impossible quantity of amps by surging.

Batterys have a CCA rating called â€œCold Circuit Ampsâ€ or â€œCold Cranking Ampsâ€ which alike an inverter and is the same as surge current rating for a battery. With some batteries its only 750CCA best are around 1500CCA so you can understand a 5Kw inverter is not only required but also more than two batteries and for larger above 5kg washer load an 8Kw inverter. One Kw of amperage in 240 volt is 4amps , in 12v it is 80amps(x 20). At moments each 2 seconds approximately it calls for 800amps from the batteries. Of CCA rating a 12v battery of the deep cycle type is only around 250amps continuous rating and secondly, the immediate storage level of the batterys' (ah) ampere hours is depreciated when high current draw is used.
You can see why a Smaller Air Conditioner or a Hot water System is no match for a washing machine.
While a Hot water System can be 2400w (9amps 240v @ 12v 180amps) it has no surge, Air Conditioners (evaporative) have a water pump and blower, and a condensed compressor coolant one has similar. Ovens and hot plates are alike hot water, Dishwashers don't surge particularly except at pumping , a little alike a small roof mounted evaporator air conditioner unit.

As example next in this "DOD Time Calculator" for a battery bank.
If total battery bank storage amps at 12 volts is 80AH (almost 1Kwh total) (e.g. just one battery) the theoretical time to 30% DOD (1/3 discharge) is "17" minutes of 1Kw.
Then 3 x 17 = 51 minutes , 3 x 30% = 90% of the battery storage size.
The following javascript form calculates the quantity of time a battery bank has if it were being discharged at a constant Kw draw level of current(amperage) use.

The average all exclusively electrical energy supplied house in Australia is between 25Kwh to 35Kwh daily,
hence draw at "1Kw"(the select options field) down to 15% DOD should "hypothetically(not necessarily)" equal "at least" around "25 hours" in the decimal-fraction hour field(output answer) in the following form, relating the settings of AH(ampere hours) of battery bank filled into the "battery banks TOTAL 12v worth of AH's" and selection of "@ "X"Kw current draw" selector.

If you had e.g. 12 x 3000ah "2"volt(not 12) batteries, then 6 batteries in series makes 3000ah of 12 volts, so 12 batteries = 2-lines x 3000ah = 6000ah TOTAL @ 12 volts.

When batteries are added inline in series the volts are added together and raised, but the AH remain the same.
When batteries are put in parallel, tha AH's are raised but the volts remain the same.

For the storage quantity by 12 volt batteries the total storage is easiest by 12v.
If you have 80 of 12v batteries that are 80ah batteries that makes 6400ah. So if all the 80 were parallel(never do that) the calculator will say you have at "1"Kw , "11.566265060240963" hours = 11.566265060240963 Kw/h's.
By the same point, **if our 80ah 12 volt batteries were arranged like next**, "8 lines of" --- "10 batteries in series" using 120v power system storage ,
and we used a calculation for 120v at current(ampere) draw of 1Kw **it would be exactly the same!!! "11.566265060240963" hours = 11.566265060240963 Kw/h's. !!!**

So you can build any voltage system you want "with 12 volt deep cycle accumulators" but voltage(by battery arrangement) does not and cannot change the quantity of electricity stored!
Just add all the 12v batteries AH ratings together for the total(equivalent to multiplying the AH rating by the number of batteries) , or if you have 2v single cell deep cycle accumulators(batteries), divide by six the total number of batteries and then multiply that number of accumulators by the AH rating they have(they should all be the same! e.g. 3000ah or 250ah or 80ah ... whatever e.t.c ...)

For an actual permanent off grid system, because "14000ah worth of 12v (25Kwh's-15%DOD)" size is too costly(for dedicated 10+ years), and as much the power system can use by management 1:1 ratio(half battery supply AND half wind/sun generator) of "battery bank" to "direct sun/wind generation" can be the day/night efficiency balance when added together, only 6000ah worth of 12v for normal grid mimic is required and around 4000ah for smaller systems the house has had its appliances remodeled for efficiency.

[Amps and Watts calculator for System Voltages]
Fill in one field only (numerals only) to calculate!
If you want to find the amps in various system voltages, simply change the volt selector after calculating!
IF you want to find watts "FROM AMPS" again, "set the voltage selector first before" "click-on-clear" a text entry field to rewrite in AMPS again and then using the Calculate button!!!

(Volts) 12v (Amps) AMPS CALCULATE (Watts) WATTS

[Watts is a measure of "job Energy" extremely "alike" Kilo-Joules or Kilo-Calories]

Hours of 240v usage from Lead Acid(Gel/fluid) battery bank storage of 12v Ampere Hours total (By DOD float discharge)

@ "X"Kw current draw 500w **[REQUIRED]**

Battery Bank in 12v AH Total total Input 12v AH here **[REQUIRED - numerals only]**

Calculate Time **(5 years Max) Kw/Hours of 240v To (30% DOD -hours) (Total in Minutes)**

(10+ years) Kw/Hours of 240v To (15% DOD -hours) (Total in Minutes)

WARNING:

[Always research GEL lead acid for discharges to price , apart normal fluid lead acid type , another is also PAM , it's usually MOQ is the deal problem but ask them]
While the calculation above shows you how much storage in "the basic daily requirement must be available", it does not tell you much about the differences of "Lead Acid type batteries alone" for the purpose of lasting 12 years to 15% DOD , the following calculation can be fed the number of discharges from the specific models' data sheet to convert to years as a decimal fraction.

If the battery is a sufficient quality it will behave something alike double the 30%DOD discharges at 15%DOD.

However, generally only half of the total daily requirement is "one single discharge" for storage (ampere hours) purpose, and in heavy management tactic and modified household refit is calculated as only 1/3rd of the total storage requirement per single discharge for the 12 year period.

calculate years **Number of Discharges to X% DOD** number of discharges **discharges to Years**

There are many chemical combination types of lead acid battery system, relating "Lifespan In Years" because of temperature and chemistry type!!!
*** PAM additive long life lead acid. Link: PAM additive deep cycle**
*** GEL more efficient basic lead acid or with PAM.**
*** Light constructed short life low discharge quantity low temperature operation.**
*** Longer life-span high temperature, heavy construction. Link: Quality GEL lead acid**
*** AGM Absorbed Glass Mat.**
*** Silicon Lead Acid wide temperature operation range.**

These are the common Lead Acid deep cycle types and efficiency varies immensely with ,
*** price (above or below MOQ , company and set quantity) * Note, always buy "EXW" or "CIF"(particularly) only!!! (*sp-note: MOQ - Minimum Order Quantity - e.g. units: "sets" or "pieces")**
*** DOD depth of discharge ratings (shorter float life-span 15%DOD is similar to 30%DOD - long-life 15% is more double 30%)**
*** with temperature-float-lifespan (accumulator model life-span should be more than 10 years always at or above 20^{o} Celsius!)**
*** local environment temperature affected "ah capacity".**
*** current draw "rate of discharge" affected "ah capacity".**

In short, there can be any combination of mentioned above offered , but it is a matter of verifying the price , the model and "data sheet information" are effective at a 12 year job.

You need to be sure it will operate around 50% capacity at 10^{o}C , the float life is more than 12 years at 20^{o}C minimum , and discharge to 30% is at least 1600 discharges , and if a GEL.

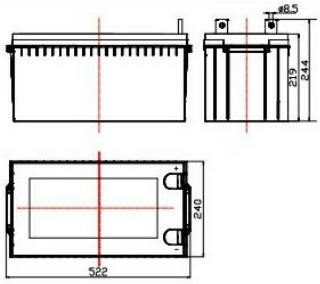
In short always ask for an estimate of 15% DOD and 30% DOD and the data sheet, and it always requires a high quality "Lead Acid" to be economic enough.

***As explained later, there are ways of keeping the temperature of batteries at a level that will give more than 10 years float life and around 80-90% capacity to charge to.**
RECAP NOTE: Remember as said before, only use a totally sealed battery type, NEVER ventilated to atmosphere!

Here is a "DATA SHEET Example" of a 200AH GEL lead acid battery" (insufficient version), their quality and specifications vary greatly alike the standard sealed fluid lead acid, however they generally have alike twice the discharges of a standard fluid type DOD to DOD comparison. This one is not sufficient because it rated below 10 years @ 20^{o}Celsius

Here is a sufficient version 80ah-100ah GEL http://mdeng.en.alibaba.com which the "100 pieces M.O.Q." trade lot will be more expensive "per piece" if only 50 were the trade deal, but the piece quantity(50) is effectively perfect by discharges for the 120v or 240v(240v would require 60 pieces) 8Kw and 10Kw Hybrid power generator systems to between 30% and 15% over 12 years compared to the high quality lead acids full stop!

OULITE **LCPC200-12** *Jiangsu Oliter Energy Technology Co.,Ltd*

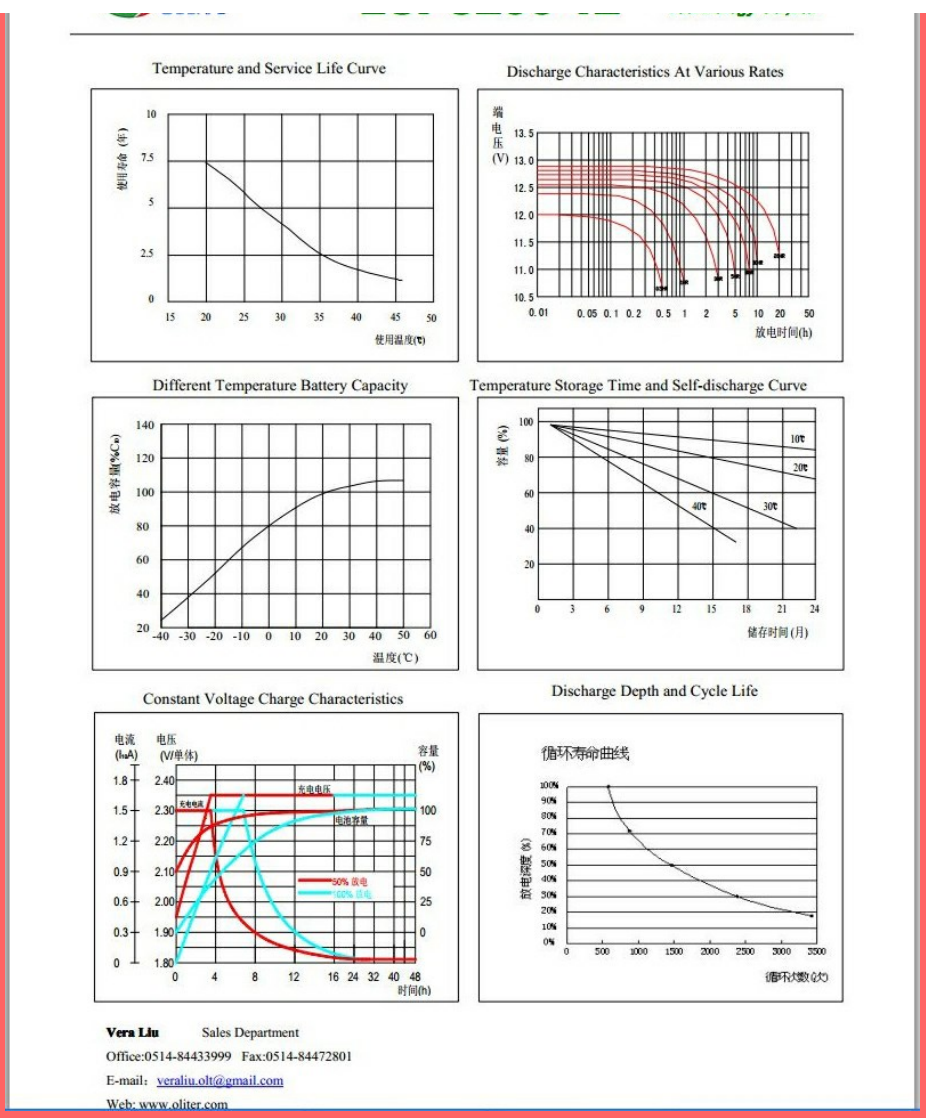


Rated Voltage	12V
Capacity(10hr,1.80V/Cell，25℃)	200 Ah
Weight	59kg±0.5
Max.Discharge Current	30I_{10}A (3min)
Self-Discharge(25℃)	<3%/month
Using Temperature	Discharge: -45℃～50℃ Charge: -20℃～45℃ Storage: -30℃～40℃
Recommended Using Temperature	15℃～25℃
Designed life	10-13years
Max.Charge Current	≤0. 25C10
Charge Voltage (25℃)	Float Charge:13.5V-13.8V Average Charge:14.4V-14.7V
Cover Material	ABS Engineering Plastic
Charge Mode(25℃)	Float Charge:2.275±0.025V/Cell Temperature Compensation Coefficient: ±3 mV/Cell ℃ Cycle Charge:2.45±0.05V/Cell Temperature Compensation Coefficient: ±5 mV/Cell ℃
Cycle life	100%DOD 572times 50%DOD 1485 times 30%DOD 2406times
Capacity Affected by Temperature	105 % @ 40℃ 85 % @ 0℃ 60 % @ -20℃

"Oliter" LCPC Gel Battery. Maintenance free and easy to use, It can be widely used in solar energy, wind energy, telecommunication systems, off-grid systems, UPS and other fields.

Certifications:
ISO9001
ISO14001
CE
CGC
TLC
Standards:
GB/T 19638.2-2005
YD/T799-2002
JISC8704-2:1999

OULITE **LCPC200-12** *Jiangsu Oliter Energy Technology Co.,Ltd*



Vera Liu Sales Department
Office:0514-84433999 Fax:0514-84472801
E-mail：veraliu.olt@gmail.com
Web: www.oliter.com

!!! Some batteries are better than others, consult manufacturers battery datasheet for discharge lifespan !!!

@ 1Kwh current draw APPROXIMATE TIME / CHARGE (ah) CHART At (30% DOD = approx 1500 discharges) At (20% DOD = approx 3100 discharges)
Battery storage (1kw = 1000w/240v = 4.1 amps) @ NOTE: 10 year battery lifespan is only achieved by 10% DOD (down to 90% full ONLY !!!) and never exceeding the usage each day from the battery bank!!!

To use 240v
240v 1000 (ah) ampere hours at 10[240v amp] current use
is 240v 100(ah)
for Solar DIVIDE BY 3 FOR 30% is
240v 100 (ah) / 3 = 33 hours at 10[240V amp] current draw 30% D.O.D.

At a Battery bank charge of
120v volts 1000 (ah)
33 / (240 / 120 = 2) = 16.5 hours (40 x 250ah batt.) 30% D.O.D.
20% D.O.D. = (16.5 / 3) * 2 = 11 hours
96v req. (32 x 250ah batt.)

At a Battery bank charge of
48v volts 1000 (ah)
33 / (240 / 48 = 5) = 6.6 hours (16 x 250ah batt.) 30% D.O.D.
20% D.O.D. = (6.6 / 3) * 2 = 4.4 hours

At a Battery bank charge of
24v volts 1000 (ah)
33 / (240 / 24 = 10) = 3.3 hours (8 x 250ah batt.) 30% D.O.D.
20% D.O.D. = (3.3 / 3) * 2 = 2.2 hours

At a Battery bank charge of
12v volts 1000 (ah)
33 / (240 / 12 = 20) = 1.65 hours (4 x 250ah batt.) 30% D.O.D.
20% D.O.D. = (1.65 / 3) * 2 = 1.1 hours
(1Kw 12v = 80 amps) (1Kw 24v = 40 amps) (1Kw 48v = 20 amps) (1Kw 96v = 10 amps)
(1Kw 192v = 5 amps) "actual 1Kw 12v = 83 amp"

The two wind turbines in this set of videos are both quiet enough to use in suburbia, they particularly do not make much noise until real wind blows, the six blade 300w trouble is it has its tail is free moving and makes a knocking sound, but anything that small up to a kilowatt and 5 blades or more is quite noiseless until real wind(after which other noise is common enough).

The better of the two is the 400w-rated-600w-Max. with five blade configuration. The only problem i had with it was the holes in the hub for the bolts to go through were too narrow and i had to drill them out wider, however, no real problem.

(DIY) 700w microwave test - with - 2500w continuous inverter

(720w solar(will be 920w at least sometime with a 60a LCD solar controller - need to know the panel operation and wattage is correct for debug safety!) -and- 700w-wind(rated)) 4 x 40ah batteries in parallel supplying current to the inverter. The initial idea is to cook a weeks worth food using grill plate and accessory hot plate one after the other at 1000-1500w size during good sunlight conditions and place it in the fridge after its cooled. That way the microwave can be used to reheat at high current draw for very short periods alike the cup of coffee here whether the generating conditions are good or after dark.Other short periods of heavy operation such as 3-4 minutes are boiling a 1400w hot water jug.

wild-canidae-conservation-forum.netne.net/austhouse15kw.html

(DIY) [Australia] HYBRID WIND-300w SOLAR-240w Charger system HD

[view in full screen in 720p HD if able or 480p resolution]
[Correction of various video details the 300w is a Sun-Share 3 phase 12v 6-blade]
[NOT shown in video is R and X Technology 400w-600w SF-600-5 3 phase 12v 5-blade]
[NOT shown in video is Controller (programmable LCD) is a EPWSC06A (200w - 600w Wind) (and 12v 150w Solar) Jiangsu Ecopower Solution Co.,Ltd]
all from "aliexpress".
[This controller in this video is a12v LED Hybrid non-programmable (200-600w Wind) (12v 150w Solar) bought on "ebay"]
[Blue solar controller is PWM 12v solar charge controller SMG50 (50A - 600w) Shanghai Saipwell Electric Co., Ltd. from aliexpress]

Initial testing of tiny hybrid(wind solar) off grid power system generators. Using a 300w 3 phase(correction) "Hyacinth 6 blade 12 volt AC three phase" wind turbine and 3 x 80w 12v panels. On a 3.5 meter pole.

It is quite true that if the modern house were not connected to the grid , a 2Kw solar controller and a 2Kw wind controller(wind turbine mounted at least 12 meter high or 15 meter above trees) at 48v battery and and (2 x 8Kw inverter -Warn never never join outputs together of two individual inverters to raise power or damage will result!!!! - each are separate and would be out of phase - use the correct size for the job) could be used by replacing inbuilt oven and grill with a 2000w electric hot plate for saucepan, a 1000w accessory grill, a 2000w fry-pan, and a 1100w microwave-grill oven(Warn! - these can draw around 4000w for a period of seconds in use), 1500w kettle, and last but not least a 160 Litre Dux hot water system with a 2400w element. You can near do that from a set of 2500w inverters. What remains is the computer 500w ,lights=1000w and the TV and air-conditioner would need to be a portable. The battery bank would need to be at least 24 x 80ah deep cycle with a 10 year life-cycle at 20 degrees Celsius and 1400-30-percent-DOD rating. A large number of jobs would be one after the other. Refrigerators and freezers are can be found reasonable size for good energy consumption - e.g. 400 - 500Kwh per annum .

(DIY) wild-canidae-conservation-forum.netne.net/austhouse15kw.html

(DIY) [Australia] Programming LCD 12v/24v MPPT Wind Solar Hybrid charge controller HD

[view in full screen in 720p HD if able or 480p resolution]
[Correction of various video details the 300w is a Sun-Share 3 phase 12v 6-blade]
[This shown in video is R and X Technology SF-600-5 3 phase 12v 5-blade]
[Controller (programmable LCD) is a EPWSC06A (200w - 600w Wind) (and 12v 150w Solar) Jiangsu Ecopower Solution Co.,Ltd]
all from "aliexpress".
[This controller in this video is a LED non-programmable (200w - 600w Wind) (12v 150w Solar) bought on "ebay"]

"How To" of function settings for 200w-600w LCD MPPT wind solar hybrid controller. Over voltage and recovery, under voltage and recovery, load timer and wattage settings, load auto on off threshold, MPPT start voltage for turbine. The instruction manual was interesting, because in mentioning voltages for setting MPPT start, it recommended 6vac for 12v turbines and 12 or 10vac for 24v turbine, however it does insinuate and by the controller settings that 0 all the way in 1v increment to 30v is acceptable no matter other settings i.e. 13.7v floating voltage. A second point about the test, this is only a crude test with the wind turbine up at 5 meters, also the solar panels (sometimes 2 not 3) are on the ground and a guide dog and a pig dog sometimes interfere with the wiring on the ground so not much occurs(sometimes some semi tame ring tail possums whom disagree about my use of the tool shed when i am in there). In consequence sometimes nothing much is occurring because of wiring mishaps.

see also VIDEO: "(DIY) MPPT Hybrid charge controller Results from MPPT start set aT 12V"

VALUABLE INFO: NOTE: Unfortunately if you want ANY wind turbine to operate properly should be placed "12 meters up minimum(15 meters ideal)" into the percentile layer above the ground level percentile layer(meteorology) to EVER operate properly whether a tiny 50w turbine or a 5Kw turbine(sworn truth). There is too much turbulence below 12 meters from obstacles. Second, whether free stand or guy wire, there must be NO wobbling vibration of the pole top. Vibration causes the blades to lose vacuum and on return bounce crash into the oncoming wind pressure, this then can lose two three Meters/second speed of air flow, cause its own turbulence situation and even "tip stall"(swing around opposite facing direction suddenly) the turbine and loose massive speed as it did often on the test pole here!!!

More VALUABLE INFO: * read the information text * see also "(DIY) 400w rated Wind Turbine (600w max.) 1st operation test"

[IMPORTANT NOTE: Recently i have found an inverter that will operate the 32Lt. Microwave at 240v AC from 12v , it requires to be a LF low frequency pure sine wave of 6000w continuous and 12000 watts surge rating - found on ebay DOT com DOT au] The before mentioned(if in a video here) microwave oven(32 Lt. max - 2300w output convection) ran for a few seconds then switched off. It seems inclusive when at 50 percent power it takes short bursts of 3600w but also drops to 500w intermittently. I then put my PC on the inverter successfully operating software i have written. Other things operated successfully as test by the inverter (completely) were a 1000w grill element oven(cooked sausages for 1/2 an hour) and a 2300w vacuum cleaner plane sux for 15 minutes(or until battery too low if i want).

(DIY) [Australia] WO' WINZSLIKE - for wind turbines HD

[view in full screen in 720p HD if able or 480p resolution]
The turbine is not in a permanent position and only strapped into position for test purpose at 5 - 6 meters altitude for the 5 days i was studying them.
Wind never reached "the rating" (which happens to be 12 m/s for these turbines). Also,wind does not continue at its top speed, it tends to pulse or gust. At no point was it higher than 4 m/s except on one or two rare occasions when it reached 6 m/s.
This is an important point because the wind generator "acts similar to a car alternator and its voltage regulation system" through the stator spindle magnets for charging.
When current is constant, the amps are increased in return, when it simply rises up and then falls away the small quantity of current gained goes up quickly then drops out quickly.

(DIY) [Australia] WIND AND TEST - wind turbines HD

[view in full screen in 720p HD if able or 480p resolution]
It was not actually the wind being the problem. I later found its brake function was in operation, HOWEVER, that does not matter, this video may as well be read interpreted and watched as what is being said in the sound track because it is exactly the same with wind and the turbine set at that height and no brake on!
Wind moves not only in layers but also veins/pockets and affected by turbukence of objects down low below 12 meters altittude.

(DIY) [Australia] Quick test on appliance of 2500w pure sine wave Inverter HD

[view in full screen in 720p HD if able or 480p resolution]
Test with a 2500w continuous output pure sine wave inverter, 12vDC to 240vAC 50Hz, acquired on ebay , wind turbine and hybrid controller obtained on aliexpress postal.
[IMPORTANT NOTE: Recently i have found an inverter that will operate the 32Lt. Microwave at 240v AC from 12v , it requires to be a LF low frequency pure sine wave of 6000w continuous and 12000 watts surge rating - found on ebay DOT com DOT au]
The before mentioned(if in a video here) microwave oven(32 Lt. max - 2300w output convection) ran for a few seconds then switched off. It seems inclusive when at 50 percent power it takes short bursts of 3600w but also drops to 500w intermittently.
I then put my PC on the inverter successfully operating software i have written.
Other things operated successfully as test by the inverter (completely) were a 1000w grill element oven(cooked sausages) and a 2300w vacuum cleaner plane sux for 15 minutes(or until battery too low if i want).

(DIY) [Australia] About the Hybrid system setup - and battery charging behavior HD

[view in full screen in 720p HD if able or 480p resolution]
Rewired the wind turbine and mast up another meter to clear wind obstructions on the roof.
The turbine was on a temporary pole in a temporary position in turbulence among trees and roofing obstructions , consequently it tip stalled and flicked around on the pole at as little as 4 m/s wind speed. The pole itself is only thick rolled galvanized sheet iron and flexes too much causes continual lower rotation speed below the value of the wind speed. However,

it reasonably did ok, being half the charge output. Wind was never actually constant only pulses and gusts.

Note: "12V 40AH lithium iron phosphate (2000 cycles to 100 percent DOD)" Battery is one type i have found(not used here) that may be interesting, for use here because a 12v system can only have 4 batteries maximum in parallel(these special lithium i'm not sure if it can or cannot have more in parallel).They are around 230 USD each (255 AUD) "at" the manufacturer with Minimum 10 of them.
In terms of its DOD and cycles, it becomes a 200ah lead acid battery with less complications.

(DIY) [Australia] 400w rated Wind Turbine (600w max.) 1st operation test HD

[view in full screen in 720p HD if able or 480p resolution]
[Correction of various video details the 300w is a Sun-Share 3 phase 12v 6-blade]
[This shown in video is R and X Technology SF-600-5 3 phase 12v 5-blade]
[Controller (programmable LCD) is a EPWSC06A (200w - 600w Wind) (and 12v 150w Solar) Jiangsu Ecopower Solution Co.,Ltd]
all from "aliexpress".
[This controller in this video is a LED non-programmable (200w - 600w Wind) (12v 150w Solar) bought on "ebay"]

This is the first run of the 5 blade, 12 volt, 400w rated at 12 m/s, 600w Maximum wind turbine. It's a little slower to start than the 12v 300w rated 320w-max. 6 blade Hyacinth but the hub and blades on this 400w are 3 times as heavy and maybe around 10 square inches less blade area than the Hyacinth. Actually it's only 5 meters up and using 6mm2 30 ft of wire. 6mm2 copper strand is only good for around 20 meters , 8mm2 up to 30 meters and beyond to 50 meters 10mm2. You would also require to have the turbine up 12 meters into the unobstructed higher layer of air because it moves faster and not much charge is produced by these small turbines, so, unless it is done properly don't bother, it requires expensive high grade high current low resistance wire or too much charge is lost from such small turbines below 1Kw rated output!

In measuring against the graph of output they showed, at 4 m/s it only outputs 75 watts. (75/13.7 = 5.5 amps) In consideration of how bad the setup is(vibrating pole with no guy cables that cause "tip stalling" and flicking around to opposite direction or wandering of wind direction) and how little wind down at 5 meters high pole (i couldn't feel much although it always shows blowing a gale at the top of trees) the 3 amps max it showed seems about right and too for how the alternator builds up with the MPPT with more constant wind speed occurring.

More than this, for compatibility with using an extra solar controller on the battery bank, the "float voltage" for solar or most controllers is usually always 13.7 volts for 12 volt systems. This means having to use a programmable wind controller to be sure no excessive argument against the electricals occurs from either controller. For most of the time i was using 13.7v as float but the other wind controller with MPPT appears to have something like 14.5v float causing the battery over-voltage quickly because they are lead acid and so touchy in chemistry when charging. When using 14.5v as float the charger would often commit brake function because of battery overcharge condition, this is because i am using lead acid batteries. The original controller had no programmable system so because it goes into break i figure its float charge is something like 14.5 volts like a real deep cycle charger. Second , it is rare that in the shade on a 40 degrees Celsius day that the batteries would reach more than 70 percent allowed capacity. Lead acid are very touchy about charge level, charge intake and temperature. Normal life often does not get beyond 20 deg. Celsius protection covered properly so winter requires enclosing them a little and they only get to around 60 percent allowed capacity. Lead acid(note: always use "sealed type" , NEVER use open air vented because explosion risk is too much) are cheap, other better types are silicate lead acid and GEL or AGM lead batteries but more expensive(all sealed).
Lithiums are generally too expensive at any point.

note: The two turbines pole shank takes a pole outer diameter of 50mm to 55mm. a reasonable guy cabling pole would have a wall thickness of the pipe of 5mm. Steel is often sold in 6m to 8m lengths(depends what the local steel merchant bulk orders). You can get hoisting cables 3mm and 4mm strand of various lengths out of ebay. a simple sensible 12m guy tower needs 6 cables. 3x fastened at 10 meters on the tower and the other 3x fastened at 5 meters on the tower pipe to prevent high wind pole wobble. That is as much to prevent the tip of the pole vibrating or wobbling as to keeping it absolute upright against gravity(wind turbines are not completely/perfectly balanced centrally related to their mounted pivot point).
NOTE: MEDIUM GALVENIZED 40NB pipe is usually in 6.5 meter lengths and 48mm outer diameter and 4.0mm wall. Two pieces are around 100 AUD from a local steel merchant, but how you move them and weld them is a localised problem i cannot cover here.

Other solar information -
wild-canidae-conservation-forum.netne.net/austhouse15kw.html

(DIY) [Australia] MPPT Hybrid charge controller Results from MPPT start set at 12v HD

[view in full screen in 720p HD if able or 480p resolution]
Like i wrote before, the turbine and charger behave similar to a car alternator and it voltage regulator through the magnet spindle to produce charge.
voltage builds as much as possible and may have some type of regulator feed to assist the magnetic rotor spindle to induce in the stator windings. When voltage is above battery level and rotation is constant, the amperage fed back is high, if it is only recent at the required voltage then current fed back is minimal.
Wind has been blowing less pulsing and less gusting, although it effectively never reached more than 4 m/s in the 5 days i had the turbine in place.

(DIY) [Australia] MPPT Hybrid charge controller Results from MPPT start set at 6v HD

[view in full screen in 720p HD if able or 480p resolution]
This is quite similar to the video of the same name but for this being 6v and it being 12v for the MPPT start voltage. Both had wind pulses and gust of 3 to 4 meters a second maximum and it appears it near performs the same in some similarity.
The wind turbine itself is a 5 blade 400w rated 600w-Maximum. So there is no doubt when i set the weather station sensor near its height it was not much wind ever although like i explain in other videos there is roaring wind above 12 meters height of a pole but this is a test position and only 5 meters high.