

# How I built an electricity producing wind turbine

by [mdavis19](#) on September 17, 2008

## Table of Contents

intro: How I built an electricity producing wind turbine .....	2
step 1: Acquiring a generator .....	2
step 2: Making the blades .....	3
step 3: Building the hub .....	4
step 4: Building the turbine mounting .....	4
step 5: Build the tower base .....	5
step 6: Paint all the wood parts .....	6
step 7: The finished head of the wind turbine .....	6
step 8: Build the charge controller .....	7
step 9: Erect the tower .....	8
step 10: Erect the wind turbine .....	9
step 11: Connect the electronics .....	10
step 12: Enjoy having power in the middle of nowhere .....	11
step 13: How much did it cost? .....	12
step 14: Update .....	12
step 15: Update 2 .....	13
Related Instructables .....	14
Advertisements .....	14
Customized Instructable T-shirts .....	14
Comments .....	14

## intro: How I built an electricity producing wind turbine

Several years ago I bought some remote property in Arizona. I am an astronomer and wanted a place to practice my hobby far away from the terrible light pollution found near cities of any real size. I found a great piece of property. The problem is, it's so remote that there is no electric service available. That's not really a problem. No electricity equals no light pollution. However, it would be nice to have at least a little electricity, since so much of life in the 21st century is dependent on it.

One thing I noticed right away about my property is that most of the time, the wind is blowing. Almost from the moment I bought it, I had the idea of putting up a wind turbine and making some electricity, and later adding some solar panels. This is the story of how I did it. Not with an expensive, store-bought turbine, but with a home-built one that cost hardly anything. If you have some fabricating skills and some electronic know-how, you can build one too. More details on this and my other projects can be found on my web site at <http://www.mdpub.com>



### step 1: Acquiring a generator

I started by Googling for information on home-built wind turbines. There are a lot of them out there in an amazing variety of designs and complexities. All of them had five things in common though:

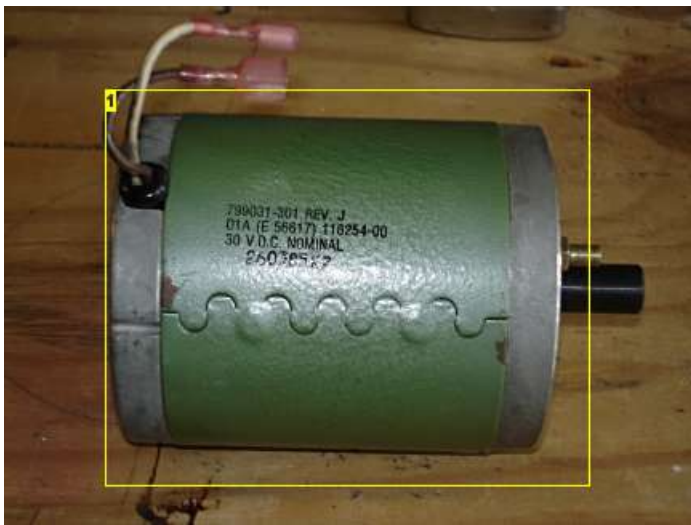
1. A generator
2. Blades
3. A mounting that keeps it turned into the wind
4. A tower to get it up into the wind
5. Batteries and an electronic control system

I reduced the project to just five little systems. If attacked one at a time, the project didn't seem too terribly difficult. I decided to start with the generator. My online research showed that a lot of people were building their own generators. That seemed a bit too complicated, at least for a first effort. Others were using surplus permanent magnet DC motors as generators in their projects. This looked like a simpler way to go. So I began looking into what motors were best for the job.

A lot of people seemed to like to use old computer tape drive motors (surplus relics from the days when computers had big reel to reel tape drives). The best apparently are a couple of models of motor made by Ametek. The best motor made by Ametek is a 99 volt DC motor that works great as a generator. Unfortunately, they are almost impossible to locate these days. There are a lot of other Ametek motors around though. A couple of their other models make decent generators and can still be found on places like Ebay. This web site talks about the virtues and vices of various Ametek motors when used as generators. <http://www.tlgwindpower.com/ametek.htm>

I managed to score one of the good 30 volt Ametek motors off of Ebay for only \$26. They don't go that cheap these days. People are catching on to the fact that they make great wind generators. Other brands will work, so don't fret about the price Ametek's are going for. Shop wisely. Anyway, The motor I got was in good shape and worked great. Even just giving the shaft a quick turn with my fingers would light a 12 volt bulb quite brightly. I gave it a real test by chucking it up in my drill press and connecting it to a dummy load. It works great as a generator, putting out easily a couple hundred Watts with this setup. I knew then that if I could make a decent set of blades to drive it, it would produce plenty of power.

There is more information on how to choose a motor for use as a generator on my web site at [http://www.mdpub.com/Wind\\_Turbine/](http://www.mdpub.com/Wind_Turbine/)



#### Image Notes

1. Surplus Ametek 30V tape drive motor bought on Ebay will be the generator.

### step 2: Making the blades

Blades and a hub to connect them to were the next order of business. More online research ensued. A lot of people made their own blades by carving them out of wood. That looked like an outrageous amount of work to me. I found that other people were making blades by cutting sections out of PVC pipe and shaping them into airfoils. That looked a lot more promising to me. This web site tells you how to make a set of blades for a small wind turbine using PVC pipe.

[http://www.yougreendream.com/diy\\_pvc\\_blades.php](http://www.yougreendream.com/diy_pvc_blades.php)

I followed their general recipe. I did things a little differently though. I used black ABS pipe since my local homecenter store just happened to have pre-cut lengths of it. I used 6 inch pipe instead of 4 inch and 24 inches long instead of 19 5/8. I started by quartering a 24 inch long piece of pipe around its circumference and cutting it lengthwise into four pieces. Then I cut out one blade, and used it as a template for cutting out the others. That left me with 4 blades (3 plus one spare).

I then did a little extra smoothing and shaping using my belt sander and palm sander on the cut edges to try to make them into better airfoils. I don't know if it's really much of an improvement, but it didn't seem to hurt, and the blades look really good (if I do say so myself).



#### Image Notes

1. Cut a piece of plastic pipe 6 inches in diameter and 24 inches long into quarters lengthwise. A jigsaw comes in handy for this.
2. Shape a blade out of each quarter.



#### Image Notes

1. I used a sander to round off the rough edges and shape them into better airfoils
2. These tabs are a problem. I learned the hard way that the blades will eventually break where the tab joins the body of the blade. I recommend not bothering making tabs.

### step 3: Building the hub

Next I needed a hub to bolt the blades to and attach to the motor. Rummaging around in my workshop, I found a toothed pulley that fit on the motor shaft, but was a little too small in diameter to bolt the blades onto. I also found a scrap disk of Aluminum 5 inches in diameter and 1/4 inch thick that I could bolt the blades onto, but wouldn't attach to the motor shaft. The simple solution of course was to bolt these two pieces together to make the hub. Much drilling, tapping and bolting later, I had a hub.



#### Image Notes

1. A toothed pulley that fits the shaft on the generator, but is too small to bolt the blades to. Solution: Bolt the two pieces together.
2. A disk of Aluminum large enough to bolt the blades to, but with no method to attach to the generator.



#### Image Notes

1. Holes drilled and tapped so the two pieces can bolt together to make the hub.
2. More holes drilled and tapped.



#### Image Notes

1. Here the two pieces are bolted together and the blades are bolted on.



#### Image Notes

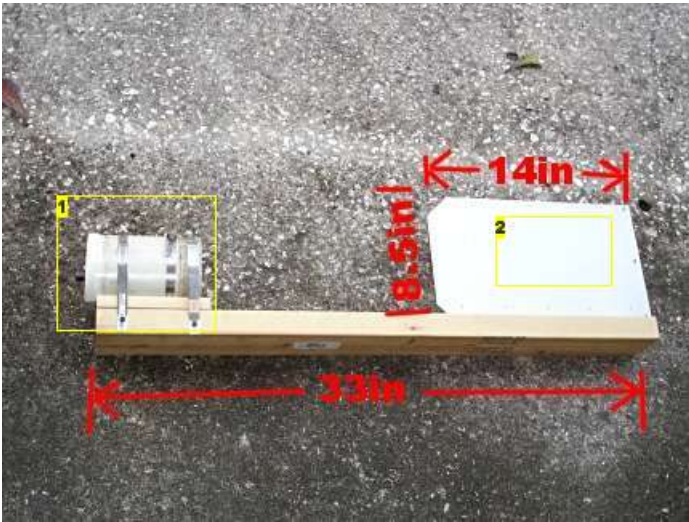
1. Another view of the completed hub with the blades mounted.

### step 4: Building the turbine mounting

Next I needed a mounting for the turbine. Keeping it simple, I opted to just strap the motor to a piece of 2 X 4 wood. The correct length of the wood was computed by the highly scientific method of picking the best looking piece of scrap 2 X 4 off my scrap wood pile and going with however long it was. I also cut a piece of 4 inch diameter PVC pipe to make a shield to go over the motor and protect it from the weather. For a tail to keep it turned into the wind, I again just used a piece of heavy sheet Aluminum I happened to have laying around. I was worried that it wouldn't be a big enough tail, but it seems to work just fine. The turbine snaps right around into the wind every time it changes direction. I have added a few dimensions to the picture. I doubt any of these measurements is critical though.

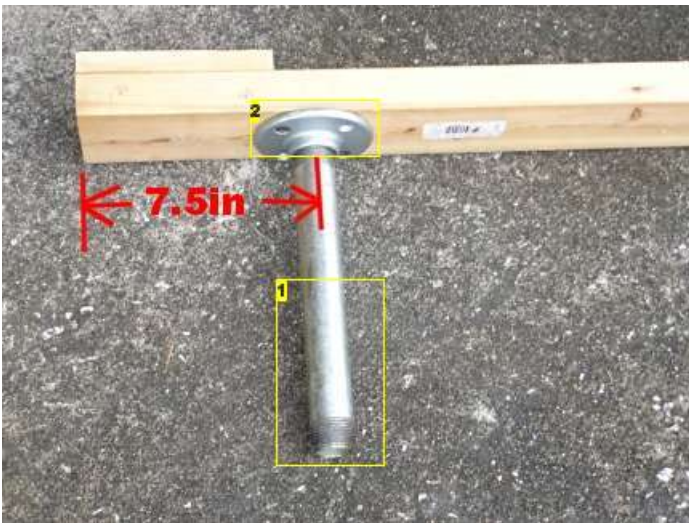
Next I had to begin thinking about some sort of tower and some sort of bearing that would allow the head to freely turn into the wind. I spent a lot of time in my local homecenter stores (Lowe's and Home Depot) brainstorming. Finally, I came up with a solution that seems to work well. While brainstorming, I noticed that 1 inch diameter iron pipe is a good slip-fit inside 1 1/4 inch diameter steel EMT electrical conduit. I could use a long piece of 1 1/4 inch conduit as my tower and 1 inch pipe fittings at either end. For the head unit I attached a 1 inch iron floor flange centered 7 1/2 inches back from the generator end of the 2X4, and screwed a 10 inch long iron pipe nipple into it. The nipple would slip into the top of the piece of conduit I'd use as a tower and form a nice bearing. Wires from the generator would pass through a hole drilled in the 2X4 down the center of the pipe/conduit unit and exit at the base of the tower. Brilliant! (if I do say so myself)





**Image Notes**

- 1. Piece of PVC pipe to protect the generator from the weather. Mounted with large hose clamps.
- 2. Random piece of sheet aluminum found on my junk pile used as a tail.



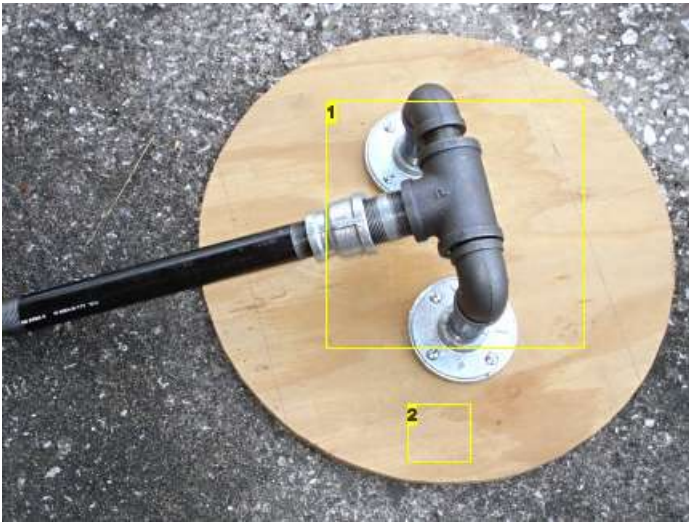
**Image Notes**

- 1. 1 inch steel pipe 10 inches long used as a bearing.
- 2. Floor flange screwed to underside of mounting board. A hole drilled through the board allows the wires from the generator to pass down the center of the flange and pipe.

**step 5: Build the tower base**

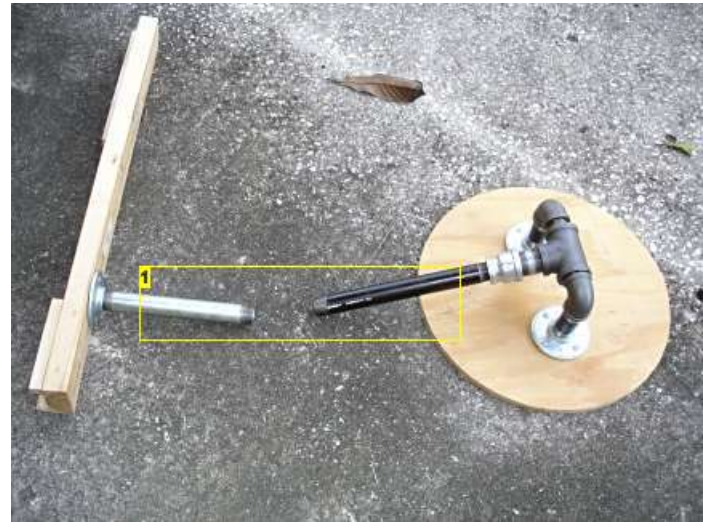
For the tower base, I started by cutting a 2 foot diameter disk out of plywood. I made a U shaped assembly out of 1 inch pipe fittings. In the middle of that assembly I put a 1 1/4 inch Tee. The Tee is free to turn around the 1 inch pipe and forms a hinge that allows me to raise and lower the tower. I then added a close nipple, a 1 1/4 to 1 reducing fitting, and a 12 inch nipple. Later I added a 1 inch Tee between the reducer and the 12 inch nipple so there would be a place for the wires to exit the pipe. This is shown in a photo further down the page. I also later drilled holes in the wooden disk to allow me to use steel stakes to lock it in place on the ground.

The second photo shows the head and base together. You can begin to see how it will go together. Imagine a 10 foot long piece of steel conduit connecting the two pieces. Since I was building this thing in Florida, but was going to use it in Arizona, I decided to hold off on purchasing the 10 foot piece of conduit until I got to Arizona. That meant the wind turbine would never be fully assembled and not get a proper test until I was ready to put it up in the field. That was a little scary because I wouldn't know if the thing actually worked until I tried it in Arizona.



**Image Notes**

1. Hinge made of pipe fittings to allow for raising and lowering the tower.
2. 4 holes (not shown) were eventually drilled in the base for hold-down stakes.



**Image Notes**

1. A ten foot length of conduit will serve as a tower. Both these pipes slide into the conduit.

**step 6: Paint all the wood parts**

Next, I painted all the wooden parts with a couple of coats of white latex paint I had leftover from another project. I wanted to protect the wood from the weather. This photo also shows the lead counterweight I added to the left side of the 2X4 under the tail to balance the head.



**Image Notes**

1. Lead counterweight to balance the turbine.
2. Paint all the wood parts to protect them from the weather.

**step 7: The finished head of the wind turbine**

This photo shows the finished head unit with the blades attached. Is that a thing of beauty or what? It almost looks like I know what I'm doing.

I never got a chance to properly test the unit before heading to Arizona. One windy day though, I did take the head outside and hold it high up in the air above my head into the wind just to see if the blades would spin it as well as I had hoped. Spin it they did. In a matter of a few seconds it spun up to a truly scary speed (no load on the generator), and I found myself holding onto a giant, spinning, whirligig of death, with no idea how to put it down without getting myself chopped to bits. Fortunately, I did eventually manage to turn it out of the wind and slow it down to a non-lethal speed. I won't make that mistake again.





### step 8: Build the charge controller

Now That I had all the mechanical parts sorted out, it was time to turn toward the electronic end of the project. A wind power system consists of the wind turbine, one or more batteries to store power produced by the turbine, a blocking diode to prevent power from the batteries being wasted spinning the motor/generator, a secondary load to dump power from the turbine into when the batteries are fully charged, and a charge controller to run everything.

There are lots of controllers for solar and wind power systems. Anyplace that sells alternative energy stuff will have them. There are also always lots of them for sale on Ebay . I decided to try building my own though. So it was back to Googling for information on wind turbine charge controllers. I found a lot of information, including some complete schematics, which was quite nice, and made building my own unit very easy. I based my unit on the schematic of the one found on this web site:

<http://www.fieldlines.com/story/2004/9/20/0406/27488>

That web site goes into a lot of detail about the controller, so I'm only going to talk about it in fairly general terms here. Again, while I followed their general recipe, I did do some things differently. Being an avid electronics tinkerer from an early age, I have a huge stock of electronic components already on hand, so I had to buy very little to complete the controller. I substituted different components for some parts and reworked the circuit a little just so I could use parts I already had on hand. That way I had to buy almost nothing to build the controller. The only part I had to buy was the relay. I built my prototype charge controller by bolting all the pieces to a piece of plywood, as seen in the first photo below. I would rebuild it in a weatherproof enclosure later.

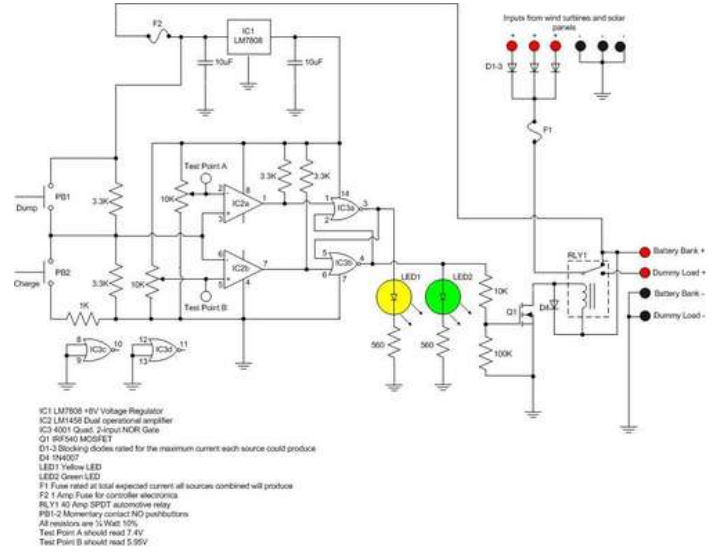
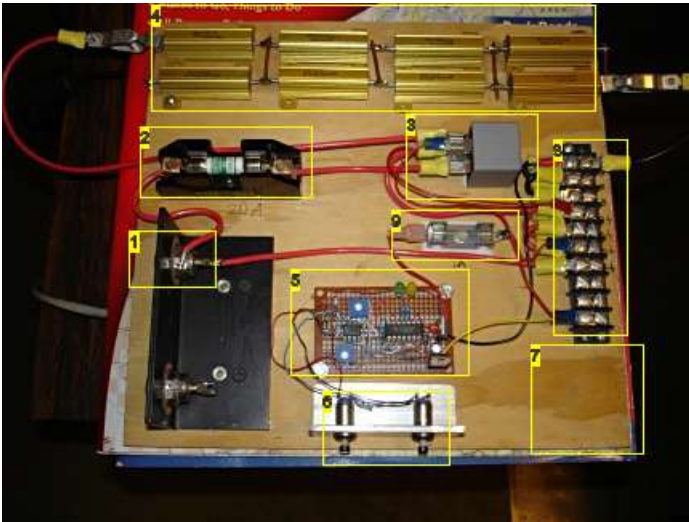
Whether you build your own, or buy one, you will need some sort of controller for your wind turbine. The general principal behind the controller is that it monitors the voltage of the battery(s) in your system and either sends power from the turbine into the batteries to recharge them, or dumps the power from the turbine into a secondary load if the batteries are fully charged (to prevent over-charging and destroying the batteries). The schematic and write-up on the above web page does a good job of explaining it. Much more information on building the charge controller, including larger and easier to read schematics, can be found on my web site at

[http://www.mdpub.com/Wind\\_Turbine/index.html](http://www.mdpub.com/Wind_Turbine/index.html)

In operation, the wind turbine is connected to the controller. Lines then run from the controller to the battery. All loads are taken directly from the battery. If the battery voltage drops below 11.9 volts, the controller switches the turbine power to charging the battery. If the battery voltage rises to 14 volts, the controller switches to dumping the turbine power into the dummy load. There are trim pots to adjust the voltage levels at which the controller toggles back and forth between the two states. I chose 11.9V for the discharge point and 14V for the fully charged point based on advice from lots of different web sites on the subject of properly charging lead acid batteries. The sites all recommended slightly different voltages. I sort of averaged them and came up with my numbers. When the battery voltage is between 11.9V and 14.8V, the system can be switched between either charging or dumping. A pair of push buttons allow me to switch between states anytime, for testing purposes. Normally the system runs automatically. When charging the battery, the yellow LED is lit. When the battery is charged and power is being dumped to the the dummy load, the green LED is lit. This gives me some minimal feedback on what is going on with the system. I also use my multimeter to measure both battery voltage, and turbine output voltage. I will probably eventually add either panel meters, or automotive-style voltage and charge/discharge meters to the system. I'll do that once I have it in some sort of enclosure.

I used my variable voltage bench power supply to simulate a battery in various states of charge and discharge to test and tune the controller. I could set the voltage of the power supply to 11.9V and set the trim pot for the low voltage trip point. Then I could crank the voltage up to 14V and set the trim pot for the high voltage trip point. I had to get it set before I took it into the field because I'd have no way to tune it up out there.

I have found out the hard way that it is important with this controller design to connect the battery first, then connect the wind turbine and/or solar panels. If you connect the wind turbine first, the wild voltage swings coming from the turbine won't be smoothed out by the load of the battery, the controller will behave erratically, the relay will click away wildly, and voltage spikes could destroy the ICs. So always connect to the battery(s) first, then connect the wind turbine. Also, make sure you disconnect the wind turbine first when taking the system apart. Disconnect the battery(s) last.



**Image Notes**

1. The blocking diode
2. The main fuse.
3. 40 Amp SPDT automotive relay.
4. Dummy load.
5. Controller electronics.
6. Charge and Dump buttons.
7. I built the prototype charge controller by bolting all the pieces onto a piece of plywood. Later I would rebuild it in a weatherproof enclosure.
8. Terminal block for connecting everything together, and for connections to the battery and wind turbine.
9. Fuse for controller electronics.

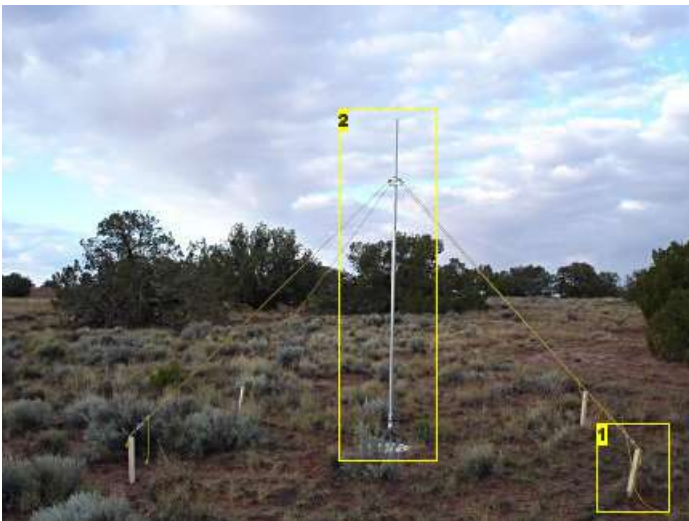
**step 9: Erect the tower**

At last, all parts of the project were complete. It was all done only a week before my vacation arrived. That was cutting it close. I disassembled the turbine and carefully packed the parts and the tools I'd need to assemble it for their trip across the country. Then I once again I drove out to my remote property in Arizona for a week of off-grid relaxation, but this time with hopes of having some actual electricity on the site.

The first order of business was setting up and bracing the tower. After arriving at my property and unloading my van, I drove to the nearest Home Depot (about 60 miles one way) and bought the 10 foot long piece of 1 1/4 inch conduit I needed for the tower. Once I had it, assembly went quickly. I used nylon rope to anchor the pole to four big wooden stakes driven in the ground. Turnbuckles on the lower ends of each guy-line allowed me to plumb up the tower. By releasing the line from either stake in line with the hinge at the base, I could raise and lower the tower easily. Eventually the nylon line and wooden stakes will be replaced with steel stakes and steel cables. For testing though, this arrangement worked fine.

The second photo shows a closeup of how the guy-lines attach near the top of the tower. I used chain-link fence brackets as tie points for my guy-lines. The fence brackets don't quite clamp down tightly on the conduit which is smaller in diameter than the fence posts they are normally used with. So there is a steel hose clamp at either end of the stack of brackets to keep them in place.

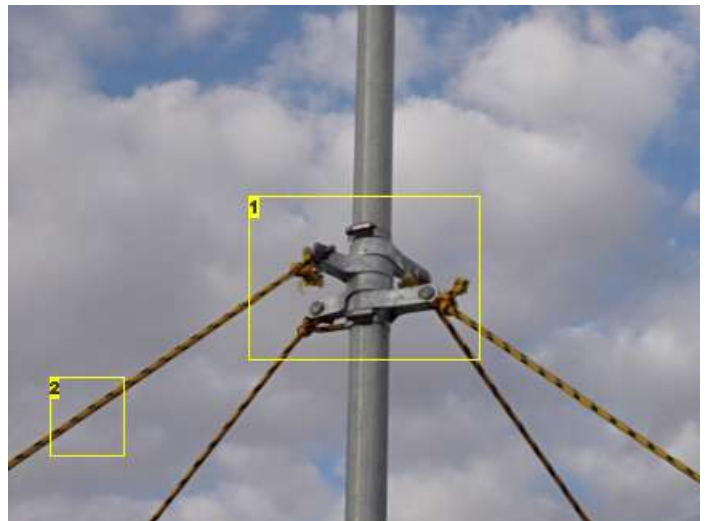
The third photo shows the base of the tower, staked to the ground, and with the wire from the wind turbine exiting from the Tee below the conduit tower. I used an old orange extension cord with a broken plug to connect between the turbine and the controller. I simply cut both ends off and put on spade lugs. Threading the wire through the tower turned out to be easy. It was a cold morning and the cord was very stiff. I was able to just push it through the length of the conduit tower. on a warmer day I probably would have had to use a fishtape or string line to pull the cord through the conduit. I got lucky.



**Image Notes**

1. 4 wooden stakes to anchor the guy lines. Eventually will be replaced with

[http://www.instructables.com/id/How\\_I\\_built\\_an\\_electricity\\_producing\\_wind\\_turbine/](http://www.instructables.com/id/How_I_built_an_electricity_producing_wind_turbine/)



**Image Notes**

1. A stack of 4 chain link fence brackets used as anchor points for the guy wires.

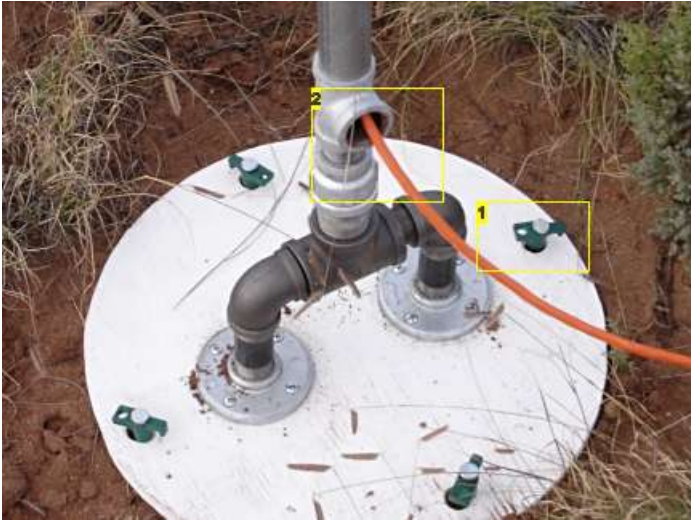


steel stakes and steel cables.

2. 10 foot length if 1 1/4 inch conduit used as the tower for the wind turbine.

Steel hose clamps above and below the stack keep them in place.

2. Nylon rope used for guy wires. Will eventually be replaced with steel cables.



#### Image Notes

1. Stakes driven through holes in the base into the ground to stabilize the base.
2. The power cable from the wind turbine exits the bottom of the tower through a tee connector.

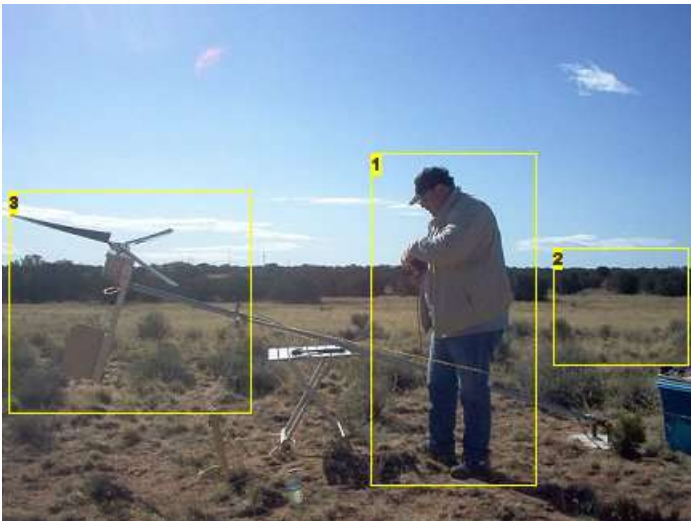
### step 10: Erect the wind turbine

The first photo shows the turbine head installed on top of the tower. I greased up the pipe on the bottom of the head and slid it into the top of the conduit. It made a great bearing, just as I'd planned. Sometimes I even amaze myself.

Too bad there was nobody around to get an Iwo Jima Flag Raising type picture of me raising the tower up with the head installed.

The second photo shows the wind turbine fully assembled. Now I'm just waiting for the wind to blow. Wouldn't you know it, it was dead calm that morning. It was the first calm day I had ever seen out there. The wind had always been blowing every other time I had been there. Well, nothing to do but wait.

Finally! The wind was up and the turbine was spinning, and the lovely electricity is starting to be produced.



#### Image Notes

1. Me.
2. My 40 acre parcel of remote Arizona property.
3. Tower hinged down for installation of the turbine head.



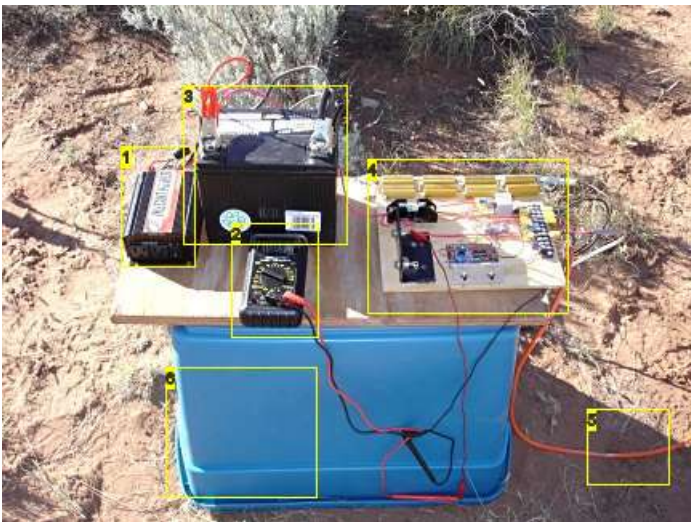


### step 11: Connect the electronics

The first photo below shows the electronics setup. The battery, inverter, meter and prototype charge controller are all sitting on a plywood board on top of a blue plastic tub. I plug a long extension cord into the inverter and run power back to my campsite. Lots more information of the electronics set-up can be found on my web site at [http://www.mdpub.com/Wind\\_Turbine/](http://www.mdpub.com/Wind_Turbine/)

Once the wind starts blowing, the turbine head snaps around into it and begins spinning up. It spins up quickly until the output voltage exceeds the battery voltage plus the blocking diode drop (around 13.2 volts, depending on the state of the battery charge). It is really running without a load until that point. Once the that voltage is exceeded, the turbine suddenly has a load as it begins dumping power into the battery. Once under load, the RPMs only slightly increase as the wind speed increases. More wind means more current into the battery which means more load on the generator. So the system is pretty much self-governing. I saw no signs of over-reving. Of course in storm-force winds, all bets are off.

Switching the controller to dump power into the dummy load did a good job of braking the turbine and slowing it way down even in stronger gusts. Actually shorting the turbine output is an even better brake. It brings the turbine to a halt right now, even in strong winds. Shorting the output is how I made the turbine safe to raise and lower, so I wouldn't get sliced and diced by the spinning blades. Warning though, the whole head assembly can still swing around and crack you hard on the noggin if the wind changes direction while you are working on these things. So be careful out there.



#### Image Notes

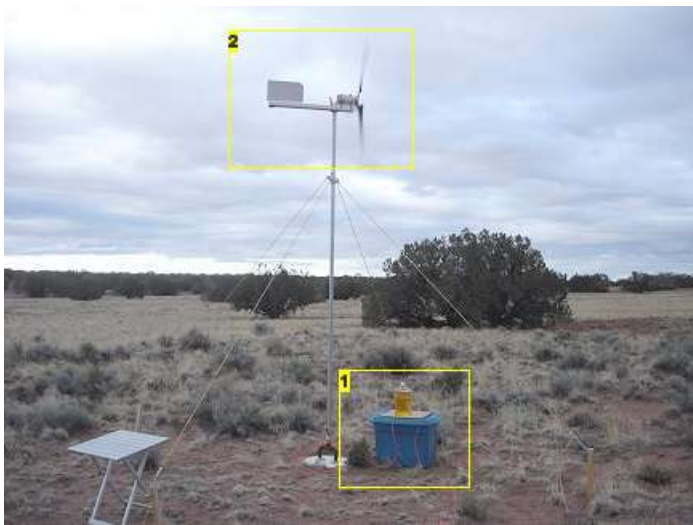
1. Inverter to provide 120V AC power. I plug an extension cord in here and run it back to my camp site to provide power.
2. Meter to monitor voltage and current.
3. 12V deep cycle lead-acid battery.
4. Prototype charge controller.
5. Cable to wind turbine
6. Blue plastic tub serving as a table for the electronics set-up. Later I would put everything inside the tub to protect it from the weather.



#### Image Notes

1. My meter shows the wind turbine producing 14.5 volts in a stiff wind.





#### Image Notes

1. Electronics put inside a blue plastic tub to protect them from rain showers. The large jug of lamp oil on top keeps the wind from ripping the lid off.
2. The wind turbine just spinning away in a stiff wind from an approaching storm front.

### step 12: Enjoy having power in the middle of nowhere

How sweet it is! I have electricity! Here I have my laptop computer set up and plugged into the power provided by the inverter, which in turn is powered by the wind turbine. I normally only have about two hours of battery life on my laptop. So I don't get to use it much while I'm camping. It comes in handy though for downloading photos out of my camera when its memory card gets full, making notes on projects like this one, working on the next great American novel, or just watching DVD movies. Now I have no battery life problems, at least as long as the wind blows. Besides the laptop, I can also now recharge all my other battery powered equipment like my cell phone, my camera, my electric shaver, my air mattress pump, etc. Life used to get real primitive on previous camping trips when the batteries in all my electronic stuff ran down.

I used the wind turbine to power my new popup trailer on a later vacation. The strong spring winds kept the wind turbine spinning all day every day and most of the nights too while I was in Arizona. The turbine provided enough power for the interior 12V lighting and enough 120V AC at the power outlets to keep my battery charger, electric shaver, and mini vacuum cleaner (camping is messy) all charged up and running. My girlfriend complained about it not having enough power to run her blow-dryer though.



#### Image Notes

1. The wind turbine powers my laptop computer, battery charger, electric shaver, cell phone, air mattress pump, and lots of other things.
2. The first time I used the wind turbine I was tent camping alone on my property, and my power needs were modest.



#### Image Notes

1. On a later camping trip, my girlfriend and I stayed on the property in my popup camper. The wind turbine powered the lights and provided 120V AC at the outlets for light loads.



### step 13: How much did it cost?

So how much did all this cost to build? Well, I saved all the receipts for everything I bought related to this project.

Part	Origin	Cost
Motor/Generator	Ebay	\$26.00
Misc. pipe fittings	Homecenter Store	\$41.49
Pipe for blades	Homecenter Store	\$12.84
Misc hardware	Homecenter Store	\$8.00
Conduit	Homecenter Store	\$19.95
Wood & Aluminum	Scrap Pile	\$0.00
Power Cable	Old extension cord	\$0.00
Rope & Turnbuckles	Homecenter Store	\$18.47
Electronic Parts	Already on hand	\$0.00
Relay	Auto Parts Store	\$13.87
Battery	Borrowed from my UPS	\$0.00
Inverter	Already on hand	\$0.00
Paint	Already on hand	\$0.00
Total		\$140.62

Not too bad. I doubt I could buy a commercially made turbine with a comparable power output, plus a commercially made charge controller, plus a commercially made tower for less than \$750-\$1000.



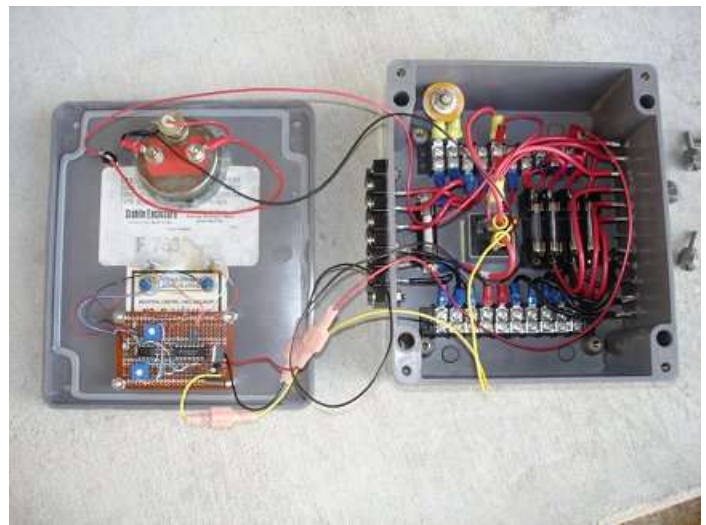
### step 14: Update

I have completed the rebuild of the charge controller. It is now in a semi-weatherproof enclosure and I have also added a built in voltage meter. Both were bought cheap on Ebay. I have also added a few new features. The unit now has provisions for power inputs from multiple sources. It also has built-in fused 12V power distribution for three external loads.

The second photo shows the inside of the charge controller. I basically just transferred everything that I originally had bolted onto the plywood board in the prototype into this box. I added an automotive illuminated voltage gage and fuses for 3 external 12V loads. I used heavy gage wire to try to reduce losses due to wire resistance. Every watt counts when you are living off-grid.

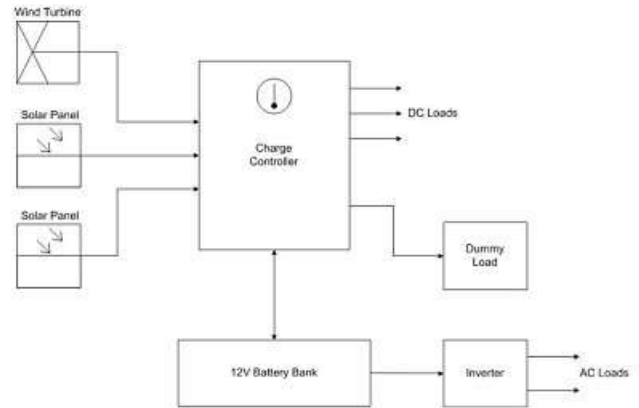
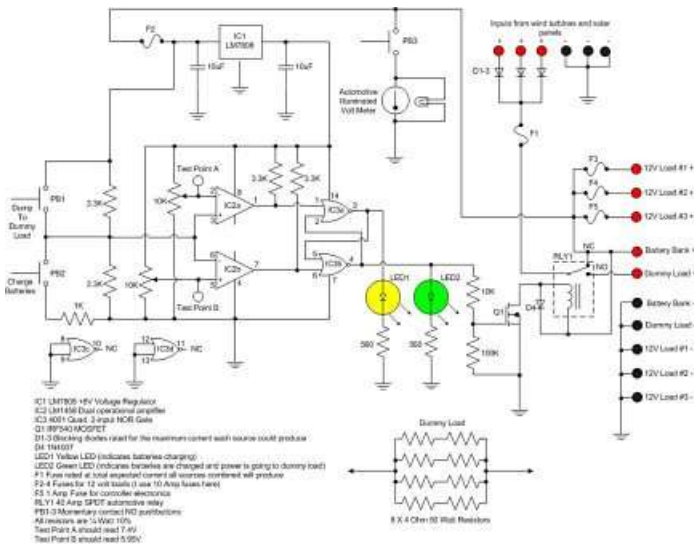
The third image is the schematic for the new charge controller. It is pretty much the same as the old one above, except for the addition of the Volt meter and extra fuse blocks for the external loads. A larger, easier to read version of the schematic, and more information on the new charge controller can be found on my web site at [http://www.mdpub.com/Wind\\_Turbine/](http://www.mdpub.com/Wind_Turbine/)

This is a block diagram of the whole power system. Note that I only have one solar panel built right now. I just haven't had the time to complete the second one. Please visit my home-built solar panel page at <http://www.mdpub.com/SolarPanel/> for more information on home-built solar panels.



### Image Notes

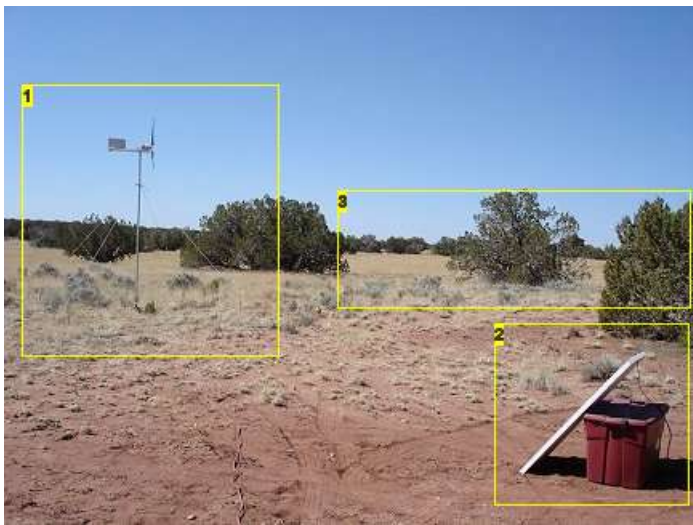
1. The new charge controller built into a weatherproof box.



### step 15: Update 2

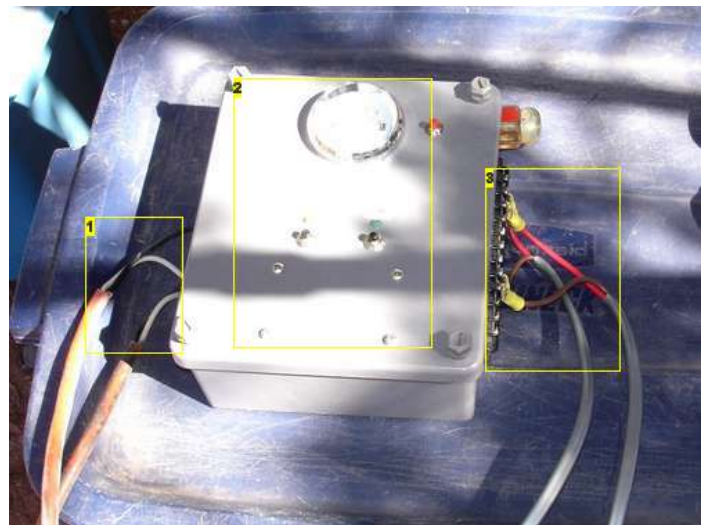
Once again I stayed on my remote property during my recent vacation in Arizona. This time I had both my home-built wind turbine and my home-built solar panel with me. Working together, they provided plenty of power for my (admittedly minimal) electricity needs.

The second photo shows the the new charge controller unit. The wires on the left side are coming from the wind turbine and solar panel. The wires on the right side are going to the battery bank and dummy load. I cut up an old heavy-duty 100 ft. extension cord to make cables to connect wind turbine and solar panel to the charge controller. The cable to the wind turbine is about 75 feet long and the cable to the solar panel is about 25 feet long. The battery bank I am currently using consists of 11 sealed lead-acid 12V batteries of 8 Amp-Hour capacity connected in parallel. That gives me 88 Amp-Hours of storage capacity, which is plenty for camping. As long as it is sunny and windy, (nearly every day is sunny and windy on my property), the wind turbine and solar panel keep the batteries well charged.



**Image Notes**

1. Wind turbine.
2. Solar panel.
3. My 40 acre parcel of remote Arizona property.



**Image Notes**

1. Cables bringing power from the wind turbine and solar panel.
2. The new charge controller unit in its weatherproof box.
3. Cables carrying power to the battery bank and dummy load.

**Related Instructables**



**DIY 1000 watt wind turbine** by sspence



**Model Wind Turbine :: KidWind Project** by kidwindrob



**Hard Drive Parts Generator and Theory Tester (slideshow)** by FullyInvolvedScien



**KNEX WIND MILL.....** by meming



**4" vawt,savonius,ve axis,wind turbine,ametek)** by faroun



**V8- Harnessing sound power** by Applebohn



**vawt,savonius,ve axis,wind turbine,;** by faroun



**Cardboard Savonius Wind Turbine** by rhackenb



**Comments**

[50 comments](#) [Add Comment](#)

[view all 69 comments](#)



**jomaro** says:

Well done mdavis 19! Nice web page also.  
 For those of you wanting to know more about slip rings try this link.  
 If you don't find the two photos of a red plastic stuff on top of a tower, let me know.  
 As you can see, there are tree ring and tree double brushes.


Good luck!


Nov 7, 2008. 8:46 AM [REPLY](#)



 **osamaawadi** says: Nov 1, 2008. 1:42 AM [REPLY](#)  
very very very verygood wind turbine


 **PeaceRabit** says: Oct 25, 2008. 1:56 PM [REPLY](#)  
that's really cool!

 **handydave937** says: Oct 23, 2008. 6:52 PM [REPLY](#)  
Kudos on a great project, and also on your 60 watt PV panels. Great to see Yankee enginunity work.

 **BlakPanther** says: Oct 11, 2008. 5:04 PM [REPLY](#)  
I'm no physicist, but would adding blades increase your efficiency, or diminish it?  
Great Job! I like it!




**mdavis19** says: Oct 11, 2008. 8:29 PM [REPLY](#)  
From what I understand, turbines with even numbers of blades tend to suffer badly from vibration. So you have to add blades two at a time. More blades means more torque, but also more drag and slower speeds. Eventually you wind up with turbines like the water pumping mills you see on farms and ranches that have lots of blades and turn slowly, but have tremendous torque. Generators like to turn fast, so most electricity generating wind turbines don't have more than 5 blades. Three is more normal.

 **hazzadobo** says: Oct 7, 2008. 8:25 PM [REPLY](#)  
i was thinking of making a small, experimental wind turbine out of a few computer fans, i am planning to use about 5 or 6 inline, would they generate much electricity? In science at school my teacher said that any motor could be a generator, but it just might not be a very efficient one.




**odiekokee** says: Oct 11, 2008. 4:36 PM [REPLY](#)  
Most computer fans use brushless DC motors, and unless I'm mistaken, I don't think brushless motors will act as generators. Someone feel free to correct me if I'm incorrect.

 **MarshW** says: Oct 9, 2008. 6:00 PM [REPLY](#)  
Eventually the wire coming down from the generator could possibly twist until it breaks. Have you investigated some means of connecting the generator through brushes or something?




**hernanai** says: Oct 9, 2008. 10:39 PM [REPLY](#)  
have you seen the brakes that are used for BMX bikes? something like that would be great to prevent breakage...

 **oddie1212** says: Oct 3, 2008. 10:53 AM [REPLY](#)  
I would like to know what are some alternative generators (/motors) that can be used for this project instead of something that may be hard to find. I understand it takes a certain type of generator to accomplish this but additional list of devices would be nice instead of just the Ametek motors.  
Does any one have other motors to be able to use for this type of project?



**mdavis19** says: Oct 4, 2008. 11:10 AM [REPLY](#)  
The type of Ametek motor I used isn't really all that hard to find, but they have gotten very expensive as people have come to realize they make great generators for wind turbines. There are other alternatives. Just about any permanent magnet DC motor rated for relatively high voltage and relatively low RPMs would make a decent generator. Motors from battery powered electric lawn mowers, battery powered floor buffers and lots of types of servo motors would work too. Also lots of other industrial DC motors.

 **Demented** says: Sep 28, 2008. 5:16 AM [REPLY](#)  
I've been asking around the net but no one seems to want to answer me. Can you connect a motor to a dynamo and the dynamo to the motor which will give you an unlimited supply of electricity? Assuming that there is no such thing as wear and tear. Of course maybe you'll need to spin the dynamo yourself first but after that, could that circuit give you an endless supply of electricity?



**sephiroth9393** says: Oct 3, 2008. 9:23 AM [REPLY](#)  
absolutely not. resonance is the closest thing and still absolutely not.



**hrishioa** says: Sep 30, 2008. 11:18 AM [REPLY](#)  
You can never do that on our earth. There's way too many forces acting on the machines when you're not looking. For example, your machine may encounter air friction, disturbing the energy equilibrium. Even if you , in a hypothetical scenario, manage to get it running for at least a minute, even the energy of photons deflected from it will be enough to send it into chaos.  
Of course, in outer space, find a place without gravity and newton's first law ensures perpetual motion, even without a dynamo and a motor.



**KeithB** says:

Sep 29, 2008. 11:15 AM [REPLY](#)

What you are dreaming of is "perpetual motion"! The energy losses in the system will always result in the system winding down and stopping. you will have to add more energy to the system in order for it to do "work".

Hope this helps you in your quest !!!



**Renegade** says:

Oct 28, 2008. 7:08 PM [REPLY](#)

well actually scientists have thought of a way to get infinite conductivity, its a theory. This theory states that if a certain plastic was to freeze to absolute zero then the conductivity would be infinite. Such as if you have a loop of this frozen plastic and send a pulse of elec. into it it will continue forever. but its a theory so who knows.



**mdavis19** says:

Sep 28, 2008. 5:34 AM [REPLY](#)

No. What you are envisioning is a perpetual motion machine. They are impossible. They violate several laws of physics. You can never get as much energy back out of a system as you put in, let alone an endless amount.



**nngreen** says:

Oct 1, 2008. 7:42 AM [REPLY](#)

Any info or contacts for building bicycle driven electric generator? You know like the one the Professor on Gilligan's Island had to run the transistor radio.



**wolfy\_9005** says:

Sep 28, 2008. 8:14 AM [REPLY](#)

I forgot the site, but it tells you how to convert an alternator to produce 110V...



**titsanonymous** says:

Sep 22, 2008. 8:08 PM [REPLY](#)

what if you use a car alternator



**niv** says:

Sep 27, 2008. 5:10 PM [REPLY](#)

Well, with a few alterations you can. See the following YouTube videos for instructions on how. I'm in the process right now.

<http://www.youtube.com/watch?v=897MdT0E88U>  
<http://www.youtube.com/watch?v=aHB4zxWd3Ls>  
<http://www.youtube.com/watch?v=K0YxYDnmaOO>  
<http://www.youtube.com/watch?v=s75-ICKKK8g>



**mdavis19** says:

Sep 27, 2008. 6:14 AM [REPLY](#)

Car alternators need to be turned at pretty high RPMs to produce a useful amount of power. Most wind turbines just don't spin fast enough.



**JuCo** says:

Sep 23, 2008. 11:54 PM [REPLY](#)

An alternator's magnet is an electromagnet, so, you'd have to power it for it to generate power. (I'm pretty sure, at least.)



**askjerry** says:

Sep 25, 2008. 6:56 PM [REPLY](#)

*Actually not.*

The difference between a DC motor (or DC generator) and an alternator is a commutator. An alternator will produce a rising pulse as the motor is turned through 180 degrees, then it will produce a negative pulse through the next 180 degrees... the pulse **ALTERNATES** (hence the name) each 180 degrees.

A commutator is a set of leads that reverses every 180 degrees... so the output is a series of positive only pulses. If you take an alternator and run the outputs through a full wave bridge rectifier you will accomplish the same thing... only at a 1.4 vdc loss typical. (Diodes have a 0.7 voltage drop... and there are always two in the path of the bridge.)

Jerry

(Yeah... I know... other diodes only have a 0.3 v drop... that's another lesson!)



**static** says:

Sep 27, 2008. 1:51 AM [REPLY](#)

Actually yes :) like an automotive generator, an automotive Alternator uses an electromagnetic field, that requires power. As others mention the drawback of an automotive alternator is it require a high speed to work well.



**askjerry** says:

Reference: <http://en.wikipedia.org/wiki/Alternator>

Sep 27, 2008. 6:05 AM [REPLY](#)

I'll give you that an alternator can have power applied until it gets up to rotational speed, but it is not required if you use a relay to switch the load once it has enough output. The current then will come from the alternator it's self.

**Quote: Modern automotive alternators have a voltage regulator built into them. The voltage regulator operates by modulating the small field current in order to produce a constant voltage at the stator output. The field current is much smaller than the output current of the alternator; for example, a 70-amp alternator may need only 2 amps of field current. The field current is supplied to the rotor windings by slip rings and brushes. The low current and relatively smooth slip rings ensure greater reliability and longer life than that obtained by a DC generator with its commutator and higher current being passed through its brushes.**

This is covered here...

**Quote: The field windings are initially supplied via the ignition switch and charge warning light, which is why the light glows when the ignition is on but the engine is not running. Once the engine is running and the alternator is generating, a diode feeds the field current from the alternator main output, thus equalizing the voltage across the warning light which goes out. The wire supplying the field current is often referred to as the "exciter" wire. The drawback of this arrangement is that if the warning light fails or the "exciter" wire is disconnected, no excitation current reaches the alternator field windings and so the alternator, due to low residual magnetism in the rotor will not generate any power. However, some alternators will self-excite when the engine is revved to a certain speed. The driver may check for a faulty exciter-circuit by ensuring that the warning light is glowing with the engine stopped.**

I hope this clarifies it a bit.  
Jerry



**JuCo** says:

nice. so, with the right gearing, an alternator could be hooked to a turbine as a generator?

Sep 26, 2008. 12:24 AM [REPLY](#)



**static** says:

If you have a source of mother earth news back issues you can access, search for their "Red Baron" project or was that the Blue baron? Nope it's the Blue Max <http://www.motherearthnews.com/Renewable-Energy/1985-05-01/The-Blue-Max-Affordable-Wind-Power.aspx> a 350watt power wind plant. A fairly involved project, one that I don't believe that could stand up to the High Plains wind I'd be subjecting it to.

Sep 27, 2008. 2:52 AM [REPLY](#)



**askjerry** says:

Yup... in fact, they work rather well. Several will produce 100 volts or so... this means that at slower RPM they are still putting out a good amount of voltage. Additionally, since they are AC, they can be run through a transformer... but generally that just wastes power. It depends on your application.

Sep 26, 2008. 9:18 AM [REPLY](#)



**JuCo** says:

wait... AC? are we both talking about alternators from a car? those aren't DC?

Sep 29, 2008. 7:05 PM [REPLY](#)



**askjerry** says:

The alternator is actually AC... it then passes through diodes which convert it to DC.

Sep 29, 2008. 9:53 PM [REPLY](#)



**JuCo** says:

right, right... because diodes are like one way roads, right? that's how it can go into a battery?

Sep 29, 2008. 10:08 PM [REPLY](#)



**askjerry** says:

Yes... this should clarify it: [http://en.wikipedia.org/wiki/Diode\\_bridge](http://en.wikipedia.org/wiki/Diode_bridge)

Sep 30, 2008. 12:11 PM [REPLY](#)



**JuCo** says:

cool, thanks

Sep 30, 2008. 4:45 PM [REPLY](#)



**JuCo** says:

P.S.- sorry about so many questions... i've no real training when it comes to any of this stuff and only know what i've picked up here 'n' there

Sep 29, 2008. 7:07 PM [REPLY](#)



**static** says:

True an automotive alternator is capable of producing up to 120 volts to operate hand power tools that use universal motors, but there are caveats. The full battery voltage has to be applied to the field, the battery isn't being charged in this mode of operation will eventually run down. The alternator has to be turned at a higher speed yet. I have known folks done this on a near daily basis, and this is hard on alternators. As for using transformers, where this use is no where near 60 cycle AC, of the shelf transformers may over heat.

Sep 27, 2008. 2:13 AM [REPLY](#)





**brokengun** says:

Sep 26, 2008. 10:41 AM [REPLY](#)

Be careful, the amount of voltage may be misleading. Alternators are designed to charge at pretty high RPMs... A lower RPM axial flux alternator is optimal for this application. However, alternators are easy to find and do still produce some power.



**BigRich** says:

Sep 23, 2008. 10:31 AM [REPLY](#)

You'll need to get HIGH RPM to get it to generate power.



**lordofthedonuts** says:

Sep 22, 2008. 5:55 PM [REPLY](#)

That's really good!

I've seen your other 'ible when you were talking about your property in Arizona, i thought there was like a small shack, but it's really in the middle of nowhere!



**mdavis19** says:

Sep 27, 2008. 6:30 AM [REPLY](#)

Yes, my property is raw, unimproved land. No structures at all. No water, power, sewer, phone or anything. The road in is barely worthy of being called a road. It is really just a set of parallel ruts. I do get cell phone reception on the property, but it is weak and I have to stand in just the right spot, or it fades out entirely. I have been camping on the property for years now. I eventually want to put a small cabin on it and power it with wind and solar.



**tubajoe1** says:

Sep 24, 2008. 1:38 PM [REPLY](#)

about how long did it take you to complete this step? i am going to try to make a wind turbine, based on your instructions, and hopefully be able to run everything in my room.

thanks



**mdavis19** says:

Sep 27, 2008. 6:20 AM [REPLY](#)

It took about a month of my spare time to build it.



**polo99a9** says:

Sep 24, 2008. 4:33 PM [REPLY](#)

the tabs will brake because you cut them wrong. I suggest that you should make the cut round, because the tension is building up in the corner. when rounded up, the tension is spread more evenly, so there is a better chance that they won't brake.



**mdavis19** says:

Sep 27, 2008. 6:19 AM [REPLY](#)

I found that the tabs aren't necessary at all. My web site at [http://www.mdpub.com/Wind\\_Turbine/](http://www.mdpub.com/Wind_Turbine/) shows how the turbine blades work now without tabs after they eventually broke.



**Jack-In-Da-Box** says:

Sep 26, 2008. 11:29 PM [REPLY](#)

Excellent, very well made and good instructable, 5\*s

=]



**realcelestialphoenix** says:

Sep 26, 2008. 2:12 PM [REPLY](#)

my dad's got a spare 1 kilo-watt motor at work- will that work any better?



**gardnerp** says:

Sep 26, 2008. 1:58 PM [REPLY](#)

Very cool! Your instructions really seem show that wind power within reach for many of us. Thanks!

PS: Also, I appreciate your updates!



**tubajoe1** says:

Sep 26, 2008. 9:27 AM [REPLY](#)

how might one go about making this slip ring? im really into this stuff, and im good at making things, but im undereducated on part names...lol



**tubajoe1** says:

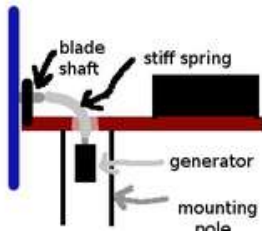
Sep 25, 2008. 9:17 PM [REPLY](#)

i just thought of a way you could mount the generator to the blades, without ever having the wires kink up...but im not sure it would be practical.

have the motor face shaft up from the mounting pole, and attach a long spring to it. then feed it through the bottom of the spinning assembly on the top of the pole, and then to the shaft of the blade assembly.

im not sure how much of that was undersandable, so i tried to make a picture...

while making the picture, i also thought that a series of gears would work well too, just as long as the motor is mounted inside the tube that holds up the main turbine structure. but again, im not too sure of how well the power transfer would be from the blades to the motor at that point. i might give it a try and see how well it works.



---

[view all 69 comments](#)