HOW TO GENERATE YOUR OWN ELECTRICITY & BUILD YOUR OWN SOLAR PANELS!

DIY: Generate your own electricity

Updated Friday, 1 March 2019

Do you want to make your own electricity? Here's a step-by-step guide to making your own generator.

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Do it yourself

A generator is simply a device that converts mechanical energy (itself derived from coal, oil, natural gas, wind, water, nuclear reactions or other sources) into electrical energy. Here, we describe how to use readily available materials to make a simple generator. Although it will only be powerful enough to light a small torch bulb, it works on the same basic principles as the power station generators that supply domestic electricity.

How a generator works

When an electric current flows through a wire, it generates a three-dimensional magnetic force field around the wire, similar to that surrounding a bar magnet. Magnets are also surrounded by a similar three-dimensional field. This can be 'seen' in two dimensions if iron filings are sprinkled on a sheet of paper placed over the magnet. The filings align themselves along the lines of magnetic force surrounding the magnet.

Two-dimensional representation of the magnetic field around a bar magnet. The arrows indicate the direction of the lines of magnetic force. The N (north) and S (south) indicate the poles of the magnet, where the lines of force are focused. The north pole of the magnet will repel the north pole of a compass or another bar magnet, while its south pole will attract the north pole of a compass or another bar magnet.

The simplest generator consists of just a coil of wire and a bar magnet. When you push the magnet through the middle of the coil, an electric current is produced in the wire. The current flows in one direction as the magnet is pushed in, and in the other direction as the magnet is removed. In other words, an alternating current is produced. If you hold the magnet absolutely still inside the coil, no current is generated at all. Another way of producing the current would be for the magnet to be rotated inside the coil, or for the coil to be rotated round the magnet.

This method of generating electricity, called induction, was discovered by Michael Faraday in 1831. He found that the stronger the magnets were, the more turns of wire in the coil, and the quicker the motion of the magnet or coil, the greater the voltage produced. Faraday also observed that it was more efficient if the coil was wound around a metal core, as this helped to concentrate the magnetic field.

Voltage and current

What do the electrical terms voltage (measured in volts) and current (measured in amperes, often shortened to amps) mean? Imagine the electric current flowing in a conducting wire to be like cars travelling along a motorway. The motorway is the wire and the voltage the speed at which the cars move. The current corresponds to the number of cars passing a given point each second.

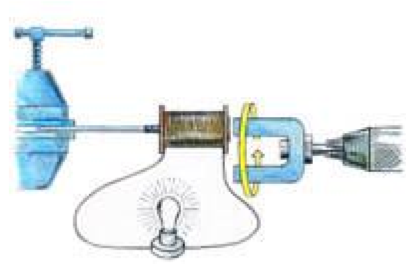
When a current flows through a wire, electrical energy is converted into other forms of energy, like heat in a heating element, light from the filament of a bulb, or sound from a loudspeaker. The electric current could also be made to produce mechanical energy, which is what happens in an electric motor. A motor is therefore just a generator operating in reverse.

Making your own generator

What you'll need

- cardboard
- 15cm long iron nail with a 6mm diameter and a large head
- 8–10cm long bolt with a 6mm diameter, and nut
- 25m enamelled copper wire (30 swg or approx. 0.3mm diameter)*
- E825 eclipse button magnet (with a fixing hole)*
- 6V, 0.06A torch bulb and bulb holder*
- a roll of insulating tape*
- a hand drill

* Obtainable from DIY stores, or electronic shops.



a simple generator

What to do

Your generator will consist of a coil held close to a spinning magnet.

1. Cut out two cardboard discs roughly 3cm in diameter, and make a 4–5mm hole in the centre of each. Insert the nail in the hole and push one disc up to its head. Cover the next 2–3cm of the nail's surface with a couple of layers of insulating tape.
2. Slide on the other disc until it butts up against the tape, and then wind more tape on the other side of it to fix it in position so that the cardboard discs are no more than 2–3cm apart. Unwind 30cm or so of wire from the reel to form a lead from the coil, and start winding the remaining wire around the insulating tape between the two cardboard discs. To keep track, it may help to make a tick mark on a piece of paper after every 100 turns. The number of turns is not critical, but the more the better; 1 500 should do.
3. Having covered the nail with a single layer of turns, continue building up layers one on top of the other. You don't have to do a particularly neat job.
4. After about 1 500 turns, leave about 30cm of wire free at the other end and then cover the windings with insulating tape. Remove a cm or so of the insulation from the two end wires by scraping off the enamel, and connect them to the bulb holder. Fit the bulb into the holder.
5. Pass the bolt through the hole drilled into the base of the magnet, and fasten it by tightening the nut. Fix the bolt into the chuck of a hand drill. Next, fix the sharp end of the nail in a vice (or between two heavy books) so that it's horizontal. Bring the magnet to within about 1mm of the nail head, which should be slightly off-centre from the middle of the spinning magnet. Make sure the gap between the magnet and the nail head is as small as possible, but not so close that they touch. A tip here is to rest the hand holding the fixed part of the drill on the table-top so that it's as steady as possible.

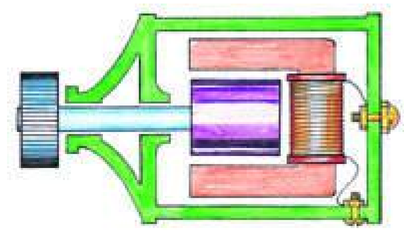
   Turn the drill handle as fast as you can and the bulb should light up. Generating electricity really is as simple as this!

Generators in bikes and cars

Cars need a direct-current supply to operate the ignition, lights, windscreen wipers, etc. This is generated by an alternator which is mechanically coupled to the engine. A device called a rectifier is used to convert the alternating current

output to direct current. A regulator also has to be fitted to control the current, so that the alternator's output voltage continues to match the voltage of the vehicle's battery as the engine speed changes.

A dynamo on a bicycle, that produces electricity as you cycle, is another example of a generator. Its basic design is just the same as the home-made generator described above.



REF:

https://www.open.edu/openlearn/science-maths-technology/physics/diy-generate-your-own-electricity#:~:text=The%20simplest%20generator%20consists%20of,as%20the%20magnet%20is%20removed

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Currently I'm a college student studying computer engineering, and this summer while I was on break I decided I wanted to learn more about solar energy and how to build a solar panel from scratch. My main reason for looking to build it myself was to learn how it all worked, and the next reason was due to the price of a commercially built solar panel.

So to get started, I searched around and found a few videos here and there, and a few articles on how to go about building a solar panel, but it was hard for me to find a full free video or article that showed you the full process to making a solar panel from scratch. I ended up having to watch about 4 different videos, and then having to sign up for a forum to ask other questions I had in order to get a basic idea of how to go about building my own solar panel.

It was basically an adventure for me, and mid-way into the project, I decided that while I'm learning about how to build a solar panel, and putting it together, why not create a free video to help others that want to learn about solar energy and how to build a solar panel. Of course it takes

time to edit the video, and time to create a website, but I see it as a small great way of giving back.

So, you'll learn how to build a 63 watt solar system in this instructable with free videos to help you get started. I know I'm a visual learner, so hopefully most find this very helpful.

For the full video series, simple visit my website at: http://www.greentechtown.com/how-to-build-a-solar-panel-diy

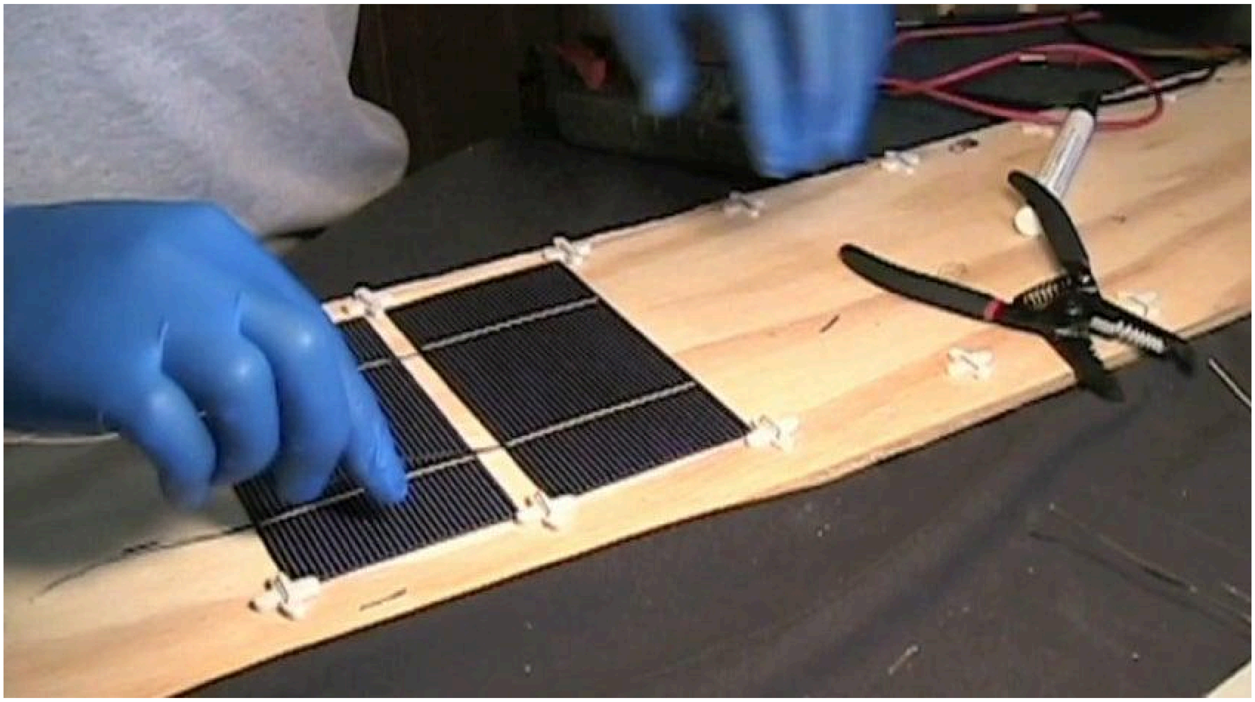
Step 1: Creating a Template & Putting Frame Together

First, I want to make a template for my solar cells. What I used was a spare piece of regular plywood, a piece of regular cardboard the size of a solar cell, some tile spacers, and a staple gun to create my template. I wanted to use the tile spacers to help keep my solar cells even as seen in Part 1 of the video.

Using a ruler helped to keep everything aligned, and it's easier to cut the plywood using a jigsaw, but a regular hand saw will do fine as well.

Next, once I finished my template, I started to put the frame together. What I used was a 1x2x8 piece of plywood, and cut that to fit my outer frame of the plywood. I wanted to make sure the outer frame was not too high to prevent from loosing any sunlight I could be using. So I then placed the pieces of plywood on top of the 2x4 pressure treated plywood, and screwed those down and sanded the entire frame afterward as seen in Part 2 of the video. After sanding and cleaning up any extra dust left over, I applied the Deck and Siding paint onto the frame. I wanted to give it 2 coats for a nice seal from UV rays, and making it water resistant. I also needed to place 2 coats of the Deck and Stain paint on the 2x4 piece of pegboard.

Step 2: Assembling the Solar Cells



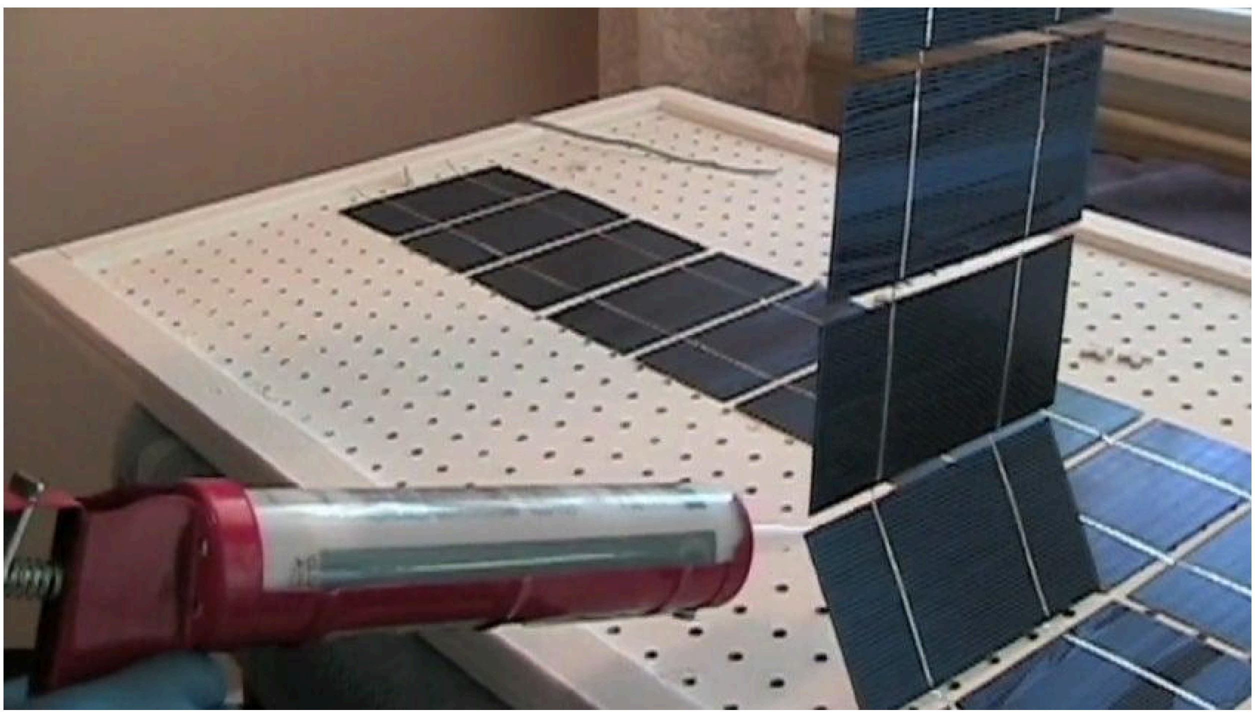
Next, while my first coat was drying, I started to work on assembling the solar cells. The best way to learn how to assemble the solar cells would be to simply watch the video. A quick overview of it is, the bottom of the solar cell is the positive side, and the top of solar cell is the negative side. I wanted to connect the solar cells in series, with a total of 36 solar cells, which will give me 63 watts. I used tabbing wire with a soldering iron to connect the solar cells together. For my panel I had 3 strings of solar cells. To connect those strings of solar cells, I used what is called a bus wire. The bus wire goes at the end of the strings to create one long string, however, curled up in a way like a snake. Again, for step 2, I recommend you watch the full video (Part 3) to understand how to work with the solar cells and how to check the voltage/current.

Step 3: Creating Holes for My Connections

Next, once the pegboard and plywood had 2 coats of Deck and Siding paint, I needed to screw the pegboard down inside the frame (plywood). What I did was first place the solar cells inside my frame to get an idea of where I'd need to place the screws, and then took the solar cells back out once I made my marks, and then screwed the pegboard down. Next I went ahead and drilled 2 holes at the end of my frame for my negative and

positive connections to run out. You can find more about this in [Part 4] of the video.

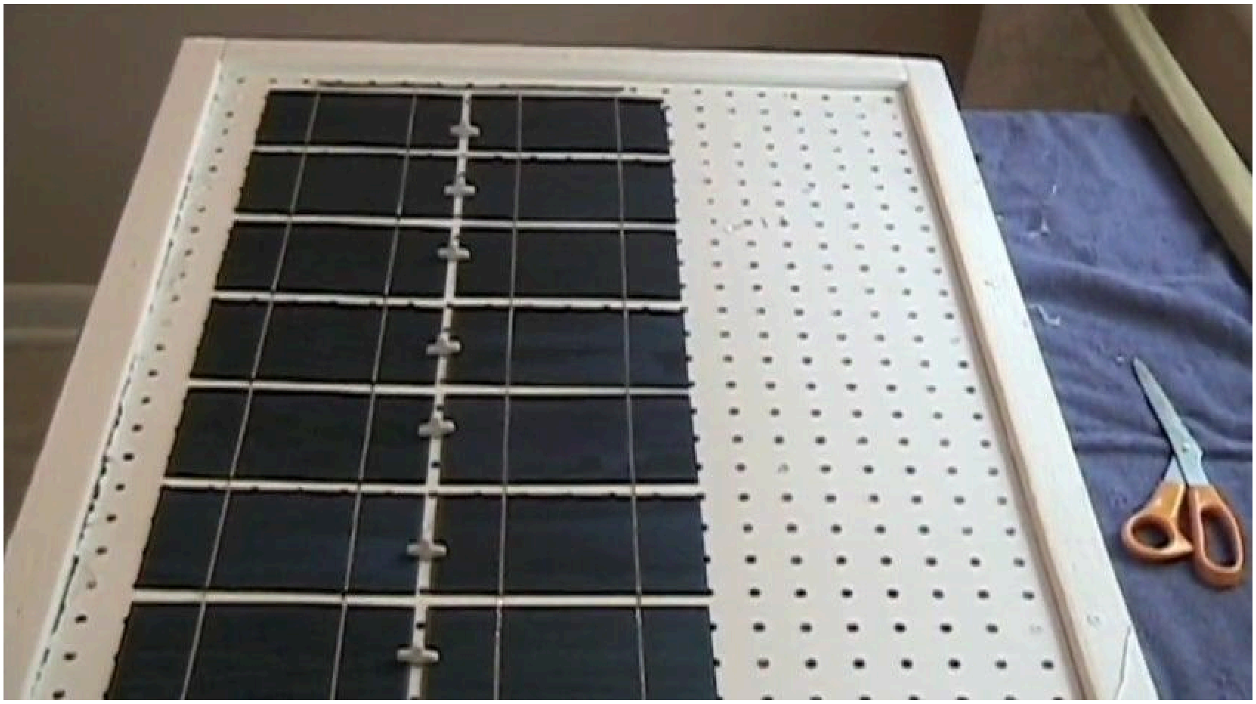
Step 4: Gluing the Solar Cells Down



Next, it was time to glue the strings of solar cells down to the pegboard with silicon. Watch Part 5 to see the method I used.

Afterward, since I had two strings completed, I was able to go ahead and solder my bus wire on one end to bond the two strings of solar cells together. Watch Part 5 and Part 6of the video to see how I went about doing this. Note* after you solder any string together, or make new connections, it is a good practice to check the voltage/current that moment, rather than waiting until you connect all the solar cells/strings together. This is also mentioned in the video as well.

Step 5: Soldering Bus Wire



Next, after hooking all 3 strings of solar cells up in series, I was ready to get my 22 gauge wires (red and black) ready for soldering. On the ends of my leads from my gauge wires, I connected some connectors to make the process of soldering them down to the bus wire a lot easier. Watch Part 7 of the video to see how I went about doing that.

To help give the inside of the solar panel a nicer look, I used 2 strips of wiremold and ran the wires inside those. This is also seen in Part 7 and Part 8 of the video. Afterward, I took the panel outside in the sun to test the voltage/current of the whole panel to make sure I was getting 18 volts and 3.5 amps in an open circuit and short circuit.

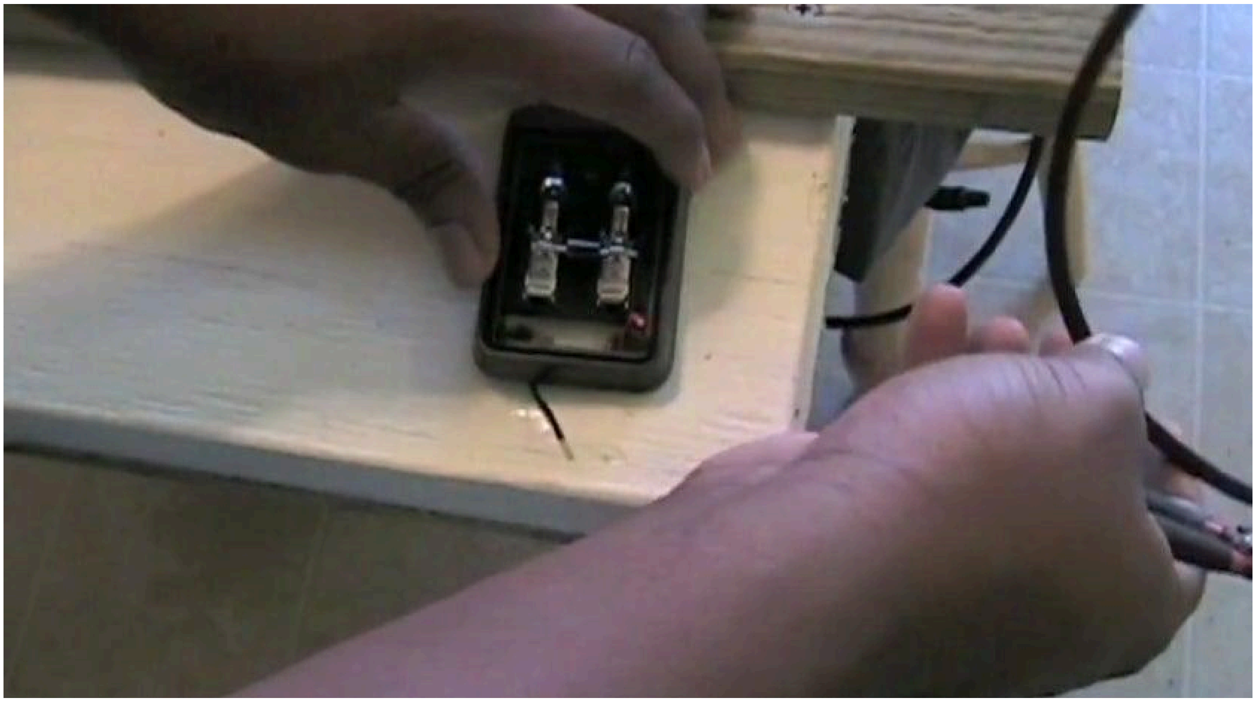
Step 6: Visiting the Electric Side

Next, in Part 9 of my video, I showed the electrical side of the solar system. Basically, what you need is a charge controller, deep cycle battery, and an inverter. To hook those up together is fairly simple as you can see in the video. I first hooked the solar panel connections up to the solar side of the charge controller, and from the battery connection side of the charge controller, I hooked that up to the deep cycle battery. From the battery, I hooked that up to the inverter, and then I was set to go. Again, watch Part 9 to see the whole process and see devices I was able to power off the solar system.

Step 7: Adding Even Pressure on the Plexiglass

Next, I found out that to secure my 2x4 piece of plexiglass I would need to provide even pressure around all the edges as you can see in [Part 10] of the video. To accomplish this, I used another set of the same outer frame pieces of plywood I had on the bottom of the plexiglass, and mounted those on top of the plexiglass to provide the even pressure I needed. Be sure to drill slowly into the plexiglass to prevent from cracking the glass, and make sure you have screws that are made for pressure treated lumber. Refer to Part 10 of the video for more details.

Step 8: Installing the Junction Box



Next, in Part 11 of the video, I finished connecting my back pieces of plywood that was going to support my whole solar panel when I was ready to mount the panel on my roof. I also installed a junction box onto the back of the solar panel since most solar panels include a junction box. As seen in the video, my junction box came with a blocking diode which prevents the backflow of current when you have the solar panel hooked up to a battery. Most charge controllers prevent the backflow of current already, but if the charge controller does not, you will need to install a blocking diode onto the solar panel. It is best to install the blocking diode on the

outside of the panel just in case something was to ever happen to it so you can easily replace it.

Lastly, I took my silicon and went around all my edges of the solar panel, as well as the junction box on the back. Next I made a final voltage/current check and was ready to mount the panel to my roof.

Step 9: My Thoughts of the Whole Project

Overall, the project was a fun experience, and the total amount of money that I spent was around $400-$500, which includes the battery, charge controller, and deep cycle battery. So I saved a large portion by building my own solar system, since a commercial solar panel would have cost $400 on up for just the solar panel itself.

If you have any questions or concerns, just visit GreenTechTown.com's Forum and I or other members will try to answer them as quickly as we can. This is a free resource including the videos, so be sure to share this with others.

REF: https://www.instructables.com/How-To-Build-A-Solar-Panel/

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Commercially built solar panels are still quite expensive however they don't need to be. Solar cells are available from a range of suppliers all over the world and can be easily assembled into your own custom built solar panel. You may have even found some broken or cracked cells for sale somewhere, these will still work and enable you to make a panel for next to nothing.

In this instructable, we will make a small 36W panel although the methodology to create a larger 200W or 300W panel is the same.

Read on for the selection of solar cell voltage and power output for different size panels.

What You Will Need For One Panel

- **9 Solar Cells (0.5V 4W) – Buy Here**
- **2 Sheets of 3mm Safety/Shatterproof Glass 0.5m x 0.6m (20″ x 24″) (Plexiglas also works well) – Buy Here**
- **Silicon Sealant – Buy Here**
- **Solar Bus Wire – Buy Here**
- **Solar Tabbing Wire – Buy Here**
- **Flux Pen / Solar Pen – Buy Here**
- **Soldering Iron – Buy Here**

The glass can be substituted for a fibre board, plywood or thick card backing to save costs further although the panel will be the most weather proof with a glass backing as well.

If you enjoyed this Instructable, please vote for it in the competitions. Thank you.

Step 1: Choose Your Cell Voltages & Power Output

Choosing Cell Voltages

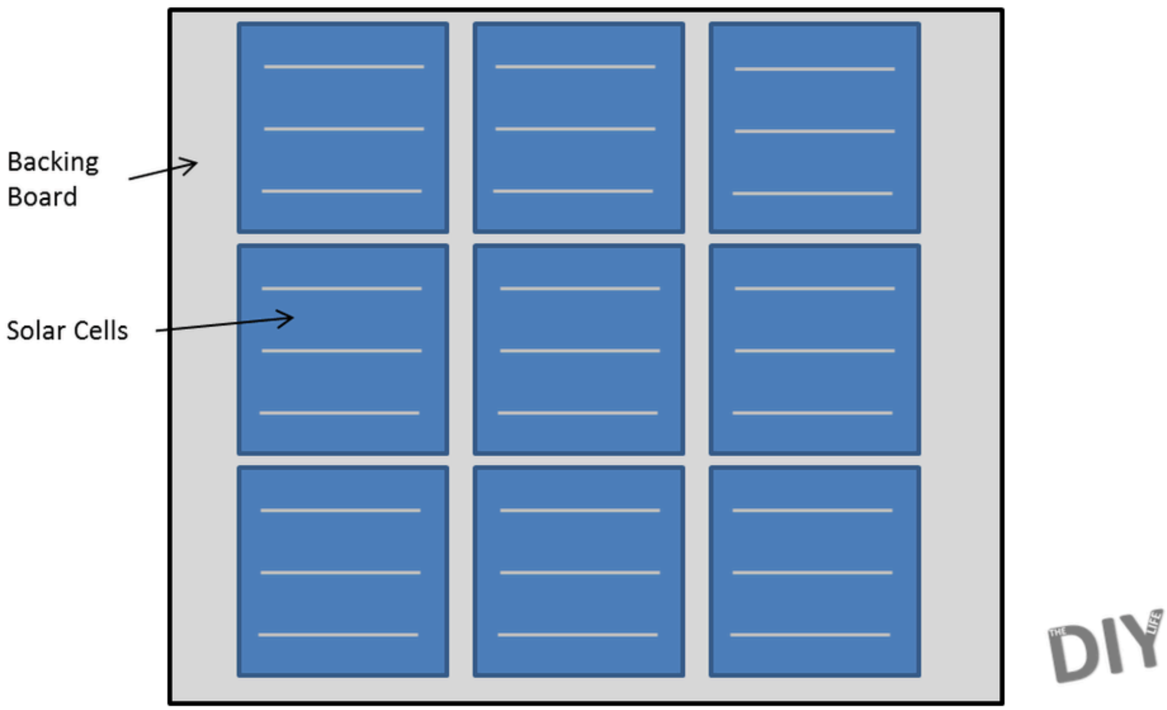
The nice thing about building your own solar panel is that you can make it to suite your needs. Solar cells are typically available in 0.5V and a range of power outputs. They can be arranged in series to get any output voltage you require in multiples of 0.5V. If you are looking to charge a 12V deep cycle battery for an off grid application then you need an 18V panel which will consist of 36 cells in series (36 x 0.5V = 18V output). You need 18V so that even when the panel is not in full sun it is able to charge the battery.

In order to reduce the number of cells you need, you could try splitting your solar cells to get a higher voltage out of each cell.

Choosing Cell Power Output

The second consideration is the power output you require. To calculate how many solar cells you need, divide the total power you need by the power of each cell. For example, if you need a 200W panel and you are using 4W cells then you need 200W / 4W = 50 cells. It is important to note that the power output is not related to whether the cells are connected in series or parallel. You can read this article on sizing your solar panel system correctly for your home for help estimating your home's power consumption. There is also a spreadsheet available to assist you with the household power consumption calculations.

Step 2: Planning Your Panel Layout



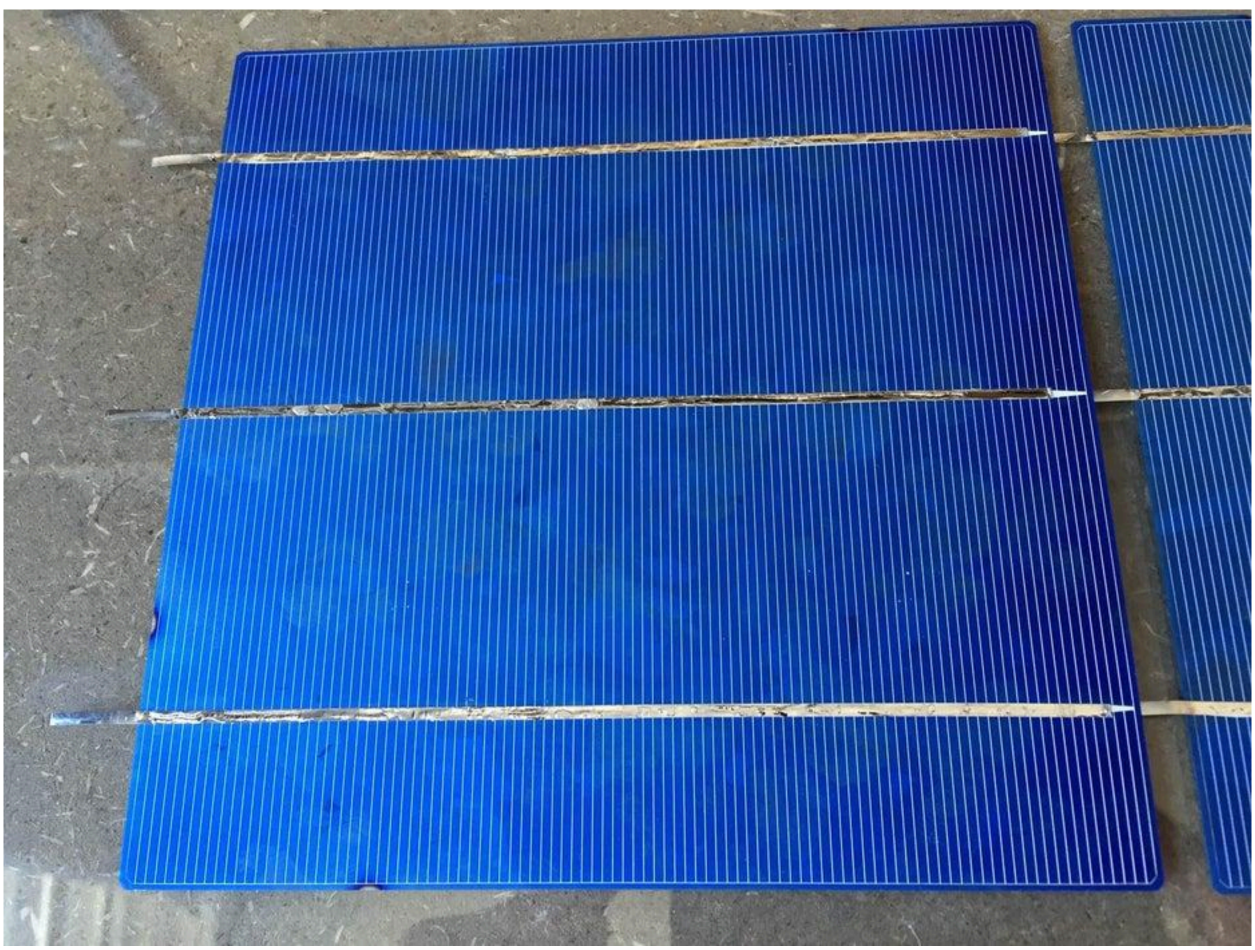
First you need to start by planning your panel layout. This is usually done according to the space you have available for the panel, you may be restricted by length or width of the panel and you can adjust the other dimensions to suite. For the 9 solar cells, a sheet of glass 0.5m x 6m (20″ x 24″) was used and the cells were laid out as shown in the attached diagram.

The panel is usually laid out in rows and columns, it doesn't matter how many of each but it does make life easier if you make

longer strings of cells in the direction of the tabbing wires and then connect them together with bus wire along the top and bottom.

Step 3: Tabbing Your Solar Cells

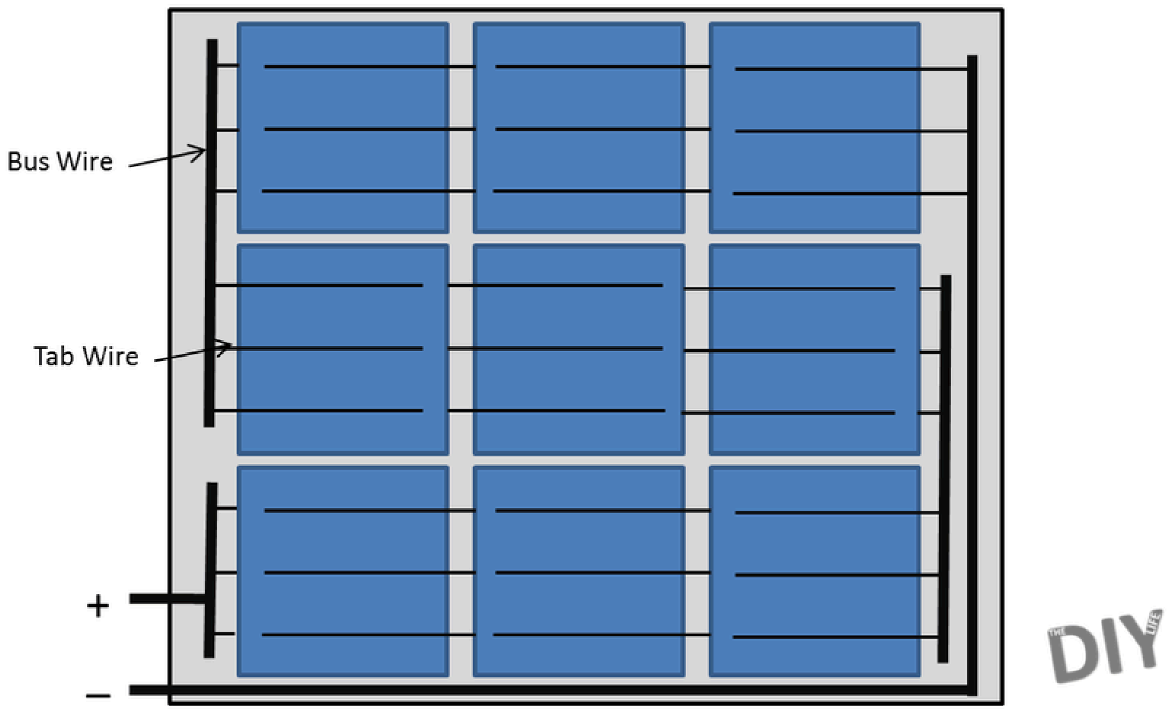
https://www.youtube.com/watch?si=iSuFbduI_9iTBAti&source_ve_path=Mjg2NjQsMTY0NTA2&v=o_19Qsve0GE&feature=youtu.be
(CHANNEL: Michael Klements How to Tab solar Panels)

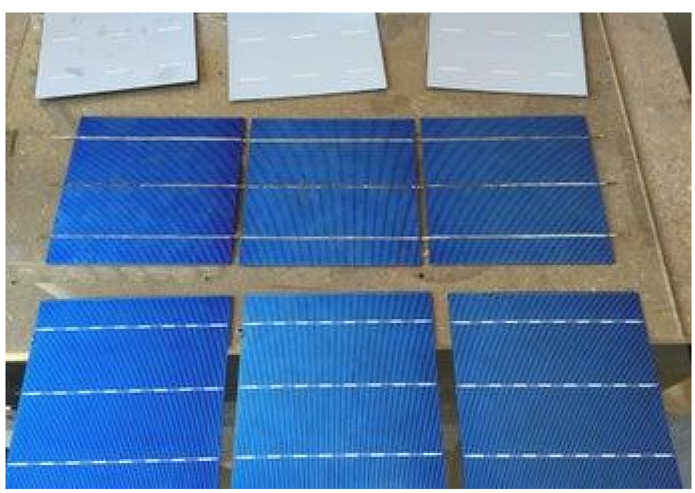


The next step, and possibly the most time consuming step, is tabbing your solar cells. You can buy pre-tabbed cells and this is recommended if you are not familiar with using a soldering iron although most solar cell suppliers will supply you with un-tabbed cells. It is not complicated once you have the correct technique but you may need to practice on one or two cells first as the tabbing wire is not easy to remove.

Cut the tabbing wire to a little (1cm / 1/2″) over the length of one cell for the end tabs and double the length of each cell for the interconnecting tabs. Now begin soldering the tabbing wire to the solar cell, see the attached video. First draw a line with the flux pen down the length of the silver tab lines. Line the tabbing wire over the tab lines and then run the hot soldering iron down the length of the tab. Do not leave the soldering iron in one area for too long as it will overheat and damage the cell. There is no need to add solder to the wire as tabbing wire comes pre-soldered.

Step 4: Connecting the Bus Wires


Bus Wire
Tab Wire
+
–
DIY



Once you have tabbed all of you cells, you need to connect them together. The front of each cell is negative and the back of the cell positive. These need to be connected like batteries in series to form a string of cells back to front. Solder the tabbing wires from the back of one cell to the front of the adjacent cell until you have completed each line. You then use the bus wire to connect the lines. The end layout should look like the attached diagram.

Remember when connecting the lines that they too need to be connected positive to negative so the adjacent lines should run in opposite directions.

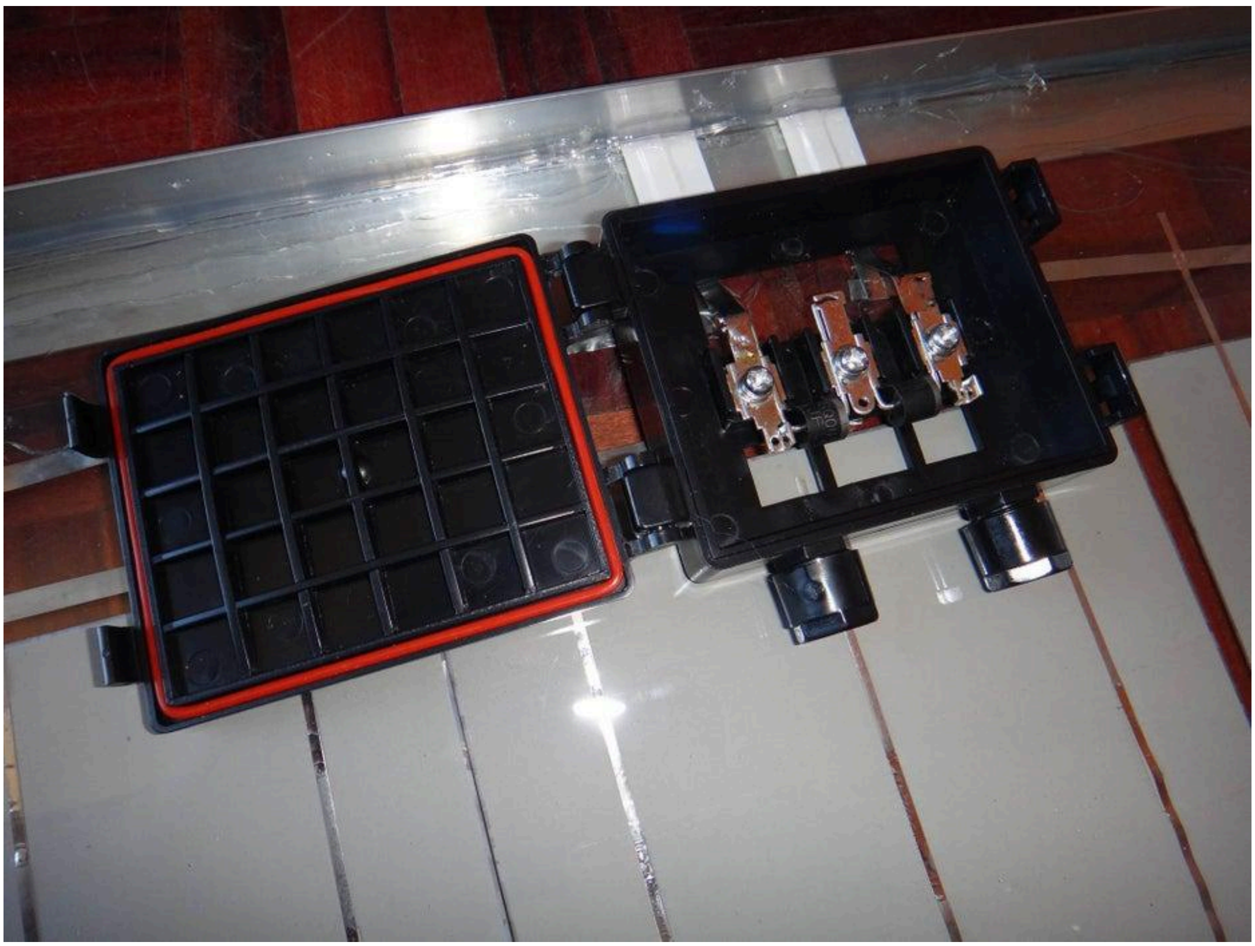
When you are done connecting your lines together, you should have one positive bus and one negative bus which will be your solar panel outputs. These can be terminated in a special solar panel box or soldered directly onto wires for smaller panels.

Step 5: Protect the Cells With the Glass

Once your bus wires are completed, you can add the protective glass or perspex cover over your solar cells. Run a continuous bead of silicon around the perimeter of the backing board and then carefully lower the glass onto the backing board over the cells. The silicon should form a continuous seal around the edges of the panel and the cells will now be protected.

Clamp the glass and the backing board together (in this case the backing board is a glass sheet as well) and allow the silicon to cure overnight. Do not use screw on clamps as they provide too much clamping force and may crack the glass, instead use plastic spring clamps.

Step 6: Mount the Terminal Box



Mount the terminal box on the backing board and solder your outgoing bus terminals to the terminal strip. The box can be mounted with screws on a wood backing board or can be attached with silicon as well if a glass backing board is used.

Lastly attached any mounting bracket you require to the back board and your solar panel is completed.

Connect it up to a solar charge controller to charge batteries or connect it directly to your DC load. If you are powering an AC load then you will need to connect a power inverter, read this guide on selecting a power inverter.

Read our full guide on switching to solar power for more information on designing a solar power system.

REF: https://www.instructables.com/Build-Your-Own-Solar-Panel/