How To Install The Power4Home System & Save $1000's

POWER4HOME

GENERAL INFORMATION & INSTALLATION MANUAL

SUBJECTS COVERED

Introduction

The Power4Home System

Electrical Setup & Installation

General Information

Copyright Notice

LEGAL DISCLAIMER

All products from www.Power4Home.com are strictly for informational purposes only!

This or any other form of home alteration maybe illegal in your town, city, state / province or country. It is your responsibility to inquire with your local government office about how to proceed if restrictions apply. Although we have not encountered a problem, you still must consult with your local government.

Power4Home.com will NOT BE RESPONSIBLE for any mishaps that occur during the build, test and application phases of your construction. We are also not responsible for a partial or complete system that has problems or causes injury. You have all the information included in this manual to safely manage and handle solar and wind generators. Common sense goes a long way. Please, if your knowledge of household electrical is not par with a certified & licensed Electrician, call your local Electrician to wire your system into the electrical breaker panel and please inform your utility company of your new system.

PLEASE READ THE ENTIRE MANUAL & ALL THE EBOOKS BEFORE DOING ANYTHING. THERE ARE TASKS AND TESTS TO BE DONE THROUGH OUT THIS BOOK

Contents

INTRODUCTION

In today's day and age, society is very dependent on the use of fossil fuels for all their energy needs. However, more and more people are coming to the realization that a time will come when we will no longer be able to rely on fossil fuel as we once did.

We are becoming more aware of the harm fossil fuels have not only on the environment and the weather, but also on the world economy. The price of oil has decreased since its rise in the summer of 2008 causing people to be less concerned about consuming gas. As more toxic exhaust output goes into our atmosphere, more people are questioning how long these prices are going to last? Not long I'm sure!

There are ways to generate power right from home. I am talking about making your own power and not at a $5000 price tag ether. Utility companies **DO** charge ridicules rates for power. ***I will show you how to slash that bill, and give you the power to decide how far you want to go.***

In the three main books I have made, I will introduce the Power4Home system. This system is perfect for all of our readers and I highly recommend that you read all the information supplied in order to fully comprehend what connection setup you want, extra parts or components you may want or need.

I, ***John Russel***, have been in the alternative home energy game for well over 10 years. It all started years ago, when I was at the peak of my trade as an Electrician with a growing interest in home power generation. I started building wind generators and PV solar panels which lead me to leave my employment. This was the life I wanted to live; as a research and developer with hopes of starting my own manufacturing business. *But I stumbled on something bigger than myself.*

As I was well into my test and build stages of bettering my generators and panels, I began to research utility company pricing and rates. WOW! These guys must be making a killing with the average home paying close to $155 a month on power. <u>That's $1860 a year on electricity ALONE!</u> How many homes are paying for power? Millions…

This was a calling right from the beginning. I came to realize that I must give people everywhere a means of beating the utility companies at their own game. That was when **Power4Home** was conceived.

The Power4Home system was designed to lead you in the right direction in terms of:

- **Understanding How Wind & Solar Works**
- **Understanding Home Power Generation As A Whole**
- **How to Build Your System Inexpensively**
- **How to Build Your System Reliably**
- **How to Calculate Power Figures (Home Use & Gain)**
- **Giving You Exact Plans & Parts To Copy**

I have read and seen many home power project books like my own but no one gives you an exact system to copy in terms of parts. **Sure, anyone can do a search online and gain knowledge on how it all works in general but how do you make a wind generator? How do you make a solar panel and how do wire the little darling?**

Those are all the right questions

The answer is simple: The Power4Home System

So what is the Power4Home system? In short, the Power4Home system is the bare minimum starting point of home energy generation.

Please don't forget you have a membership on our support site. There are updates and downloads to review. The Books are also updated periodically.

The Power4Home System

Still to this day, I have not been able to find anyone that offers a true step by step instructional manual with **GOOD** illustrations and videos to build a sound wind generator and solar panel.

But I am not surprised. All I have seen is just general info that confuses most folks and in the end, you just want your money back. The problem is almost **ALL OF YOU** want step by step instructions and NO ONE offers just that. Well, I'm here to offer you just that. I actually have built a wind generator, solar panel and I have wired it all into my own home.

Because everyone has different power needs and budgets, it really is hard to come up with pictures and build plans for every system available on the market today so I thought about a generic power generation setup for the average home and business owner.

There are 3 parts to this system to build:

1. **A 400 watt wind generator**
2. **A 60 to 120 watt solar panel**
3. **A common electrical panel with inverters**

The system itself costs about $200 after you source all your parts. But it depends on how much you can get your parts for. If you were to buy everything at full retail value, you may be looking at $450 so start checking kijiji.com, garage sales and clearance sales.

If you where to purchase a wind generator and solar panel of equal power production not including the wire cables and inverters, you will have to spend over $1500 and labor is not included.

Now if you are wondering why I said a 60 to 120 watt solar panel and not just an exact number, it is because you may not find the exact solar cells as mine. There are hundreds of different types of cells out there and you may not purchase the exact ones. Regardless, the setup is the same.

Is it upgradable?

Absolutely! That is one of the greatest aspects of this system. Let's say you built a wind generator and an 80 watt solar panel but wish to increase the power output in a year or two, all you need to do is build more panels or generators and tie it into your electrical panel that you built. You have already built one of each and know what to expect.

You may need to buy higher output inverters as you will out-grow the inverters ability. If you know you're going to upgrade the system in advance, than purchase high output inverters the first time to save money.

NOTE: It is not recommended to build more than 2 or 3 wind generators as its purpose is to help supplement power. Solar power is more consistent.

I have to build an electrical panel?

Most folks run their systems right to their house's electrical panel. Using the Power4Home system, you can run right off one of the outlets outside or in the garage. No, I'm not kidding. Because the Power4Home system is only about 500 Watts to start, at 110 Volts, we would only push 4.5 Amps. One of your breakers are rated a 30 amps. That means it can handle up to 3300 Watts per breaker!

You don't have to build the box but it does clean the system up and makes it look good.

Mounting

Now that you have completed your wind and solar generators, it's time to consider suitable locations to mount them and how to mount them. I will discuss each generator separately.

But before I break it down, I have to consider you, the customer, first. You will most likely live in the suburbs but some of you may live in the country or wide-open areas. I will take both into account…

Wind Generator

Suitable Locations

It's all about figuring out where the wind will have the highest speeds from all directions. In your setting, you will have to decide if you want to have the generator on a portable basketball net and place it in your backyard or mount it on your roof. The roof will give you more wind but it is considered an eye-sore to most. Because of this, your neighbor may file a complaint so ask around before you install it.

The peak of the roof, the highest point, will be the best location. If you have a chimney, mount the generator at the opposite side of the roof. If the backyard is more appealing to you because it is easier, mount your generator to the middle point between the row of houses you live along. So basically at the fence that divides you from the neighbor across from you. A row of houses create an open-channel; the wind cannot past through the homes so it runs between them.

Ever walk between 2 homes that are only 2 meters apart or less but there is always a draft or high wind speed? That is also a good location for a wind generator. If you own a large piece of land, pick a spot with the highest peak with the least amount of obstructions like trees, rocks and buildings.

Mounting

Basketball Tower

The basketball stand only needs water and a couple of sand bags (100 Lbs total). Once in place, you are done. That is why I recommend this as a stand, it is so easy to set up and it works.

Pole Stand

A pole stand is your standard method of mounting. If you are mounting your pole in the ground, erect the pole roughly 10 to 15 feet in the air. You will be required to dig a 4 foot deep hole and fill it with concrete.

These are the steps:

1. Dig a 4 foot hole with a gas powered hole digger (Rentable)
2. Place the lower half of the pole and place it in the hole at the center
3. Mix your concrete and fill the hole
4. Place a level along the length of the pole and straighten the pole. Then move the level 90 degrees around and straighten again.
5. Use some tie down ropes to keep it leveled. Allow time for the concrete to cure and cover the concrete if it is going to rain
6. Once the concrete has cured, attach the connecting poles and the generator the top

If you are after the best wind speeds possible, you should mount the generator 20 feet above the highest peak around your home. The gain is about 30% more wind turbulence, but is not absolutely needed.

Roof Pole Stand

The best thing that I have seen for a roof mount is using a satellite mounting base. The base is just a flat plate with a short pole. However, the pole can be adjusted for different angles. Then, I would use automotive exhaust pipe increasers with clamps to the desired inner diameter for

your bearing. Use a level to ensure a straight fit. If you have a welder or know a welder, it doesn't hurt to weld the adjustable points. This will add rigidity to your base. When mounting to the roof, drill all your pilot holes and fill them with a lot of silicone sealant. Then, secure the screws into the roof. You only need 1 and ½ inches to enter the roof's wooden frame.

Solar Generator

Suitable Locations

Solar power is all about maximizing your panel's exposure to sunlight. The roof is the obvious choice as you WILL get the most amount of light exposure. Run the ends of your panel, length wise, from east to west. This means the panel is exposed to the sun all day.

Take a good long look at your roof

Check to see where the sun rises and sets above your home. The sun will rise from the east and set in the west. See what area of your roof is getting the most amount of sun. Now, keep in mind that the panel MUST be tilted in order for the rain to drain off the panel and for snow to slide off.

Precipitation is another reason we have the panel tilted along the plain of the roof.

Mounting

Once you have picked a good location to mount your solar panel, it is now time to install it. The roof is completely housed by plywood over half an inch thick, this is perfect for mounting purposes. The pickets that we are using are 2" by 2" by 3 feet.

We will need (4) 2" ¾ inch wood screws to screw in the panel to the roof. You must pre-drill all your holes as the thickness of the screw might split the wood. Also, after pre-drilling we have a means in sealing the hole you just made.

Mounting steps:

1. Lift the panel to the roof
2. Position the panel to its mounting location
3. Pre-drill all holes and clean off debris
4. Apply a liberal amount of silicone sealant to all the holes on the roof and the mating surfaces(where the roof and panel contact each other)
5. Screw in all of your screws
6. Run your extension cord to the edge of the roof using an easy and safe path to run down to ground level. NEED A GOOD EXAMPLE, LOOK AT HOW TV CABLES RUN ON YOUR HOME
7. Feed wire to your Power4Home electrical box.

Considerations:

- Make sure that it will not rain 24 hours after installation (Silicone cure time)
- Use wire mount loops to affix the extension cord along the path you run the cord
- Have someone help you!
- Use a black extension cord - The orange looks bad

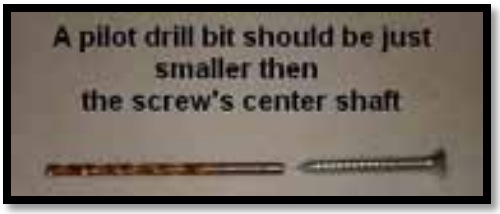
Batteries

Most of you are not "off the grid" and will still depend on power companies for consistent power.

Let's face it. Almost all of you are looking to reduce your power bill as much as possible. The truth is that batteries are only good for power when you have no power. In other words; a power failure. Think about it, when your solar panel and wind generator are producing power, your battery bank is absorbing the power till the battery bank is full. After that, the power is still pulled back into the grid. That is when your power meter starts turning backwards.

As your house produces power, the main power grid will pull power into it. **THAT'S RIGHT!** The power meter at the side of the house will literally start turning backwards simply because you have self-made power. This is assuming you have no appliances drawing power.

Household power is 120 Volts A/C. Because of power drain by businesses and households that draw of power now creates a "load" condition that strains the utility grid. The grid voltage will drop to 110 Volts during peak hours, your system will register as a power source and begin to supply that demand. Even during



non peak hours, the voltage of your system will read higher than the grid, and still turn the meter backwards. Your system will always draw power to the power grid. ALWAYS…

The cost of batteries and the charge controller and other costs far exceed the benefit of buying batteries. You don't need them. Really! I am giving you info on how to use them in conjunction with different system setups but unless your off the grid. They are ***VERY EXPENSIVE!***

Using the Power4Home setup, the purchase and setup of a battery bank is not required. All you need to do is plug your inverters into the wall socket and nothing more.

SAVING YOU HUNDREDS TO THOUSANDS OF DOLLARS

Parts for the Power4Home Electrical Panel

Here, you will find all the parts you will need to complete your electrical box. You will notice that I do not add a price to each item. That is because you will get a different price then what I had to pay. The more expensive items can change in price depending on the source (eBay or kijiji) so do your homework on the big ticket items.

Keep In Mind: Searching on Google, EBay, Kijiji and Craigslist is very beneficial.

Fasteners & Cabinet Materials:

Home Depot or Lowe's carry all of the fasteners, hinges, silicone and cabinet locks that you will need. You may even have some at home.

Wood:

You or a friend may have the pieces that you will need. If not, Try construction sites or wood workshops and take some scrap pieces. Wood is cheap anyways.

Inverters:
Inverters can be quite pricey but in our case it's not bad at all. A 175 & 400 Watt Inverter can run up to $45 for both from a retail store like Pep Boys. I got both of mine from a guy in Canada for $25 US. Do your searches for deals.

Electrical Materials:
Go to an electronics store and get what you need. They may even have inverters for cheap!

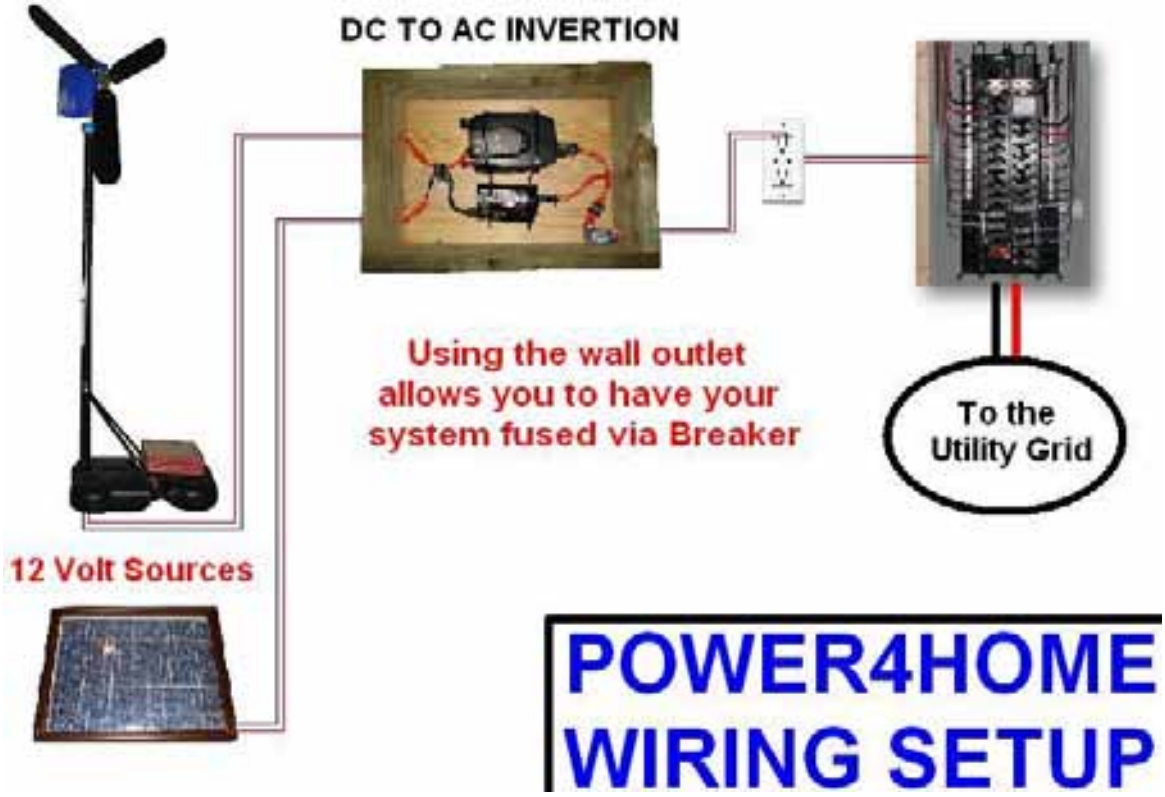
Refer To Your Parts List for Part Descriptions & Quantities

How to Build a Power4Home Electrical Box

The main function of the electrical box is to group your multiple sources of home energy into one easy to manage power line. This line serves as a power out point of wiring and allows you to disconnect the system from the grid by simply unplugging the cord from the wall.

It also acts as a testing point and an excellent location to mount the inverters.

The Power4Home Wiring Setup



There are 5 Phases to Complete:

1. *The Electrical Box Housing Assembly*
2. *Mounting The Inverters*
3. *The Wiring & Connectors*
4. *The Box Door, Hinges & Lock Assembly*
5. *Mounting The Electrical Box*

Perform each phase in the order stated above. Each phase has a step by step process with full illustrations in case you are a little confused. You can print out only the pages you need so you can build in your garage with a manual right beside you as oppose to having to go inside the house every 15 minutes.

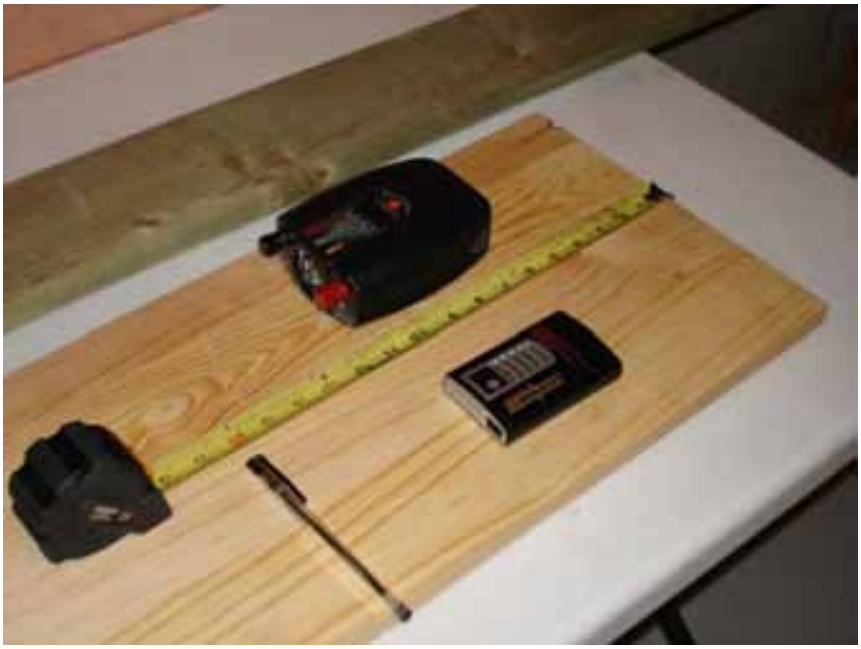
If you wish to have an externally mounted electrical box, be prepared to silicone seal all the connecting housing pieces including the swing door. Add sealant to all the holes and heavily paint the exterior housing. Mount to the house using 4 Tapcon screws (Mason Screw), and don't forget to drill into your home.

I suggest you mount your box inside the garage but you can mount it anywhere you wish.

Phase 1:
The Electrical Box Housing Assembly

Step 1

Take your 12 inch wide piece and cut 2 16” long pieces



Use the first cut to measure the second one. Line up the first cut on top of the wood and use a pen to mark it. Do all this using the “square” end of the saw.

Remember that when duplicating a piece with another that you must line the blade up to the line meaning the line marking itself will be cut.

Step 2

Take your 6 inch wide piece and cut 2 pieces.

Step 3

And finish by cutting 2 10 inch pieces.

Step 4

After all wood pieces are cut, take one 10 by 6 and one 16 by 6 & screw them together like in the photo – Use the 4 X 1 1/2 Inch Wood Screws

The 16 by 6 inch long pieces will run the entire with of the box

Pre-drill your holes and use 1 ½ inch wood screws to mate the ends. Attach all pieces.

Step 5

With the outer edges made, take one of the 12 inch wide pieces and screw into the box. Pre-drill all your holes; 3 for the width and 4 for the length

The Phase is Complete

Phase 2: Mounting the Inverters

You will now mount the inverters into the box housing you have made so far. You will now use zip-ties to secure the inverters.

Step 1

Place your inverters into the box like in the photo.

Mark 6 holes for drilling: 2 center, 2 below and 2 above. Line up your holes so that the zip-ties do not strap over the inverter's display and buttons.

Step 2

With the inverters removed, drill out your holes. Use a ¼ inch bit

Step 3

With the inverters in place, run your zip-ties through the center and tie-in your inverters.

Pull the tie hard & cut off the remaining tab.

Phase 3: The Wiring & Connectors

Step 1

Mark 2 holes on the DC side of the box for drilling. These holes are used to feed in the wind and solar power cords. Anywhere is fine.

Drill your holes.

Step 2

Do the same to the opposite side but only 1 hole and at the bottom.

Step 3

Run the wind and solar cords through the DC side of the box. Some inverters can directly be mounted to the inverter. Others may need to be tied-in to their own harness.

Use white for + & black for -

Step 4

You may need to connect multiple male connectors on the AC side. Use the male ends of the extension cords that you purchased. Splice them together with a 3rd cord to plug into the wall.

With the two AC wires spliced with the wall outlet cord, feed the wall cord end through the AC OUT hole and install another connector. Duct tape all spliced connections.

Step5

Wrap a loop around the DC and AC cords. Use a self-tapping screw to secure the loop. Squeeze down tight. You can mount them anywhere in the box.

Phase 4 Complete

Phase 4: The Box Door, Hinges & Lock Assembly

Step 1

The hinges will be mounted on the left side (DC) end of the box. Measure 1 ½ inches in from top to bottom and begin marking all your holes with a pen. Pre-drill your holes.

Now screw in all your screws – Use the 10 X 3/4 Inch Wood Screws

Step 2

On the opposite side of the box, the AC side lay your locking latch in place. Mark your holes, pre-drill and screw it in. Screws are provided in the packaging.

With the latch in the “closed” position, hold the locking clip in a position where the latch will swing in and out freely without hitting the clip. Then, mark your hole, pre-drill and screw it in.

Phase 4 Complete

Phase 5: Mounting the Electrical Box

Find a location to mount your electrical box; preferably close to a wall socket. If you are mounting in the garage, use a stud finder. If you are running it to the home's AC breaker panel, then just mount it to the plywood sheet you breaker is mounted to as seen above.

Step 1

Take your box with the box door open and place the box into the mounting position. Now, pre-drill only one side and screw it in.

Now take your level and straighten the box. Now, pre-drill a hole on the opposite side & screw it in. Do the same to the other two corners if you wish.

Phase 5 Complete

The Electrical Box is Now Complete

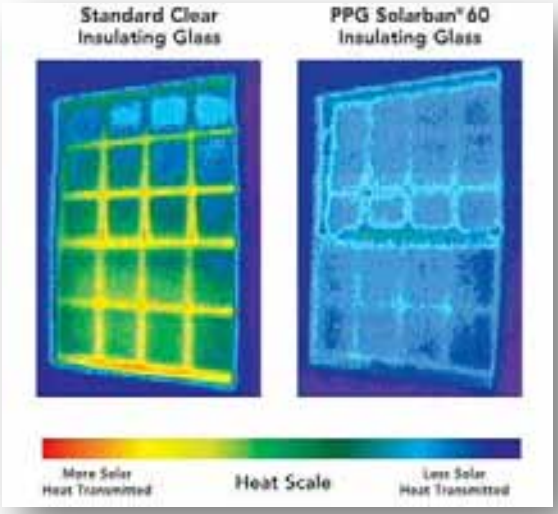
EVERYDAY WAYS TO CUT DOWN ENERGY EXPENSES

As it stands, society is slowly realizing that renewable energy is starting to peak its ugly head out from under us. Folks, it's true, filthy rich executives and owners in the energy sector **DO NOT** want you to have a 100% self-sustained power supply.

However, this does not mean that you should give up. There are many things that we can do in our everyday lives to reduce the cost and amount of energy we use. The following are some easy to use suggestions:

- Use energy efficient fluorescent light bulbs in all your home's light fixtures.
- Turn off appliances and other electronic equipment when not in use. Also, be aware that setting electronic equipment such as computers to standby mode still uses energy.
- Seal windows and doors in your home to avoid letting warm/cold air escape. This will noticeably reduce your utility bills.
- Let clothes and dishes air dry when practical.

- Allow dishwasher and washing machine to be full before running.
- Take quick showers and avoid taking baths.
- Set the thermostat in your home to a moderate temperature so that it is neither too cold in the summer nor too hot in the winter.
- Perform regular maintenance and tune ups on your vehicle to keep it fuel efficient.
- While driving, avoid speeding and accelerating/braking too quickly as this uses more gas.



Although the suggestions above can be used by anyone, if you are going to use an alternative energy source such as wind or solar power to live off the grid, then these suggestions are mandatory.

It defeats the purpose of using alternative energy if we do not do live energy efficient lifestyles.

ASSESSING YOUR ENERGY NEEDS

Every home has a different energy need which is reflected in our bills. When going to the effort of making a system that utilizes wind or solar power we want to make sure that it will have a noticeable impact on our energy bills.

So how much energy does the system need to create to lower your bill? It may sound surprising but only 450 watts. To generate this much energy the system would have to include 5 PV panels creating 24 volts with 4 amperes.

This set up, which creates renewable energy, makes enough electricity to power countless small appliances and the lights in the entire house! Not to mention your wind generator at work too. The wind generator at roughly 1800 RPM can supply that power alone.

A standard light bulb is 60 watts but a fluorescent bulb is 13 watts, big difference right there!

All of your appliances have wattage ratings on them, now group the number together. Remember, the big appliances should not be counted unless you're going to live off the grid.

Estimating Consumption For Your System

If you're estimating for something that isn't currently powered or not even installed yet, then you're in for a little more work to get the numbers you'll need. If you're application is a single item or system (like a water pump or heater), then the numbers you'll need are probably right on the manufacturer's specs. Easy enough.

You're probably not that lucky though, so you're reading this instead of a spec sheet to figure out what you're going to need. Let's assume that you're going with the biggest project possible and are planning to set up a system to power a cabin

daily, all year round. So what you'll need to know is what in that cabin will you be powering.

Make a list of all of the appliances, lighting, tools, and other items that will be powered off the system. Use the chart provided as “Appendix I” at the end of this book for an easy start. Be sure to list every item you'll be using that runs on electricity, no matter how small or infrequent. There are two ways to get the rated watt hours for an item.

If you already have the item or have access to its manufacturer's information sheets (spec sheets or ratings), then you can use the numbers they provide. If you're buying new appliances, now is the time to consider spending the extra money to get the most efficient model possible. Some items will have two numbers listed, one for “running” and another for when it's just plugged in.

Many items use power even when they aren't “on.” Your television, AC to DC conversion plugs, and similar things are examples of this. If you don't have access to the manufacturer's information and can't find a UL (United Laboratories) sticker or spec plate on the item, you'll need to figure it out on your own. Most common items are relatively the same, so you can find out what the item uses by going to a store and comparing the specs from a new item that is similar to yours. Another way is to measure the item's usage with a meter, which you can buy from a local hardware store or PV supplier.

These little devices plug into a wall socket and provide a new socket, which you plug the appliance into. It measures the power usage and gives you a reading. Whichever method you use to gather the data, make sure it's as accurate as possible. If you own the appliance and have a meter to test it, then measure that way rather than going off the spec sheets.

Over time, older appliances tend to lose some of their efficiency and the spec sheets may be a “best case” number. Once your worksheet is filled out, you now have a base line number to go from. If you're planning to run the entire household or building from just your turbine, then you'll want to ad at least ten percent (10%) as a cushion in case any of your numbers are wrong. Next, we'll discuss how you're going to estimate what you're really going to be using and how much it will cost to set it up.

Home Power Usage Chart				
Appliance	# of items	Wattage Rating	Hours Used Per Day	**Total Watt-Hours (Watts x Hours)**
TOTALS				

Estimating Costs

Now that you know your requirements, you're ready to start figuring out how much your system will cost to purchase and install. The information you compiled about your usages and needs will be your beginning guideline towards pricing the components of the system.

At this point, since you haven't fully fleshed out a design for your system, you're after ballpark figures and estimates to get an idea what it will cost per kilowatt, per day, or however you'd like to break it down. This is also the stage where you'll be finding out more about what the components of a wind turbine electrical system and solar PV system are.

Before we do that, however, let's consider some of the ways you can find out what your cost will be. There are a lot of ways to do this and many of them

require only that you get online. Most reputable turbine and PV dealers have lots of useful information on their websites.

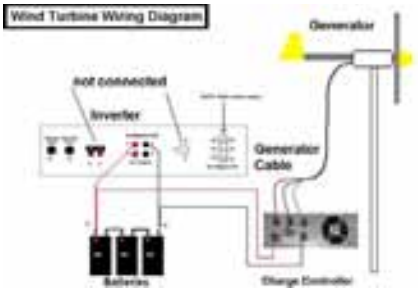
Visiting their store, if you can, is usually better as there you'll find someone who can talk to you one-on-one about your proposed setup and get some more information about your system's price tag.

Regardless of how you get the actual dollar figures, make sure you get the following if you plan to purchase full setups (systems) from a dealer: what is the price per kilowatt hour per day or per month and do their prices include installation? Most of the time, you'll find that their prices do not include installation—which is fine if you're a do-it-yourselfer and just want to purchase the setup and install it yourself.

If you plan to have someone install it, find out if they have a recommended person in your area and then find out what their price tag is. Also, make sure the system includes more than just the turbine (conversion boxes, tower, wiring, and so forth).

If the system they're proposing includes only the turbine and nothing more and you don't plan to install it yourself, either make sure your installer knows this when giving you a bid or find another dealer to get your system from.

Regardless, at this stage you're only getting general numbers so you have an idea what your budget is likely to be like. Before you can set your numbers in stone and be ready to install, you're going to need to know more about the various components of a wind turbine electrical generation system.



Connection Types

There are three basic types of electrical power connection systems:

- **Utility Grid-Active Connection**
- **Multi-Source**
- **Off-the-grid (Stand Alone)**

A Utility Grid-Active Connection system is a wind turbine that is connected to the utility grid or to a building or home that is already connected to the power utility's grid. So if your home already has electricity from the local utility and you're wishing to supplement that with a wind turbine, then you're planning a "grid-connected" system. **This is recommended to all on the grid.**

A Multi-Source System is one in which wind would be a part of the whole electricity generating system. In this case, another electrical generation option is also included, such as solar PV or a backup generator. This setup is common in cabins, recreational vehicles, job sites, remote farms, and so forth. In this scenario, the wind turbine is part of a larger electrical generation system and may or may not be the main component of that system.

An Off-The-Grid (stand-alone) system is one in which the wind turbine is the only means of generating electricity for the application. Often that turbine is coupled with a battery storage bank for power storage. This is a very common setup for water pumps, small appliance applications, and for recharging systems on a machine or battery series. It's not uncommon for remote houses and cabins to use this and a battery bank as their only electrical generation system.

Generator Setup Diagram:

a) DC Power Source (Wind or Solar)
b) Charge controller
c) Battery
d) Inverter
e) Electronic equipment (i.e. TV, Stereo, lights, etc.)

Also, later in the book we will discuss how you can build on this basic solar generator system by using numerous solar panels and batteries.

Please note that the solar panel can either be bought or made at home. Instructions for making your own solar panel are included later in the book.

Additional Parts

System Meter: is placed between the battery and inverter and tells you how much energy the appliance is using and how full the battery is.

Battery Box: keeps the battery at an optimal warm temperature of all the batteries and keep your battery bank tidy.

Grid-Tied Solar and Wind Power System Setups

I recommend using the grid-tied power system if the power you are using is from the grid. Some of you reading this book may have heard of this system also referred to as a utility interactive solar electric, on grid, or grid-intertied.

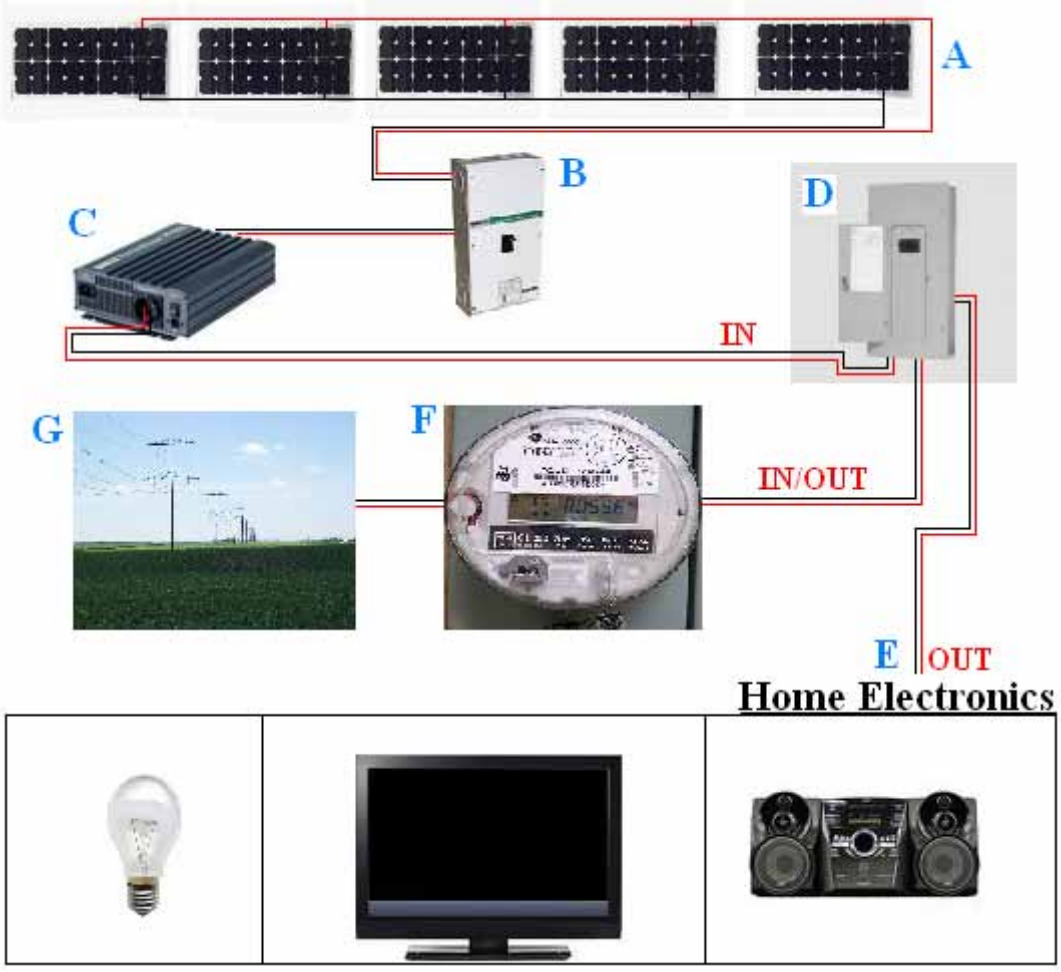
An extremely attractive feature of this system is the effect it has on your electricity bill.

When using this system you should contact your electricity provider or the statistics regulatory agency for information on net marketing or net billing.

Net billing is highly recommended because if there is an excess in electricity when using the solar and wind power systems because you are not using the same amount as before, the electrical meter will turn backwards giving you a credit on your account.

This credit can then be used at a later time such as when the solar power system is not generating as much power due to weather conditions.

Diagram of Grid-Tied System:



a) DC Power Source (Wind or Solar)
b) DC Disconnect
c) Inverter
d) AC Breaker Panel
e) Electrical appliances
f) kW/hour meter
g) Grid

Grid-Intertied Power System Diagram (including battery backup):

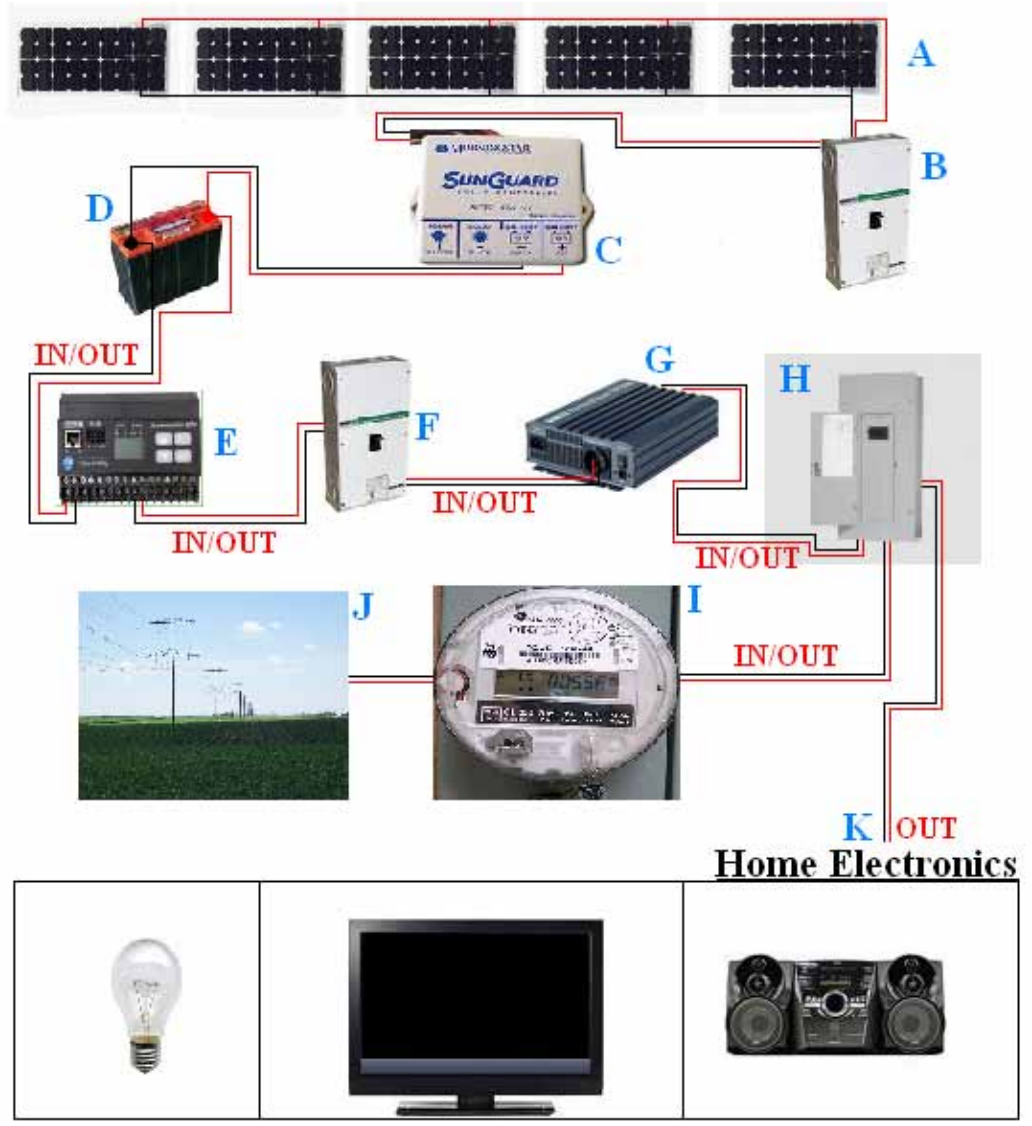
This system is absolutely useful when performing maintenance on the system or when the weather does not permit the system to work at full capacity. The system monitor is handy in a complete measure of power gain.

WARNING

Whenever working on the roof or working on power wires, make sure safety is your FIRST PRIORITY!

Harnesses and insulated gloves are great measures to take.

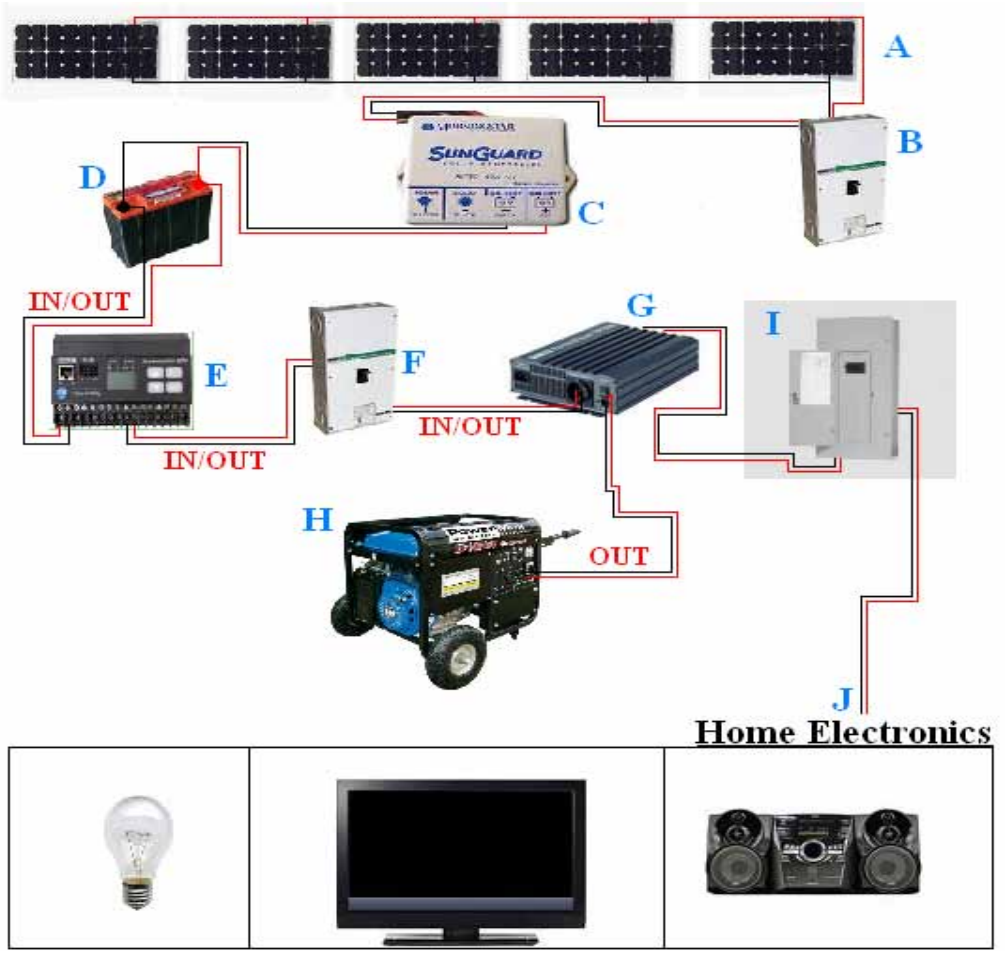
Electrocution is very serious and something you do not want to experience so please be safe. If you have no formal knowledge of electricity in d/c or a/c form, you must contact your local Electrician to hook up your system.



a) DC Power Source (Wind or Solar)
b) DC disconnect
c) Charge Controller
d) Deep cycle battery
e) System Meter
f) Main DC disconnect
g) Inverter
h) AC breaker panel
i) kW/hour meter
j) Grid
k) Electrical appliances

Off-Grid Power System Diagram

This system is convenient to use when the sun cannot keep the battery charged as it uses a generator.



a) Solar Panels
b) DC disconnect
c) Charge controller
d) Deep cycle battery
e) System Meter
f) Main DC disconnect
g) Inverter
h) Generator
i) AC Breaker Panel
j) Electrical Appliances

Wiring In General

There is nothing really special about the wiring for your PV array, though a few considerations need to be given. First, most of your array's wiring is going to be outdoors and exposed to the weather. This means it needs to be protected.

Heavily shielded wiring is your first priority and has the added benefit of having loss of power to heat and other factors, which makes your array more efficient.

Consider using conduit to run the wiring through and underground if your wiring is to run very far across the ground. If your panels are mounted on the rooftop of your house, then entering it into the house as close to the panels as possible will save you expense and trouble later.

The sooner the wire goes inside your house, the less of it that will be exposed to the elements. Finally, the connectors you use are very important.

The Power4Home wiring scheme is in the build section of this manual. Read the "How to Build A Power4Home Electrical Box" chapter

A couple of notes on connectors:

1. They connect the wires one to the other and they allow for easy disconnection and replacement of components or wire runs.

2. They also provide a great place for your system to lose efficiency as power is lost to heat or the atmosphere. So use the best connectors you can get.

Wiring in Parallel

Assuming you have 12v batteries and are planning to wire them to a 12v inverter, you're going to be doing so by wiring the batteries, one to another, in parallel. In parallel wiring, voltage stays the same while amperage is increased, so you end up with more amp hours without increasing voltage.

This is the most common setup for solar PV battery banks. If you are using 6v or even 2v batteries, then see the next two sections and combine the information. If you have a 24v inverter, see the next two sections as well. So, with 12 volts for both battery and inverter, you've got to wire the batteries together without increasing voltage.

This is easily done just by connecting the positive terminals to positive terminals through the line until you reach the end. Then do the same with the negative terminals, one after the other. Here's an example: You have six batteries which are 12v by 350 amp hour rated.

You connect the positive terminals to one another, starting from the first, going to the next, then the next, etc. You now have a continuous positive connection from the first battery to the last. Now you do the same with the negative connections, down the line. Your end result is a 12v by 2100 amp hour (350 x 6) battery bank.

Wiring in Series

If you need to increase voltage in order to meet your needs, then you'll want to wire in series rather than in parallel. Using a series connection increases the battery bank's voltage while leaving the amperage the same.
This wiring method is exactly the opposite of parallel, in that the positive post of the first battery is connected to the negative post of the next, which goes to the positive, then the negative, etc. Then the negative of the first is connected to the positive of the next, and so forth.

At the end, you still have two wires, but they've overlapped several times going from positive to negative and back again. With our example six battery bank, it works like this: the positive terminal on the first battery is connected to the negative terminal on the next.

That is then connected to the positive terminal on the third, and so forth. Then the negative terminal on the first is connected to the positive terminal on the second, which connects to the negative terminal on the third and so forth. At the end of the line, with our 12v by 350 amp hour batteries, we have a 72v by 350 amp hour battery bank.

Combining Series and Parallel

Now let's look at using both series and parallel circuits to increase your batteries to what your inverter's specifications are. This simple example should get the idea across well enough that you can convert the information to 6v, 2v, or whatever you're using. We'll be looking at our same six batteries, but in a 24v configuration instead of a 12v.

So we have a 24v inverter and our six batteries are 12v by 350 amp hours. To make our battery bank a 24v setup, we'll need to combine our batteries in twos to make them 24 volt batteries. So we'll combine our batteries in sets of two to make 24v by 350 amp hour series and then combine those sets of two together in parallel to make a total setup of 24v by 1050 amp hour battery bank. It's not as complicated as it sounds.
First, we'll organize our batteries into three sets of two. Each of these sets will be combined to make one big battery out of the two batteries in the set. So we'll connect the first battery to its mate, positive to negative, in a series.

Then we'll connect the negative to the positive making the two batteries one unit, which is now running at 24v. We'll do this same thing with each of the other two sets, making three sets of 24v batteries. Now those three will be combined together in parallel, positive to positive to positive and negative to negative to negative.

This gives a total of 24v and 1050 amp hours. You can do this same thing with 2, 6, or any other voltage batteries to make whatever voltage you need or whatever amp hours are required.

Inverter/Breaker Box and Battery Exciser

Now that your battery bank is installed and ready to go, you can set up the inverter and (if you have one) battery exerciser. If you got a good inverter/controller, it will have a monitoring system to watch for changes in the input from the batteries.

There are several good reasons you want this included and should spend the extra money to insure it's there:

1. This simple monitoring can be what first clues you in to a battery going bad. If you check your system regularly and watch the changes in it, you'll see something is wrong immediately and can then check each battery individually to find the culprit. Some of the more sophisticated controller boxes connect to your computer to give maximum detail and ease of use.

2. When the batteries get low because they haven't received a charge in some time (bad weather, disconnected solar panels, etc.), a good controller can shut off high-load applications or shut down the entire, non-essentials in your electrical system to prevent total battery discharge. This saves the life of those expensive batteries.

3. This monitor can also be an extra defense against surges, unexpected failures, or sudden changes in your power usage that could cause harm. If, for instance, you're running your computer and your television and someone in your family, not knowing this, turns on the hairdryer and dishwasher, which could potentially overload your system. A good controller will prevent this. The rest of your installation will be according to your manufacturer's recommendations and hookups.

Be aware of the following safety concerns:

☐ Set the unit up and attach it to its permanent location BEFORE you plug in any power or wiring to it. MAKE SURE ALL POWER IS OFF BEFORE YOU HOOK IT UP!

☐ If you aren't totally comfortable with setting up this part of the system, DON'T DO IT! Call a qualified electrician and have it done right.

☐ I'm not giving specific instructions on how to set up this part for a reason. You can survive falling off the roof when you're setting up your panels, but you're not likely to survive intact after electrocuting yourself while working with your house's main power inlet.

☐ Finally, the panels and controller/inverter need to be in a safe, fire resistant location. If you're working in an area that already houses your home's fuse panel and utilities, you're likely in the right spot. Use the correct mounting hardware and shielded connections to avoid fire hazards and other problems later. DO NOT "MAKE DO" WITH SUBSTANDARD EQUIPMENT when installing high powered electrical items. That's a very quick way to have a very bad day.

Connecting the System

If you've already got the panels in place or if you're planning to run a grid-connected system, then you can "go live" with what you've got in place right now. Otherwise, wait until it's all ready to go before doing so. There's nothing wrong with testing it, of course, but if it's not all in place, wait until it is before you flip the big switch to the "on" position.

PERSONAL FOSSIL FUEL USE

In order to really make a difference when it comes to the amount of energy we use, one of the first things we should look at is how much fuel we use when travelling in our everyday lives. In order to reduce the amount of fuel we consume, we will discuss several alternatives.

For starters, using public transportation, walking, biking or just keeping your car well maintained can greatly reduce fuel consumption.

Another idea is purchasing a grease powered conversion kit. This kit is used to alter a diesel engine so that it also runs on vegetable oil.

Now, although these engines use diesel fuel when you first start and idle the car, it is still cheaper, more environmentally friendly, and renewable. The ideal candidates for the grease power conversion kit are those people who spend a long time on the road everyday.

Also, for those of you who can afford it, the hybrid vehicles that are available today are not only incredibly fuel efficient, affordable and conscientious, but they look great too! Although hybrids are now available to the public, there are many environmentally friendly vehicles that use alternate forms of energy such as solar, electrical, and even hydrogen that are not so readily available.

These advances in automotive technology have many implications that are closely tied with what we have discussed so far in the book.

We have already reviewed many energy systems that utilize renewable energy such as wind, water and sun to generate electricity. This means that we already have the ability to power the batteries for these vehicles efficiently. The future holds great promise in our quest to stop relying of fossil fuels.

There is one more device you might want to try. An old friend of mine, Vic Lawson with www.gas4free.com, visited me with the interest of adopting a system into my current vehicle. It's called the G4Free system and you can install in almost any car.

It's not a device you can buy made, you have to build it yourself but I have already installed it in my 2000 Ford Mustang with GREAT RESULTS! My 3.8L V6 would get 18 MPG till I installed this little system and WOW, I got an extra 7 MPG. I'm sure I can get more out of it as I am yet to tweak it.

This device works so well that we are selling it as well.

HOME ENERGY

Although in this book we have discussed how we can use alternative energy sources to supplement the use of fossil fuels to power the home, you can actually live in a home that is completely powered by alternate energy.

Such a home can be built from the ground up or can be the result of altering an existing home.

There are many perks to living in such a home including helping to preserve nature, increase in property value, reducing your fossil fuel dependence, and finally saving money.

However, there is a downside to this type of house, namely the cost. The cost associated with having a self-powering house is approximately 100,000 in alterations.

In the future it will be more affordable to have this energy efficient home but until then not many people will have access to this kind of home.

However, despite the initial cost being high, the home will save you a great deal of money on utility bills and increase the value if you decide to sell the home.

For more information on self powering homes the following websites are recommended:

http://www.solarenergy.org

http://www.greenpowergovs.org/

http://www.akeena.net

A self powered house can utilize many different systems for generating energy.

The deciding factor when it comes to choosing which system you will use is location.

Location will decide what natural resources such as wind or sun are available where you live. Also, many self powered houses use a multiple sources such as hydro and wind as this increases efficiency.

For people who live in a self powered home, one of the major adjustments they face when first living independent of an energy supplier is that the house cannot supply the amount of energy that is needed when compared with how much energy they used when they lived on the grid.

To avoid this hassle, prepare in advance by reducing the energy used by making sure the electrical equipment you have is energy efficient.

For example, a desktop computer uses a lot more energy than a laptop.

Uses less than

Also, always turning lights and equipment off when not in use will also help. If reducing your energy consumption does not result in sufficient energy, an option is to use a mixture of power from the grid and power from alternate sources.

Only use what is needed

Turn off the radio when watching TV

Use candles at night

ALTERNATIVE ENERGY PRODUCED FROM CORN

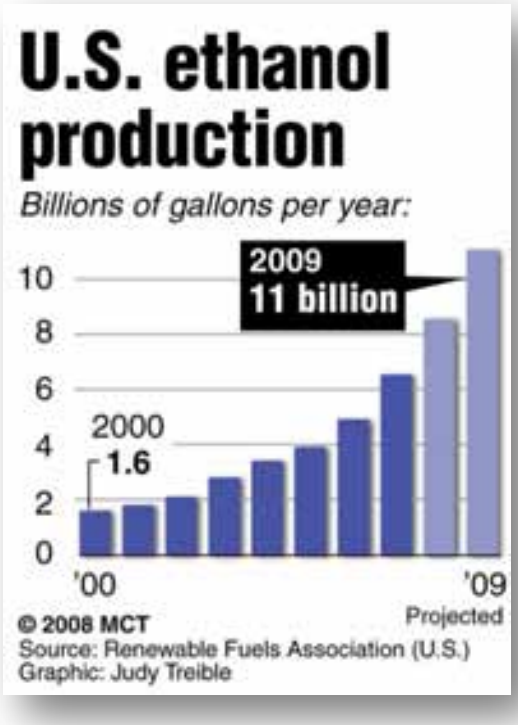
An alternative energy that can be produced by corn or sugar is called Ethanol. Many countries use this alcohol based fuel in addition to gasoline to power cars.

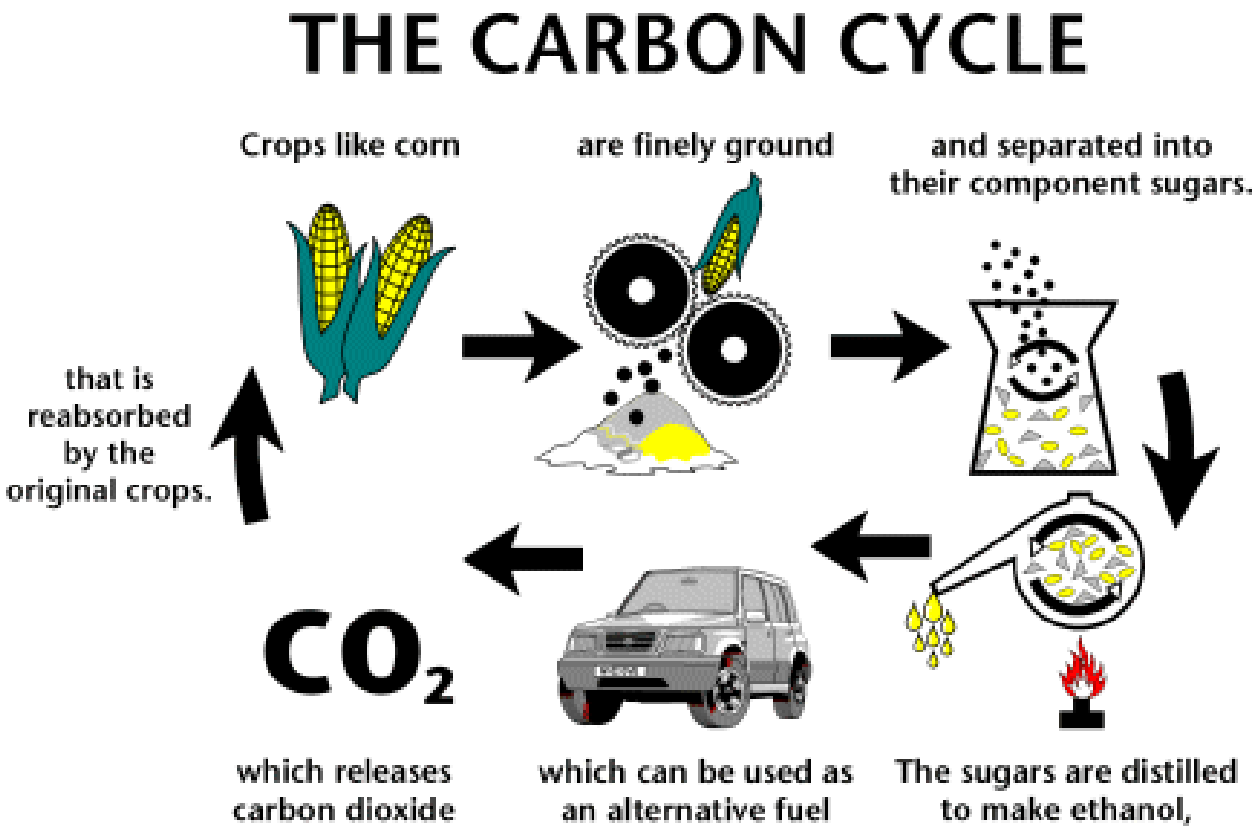
Unfortunately, many people argue that using ethanol is not only expensive but it is not necessarily more practical than gasoline.

For starters, it is very expensive to produce ethanol. Ethanol is produced from corn which means that in order to get crops large enough to produce the necessary ethanol there is a huge overhead cost.

Included in the overhead costs are things like land, subsidies for farmers, transporting, manufacturing etc. Another issue related to cost is the fact that because farmers are using parts of their corn crops that were once used for food, the cost of corn has been affected.

And it doesn't stop there, the cost of dairy and beef has also been affected indirectly as a result.





Regardless of the downside, it is undeniable that ethanol is a renewable energy source that provides us with a cheaper alternative to producing fossil fuels.

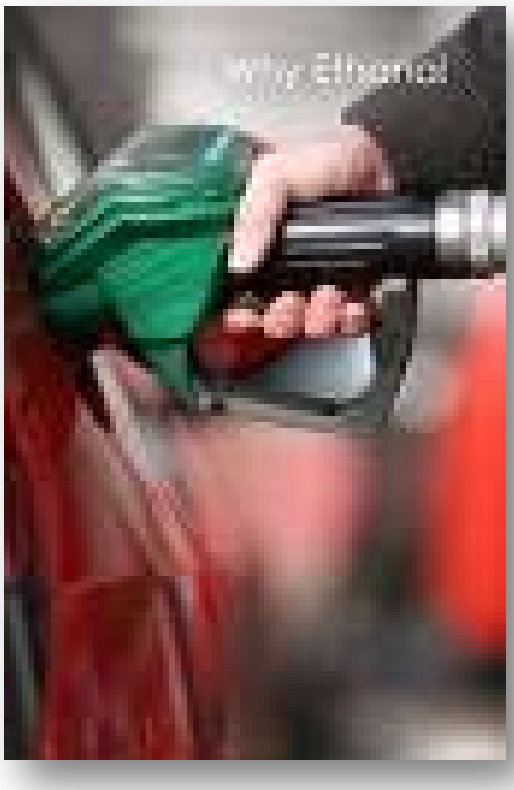
Other benefits of using ethanol are that it releases little to no carbon monoxide, it burns cleaner than other fuels, and creates new job opportunities.

Also, despite the fact that it is expensive to produce ethanol today, this will not always be the case.

As long as major companies and governments around the world start and continue to invest in research we will soon be able to create more efficient means of harnessing alternative energy.

Countries like Canada, the United States and Brazil already offer gasoline combined with ethanol as an alternate to regular gas. In some places it is even mandatory to have a certain percentage of ethanol mixed into the regular fuel.

As the technology associated with ethanol is becoming geared towards making production more economically efficient, it is only a matter of time before it will be used to meet our fueling needs.



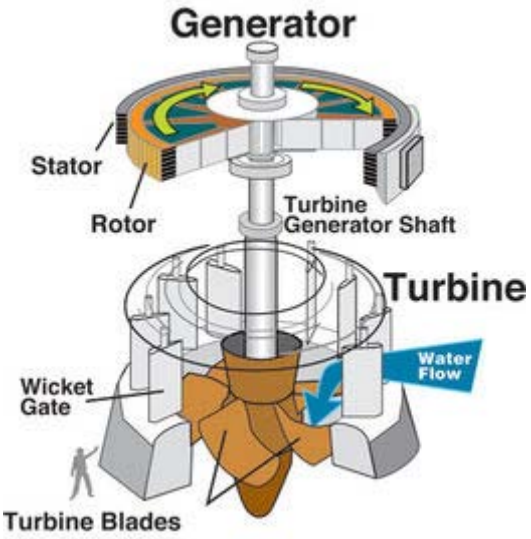
USING HYDROELECTRICITY

Hydroelectricity is the most popular renewable source of energy and provides a cleaner alternative to using fossil fuels. Like ethanol, using hydroelectricity also has a downside.

In order to create hydroelectricity a dam must be built. Some claim that it is a necessary evil but when building a dam many plants and animals lose their natural habitat when it is flooded.

Also, because the dam holds such a vast amount of water, damage to the structure from either natural forces or human involvement such as wartime bombings can result in countless deaths, homelessness, damages and economic consequences.

However, this is not a common occurrence and despite the cons, one cannot deny that the renewable power generated is sufficient to power a city and is used all over the world.



ALTERNATIVE ENERGY IN THE LONG RUN

The fact that we are already looking for alternative energy sources and finding them is a clear indication that the future holds many possibilities. The following are two exciting projects that are currently underway:

a) Floating Wind Farms: these would be located in the ocean on a floating mechanism which would allow the structure to reside in areas of much higher wind than would be found on dry land.

b) PV Panels in Space: although still in the very early stages, one idea that holds a lot of promise is to use PV panels to gather solar energy from the sun without any obstructions or limitations. Many theories related to this concept focus on different ways to transfer the energy from space to earth.

GLOSSARY OF PARTS

I will now go through all the components and there respected function so you have a better understanding of what does what.

AC Breaker Panel

This is found in a metal box or cabinet either in the homes' garage/utility room or outside of the home. It is here that the electrical wiring in the house connects to the electrical source/provider.

Although your solar power system can be connected directly to the AC breaker panel, it is recommended that this is done by a certified electrician as in many areas it is illegal to hook it up unless you are qualified.

For those of you who prefer *not* to connect it to the AC breaker panel, an affordable and easy option is using the AC inverter to power your electrical equipment.

DC Disconnect

This part of the power system is used to shut off the power much easier and when performing maintenance on the system. It's a switch in other words.

Charge Controller

Depending on the type of charge controller you buy, it can perform functions such as not allowing the battery to over charge, keep the battery from discharging when there is no sunlight, and it increases the amount of time the battery lasts overall.

Deep Cycle Battery

This battery is recommended for use in solar system power generators as they are best suited for storing the power created by the solar panels.

These batteries can be purchased new or found in things such as golf carts.

Electrical Equipment (Appliances or Electrical Load)

This refers to electronics in the home that are plugged into the wall and get electricity from the AC breaker panel.

Generator

Produces electricity and can be used when the weather does not allow for the solar panels to create energy or when maintaining the system.

A generator is also necessary if you are not getting electricity from the grid.

Power Grid / Utility Grid

This refers to the electrical power supply/source for your home.

Inverter

This part of the electrical power system turns direct current (DC) into alternating current (AC) or vice versa. Most electrical equipment uses alternating current.

If you are planning to use your system with appliances that use DC you can purchase a DC input instead for less than $20.

KW/ hour Meter

This meter measures the amount of electricity from the grid and from the solar power system you are using. The meter turns backwards when there is a surplus of electricity.

Solar Panel(s)

This is the main part of the solar power system as it is responsible for gathering the sunlight and converting it to DC electricity. The solar panels are also called PV panels and are rated by watts depending on the greatest amount of power it can create under perfect weather conditions.

When trying to decide how many PV panels to use in your solar power system, it is important to keep in mind the rating in watts as this will let you know the amount of panels necessary to for the electrical needs of your household. Multiple panels can be joined in a series or array with various wiring configurations. This will be covered in the Solar Power book.

System Meter

This part keeps track of the power in the battery bank and allows you to inspect the amount of power being utilized at any given time by the entire solar power system.

CLOSING REMARKS

The very fact that you are reading this book and taking the steps to create a better world for our children is an indication that we are on the right track as a society.

Throughout the book we discussed many actions you can perform in your daily lives such as maintaining your car and using fuel containing ethanol that will reduce our reliance on fossil fuels and save money in the long run.

Also, we have outlined the materials and steps necessary to create alternative means of creating home energy including wind turbines and portable solar power generator within the other 2 books.

Not only do you have the necessary information to construct your own source of renewable energy, but you have also learned many tricks to finding the materials at a discounted price.

In the last section of this book we reviewed some of the alternative energy sources and theories that are creating controversy and starting discussions about energy all over the world.

Although we are still waiting for technology to catch up to our ideas, the future looks very optimistic.

THANK YOU

Dear Reader,

My Team and I would like to thank you for the purchase of our guide and all the support you have shown us.

As we move forward in our research, we are committed to sharing our findings with everyone so that we all can gain.

Welcome to the distinct group of people that decided to take the plunge like yourself in changing the future and saving yourself the money you shouldn't have to pay in the first place.

Were in this together now!