OFF GRID POWER BACKUP

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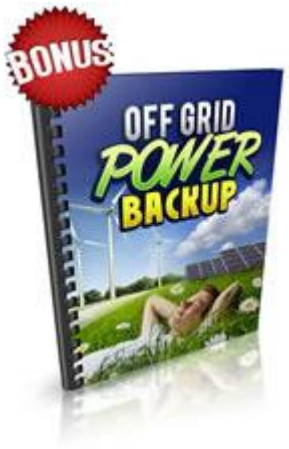

Our Sun

The Sun is the most prominent feature in our solar system. It is the largest object and contains approximately 98% of the total solar system mass. One hundred and nine Earths would be required to fit across the Sun's disk, and its interior could hold over 1.3 million Earths.

Solar energy is created deep within the core of the Sun. It is here that the temperature (15,000,000° C; 27,000,000° F) and pressure (340 billion times Earth's air pressure at sea level) is so intense that nuclear reactions take place. This reaction causes four protons or hydrogen nuclei to fuse together to form one alpha particle or helium nucleus.

This is all interesting stuff, but the average person doesn't care about this technical stuff. All they want is for the sun to rise in the morning and fall at night.

Did you know in just one hour the earth receives more energy from the sun than the world uses in an entire year.

The idea of solar energy is based on the process that over a specified surface area the energy produced by the sun is collected and then converted into usable electricity for homes and buildings.

Solar panels are used in solar energy systems made up of photovoltaic (photo means light and voltaic means electricity) cells to convert and collect the sun's energy into electricity that we can use. Many photovoltaic (PV) cells are made up of very thin layer of silicon and then impregnated with small amounts of elements such as phosphorus and boron.

A “reaction” occurs when the sun’s rays contact the photovoltaic cells and thus energy is produced. The Sun’s energy is absorbed by the semiconductors. Because of this the electrons break free from their atoms and create electricity that is pushed through the cell’s substrate.

Today, in more than 1 million homes worldwide, PV solar modules supply electrical power. Thousands of jobs are supported by this technology and creates opportunities for a sustainable economy. Some of the applications available today for solar PV energy: refrigeration for health care, irrigation of crops, purification of water, communications, lighting, utility power and other residential and commercial applications.

Different Types Of Solar Energy Systems

1. A photovoltaic system is a simple portable power supply that operates just about anything you can think of. The great part is its cost, that ranges between $200 and $500 for assembly at home and it is the best system for camps and camping trips. In a few short months this system easily pays for itself.

Their connections in order and component for this simple system are:

1. Energy source or PV Panels
2. Charge controller
3. Deep Cycle Battery
4. Inverter

2. Most households are already tied to commercial grid power opt to use such as an on-grid solar power system. Some energy efficient households can actually be paid back by this utility through net metering, the system owner receiving retail credit for a portion of the electricity they generate. The important thing to mention about this system is that, you will not have power in the home, if your power from the commercial grid is interrupted.

For more information on net metering in your area, you will need to consult your local electricity provider and state regulatory agency.

Their connection in order and its component for this solar system are:

1. Energy source or PV Panels
2. Array DC Disconnect
3. Inverter
4. AC Breaker Panel
5. Kilowatt Per Hour Meter
6. Grid tie in

3. The same as the grid system is an on-grid system with battery back-up, for storing energy as additional battery elements. When it is cloudy or rainy or when the power grid is interrupted; in this case the sun will not be available and this stored battery power will be used.

Their connections in order and its component for this solar power system are:

1. Energy Source or PV Panels
2. Array DC Disconnect
3. Charge Controller
4. Deep Cycle Battery
5. System Meter
6. Main DC Disconnect
7. Inverter
8. AC Breaker Panel
9. Kilowatt Per Hour Meter

4. The popular choice for remote locations is the off-grid energy system where it would be too great or too intrusive on the landscape for the cost of running the commercial electricity. For those individuals who do not wish to see their monthly electric bill in the mailbox can choose this option. When there is not enough sun exposure to produce the electricity needed for the home or business, the generator includes a system to charge batteries.

Their connections in order and the component for this solar power system are:

1. Energy Source or PV Panels
2. Array DC Disconnect
3. Charge Controller
4. Deep Cycle Battery
5. System Meter
6. Main DC Disconnect
7. Inverter
8. Generator

9. AC Breaker Panel

Constructing your Solar System

For members of an average income household the cost of purchasing a commercial solar generator or a solar energy system at a retail value is not an option. The cost effective way to introduce alternative energy into your home and business is to construct your own solar generator, which is easier than you imagine. The life span usually includes a manufacturer's warranty that may last for 20 years or more for a photovoltaic cell.

To reduce your commercial energy dependence and reduce cost of your energy, there are types of applications used within your home or business for solar power. But let's know more about the individual parts of most solar energy systems and their functions before we start describing the various systems. Becoming familiar with these elements will make you understand the design presented later in this book, easy to understand.

The Functions & Their Parts of Photovoltaic System

Solar Cell: Photovoltaic (PV) cell is the key ingredient of the Photovoltaic system. To create PV panels, PV cells are connected together.

Stringer: They are known as stringers when the individual PV cells are connected together in a "string". Four (4), 9 cell stringer make up a 36 cell panel.

Solar Panels: The "heart" of a solar electric system is the panels, which is also called PV (or photovoltaic) panels. The Sun's energy is captured and converted into direct current or DC electricity by these panels.

Depending upon the surface area of a cell, each PV cell produces approximately .55 volts DC and from 1 to 8 amps per PV cell. To create PV panels, the PV cells are connected together and to create a Photovoltaic (PV) System, referred to as a PV Array.

To find the proper panel for your project you need to determine your electricity usage and the best solar panels are rated with wattage information. To meet up your system requirements you can combine multiple panels into an Array. Standard panels usually have either 36 or 72 cells. (36 PV cells per panel X .55 VDC per PV Cell = approx. 20 Volts DC per panel x 4 Amps/cell = approx. 80 watts of power).

From individual solar cells you can create your first PV module. You can connect them together to create the necessary array size as you create additional PV modules for your home needs.

As the required number of PV panels is built, then the Array can be installed on the ground or on the roof to generate electrical power.

An example of an Array on the ground:

An example of an Array on the roof:

Other Components

Array DC Disconnect: For any solar panel system the DC Disconnect is an important maintenance element. Shutting off power from the solar panels is easy and safe by the DC Disconnect.

Note: The Disconnect must be DC rated and not AC rated!

Charge Controller: If batteries are to be utilized in a PV system then a Charge Controller must be used. It will benefit the life and the charge duration of your battery system. Once the batteries are fully charged, by interrupting the charge process, the charge controller protects the batteries from becoming overcharged. The battery is prevented from discharging at night by several incorporated charge controllers.

The safest and best battery to use with any alternate energy system is the Deep Cycle Batteries. The energy produced by the solar panels is stored in this battery. From the suppliers of other machines that utilize deep cycle batteries such as golf carts, forklifts and fishing boats, it is possible to find free deep cycle batteries. To purchase new batteries with a manufacturer's warranty is probably the best thing to do.

System Meter: To monitor how fully your system is charged, a system meter can be used in coordination with your battery bank. To determine how much energy is being consumed can also be used by the system meter at any given time. The system meter allows many homeowners to "go online" with their system to monitor their PV System.

Main DC Disconnect: To safely and easily disconnect the inverter for maintenance, a main DC Disconnect is used. It is installed between the battery bank and the inverter.

Inverter: An integral element in any alternative energy system is known as an inverter. The DC energy generated by your solar panels is converted into alternating current or AC current by this unit. The type of electricity used by household appliances is the AC current. No other conversion from DC to AC power is necessary, if you want to operate only DC appliances.

Generator: For all alternative energy systems, a generator is not a necessary element. You will learn later more about the most beneficial “off-grid” systems. It is also used as a “back-up” source of power by some individuals who decided to include a generator in their alternative energy system. When there is not enough sun exposure to produce electricity this can be used to generate energy on that day. The generator can be used to recharge the Deep Cycle Batteries in the PV

System's battery backup system, in addition to providing power when there is not enough sunshine to operate the PV System.

AC Breaker Panel: A breaker panel has been located somewhere on the premises almost in every home, except maybe those with no existing electricity. This is the point where all of the home's electrical wiring meets with the electricity provider. Through an alternative system (PV) or through a hybrid system that combines both (AC + PV) via a commercial grid system provides electricity. To operate a hybrid PV system which is a PV system plus a tied grid system is another alternative.

The alternative energy sources are connected to the AC breaker panel with every state and or local governmental agency that has their own set of codes and guidelines regarding their ways. To connect your alternative energy system to the AC breaker panel, it is recommended that you always employ a qualified and licensed electrician, who is knowledgeable about PV system.

You can even run your appliances directly from your inverter. With this you can avoid the cost of hiring an electrician and tapping into the commercial grid system. Your commercial utility (electrical company) is opposed only by utilizing the inverter as recommend when you connect.

Before you attempt to connect your PV system to the local utility, always check the rules and regulations regarding in your area for having a "grid-tied" electrical system.

The cost of solar products

Solar panels are getting cheaper ever month as more competition comes from China. Many people think that Chinese products are poor quality but this isn't the case. These days many companies from all over the world use Chinese factories to make their products. They all must meet certain standards and more likely than not, some of your favorite brands will be made in China.

80 solar panels can be purchase online from places like eBay for as little as $180. These panels will usually come with a 20+ year performance warranty and 5+ year workmanship warranty.

Solar panels are not the only products that are cheaper than ever before. Just about everything you need to build your own off grid solar system are now more affordable than ever before.

I estimate that you can get all of the parts needed for a 320w (4x80w panels) off grid solar system for as little as $1200. This includes the panels, charge controller, cable, mc4 connectors, battery and inverter.

Wind Power

One of civilization's oldest forms of mechanical power is wind. It suffered something of a relapse since the start of this century as the benefits of mass cheap energy supply came through. Wind is making a big comeback, as the true cost of mass fossil fuel use come to light. As part of a range of vital measures towards sustainability, a growing number of countries are doing their best to encourage wind energy generation.

How does it work?

Several rotating blades present in a wind turbine will actually convert the power of the wind into kinetic energy. The collected kinetic energy is then sent to the generator. Using electromagnetic induction electricity is produced within the generator. Magnets placed around a coil are moved by the wind which creates magnetic fields, generating power, and this power, called kinetic energy, is then turned into electricity due to their atoms that set the electrons free.

How much energy can a wind turbine produce?

We must determine how windy it is where you are planning to install. It does not depend whether it is ever windy where you live or only windy during storms as that is merely an observation about the weather. To know about the long-term average wind speed for your area you must rely on historic climate data and not day to day weather. The more the turbine spins, the more energy it produces.

What does small wind turbine mean?

For individual homes, farms, and small businesses, emissions-free renewable power and electric generators that utilize wind energy to produce clean electricity, these wind turbines are used to design this. They have a rated capacity

up to 100 Kilowatts. The wind turbine is just like the solar panel, simply a collector. If the collector is made up of a number of blades that rotate to turn the electrical generator, then it is known as spinning rotor. Small blades have a small root diameter that translates into small collector area, which further translates into small amounts of electricity generated.

Buying a wind generator

The question you need to ask yourself, “is it worth it?”. To determine this you must establish the proportion of wind speed in your area and check the monthly energy consumption. With respect to the energy consumption, 10 mph should be the minimum average wind speed that is easily controllable.

Even if the wind generator proves to be worthwhile, not all people find it convenient to buy one.

Many cannot afford to pay thousands of dollars for such a piece of machinery. Building a wind generator is the one satisfying solution for such people since the costs will not exceed $100.

Face the reality and just make it clear! If you are not living in a frequently windy region then you should use systems that fit your climate circumstances.

You will require a DC power motor, a body assembly, a tail assembly, the necessary blades for collecting the wind power, a hub to connect the propeller to the motor, a battery bank, some nuts and bolts, and some hardware in order to build a wind turbine. And tools such as screwdrivers, a grinder, a jigsaw, a socket set and some sandpaper should be enough. Also, a tower in close vicinity to your home.

To get your work done, you need to find a good step by step guide. When your wind turbine starts to turn and power flows into your battery for the first time, it will be a great moment.

Patience and a lot of wind are the two critical things.

Combining wind and solar power

Both are alternative forms of energy that are efficient and can even save you a lot of money. For decades, two types of energy have been used successfully and are separately performed.

There have been great strides in both technologies recently. Saving the homeowner money on electricity, it is now possible for a home to be solely powered by wind and sunlight. One system can save even more money by combining both wind and solar power.

To install in their homes, many people have solar power as option. Power is generated by the solar panels and the energy is stored in a battery. The power company has the excess energy that gives you the funds to be able to buy power when you need it.

When you send this extra power back to the power company, it will actually make you money. You may not be able to store enough energy to power your home during the night or a cloudy day.

The fastest growing form of renewable and clean energy is wind power. Kinetic energy is converted into mechanical energy when wind turns the turbines, which is later converted into electrical energy through a DC motor which is connected to a storage system.

If you did not have this stored energy then your electricity would be constantly flickering because of wind that does not blow constantly. Yet, many areas are not prone to all that much wind.

How to optimize your savings and even make money on your decision to provide your own power

For this you have to combine both solar and wind energy. When one does not work, the other steps in. As long as there is a breeze, wind turbine can work

during the day or night. There will be sunlight to increase your solar power reserves when there isn't a breeze.

When both wind and solar energy is combined they save even more money and power and are very efficient alternative sources of power on their own. They emit no greenhouse gases as they both are clean, renewable and easily distributed.

To a safe future,

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