



# Alternative Electric Energy Sources for Your Homestead

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## How to Use Nature to Create Alternative Energy

With rising inflation and increasing prices on all utilities, it's no wonder that many Americans today are looking for ways to cut costs wherever they can.

In addition to being a great alternative for those looking to slash costs on their utility bills and annual heating and cooling costs, wind, solar, and hydro power offer an attractive power source to the prepper or the steadfast homesteader interested in maximizing their self-sufficiency or general ability to live off the grid.

Alternative energy can also be used in areas where the power grid is prone to failure.

### Solar Power

Solar power is of course the most well-known alternative energy source, but it is not always a viable option for everyone, especially those who live in northern climates where daylight hours are short or sunlight is scarce.

If you live closer to the equator and have sufficient sunlight and the necessary do-it-yourself skills, though, solar power can be some of the cheapest of alternative energy systems to set up.

In addition to being lower cost and easier to set up, a standard solar panel array is very low maintenance and has an extremely long lifetime. Such panels can be left unmonitored for extended periods, their operation is silent and unobtrusive, and they offer reliable, predictable levels of power output based on the amount of sunlight they receive.

Standard components for a solar panel system include not just the solar panels themselves but also the controller, which protects the batteries by regulating the flow of electricity from the panels, the batteries for storing electricity for later use, and an inverter, which converts the energy stored in the batteries to the voltage needed to run standard electrical equipment.

As a do it yourself project, solar panels average \$3.00 – \$6.00 per watt or more to install.

Small, preassembled solar panel kits are also available from many retailers and are capable of producing anywhere from 45 watts to 150 watts of energy, and range in price from \$200 – \$600 and higher.

All solar panels will come with a standard rating from the manufacturer for the



wattage they should produce per square foot; for most solar panels production averages approximately 10 watts per square foot, or approximately 12% efficiency. This translates into needing approximately one hundred square feet of solar panels to produce one kilowatt of energy under ideal, full sun\* circumstances.

When purchasing from most retailers, however, it's important to remember that in the world of solar panels you largely get what you pay for. So, when a deal seems too good to be true, it probably is. Quality solar panels and other materials for a DIY project will generally range in price from a minimum of \$500 to upwards of \$5000.

Costs include the price of setting up the actual panels as well as the batteries to store the electricity they generate, the battery chargers, the inverters, the monitors, the cables, fuse protection, and generally some form of backup generator as well.

Compared to the cost of a professionally installed, full house system, a do-it-yourself solar panel system can save you tens of thousands of dollars. Although government subsidies and lucrative tax credits can reduce the cost of the \$50,000 – \$60,000 solar panel installation for your on the grid home to anywhere from \$25,000-\$45,000.

In addition to the reduced cost, if your solar panel array produces enough electricity to put energy back into the power grid, your power company will actually send you a check each month for the energy produced. Such systems are also guaranteed for 20 years or more by the installing contractor.

If the cost of a full-scale solar power set up is off-putting or simply beyond your budget, however, wind power may be just the alternative you're looking for. With small wind power generators increasing in popularity and falling in price in recent years, it's now possible to set up a wind power generator for as little as \$1.50 per watt.

You have to live in a very windy climate for this generator to be of true use, but assuming you have the wind this is one of the cheapest alternative energies available and can prove more reliable than the sun in some locations.

### Wind Power

Wind generators also have the advantage of operating day and night, but location is critical to achieve maximum production, and because of their moving parts, they do also require increased maintenance.



Larger wind generators can also incur additional mounting costs in order to be mounted on towers where they can catch the best wind current.

Low wind speeds can also lead to little or no power output, and larger wind turbine arrays may pose a hazard to passing birds, particularly birds of prey. There is also a slight chance for noise pollution, especially if your wind turbine is particularly productive, resulting from the whirring sound of the blades.

Small wind generators designed to produce anywhere from 50 watts to 200 watts are available from a variety of manufacturers and range in price from approximately \$700 to upwards of \$1200.

### Hydropower

Another option you may consider for alternative energy generation is **hydropower** or micro-hydro generation.

This is a great option to take advantage of if you have a fast-moving, reliable source of water to make use of, and it comes with several advantages including being able to operate 24/7, much greater reliability than solar or wind power under most circumstances and cheaper cost for initial implementation.

On the downside, hydropower generators are not the most portable of units (of course neither are most wind power generators) so solar power is generally a better option for powering portable objects such as calculators, laptops, flashlights and batteries, etc.



and freezing temperatures can affect the ability to harvest energy from free-flowing water.

In a stationary location, such as that of semi-permanent bug out location or on a homestead or family farm however, hydropower is exceptionally cheap, abundant and reasonably easy to maintain.



Ranging in price from roughly \$1000 to upwards of \$30,000 based on their power output, hydroelectricity generators are one of the most reliable power sources on the planet.

Although a fast-moving body of water is generally preferred for use in hydropower generation, some manufacturers have developed hydropower generators specifically designed for low speed currents.

Hydropower generators do require some additional maintenance, especially when it comes to cleaning the screens for water intake to maintain strong and steady flow, but are otherwise rather low maintenance and can operate quietly and rather unobtrusively depending on how you install them.



## How to Use Your Garbage to Create Energy

As preppers, we have many goals but most of them revolve around a few primary concepts: to be independent, to find ways to reuse and recycle items in order to be as efficient as possible, and to live in a self-sustaining, disease-free environment. Using waste to create energy meets all of those needs.

There are many ways that this can be accomplished. Some are more feasible than others and some are still in the early stages of development.

At this moment, there are very few efficient ways to convert waste to energy, especially in a residential setting, but those in the know are working on it.

If we put our collective heads together, solutions may come even faster. After all, that's how most of these ideas started anyway – in somebody who gave a flip's backyard.

### **Converting Garbage to Energy Safely**

We thought we had this one solved until we realized that the old-school methods of combustion of garbage was releasing fly ash, toxic fumes, heavy metals and trace dioxins into the air. One of the results of this was acid rain.

Thankfully, modern methods of combustion are much more efficient. Waste gases are passed through lime scrubbers, electro-static precipitators, fabric filters, reactors and catalysts that neutralize acid levels and catch pollutants on their way out of the factory.

It's been claimed that modern methods of incineration release less dioxins and other pollutants into the air than home fireplaces and BBQ's (Barbecue).

The basic idea here is that personal and municipal waste (trash) is collected and taken to a facility that burns it in order to turn it into gas that is then converted to electricity. Critics claim that it's inefficient and uses more energy to process than it creates. That argument used to stand but with improvements in technology, it's not so accurate anymore.

Also, we're keeping garbage out of landfills because the original volume of the waste is reduced by up to 95%. That's certainly a critical factor that should be considered because this is one of the primary goals of prepping – having waste management and energy production systems in place when SHTF. So, the next logical question is, "Can we do this at home?" Of course we can!

Incineration isn't the only method of converting waste to energy.

For that matter, it isn't necessarily even the most efficient. Other methods include:

### Pyrolysis

Pyrolysis is the creation of biofuels by thermochemically breaking down the waste at elevated temperatures without oxygen.

This is how you make charcoal and convert wood to methanol. It's also being used with plastics: when you burn them, they release a gas that, when cooled and converted back to a liquid, is oil.



Plastics are petroleum-based so when you break them down like this, petroleum is the result. Convert the oil to fuel and you've got it.

Pyrolysis isn't particularly efficient at the residential level because it takes a boatload of heat to cause the chemical breakdown. It's a simple process though that, with some tweaking, may one day be viable in a survival situation because it doesn't really require any specialized equipment that you can't build for yourself.

### Gasification

With gasification, organic matter such as fossil fuels or biowaste is converted into syngas by heating to high temperatures without allowing combustion.

The pros of gasification include an extremely clean end product that can be used directly in gas engines or can be used to create synthetic fuel or electricity, and it's fairly uncomplicated to do. It's also sustainable.

The downside is that it often takes as much or more energy to perform as the process produces.

An example of gasification is the use of coal to produce gas for the oil lights of the early 1900's.

### **Anaerobic Digestion**

Now we're getting somewhere. Anaerobic digestion is a combination of processes that breaks biodegradable material (read biowaste for our purposes) into a usable fuel without the presence of oxygen. To simplify it, think about the fermentation process used to make beer, wine or bread. That's an example of fermentation, which is a part of anaerobic digestion.

Another example is the conversion of farm manure to methane. By controlling the process and bottling the methane, we're reducing the largest source of greenhouse gas on the planet while creating a renewable source of fuel.

Methane can be used in a variety of ways, including being used directly in a combined heat and power gas engine. It can also be converted into biomethane which can be used pretty much the same way that any natural gas is used. Uses include electric, heating and transportation.

The way that anaerobic digestion works is that microorganisms will eat the organic material, then produce gas as a digestive byproduct. This is an extremely simplified explanation though. Anaerobic digestion actually occurs in four stages: hydrolysis, acidogenesis, acetogenesis and methanogenesis.

On your farm, you can set up your anaerobic digester to work either in batches or continuously. You can also use different temperatures, types of organic material, and levels of complexity.

At the very simplest, called a single-stage digestion system, the entire process occurs in one sealed reactor, holding tank or lagoon. This reduces costs but is less predictable and often less efficient.

With two-stage digestion systems, you have greater control over the bacterial communities in your tanks and can therefore control the process a bit more.

If biogas is your goal, you need to be aware of how digestible your waste materials are. Paper waste, grass cuttings, food leftovers, animal manure and sewage are all great starters. Just about any organic material works except wood. For some reason, it's not really digestible to the bacteria.

### **Lipid Transesterification and Esterification**

This is the process used to convert used vegetable oil into usable biodiesel. It's a chemical process that exchanges the ester in the oil for an alcohol. That's usually done by using an acid or a base catalyst. Specifically, the veggie oil-to-biofuel process usually uses lye, methanol and alcohol as catalysts.

There are many different ways of using waste to create energy on a survival farm or even in your back yard. What method you'll use will depend upon what you want to use the fuel for and what types of waste you have access to.

Beyond that, most of the processes can be completed using simple equipment that you can buy for very little money or that you can make yourself.



## Pedal Power: Using Your Body to Create Energy

It's been noted that in virtually all the post-apocalyptic scenarios depicted in movies, or novels, you rarely ever encounter anyone riding a bicycle. But it stands to reason that bicycles will end up being one of the chief modes of transportation in the event of grid failure or almost any long-term SHTF situation.

Internal combustion engines can be difficult to maintain over a long period, especially if you don't have access to the right tools, spare parts, etc.

On the other hand, a well-maintained bicycle can last for decades, requiring a minimum of spare parts, tools and know-how. That's not to even mention the low cost of purchasing one in the first place.

Bicycles have been around for centuries now, and aside from some relatively minor improvements and lots of variations on the theme, the technology is essentially the same as it was in the late 19th century, when the first chain-driven upright bikes were introduced.

The bicycle is possibly one of man's greatest inventions, especially when one considers the facts that riding a bicycle causes essentially zero harm to the environment and is the most efficient means of human-powered transportation available. The raw materials and energy expended to manufacture a bicycle are negligible compared to its long-term potential value.

Aside from being a means of getting from one place to another much more quickly than on foot, bicycles have many advantages over foot power, and in some cases, even over motorized transportation.

### **6 Reasons to Use Pedal Power**

Although, of course, a bicycle may not be as fast or capable of the long distances achievable with a motorcycle, car or truck, the relative advantages are numerous:

- **Cost** – A good bicycle purchased new only costs a few hundred dollars, maximum. Used bicycles are ridiculously cheap and can often be scavenged for free.
- **Reliability** - A well built and maintained bicycle is almost indestructible. Almost everything needed to repair and maintain a bike can be carried along, including spare inner tubes, tools, lube, etc.
- **Durability** - A well-maintained bicycle can last almost indefinitely if care is taken to prevent rusting and corrosion of its parts. With a few spare parts and careful maintenance, a bicycle will provide service for decades.
- **Efficiency** – As mentioned above, bicycles are the most efficient form of human-powered transportation and the health benefits associated with bike riding are obvious. Bicycles are also extremely efficient in terms of cargo transportation.



- **Stealth** – One of the possibly less obvious, but potentially important advantages of a bicycle is its nearly silent operation. This could prove to be a life-saving quality in a SHTF situation. A bicycle can be used for covering great distances for hunting wild game as well, without calling attention to one's presence.
- **Accessibility** – Bicycles are capable of going places few other vehicles can manage. A mountain bike can be used almost anywhere – even in some of the roughest imaginable terrain.

## Innovative Uses of Bicycle Power

Bicycles also have many valuable uses beyond simple transportation. Bicycle parts, particularly the pedals and drive train, can be converted into highly useful tools.

Pedal power can be harnessed to perform a great number of tasks, including generating electricity, recharging batteries and powering a wide variety of tools.

If the power grid goes down or if there is no available electrical power for whatever reason, converted bicycles can be a major source of efficient human-powered energy.

Pedal power can be harnessed to directly power many types of machines, and converted bicycles can also be used to generate electricity, which can be stored in batteries. Actually, almost anything that can be done with an electric motor can also be accomplished using bicycle power:



- A bicycle can be converted to power a water pump capable of transporting 10 liters of water per minute. The pump could be made from bicycle parts, an old belt-driven water pump and other scrap materials found around this resourceful Irish couple's off-the-grid home.
- Threshing wheat or other types of grain can pose a real challenge for an off-the-grid farmer.
- The pedal power can be used to drive a sewing machine.

The positives of using pedal power are many and the drawbacks are few. And the health benefits of using human power are obvious – using a bicycle-powered water pump, for instance, is a great form of exercise as well as a being a practical solution for off-the-grid living.



## The Power Generator: Building or Buying One?

It's a safe bet that you've come to the realization that dependence on a power grid is a bad thing.

As much as you'd like to live entirely without it, electricity is an integral part of day to day life and, to be honest, you probably don't WANT to live entirely without it. You need a better option.

Fortunately for you, you've started at a great time. There is a now huge push to live off the grid and suppliers of home generators that run on solar or biodiesel power are abundant.

However, there are a few problems associated with this equipment that have led many people to learn to build their own power generators. If you're not quite convinced that going off the grid is for you, here are just a few reasons why you should consider it.

### What Do You Do When the Power Grid Goes Down?



At one time or another, we've all experienced a power outage.

Since most of the modern-day conveniences that we depend upon to function run on electricity, life changes drastically when the power goes out.

Loss of electricity is more than just inconvenient; it can be extremely

expensive as well. Refrigerated food only keeps for about a day without electricity and the food in your freezer will be bad in less than a week.

Though many of us may not store more than that, you also have to remember that you won't be able to go to the store to replenish your supplies. Even if the stores have power to keep the food good, you have no way to store it once you get it home.

Electrical appliances such as stoves and hot water heaters also depend on electricity so you won't have an indoor source of cooking or the ability to take a hot shower. That may not be so terrible in the summer but in the winter, it can be horrible. You may have a temporary way to cook outside, such as a grill, but what happens when you run out of fuel for it?

It's likely that you use electricity for communication, too. Even though your cell works for a short period of time when the power goes down, most batteries won't last more than 24 hours without needing to be charged. Since most of us also use our phones for

weather alerts and to read the local news, your handheld device is a crucial piece of equipment in short term emergencies.

### **Power Obtained from the Public Grid Costs a Fortune**

Public electricity is also expensive. Most homes nowadays use it as the primary source of heating and cooling in addition to running electrical appliances. In the winter, heating bills soar and in the summer, it can cost a small fortune to keep an average sized home cool.

Officially, electric bills can reach as much as 20% of a low-income family's income. In reality, it can be even more than that if the family only has one money maker. Going off the grid even partially can reduce or eliminate that burden!

### **Mass Electricity Production Strains Natural Resources**

Another reason to build your own power generator is that you can greatly reduce your carbon footprint. The majority of electricity in the US is generated using fossil fuels such as oil, gas and coal. Electricity use accounts for as much as 40% of the total energy consumed in America. That means that if you're living on the grid, a significant portion of your carbon footprint is caused by using electricity.

Harvesting fossil fuels wreaks havoc on the environment and burning them creates greenhouse gases that damage the atmosphere. Going off the grid is extremely clean because it typically uses sources such as the sun, wind or water to create electricity. Even if you opt to use biodiesel, you're still greatly reducing your carbon footprint.

## **3 Reasons for Building a Power Generator**

The obvious solution to dependence on public utilities is to go off the grid, but if you opt to purchase all of the equipment necessary to do so, you'll need a small fortune. You'll also need training to use your equipment and if it breaks down, you'll be dependent upon suppliers to get you the parts that you need to repair it.

There is another option, though: build your own power generator! There are several advantages to this option.

### **Commercial Gas Generators are Expensive, Noisy and Require Gas or Diesel**

First and foremost is the cost. Generators that will run your entire house (or even your major appliances) can cost thousands of dollars. If you opt to go with a gas or diesel generator, you'll have to store fuel to keep these generators running and they use several gallons per day.

If you build your own generator, you can use solar power, wind or water to fuel it. Biodiesel is another option. Regardless of which route you choose, you're not going to be dependent upon fossil fuels to keep you going and you won't have to store a ton of flammable gas or diesel in your shed or basement.

Another downside to gas generators is that they're noisy. If you're in a SHTF situation, the last thing you want to do is advertise to the world that you have power. It's almost a guarantee that you'll have to defend your property if things go south long-term.

You're also going to run out of fuel eventually, which will make your generator as useless as your refrigerator. Not the best option.

### **Commercial Solar Panel Generators are Costly and Hard to Repair**

Solar panels and all of the accoutrements needed to run them can cost thousands of dollars and are dependent upon specific parts and pieces to function correctly.

Sure, you can use them and keep spare parts handy if you have the money, but what happens if SHTF long-term and something breaks on them?

Also, do you have the knowledge to correctly diagnose and repair a commercial solar panel system? Most of us don't.

### Personal Satisfaction



There's something to be said for the satisfaction gained from building your own power generator.

Just as with all things, the sense of accomplishment and pride that you'll feel is huge. You took a few pieces of material and built something that will keep you and your family comfortable no matter what happens.

When you build the system yourself, you don't depend on anybody else and you know exactly how to fix it if it breaks. Chances are pretty good that you'll even have the parts necessary to do so without spending a fortune or depending upon a supplier.

Some power generators can be built for as little as \$300 and you don't need a degree in engineering to do it. You will need some basic building skills but we're going to tell you, step by step, how to build your own power generator in steps that are easy to understand and follow.

You can choose to go completely off the grid if you'd like or you can just do enough to power your major appliances or light up your shed. Just as with all things DIY, how much you do is up to you!

### What to Beware when Buying a Power Generator

When most people think of a power generator, they think of a gas operated one. Gas operated generators are relatively inexpensive to buy comparing to other means, but extremely expensive to operate. For any long-term emergency situation, gas operated generators just aren't practical.

The other problem with gas operated generators is that they are noisy.

If you want to maintain OPSEC and not let people know that you are prepared to deal with the emergency, then the last thing you want to be using is a gas operated generator.

The noise alone will give you away and attract much unwanted attention.

That's part of the beauty of solar power. Of all the power options available for use in an emergency, solar power is the best. The one drawback to it is that solar panels are expensive.

However, once purchased, there are no operating expenses and solar panels will work for up to 20 years, with minimal power loss. For long-term power generation, solar is the best emergency backup system you can go with.

For solar to become a complete backup solution, you need more than just a solar panel. The solar panel absorbs sunlight and converts it to electricity. Typically, solar panels put out about 18 volts DC, which makes them perfect for charging 12 volt batteries. The slight over voltage of the solar panel means that it will still charge the battery, even if clouds are preventing the solar panel from operating at 100% efficiency.

The 12 volt DC of the battery can either be used as it is, such as for plugging in cell phones and other devices to charge them, or it can be inverted up to 120 volts AC, for use in powering home electronics. Either way, the solar generator is providing necessary electrical power for meeting your needs.

Most solar power generation is done by solar panels that are mounted to a home. However, there are also portable solar generator stations, such as the PowerWhisperer.





This is a fully self-contained solar power generation system, with on board battery and voltage inverter. The heavy-duty aluminum case protects the system from EMP and the generator is mounted on a cart, making it portable.

Another thing you might want to consider is having a small, flexible solar panel for your bug out bag. That would allow you to power your electronics while away from home. There are a number of options for those types of solar generators as well.

While not big enough to provide electricity for your home electronics, they are big enough for charging cell phones, GPS units, tablets and portable computers that you might take with you on a bug out.