

## Choosing and using a generator in an off-grid environmentally sensitive household



A generator is a necessity for almost all off-grid homes. This article describes their limitations and what to look for when buying one for an environmentally sensitive household.

*Keywords: Generator, electric generator, off-grid, off grid, dirty electricity, noise, fuel, MCS, chemical sensitivity, electrical sensitivity, environmental illness*

### **Introduction**

A generator makes electricity using an engine that burns either gasoline, diesel or propane gas. A generator is expensive to run, so it is generally used intermittently. Solar and wind energy is usually much more cost effective.

In an off-grid home, the generator is typically used when the solar or wind systems do not provide enough electricity, such as during cloudy or still weather. The generator may also be used to power some appliances when the solar/wind system

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is rather small, or if a 12 volt DC system is used. In these cases, the generator may power a washing machine, well pump (with storage tank) and perhaps even charge portable cordless devices.

People with severe environmental sensitivities are often affected by a generator, but these problems can often be remediated by choice of generator and setup.

### **Power quality limitations**

Most generators produce low-quality electricity, with lots of added frequencies (harmonics). The electricity is not the usual smooth sine wave we are used to from grid power. This can be a problem for both appliances and humans (see following section).

Some washing machines will not run on generator power. This is mostly a problem with the fancier electronically controlled washers. Some washers are factory-certified to run on generator power. Some electronics, such as stereos and computers, may not run on generator power, or may even be damaged by it.

Small generators tend to produce lower quality electricity than larger models. They also tend to vary the voltage more.

Some manufacturers have built inverters into their generators to improve the power quality. This removes the low-frequency problems, which are so damaging to electronics, but it adds higher frequencies, which can be a problem for sensitive people.

### **Limitations for environmentally sensitive people**

Generators are a problem for environmentally sensitive people. They are noisy, they produce dirty electricity, they pollute and the fuel is a hazard. Despite all these problems, several people with severe chemical and electrical hypersensitivities use generators, but they had to choose the model and their setup carefully.

All generators produce dirty electricity, including those with a built-in inverter. Dirty electricity turns the wires into antennas, radiating the various frequencies. Some sensitive people get sick if inside a house fed dirty electricity.

The solution is to not connect the generator to the house wiring, or only do so for short periods of time. A washing machine can be placed in a garage or outbuilding and fed electricity directly, or the breakers can be left off for the rest of the house.

A generator also puts out strong low-frequency EMF, but it should be safe with about 20 ft (7 m) distance. Some people are fine standing next to the generator during the brief startup, while some may need a remote starter. With push-button start, it is like starting a car engine.

The generator should not be used inside a house or a garage attached to a house. This is also the case for healthy people. About a hundred Americans are killed each year by carbon monoxide from generators. A generator really should only be used outside, not in any enclosed space.



*An off-gridder with a portable 2000 watt Honda EU2000i generator with optional propane kit.*

### **Economical limitations**

Generators are expensive to run. A generator should not be the only source of electricity for a full-time household — that only makes sense for a weekend cabin or camping trailer.

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It is not realistic to use a generator to run appliances that must be on all the time, such as a refrigerator.

It makes economical sense to substitute other energy sources than generator power. It may make more sense to buy a propane clothes dryer instead of an electric model, or simply use a clothesline.

An electric water heater can be powered by a generator, but it probably makes a lot more sense to use a propane heater. These can be hooked up to the small tanks used for barbecue grills, or to a central tank serving other uses in the house. Gas can be used safely by sensitive people, if sealed off from the living space, though this may not be feasible.

Using a generator to run more than one thing at the same time is a more efficient use of this expensive resource. If the generator is big enough, an off-grid household may use it to wash clothes, pump water and vacuum the house at the same time. Putting larger loads on a generator is not free, it consumes more fuel, just as a car does by going faster. But the wear is about the same, just make sure not to overload it.

#### **Using the generator in a grid-connected home**

There is probably no advantage to using a generator instead of grid power. The generator's electricity is of a lower quality (dirty electricity), which is a problem to some sensitive people. The cost of the electricity is also many times higher.

A generator can be very helpful if the grid is down for many hours, or even days, as can happen in rural areas.

If using a generator in a grid-connected home, make sure to have a transfer switch installed, to make sure the house is powered by either the generator or the grid. A transfer switch can prevent dangerous situations where power is backfed onto the grid and possibly kill a lineman, and it can prevent damage to the generator when grid-power is restored.

## **Choosing the generator**

There are many generator models available. Look in various tool catalogs.

The issues to consider include:

- size
- fuel type
- starter system
- weatherized enclosure
- quality/price
- noise level
- inverter option
- portability

The size needed depends on what the generator will power. Look at the nameplate rating of each appliance and add them together. If the list includes any electrical motors (such as well pumps and washing machine), triple the number to account for the starting surge and the power factor, or contact the manufacturer for the maximum power consumption. Then add a hefty margin. This should give a good idea how big a generator is needed.

Some generators deliver 120 and 240 volts, with the full power only available at 240 volts. Some have two separate 120 volt outlets, each providing up to half the rated power.

Most of the small models are started with a pull-cord, while the larger models all have an electric starter for push-button convenience. Most models with an electric starter have the option for remote starting, so they can be started from inside the house.

A generator that is too big will be a waste of money, and also consume more fuel. Too small a generator will be overloaded and wear out faster.

A small household may do fine with a 2000 watt generator, while a house with a well and other appliances to run at the same time will likely need a generator in the 5000-7500 watt range.

There are three fuel types available: gasoline, diesel and propane. Propane is by far the cleanest burning and it is also the safest to transport. A gasoline or diesel generator often stinks, even when not running. A propane generator does not. If

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your house has a propane tank, it may be possible to feed the generator directly from it.

The downside to propane is there are fewer generator models available. They are also a little more temperamental to start, as one has to prime them by opening for the gas and letting it flow for a few seconds.

The generator is best run outdoors, to avoid exposures to exhaust and other fumes. Some generators come with a weatherized enclosure, ready to leave outside, perhaps with a tarp over it. Some generators are small enough that they can be stored in a garden shed and carried or rolled outside when needed.

Regarding quality: you get what you pay for. Diesel generators tend to last the longest, while gasoline models wear out the fastest of the three types. Generators with a low rpm (typically 1800 rpm) should last longer than those that run at a faster rpm (typically 3600 rpm).

Generators with enclosures and push-button starters cost a lot more than portable generators.

Engine noise is a big issue for many people with environmental illness. Some people get actual symptoms from noise. Many generators are very noisy. Noise is simply not a design criteria in most models.

For low-noise models, look for those with a low rpm. The U.S. National Park Service has a program to certify generators for use by RV campers in their parks. These models are much quieter than the regular designs.

Some generators have a built-in inverter that makes the AC sine-wave smoother. But inverters send out high-frequency EMF that is very disturbing to some sensitive people. These models are best avoided by people who are electrically sensitive.

The weight of the generator depends on the wattage. A 2000 watt generator can be carried by a person, while 5000-10,000 watt generators come with wheels. Portability is typically not needed for an off-grid household, where a generator can be stationary. For trailer use, the smaller portable generators are probably the best choice.

## **Installation**

The generator can be placed on a concrete pad or just some blocks in the yard. There needs to be some weather protection if it is not an outdoor model. Some people build a lean-to or have a wooden box that is placed over the generator when not in use. A simple tarp can also be used in some cases.

For a permanent installation, the generator should be connected to a breaker panel, from where power flows to the different needs (well, house, outbuilding, etc.). This breaker panel should have a ground rod and be the bonding point (neutral-ground connection). It should be the only bonding point in the electrical system (i.e. no neutral-ground connections in any other electrical panels). Having only one bonding point eliminates the problem of some electricity running in the soil (between multiple ground rods), which causes unbalanced circuits and elevated magnetic fields.

In temporary setups, such as trailers, heavy-duty extension cords can be used to power equipment. There is no need for grounding such a generator.

## **More information**

More information about off-grid technologies for environmentally sensitive people can be found on [www.eiwellspring.org/offgrid.html](http://www.eiwellspring.org/offgrid.html).

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