

OFF-GRID, GRID-INTERACTIVE, GRID-TIED, GRID-TIE WITH BACKUP, HYBRID WIND/SOLAR, DIRECT GRID TIE, NET METERING, NET-ZERO ! ! ! !

What does it all mean?

Most of you reading this article are **GRID-TIED (you are connected to and your power comes from *the local power grid*)**. You are buying your power from Central Vermont Public Service Corp. (CVPS), Green Mountain Power (GMP), Burlington Electric Department (BED), Vermont Electric Cooperative (VEC) or from the local power companies in Northfield, Proctor (OMYA), Orleans, Readsboro, Stowe, Barton, Enosburg Falls, Hardwick, Hyde Park, Jacksonville, Johnson, Ludlow, Lyndonville, Morrisville, Swanton, or Washington. These power companies sell you power generated by them or others made in state with hydropower, nuclear power, some windpower, biomass, some fossil fuel, cow power(methane), landfill (methane) or solar power. Imported power may be all of the above but also including a large percentage of oil and coal generated power.



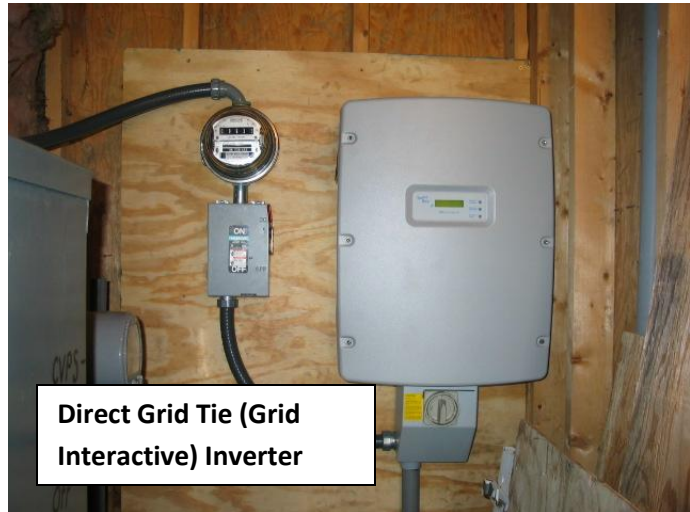
A few of you, ***connected to the local power grid***, may also be generating your own power on site with renewable energy such as wind or solar. In this case, you may be using the solar or wind power only as a backup (**GRID- TIED** or grid connected but not **grid- interactive**). You are using grid power to recharge batteries after an outage but cannot send power back to the grid.

GRID INTERACTIVE is when you may draw power from the grid or **sell** power back to the grid – Bi-directional power flow. This introduces **NET METERING**. A grid interactive system with solar, wind, hydro or other on site power generation is, in economic terms, trading **kilowatt hours** of electricity with the power company (**NET METERING**). When you have excess power being generated, your power system is “selling” the excess kilowatt hours of electricity to the power company, **turning your meter backwards**. When your needs exceed your own power production, you draw power from the grid, turning your meter forward. Ideally, you would like to **NET-ZERO**, which means you send back as much power as you bring in, eliminating or getting

close to eliminating the KWHR charges on your bill. This also reduces the taxes and efficiency charges on your bill. You will still have to pay to receive the service of providing power to you. Your system is probably a **DIRECT GRID-TIE** system, without batteries or backup capability.

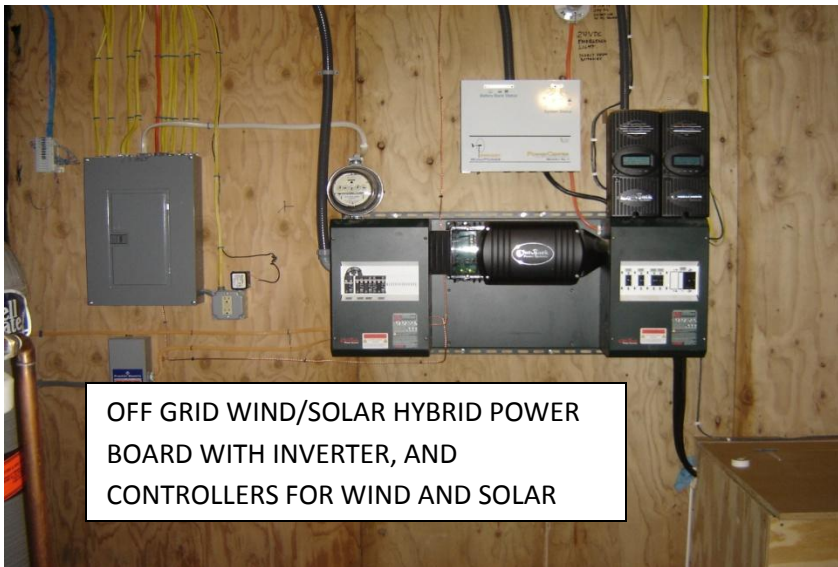
Even fewer of you may have a **GRID-TIE WITH BACKUP**, which is **GRID INTERACTIVE**, and does **NET METERING**.

This system is similar to an OFF-GRID system in that there are batteries to store power, a separate solar and/or wind charge controller and/or a load controller on a microhydro system to make sure the batteries do not overcharge. If more than one source of renewable energy is connected to the system, it is usually referred to as a **HYBRID** system. A hybrid system can be GRID INTERACTIVE or just GRID CONNECTED. Often, this type of system can be designed to accept all the sources of power with a common battery bank, inverter, controls, switch gear and battery monitoring.



This system is designed to provide backup power during an outage with the renewable energy sources assisting the battery storage to supply the backup power. With more equipment and batteries needed, this system is typically more expensive than a direct grid tie system but extra cost may not be more than the cost of installing an automated backup generator. Some Inverter manufacturers make a model that can be grid interactive and also have a generator input to make a system that does everything. Unless you live in an outage prone area, the extra cost of this type of system may not be necessary. This type of system qualifies for the 30% federal solar or wind tax credit to offset some of the additional cost.

A sizeable number of Vermonters live with an **OFF-GRID** system. In fact, I suspect that Vermont has one of the highest numbers of off-grid homes per capita of all states except possibly Alaska. The exact number of off-grid installations is unknown as many were self installed and there are tremendous differences in the size of the system from a small 50 watt inverter and single PV panel to keep a light and cell phone working to very large commercial scale systems for large off-grid homes. Off-grid is exactly that! Off-the- grid. Stand alone systems not connected to the grid. Usually off-grid installations are a product of necessity. Typically, the cost of bringing power to the site is very expensive and the alternative of generating power on site is appealing. With a large network of back roads traversing areas that have never had power lines installed in Vermont, the availability of off-grid parcels of land is great. Off Grid systems require an inverter, batteries, Switchgear, monitoring, backup generator and a renewable power source. Off grid systems can be designed to run small camps or large homes. The most important point to keep in mind when contemplating an off-grid system is that you will have a system that may require monitoring and some maintenance. It



would be your own power station and you would be the manager, trouble shooter and maintenance person. If the lights go out, you can't call the power company to fix it. IF you are not able to be the system manager, repairman etc., you would need to arrange for someone else to fill the position, whether it be the installer with a maintenance contract, a caretaker or a friend with off

grid living experience. Also a large amount of planning and design needs to be put into all aspects of efficiency in the home to minimize power consumption and consequently lower

costs for batteries and power generation. Higher loads mean more dependence on a backup generator when wind and solar performance is low. The weakest link in an off grid system is the backup generator. With a properly sized and installed system, off-grid living can be a great experience.

