

TRUEWEST SOLAR

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INFO GRID TIE SYSTEMS

There are **FOUR** main components in an grid tie solar electric system:

I. Solar Panels – Also referred to as PV panels or modules. PV is short for photo-voltaic (“light-powered”). A group of PV panels is called an array.

II. PV Combiner Box. Combines the different strings of PV modules into one.

III. Mounts – This is a metal support structure that holds an array of solar panels in a tilted position facing the sun. There are roof mounts, ground mounts and pole mounts. Some even track the sun.

IV. Inverter – PV panels produce power that is incompatible with the grid. Inverters accept solar electricity on one side and emit utility type of electricity on the other.

The utility meter then tracks the amount of solar power produced, giving you credit for what you produce. Some companies require a external disconnect switch for a 365/24/7 access.



What is the Advantage of a Grid-Tie System?

The main advantage is its cost and low maintenance costs. Since grid-tie systems feed directly in the grid, expensive batteries are not needed. Also, since you are still connected to the grid, strict system sizing calculations are not required, giving you a large range of options. You can have a system as small as 1 kWh to reduce your electric bill, or a system that is large enough to virtually eliminate all your electric bills.

How Much Does a Grid-Tie System Cost?

We like to tell our customers 10 k per installed kW of solar. We supply and designs any type of grid tie system for clients which have a plan how to utilize solar for their needs.

Is the Grid-Tie System Cost Effective?

Grid-tie systems are cost effective when viewed in the long run. Electricity rates are still low and you can not generate power at the price your power company does. Although the current return on investment is projected to be about 15 years, there are several factors to consider. The cost of electricity is projected to increase significantly in the near future.

If you are concerned about a more **immediate** and higher financial return you should consider a **SDHW** (solar domestic hot water system). A SDHW system typically runs from \$ 4000 to \$7000 and provides 60-90% of your annual domestic hot water needs. Attached is a short general info on solar hot water for your convenience. Please see page 6.

Another fact to consider is that solar panels carry a 25-year warranty, with a life span of 40 + years. Installing a solar system in your house will increase both the value of your home and its marketability.



Facts about PV versus the Local Utility Grid

Since there are no real progressive incentive PV programs in Canada on a federal or provincial government level in place, except the non payable sales tax in some provinces on the PV system purchase itself, and some system contribution in Ontario, it is difficult to justify the cost of a solar grid-connected system under the present political situation.

There is a wide variety of reasons why homeowners are considering generating some portion — if not all — of their energy requirements using PV systems. PV systems provide a buffer from rising energy prices, and the presence of an on-site battery system can supply electricity during utility power outages.

Solar power can also help make a difference in the way that we address our responsibilities for the environment and climate change. Finally, solar systems will be the next “status symbol” , if trends appearing in Japan, Australia, NZ and the EU emerge in North America - as happen already across the border.

Utilities and their regulators in Canada are only beginning to address the issues of on-site generation where individual homeowners are their own power suppliers. An agreement must be made with the utility and working through the bureaucracy can sometimes seem daunting but in our experience it always works out.

For grid-connected systems, on days where excess electricity is produced, it is possible to feed the electricity back to the utility through your electric meter. This is known as “**net-metering.**” However net-metering is not yet common practice in Canada. Currently most “*standard*” electric meters have not been approved for net-metering.

Instead of using only one meter, a second one may be required to record how much solar energy is fed into the grid. This amount would be used to reduce your electrical bill — this method is referred to as “**net-billing.**” and is practiced by most power companies.

The economics of solar power changes significantly when **time-of-day billing** is applied along with **net metering**. Most solar systems generate excess electricity during peak-times — when electrical generation costs can be four times or more the average cost. Currently there are no utilities in Canada I know off that are offering both time-off-day and net-metering billing at the same time — but this may be changing.

The Canadian Electrical Code and its provincial equivalents govern installations of electric systems. Equipment must be installed by a provincially certified electrician.

To ensure that electrical systems, including PV systems, comply with the Electrical Code, the system must be inspected by the provincial Electrical Safety Authority (ESA) or CSA (Canadian Standards Association).

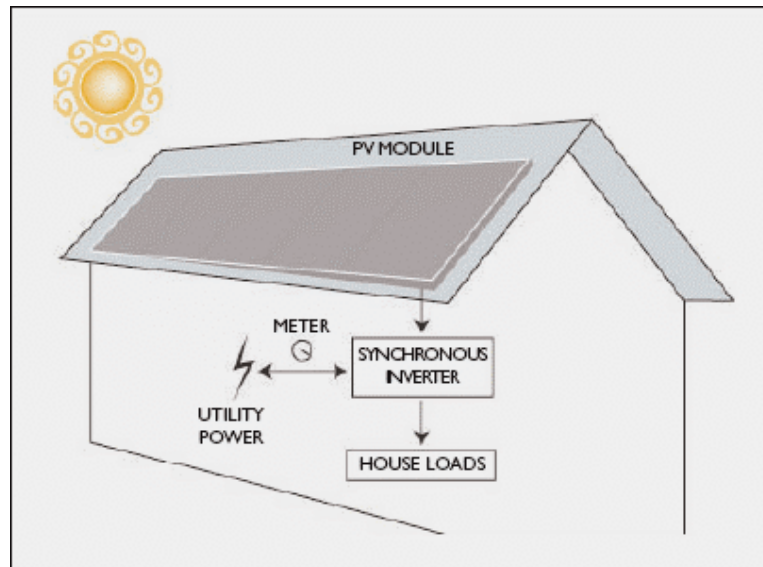
All products have to be approved to meet those specifications. By having an electrical inspection done, you are transferring the safety liability to the ESA or CSA and ensuring that your insurer will cover potential home liability claims. Installation is straight forward and all the equipment involved is ready for assembly or plug and play operation.

Since PV is an income producing asset it can be useful to compare it to other investments you might make. You are adding value to your home. A solar investment is more risk free than most other investments, and is simple to install.

This said the fact remains: Solar today is the safest and most reliable of all power sources.



Synchronous System In A Box



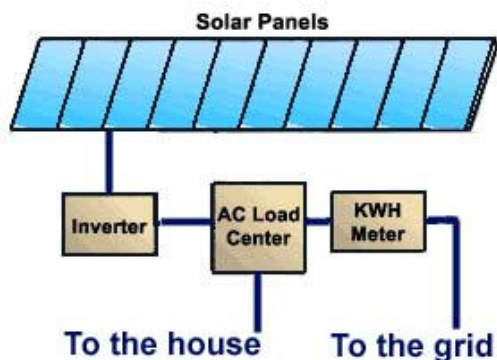
The simplest and most popular type of grid-connected solar power is the “synchronous” system. The solar array is connected to a synchronous inverter that blends the PV generated electricity with grid power, after which the combined electricity is fed into the house to run the domestic energy loads.

If your PV makes more than you are using the excess can be sold. If you use more power than your PV can supply, the utility makes up the difference. This type of system makes sense if you have utility power. Components used: PV modules, PV combiner box, Inverter, Meter, and Disconnect switch.

Unfortunately, if the utility power goes down this type of system will go off too. This is a utility safety requirement to protect utility service employees that may be working on the lines.

A grid-tie inverter purchase is straightforward, since you will not need heavy battery cables, batteries, or large DC disconnects. Since most inverters are plug and play and with digital display and built-in ground fault circuit breakers for multiple solar array inputs, the only other electrical component you will need is a circuit breaker to feed the new inverter AC output to your existing main house circuit breaker panel.

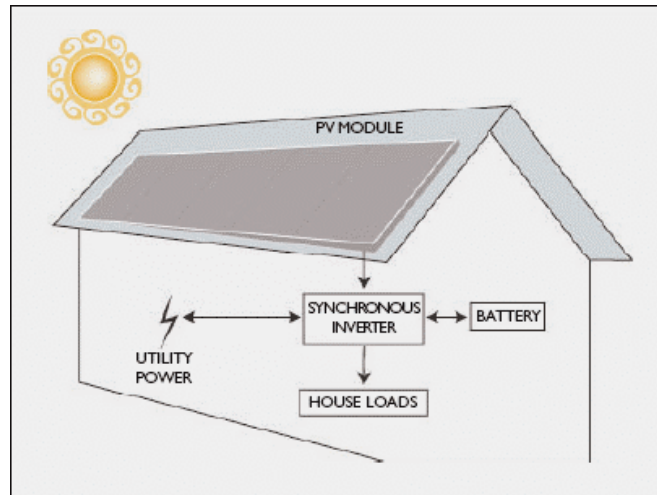
Approval of your power company, a contract and a licensed electrician for set-up is needed because you are feeding back into the grid.



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Synchronous System with Batteries In A Box



A grid --tie system allows the blending of a PV with grid power, but also offers the advantage of “**islanding**” in case of a power failure. A synchronous system automatically disconnects the utility power from the house and operates like an off-grid home during power failures.

The batteries should be as large as possible in case of an outage if the bank has to support all the household loads connected to the household power panel.

If power outages are not very often an expensive battery bank stays idle. If the battery storage is too small you have a limited use of loads depending on length of outage and the use of kwh during this time.

It helps to go through the trouble and select the appliances which are essential to run in case of an outage like water pumps, circulation pumps, fans, lights TV fax and communication lines etc, and wire them into a **dedicated sub panel**, so you can keep battery cost down.

The system feeds back into the grid offsetting your power usage and can operate off -grid, if the power goes down.

However, the system is only expandable to a maximum of two inverters (7,2kw 120/240V) Different systems are available from a plug and play “one in all” unit (Inverter and Battery box) to more flexible systems like pictured on the left.

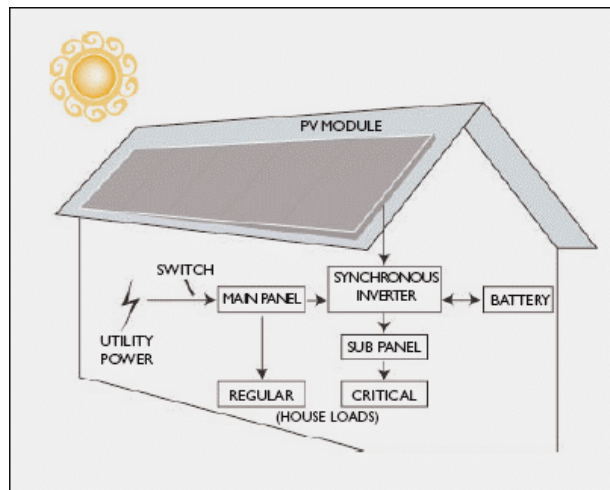
Everything coming from the **DC** side to the inverter, like PV modules and mounting structure can be installed by the homeowner under his electrical home permit.

On the **AC** side – going from the Inverter to the power panel connected to the grid, a licensed electrician is required to wire into the power panel

The system needs the approval of your power company. A contract is signed between the utility company and home owner. You are now providing power to the power company.



Grid Connect With Back-Up In A BOX



Another type of grid-connected system is referred to as an interconnected, back-up or emergency power system. The operation of this type of system is similar to the UPS (Uninterruptible Power Supply) systems that are used by phone companies and to protect computers from power surges and outages.

An off-grid type inverter is connected between the utility power and a sub-panel that runs critical loads into the house. The inverter simply passes the utility electricity directly to the selected loads. When the utility power fails, the inverter automatically turns on and supplies power to the selected loads from a battery bank.

Once utility power is restored, the inverter turns into a battery charger to recharge the batteries. By adding PV modules to charge the batteries, the system can be run indefinitely during outages, provided there is sunshine during these days enabling the PV panels to charge.

The homeowner also has the option to manually turn off the utility power to the sub-panel during sunny periods when the batteries are full, and to go partially “off-grid.”

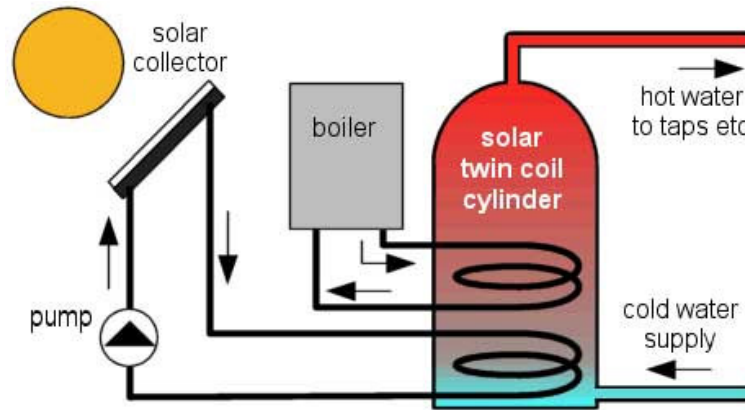
This system however does NOT feed back into the grid. The solar panels are only used as a second backup and to maintain the battery charge in case of power outages.

Telecommunication companies and businesses with sensitive data bases use this type of system.



DOMESTIC SOLAR HOT WATER HEATING

Solar thermal is typically thought to be a more basic form of utilizing the sun's power, as opposed to the electronically more complex systems used in photovoltaic systems. A home or business owner can simply throw some collectors on the roof and before he knows it, he's got a tank of hot water. Run some pipes, and that hot water is in your house and coming out of your faucets and showerhead.



Economic Benefits: Many home builders choose electric water heaters because they are relatively inexpensive to purchase. However, research shows that an average household with an electric or gas water heater spends about 35% - 38% of its home energy costs on heating water.

It makes economic sense to think beyond the initial purchase price and consider lifetime energy costs, or how much you will spend on energy to use the appliance over its lifetime.

The Solar Energy Centre studied the potential savings to homeowners of common water-heating systems compared with electric water heaters. It found that solar water heaters offered the largest potential savings, with solar water-heater owners saving as much as 50% to 85% annually on their utility bills over the cost of electric water heating.

Analysis illustrates that the initial installed cost of a solar water heater system (\$3,000 to \$7,000) is higher than that of a gas water heater (\$550 to \$1050) or an electric water heater (\$350 to \$950). Depending on the price of fuel sources, the solar water heater can be more economical over the lifetime of the system than heating water with electricity, fuel oil, propane, or even natural gas because the fuel (sunshine) is free.

Paybacks vary widely, but you can expect a simple payback of 3 to 4 years on a well-designed and properly installed solar water heater. **(Simple payback is the length of time required to recover your investment through reduced or avoided energy costs.)**

After the payback period, you accrue the savings over the life of the system, which ranges from 15 to 40 years, depending on the system and how well the maintenance. If you are building a new home or refinancing your present home to do a major renovation, the economics are even more attractive.

Long-Term Benefits: Solar water heaters offer long-term benefits that go beyond simple economics. In addition to having free hot water after the system has paid for itself in reduced utility bills, you and your family will be cushioned from future fuel shortages and price increases.

TRUWEST SOLAR recommends for the do it yourself home owner the Fireball2001 system collectors – found at our website www.truewest.ca heating section. This System is easy to assemble and works.