

Solar Photo Voltaic Systems

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Company Profile

Groundwater Engineering is an international company specializing in water well engineering, dewatering and groundwater control for clients in the construction, mining and oil & gas industries

Backed by decades of industry experience and technical expertise we are committed to providing our clients with high quality and cost-effective solutions to their groundwater problems based on offering services in:

- Contracting
- Consultancy
- Equipment sales and rental

The company has evolved to supply and install Solar Pumping Systems for Residential or Irrigation needs and Solar PV installations.



Synopsis

- Overview of solar PV systems
- Applications
- Types of installation
- Pros and cons of solar PV systems



Solar PV Overview

- A **Photovoltaic system** (informally, **PV system**) is an arrangement of components designed to supply usable electric power for a variety of purposes, using the Sun as the power source.
- A photovoltaic array (also called a solar array) consists of multiple photovoltaic modules, usually referred to as solar panels, to convert solar radiation (sunlight) into usable direct current (DC) electricity. A photovoltaic system for residential, commercial, or industrial energy supply normally contains an array of photovoltaic (PV) modules, one or more DC to alternating current (AC) power converters (also known as inverters), a racking system that supports the solar modules, electrical wiring and interconnections, and mounting for other components.



Solar PV Overview

- While solar electric systems are expensive to purchase in the short term, they are quite reliable, can be expected to last well beyond the 25 year warranty provided by most panel manufacturers, and they will eventually pay for themselves by offsetting electricity you buy from the power company.
- **Efficiency first!** Reducing your electricity usage through conservation and efficiency measures, every \$1 spent on energy efficiency is estimated to save between \$3 to \$5 on PV system costs. As a system designer, it is virtually impossible to mandate wise energy use by the end user, but we can help by specifying efficient appliances.
- Air Conditioning (AC) not included! In warmer regions AC can be 60-70% of your electricity bill.



Applications

- **Solar power stations** – Many of these plants are integrated with agriculture and some use innovative tracking systems that follow the sun's daily path across the sky to generate more electricity than conventional fixed-mounted systems. There are no fuel costs or emissions during operation of the solar power stations.
- **In buildings** – Photovoltaic (PV) arrays are often associated with buildings: either integrated into them, mounted on them or mounted nearby on the ground.
- **In transport** – Solar technology is being used increasingly to provide auxiliary power in boats and cars. Some automobiles are fitted with solar powered air conditioning to limit interior temperatures on hot days.



Applications

- **Rural electrification** – In developing countries, where many villages are often more than five kilometers away from grid power, use of photovoltaics is increasing.
 - **Solar roadways** – To light highways and roads and to offset electric power spending.
 - **Floatovoltaics** – A system of installing photovoltaic solar panels onto pontoons and floating them on irrigation ponds or fish ponds. This will be able to fully offset electricity consumption.
 - **Telecommunication and signalling** – In most telecommunication applications, storage batteries are already in use and the electrical system is basically DC, which is a good match for solar power.
 - **Pumping** – For domestic use or irrigation which will offset electrical consumption or can be totally self reliant.
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Types of Installation

- **Off Grid PV Systems**

An off-grid PV system is an independent power system which provides limited power where utility service is not available. It uses a battery to store the energy produced from your photovoltaic system (for nighttime and cloudy day use). An inverter may be included in the system to provide 220V AC power.

- **Pros**

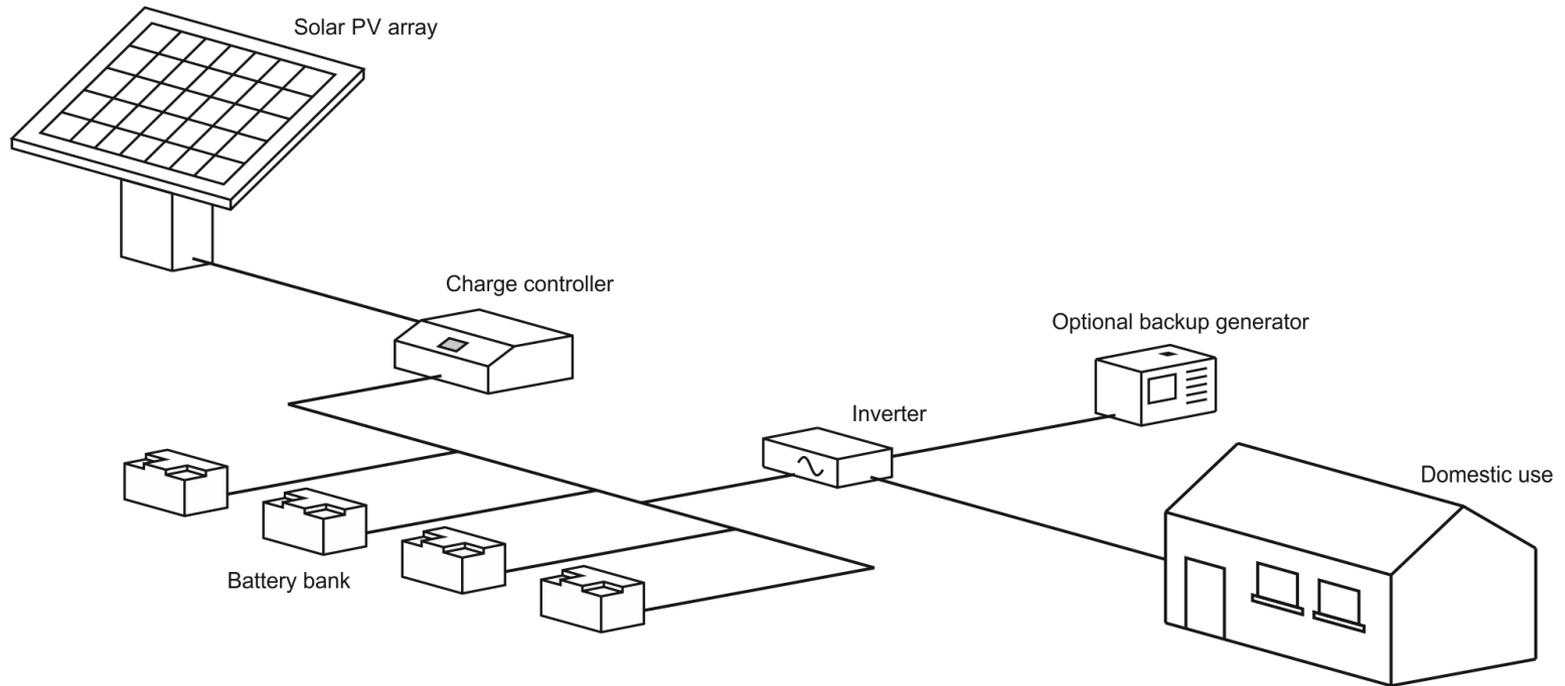
Off-grid PV systems are good for those who need power in a remote area where the power lines don't reach, or when it is too expensive to extend power lines to the desired location. Off-grid systems also offer the satisfaction of being self-sufficient and conscious of your energy use.

- **Cons**

Extra equipment (batteries, charge controller and DC wiring) required for an off grid system mean extra cost and regular maintenance.



Off-Grid Installation





Types of Installation

- **Grid-Tie PV Systems**

A grid-tie PV system is connected to the utility grid. You always have all the power you need no matter what size PV system is installed. When the power produced is greater than consumption, excess power is fed back to the utility grid. Your meter spins backwards. This is called net metering and is essentially selling retail to your utility company. When your consumption is greater than that produced by PV, your power comes from the utility.

- **Pros**

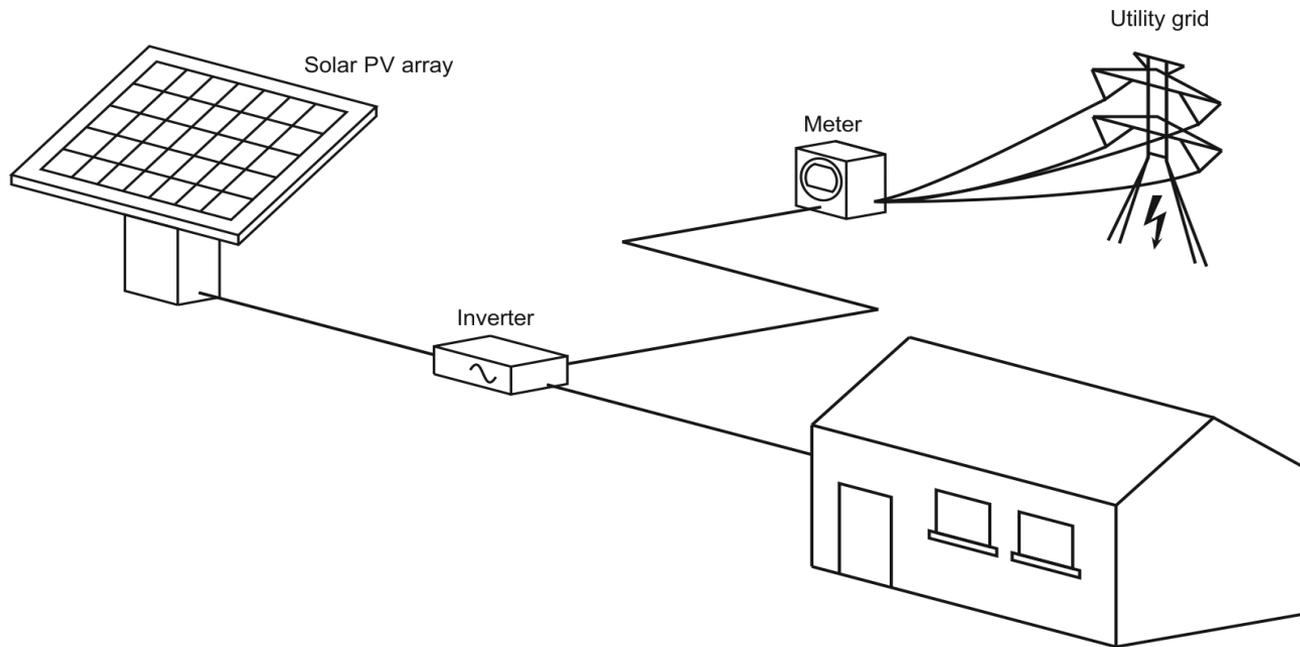
Grid-tie PV systems offer the advantage of unlimited utility power when you need it. You can also sell your extra energy back to the grid. Connecting to the grid is an essential of lowering the cost of your system.

- **Cons**

You will not be able to receive power to your house when the grid is down. As a safety measure, the grid-tie inverter will shut down when the grid goes down.



Grid-Tie Installation





Types of Installation

- **Grid-Tie with Battery Back-up PV Systems**

Sometimes called a hybrid PV system is basically a grid-tie and off-grid PV system combined. It is a system that is attached to the grid but when the grid goes down the inverter switches over to the battery bank.

- **Pros**

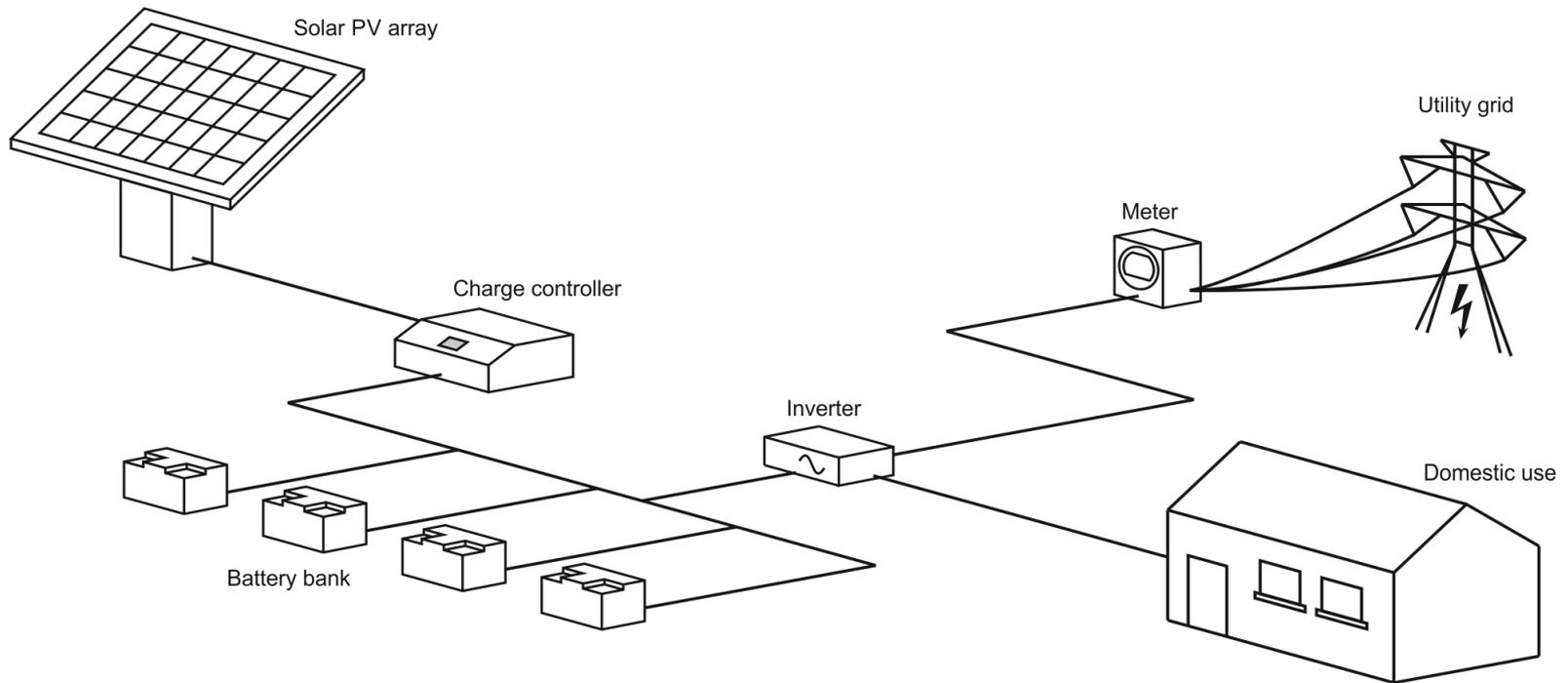
This system is good/ best for areas where you have grid power but the grid goes down often.

- **Cons**

More expensive than conventional PV systems and requires regular maintenance.



Hybrid Installation





Pros of Solar PV

- Sunlight is free and completely renewable.
 - The production of energy from solar is very quiet unlike other forms for energy generation such as engines and wind turbines.
 - There is no need to be connected to a national power grid, it is possible to generate solar electricity in remote locations.
 - Solar panels take advantage of energy that would otherwise go to waste.
 - Solar panels can save you a lot of money on monthly electric bills.
 - Less dependent on foreign oil supplies.
 - Systems are very low maintenance.
 - The production of energy using solar panels creates zero pollution.
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Cons of Solar PV

- Panels can look unsightly or ugly in some installations
- Large area is needed to achieve a good level of efficiency.
- Cloudy days can affect the amount of energy you can generate.
- Only able to generate electricity during daylight hours.
- The initial purchase cost can be very expensive.





Thank you for your attention!

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