

Solar Photovoltaic (PV) systems Explained

There are two general categories of PV systems:

- Off-grid PV systems
- Grid-tied PV systems

The below picture shows some of the essential components in both off-grid and grid-tied systems. Off-grid systems generate electricity that is consumed on site (self consumption of the plant owner) while Grid-tied systems inject electricity into the power grid, where it flows to different points of consumption.

The overwhelming majority of systems will fall into the above two categories.

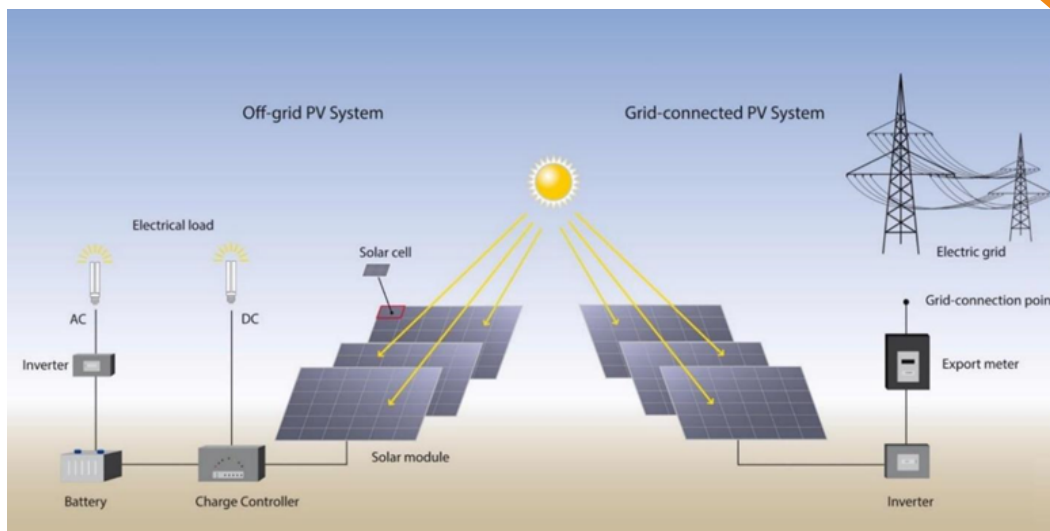


Figure 1: off-grid and grid-tied systems

The two main categories also have further sub-categories. Grid-connected PV systems can feed into different voltage levels of the grid, depending on the capacity of the PV plant. The higher the power generation capacity, the higher the voltage level to which the PV plant is connected. Off-grid PV systems can be split into stand-alone systems with or without batteries for storage of electricity, or micro-grids which combine PV with other electricity generation and storage technologies in order to secure electricity supply, e.g. A diesel + PV hybrid system. In regions with a weak electrical grid, grid-tied PV systems may be installed in such a way that they can be used as off-grid systems during power outages.

Below diagram explains how these 2 categories are divided into more sub-categories:

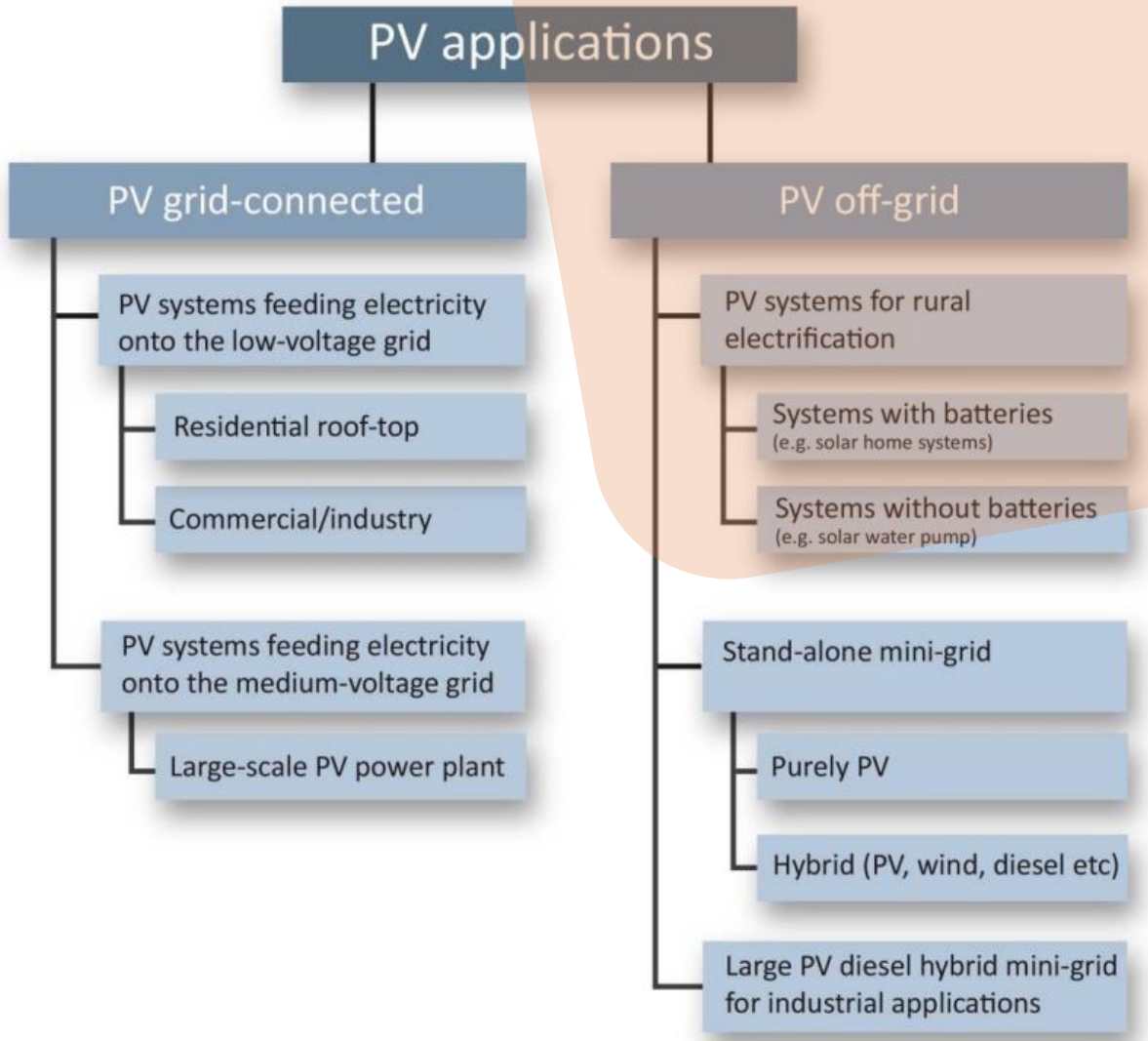


Figure 2: sub-categories of different PV system configurations

Most installed systems in Ontario and even globally are grid-tied PV systems.



Grid-connected configuration

Distributed PV systems can have various sizes and will be located at different points in an electrical grid. Distributed systems are typically constructed on commercial or industrial buildings (see figure 3). Systems on commercial or industrial roofs are used to either offset on-site electricity consumption or to sell electricity to the utility. You can find out more about net-metering and how it works [here](#). We at Circuit Energy specialize in providing turn-key commercial grade Solar PV systems.

Central PV systems are also known as solar farms (see figure 4), solar parks or utility-scale PV systems. Large-scale PV power generation is concentrated at one specific location. Such plants can take up large areas of land and feed directly into the electricity grid. The configuration of such plants is more comparable to conventional power plants, producing 3-phase power. They are connected to medium or high voltage transmission networks. In all grid-tied systems, the PV array (sometimes referred to as solar generator) generates DC electricity and is connected via combiner boxes to an inverter, which converts the direct current (DC) into alternating current (AC). The inverter output is connected to a meter which records the amount of energy being fed into the grid.



Figure 3: Commercial/industrial PV installation





Figure 4: solar farm installation

In the upcoming whitepapers we will discuss more about industrial and commercial configurations.

Please do not hesitate to **contact us** if you have any questions or would like to speak to one of our specialists about your project.

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