Solar panels

PV cells connected together in a solar panel.Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The structural (load carrying) member of a module can either be the top layer (superstrate) or the back layer (substrate). The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. Crystalline silicon is a commonly used semiconductor.

In order to use the cells in practical applications, they must be

connected electrically to one another and to the rest of the system

protected from mechanical damage during manufacture, transport, installation and use (in particular against hail impact, wind and snow loads). This is especially important for wafer-based silicon cells which are brittle.

protected from moisture, which corrodes metal contacts and interconnections, and for thin-film cells the transparent conductive oxide layer, thus decreasing performance and lifetime.

Most solar panels are rigid, but semi-flexible ones are available, based on thin-film cells.

Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired amount of current source capability.

Separate diodes may be needed to avoid reverse currents, in case of partial or total shading, and at night. The p-n junctions of mono-crystalline silicon cells may have adequate reverse current characteristics that these are not necessary. Reverse currents are not only inefficient as they represent power losses, but they can also lead to problematic heating of shaded cells. Solar cells become less efficient at higher temperatures and so it desirable to minimize heat in the panels. Very few modules incorporate any design features to decrease temperature, but installers try to provide good vA solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel can be used as a component of a ***larger photovoltaic system to generate and supply electricity in commercial and residential applications.***

Because a single solar panel can only produce a limited amount of power, many installations contain several panels. This is known as a photovoltaic

array. A photovoltaic installation typically includes an array of solar panels, an inverter, batteries and interconnection wiring.

Photovoltaic systems are used for either on- or off-grid applications, and on spacecraft.