



Solar energy transformation into electricity



Solar cells are used to convert solar energy directly into electricity. As sunlight is uniformly distributed, every building in a given area has the potential to generate solar electricity locally.

The so-called photovoltaic effect helps us to better understand how solar energy is transformed into electricity. This is a physical phenomenon involving semiconductors. When light particles (called photons) strike the surface of the semiconductors, their energy is transferred

to the semiconductor materials, and especially to electrons in the semiconductor structure. This forms the basis of an electric current.

The raw material for producing photovoltaic cells is silicon, which is made from silica, the main constituent of sand. The production of photovoltaic cells and modules requires very pure silicon crystals that are cut into extremely thin slices (300 micrometres thick), which are then formed into cells. Each cell generates a very small amount of electricity. To obtain a stronger electrical current and to increase the power input, the cells are connected in a series to form large photovoltaic panels, or modules. As the cells are extremely thin and fragile, they are protected by a weatherproof cover and a sheet of solid, transparent glass. Modules are generally rectangular in shape and a few centimetres thick. They can be integrated into construction materials, such as tiles, slates or transparent frames.

Solar cells are widely used to power spacecraft and common low-power devices like calculators. Solar panels do not pollute the environment during their service life. It does, however, take a lot of energy to produce solar cells, since they are made of high-quality refined silicon. Also, their decommissioning results in the formation of waste that is difficult to dispose of. Solar panels are suitable for household use. They are especially efficient in a sunny and arid climate, and in large uninhabited areas.

There are two ways to install household photovoltaic modules:

- by integrating them with the national grid as a result of combining the electricity produced with conventionally provided electricity; or
- as stand-alone systems that combine photovoltaic modules with batteries to store electricity when generation exceeds demand.

It is important to choose energy-efficient appliances, as electricity storage in batteries is expensive and takes up a lot of space. The autonomy of photovoltaic systems makes it possible to avoid occasional service shutdowns when maintenance work is performed on the electricity grid. Mountain chalets, isolated buildings, farms, telecommunication posts, water pumps and refuges are the types of building most frequently equipped with photovoltaic systems.