

## Solar energy junior

The Sun is the star that is closest to us, and it is the one that fuels life on the Earth. Solar power: the energy released by the Sun, due to the nuclear reactions that take place within the Sun and travel to the Earth in the form of electromagnetic radiation, is known as Radiant solar energy. The quantity of energy that the Earth receives from the Sun in a year is enormous, and is equivalent to approximately ten thousand times the annual energy requirement of the entire human race. Solar energy is clean and can be transformed into heat and into electricity. Furthermore most of the sources of energy on our planet derive directly or indirectly from the Sun. The immense quantity of energy that invests the Earth gives origin to water, chemical (from combustible fossils and the biomasses) and wind energy (the wind, and as a consequence, wave-motion).

Solar radiation reaches the Earth's surface in a non homogeneous manner. Of the enormous flow of energy that reaches the Earth from the Sun, only a part can be transformed into useful energy. The quantity of solar energy that reaches the Earth's surface, that can be "collected" in a useful manner, depends on the amount of radiation the area receives. Radiation is in fact the quantity of solar energy that reaches a surface in one day. Radiation is influenced by the local climatic conditions (clouds, mist, etc.) and depends on the latitude of the area: the closer the area is to the equator, the more radiation there will be.

Man has always known that when the Sun's rays illuminate a dark coloured object, it gets heated. The first solar collector, invented in 1767 by the Swiss physicist Horace de Saussure was based on this principle: the "black pot" used by the first American pioneers to warm the water and cook, when they travelled towards the West. In 1891, Clarence Kemp patented the first solar energy water boiler which, eighty years later, became the solar panels that are now spreading rapidly. Today thermal solar panels, which capture the Sun's energy to produce hot water (up to 60-70 degrees centigrade), are used. When accumulated in a special tank, this water can be used for domestic purposes (as for example for heating systems in houses, and for heating the water), and for industrial purposes, for the production of electric energy on a vast scale through solar thermoelectric power stations. Furthermore, man has also learnt to exploit the electromagnetic effect of the solar radiations and not only the heat coming from the Sun. The Sun's rays are converted into electric energy by means of special devices: photovoltaic cells. Photovoltaic technology, that enables direct transformation of the sun's light into electric energy using the so-called photovoltaic effect, is based on the properties of semiconductor materials, such as silicon, which, opportunely processed, generate electrical energy when they are struck by solar radiation. Photovoltaic cells are the most elementary device that can carry out this conversion. Many cells, assembled and connected to each other in a single structure, form a photovoltaic module. To increase the energy that is produced, a number of modules are connected together, thus forming a photovoltaic panel.