Renewable energy:

"solar park control system" project

Protecting the environment is one of the biggest challenges that the world of technological research will have to face over the next decades, with the primary goal of developing efficient and low-cost systems to produce electricity from renewable energy sources (solar, water, wind, geothermal power), that are almost unlimited and with virtually no environmental impact.

At any given moment the Sun transmits 1367 watts per m^2.

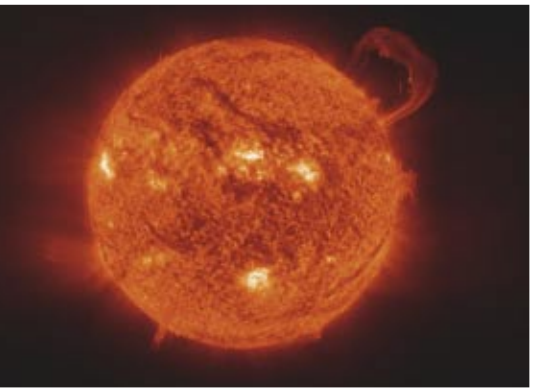
Bearing in mind that the Earth is a sphere that rotates, the average solar radiation is, at European latitudes, of around 200 watts per m^2. By multiplying this average power/m^2 by the surface of the Earth's hemisphere exposed to the Sun each instant, the result is a power over 50m GW (one GW - gigawatt - is around the average power of a large electric plant).

Therefore the amount of solar energy that reaches the Earth's surface is huge, around 10,000 higher than all the energy used by humankind.

However, its level of concentration is low, in the sense that one needs to collect energy from a very wide area to obtain a significant amount of energy and it is very difficult to convert it into a form of energy that could be used with acceptable efficiency levels.

Photovoltaic panels with solar "trackers" are one of the most promising technological innovations available.

The activity carried out by SMILAB in this sector has led to the creation of a control system that adjusts the movements of individual trackers located in Spirano's Photovoltaic Solar Pack near Bergamo.



A solar photovoltaic park with "tracking systems" is composed of a number of small groups of solar panels that, instead of having a fixed orientation, are designed to rotate towards the sun and follow its movements.
This system increases annual output by 30-40% compared to fixed solar panels and allows to considerably reduce CO2 emissions generated by the process.
There are two kinds of tracking systems: single-axis and "sunflower trackers", a technical term used to identify dual-axis panel tracking systems.
Spirano's Solar Photovoltaic Park with tracking systems covers an area of 43,000 sq m and, thanks to its 92 imposing "sunflowers" (the dual-axis tracking system), it is the largest system of its kind in the Lombardy region.
The system belongs to Sines Energia (a joint venture created by SER, Sistemi Energie Rinnovabili Srl, and Colosio Spa) and at peak times it can reach an output of one megawatt.
Spirano's Solar Photovoltaic Park was inaugurated on 19th June 2010 and, as well as being used to generate electricity, is also used as an "educational path" by technical secondary schools and universities as part of their curricular activities and to raise awareness about the use of renewable energies to protect the planet.
SMILAB's experts have created a "centralised" control system, with a master central unit and a remote unit mounted on each tracker.
The central unit "directs" each tracker in real time, sending them the commands and the position they should reach to be perfectly aligned with the Sun.
The master unit also detects solar radiation and wind speed. If there is too much wind or not enough solar radiation, the central unit sends each tracker a safety command, so that it moves into the most suitable position.
The system requires minimal wiring, as the central unit and the remote units communicate via the electric power supply cable, thanks to a solution based on a LonWorks platform.
The central unit is equipped with a proprietary "Scada" system, which can be accessed online, and through which users are allowed to view the operating status of the system in real time.
It is also possible to integrate the management of the communication signals with the inverters in the main system, which allows users to monitor productivity levels of the whole system from just one point of control.