



Sunlight, an inexhaustible gift

The three technological innovations developed by Eni to use the energy released by the main sequence star.

by **Eni Staff** | 01 FEBRUARY 2021

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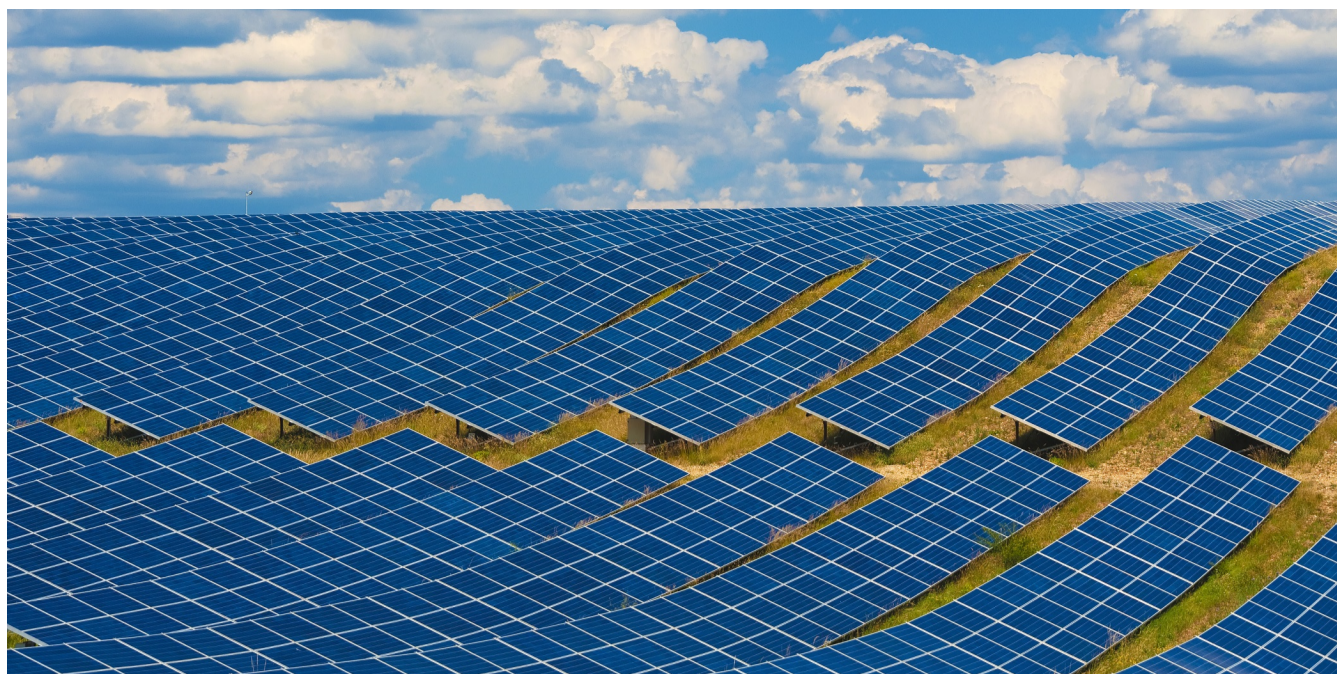
What is solar energy?

The definition of **solar energy** may seem obvious, but it's not. Solar energy can be defined as the energy that the sun transmits to Earth in the form of electromagnetic waves. The energy that comes to us from the sun produces all the forms of renewable energy known to us – the sun is the cause behind the warming of the atmosphere, the wind, waves, tides, plant growth (including the plants from millions of years ago that produced fossil fuels), and also geothermal energy, which is left over from the formation of our planet from the collection of dusts that orbited the sun at the beginning of its history. The use of this immense resource is a topical issue that transcends decades, and even centuries. "I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that", said [Thomas Edison](#) in 1931. But his words hit the nail on the head, even today. The sun continues to play a fundamental role nowadays, on the path towards **decarbonization**. The recent Princeton study, [Net-Zero America: Potential Pathways, Infrastructure, and Impacts](#), foreshadows the energy future of the United States. In four of the five outlined scenarios, the capacity to generate solar and wind energy is expected to quadruple by 2030 to cover half of the nation's electricity needs. These numbers indicate the path forward for both Europe and the rest of the world, of course.

Photovoltaic technology in Europe

In the old continent, **photovoltaic technology**, which uses sunlight to directly produce electricity, is booming. This level of growth has not been seen in many years, at least not since the initial boom of new installations led by Germany and Italy in 2010/11, which was made possible through tax and financial incentives. The situation in Europe looks very promising; Spain, despite being an "old" market where the sector has stagnated for many years, has now taken the lead in Europe, with 4.7 GW installed in 2019. They are followed by Germany, the Netherlands and France, with 4, 2.5 and 1.1 GW of new installed capacity respectively in the current year. Surprisingly, Poland was in fifth place, with 784 M² times more than in the previous twelve months.





According to SPE estimates, Italy, with 598 MW, ranks eighth, behind Hungary and Belgium, but up from 2018 (by around +100 MW). Nonetheless, to stay in line with the target set by the National Energy and Climate Plan (NECP), 26.8 GW from photovoltaics in 2025, Italian growth needs to progress much faster and reach a new average output level of 1 GW every year. However, the limitations of this type of energy source are its intermittency and variability; after all, the sun, by definition, only shines during the day and with varying levels of intensity depending on latitude, season and weather conditions.

With which technologies can solar energy be used?

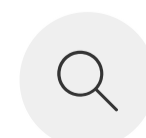
At the Eni Research Centre for Renewable Energy and the Environment, three technologies were created, tested and developed to make use of solar energy with significant advantages over traditional photovoltaic panels.

- Organic Photovoltaic Cells (OPV)
- Luminescent Solar Concentrators (LSC)
- Concentrating Solar-Thermal Power (CSP) technologies

These technologies were designed for industrial applications aimed at improving energy efficiency and sustainability.

OPV

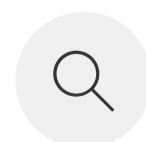
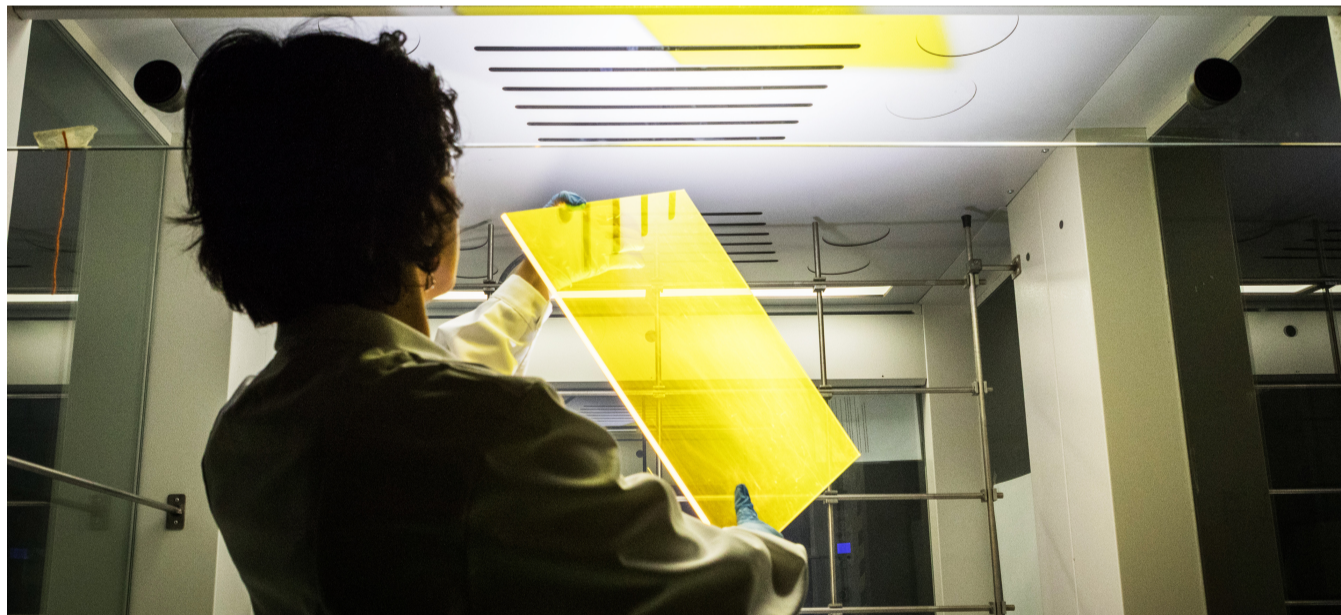
Organic photovoltaic cells (OPV) are thin and flexible solar cells consisting of special inks printed on a simple medium. Among the advantages of these silicon-free cells is extreme versatility –they do not need to be mounted to trusses on roofs. Instead, they can be printed directly on tiles, bricks or shingles and become a direct part of a building's structural components. Unlike silicon panels, OPVs also work in diffused-light conditions, such as dawn or sunset, or when it is overcast or foggy. Because of this, they do not need to be positioned to face exactly to the south at a precise angle, and can instead be installed on all house surfaces, including vertical walls.





LSC

Another technological innovation developed at the Eni Research Centre for Renewable Energy and the Environment is **luminescent solar concentrators** (LSCs). These are special clear, coloured windows capable of producing energy and regulating the brightness and temperature of the environment in which they are mounted. In this way, not only electricity is generated, but you can also save on heating or air conditioning costs. On a building, in addition to silicon solar panels placed on a south-facing roof, a combination of these two technologies can also be installed (OPVs on the walls and on all opaque surfaces, with LSCs in windows, skylights and all transparent surfaces). In both cases, OPV cells can be installed on all walls exposed to the cardinal points, whilst all windows on all sides can be equipped with LSC technology.



CSP

Concentrating Solar-Thermal Power (CSP) technology also makes use of solar energy. It works based on a simple principle: a parabolic mirror concentrates the sun's rays into a single spot called the "focal point", generating a temperature of about 550 °C. A pipe, called the receiver, contains a fluid capable of storing heat which, thanks to an exchanger, is then used to generate industrial steam or to run a turbine and produce electricity. A heat-transfer fluid with an optimised composition means that the system can be kept running even at night, re-using the heat absorbed during the day. To make CSP more appealing from an industrial point of view, we have made it more efficient, economical and versatile by updating the mirror, pipe coating, heat-transfer fluid and overall design.

The advantages of CSP technology are its cost-effectiveness, simplicity and versatility, all of which mean that it can be easily and broadly applied even in areas a long way from logistics facilities, as is the case in many of the scenarios in which we operate. Thanks to energy storing options, the systems offer a service that is not strictly dependent on periods of sun availability and can be modulated according to users' energy needs. CSP is therefore a resource with great potential and can play an important role along the direct path to a zero-emission future.



PROJECT
OPV: photovoltaic cells that can be printed on film



PROJECT
LSC: transparent sheets for capturing solar energy



PROJECT
CSP: simple solutions for generating heat



Our integrated activities



a just energy transition, with the objective of preserving our planet and promoting an efficient and sustainable access to energy for all. Our work is based on passion and innovation, on our unique strengths and skills, on the equal dignity of each person, recognizing diversity as a key value for human development, on the responsibility, integrity and transparency of our actions. We believe in the value of long term partnerships with the countries and communities where we operate, bringing long-lasting prosperity for all.

[Find out more](#)

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