Introduction

“Solar power is the [conversion of energy](https://en.wikipedia.org/wiki/Energy_transformation) from [sunlight](https://en.wikipedia.org/wiki/Sunlight) into [electricity](https://en.wikipedia.org/wiki/Electricity), either directly using [photovoltaics](https://en.wikipedia.org/wiki/Photovoltaics) (PV), indirectly using [concentrated solar power](https://en.wikipedia.org/wiki/Concentrated_solar_power), or a combination. Concentrated solar power systems use [lenses](https://en.wikipedia.org/wiki/Lens_(optics)" \o "Lens (optics))or [mirrors](https://en.wikipedia.org/wiki/Mirrors) and [tracking systems](https://en.wikipedia.org/wiki/Solar_tracking) to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an [electric current](https://en.wikipedia.org/wiki/Electric_current) using the [photovoltaic effect](https://en.wikipedia.org/wiki/Photovoltaic_effect).[[1]](https://en.wikipedia.org/wiki/Solar_power#cite_note-1)

Photovoltaics were initially solely used as a source of [electricity](https://en.wikipedia.org/wiki/Electricity) for small and medium-sized applications, from the [calculator](https://en.wikipedia.org/wiki/Amorphous_silicon#Solar_cells) powered by a single solar cell to remote homes powered by an [off-grid](https://en.wikipedia.org/wiki/Off-grid) rooftop PV system. Commercial concentrated solar power plants were first developed in the 1980s. The 392 MW [Ivanpah](https://en.wikipedia.org/wiki/Ivanpah_Solar_Power_Facility" \o "Ivanpah Solar Power Facility) installation is the largest concentrating solar power plant in the world, located in the [Mojave Desert](https://en.wikipedia.org/wiki/Mojave_Desert) of [California](https://en.wikipedia.org/wiki/California).

As the cost of solar electricity has fallen, the number of grid-connected [solar PV systems](https://en.wikipedia.org/wiki/Solar_PV_systems) has [grown into the millions](https://en.wikipedia.org/wiki/Growth_of_photovoltaics) and utility-scale [solar power stations](https://en.wikipedia.org/wiki/Photovoltaic_power_station) with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness [renewable energy](https://en.wikipedia.org/wiki/Renewable_energy) from the Sun. The current largest photovoltaic power station in the world is the 850 MW [Longyangxia Dam](https://en.wikipedia.org/wiki/Longyangxia_Dam" \o "Longyangxia Dam) Solar Park, in [Qinghai](https://en.wikipedia.org/wiki/Qinghai), [China](https://en.wikipedia.org/wiki/China).

The [International Energy Agency](https://en.wikipedia.org/wiki/International_Energy_Agency) projected in 2014 that under its "high renewables" scenario, by 2050, solar photovoltaics and concentrated solar power would contribute about 16 and 11 percent, respectively, of the [worldwide electricity consumption](https://en.wikipedia.org/wiki/Worldwide_electricity_consumption), and solar would be the world's largest source of electricity. Most solar installations would be in [China](https://en.wikipedia.org/wiki/Solar_power_in_China) and [India](https://en.wikipedia.org/wiki/Solar_power_in_India).[[2]](https://en.wikipedia.org/wiki/Solar_power#cite_note-IEA-roadmap-PV-2014-2) As of 2016, solar power provided just 1% of total worldwide electricity production but was growing at 33% per annum.”- https://en.wikipedia.org/wiki/Solar\_power

Early days

“The early development of solar technologies starting in the 1860s was driven by an expectation that coal would soon become scarce. [Charles Fritts](https://en.wikipedia.org/wiki/Charles_Fritts) installed the world's first rooftop photovoltaic solar array, using 1%-efficient [selenium](https://en.wikipedia.org/wiki/Selenium) cells, on a New York City roof in 1884.[[26]](https://en.wikipedia.org/wiki/Solar_power#cite_note-26) However, development of solar technologies stagnated in the early 20th century in the face of the increasing availability, economy, and utility of coal and [petroleum](https://en.wikipedia.org/wiki/Petroleum).[[27]](https://en.wikipedia.org/wiki/Solar_power#cite_note-27) In 1974 it was estimated that only six private homes in all of North America were entirely heated or cooled by functional solar power systems.[[28]](https://en.wikipedia.org/wiki/Solar_power#cite_note-28) The [1973 oil embargo](https://en.wikipedia.org/wiki/1973_oil_crisis) and [1979 energy crisis](https://en.wikipedia.org/wiki/1979_energy_crisis) caused a reorganization of energy policies around the world and brought renewed attention to developing solar technologies.[[29]](https://en.wikipedia.org/wiki/Solar_power#cite_note-29)[[30]](https://en.wikipedia.org/wiki/Solar_power#cite_note-30) Deployment strategies focused on incentive programs such as the Federal Photovoltaic Utilization Program in the US and the Sunshine Program in Japan. Other efforts included the formation of research facilities in the United States (SERI, now [NREL](https://en.wikipedia.org/wiki/NREL)), Japan ([NEDO](https://en.wikipedia.org/wiki/New_Energy_and_Industrial_Technology_Development_Organization)), and Germany ([Fraunhofer–ISE](https://en.wikipedia.org/wiki/Fraunhofer_Society" \o "Fraunhofer Society)).[[31]](https://en.wikipedia.org/wiki/Solar_power#cite_note-31) Between 1970 and 1983 installations of photovoltaic systems grew rapidly, but falling oil prices in the early 1980s moderated the [growth of photovoltaics](https://en.wikipedia.org/wiki/Growth_of_photovoltaics) from 1984 to 1996.”- https://en.wikipedia.org/wiki/Solar\_power

Mid-1990s to early 2010s

“In the mid-1990s, development of both, residential and commercial [rooftop solar](https://en.wikipedia.org/wiki/Rooftop_solar) as well as utility-scale [photovoltaic power stations](https://en.wikipedia.org/wiki/Photovoltaic_power_station), began to accelerate again due to supply issues with oil and natural gas, [global warming concerns](https://en.wikipedia.org/wiki/Kyoto_Protocol), and the improving economic position of PV relative to other energy technologies.[[32]](https://en.wikipedia.org/wiki/Solar_power#cite_note-32) In the early 2000s, the adoption of [feed-in tariffs](https://en.wikipedia.org/wiki/Feed-in_tariff)—a policy mechanism, that gives renewables priority on the grid and defines a fixed price for the generated electricity—lead to a high level of investment security and to a soaring number of PV deployments in Europe.”- https://en.wikipedia.org/wiki/Solar\_power

Current status

“For several years, worldwide growth of solar PV was driven by [European deployment](https://en.wikipedia.org/wiki/Solar_power_in_the_European_Union), but has since shifted to Asia, especially [China](https://en.wikipedia.org/wiki/Solar_power_in_China) and [Japan](https://en.wikipedia.org/wiki/Solar_power_in_Japan), and to a growing number of countries and regions all over the world, including, but not limited to, [Australia](https://en.wikipedia.org/wiki/Solar_power_in_Australia), [Canada](https://en.wikipedia.org/wiki/Solar_power_in_Canada), [Chile](https://en.wikipedia.org/wiki/Solar_power_in_Chile), [India](https://en.wikipedia.org/wiki/Solar_power_in_India), [Israel](https://en.wikipedia.org/wiki/Solar_power_in_Israel), [Mexico](https://en.wikipedia.org/wiki/Solar_power_in_Mexico), [South Africa](https://en.wikipedia.org/wiki/Solar_power_in_South_Africa), [South Korea](https://en.wikipedia.org/wiki/Energy_in_South_Korea), [Thailand](https://en.wikipedia.org/wiki/Solar_power_in_Thailand), and the [United States](https://en.wikipedia.org/wiki/Solar_power_in_the_United_States).

Worldwide growth of photovoltaics has averaged 40% per year from 2000 to 2013[[33]](https://en.wikipedia.org/wiki/Solar_power#cite_note-:0-33) and total installed capacity reached 303 GW at the end of 2016 with [China](https://en.wikipedia.org/wiki/Solar_power_in_China) having the most cumulative installations (78 GW)[[34]](https://en.wikipedia.org/wiki/Solar_power#cite_note-:1-34) and [Honduras](https://en.wikipedia.org/wiki/Renewable_energy_in_Honduras" \o "Renewable energy in Honduras)having the highest theoretical percentage of annual electricity usage which could be generated by solar PV (12.5%).[[34]](https://en.wikipedia.org/wiki/Solar_power#cite_note-:1-34)[[33]](https://en.wikipedia.org/wiki/Solar_power#cite_note-:0-33) The largest manufacturers are located in China.[[35]](https://en.wikipedia.org/wiki/Solar_power#cite_note-35)[[36]](https://en.wikipedia.org/wiki/Solar_power#cite_note-36)

Concentrated solar power (CSP) also started to grow rapidly, increasing its capacity nearly tenfold from 2004 to 2013, albeit from a lower level and involving fewer countries than solar PV.[[37]](https://en.wikipedia.org/wiki/Solar_power#cite_note-ren21-gsr-2014-37):51 As of the end of 2013, [worldwide cumulative CSP-capacity](https://en.wikipedia.org/wiki/Concentrated_solar_power#Deployment_around_the_world) reached 3,425 MW”- https://en.wikipedia.org/wiki/Solar\_power

How solar energy works

“We harness the sun’s energy in several ways. Passive solar design is the use of solar radiation to heat our buildings. Buildings that are specifically passive solar designed make best use of the sun’s free warmth in winter, whilst keeping it out in summer when it is not needed. Solar panels, also known as photovoltaic (PV) panels, generate electricity directly from sunlight. Another technology, solar water heating, uses the sun to heat water” -www.eeca.govt.nz/energy-use-in-new-zealand/renewable-energy-resources/solar/