

Solar energy tskhinvali

In 2011, the International Energy Agency said that "the development of affordable, inexhaustible and clean solar energy technologies will have huge longer-term benefits. It will increase countries' energy security through reliance on an indigenous, inexhaustible, and mostly import-independent resource, enhance sustainability, reduce pollution, lower the costs of mitigating global warming these advantages are global".

The Earth receives 174 petawatts (PW) of incoming solar radiation (insolation) at the upper atmosphere. Approximately 30% is reflected back to space while the rest, 122 PW, is absorbed by clouds, oceans and land masses. The spectrum of solar light at the Earth's surface is mostly spread across the visible and near-infrared ranges with a small part in the near-ultraviolet. Most of the world's population live in areas with insolation levels of 150-300 watts/m², or 3.5-7.0 kWh/m² per day.

The total solar energy absorbed by Earth's atmosphere, oceans and land masses is approximately 122 PW/year = 3,850,000 exajoules (EJ) per year. In 2002 (2019), this was more energy in one hour (one hour and 25 minutes) than the world used in one year. Photosynthesis captures approximately 3,000 EJ per year in biomass.

The potential solar energy that could be used by humans differs from the amount of solar energy present near the surface of the planet because factors such as geography, time variation, cloud cover, and the land available to humans limit the amount of solar energy that we can acquire. In 2021, Carbon Tracker Initiative estimated the land area needed to generate all our energy from solar alone was 450,000 km² -- or about the same as the area of Sweden, or the area of Morocco, or the area of California (0.3% of the Earth's total land area).

Solar technologies are categorized as either passive or active depending on the way they capture, convert and distribute sunlight and enable solar energy to be harnessed at different levels around the world, mostly depending on the distance from the Equator. Although solar energy refers primarily to the use of solar radiation for practical ends, all types of renewable energy, other than geothermal power and tidal power, are derived either directly or indirectly from the Sun.

Active solar techniques use photovoltaics, concentrated solar power, solar thermal collectors, pumps, and fans to convert sunlight into useful output. Passive solar techniques include selecting materials with favorable thermal properties, designing spaces that naturally circulate air, and referencing the position of a building to the Sun. Active solar technologies increase the supply of energy and are considered supply side technologies, while passive solar technologies reduce the need for alternative resources and are generally considered demand-side technologies.

In 2000, the United Nations Development Programme, UN Department of Economic and Social Affairs, and World Energy Council published an estimate of the potential solar energy that could be used by humans each year. This took into account factors such as insolation, cloud cover, and the land that is usable by humans. It was stated that solar energy has a global potential of 1,600 to 49,800 exajoules (4.4×10^{14} to 1.4×10^{16} kWh) per year (see table below).

Quantitative relation of global solar potential vs. the world's primary energy consumption:

Source: United Nations Development Programme - World Energy Assessment (2000)

Solar thermal technologies can be used for water heating, space heating, space cooling and process heat generation.

In 1878, at the Universal Exposition in Paris, Augustin Mouchot successfully demonstrated a solar steam engine but could not continue development because of cheap coal and other factors.

Shuman built the world's first solar thermal power station in Maadi, Egypt, between 1912 and 1913. His plant used parabolic troughs to power a 45-52 kilowatts (60-70 hp) engine that pumped more than 22,000 litres (4,800 imp gal; 5,800 US gal) of water per minute from the Nile River to adjacent cotton fields. Although the outbreak of World War I and the discovery of cheap oil in the 1930s discouraged the advancement of solar energy, Shuman's vision, and basic design were resurrected in the 1970s with a new wave of interest in solar thermal energy. In 1916 Shuman was quoted in the media advocating solar energy's utilization, saying:

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