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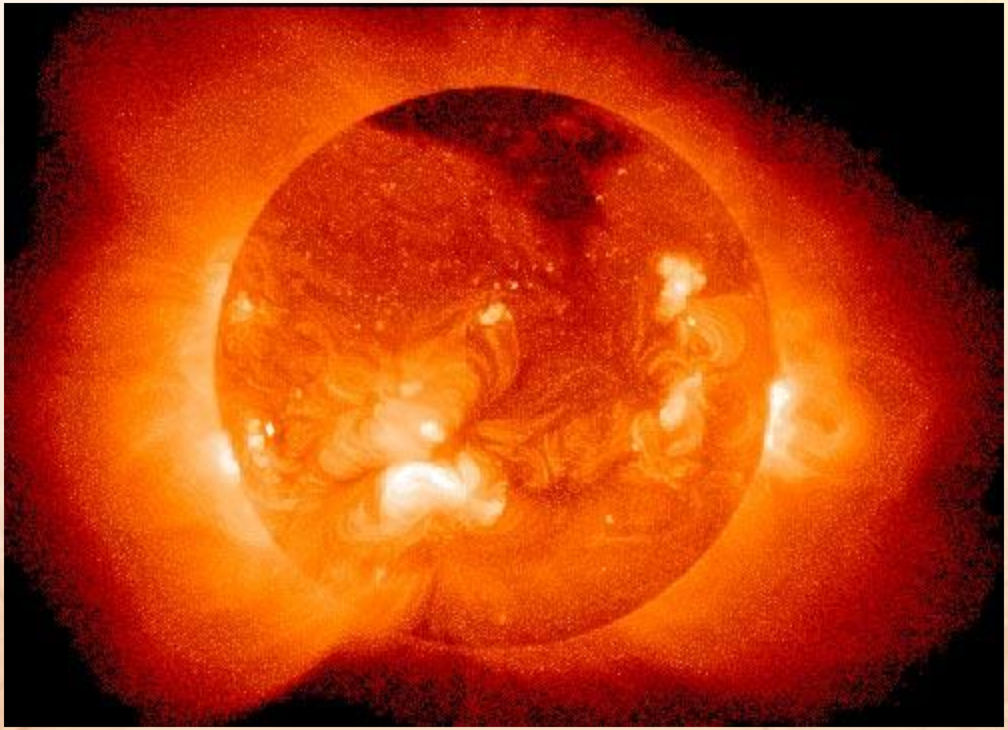
Solar energy

Solar energy

A parabolic dish and Stirling engine system, which concentrates solar energy to produce useful solar power.

Solar energy is the radiantSolar energy is the radiant light and heat from the Sun. Solar radiation along with secondary solar resources such as wind and wave power, hydroelectricity and biomass account for most of the availableSolar energy is the radiant light and heat from the Sun. Solar radiation

Solar power technologies provide electrical generation by means of heat engines.



Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute sunlight.

Active solar techniques include the use of photovoltaic panels, solar thermal collectors, with electrical or mechanical equipment, to convert sunlight into useful outputs.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Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing

Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces naturally

Energy from the Sun

About half the incomingAbout half the incoming solar energy reaches the Earth's surface

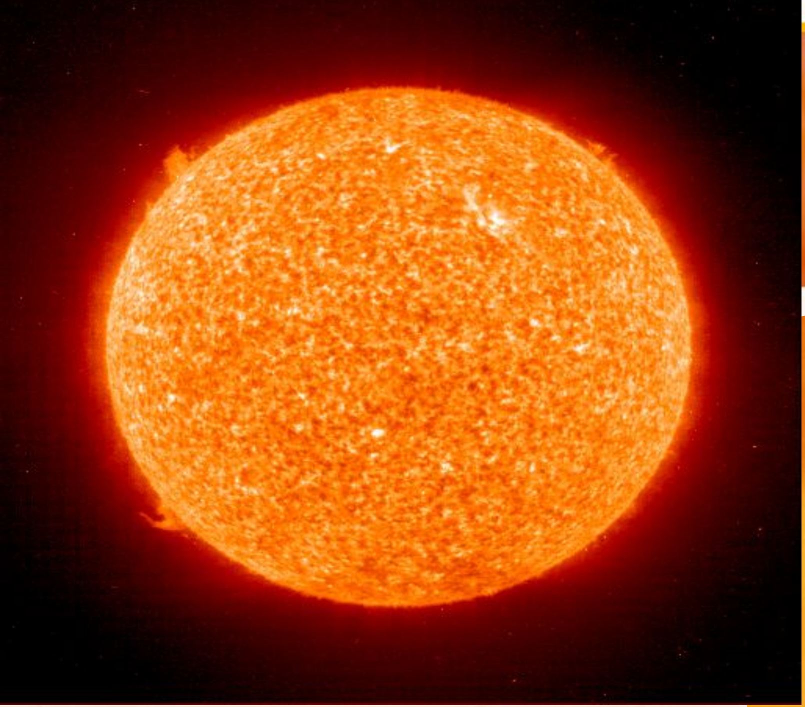
The Earth receives
174 petawatts (PW) of
incoming solar radiation
(insolation) at the upper
atmosphere.

Approximately 30% is reflected back to space while the rest 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.

Earth's land surface, oceans and atmosphere absorb solar radiation, and this raises their temperature. Warm air containing evaporated Earth's land surface, oceans and atmosphere absorb solar radiation, and this raises their temperature. Warm air containing evaporated water from the oceans rises, causing atmospheric circulationEarth's land surface, oceans and atmosphere absorb solar radiation, and this raises their temperature. Warm air

The latentThe latent heat of water condensation amplifies convection, producing atmospheric phenomena such as wind, cyclones and anti-cyclones



Sunlight absorbed by the oceans and land masses keeps the surface at an average temperature of 14 C. By photosynthesis green plants convert solar energy into chemical energy, which produces food, wood and the biomass from which fossil fuels are derived.

The total solar energy absorbed by Earth's atmosphere, oceans and land masses is approximately 3,850,000 exajoules (EJ) per year.

From the table of resources it would appear that solar, wind or biomass would be sufficient to supply all of our energy needs, however, the increased use of biomass has had a negative effect on global warming and [dramatically](#)From the table of resources it would appear that solar, wind or biomass would be sufficient to supply all of our energy needs, however, the increased use of biomass has had a negative effect on global warming and dramatically increased food prices by diverting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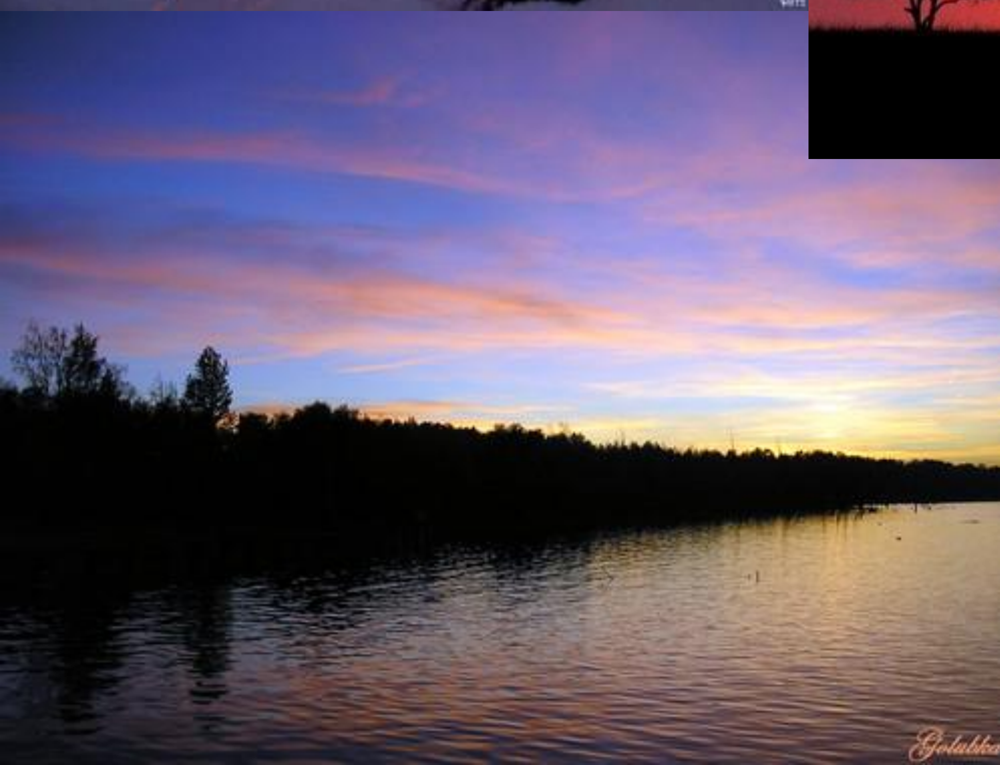
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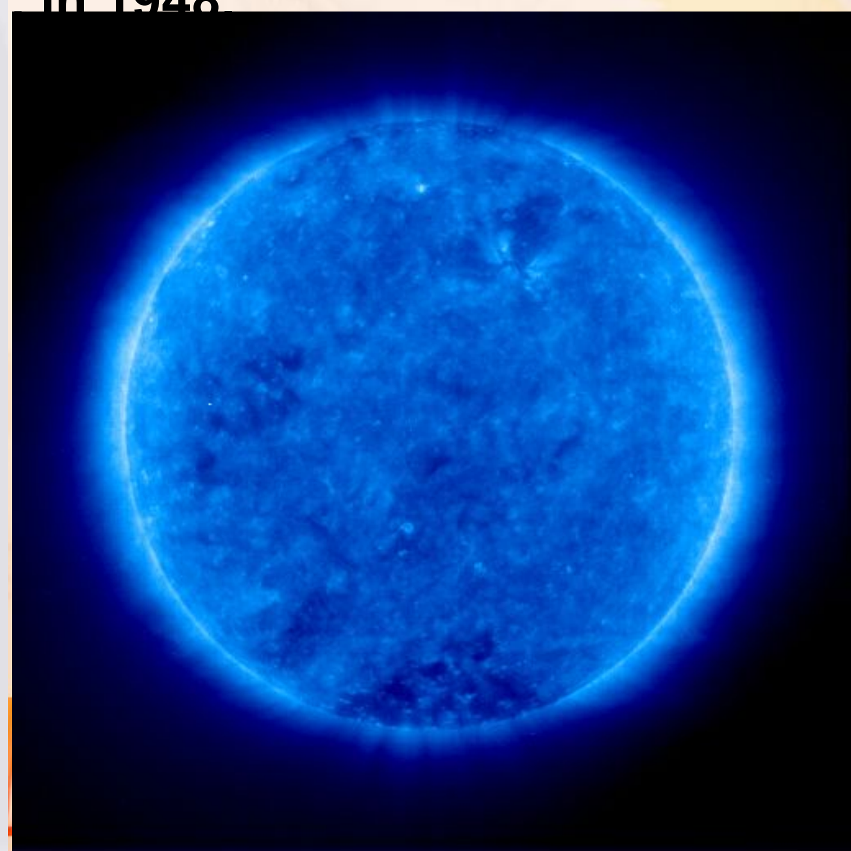
Energy storage methods

Solar energy is not available at night, and energy storage is an important issue because modern energy systems usually assume continuous availability of energy.

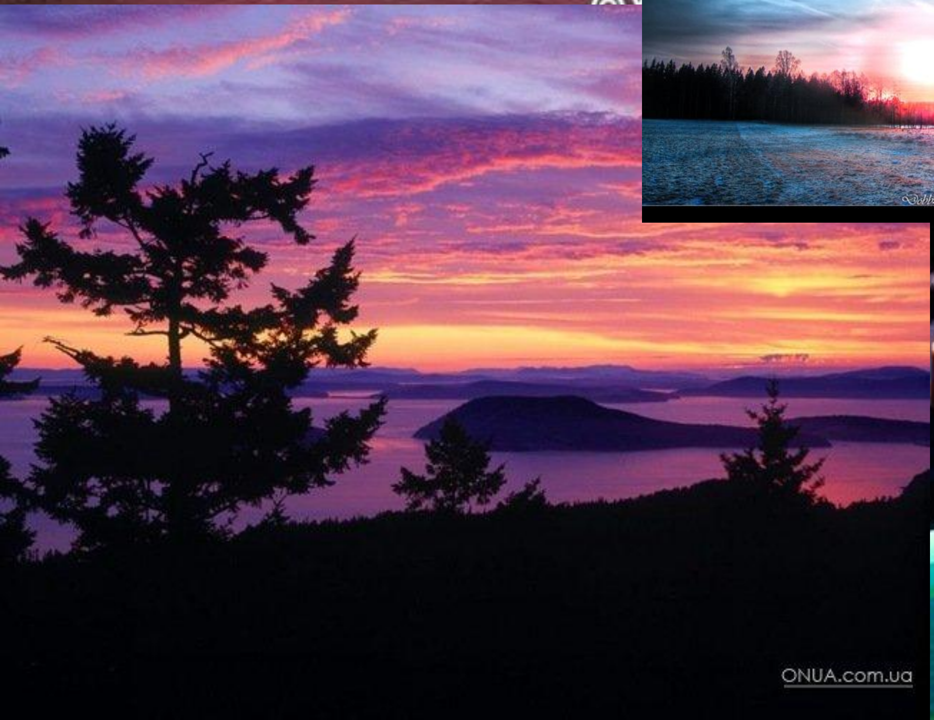
Thermal mass systems can store solar energy in the form of heat at domestically useful temperatures for daily or seasonal durationsThermal mass systems can store solar energy in the form of heat at domestically useful temperatures for daily or seasonal durations. Thermal storage systems generally use readily available materials with high specific heat capacities such as water, earth and stone. Well-designed systems can lower peak demand, shift time-of-use to off-peak

Phase change materials such as paraffin wax and Glauber's salt Phase change materials such as paraffin wax and Glauber's salt are another thermal storage media. These materials are inexpensive, readily available, and can deliver domestically useful temperatures (approximately 64 °C). The "Dover House" (in Dover, Massachusetts) was the first to use a Glauber's salt … in 1948.



Solar energy can be stored at high temperatures using molten salts. Salts are an effective storage medium because they are low-cost, have a high specific heat capacity and can deliver heat at temperatures compatible with conventional power systems.

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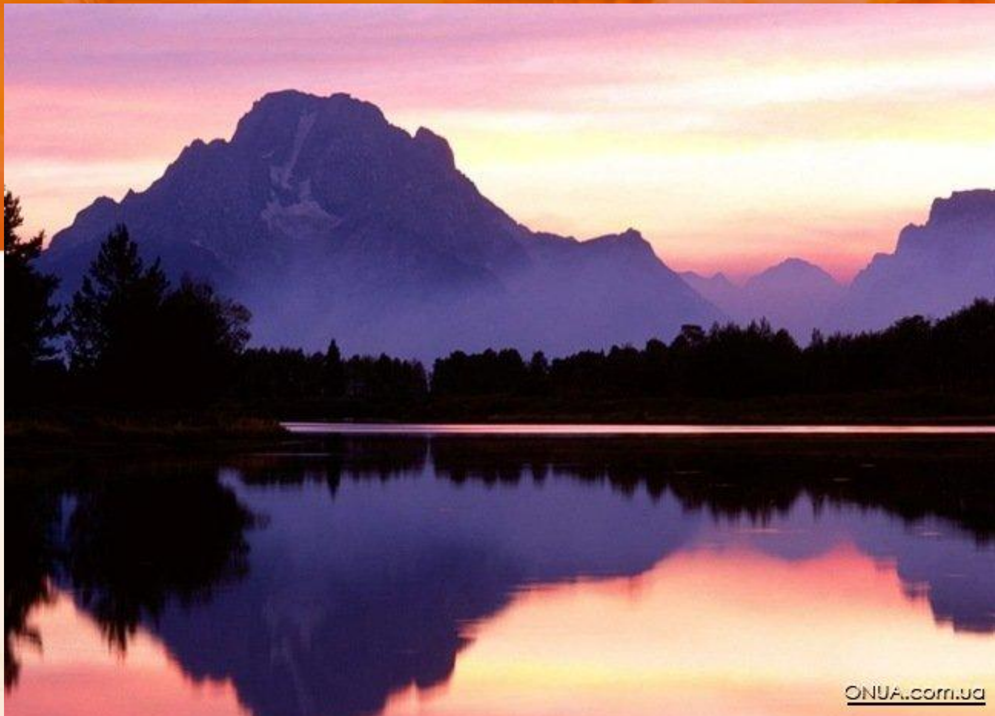
Off-grid PV systems have traditionally used rechargeable Off-grid PV systems have traditionally used rechargeable batteries to store excess electricity. With grid-tied systems, excess electricity can be sent to the transmission grid. Net metering programs give these systems a credit for the electricity they deliver to the grid. This credit offsets electricity provided from the grid when the system cannot meet demand, effectively using the grid as a storage mechanism.



Pumped-storage hydroelectricity stores energy in the form of water pumped when energy is available from a lower elevation reservoir to a higher elevation one. The energy is recovered when demand is high by releasing the water to run through a hydroelectric power generator.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END