

Photovoltaics



Using the sun
to generate
electricity

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An increasingly popular use of solar energy involves solar electric systems, called photovoltaics.

Photovoltaic (PV) systems convert sunlight directly into electricity, and are potentially one of the most useful of the renewable energy technologies.

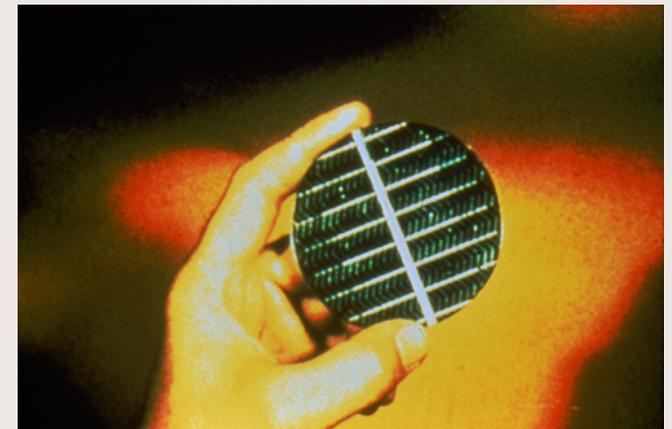
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On a planet where more than two billion people have no access to electricity, PV systems can provide power for many uses.



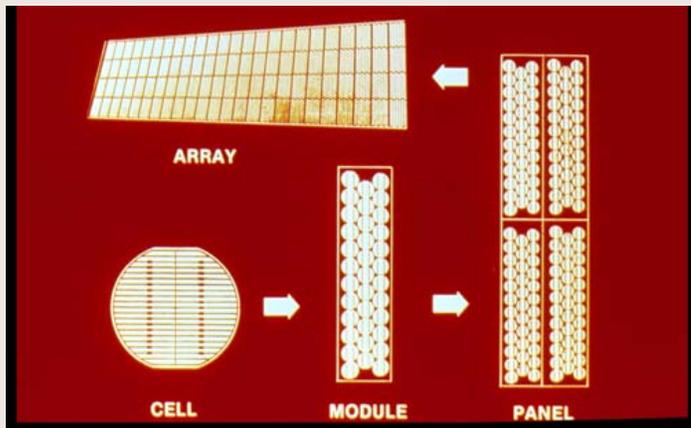
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The heart of a photovoltaic system is a solid-state device called a solar cell.



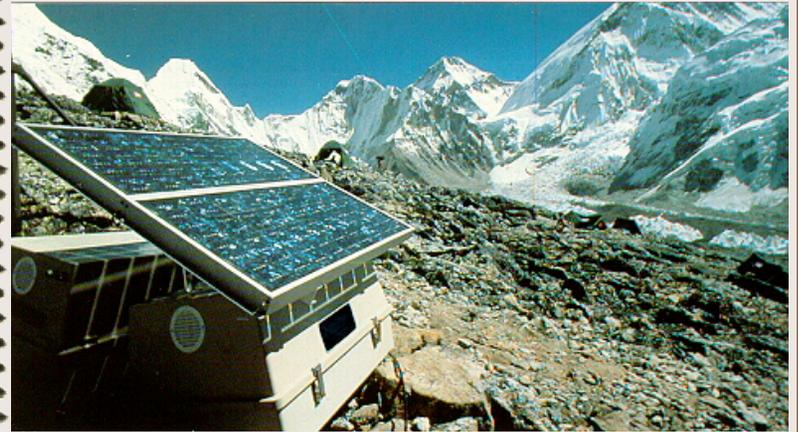
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Groups of solar cells can be packaged into modules, panels and arrays to provide useful output voltages and currents to provide a specific power output.



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Photovoltaic power is ideal for remote applications where other power sources are impractical or unavailable, such as in the Swiss Alps.

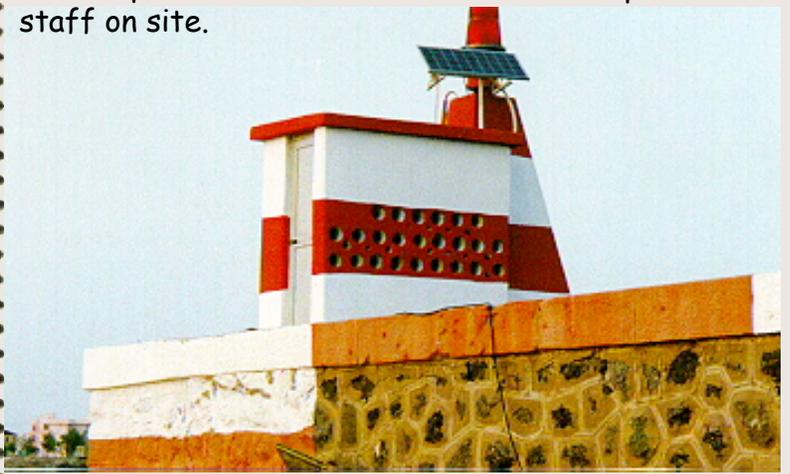


This mountain hut in a very remote area of France uses PV to generate power.



7

Here is a lighthouse along the coast of Eritrea in Africa. Before this PV system was installed, the Lighthouse relied on bottled gas for power - a system that required constant maintenance and a permanent staff on site.



Here is a stand-alone PV system in Oix, La Garrotxa in rural Spain. This system consists of a 900-watt PV array with inverter and batteries. More than 60 rural homes in this mountainous area have been electrified with PV.



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PV power for off-shore navigational aids eliminates trips to and from shore to refill generators with fossil fuels.



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Solar-powered water pumps are very efficient and cost-effective in agricultural applications like this system in Kansas.



11



Another farm application - keeping animals where they belong, behind PV-electrified fence chargers.



PV-powered streetlights like these in a rural town in Central America help contribute to the safety, security and general standard of living in remote areas all over the world.

13



The lamp in this PV-powered insect-trap comes on automatically after sunset. It attracts insects which collide with the metal grid and drop into the receiver below.

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PV applications include lighting for remote signs like this outdoor board along a U.S. highway.

15



Off-shore navigational aids, which require little maintenance, can withstand harsh storms, and cut down on the cost and pollution of battery replacement and disposal by using PV for power.

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Highway directional signs can use PV systems to save the expense of excavation to extend electric lights to the sign as well as the cost of maintaining the electric line.



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PV is an excellent source of power for battery chargers for boats, vehicles, and equipment. The solar-powered charger assures that the battery is charged and ready for use, even if the boat or vehicle has sat for a long time and the battery has discharged.

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Campers can use PV in remote areas to provide power for lighting, appliances and other uses.



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It is estimated that more than 15,000 homes in remote parts of the U.S. rely on PV systems to meet their energy needs. In many cases, it is more cost-effective to install a PV system than pay the costs of having the utility company extend the power lines to the home.



20

Many utility companies in the U.S. are turning to large PV systems to help meet peak power demand and reduce the need for building new power plants.



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Around the world, there are many dramatic examples of PV systems. They include this PV-wind-diesel hybrid system in Mexico that provides village-wide power for 43 homes, three schools, two stores, a church and an auditorium.



22

In 1987, the Swiss government started a program to mount PV arrays on a sound barrier along a main motorway.



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This billboard in Mexico promotes a project that uses solar power to electrify streetlights.



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This photovoltaic system in the Philippines not only provides electricity to the home, but also creates a shelter for this motorcycle.

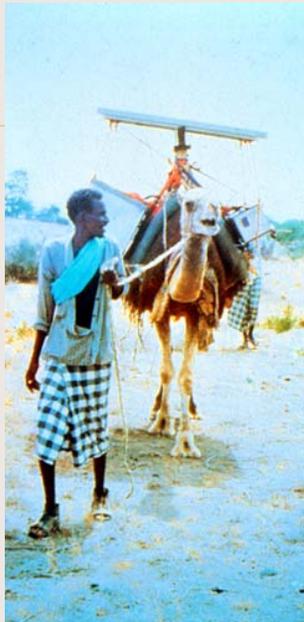


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PV modules are used in this remote area in Africa north of Nairobi at the Kenya Gliding Club to charge batteries in VHF radios in gliders, to maintain the starter battery in the tow vehicle which moves the gliders around the airstrip, and to power other instruments.



26



Maybe no uses are as dramatic and important as the portable PV panels and small refrigerators carried around Africa on the backs of camels.

27



Refrigerators like this, carried on the backs of camels and powered by PV panels, allow vaccines to be kept in good condition and transported to remote villages where medicines are needed.

28



This is the entrance sign at a Wisconsin state park. The PV system powers lights that operate from dusk to dawn.

29



This restroom PV lighting system at a state park has exterior amber LED lights, interior white LED lights, and a fluorescent light in a storeroom.

30



A PV-powered police car in Zermatt, Switzerland. Only electric, solar-powered, or horse-drawn vehicles are allowed in this quaint town in the Alps.

31



A photovoltaic kit is used to recharge portable lamps in the Ivory Coast in Africa.

32

This solar panel powers a light in a bus shelter in Australia, providing security and convenience at night.



33

In many parts of the world, getting water is as important as getting energy. This experimental system in Israel uses PV and wind energy in a desalination project.



34

AT&T Park home of San Francisco Giants



Uses 590 solar panels to provide a total of 120 kW. This system provides enough electricity to power the stadium's scoreboard, which is equivalent to powering 40 homes



Crayola headquarters in Easton, Pa.



Over 30,000 solar panels that are installed at Crayola headquarters in Easton, Pa., powering the factory with electricity made from the sun.



36

Patel Family in Maryland



Location:
Huntingtown, MD

System Size:
7.7kW

Estimated Monthly Production:
668kW

Projected Savings This Year:
\$1,275

37

RETC



20kW system provides enough electricity to power equivalent to powering 4-5 homes

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Discussion Questions

- Are PV systems as efficient or economic as fossil-fueled systems?
- Is PV a viable alternative for all of our power needs? For homes? For vehicles? For other needs?
- Is PV the answer to all of the world's power needs?

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