

Renewable Energy Intro

Kinds of Energy


POTENTIAL ENERGY	KINETIC ENERGY	CHEMICAL ENERGY	RADIANT ENERGY
GRAVITATIONAL POTENTIAL ENERGY	THERMAL ENERGY	NUCLEAR ENERGY	SOUND ENERGY
ELASTIC ENERGY	ELECTRICAL ENERGY		MOTION ENERGY

Energy Sources

U.S. Energy Consumption by Source, 2021

NONRENEWABLE



PETROLEUM 36%  *

Uses: transportation, manufacturing - includes propane



NATURAL GAS 32%  *

Uses: heating, manufacturing, electricity - includes propane



COAL 11%

Uses: electricity, manufacturing



URANIUM 8%

Uses: electricity



PROPANE

Uses: heating, manufacturing

*Propane consumption is included in petroleum and natural gas totals.

RENEWABLE



BIOMASS 5%

Uses: heating, electricity, transportation



WIND 3%

Uses: electricity



HYDROPOWER 2%

Uses: electricity



SOLAR 2%

Uses: heating, electricity



GEOHERMAL < 1%

Uses: heating, electricity

What does it mean to be non-renewable vs renewable?

What are your thoughts on energy sources?

Solar Energy Concepts

- The sun produces enormous amounts of energy, some in the form of radiant energy that travels through space to the Earth.
- Most of the energy on Earth comes from the sun. Only geothermal, nuclear, and tidal energy do not.
- The sun's energy makes life possible on Earth because of the greenhouse effect.
- We use the sun's energy to see.
- Through the process of photosynthesis, plants convert the sun's energy to chemical energy to provide food for growth and life.
- Fossil fuels and biomass contain chemical energy from plants and animals that we use to produce heat and light.
- Radiant energy from the sun powers the water cycle and produces wind through the process of convection.
- It is difficult to capture the sun's energy because it is spread out—not concentrated in any one area. We can capture solar energy with solar collectors that convert the energy into heat.
- Photovoltaic (PV) cells convert radiant energy directly into electricity.

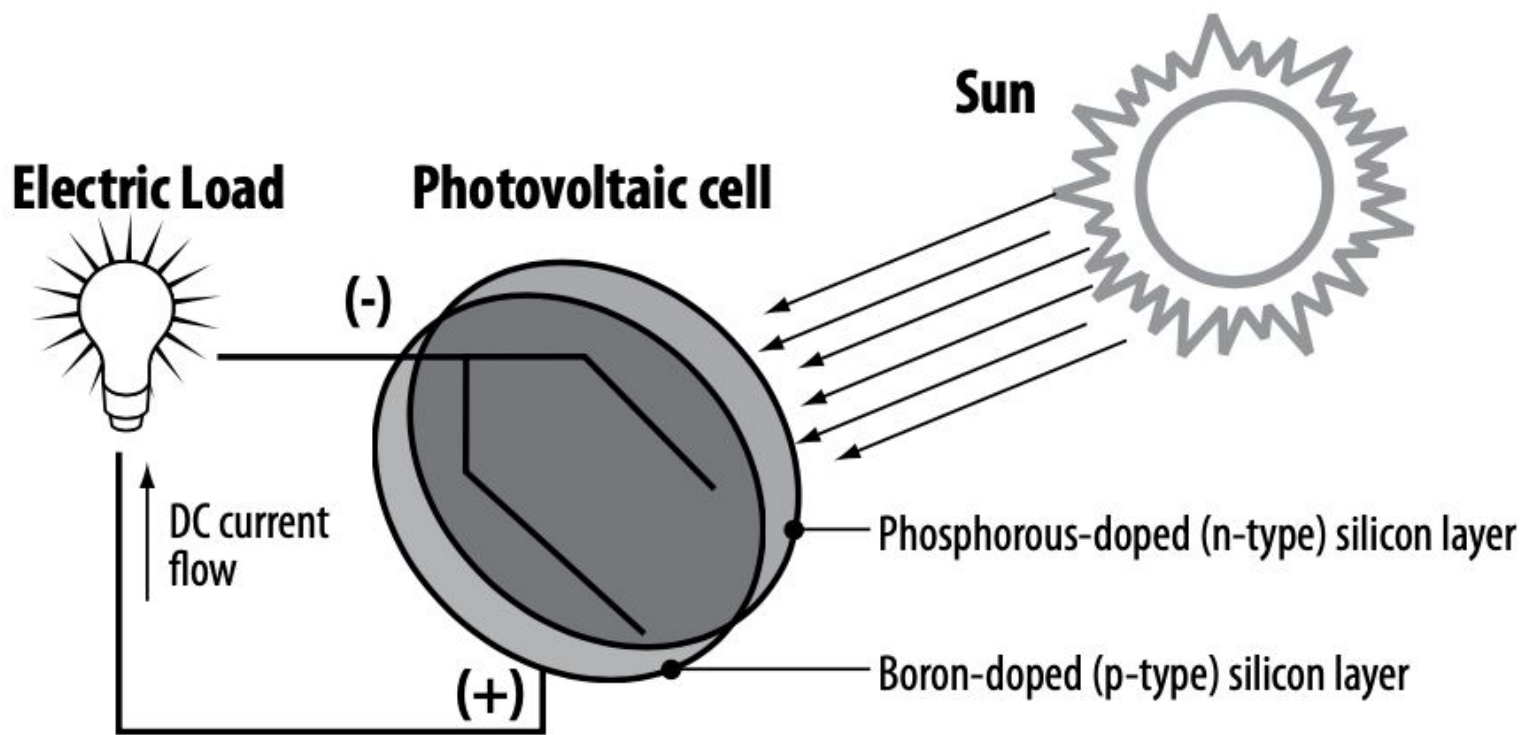
Solar Energy

Solar energy is radiant energy from the sun. The sun is a giant ball of hydrogen and helium gas. The enormous heat and pressure in the interior of the sun cause the nuclei of hydrogen atoms to fuse, producing larger helium atoms in a process called fusion. During fusion, nuclear energy is converted into thermal (heat) and radiant energy. The radiant energy is emitted from the sun in all directions and some of it reaches Earth. Radiant energy is energy that travels in electromagnetic waves or rays. Radiant energy includes visible light, x-rays, infrared rays, microwaves, gamma rays, and others. These rays have different amounts of energy depending upon their wavelength. The shorter the wavelength, the more energy they contain.

Photovoltaic (Solar) Cells

When the PV cell is placed in the sun, the radiant energy energizes the free electrons. If a circuit is made connecting the sides, electrons flow from the n-type through the wire to the p-type. The PV cell is producing electricity—the flow of electrons. If a load such as a light bulb is placed along the wire, the electricity will do work as it flows. The conversion of sunlight into electricity takes place silently and instantly. There are no mechanical parts to wear out.

Sunlight to Electricity



Wind Energy

- Wind is moving air. It comes from the uneven heating of the Earth's surface by the sun. Wind can do work.
- Wind speed and direction can be measured.
- Wind speed and direction vary by location and time of day.
- A wind turbine changes wind energy into electricity.

