

Solar Energy



NM
STATE

All About Discovery!™
New Mexico State University
nmsu.edu

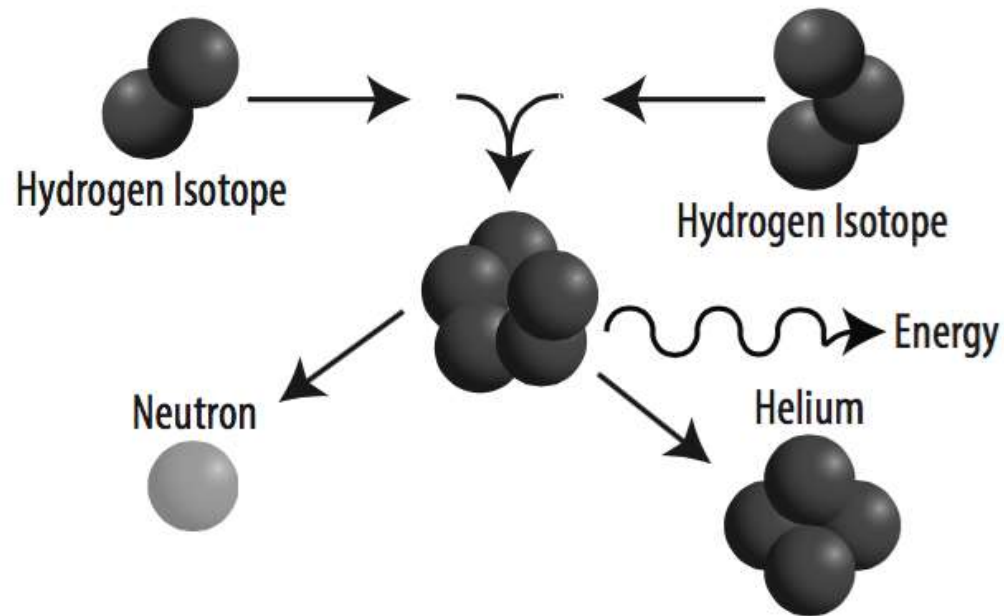
Solar Energy

- The sun radiates massive amounts of energy, everyday. This is called *solar energy*.
- The sun is made of helium and hydrogen gases. The inner core of the sun produces energy through a process called *fusion*.

Solar Energy

Fusion

The process of fusion most commonly involves hydrogen isotopes combining to form a helium atom with a transformation of matter. This matter is emitted as radiant energy.



Solar Energy

Radiant Energy

- This is visible light that comes from the sun. Only a small part of the sun's radiant energy makes it to Earth.
- Radiant energy takes about eight minutes to reach 93 million miles to Earth.
- Solar energy travels at the speed of light. The speed of light is 186,000 miles per second or 3.0×10^8 meters per second.

Solar Energy

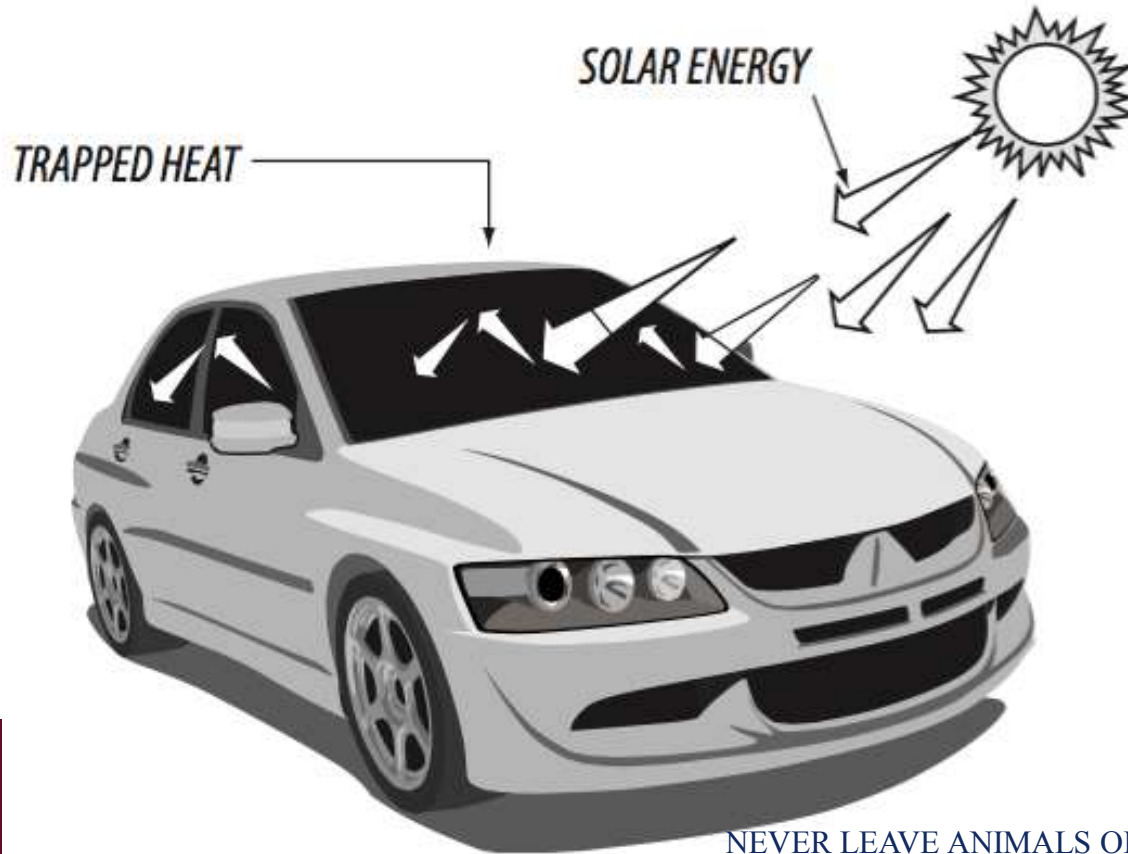
- Every hour, the amount of solar energy that reaches the Earth is enough to supply the United States energy for one year.
- This is considered to be a renewable energy source because there is so much available solar energy.

Solar Collectors

- Sunlight that reaches the Earth is spread out over huge areas. This makes it difficult to capture and put sunlight to work.
- Solar Collectors are needed to capture the sunlight and convert it to usable heat energy.

Solar Collectors

On a sunny day, a closed car becomes a solar collector. Light energy passes through the window glass, is absorbed by the car's interior, and converted into heat energy. The heat energy becomes trapped inside.



NEVER LEAVE ANIMALS OR CHILDREN IN A CAR!

NM
STATE

All About Discovery!™
New Mexico State University
nmsu.edu

Passive Solar Heating

- Many homes use passive solar heating. This happens when sunlight penetrates through windows. The sunlight heats the floors and walls, trapping the heat inside.
- Passive solar heat does not use any mechanical mechanisms for creating heat, but active solar heating does.

3 Approaches to Passive Systems

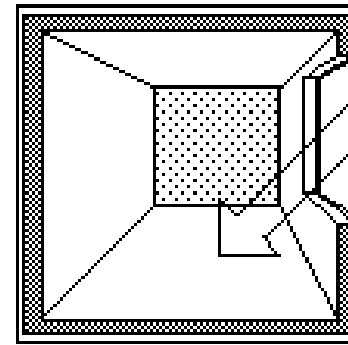
- Direct Gain
- Indirect Gain
- Isolated Gain



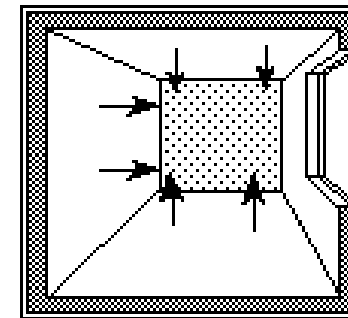
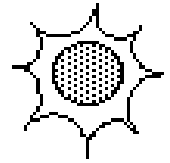
Direct Gain

The living space is a solar collector, heat absorber and distribution system.

South facing windows allow solar energy into the house where it is absorbed by such things as masonry floors and walls.



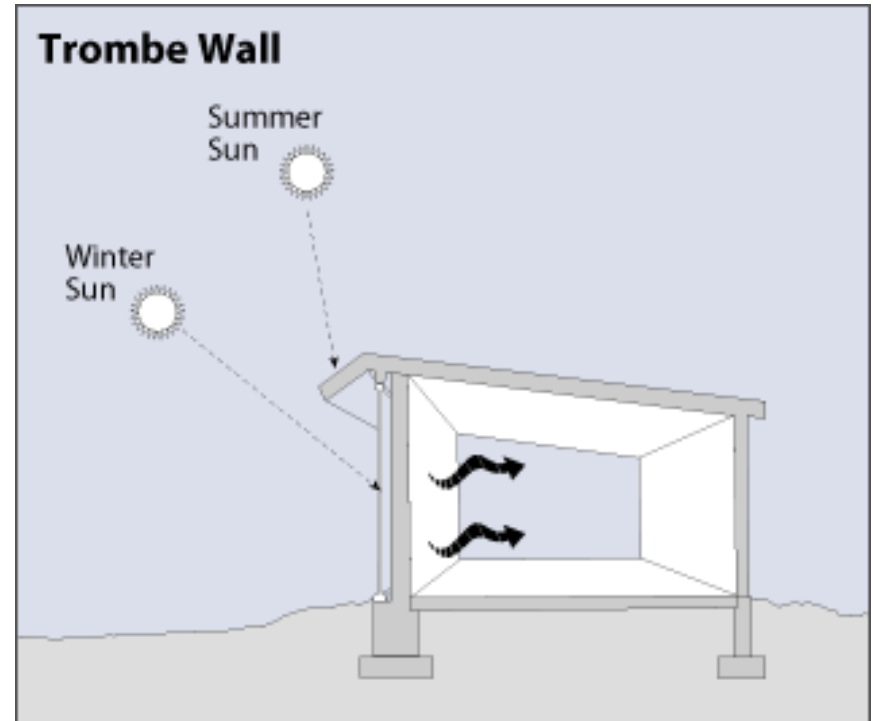
DAY



NIGHT

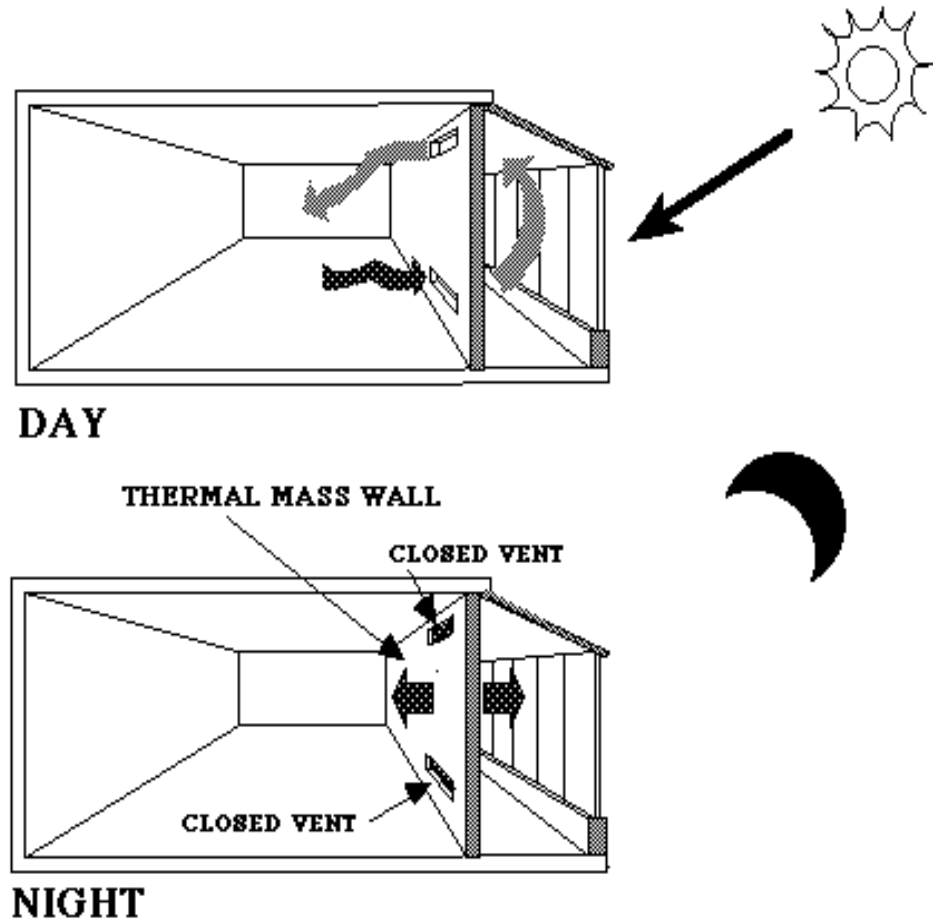
Indirect Gain

- Glass is layered over a masonry wall on the south side of a house.
- Solar heat is absorbed by the wall's dark-colored outside surface and stored in the wall's mass, where it radiates into the living space.



Isolated Gain

- A sunroom is the most common example of an isolated gain system.



Solar Electricity

- There are two ways make solar energy into electricity.
 - Photovoltaic (PV) Photo = light, Voltaic = measurement of electricity. Also called solar cells.
 - Solar Thermal Electricity

Photovoltaic

- Photovoltaic cells are made of silicon.
 - Used in calculators and solar-powered toys, for example.
 - PV cells can supply energy to anything powered with batteries or electrical power.

Photovoltaic Cells



Photovoltaic Cells

- Radiant energy from the sun reaches the PV cell, causing the electrons to move around, creating electricity.
- The movement of the electrons start an electrical current.
- The conversion of sunlight to electricity makes no sound and there are no mechanical components to wear out.

Solar Thermal Electricity

- Solar Thermal Systems are also called Concentrated Solar Power (CSP).
 - Produces electricity through solar energy, but differently than PV cells.
 - Most solar thermal systems use solar collectors with mirrored surfaces to focus the sunlight onto a receiver that heats a liquid.
 - The super-heated liquid makes steam to produce electricity the same way as coal plants.

Solar Thermal Electricity



Electricity Vocabulary

- Electric current –
 - Motion of electrons through a conductor.
- Amps –
 - Measurement of current.
- Voltage –
 - Electrical potential difference related to an electric field initiating electrons to move.
- Volts –
 - Measurement of voltage.