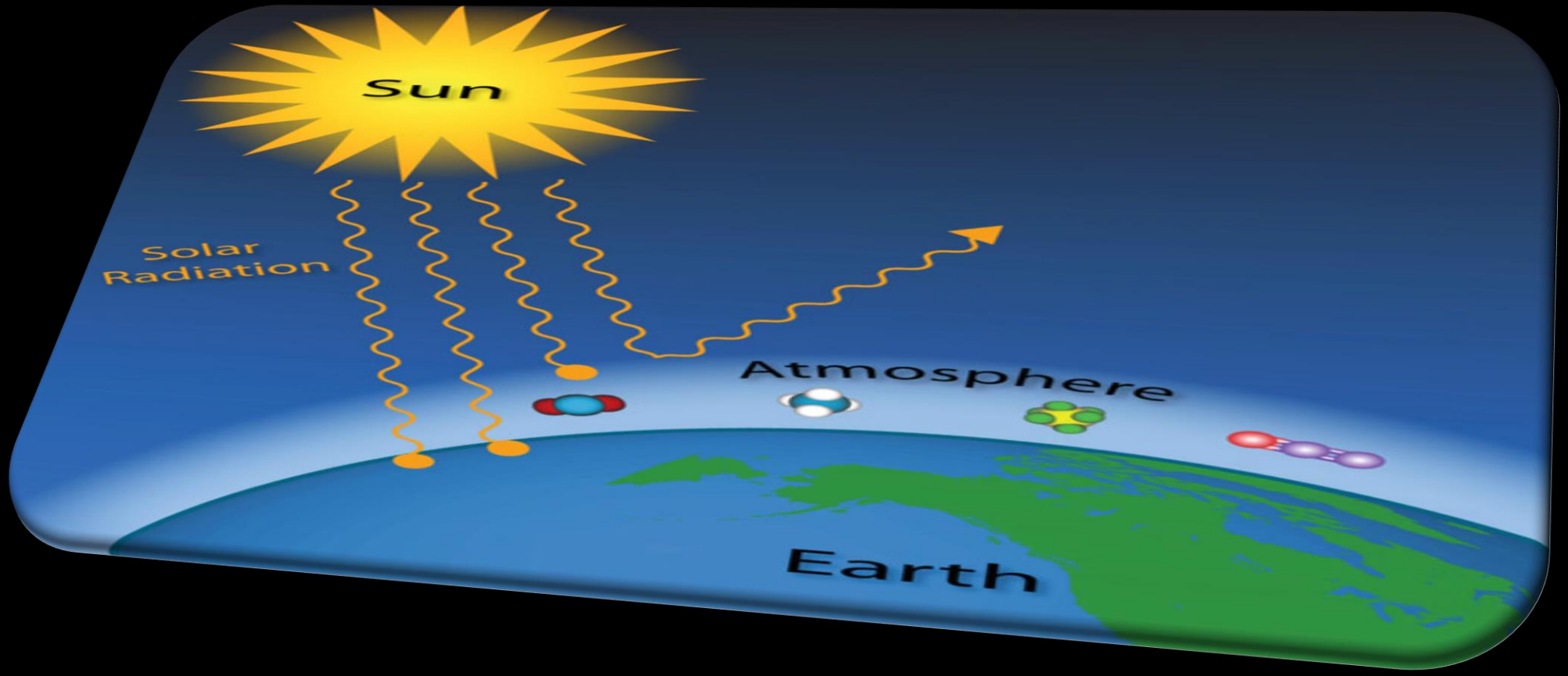
WHAT IS SOLAR ENERGY?

A VISUAL FEAST SOURCE OF LIGHT AND LIFE

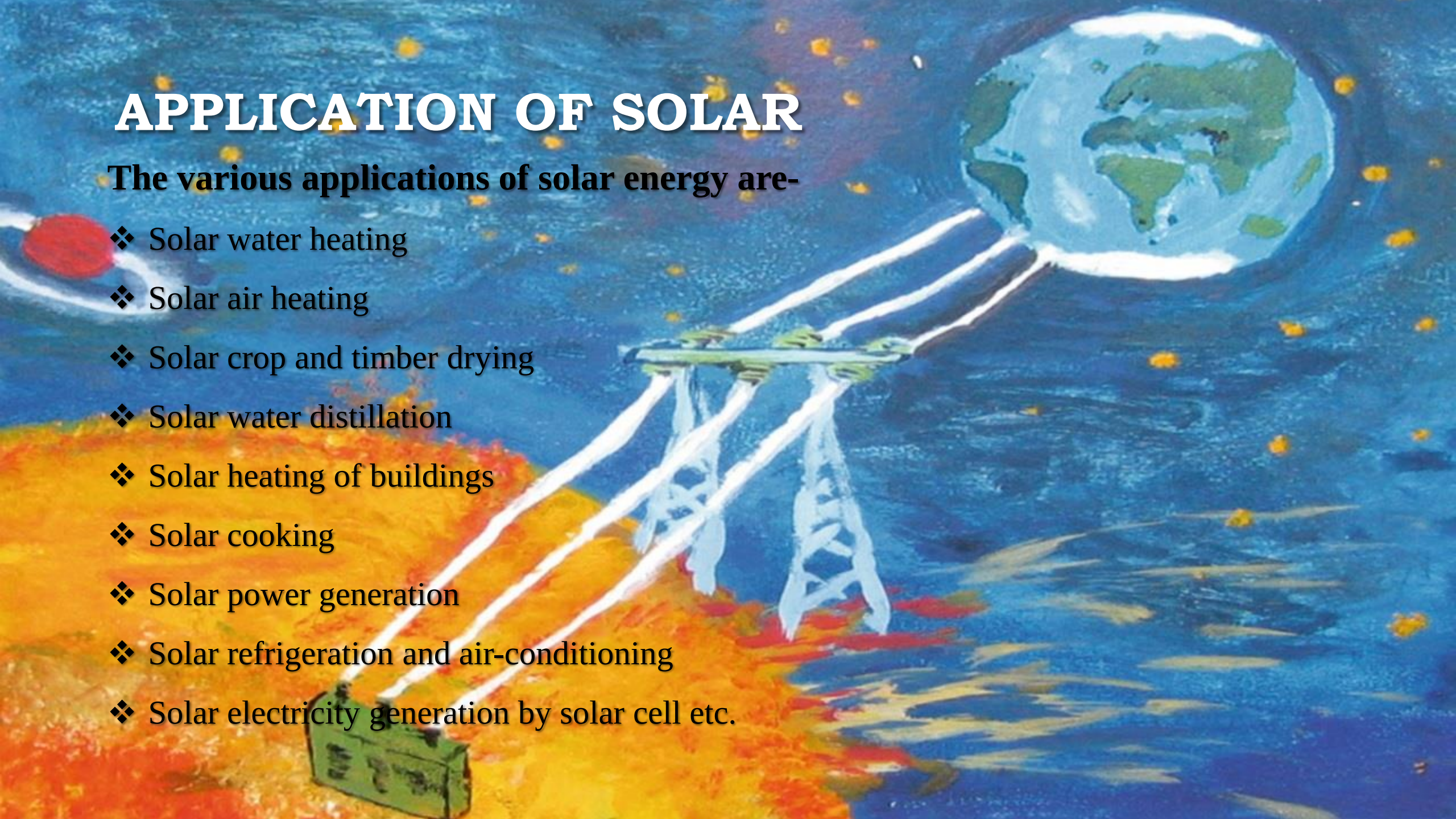
Solar energy is, simply, energy provided by the sun. This energy is in the form of solar radiation, which makes the production of solar electricity possible.



APPLICATION OF SOLAR

The various applications of solar energy are-

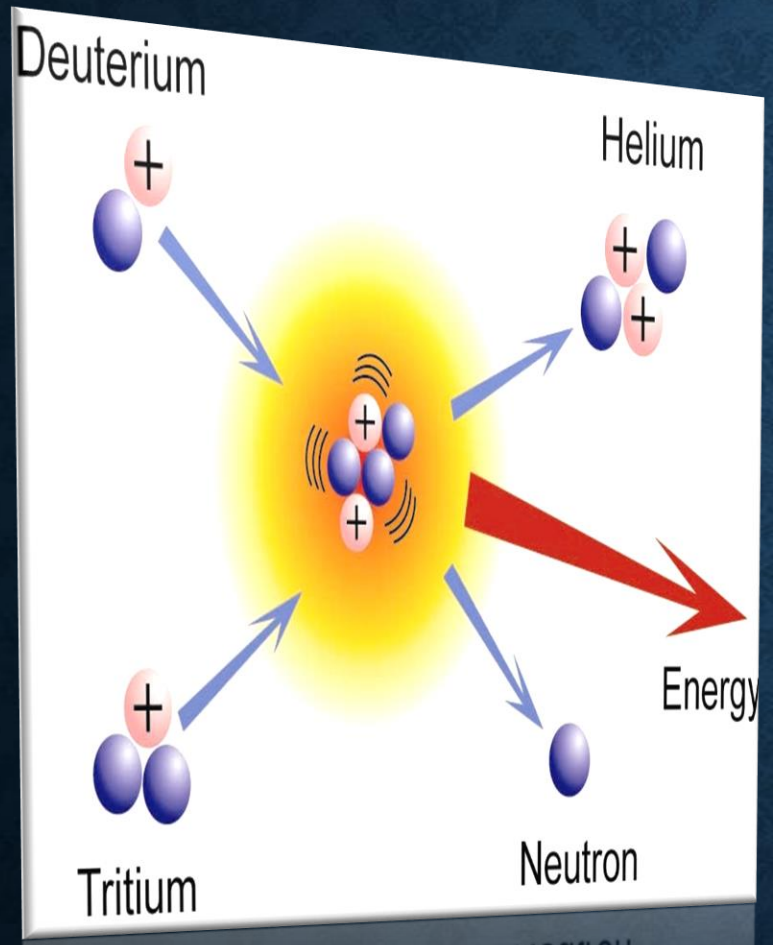
- Solar water heating
- Solar air heating
- Solar crop and timber drying
- Solar water distillation
- Solar heating of buildings
- Solar cooking
- Solar power generation
- Solar refrigeration and air-conditioning
- Solar electricity generation by solar cell etc.

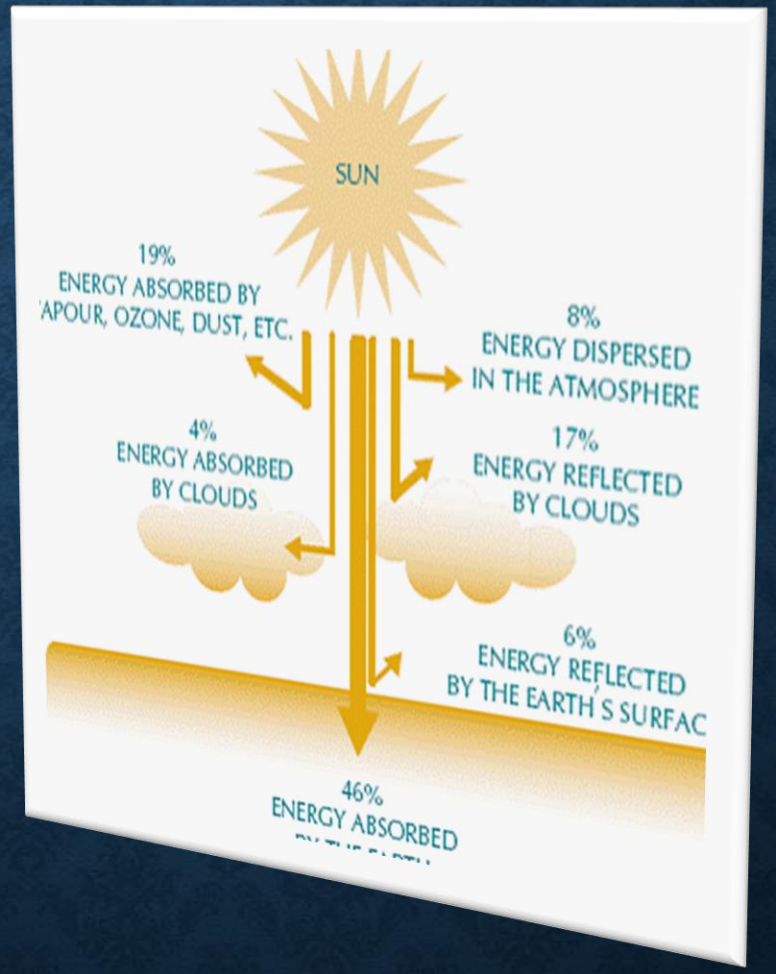


- Drying Agricultural Products
- Heating Water
- Space Heating
- Generating Electrical Energy

MAJOR USES OF SOLAR ENERGY

RADIANT ENERGY



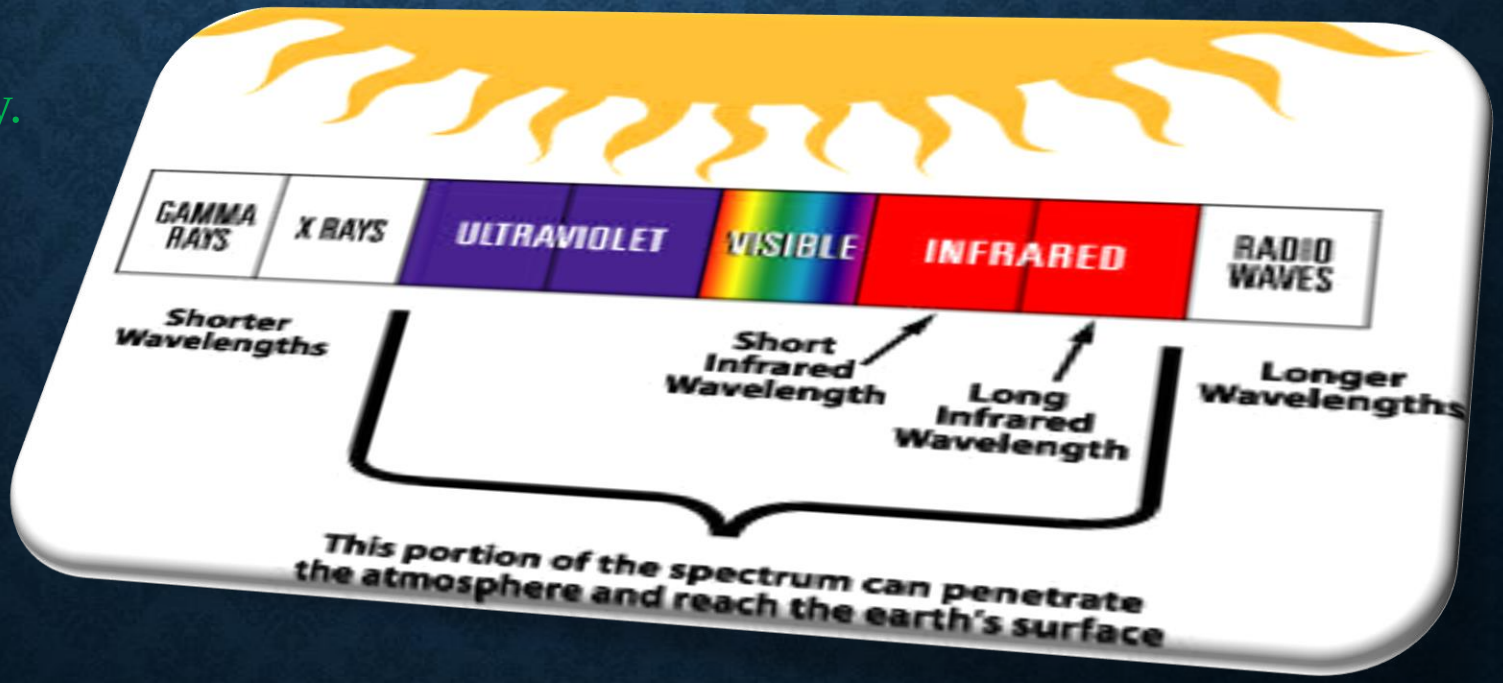


FUNDAMENTAL OF SOLAR ENERGY

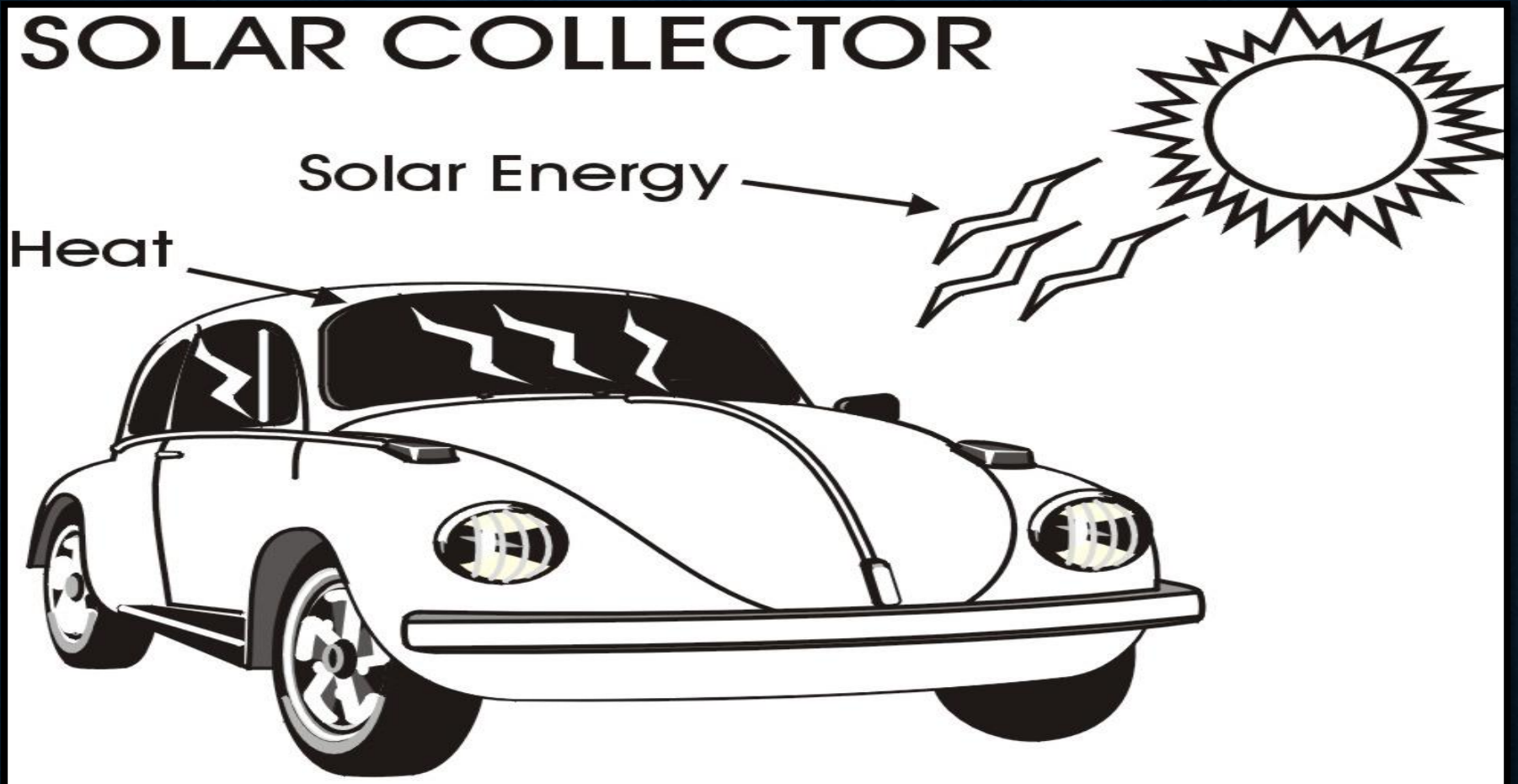
Solar is the Latin word for sun a powerful source of energy that can be used to heat, cool, and light our homes and businesses. That's because more energy from the sun falls on the earth in one hour than is used by everyone in the world in one year. A variety of technologies convert sunlight to usable energy for buildings. The most commonly used solar technologies for homes and businesses are solar water heating, passive solar design for space heating and cooling, and solar photovoltaic for electricity.

Solar energy, radiant light and heat from the sun, is harnessed using a range of ever-evolving technologies such as-

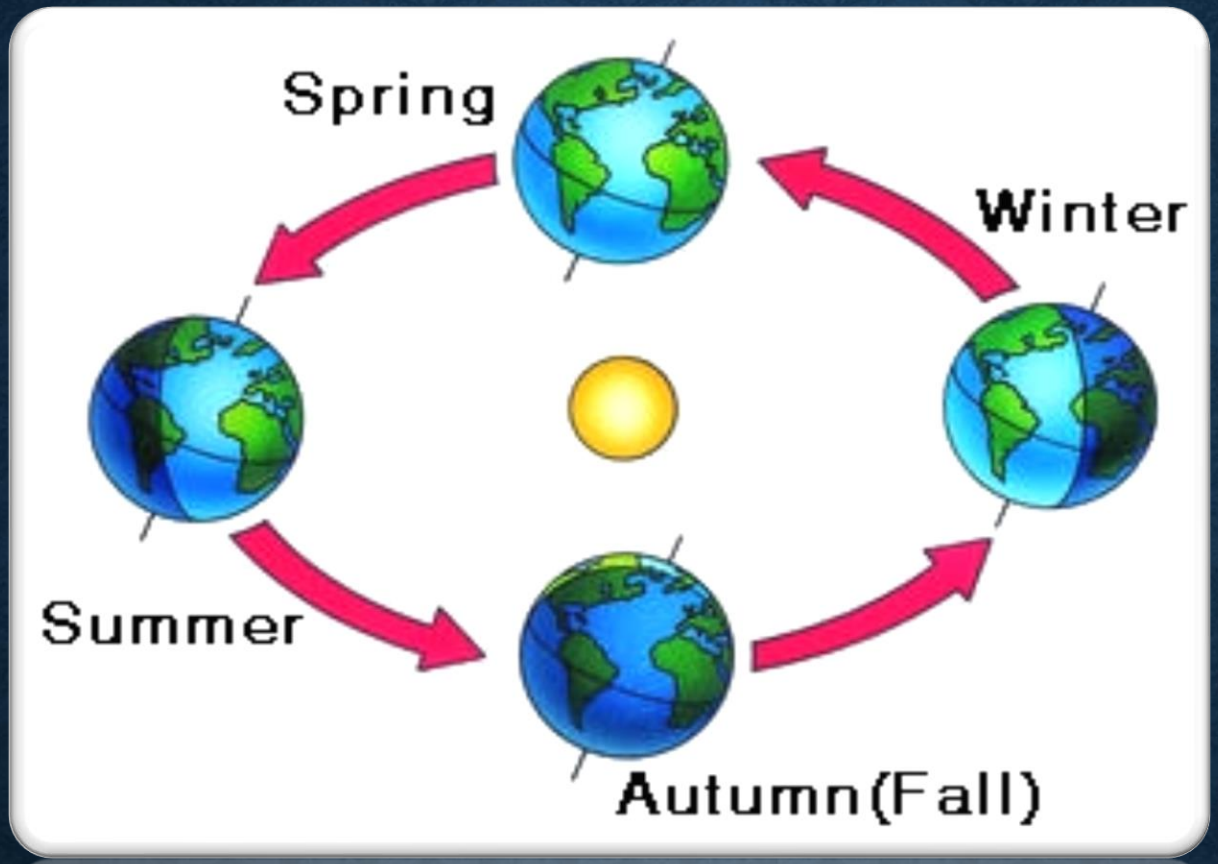
- solar heating.
- solar photovoltaics.
- solar thermal electricity.



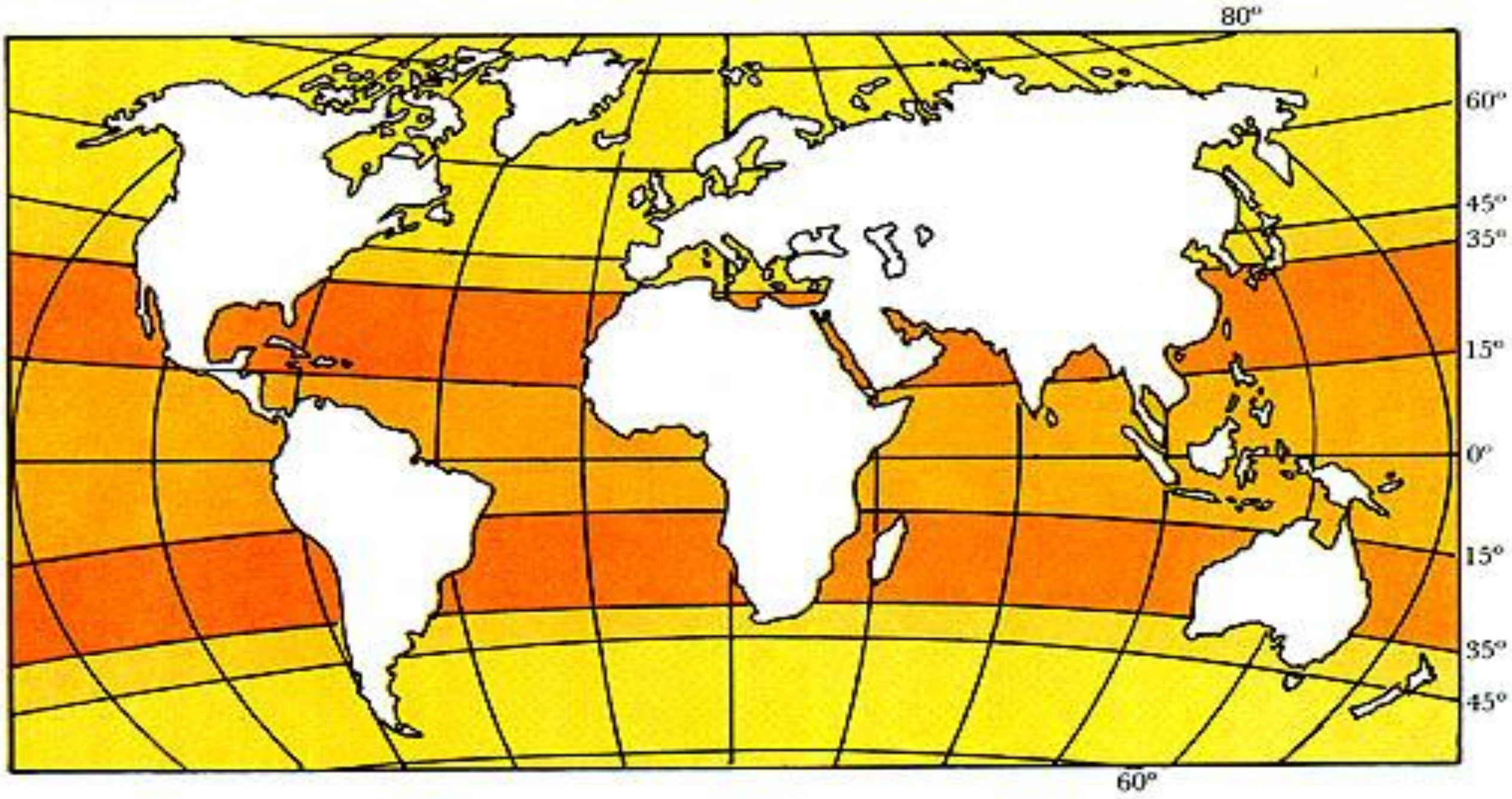
SOLAR COLLECTOR



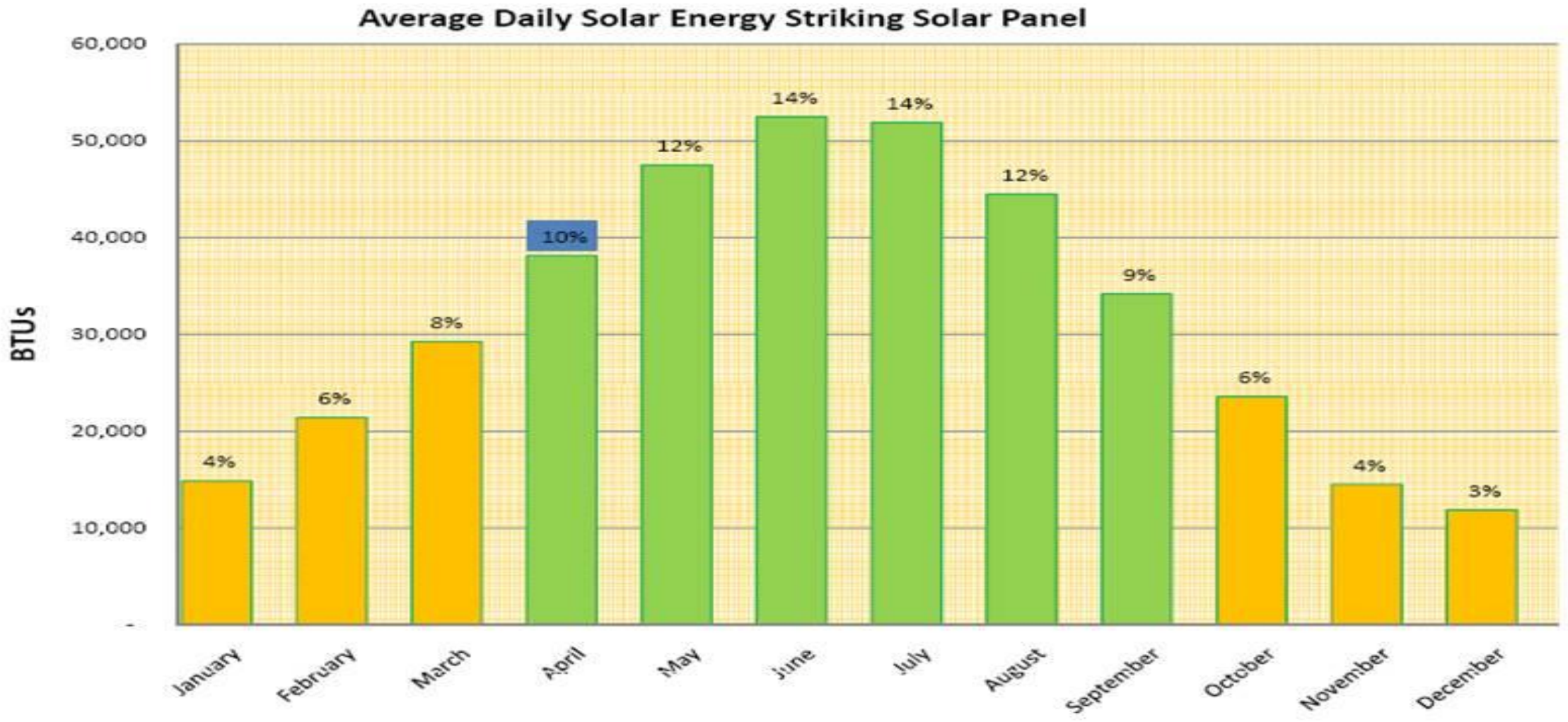
On a sunny day, a closed car is a solar collector.
Solar energy passes through the glass,
hits the inside of the car and changes into heat.
The heat gets trapped inside.



SOLAR RADIATION

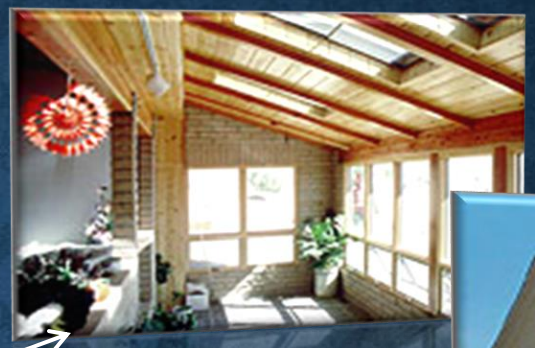

80°
60°
45°
35°
15°
0°
15°
35°
45°
60°
Most favourable
Moderately favourable
Less favourable
Least favourable

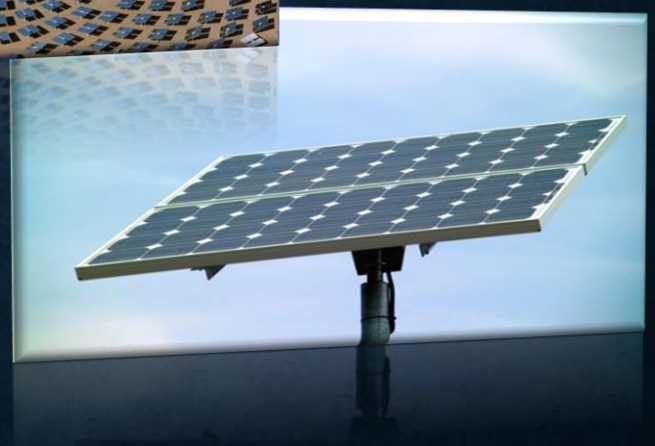
70% of Solar Energy Comes from the Middle 6 Months



SOLAR TECHNOLOGIES

- Daylighting
- Passive Solar Heating
- Active Solar Heating
- Concentrating Solar Thermal
- Photovoltaics (PV)



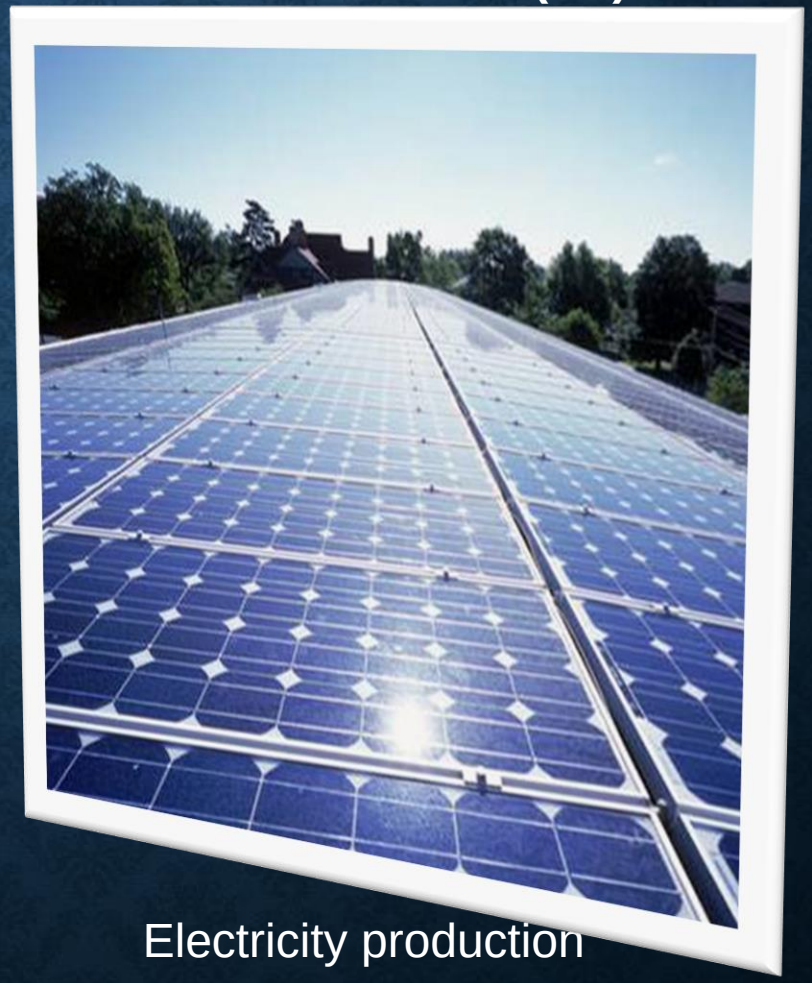


TWO MAIN CATEGORIES:

Solar Thermal

Water heating and cooking

Solar Photovoltaic (PV)



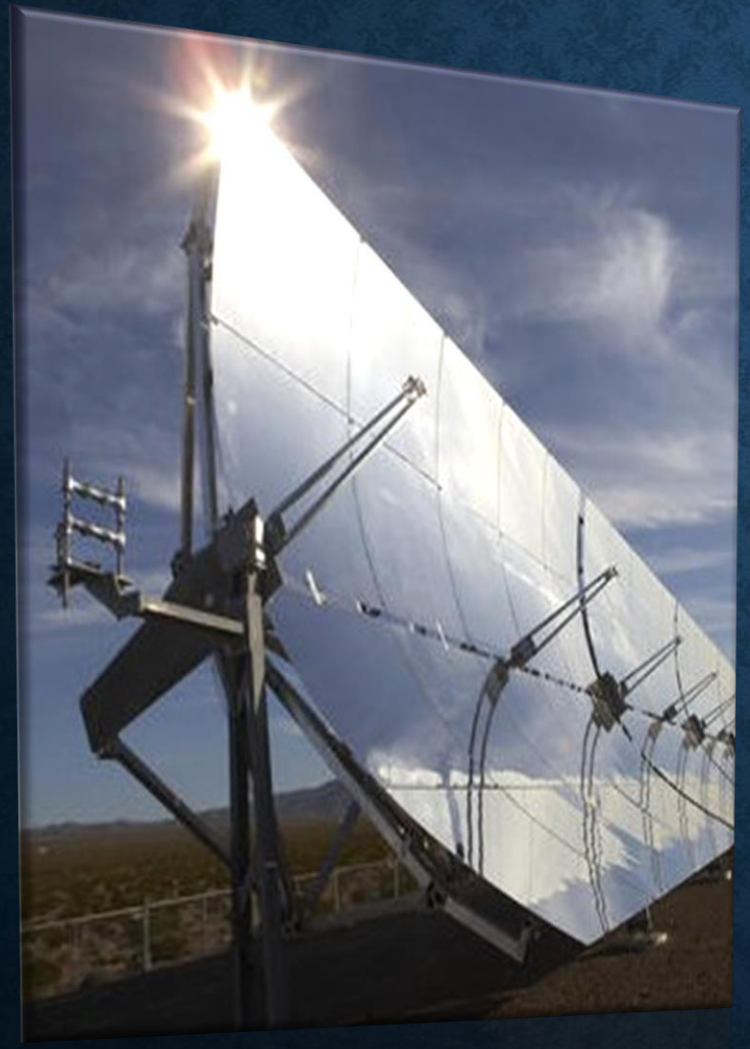
Electricity production

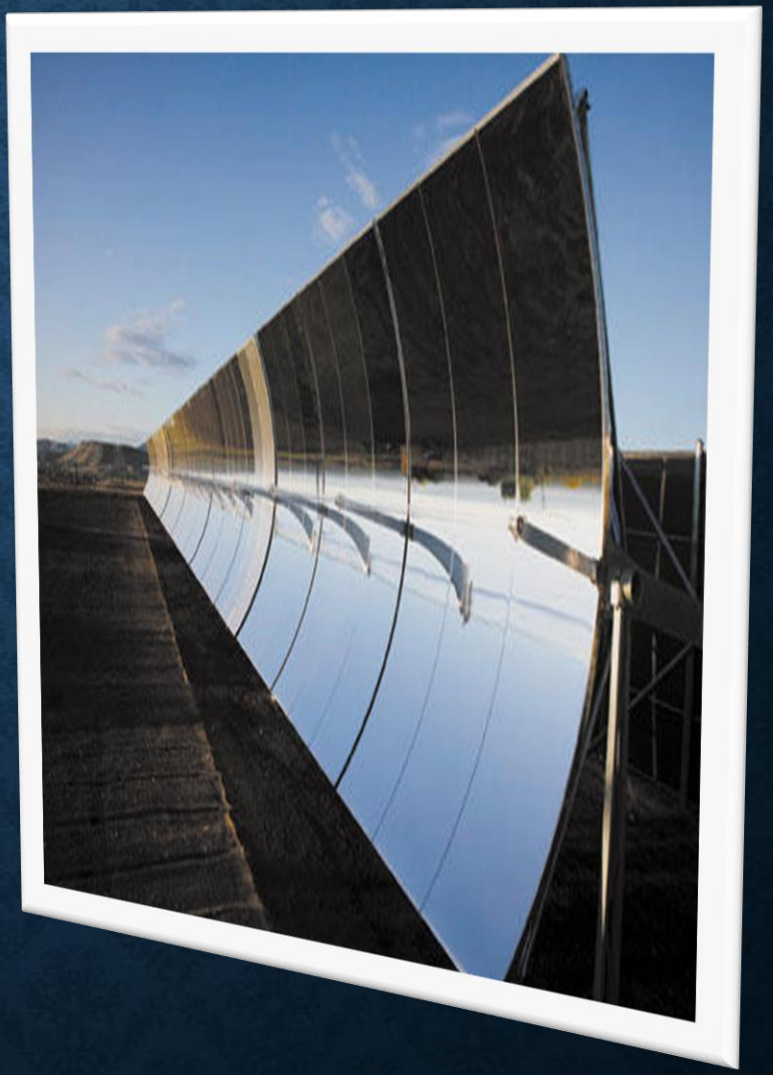
PASSIVE SOLAR

DAYLIGHTING

ACTIVE SOLAR HEATING

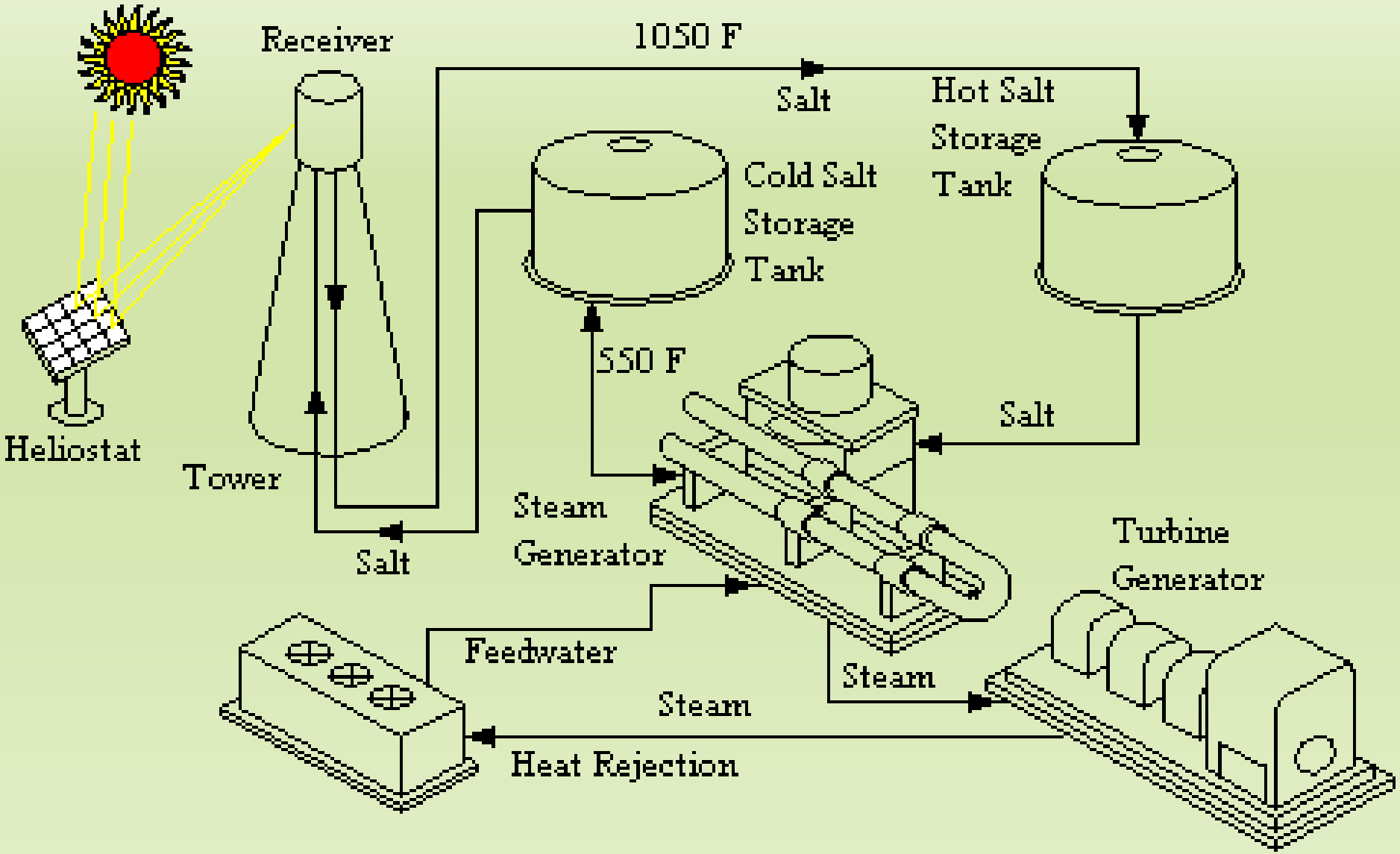
CONCENTRATING SOLAR POWER





POWER TOWER

HOW A POWER TOWER WORKS

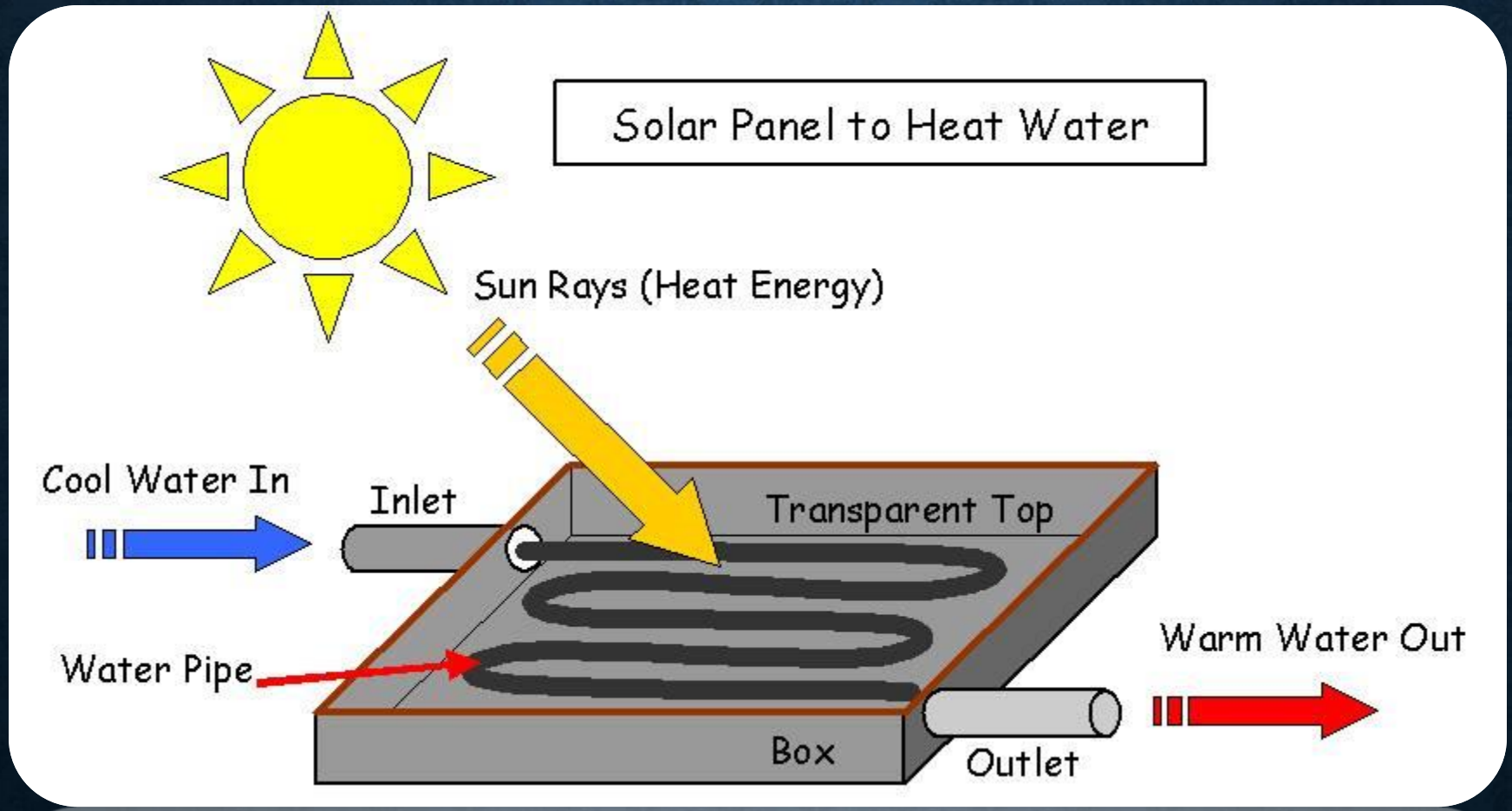


SOLAR THERMAL ENERGY

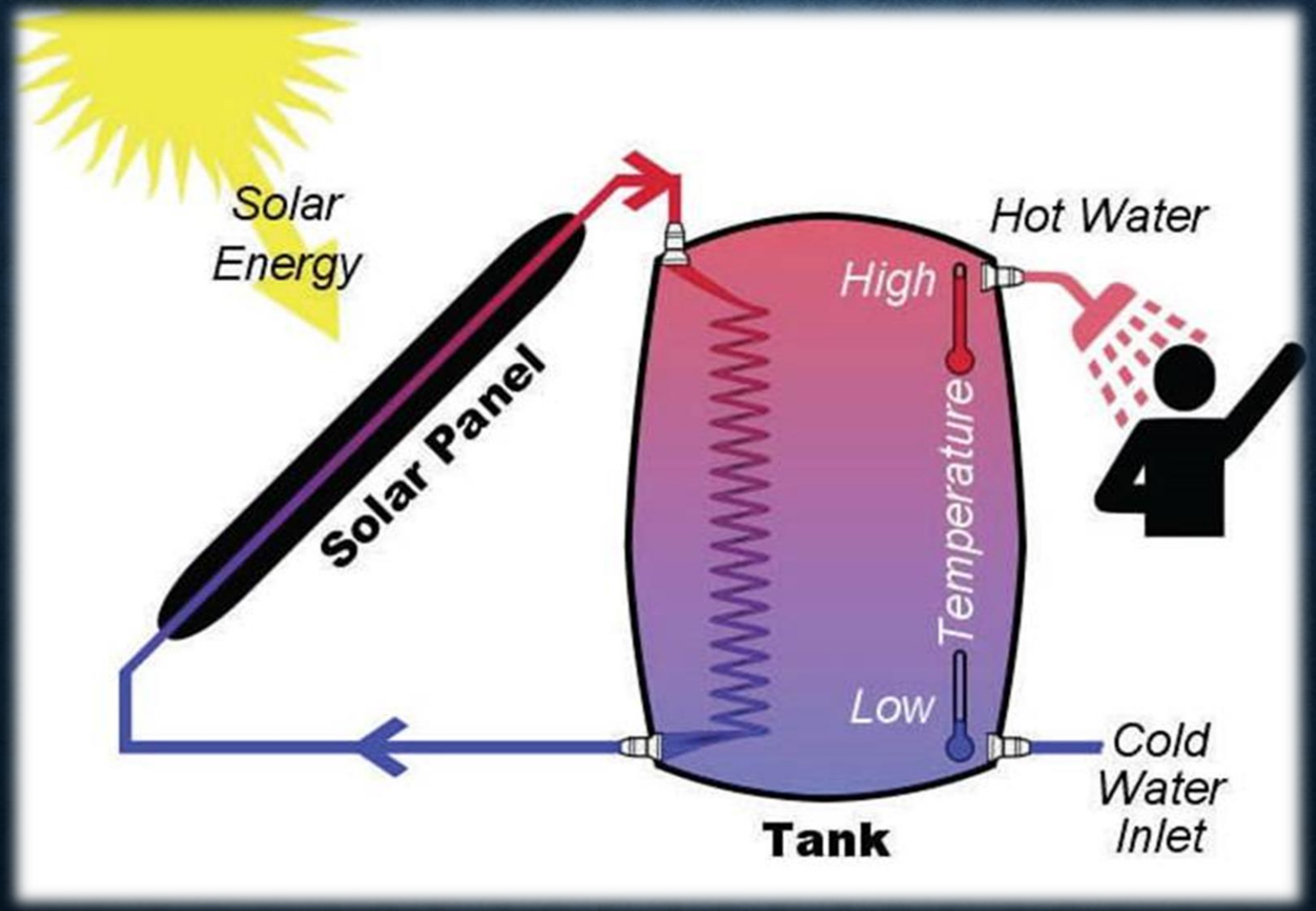
Cooking

Water Heating

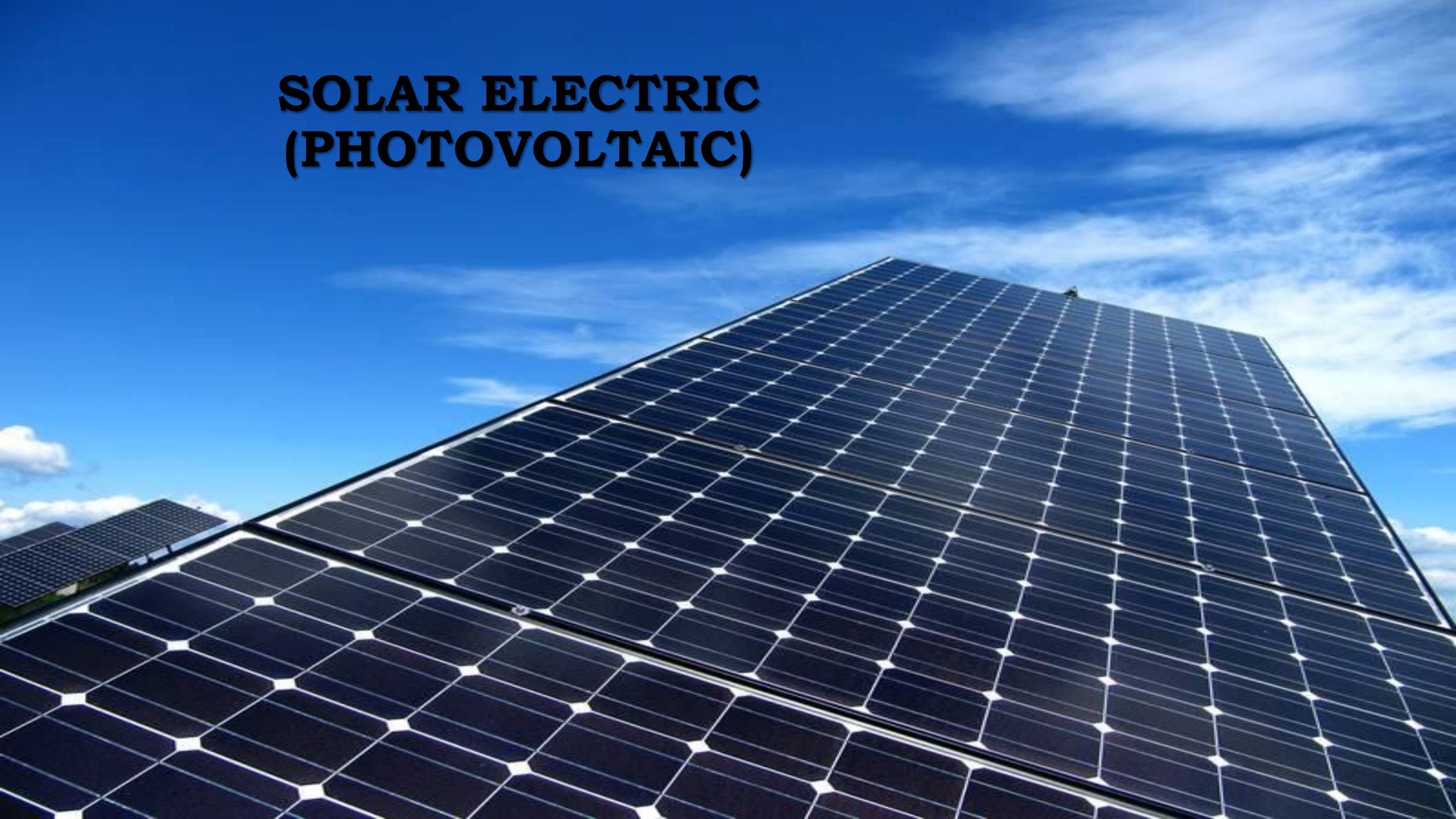
HOW DOES IT WORK?



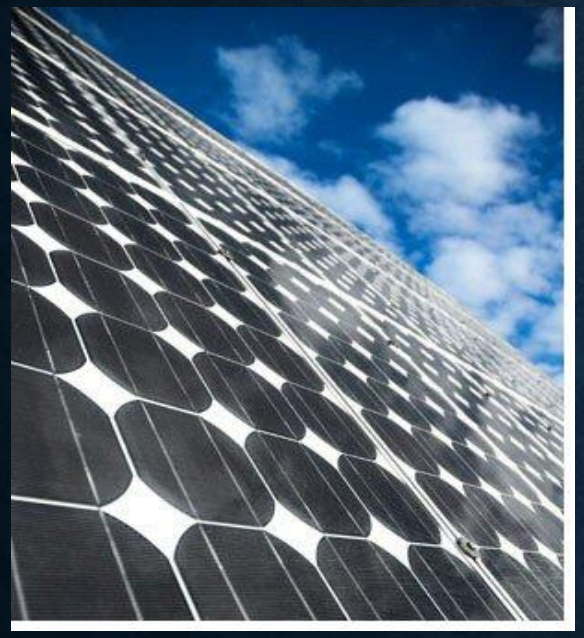
SOLAR WATER HEATING



SOLAR ELECTRIC (PHOTOVOLTAIC)



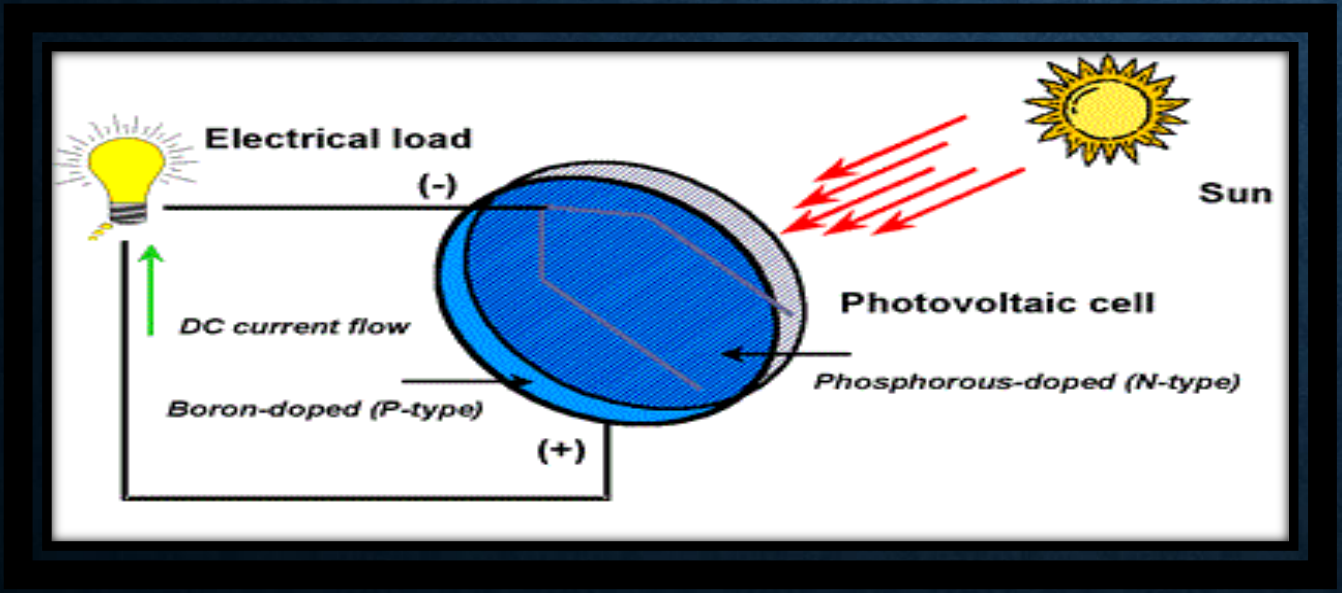
SOLAR ELECTRIC SYSTEMS



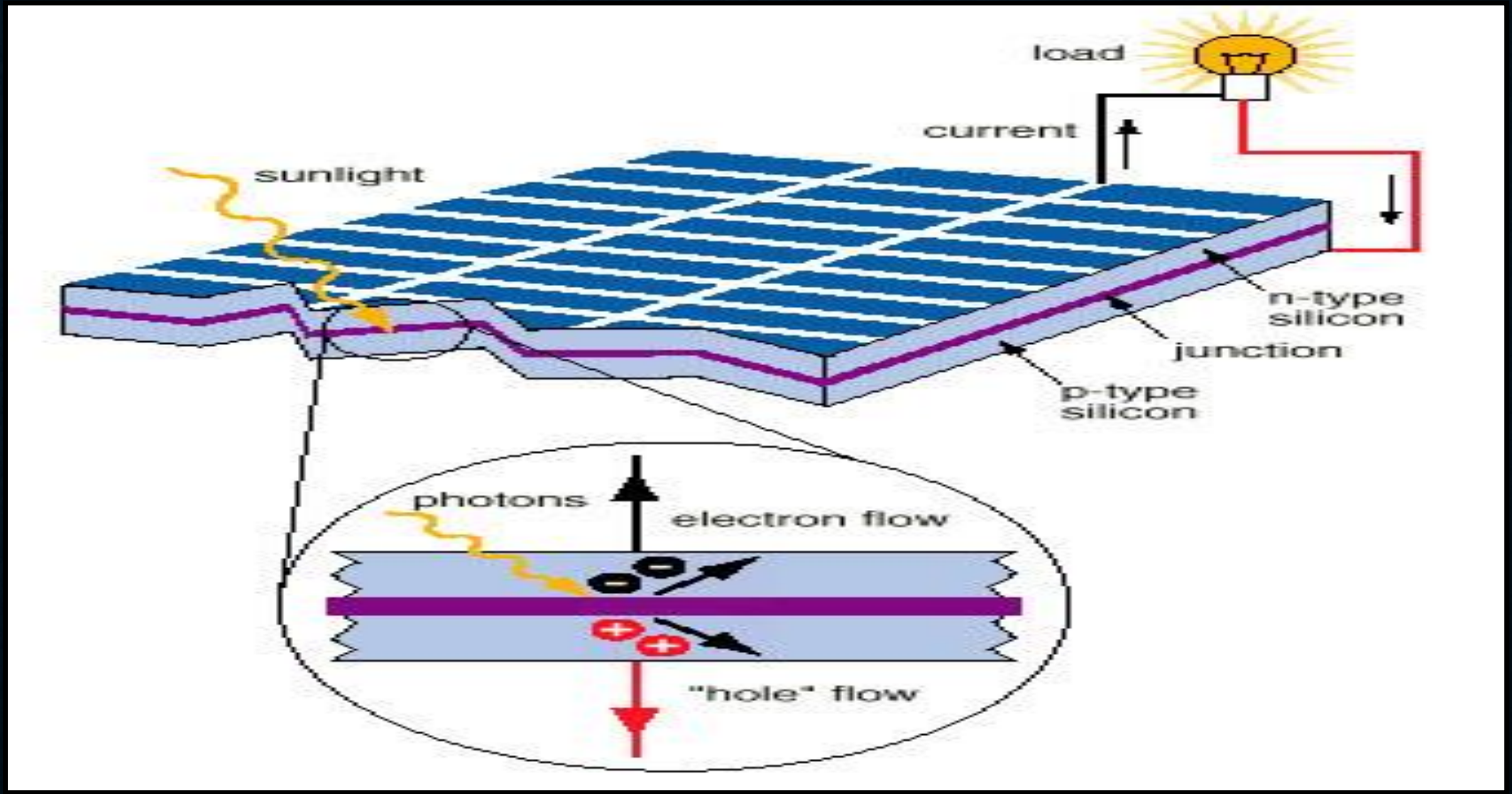
- **Photovoltaic (PV) systems convert light energy directly into electricity.**
- **Commonly known as “solar cells.”**
- **The simplest systems power the small calculators we use every day. More complicated systems will provide a large portion of the electricity in the near future.**
- PV represents one of the most promising means of maintaining our energy intensive standard of living while not contributing to global warming and pollution.

HOW DOES IT WORK?

- Sunlight is composed of **photons**, or bundles of radiant energy. When photons strike a PV cell, they may be reflected or absorbed (transmitted through the cell). Only the absorbed photons generate electricity. When the photons are absorbed, the energy of the photons is transferred to electrons in the atoms of the solar cell.



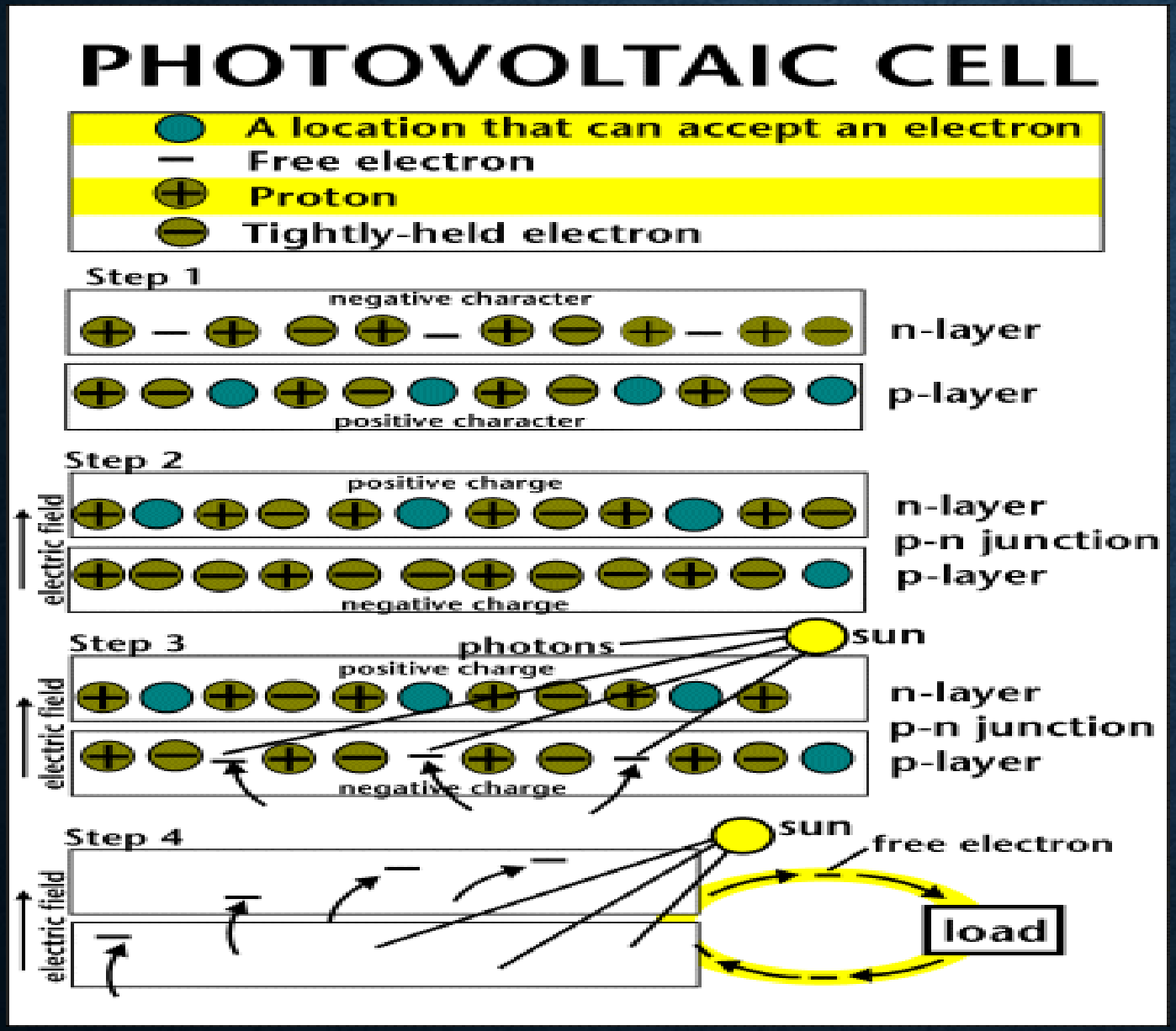
HOW DOES IT WORK?



HOW DOES IT WORK?

- Solar cells are usually made of two thin pieces of **silicon**, the substance that makes up sand and the second most common substance on earth.
- One piece of silicon has a small amount of boron added to it, which gives it a tendency to attract electrons. It is called the **p-layer** because of its positive tendency.
- The other piece of silicon has a small amount of phosphorous added to it, giving it an excess of free electrons. This is called the **n-layer** because it has a tendency to give up negatively charged electrons.

PV CELL


PHOTOVOLTAIC CELL
A location that can accept an electron
Free electron
Proton
Tightly-held electron
Step 1
negative character
n-layer
p-layer
positive character
Step 2
positive charge
electric field
n-layer
p-n junction
p-layer
negative charge
Step 3
photons
sun
positive charge
electric field
n-layer
p-n junction
p-layer
negative charge
Step 4
sun
free electron
electric field
load


RC 01
PV
EETS
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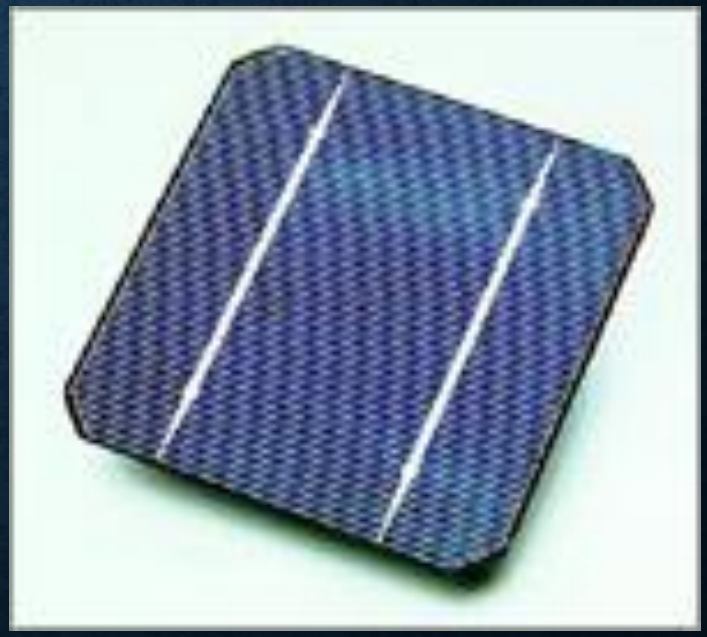
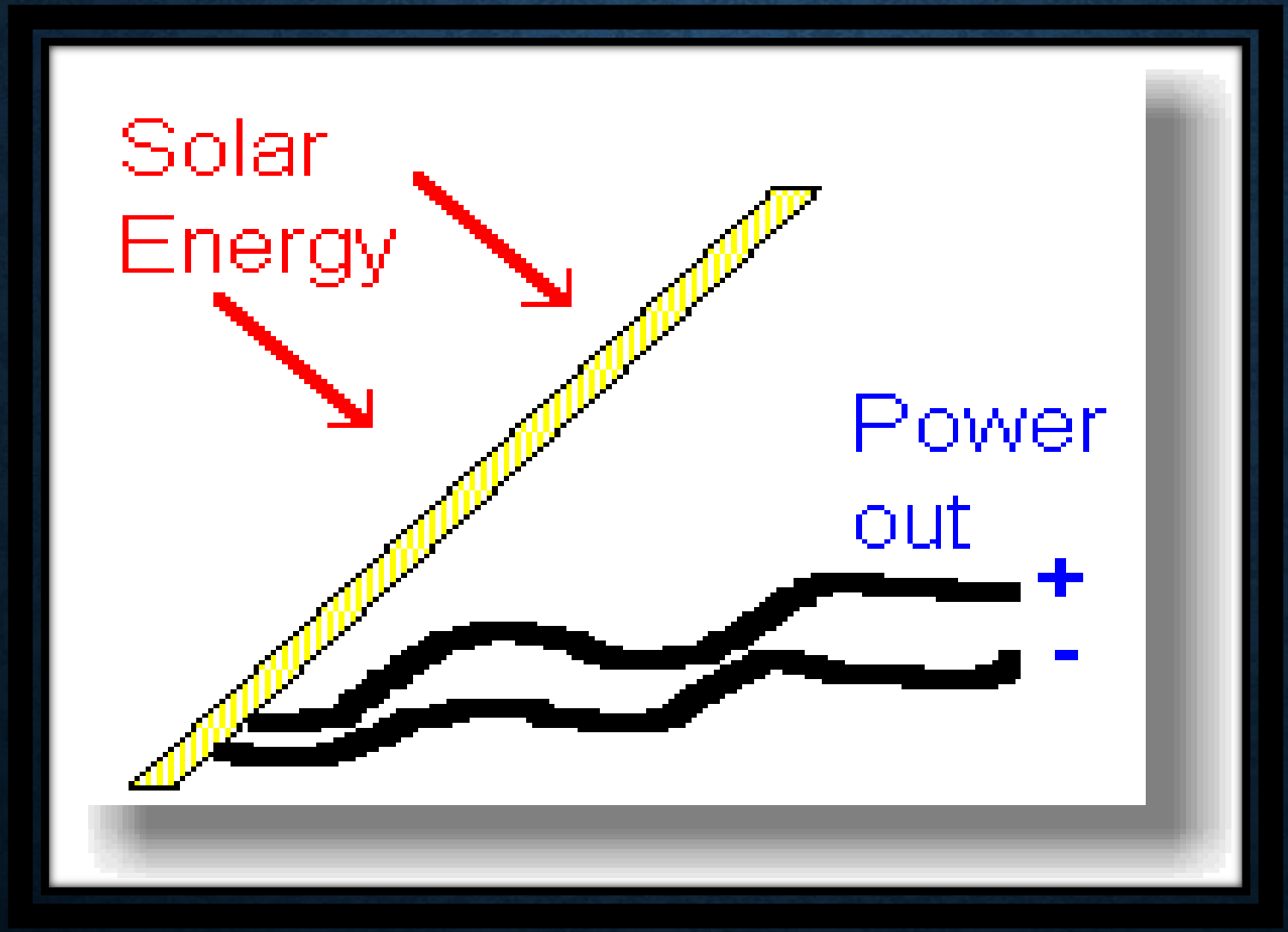
ENERGY
EQUIPMENT
TESTING SERVICE

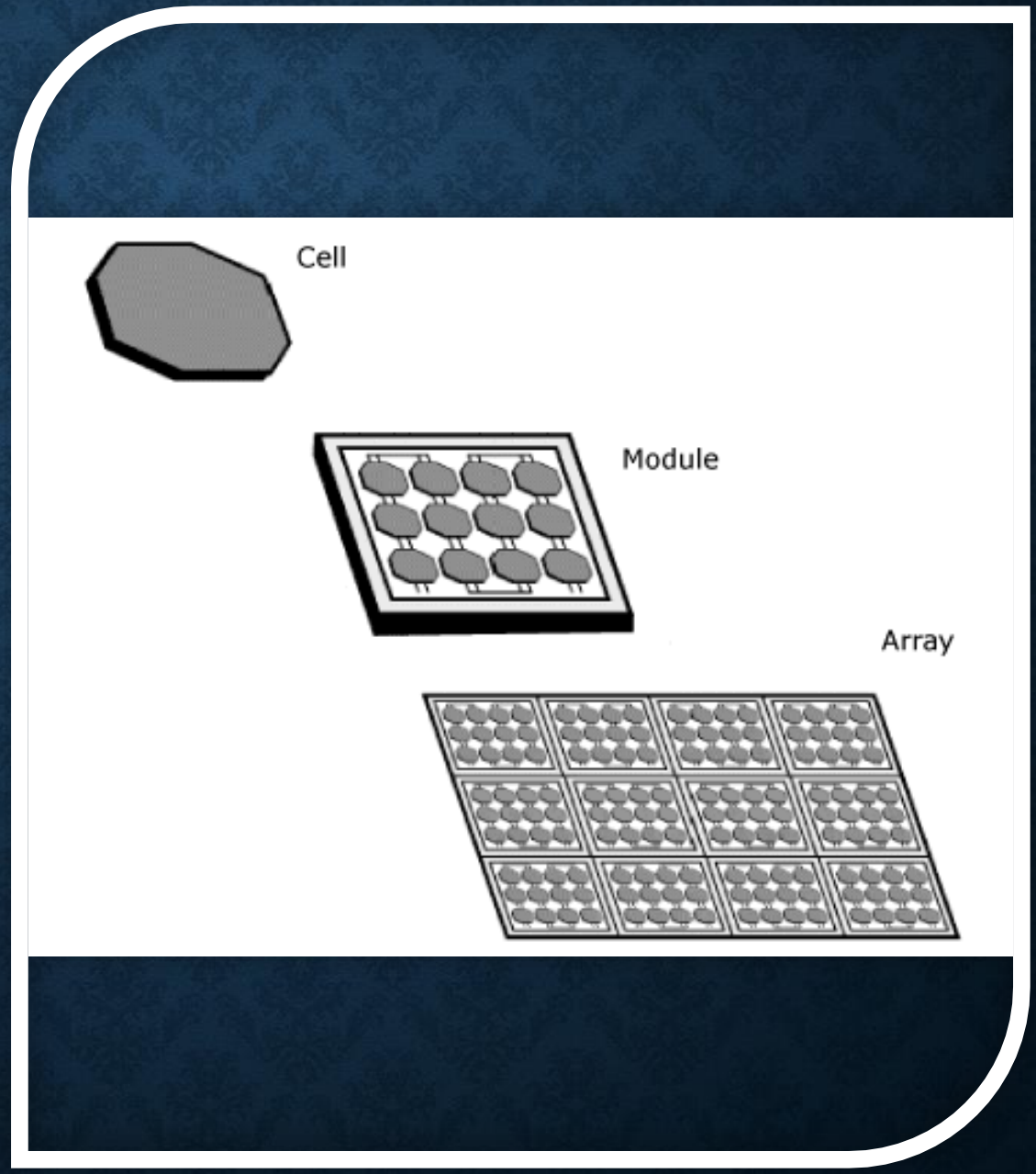


CONVERSION EFFICIENCY

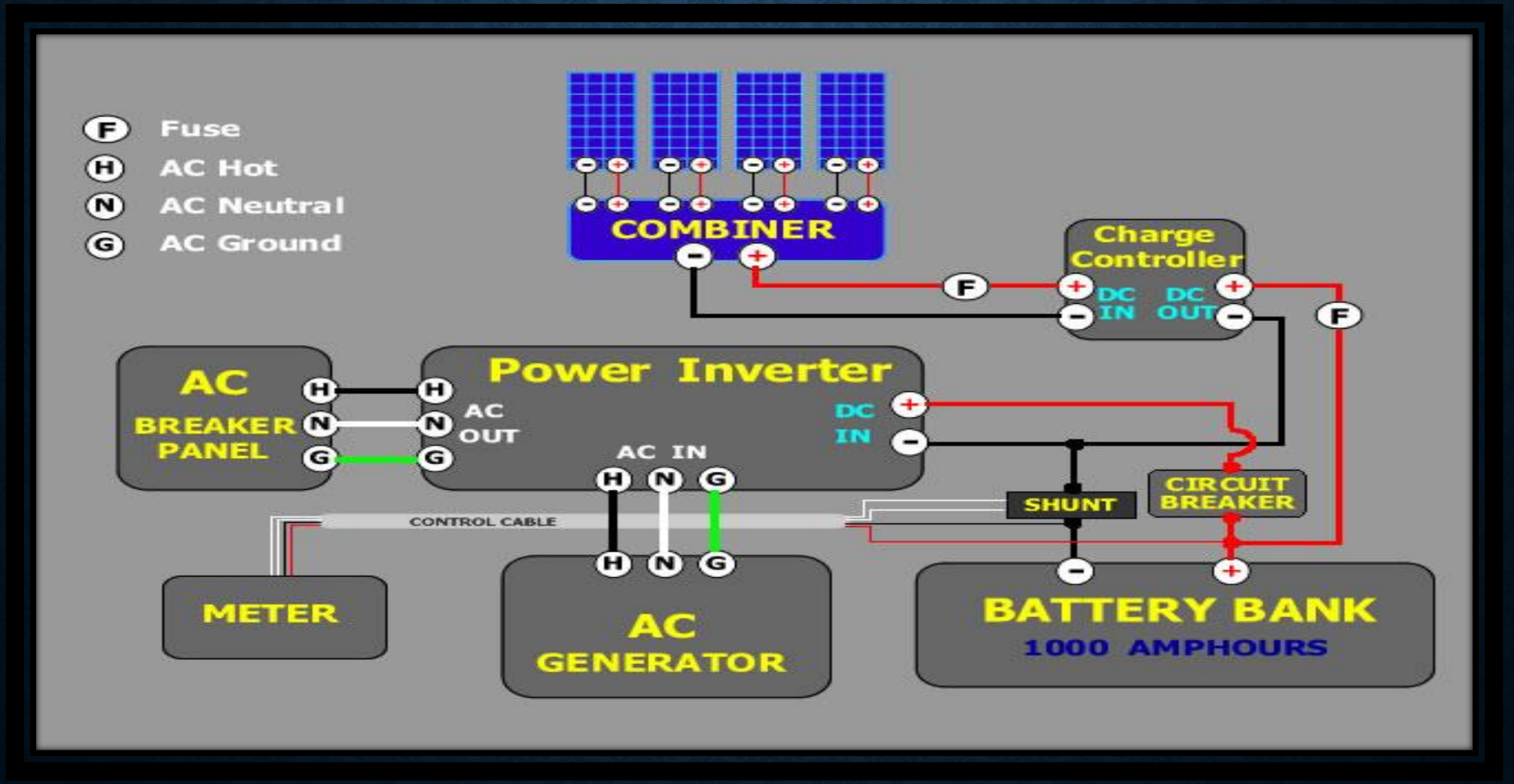


PV ARRAY COMPONENTS

- PV Cells
- Modules
- Arrays



THE BASIC COMPONENTS



MERITS

- Solar Energy is a renewable form of energy and tends to give us large amount of energy and light. Oil, on the other hand is not renewable and also degrades the environment.
- Solar energy is available free of cost.
- Solar cells are very silent in their working and they are quite efficient too,
- Solar energy equipment's do not emit any harmful gases or radiations. They are highly eco-friendly.
- Solar cells require very less maintenance and they have a long life too.

DEMERITS

- The initial set up cost of the solar panels is expensive.
- It not work at night or Absence of sunshine.

SELECTION CRITERIA

Let's assume you have a small load of 100 watts.

To figure out what size solar panel, batteries, charge controller and inverter you need, follow the simple steps below-

- Calculate how much energy is needed. 100 Watts x 10 hours = 1,000 Watt hours. That is the total energy you will need.
- Now calculate what size solar panel .Always choose the worst case scenario for your solar panel. In this case, go with a winter day of 5 hours sunlight. 1,000 Watt hours / 5 hours sunlight = 200 Watt solar panel.
- Calculate what size batteries you need. 1,000 Watt hours divided by 12 Volts = 83 Amp Hours of reserve battery power.

  1,000 / 12 = 83.3

  Select a larger size battery to be sure, say 100 Amp hours capacity.

CONTI…

- To figure what size solar charge controller is needed, take your solar panel wattage, which is 100 watts divided by 12 Volts.

  100 / 12 = 8.3 Amps.

  Always go larger, in this case use a 10 Amp solar charge controller.\

- Calculate what size inverter is needed. That's the easy part. You need to power a 100 Watt load, so select an inverter that has

  at least 100 Watts continuous power rating.

SCOPE OF SOLAR ENERGY

- It is the basic motor of all forms of energy generation methods.
- Since solar energy is available free of cost, so its utilization would definitely be very beneficial to a developing country like India.
- The gap between demand and supply of energy is ever increasing. One of the possible solutions to this would be to trap the solar energy, which can be used both directly and indirectly.
- There is ample scope for solar power in a tropical country like India. Its going to increase as the need for energy requirement is increasing and now itself the energy resources - mainly the Hyde, then the nuclear thermal- are over stressed.
- This form of energy is available in abundance in our environment. The fossil fuels are also mere frozen solar power.


THANKYOU ?