

★ Renewable Energy 18.1

Or How to Save the world from global warming and economic disaster!

★ Renewable Energy

What is it?

Sources of energy constantly being formed and replenished in a short amount of time

Can you name some?

★ Renewable Energy

Solar

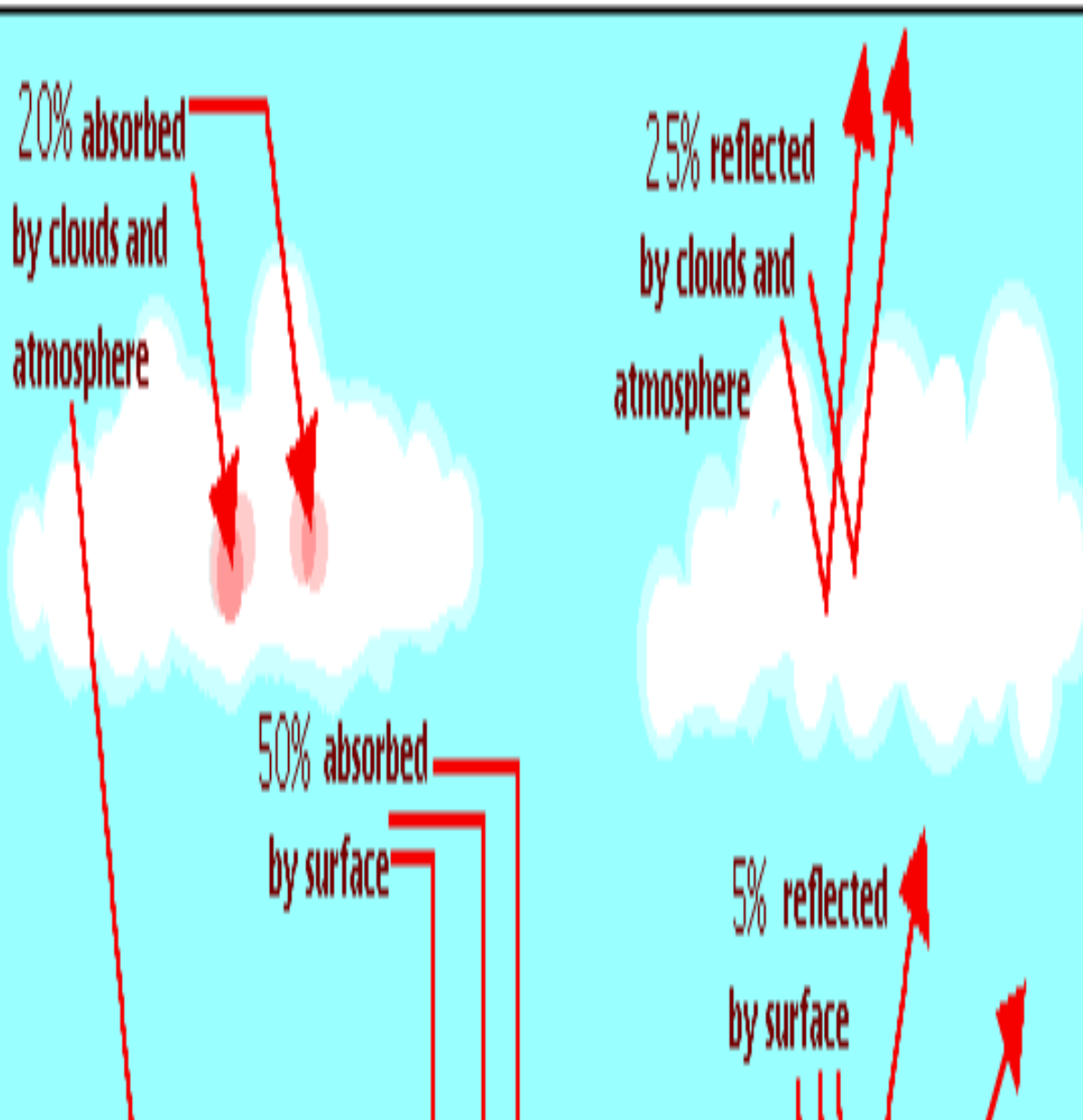
Wind

Water

Geothermal

★ Solar Energy - How?

- Sun is a yellow dwarf star (medium sized compared to others in galaxy)
- Powered by thermonuclear fusion at its core
- Releases immense amounts of energy
- Very little energy makes it to earth
- of the little sunlight that makes it only 50% reaches the surface



★ Solar Energy - Why?

Energy that does reach Earth powers:

water cycle

global and local winds

storms like hurricanes and tornados

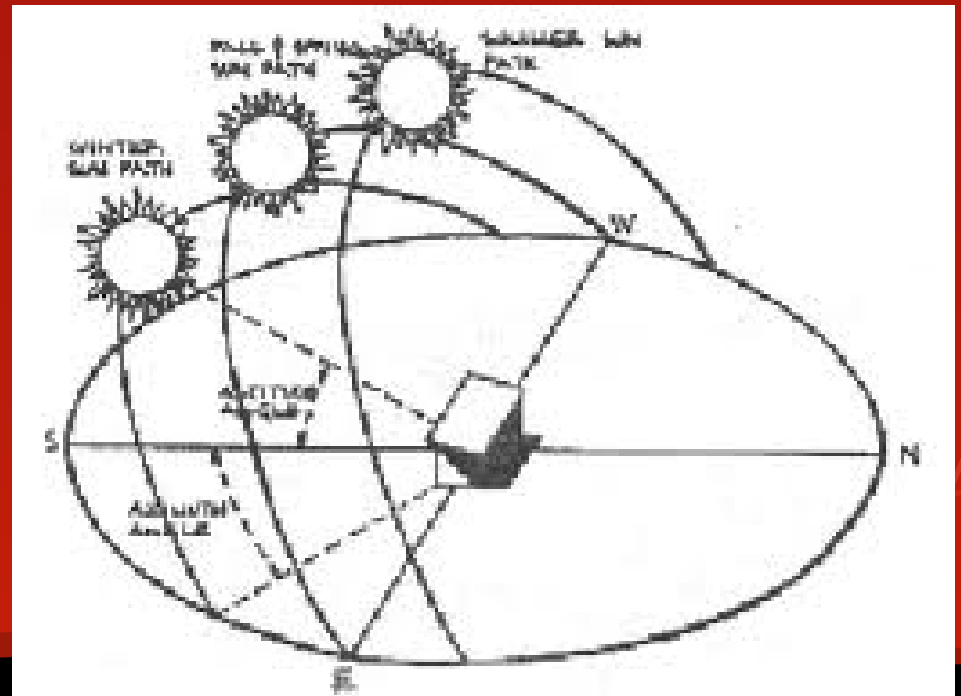
all global plant growth

Thus, it has a lot of potential

★ Solar Energy - Put to Use

Passive Solar Heating - Buildings are designed to absorb sunlight and re-emit heat energy over time or deflect energy to keep cool in winter

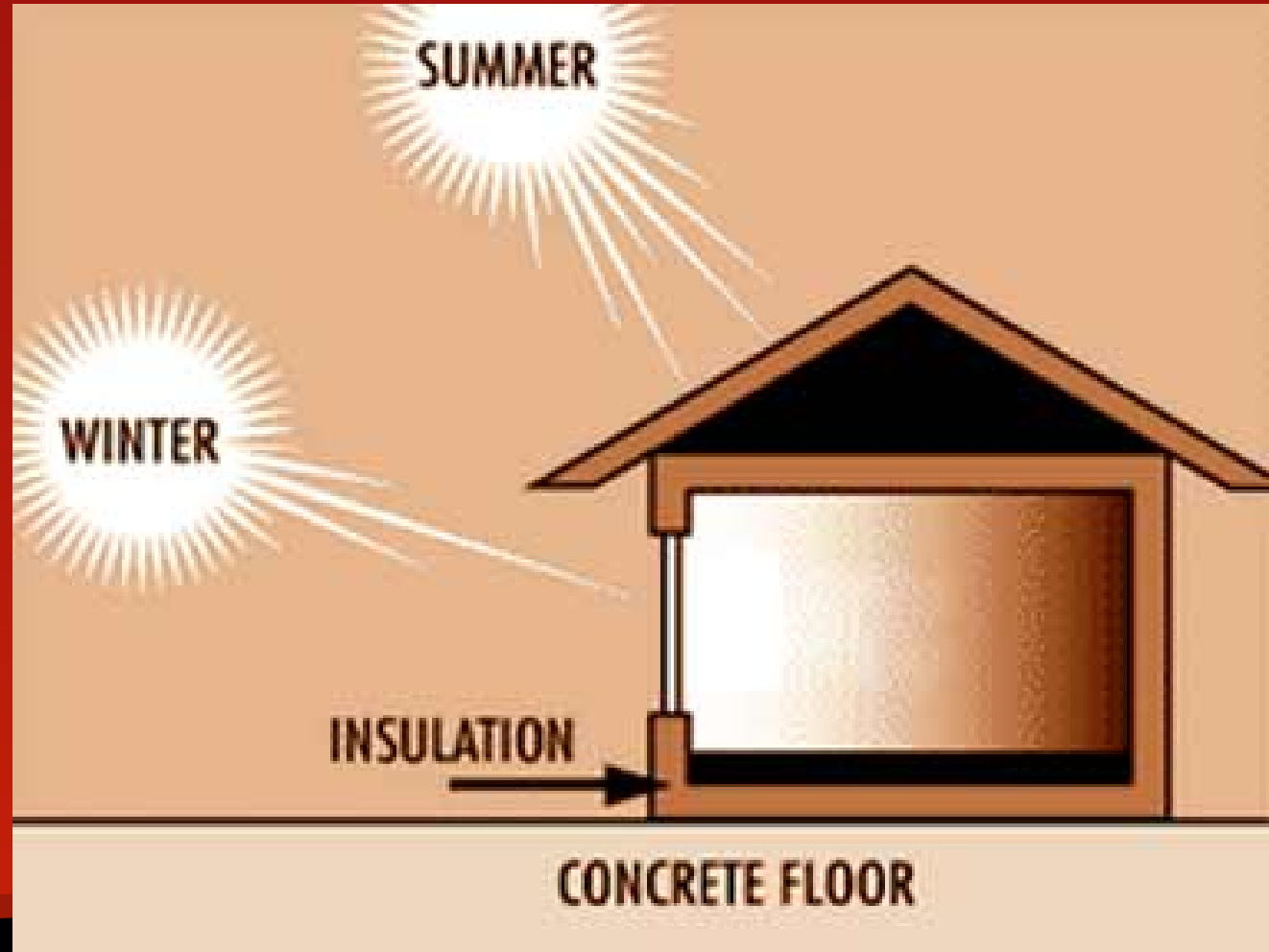
Sun angle changes with seasons



★ Solar Energy - Put to use

Sunlight
penetrates
house in
winter

Deflected
by roof in
summer



★ Solar Energy - put to use

Thermal Mass -

- Floor or walls built with thick stone or concrete that absorbs energy, stores energy and releases energy over time
- High Specific Heat Capacity
- Southern Exposure - windows face south

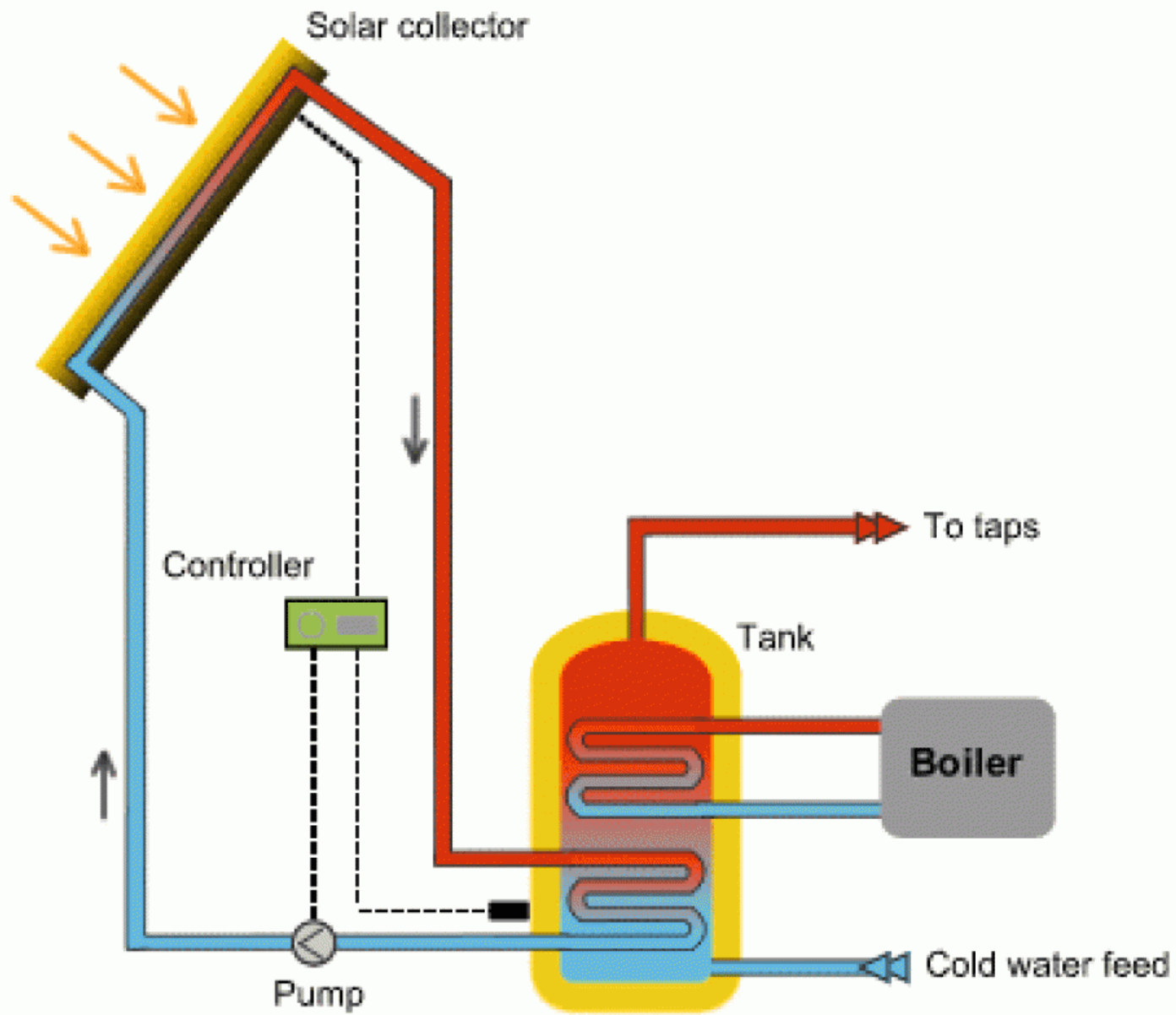
★ Solar Energy - Put to use

Active Solar Heating -

Solar Collector - Sun energy is captured usually on the roof of a house

Heated fluid is pumped into the house

Energy is transferred to water supply to make household hot water



★ Solar Energy - Put to use

8% of total energy in USA is used to heat water in homes

Considerable energy savings for USA

★ Solar Energy - Put to use

Photovoltaic Cells -

Photo= light voltaic = electricity
electricity made from sunlight



★ Solar Energy - Put to use



★ Solar Energy - Put to use

Sunlight shines on silicon panel

Excites electrons

Causes electron flow

electron flow = electricity

★ Wind Power -

Sun heats earth

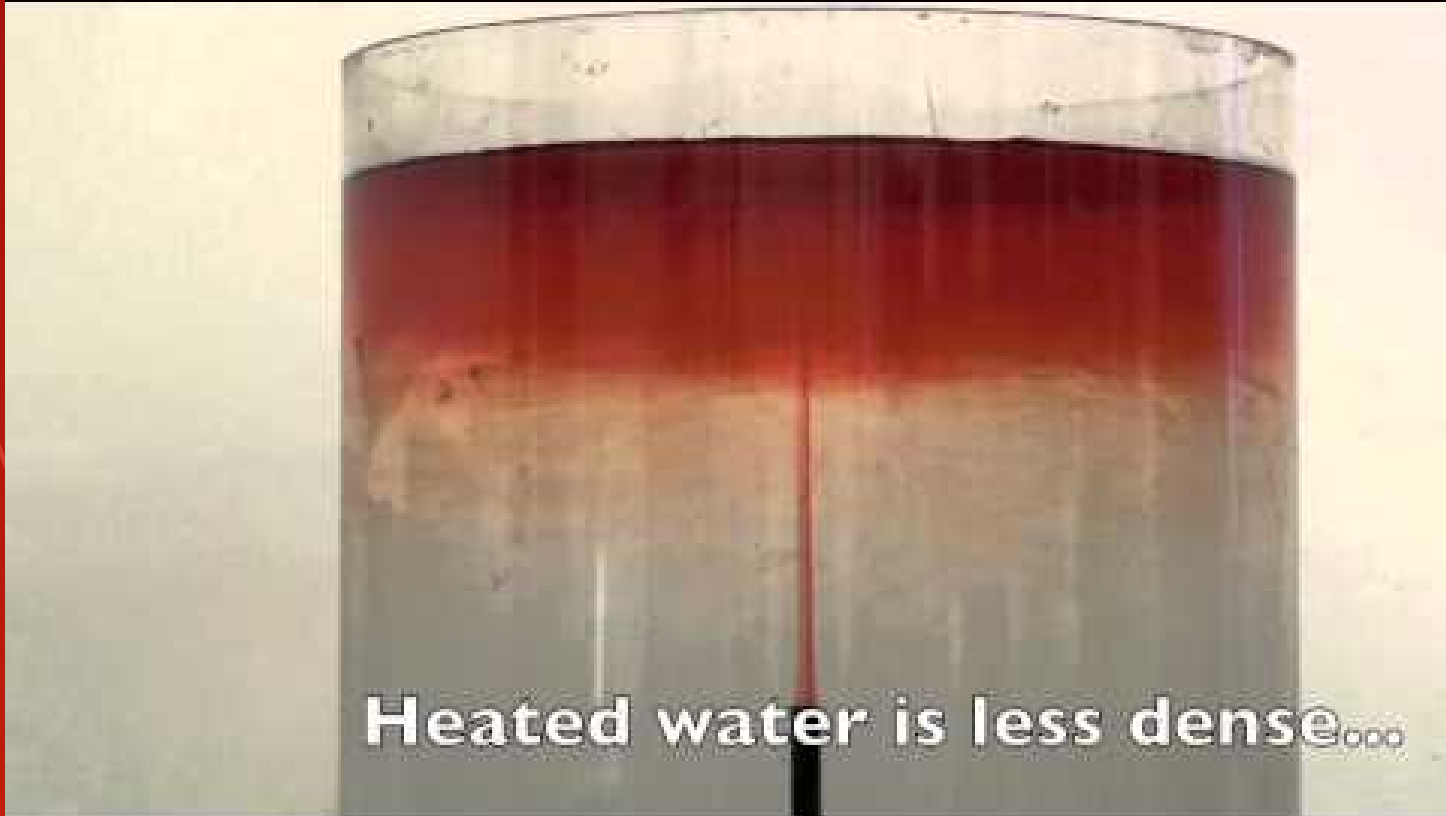
Some land areas absorb more energy, some less energy (surface - dark vs. light)

Heated air rises, cool air sinks

Convection currents cause wind currents

Global and local wind patterns are predictable

★ Convection and Wind



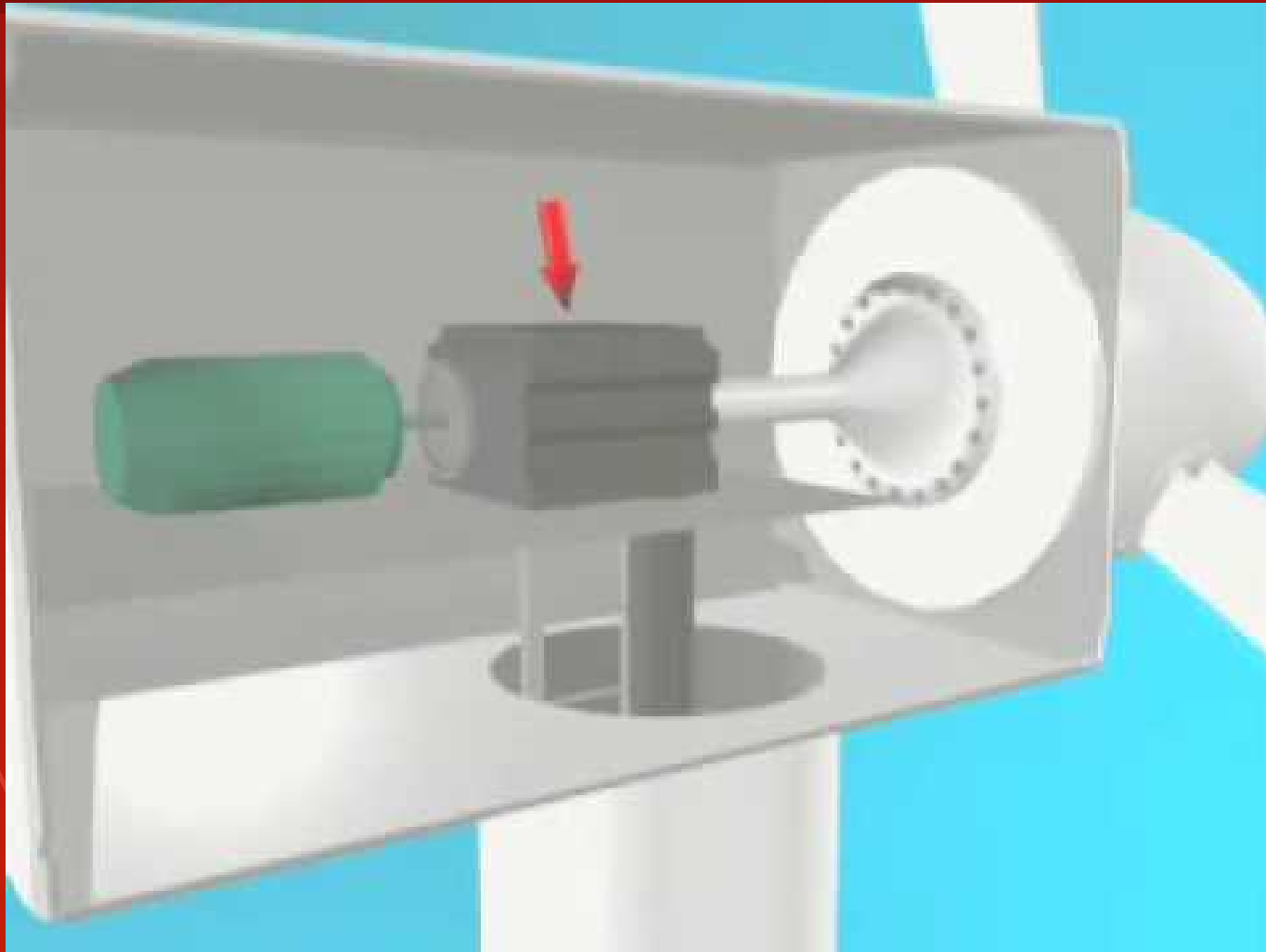
Heated water is less dense ©

★ Wind Power

Large Fan blades turn with the wind
Generators convert energy into electricity



★ How does a Wind generator work?



★ Wind Power

Wind Farms - large arrays of turbines

"Scientists estimate that the windiest places in the world could generate more than 10 times the energy used worldwide"

★ Wind Power

Cons:

- Electricity cannot be transported long distances (loss due to friction / heat)
- Wind Farms are remotely located must place turbines in windy locations (i.e. high altitude, open areas)

Pros:

- Electricity can be stored
 - Wind farms can generate hydrogen gas (by electrolysis) which can be transported or piped to cities
- Small footprint; can place on farms with crops

★ - Biomass

Biomass Fuel - any source of power from living things

Can you name some?

★ Biomass

Wood - big source with developing countries
Dung

Problem:

- A. If wood is used faster than it is replaced it harms the environment (how?)
- B. Produces pollution (what type?)

★ Biomass

Methane - decomposition of waste creates this flammable gas (same as natural gas)

collected from manure, landfills



Alcohol - a liquid fuel created from the fermentation of farm waste or fruit

Corn is a major source

Today 10% of our gasoline is ethanol

★ Hydroelectricity

Use of moving water to spin a turbine generator

Water has gravitational potential energy

Dam can hold back water and force through a turbine

Today 20% of our energy comes from hydroelectric sources

◆ Hydroelectricity

Tidal Energy - harness the movement of the tidal waters to generate electricity

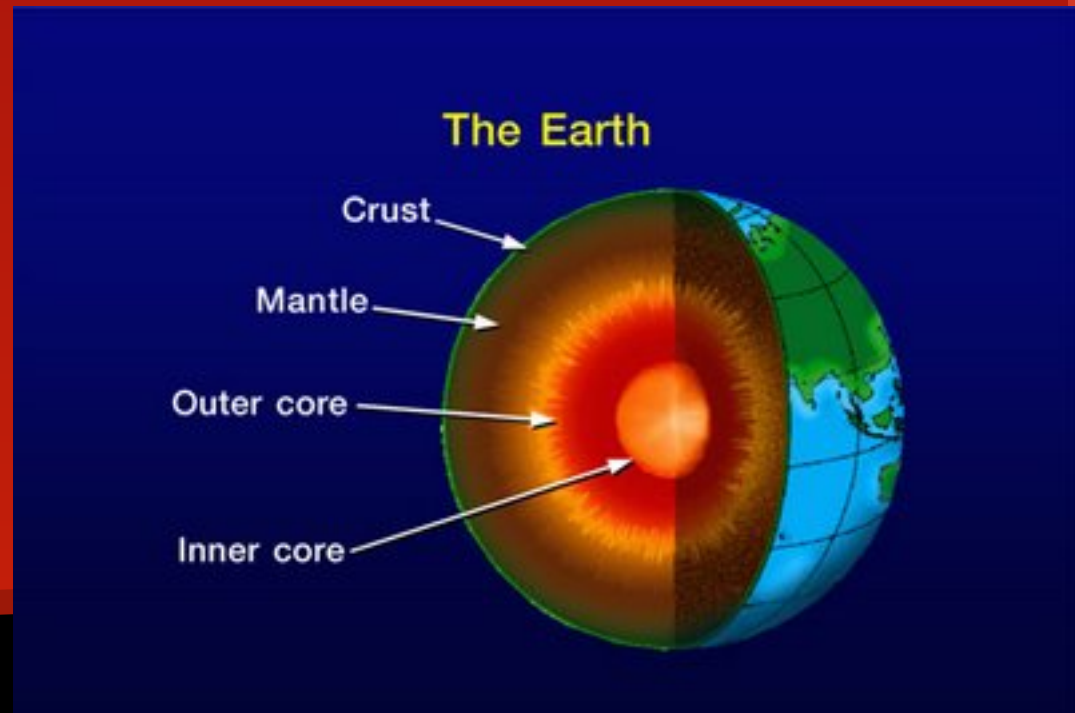


★ Geothermal Energy

Geo - Earth

Thermal - heat

Geothermal - heat energy from the Earth's crust



★ Geothermal Energy

Industrial Usage -

1. Steam is captured from deep inside earth
2. Steam pushes a turbine to generate electricity
3. Condensed water is returned to the Earth

US is largest producer of geothermal energy!

★ Geothermal Energy

Residential Usage -

Geothermal Heat Pump

- Uses loop of piping that contains fluid
- Ground maintains its temperature throughout the seasons (50 - 60 deg. F)
- Heats house in winter
- Cools house in summer

