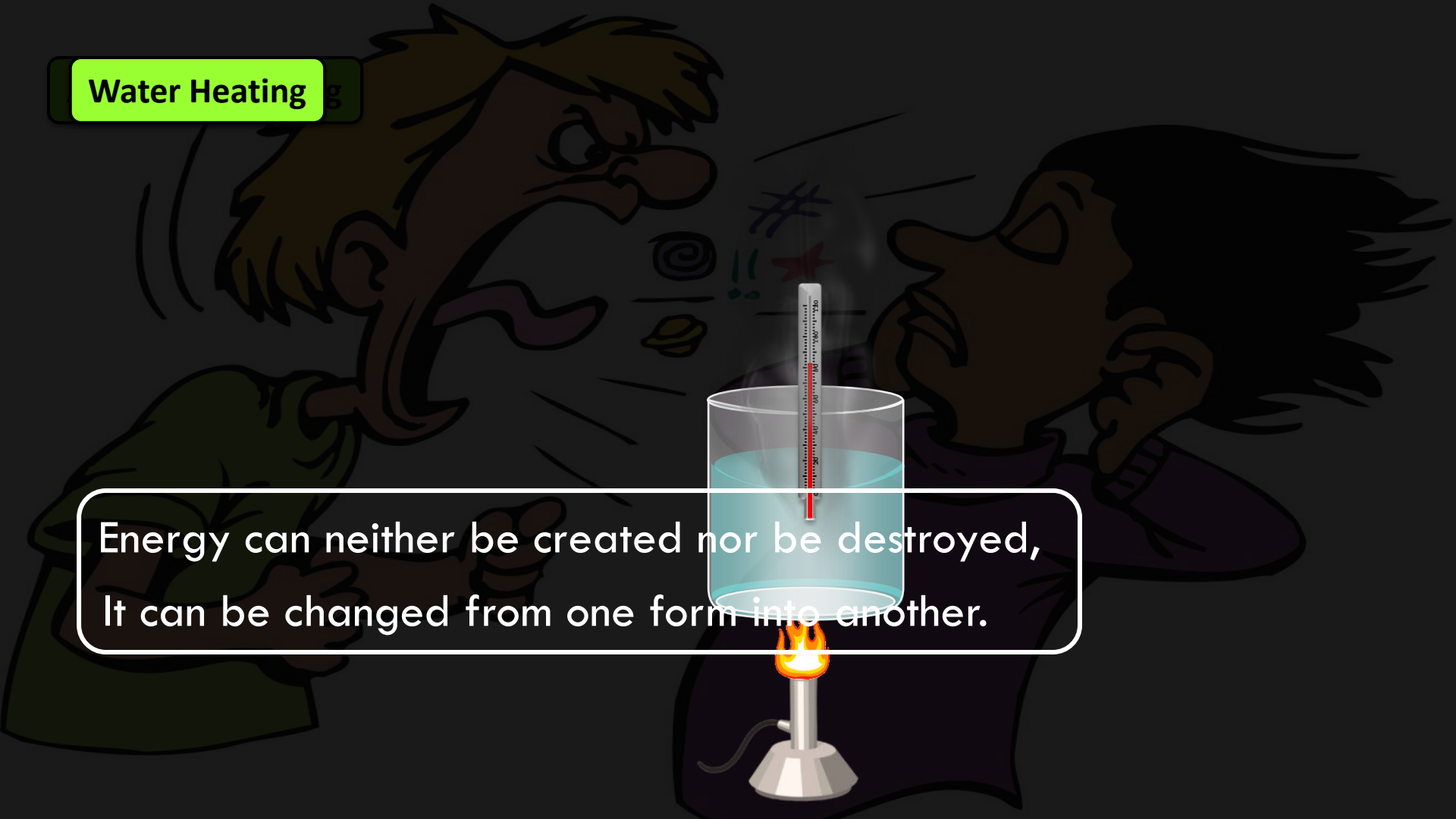
Lec - 1

SOURCES OF ENERGY

Water Heating



Energy can neither be created nor be destroyed,

It can be changed from one form into another.

ENERGY DEGRADATION

The gradual decrease of useful energy due to radiation loss, friction, etc. is called the degradation of energy.

EXAMPLES OF ENERGY DEGRADATION

1. Light Bulb using electricity

25% OF THE ELECTRICAL

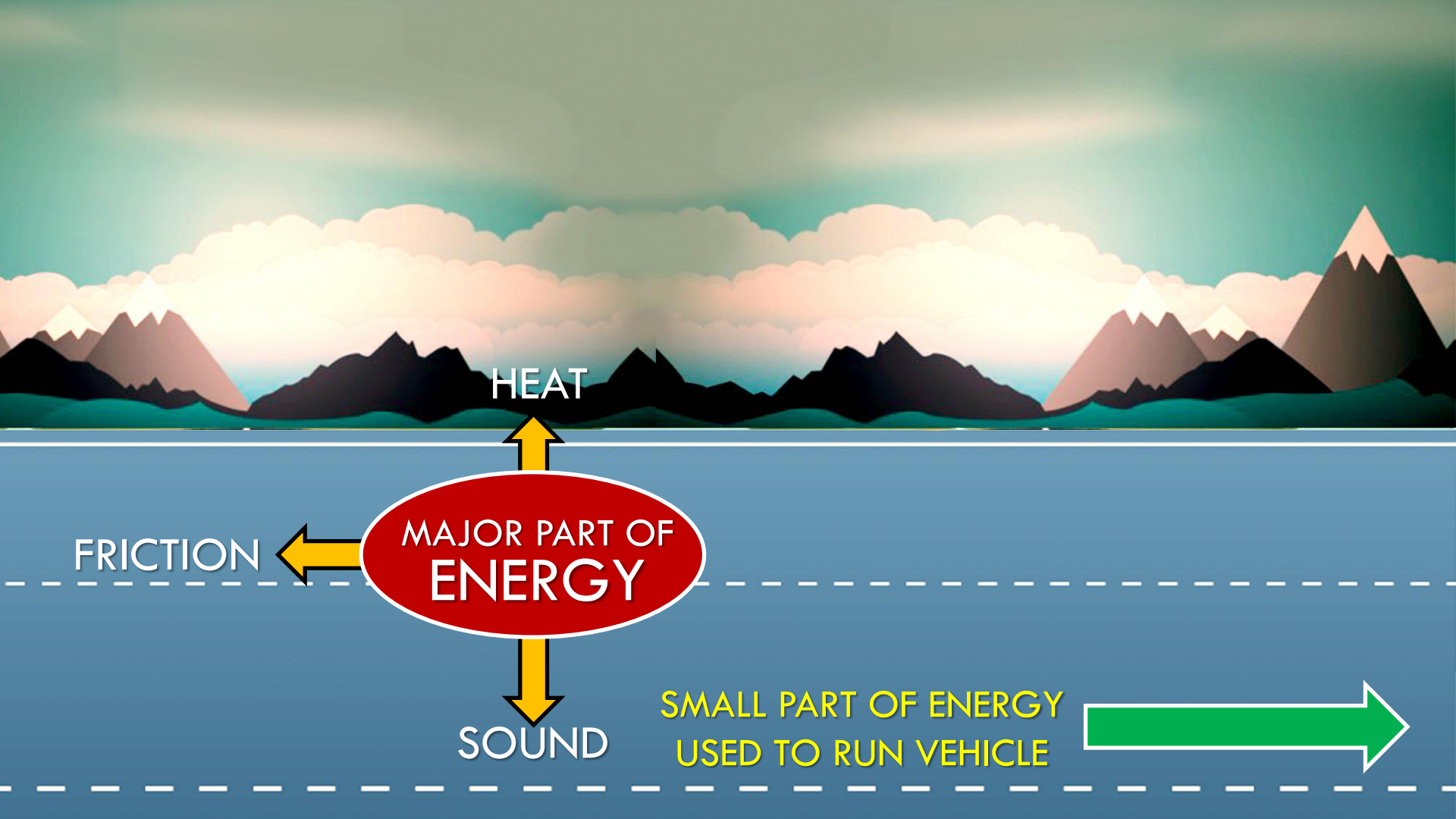
LIGHT ENERGY

MAJOR PART CONVERTS INTO HEAT

EXAMPLES OF ENERGY DEGRADATION

1. Light Bulb using electricity

2. A Running vehicle


HEAT
FRICTION
MAJOR PART OF
ENERGY
SOUND
SMALL PART OF ENERGY
USED TO RUN VEHICLE

EXAMPLES OF ENERGY DEGRADATION

ectricity

es runni

ELECTRICAL ENERGY

HEAT

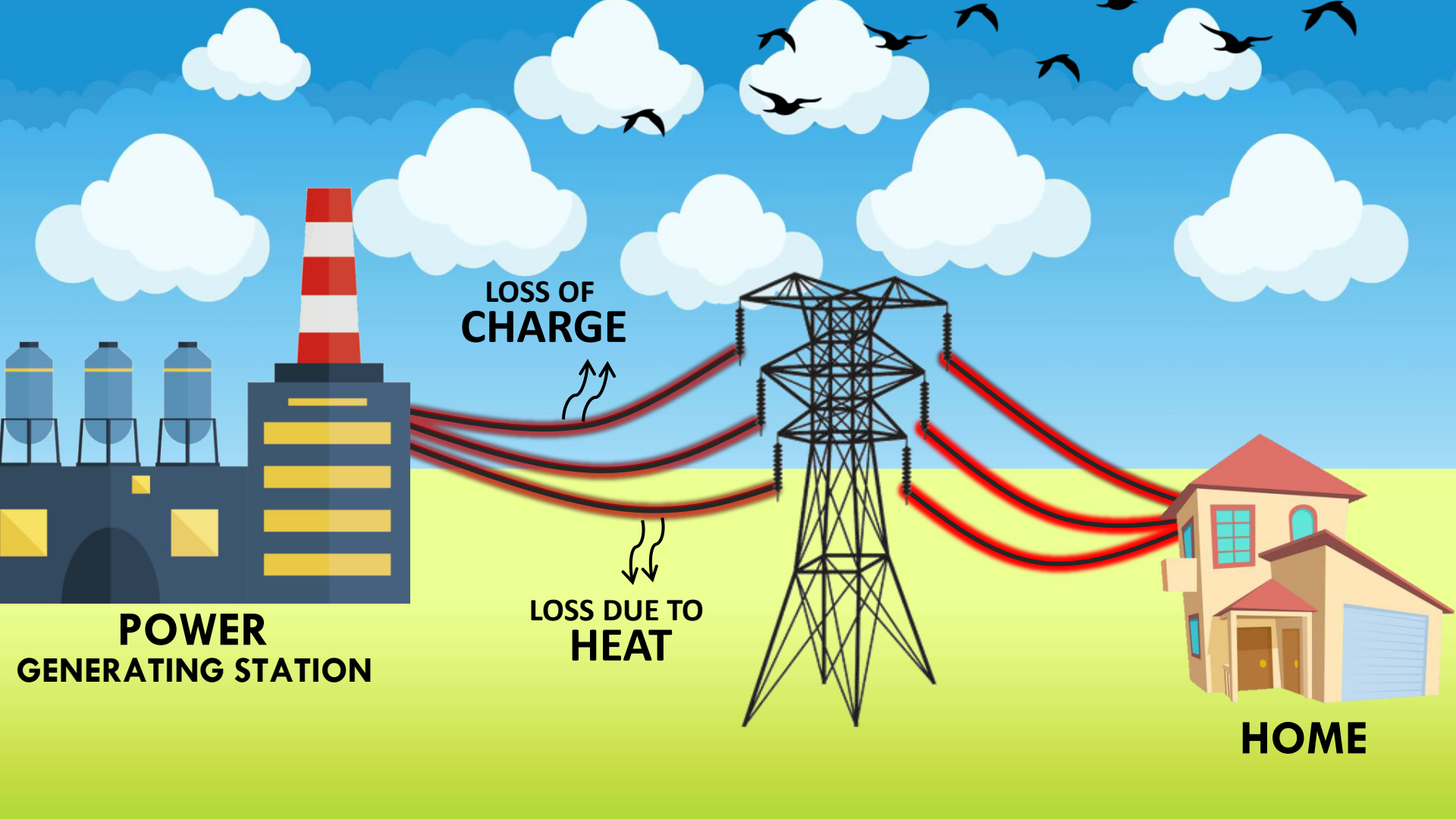
EXAMPLES OF ENERGY DEGRADATION

1. Light Bulb using electricity

2. A Running vehicle

3. Electrical appliances running on electricity

4. Transmission of electricity from power generating station


LOSS OF
CHARGE
LOSS DUE TO
HEAT
POWER
GENERATING STATION
HOME

Chemical Energy Is Used To Run The Trains

Q. **What are the qualities of an ideal source of energy?**

Q. **If you could use any source of energy for heating your food, which one would you use and why?**

Ans:

- Natural gas can be used for heating and cooking food as it is a clean source of energy.
- It has high calorific value also it does not produce a large amount of smoke on burning.
- It is easy to use and easy to transport.

Q. What is a good fuel?

Ans: Characteristics of an ideal fuel are :

1. High calorific value.
2. Burn without creating pollution.
3. Proper ignition temperature.
4. Economical and easily available.
5. It should be easy to handle, safe to transport and convenient to store.
6. Burn smoothly at a steady rate.

Q. **Hydrogen has been used as a rocket fuel. Would you consider it a cleaner fuel than CNG ? Why or why not ?**

Ans:

- Hydrogen is a cleaner fuel than CNG. This is because burning of hydrogen produces only water, which is totally harmless.
- On the other hand, burning of CNG produces carbon dioxide gas and water.
- This carbon dioxide can produce greenhouse effect in the atmosphere and lead to the excessive heating of the environment in the long run.

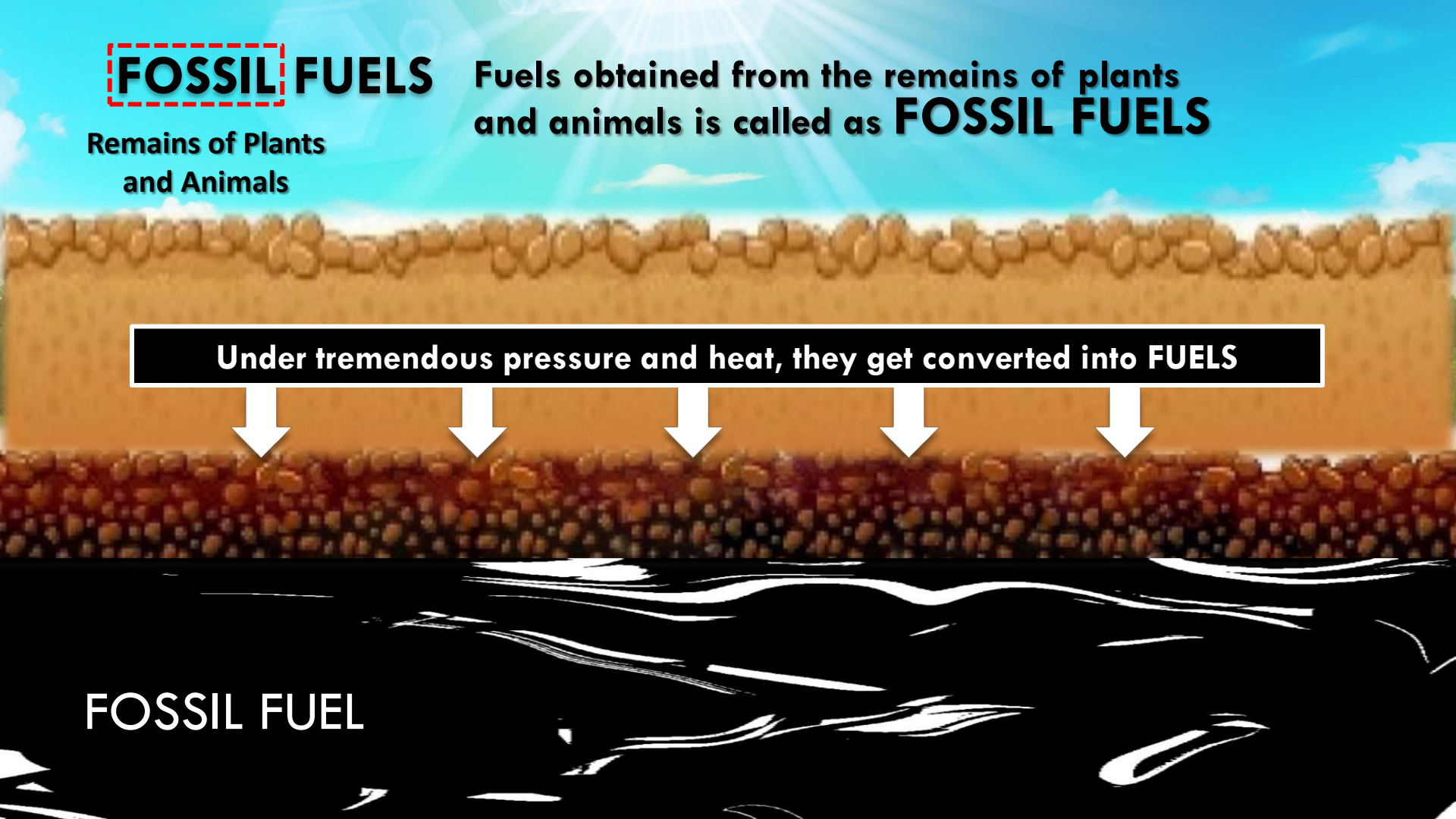
NATURAL GAS

Solar Energy gets stored in the Plants and Animals in the form of CHEMICAL ENERGY

FOSSIL FUELS

Remains of Plants and Animals

Fuels obtained from the remains of plants and animals is called as **FOSSIL FUELS**



Deposits of Fossil Fuels are limited

Lakhs of years ago, remnants of plants and animals got buried into the Earth

They were converted into Fossil Fuels due to tremendous pressure of the Earth's layer and the Heat inside.

As this process does not take place in a short time, the deposits of fossil fuels are limited.

Energy cycle

Non-renewable or
Conventional sources of energy

The sources of energy which have accumulated in nature over a very long period and cannot be quickly replaced when exhausted, are called the **non-renewable or conventional.**

They are formed by the decomposition of the remains of plants and animals buried under the earth, millions of years ago.

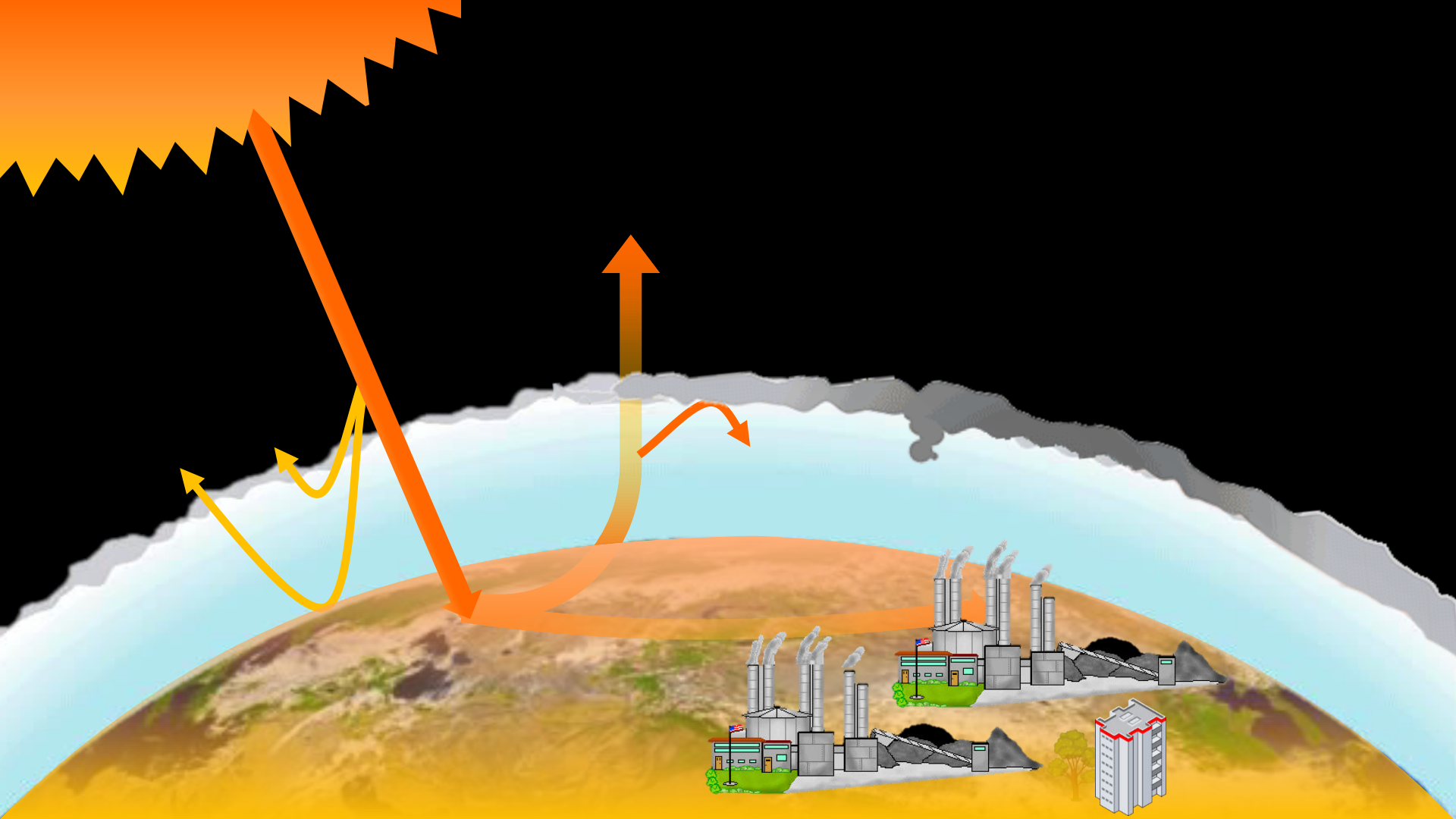
HARMFUL EFFECTS OF BURNING FOSSIL FUELS

1. POLLUTION


Companies release smoke
causing AIR POLLUTION

HARMFUL EFFECTS OF BURNING FOSSIL FUELS

1. POLLUTION
2. GLOBAL WARMING



HARMFUL EFFECTS OF BURNING FOSSIL FUELS

1. POLLUTION
2. GLOBAL WARMING
3. HOLE IN THE OZONE LAYER
4. ACID RAIN

HARMFUL EFFECTS OF

BURNING FOSSIL FUELS

1. POLLUTION
2. GLOBAL WARMING
3. HOLE IN THE OZONE LAYER
4. ACID RAIN
5. Destruction of Diversity

Q. What are the disadvantages of fossil fuels?

Q. Why are we looking at alternate sources of energy?

Ans:

- Fossil fuels that are traditionally used as a source of energy everywhere are nonrenewable.
- They are limited in amount and once exhausted, they won't be available again.
- Thus, there is a need to look for alternate sources of energy.

Thank You

Lec - 2

THERMAL
POWER PLANT

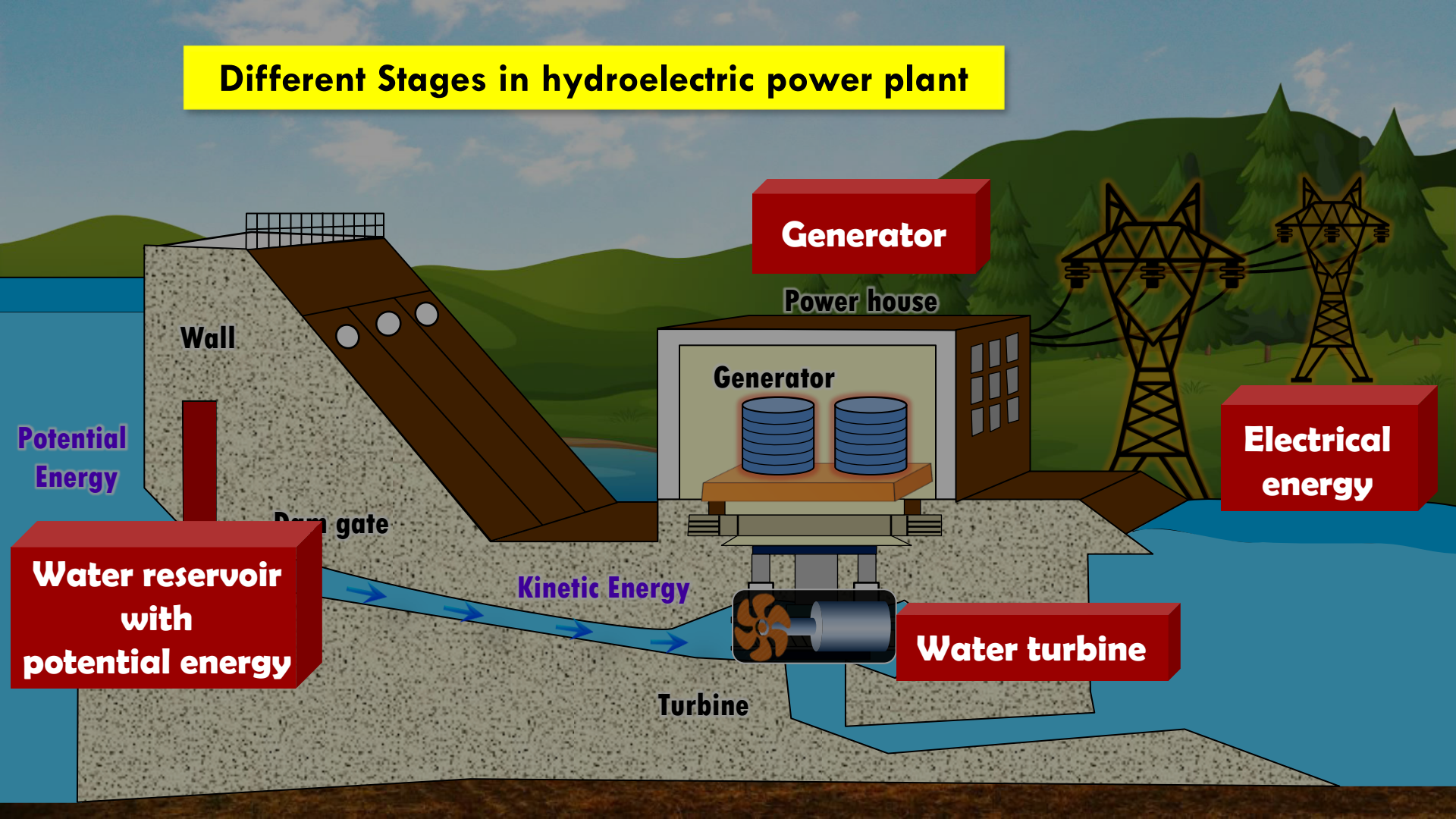
FOSSIL FUELS → ELECTRICITY

HEAT → STEAM → MECHANICAL ENERGY → ELECTRICITY

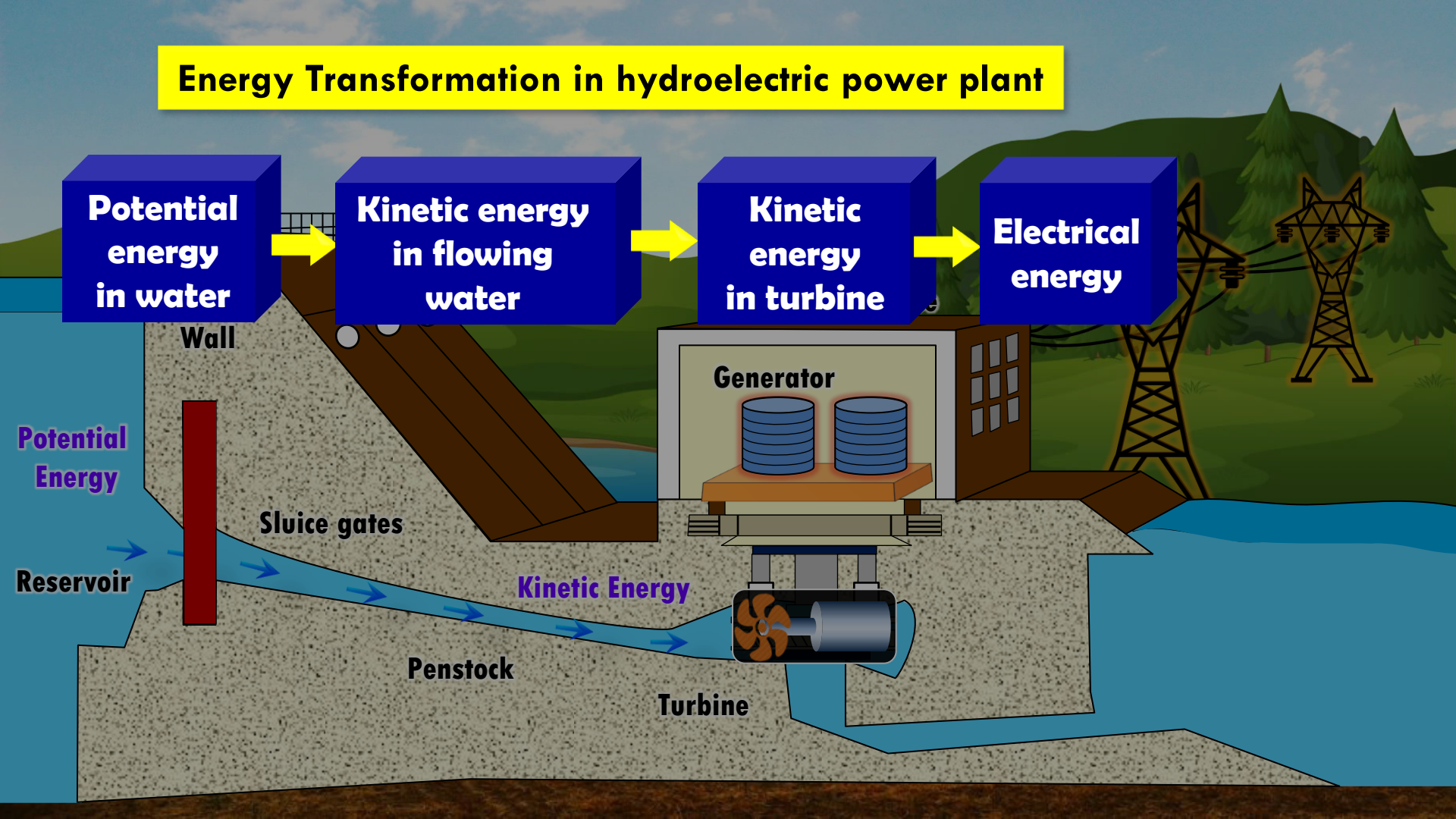
Why are thermal power plants set up near coal or oil fields?

→ Transmission of electricity is more efficient than transporting coal or petroleum over the same distance


HYDRO ELECTRIC
POWER STATION


Different Stages in hydroelectric power plant
Generator
Power house
Wall
Generator
Potential Energy
Electrical energy
Dam gate
Water reservoir with potential energy
Kinetic Energy
Water turbine
Turbine

Energy Transformation in hydroelectric power plant



ADVANTAGES OF USING THE HYDRO ENERGY

- It does not produce any environmental pollution.
- It is a renewable source of energy.
- The dam constructed over river help in irrigation and control of floods in river.

LIMITATIONS OF USING HYDRO ENERGY

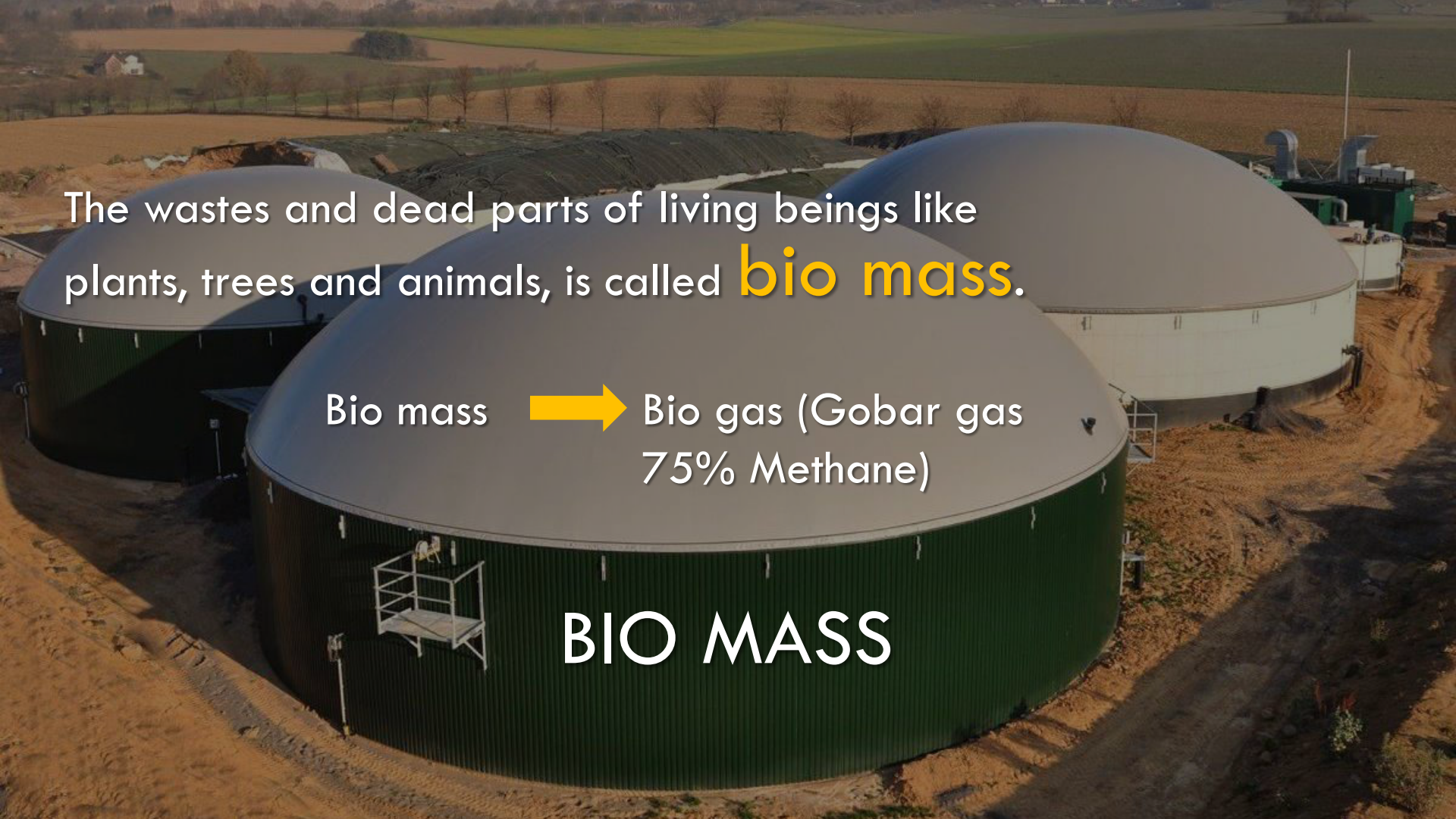
- The vegetation which is submerged rots under anaerobic conditions and generates methane (green-house gas).
- The ecological balance in the downstream areas of rivers gets disturbed.

WOOD AS FUEL

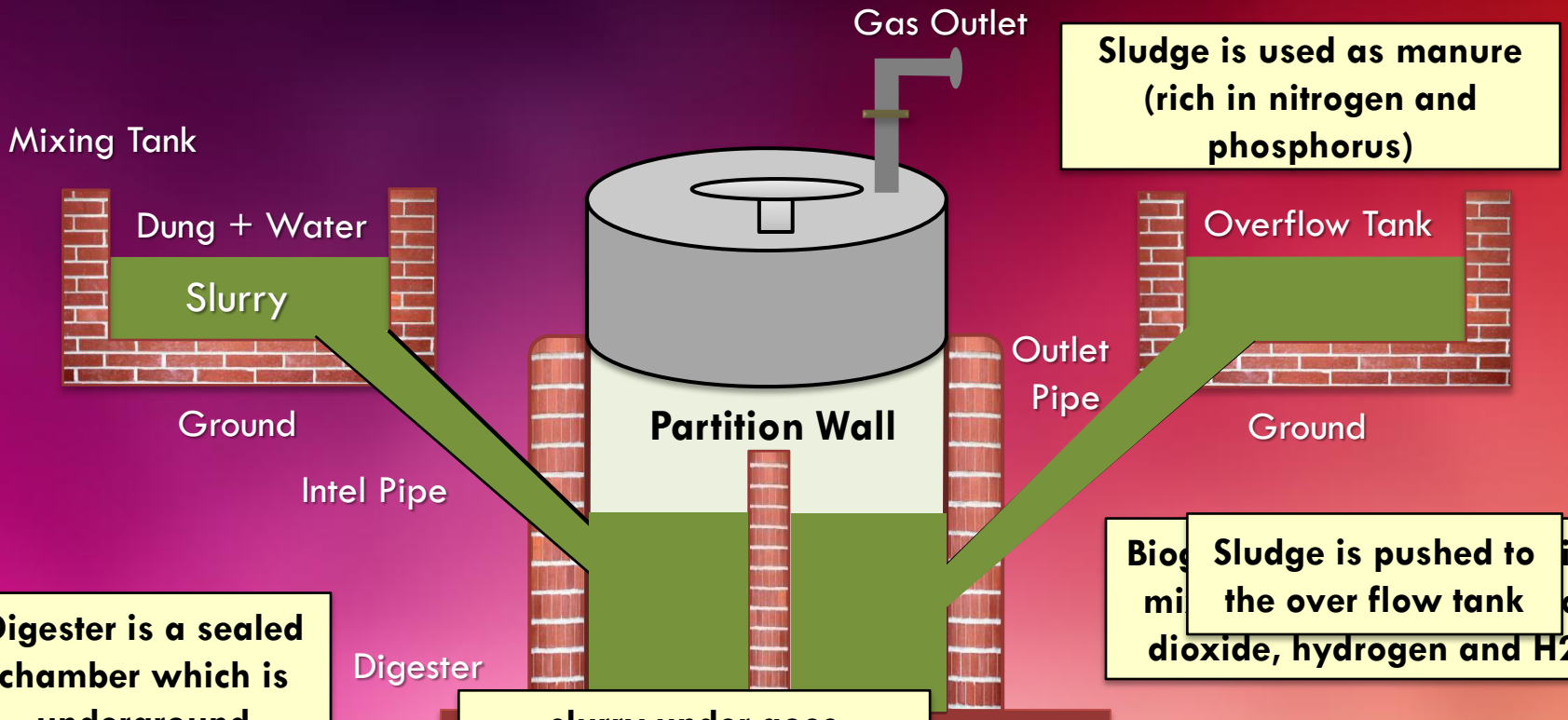
When wood is burnt in a limited supply of oxygen it forms CHARCOAL

Charcoal burns without flames, smoke and has a high calorific value

CHARCOAL

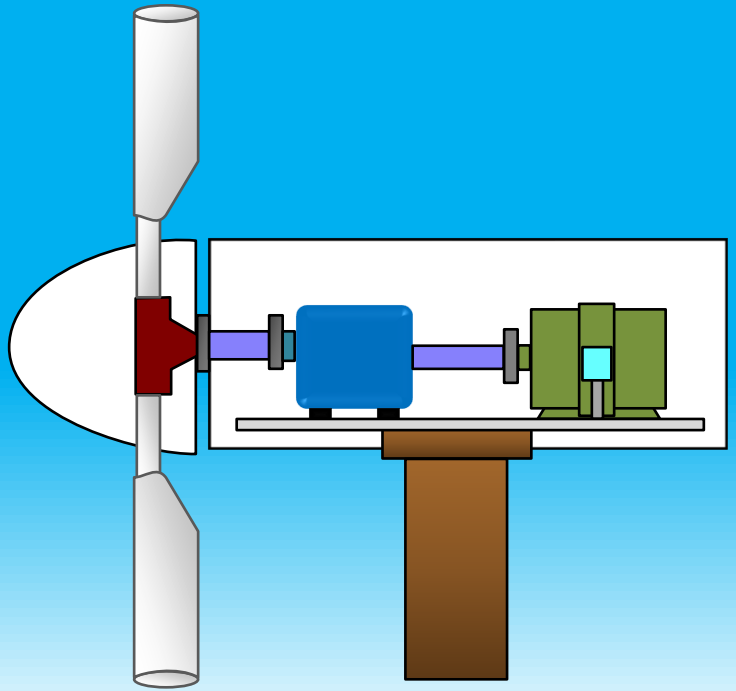

The wastes and dead parts of living beings like plants, trees and animals, is called bio mass.
Bio mass
Bio gas (Gobar gas 75% Methane)
BIO MASS

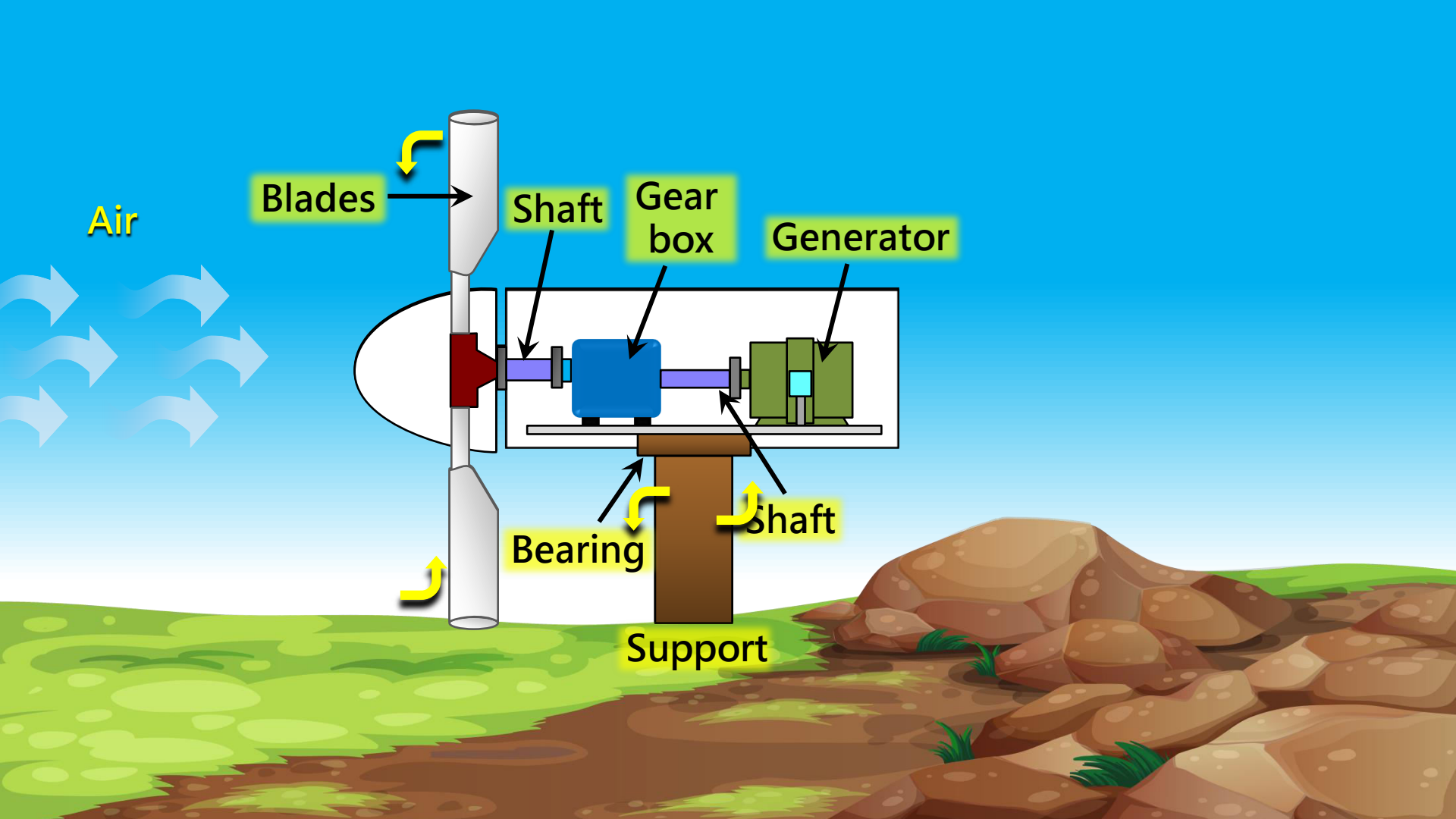
BIOGAS PLANT



Thank You

Lec - 3

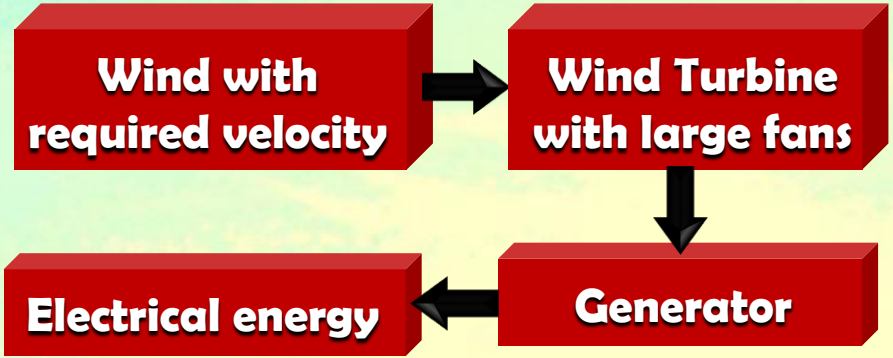



Air
Blades
Shaft
Gear box
Generator
Bearing
Shaft
Support

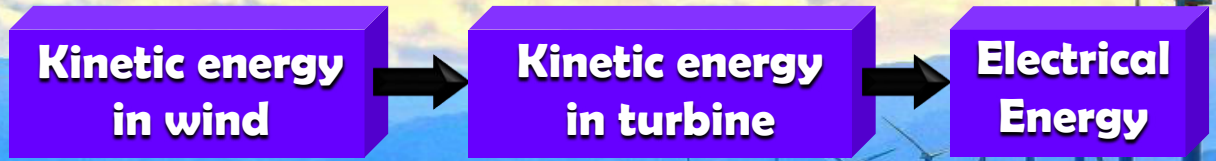

Wind
N
S
T_1
T_2

Stages in electric generator using wind energy

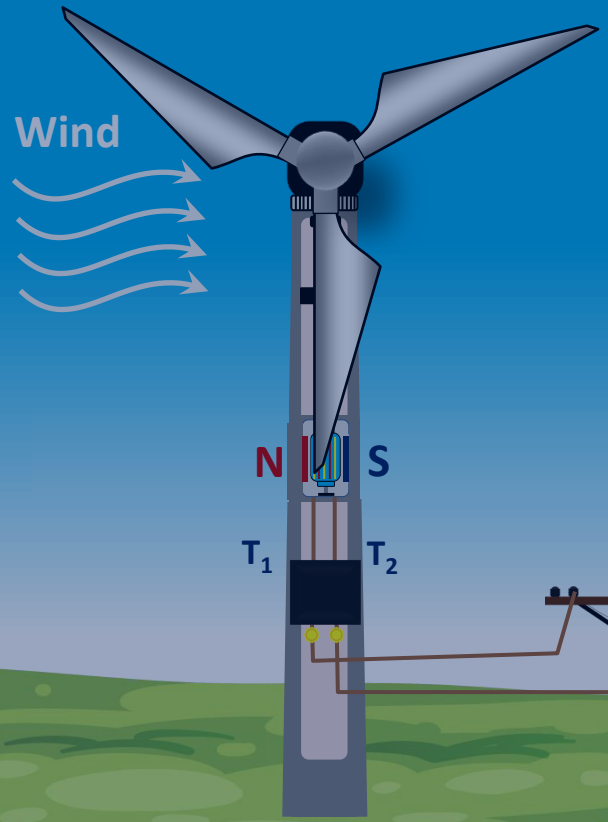
More than 15km/h



Transformation of energy in an electric generator using wind energy



Production of Electricity from Wind Energy



ADVANTAGES :

- Does not cause any pollution.
- Renewable source of energy.

LIMITATION :

- Wind energy farms cannot be established everywhere.
- Expensive

Production of Electricity from Wind Energy

Mention some limitations of harnessing wind energy.

How has the traditional use of wind and water energy been modified for our convenience?

Ans:

- Traditionally, waterfalls were used as a source of potential energy in which water is allowed to fall on the blades of the turbine and the rotatory motion of the blades is converted into electrical energy.
- But waterfalls are few in number therefore water dams have been constructed.
- Nowadays, hydroelectric power stations are used in order to harness potential energy of stored water.
- Earlier, the windmills were used to harness wind energy to do mechanical work such as lifting or drawing water from a well.
- But nowadays, windmills are used to generate electricity.

RENEWABLE SOURCES OF ENERGY

A natural source providing us energy continuously is called a renewable (or non-conventional) source of energy.

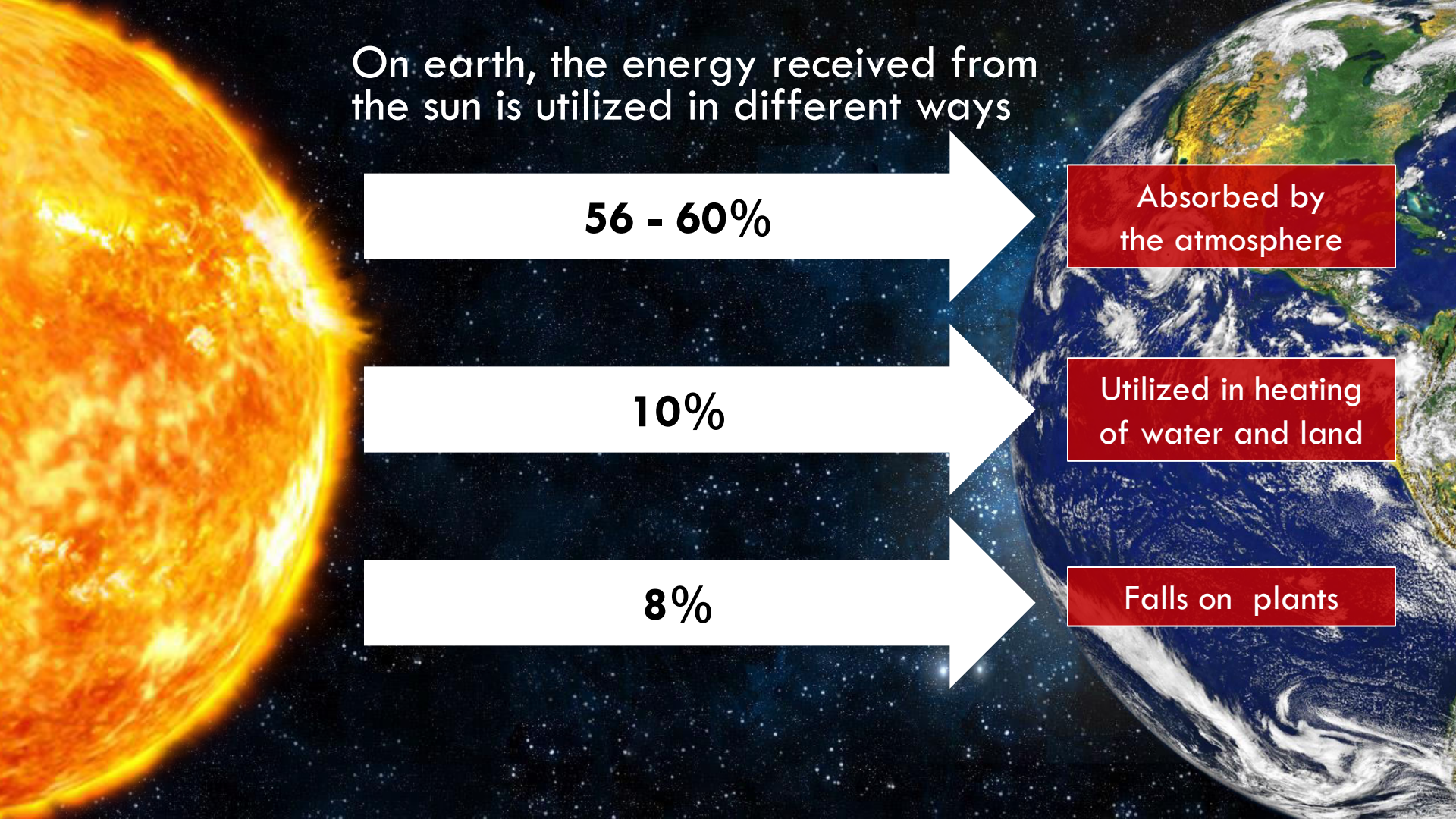
1. Sun
2. Tides
3. Oceans
4. Wave
5. Geothermal
6. Nuclear fuel

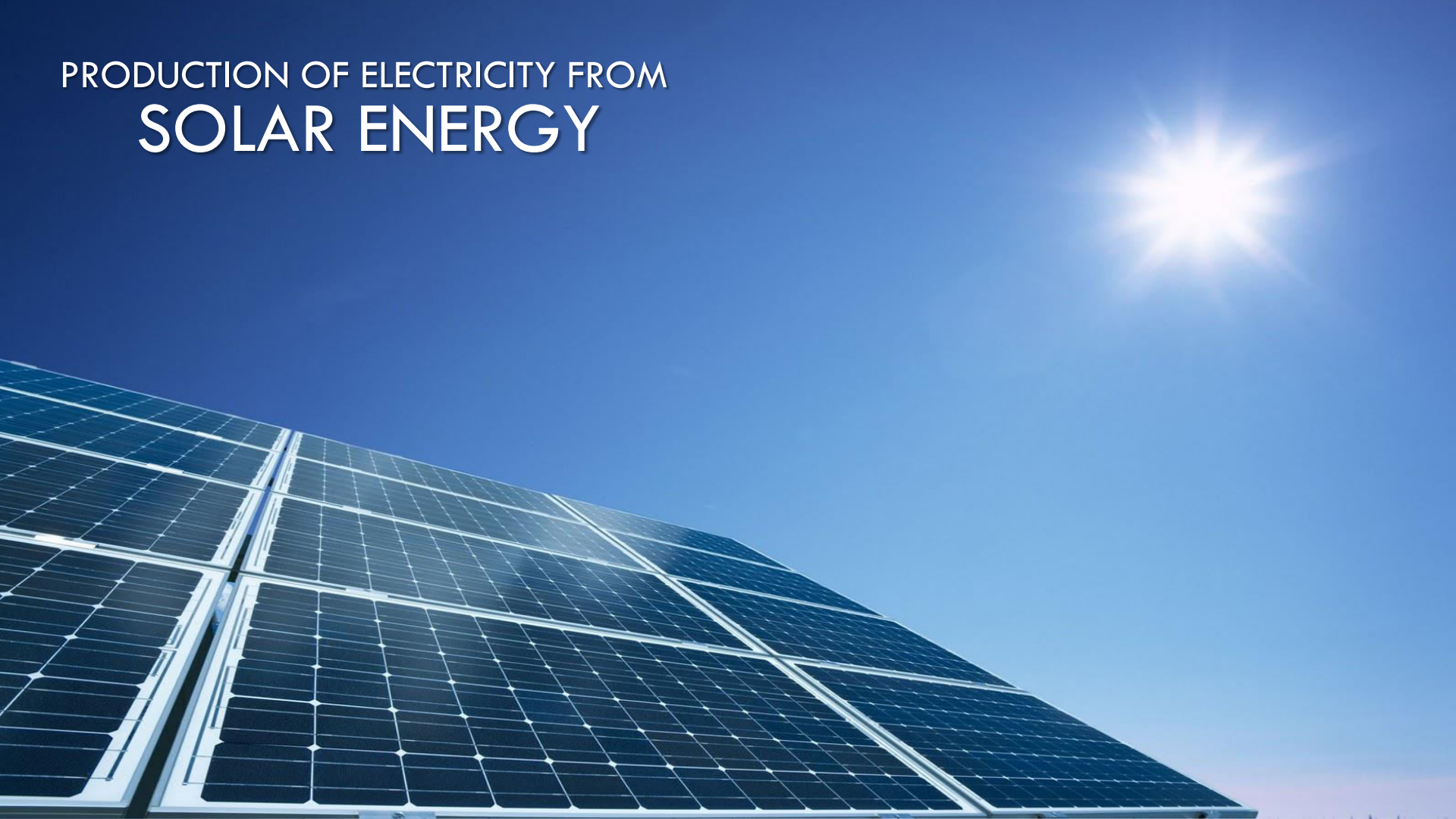
Sun is the main source of energy for us on the earth.

SUN AS SOURCE OF ENERGY

Sun is the main source of energy for us on the earth.

THE ENERGY OBTAINED FROM SUN IS CALLED THE SOLAR ENERGY.


On earth, the energy received from the sun is utilized in different ways
56 - 60%
Absorbed by the atmosphere
10%
Utilized in heating of water and land
8%
Falls on plants


PRODUCTION OF ELECTRICITY FROM
SOLAR ENERGY

SOLAR COOKER

For cooking it requires slow heating i.e. about 100°C - 140°C.

GLASS LID

The inner surface is black because 98% of heat is absorbed by black colour.

COOKING POTS

INSULATED BOX

What kind of mirror – concave, convex or plain – would be best suited for use in a solar cooker? Why?

Q. What are the advantages and limitations of solar cooker?

Ans:

Advantage :

i. Does not use fuels like coal, kerosene and LPG.
ii. No smoke.
iii. Since the food is cooked at a comparatively lower temperature in a solar cooker, its nutrients do not get destroyed.

Q. What are the advantages and limitations of solar cooker?

Ans:

Limitations :

i. Cannot be used during night time and cloudy days.
ii. The direction of the mirror of the solar cooker has to be changed from time to time to keep it facing the sun.
iii. It cannot be used for baking (making chapatis, etc) and frying.

Thank You

Lec - 4

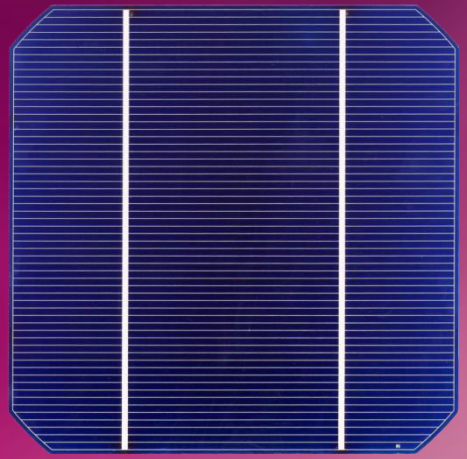
PRODUCTION OF ELECTRICITY FROM

SOLAR ENERGY

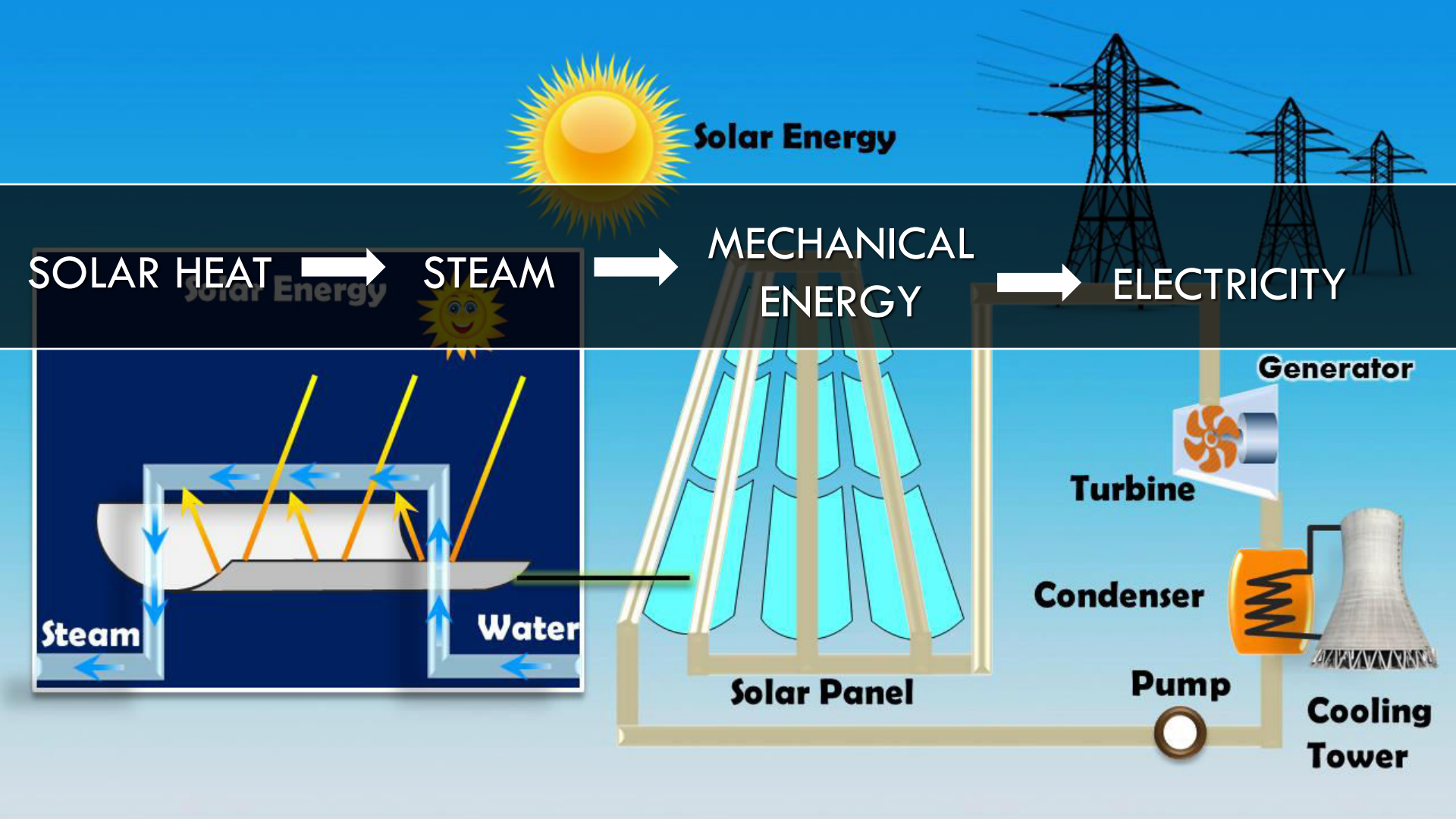
To obtain electricity from the solar energy, there are two methods

SOLAR CELL

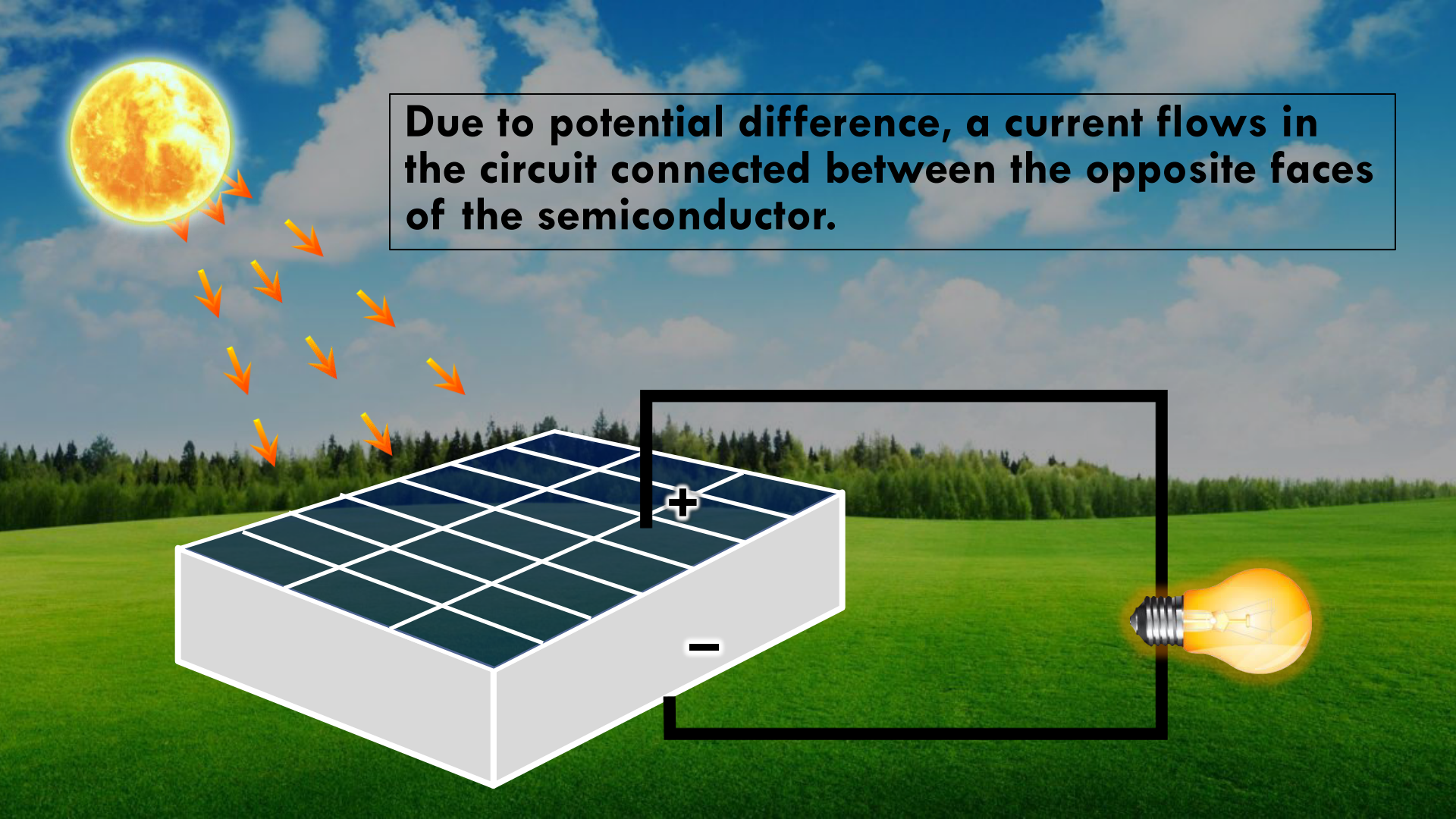
SOLAR THERMAL POWER PLANT



LIGHT → ELECTRICITY


Solar Energy
SOLAR HEAT
STEAM
MECHANICAL ENERGY
ELECTRICITY
Steam
Water
Solar Panel
Generator
Turbine
Condenser
Pump
Cooling Tower

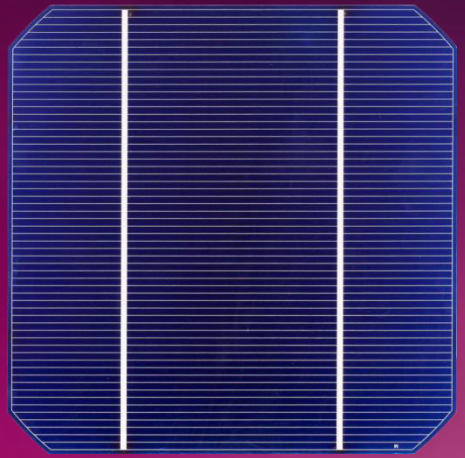

GALLIUM


Due to potential difference, a current flows in the circuit connected between the opposite faces of the semiconductor.
+
−

PRODUCTION OF ELECTRICITY FROM

SOLAR ENERGY

SOLAR CELL



VOLTAGE ➡ 0.5 volt – 1.0 volt

POWER ➡ 0.7 watt

PRODUCTION OF ELECTRICITY FROM

SOLAR ENERGY

LOW EFFICIENCY

PRODUCE SUFFICIENT ELECTRICITY


STREET
CALCULATOR
LIGHTS
CHECK
CORRECT DELETE
GT
MU
CE
AUTO REPLAY
ON AC

ADVANTAGES OF USING SOLAR PANELS

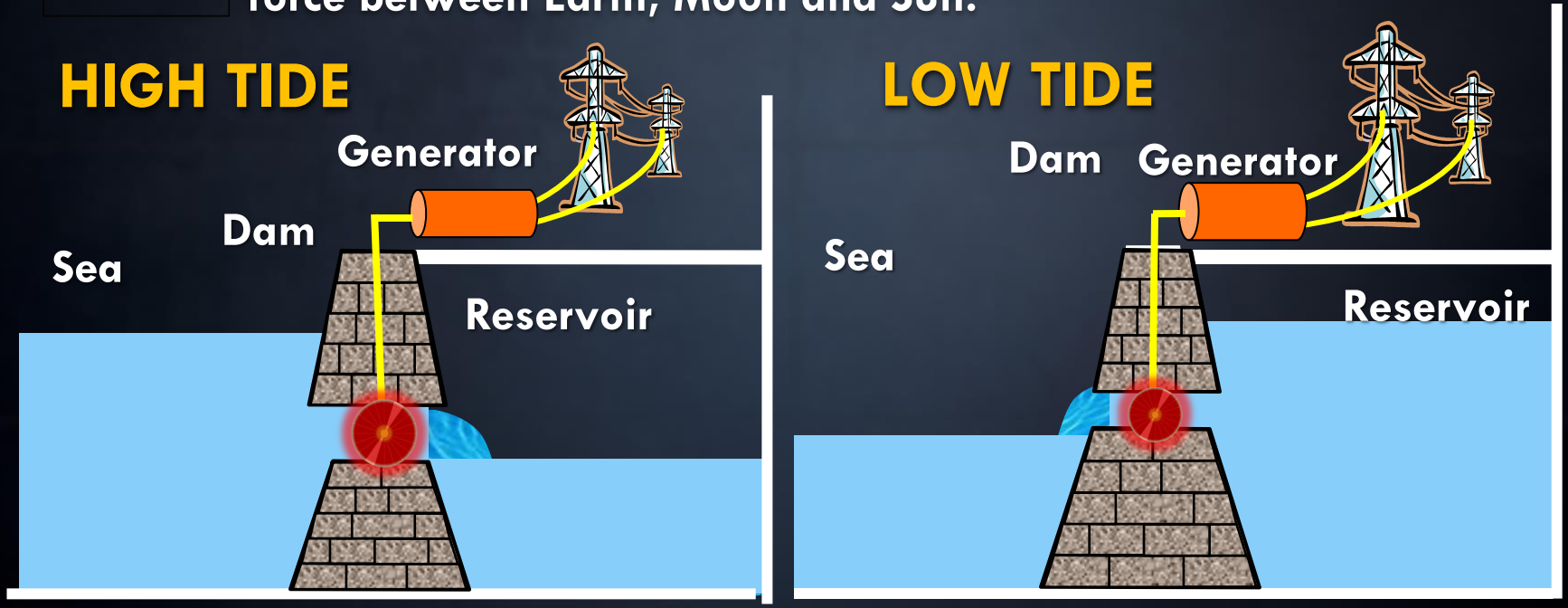
- They do not require any maintenance.
- They last over a long period of time.
- Their running cost is almost zero.
- They are most suitable for the remote, inaccessible, and isolated places where electric power lines cannot be laid.

DISADVANTAGES OF USING SOLAR PANELS

- The initial cost of a solar panel is sufficiently high.
- The efficiency of conversion of solar energy to electricity is low.


TIDAL
POWER PLANT

TIDE : Rise & fall in sea- level due to the gravitational force between Earth, Moon and Sun.



POTENTIAL ENERGY → KINETIC / MECHANICAL ENERGY → ELECTRICITY

1) Rise and fall of water is insufficient to generate electricity on large scale.

2) The locations where such dams can be built are limited .

OCEAN AS SOURCE OF ENERGY

WATER IN OCEANS POSSESSES ENERGY IN **TWO FORMS**

OCEAN THERMAL ENERGY

OCEANIC WAVES ENERGY

OCEAN THERMAL ENERGY

The warm surface water is used to boil a volatile liquid like ammonia. The vapours a ammonia is used to run the turbine of generator.

Water at the surface of an ocean gets heated by absorbing the heat of sun

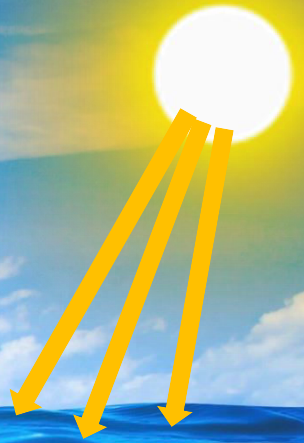
HEAT

Hot water – Cold water > = 20°C

2 km

Water at its deeper levels remains cold.

COLD




Ocean thermal energy is harnessed for producing electricity by a device called ocean thermal energy conversion power plant (OCTEC power plant).

OCEANIC WAVES
ENERGY

Waves move at high speed on its surface are called as
OCEANIC WAVES

HIGH KINETIC
ENERGY

Thank You

Lec - 5

NUCLEAR ENERGY

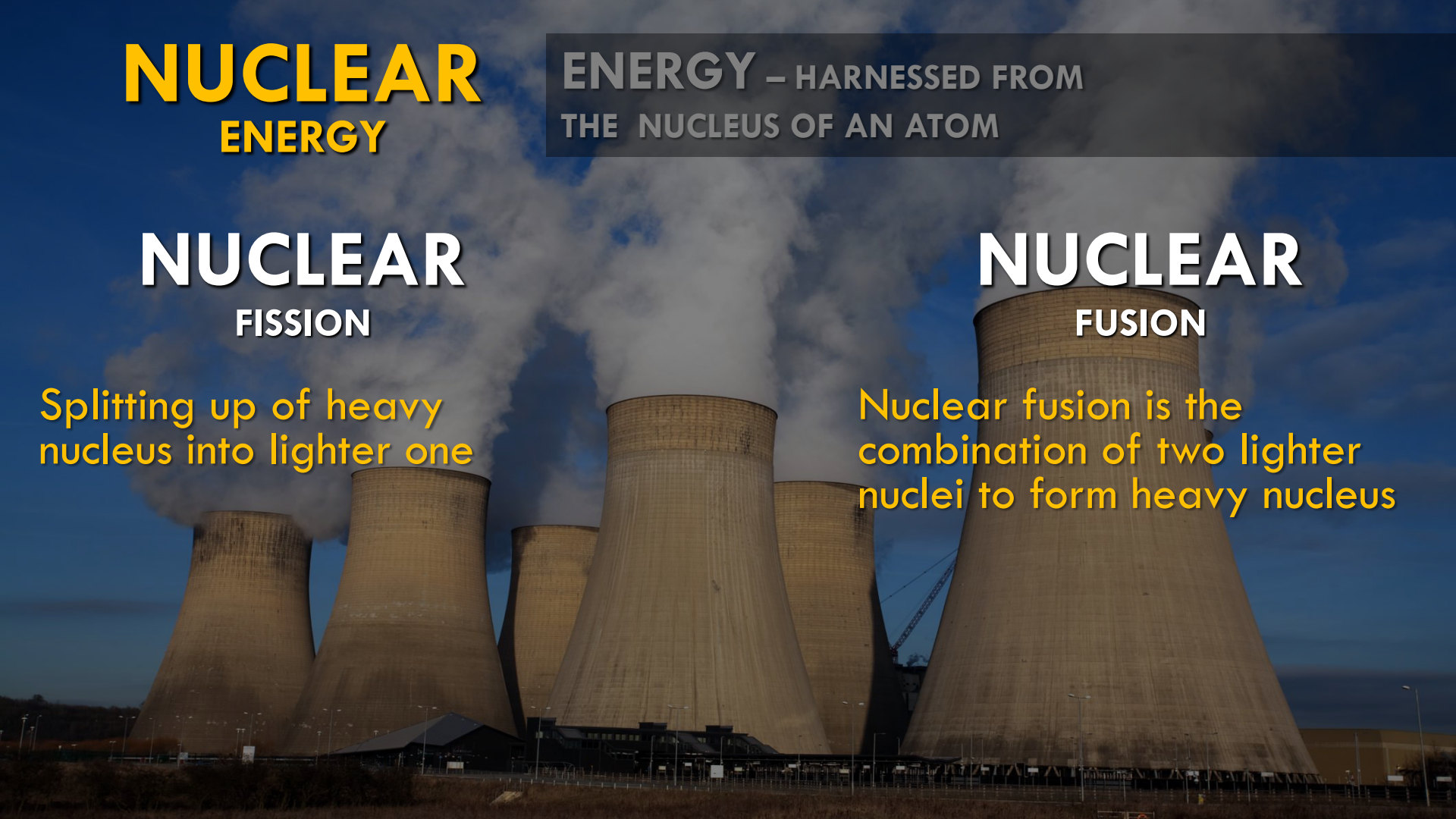
ENERGY – HARNESSED FROM THE NUCLEUS OF AN ATOM

NUCLEAR FISSION

Splitting up of heavy nucleus into lighter one

NUCLEAR FUSION

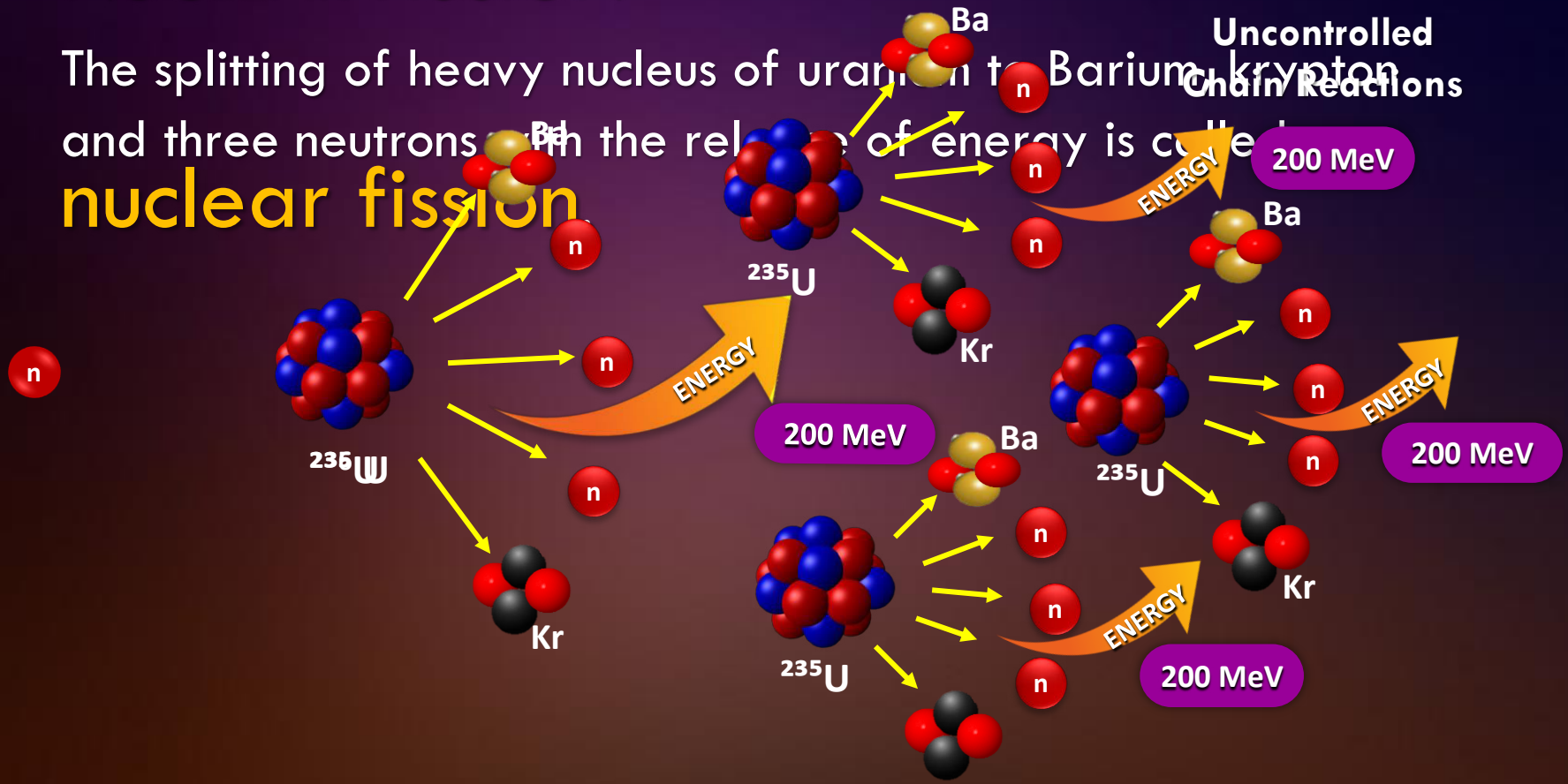
Nuclear fusion is the combination of two lighter nuclei to form heavy nucleus



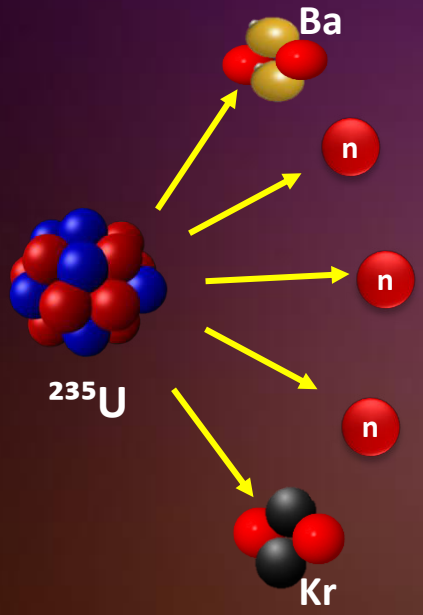
NUCLEAR FISSION

The splitting of heavy nucleus of uranium to Barium, krypton and three neutrons with the release of energy is called

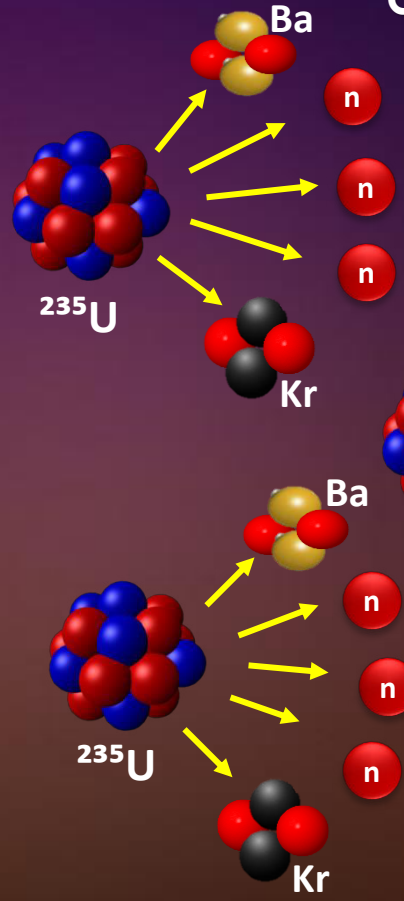
nuclear fission

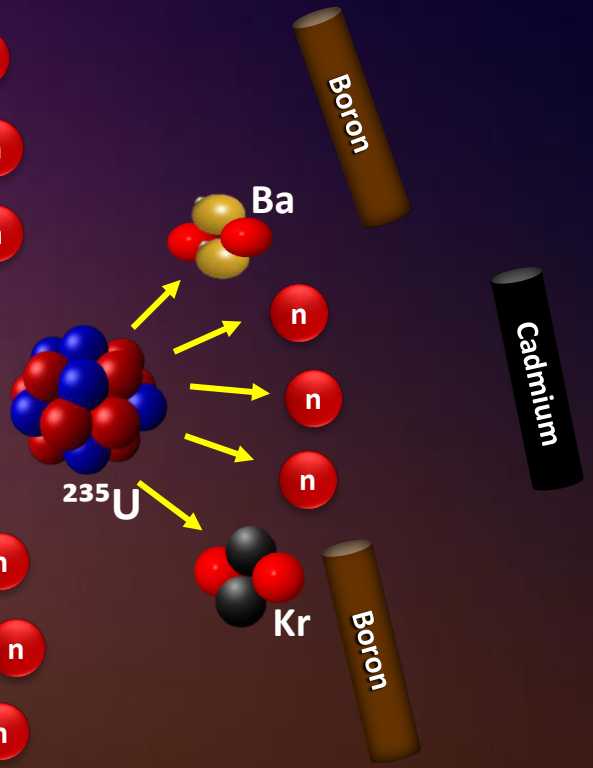


NUCLEAR FISSION

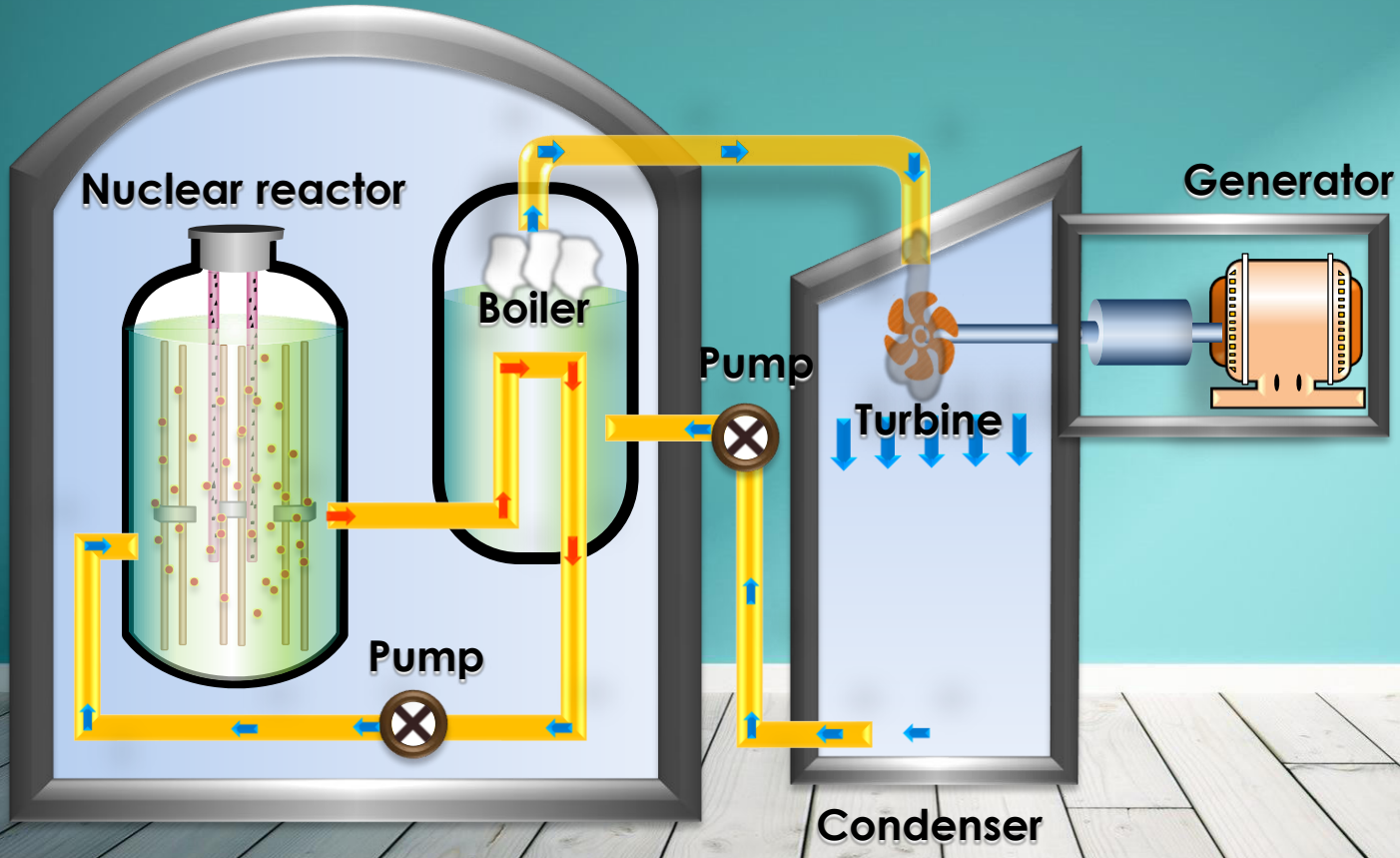


Controlled Chain Reactions



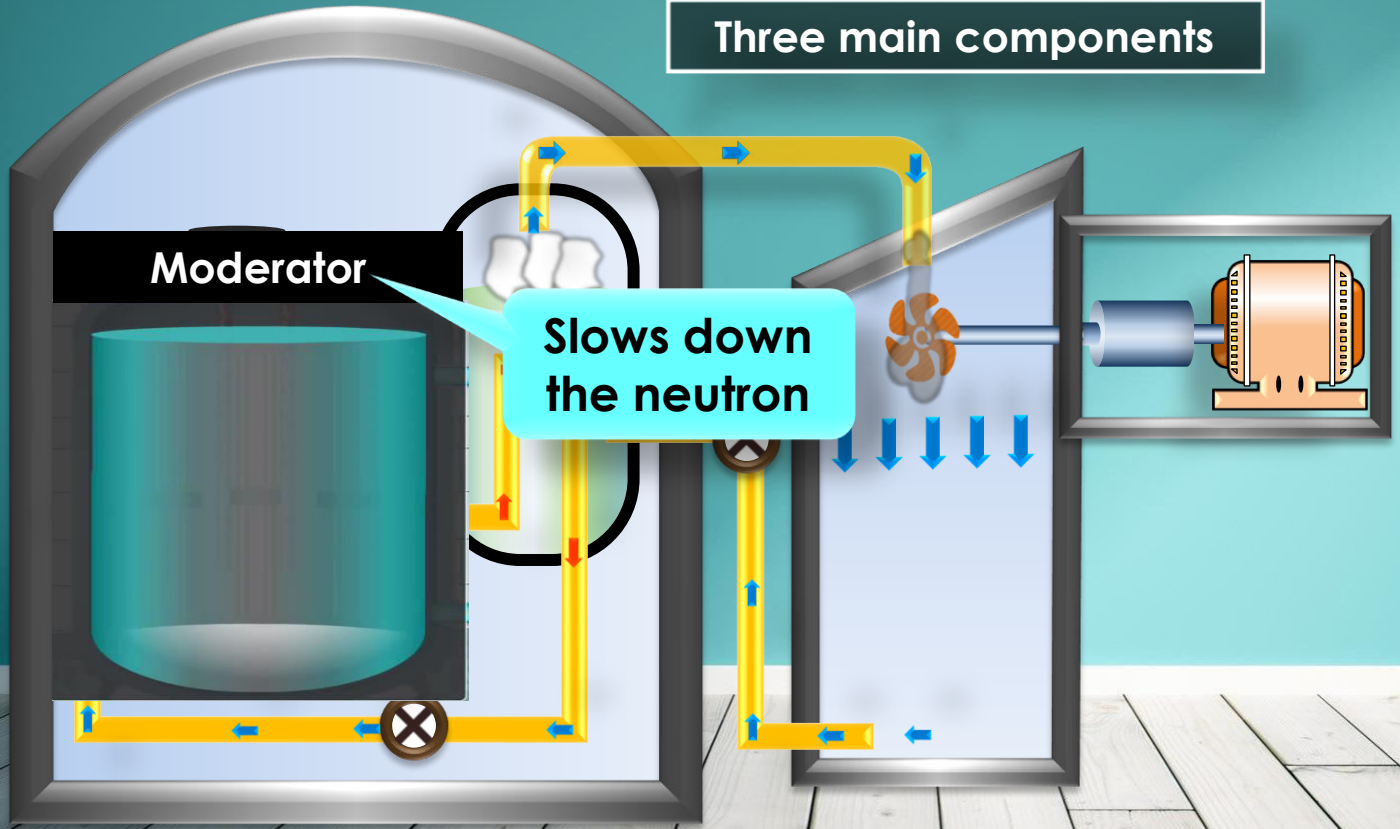


Nuclear Power Plant (Controlled Chain Reaction)

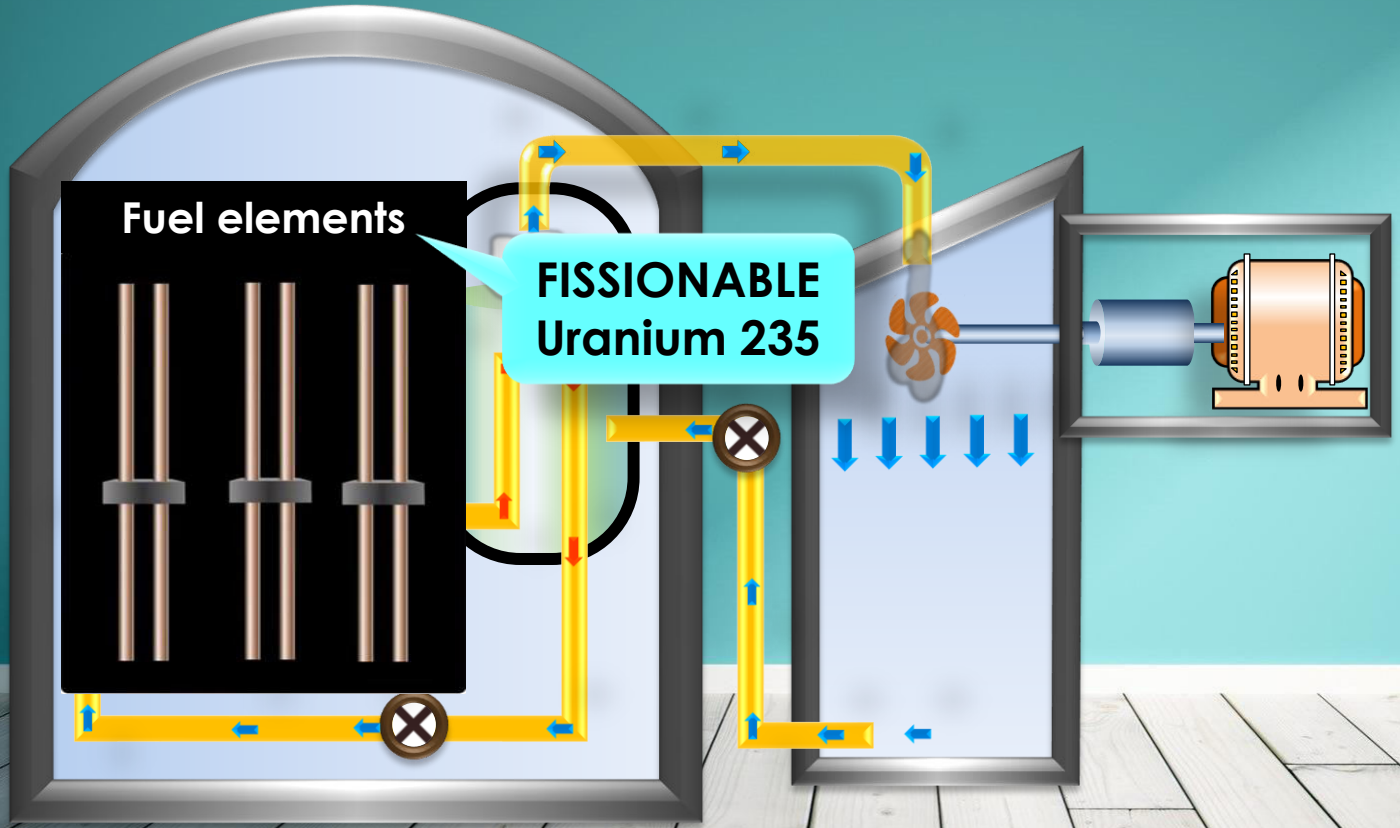


Nuclear Power Plant (Controlled Chain Reaction)

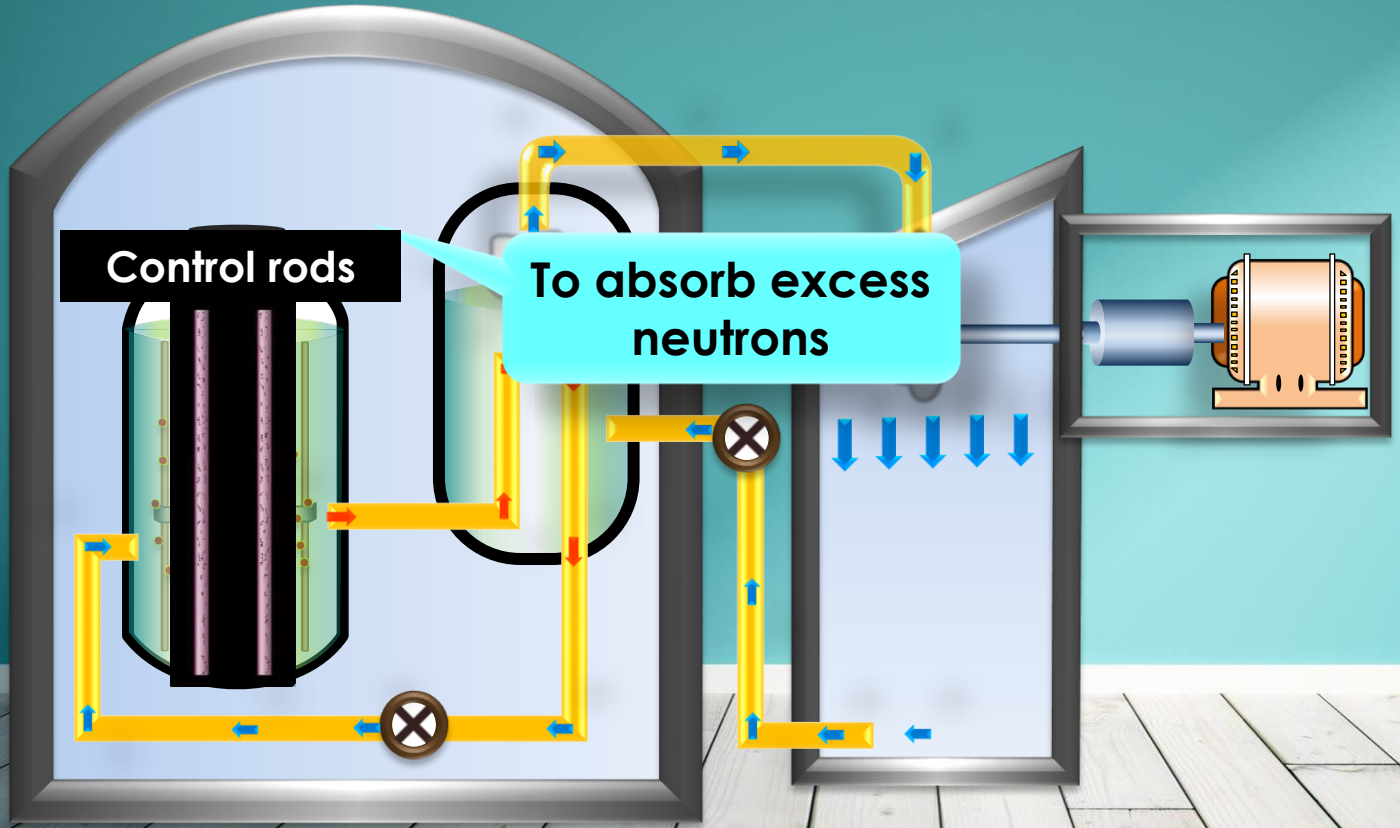
Three main components

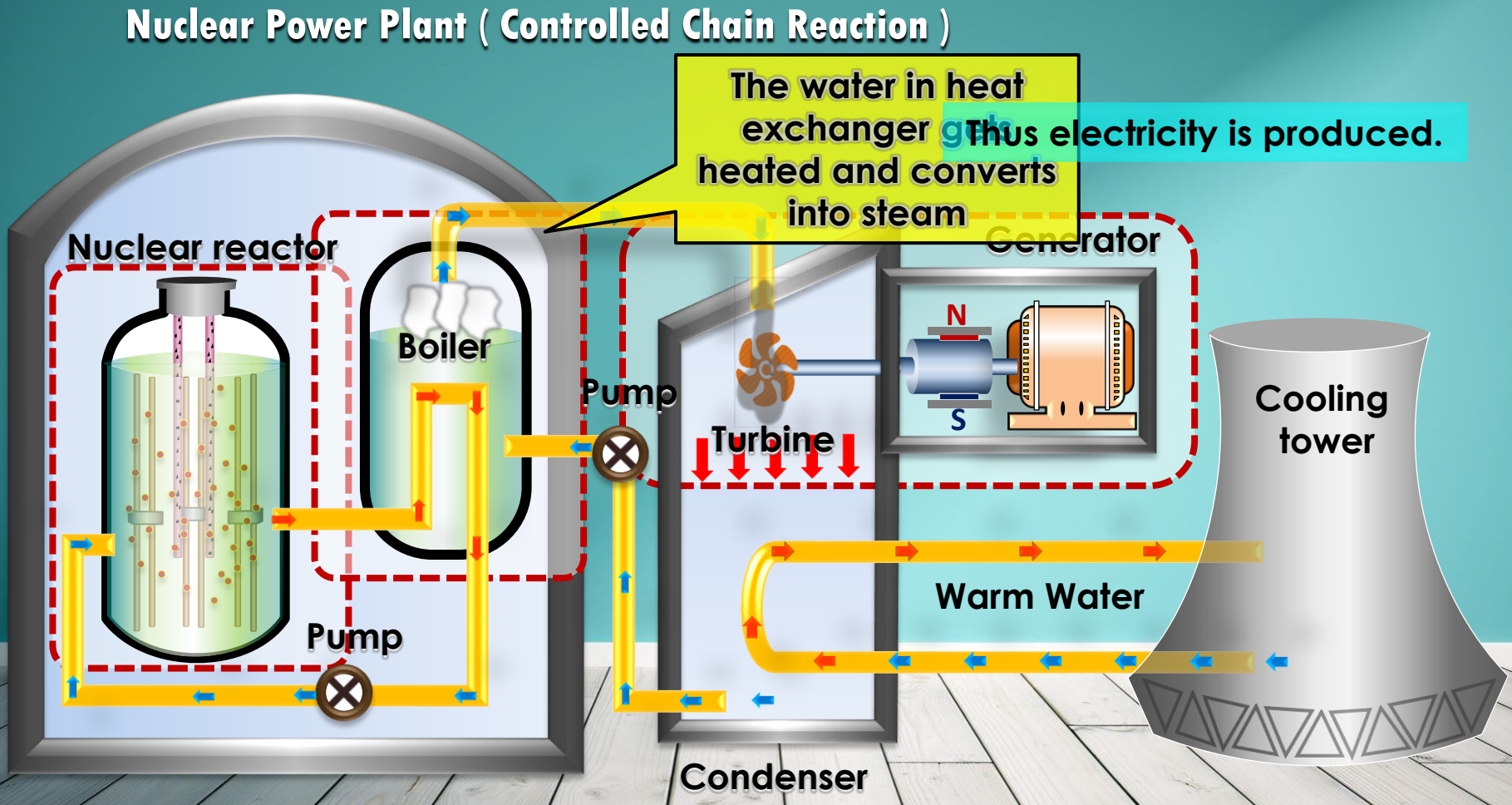


Nuclear Power Plant (Controlled Chain Reaction)

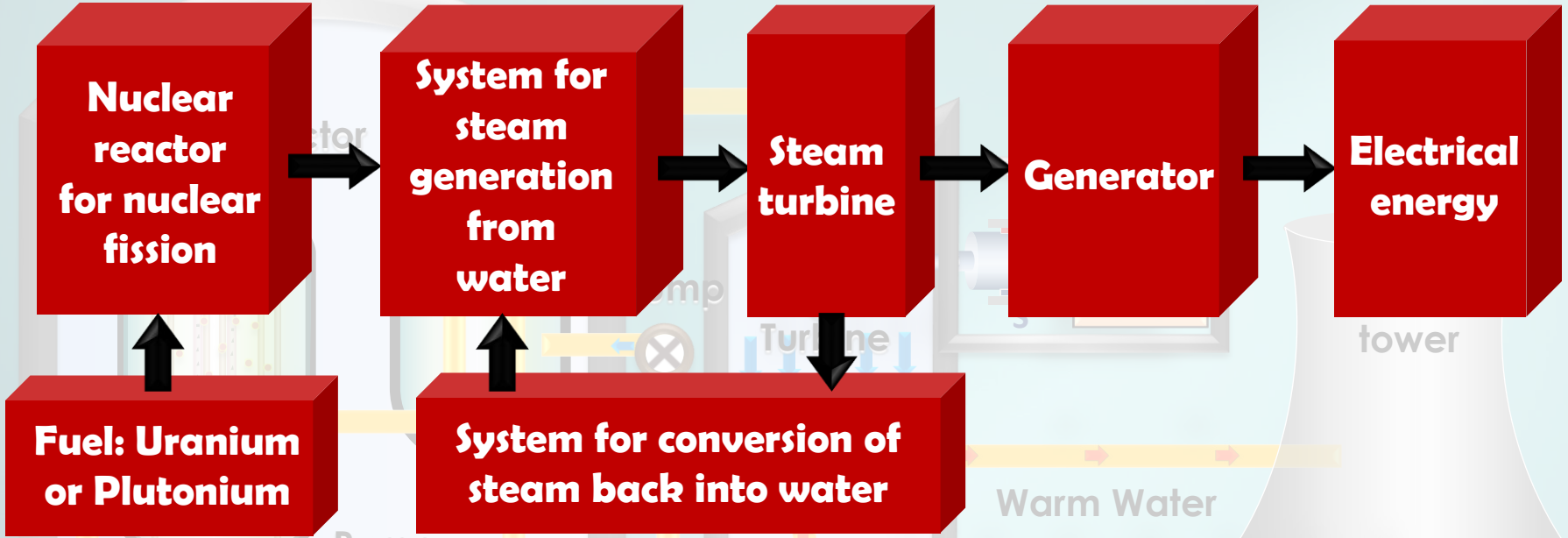


Nuclear Power Plant (Controlled Chain Reaction)

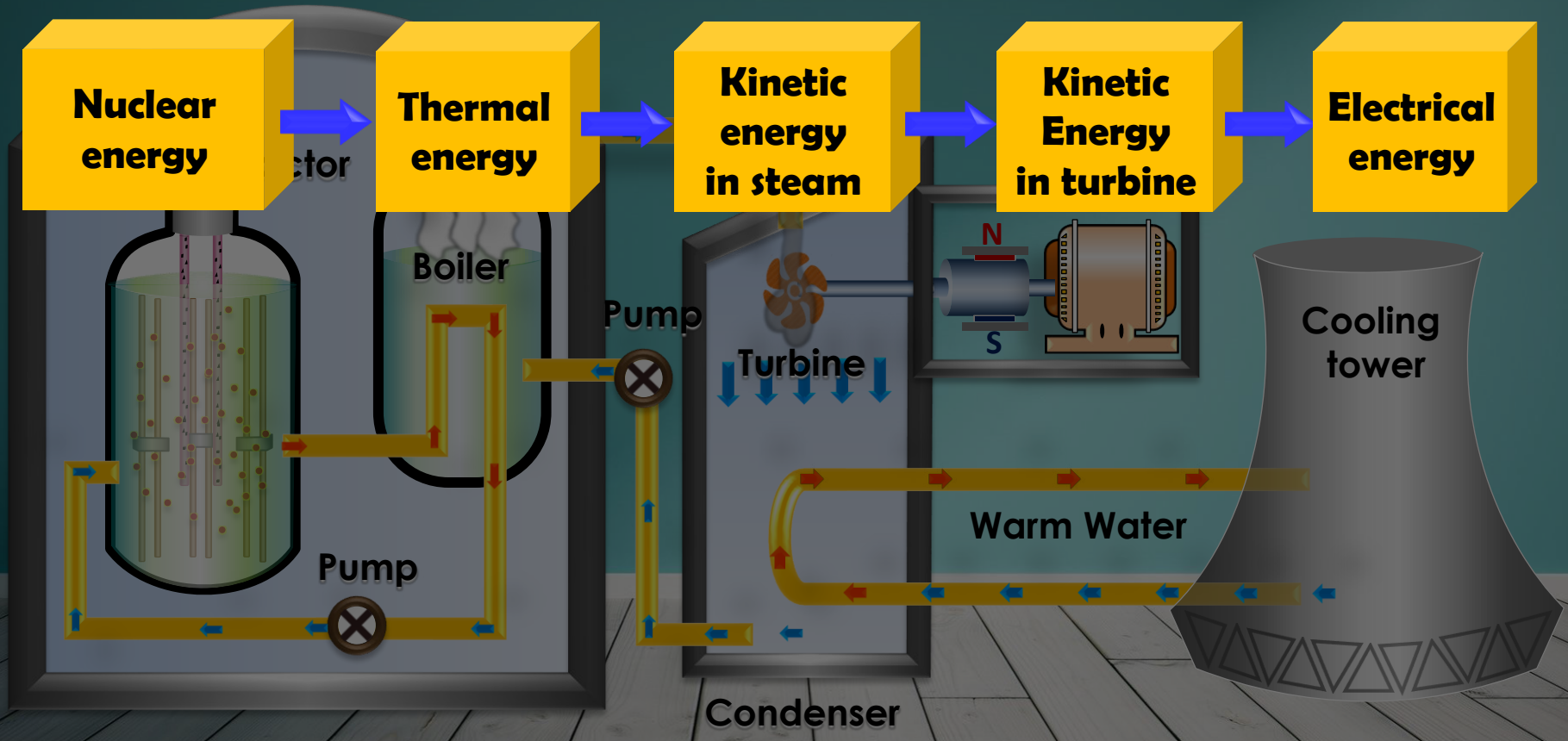



Nuclear Power Plant (Controlled Chain Reaction)
The water in heat exchanger gets heated and converts into steam
Thus electricity is produced.
Nuclear reactor
Boiler
Pump
Turbine
Generator
N
S
Cooling tower
Warm Water
Pump
Condenser

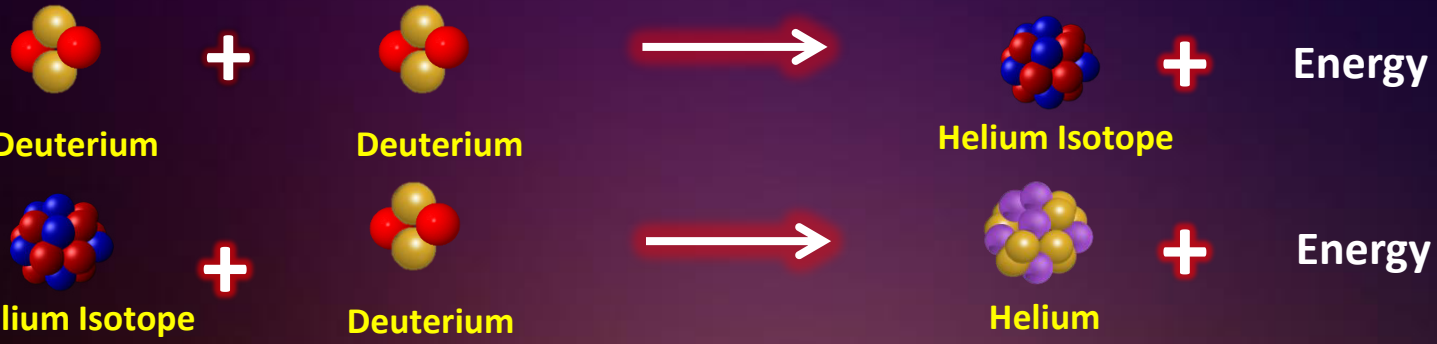
Nuclear Power Plant (Controlled Chain Reaction)

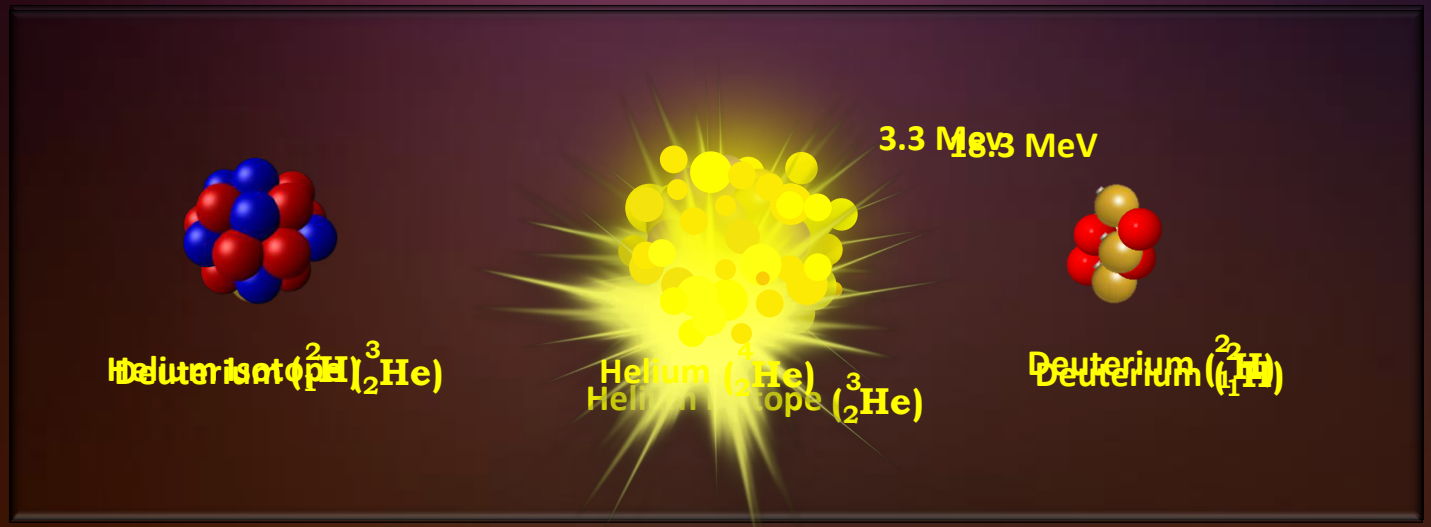


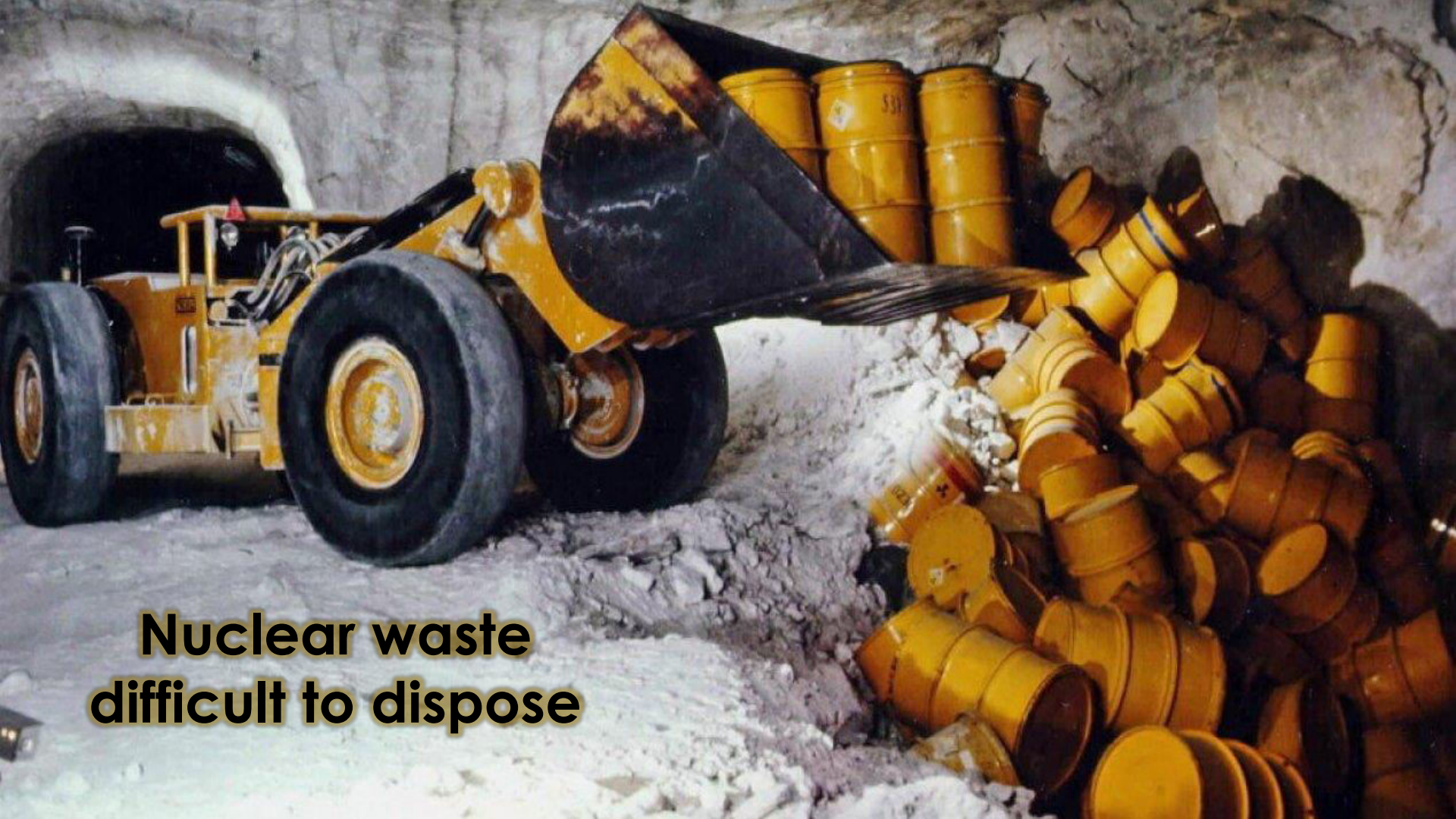
Nuclear Power Plant (Controlled Chain Reaction)



NUCLEAR FUSION






Nuclear waste
difficult to dispose

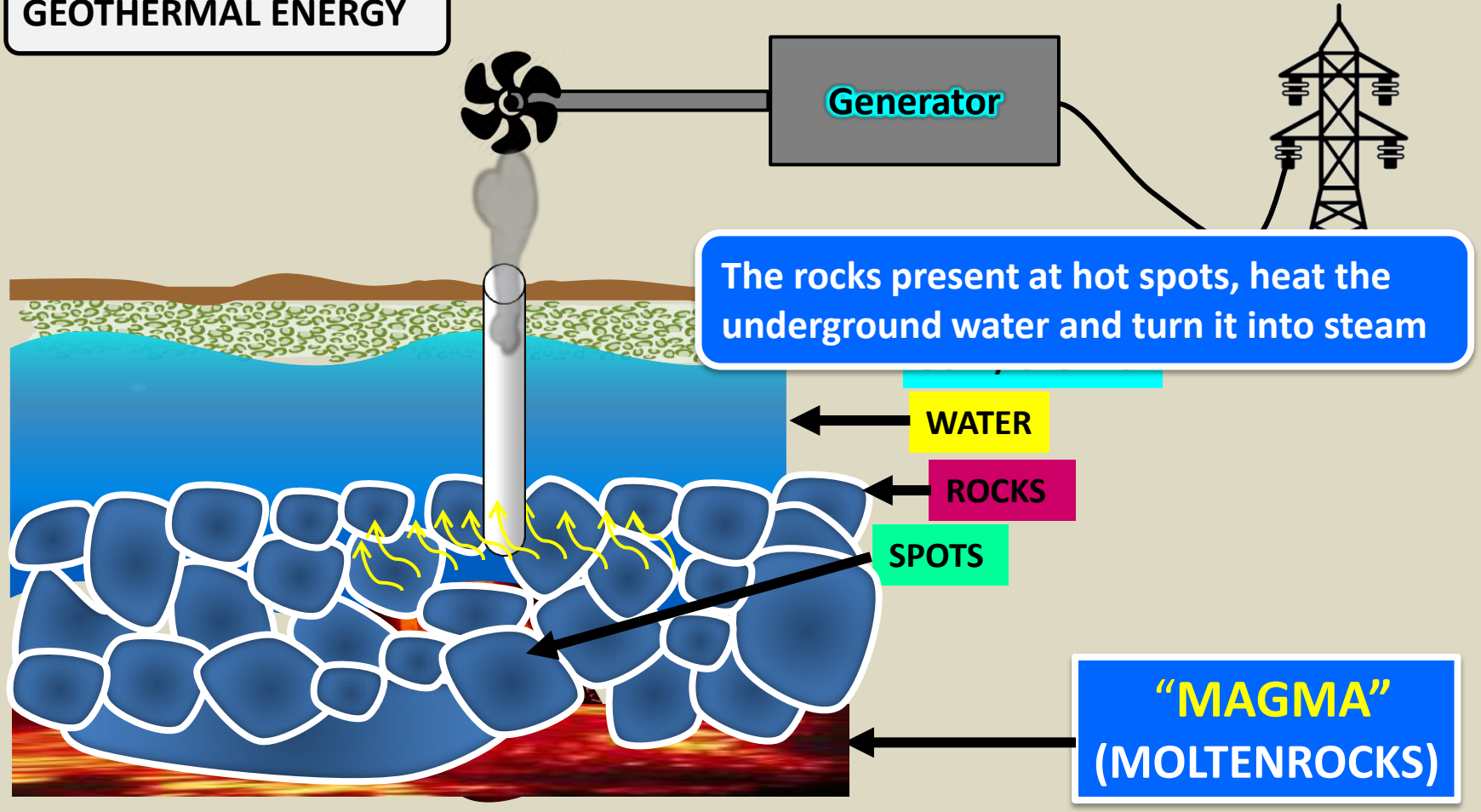
Q. What are the advantages of nuclear energy?

Ans:

i. Large amount of useful energy from a very small amount of a nuclear fuel.
ii. Continuous generation of Electricity
iii. It does not produce gases like CO_2 which contributes to greenhouse effect or SO_2 which causes acid rain.

At some places, molten rocks formed in the deeper hot regions of Earth's crust are pushed upward and trapped in certain regions known as hot spots.

GEOTHERMAL ENERGY



ENVIRONMENTAL CONSEQUENCES

Exploiting any source of energy disturbs the environment in some way.

Factors on which the Source of Energy to be selected

1. Ease of Extraction of Energy from the Source
2. Efficiency of the Technology available
3. Environmental damage caused

Q. **Suggest some steps which can be taken to reduce energy consumption.**

Ans:

i. Switch off lights, fans, TV and other such electrical appliances when not needed, to save electricity.

ii. Use energy efficient electrical appliances to save electricity. This can be done by using compact fluorescent lamps (CFL) and tube - lights in place of conventional filament - type electric bulbs.

iii. Good quality stoves should be used to burn fuels like kerosene and LPG so as to obtain maximum heat.

iv. Pressure cookers should be used for cooking food to save fuel.

Q. **What are the environmental consequences of the increasing demand for energy?**

Ans:

i. The combustion of fossil fuels produces acid rain damaging plants (crops), soil and aquatic life.
ii. The burning of fossil fuels increases the amount of greenhouse in the atmosphere.
iii. Deforestation for obtaining firewood causes soil erosion and destroying wild life.
iv. The construction of hydro - power plants is disturbs ecological balance.

Thank You