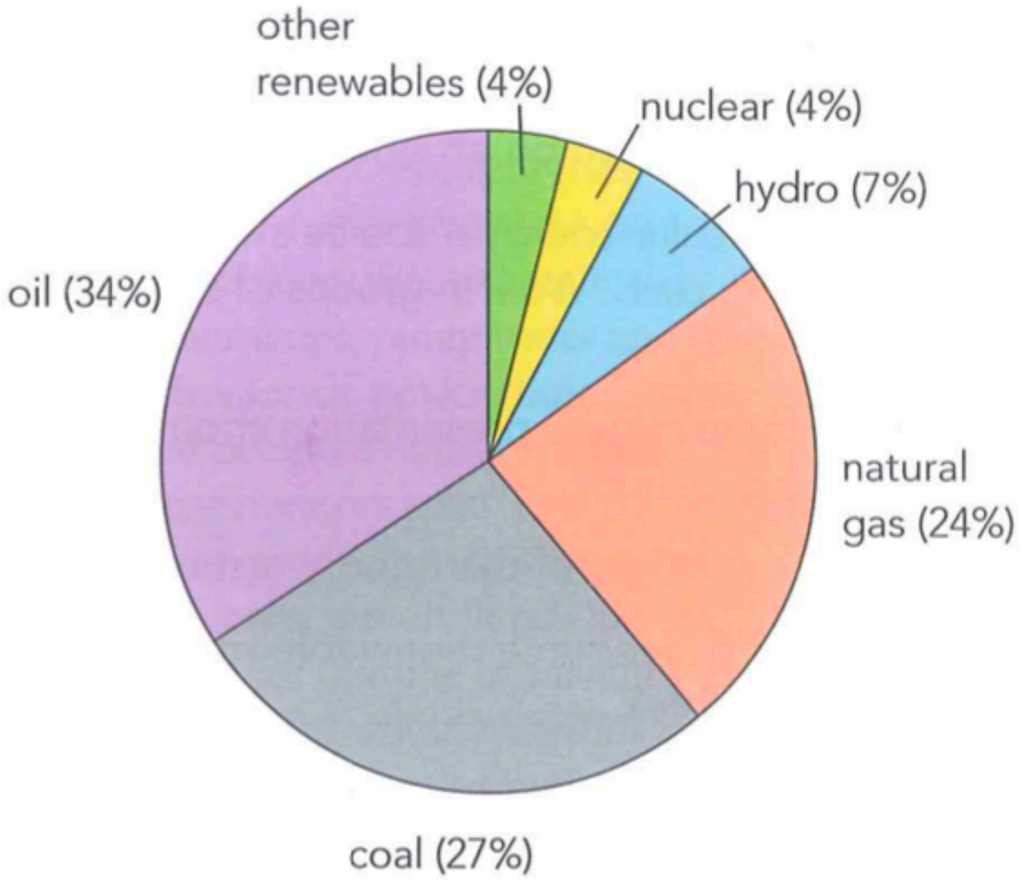
Chapter 7.
Energy Resources

Energy resources

World energy use in 2018



<u>Renewables vs non-renewables：</u>

An energy resource that will be **replenished/replaces** naturally when used

vs

An energy resource that is **gone** forever once been used

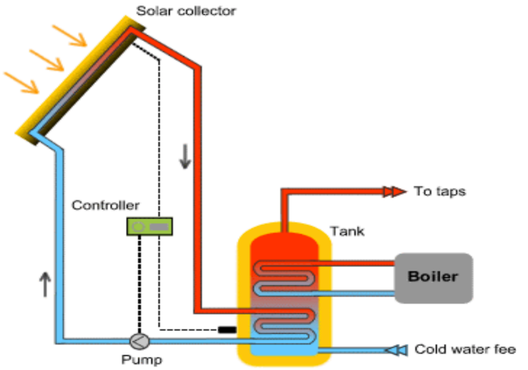
1. Solar energy

Source: the Sun

Origin： the Sun

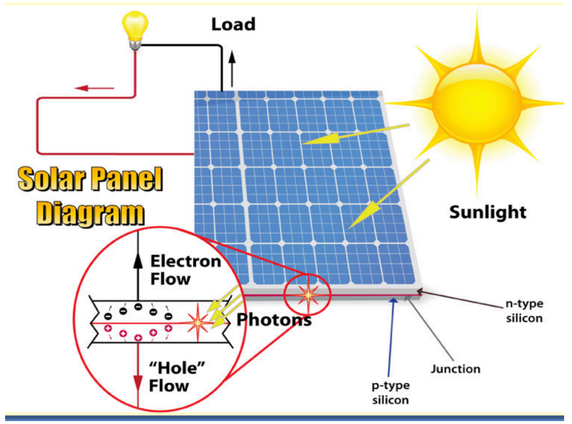
Energy stored form: Solar energy

How to make use of it?



Solar panel => heating water

Solar cell => generating electricity



1. Solar energy

Source: **the Sun**

Origin： **the Sun**

Energy stored form: **Solar energy**

How to make use of it?

advantages	disadvantages
Renewable No contribution to global warming No pollution Running cost almost free	**Unreliable (only work on daytime; no enough energy on cloudy days)** **Not concentrated/diffuse/ dilute**(needs a large area of land or roof to generating power) Expensive initial cost

Exercise

What’s the difference between solar cell and solar panel?

2. Wind power

Source: wind

Origin： the Sun

Energy stored form： k.e.

How to make use of it?

Windmills:

Grinding, pumping

generating electricity(turbine->generator)

2. Wind power

Source: water

Origin： the Sun

Energy stored form: g.p.e + k.e.

How to make use of it?

advantages	disadvantages
Renewable No contribution to global warming No pollution/clean	Unreliable Not concentrated/dilute/diffuse noisy+visual pollution

Exercise

Explain why wind power can be traced back to sunlight.

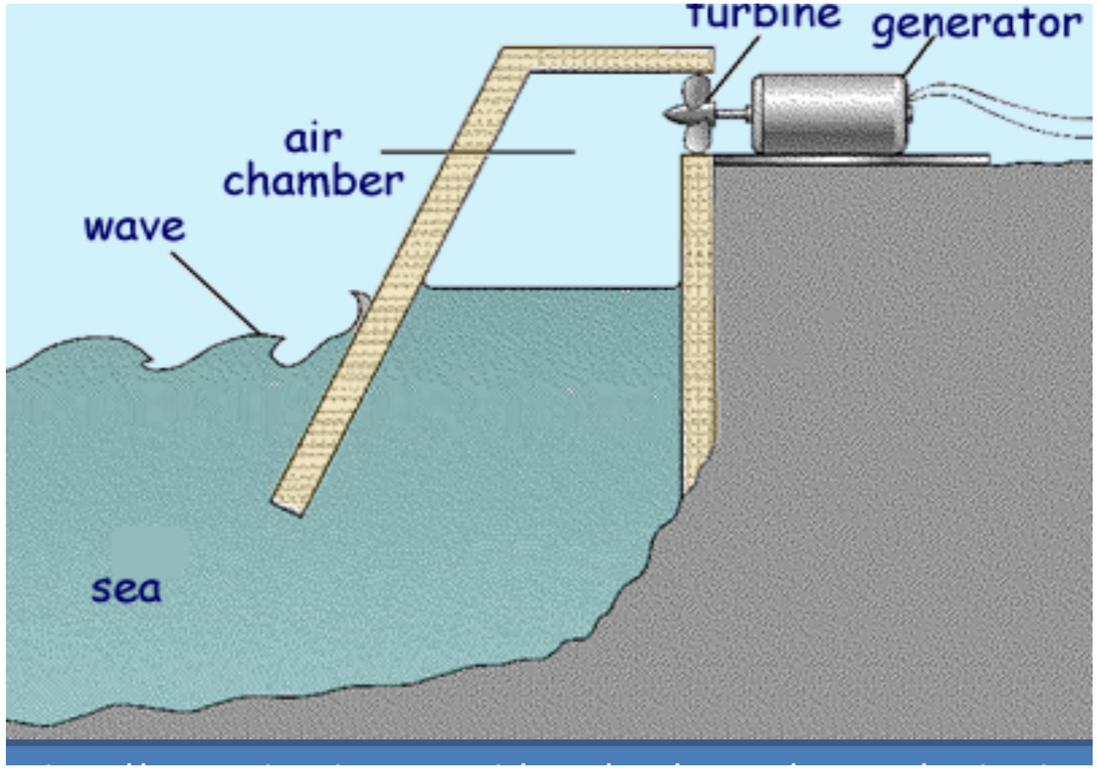
3. Wave power

Source: water

Origin： the Sun

Energy stored form: g.p.e + k.e.

How to make use of it?



3. Wave power

Source: water

Origin： the Sun

Energy stored form: g.p.e + k.e.

How to make use of it?

advantages	disadvantages
Renewable No contribution to global warming No pollution	Unreliable (heights of waves can vary) Hard to convert up-down movement to spin High cost(machine corrode in saltwater, damage in storms) Affect marine life

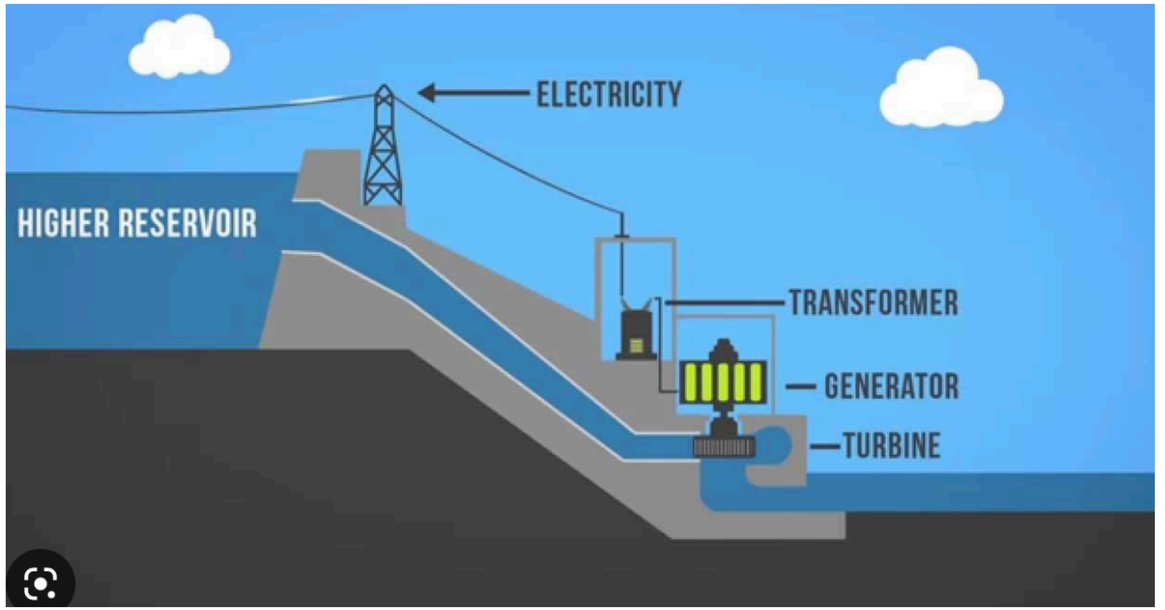
4. Hydroelectric power

Source: water

Origin： the Sun

Energy stored form: g.p.e

How to make use of it?



g.p.e => k.e. => electricity

NO boiling water(steam) involved!

4. Hydroelectric power

Source: water

Origin： the Sun

Energy stored form: g.p.e

How to make use of it?

advantages	disadvantages
Renewable No contribution to global warming Short start up time Reliable Safe	Harmful to environment(floods, destroy hunting/farming land, wildlife habitats)

5. Biomass fuel

Source: Biomass(wood, animal dung, biogas)

Origin： the Sun (photosynthesis)

Energy stored form: chemical

How to make use of it?

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Source: Biomass(wood, animal dung, biogas)

Origin： the Sun (photosynthesis)

Energy stored form: chemical

How to make use of it?

advantages	disadvantages
Renewable **No contribution to global warming** Reliable	Lead to respiratory & health problems

6.Fossil fuel

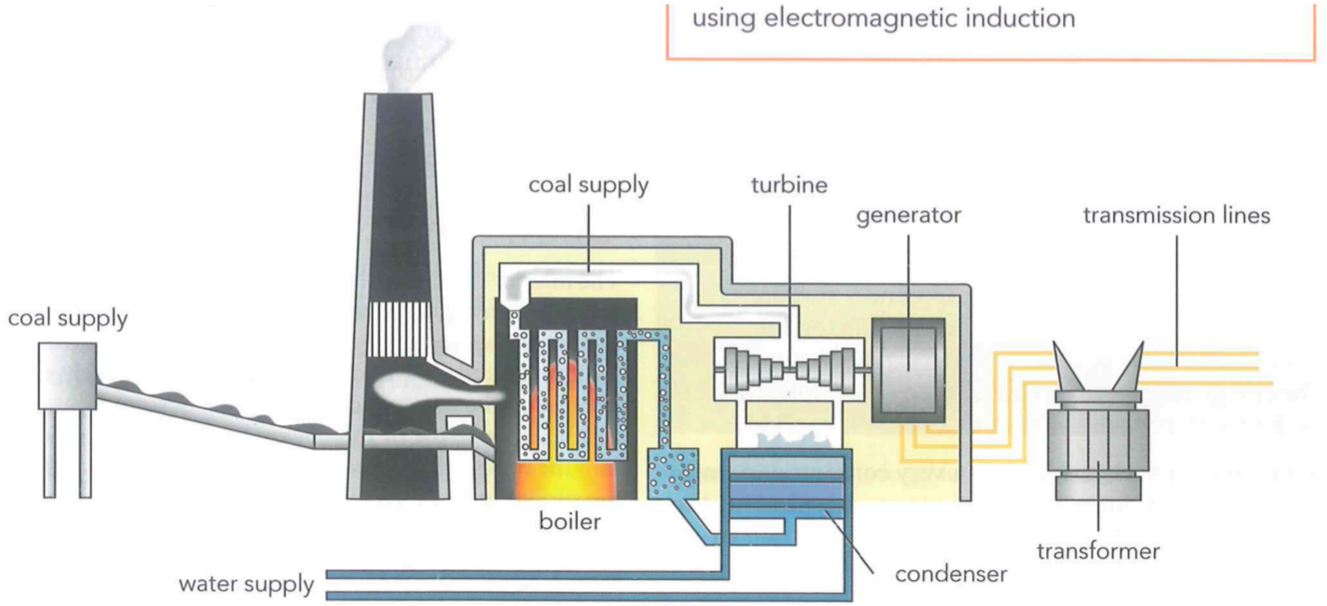
Non-renewable

Source: oil, natural gas, coal

Origin： the Sun

Energy stored form: chemical

How to make use of it?



6.Fossil fuel

Non-renewable

Source: oil, natural gas, coal

Origin： the Sun

Energy stored form: chemical

How to make use of it?

advantages	disadvantages
Reliable Relatively cheap Relatively concentrated	Non-renewable Contribute to global warming Polluting (acid rain, sulfur dioxide)

Exercise

In terms of fuel source origins, how do bio and fossil fuels differ?

7. Nuclear fuel

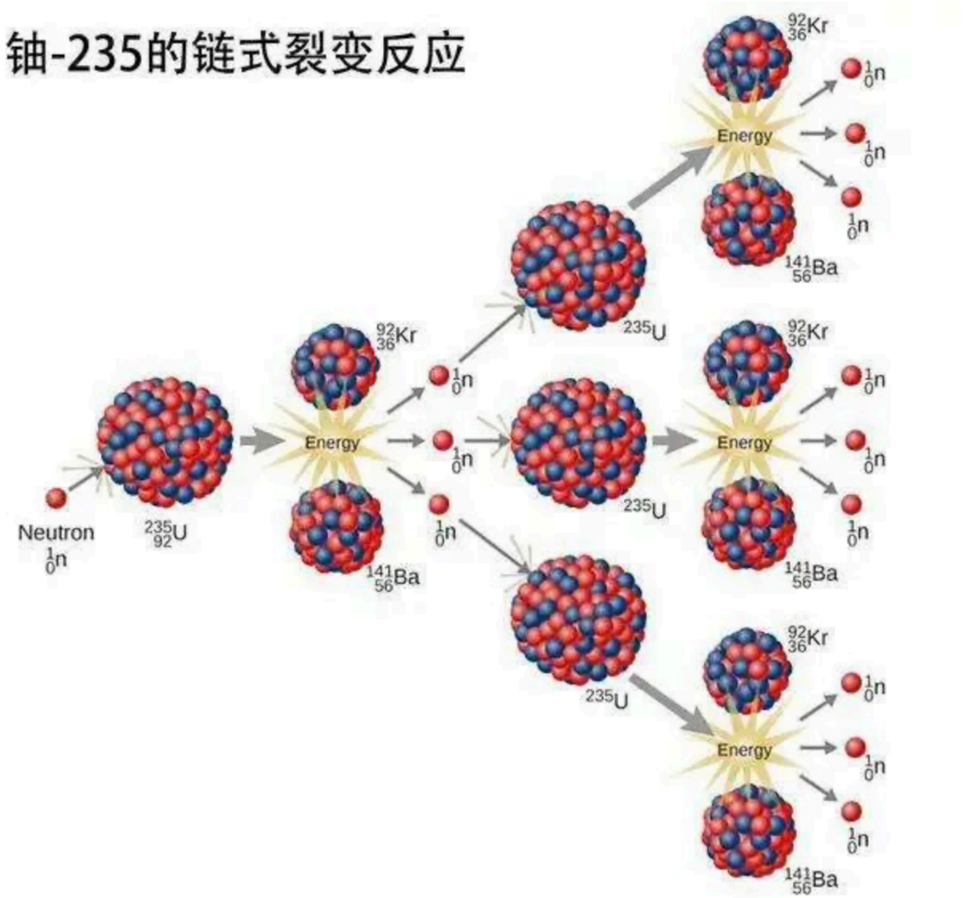
Non-renewable

Source: Uranium

Origin： not from the Sun

Energy stored form: nuclear

How to make use of it?



7. Nuclear fuel

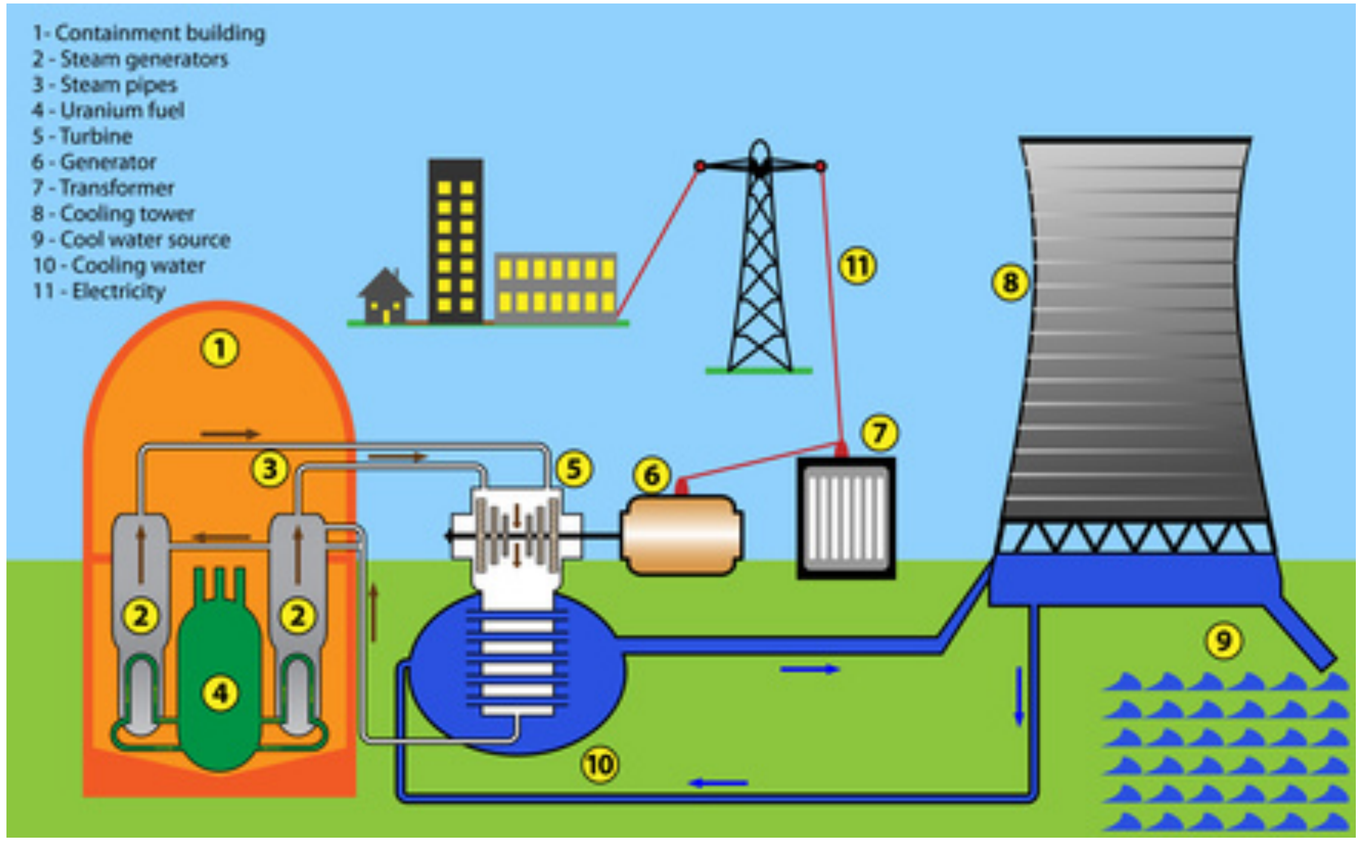
Non-renewable

Source: Uranium

Origin： not from the Sun

Energy stored form: nuclear

How to make use of it?



7. Nuclear fuel

Non-renewable

advantages	disadvantages
Clean Concentrated running cost: relatively cheap	Expensive initial cost Redioactive waste Accidents

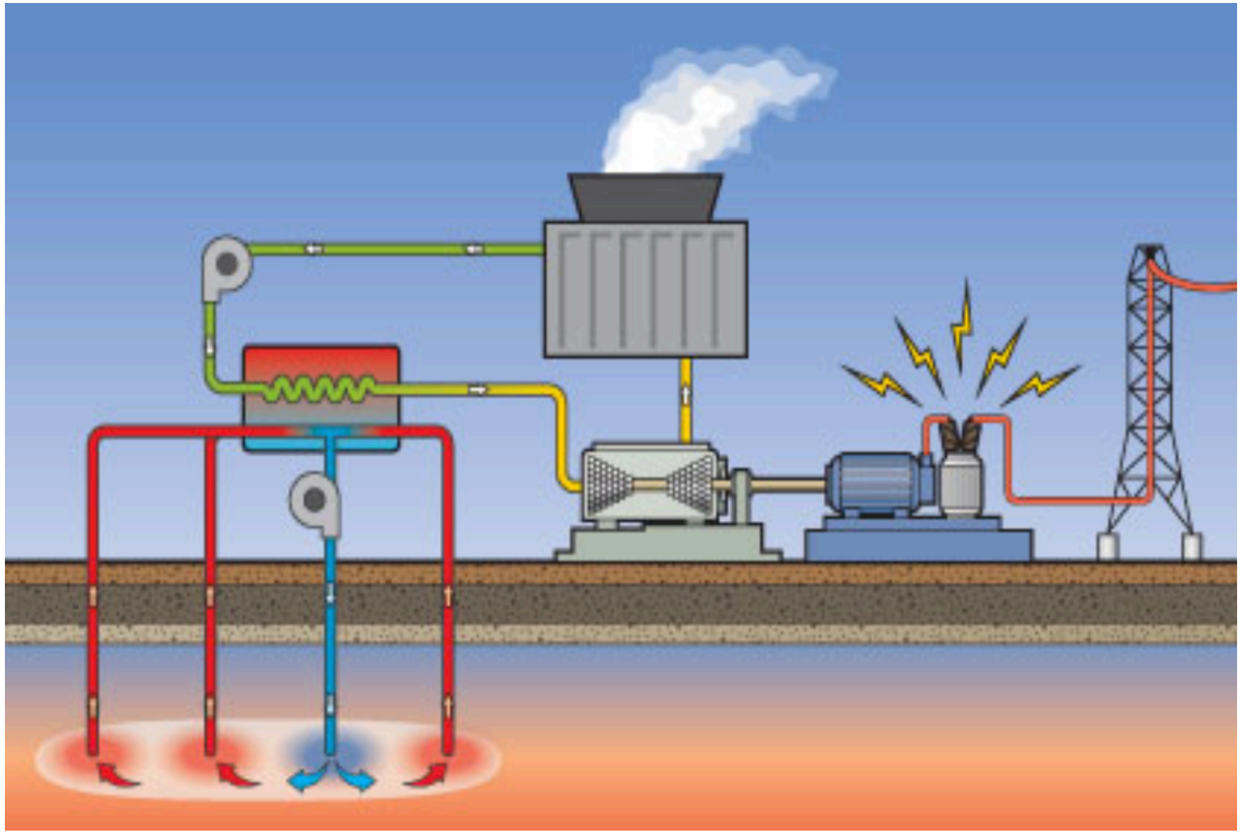
8. Geothermal energy

Source: the Earth

Origin： not the Sun, core of Earth

Energy stored form: thermal

How to make use of it?



8. Geothermal energy

Source: the Earth

Origin： not the Sun, core of Earth

Energy stored form: thermal

How to make use of it?

advantages	disadvantages
Renewable No contribution to global warming Reliable Running cost: almost free Clean	High initial cost (drilling several kms to hot rocks)

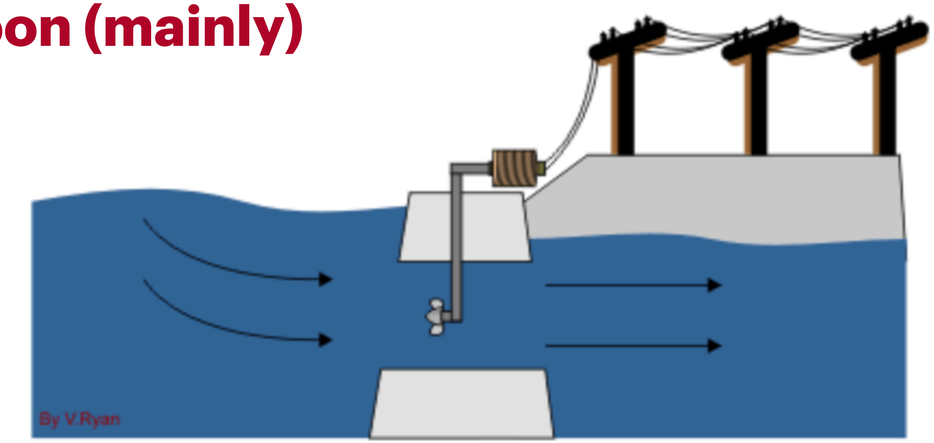
9. Tidal energy

Source: water

Origin： not from sun, from gravi. pull of the Moon (mainly)

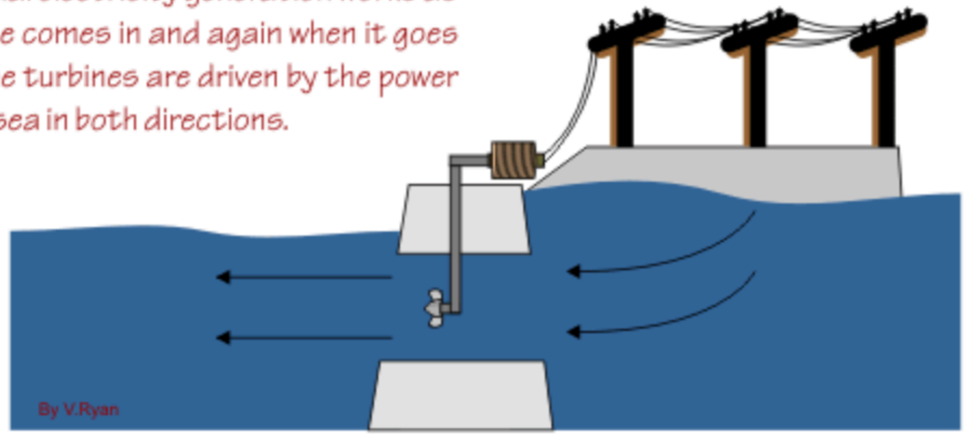
Energy stored form: g.p.e + k.e.

How to make use of it?



TIDE COMING IN

This tidal electricity generation works as the tide comes in and again when it goes out. The turbines are driven by the power of the sea in both directions.



TIDE GOING OUT

9. Tidal energy

Source: water

Origin： not from sun, from gravi. pull of the Moon (mainly)

Energy stored form: g.p.e + k.e.

How to make use of it?

advantages	disadvantages
Renewable Reliable(predictable)	Destroy wetlands Blocking shipping routes

Classification

1. From the Sun or not：

From Sun	Not from Sun

Classification

2. Renewable or not：

Renewables	Unrenewables

Exercise

Which of the following energy resources is renewable?
a. Oil b. Nuclear. c. Biofuels d. Coal

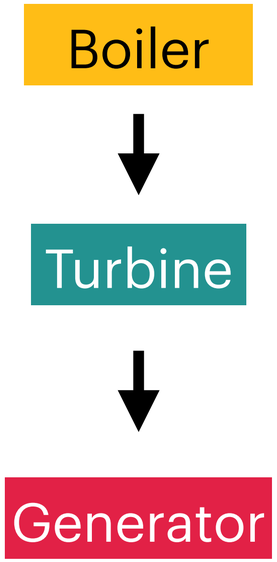
Exercise

Which of the following energy resource is not renewable?

a. Hydroelectric power b. Wind c.Tidal d. Nuclear

Generating electricity

Almost all energy resources can be used to generate electricity. What are the common procedures?



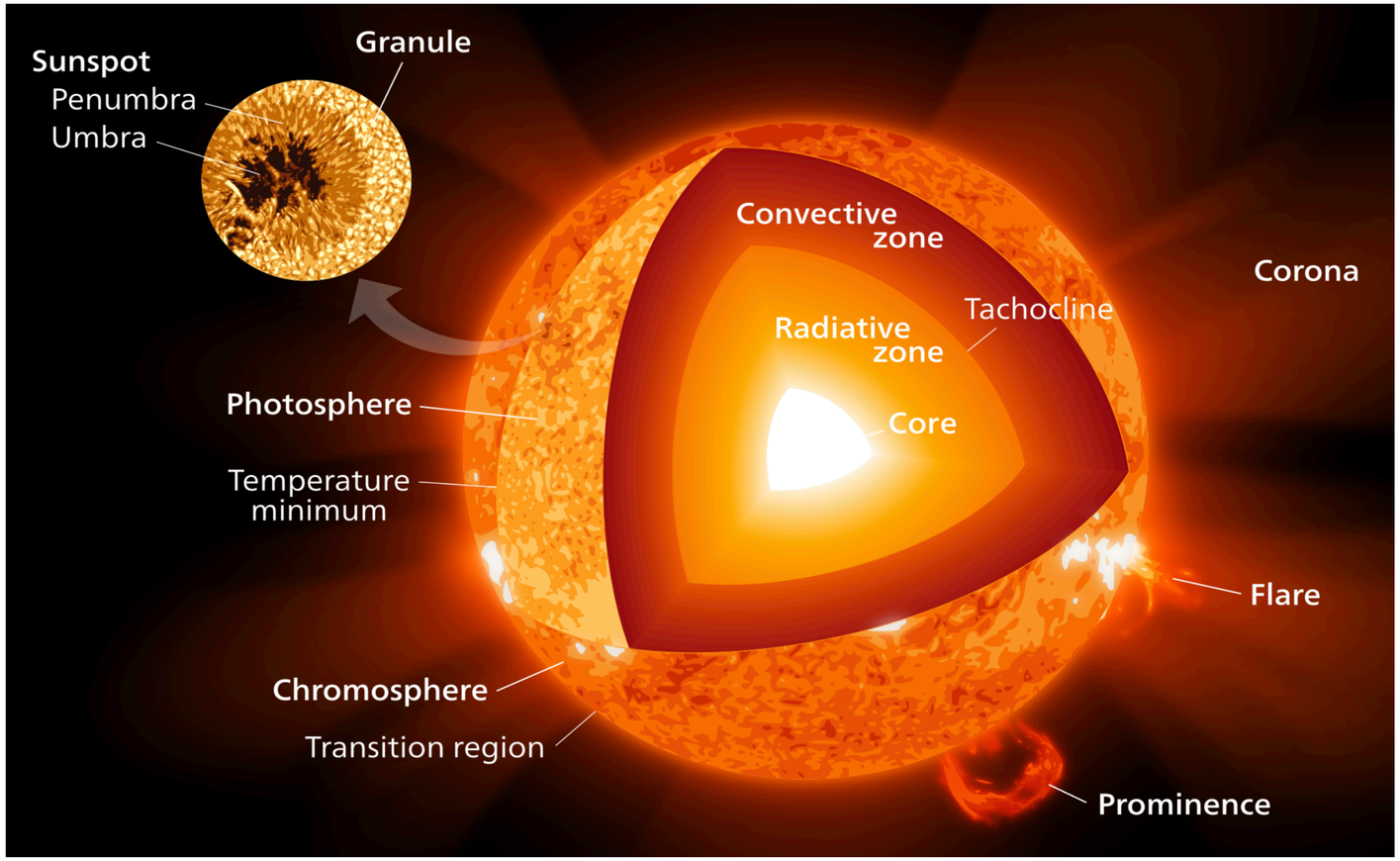
Comparing energy resources —— considerations:

1. **Renewability**
2. **Cost (initial vs running)**
3. **Availability**
4. **Reliability**
5. **Scale**
6. **Environment impact**

Energy from the Sun

Many energy resource can trace back to the Sun, but where does the Sun's energy come from?

Nuclear fusion in the core of the Sun



Nuclear fusion on Earth

Requirements for fusion: high T, P => plasma()

Totamak

Exercise

What is the difference between nuclear fusion and nuclear fission?