

# Chapter 7. Energy resources

## Contents:

- 7.1 Energy resources
- 7.2 Energy from the Sun

### New word list:

biomass, biofuel, respiratory, fossil fuel, boiler, turbine, generator, solar panel, solar cell, replenish, windmill, renewable, dilute, diffuse, nucleus, nuclei, ionize, reactor, reliable, grind, reservoir, habitat

#### 1.7.3 Energy resources

##### Core

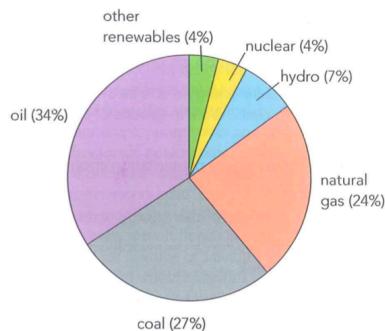
- 1 Describe how useful energy may be obtained, or electrical power generated, from:
  - (a) chemical energy stored in fossil fuels
  - (b) chemical energy stored in biofuels
  - (c) water, including the energy stored in waves, in tides, and in water behind hydroelectric dams
  - (d) geothermal resources
  - (e) nuclear fuel
  - (f) light from the Sun to generate electrical power (solar cells)
  - (g) infrared and other electromagnetic waves from the Sun to heat water (solar panels) and be the source of wind energyincluding references to a boiler, turbine and generator where they are used
- 2 Describe advantages and disadvantages of each method in terms of renewability, availability, reliability, scale and environmental impact
- 3 Understand, qualitatively, the concept of efficiency of energy transfer

##### Supplement

- 4 Know that radiation from the Sun is the main source of energy for all our energy resources except geothermal, nuclear and tidal
- 5 Know that energy is released by nuclear fusion in the Sun
- 6 Know that research is being carried out to investigate how energy released by nuclear fusion can be used to produce electrical energy on a large scale
- 7 Define efficiency as:
  - (a)  
$$(\%) \text{ efficiency} = \frac{(\text{useful energy output})}{(\text{total energy input})} \times 100\%$$
  - (b)  
$$(\%) \text{ efficiency} = \frac{(\text{useful power output})}{(\text{total power input})} \times 100\%$$recall and use these equations

## 7.1 Energy resources

World energy use in 2018:



### Renewables:

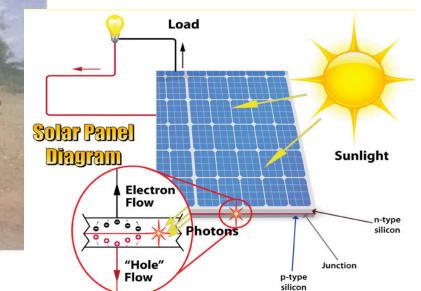
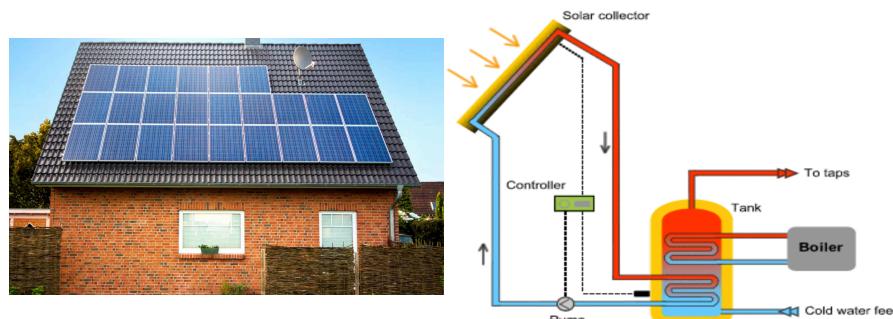
#### 1. Solar energy

Source:

Origin:

Energy stored form:

How to make use of it?



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

Exercise 7.1

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

**2. Wind power**

Source:

Origin:

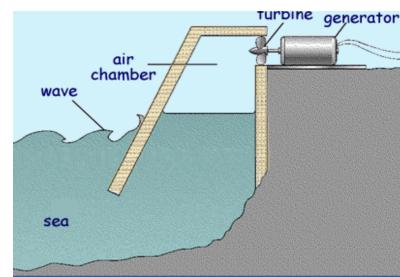
Energy stored forms:  
How to make use of it?



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

Exercise**7.2**

Explain why wind power can be traced back to sunlight.

**3. Wave power**

Source:

Origin:

Energy stored forms:  
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

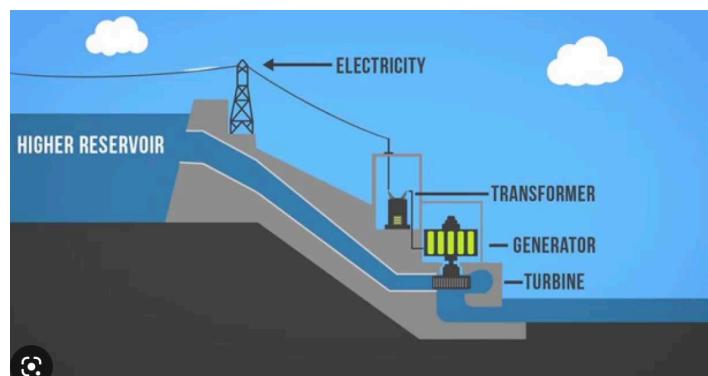
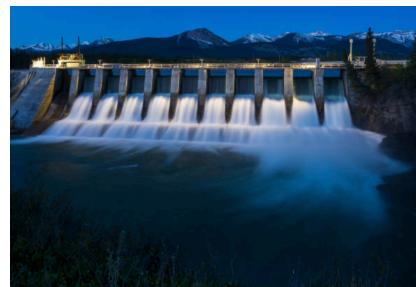
#### 4. Hydroelectric power

Source:

Origin:

Energy stored forms:

How to make use of it?



energy transformation:

**NO boiling water(steam) involved!**

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

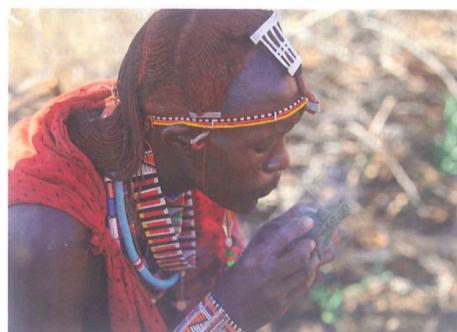
#### 5. Biomass fuel

Source:

Origin:

Energy stored forms:

How to make use of it?



advantages	disadvantages
Renewable <b>No contribution to global warming</b> Reliable No pollution	Lead to respiratory & health problems

## 6. Fossil fuel

Source:

Origin:

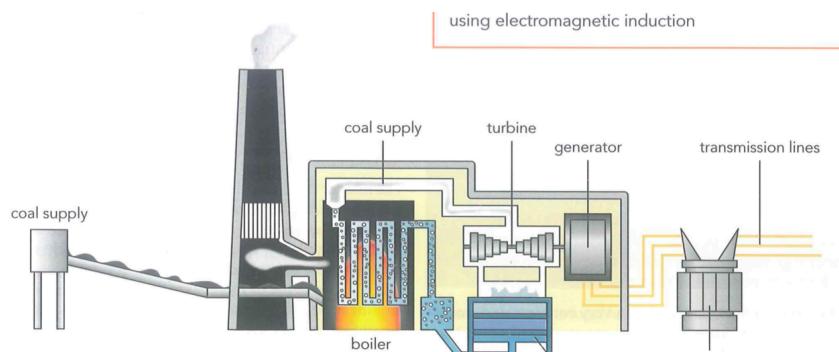


### Exercise 7.3:

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

Energy stored forms:

How to make use of it?



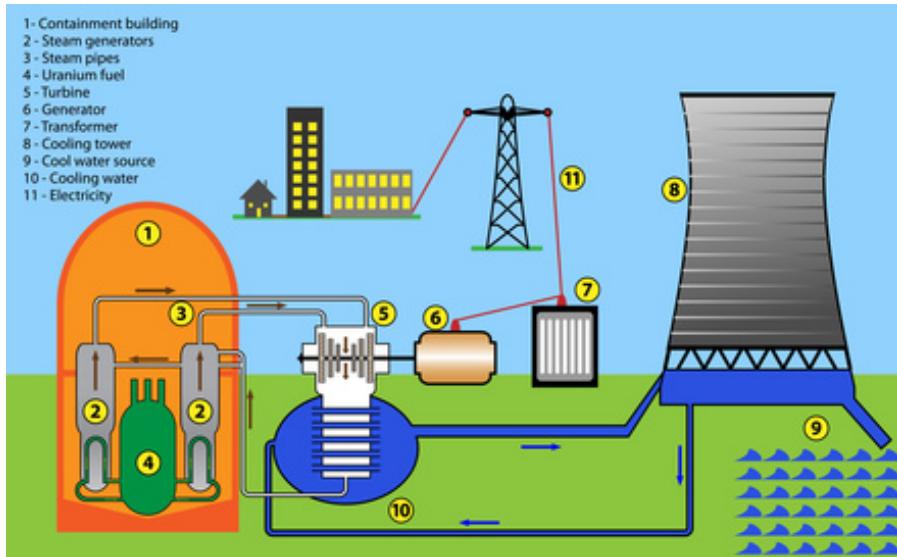
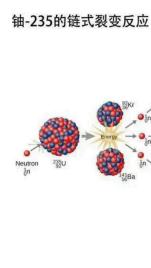
advantages	disadvantages
Reliable Relatively cheap Relatively concentrated	Non-renewable Contribute to global warming Polluting (acid rain, sulfur dioxide)

## 7. Nuclear fuel

Source:

Origin:

Energy stored forms:  
How to make use of it?



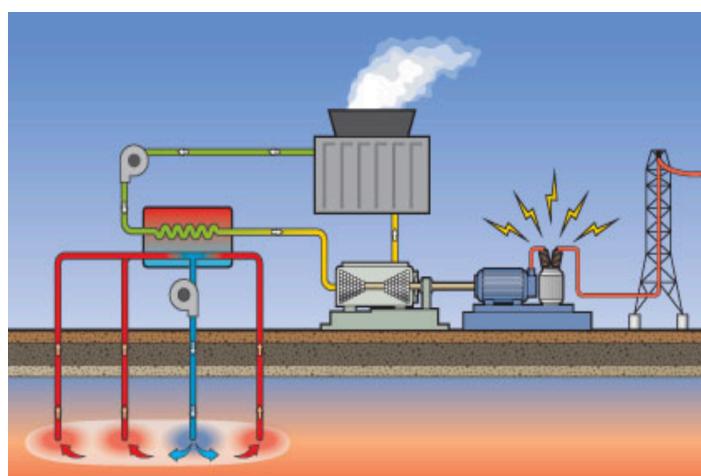
## 8. Geothermal energy

Source:

Origin:

Energy stored forms:

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)

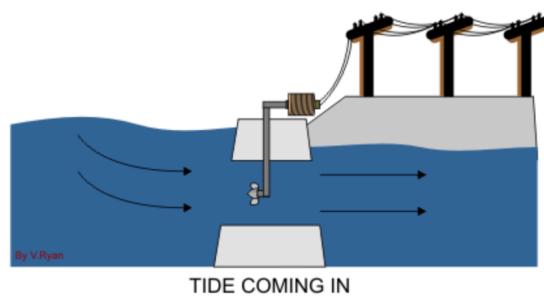
## 9. Tidal energy

Source:

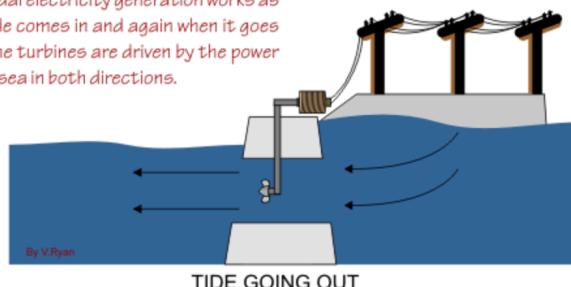
Origin:

Energy stored forms:

How to make use of it?



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.



advantages	disadvantages
Renewable Reliable(predictable) No contribution to global warming No pollution	Destroy wetlands Blocking shipping routes

### **Classification**

1. From sun

From Sun	Not from Sun

2. Renewable

Renewables	Unrenewables

#### **Exercise 7.4**

Which of the following energy resources is renewable?

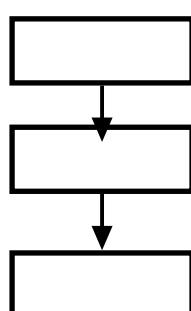
- a. Oil
- b. Nuclear.
- c. Biofuels
- d. Coal

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:

#### Summary

Energy resource	Source	From sun /not	Energy forms	Renewable / not	Reliable/not	Use steam/not
Solar						
Wind						
Wave						
Hydroelectric						
Biomass						
Fossil						
Nuclear						
Geothermal						
Tidal						

## 7.2 Energy from the Sun

The source of the Sun's energy:

Nuclear fusion reactors — artificial suns on Earth

#### Exercise 7.5:

What is the difference between nuclear fusion and nuclear fission?

