

Renewable and Non-Renewable

Energy

SOURCES OF ENERGY



**RENEWABLE ENERGY
SOURCES**

Infinite supply

**NON-RENEWABLE
ENERGY SOURCES**

Limited supply

Part 1

Fossil Fuels

NON-RENEWABLE ENERGY SOURCES

FOSSIL FUELS



Coal, petrol, petroleum and gas
Mined from the Earth-Formed by animals and
plants.

**Advantage: High
energy density,
Convenient**



**Disadvantage:
Pollute, Cause
Greenhouse
Effect, Cause acid
rain (CO_2 & SO_2)**

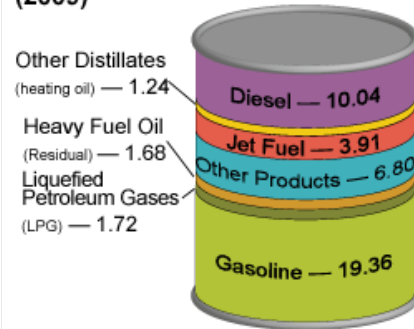


Fossil fuels- what are they?



Coal

Products Made from a Barrel of Crude Oil (Gallons) (2009)



Oil



Natural gas

Fossil fuels- what do we use them for?

For energy!

Fossil fuels- where can they be found?

- Underground!

Fossil fuels- how are they formed?

- They were formed from the remains of **dead plants** and **dead animals** which lived millions of years ago.
- Fossil fuel formation is a long process

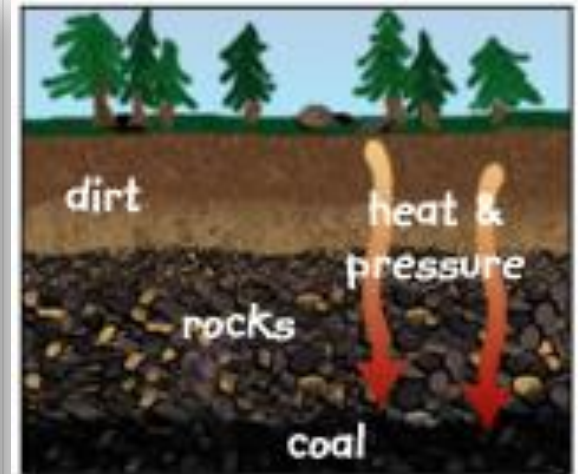
Coal Formation



Swamps with giant plants hundreds of millions of years ago covered the earth.

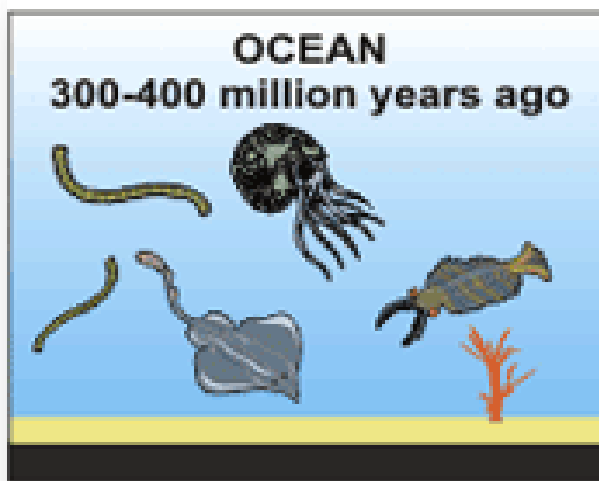


Water and dirt covered the plant remains 100 million years ago.

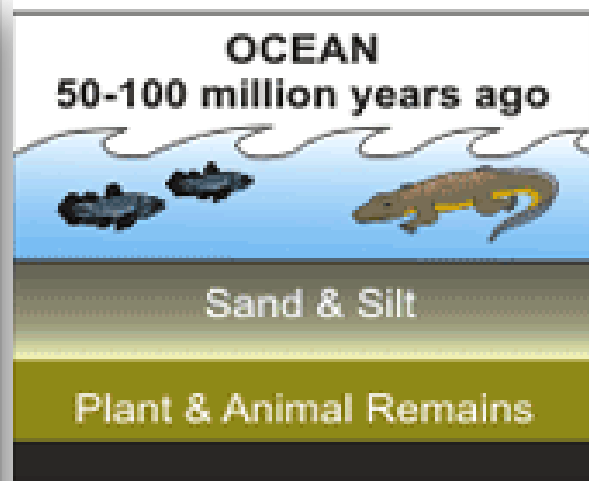


Rocks, dirt and sediment created pressure and heat to form coal deep in the ground.

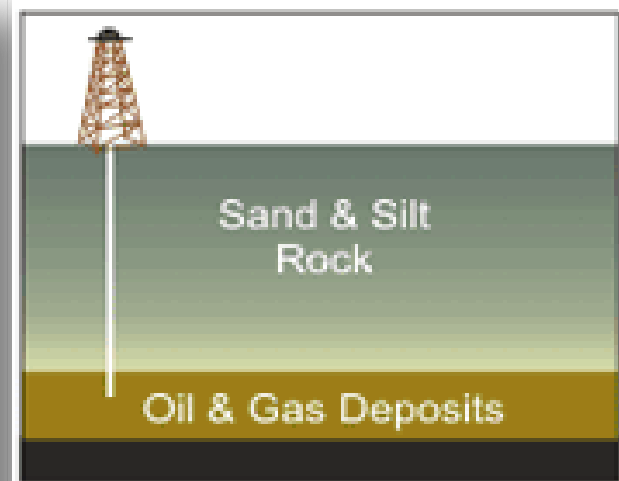
Petroleum and natural gas formation



Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of silt and sand.



Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.



Today, we drill down through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits.

Why do you think fossil fuels are called 'fossil fuels'?

Because they are the result of dead living material... 'fossil'

And they store lots of energy...
'fuel'

Where did the energy in fossil fuels come from?

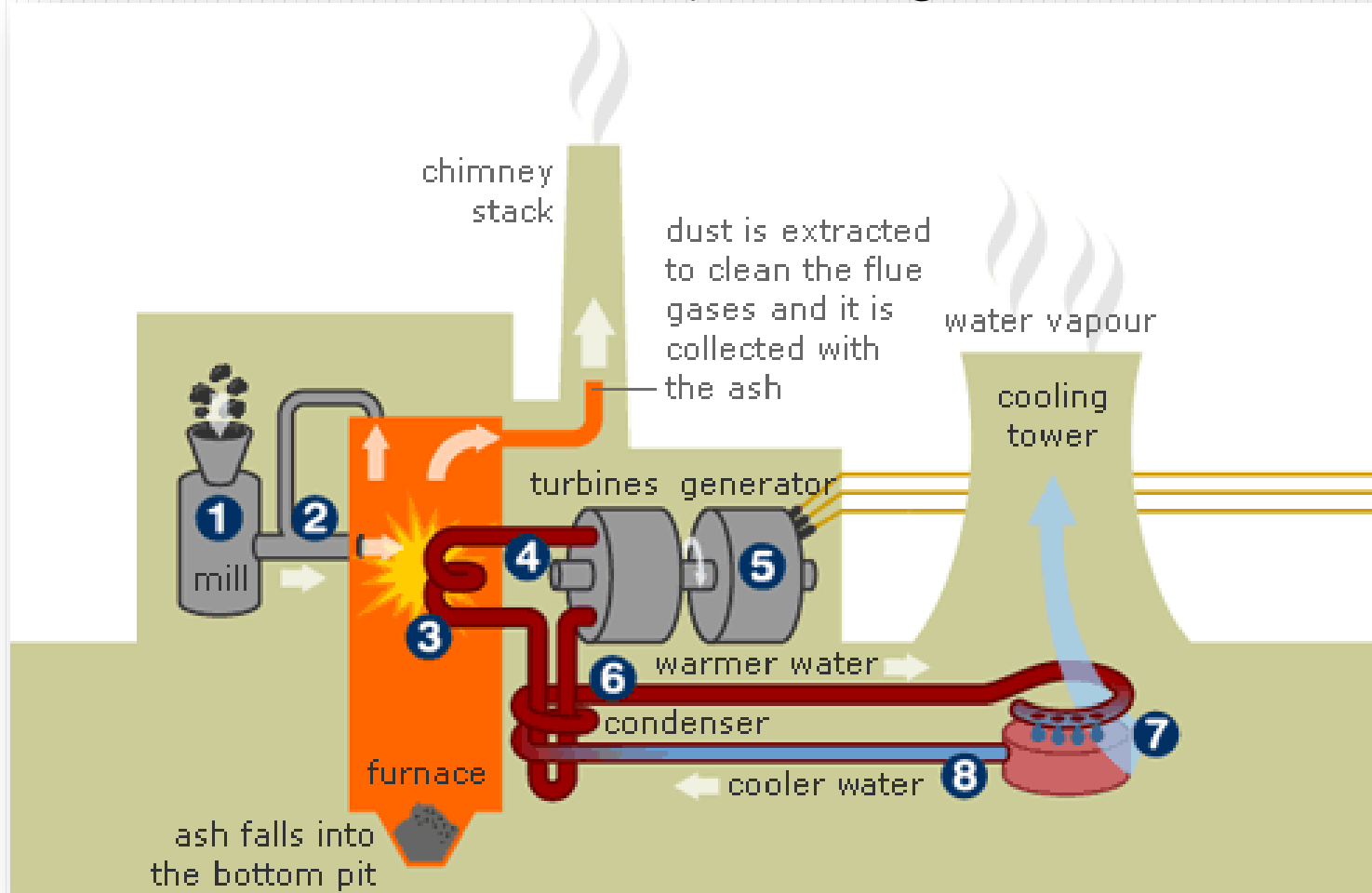
Energy in fossil fuels came from...

Biomass of plants and animals which died millions of years ago.

How do we get energy from
the fossil fuels? **By burning!**

What happens in a power station?

- Fossil fuels are burnt. This releases thermal energy.
- The thermal energy causes water to change into steam.
- The steam powers machinery... This generates electricity.



Why are fossil fuels non-renewable?

Fossil fuels are called *non-renewable* sources of energy since after burning them they cannot be used again!

The world is burning fossil fuels quicker than they are being formed and now they are finishing!

Task

<i>Fossil fuel</i>	<i>Easy to light?</i>	<i>Burns cleanly?</i>	<i>Amount of energy released</i>	<i>Approx. amount of energy per €100</i>
Natural gas	Very easy	Yes	55 kJ per gram	230 000 kJ
Oil	Yes	No	45 kJ per gram	250 000 kJ
Coal	No	No	30 kJ per gram	300 000 kJ

1. Which fuel is easiest to set alight?
2. Which fuel burns most cleanly?
3. Which fossil fuel is a solid?
4. Which is the liquid that gives us petrol?
5. Which fuel gives most energy when 1 gram of it is burned?
6. The price of these fuels varies from year to year, but from the table which is the cheapest?

How long will the fossil fuels last?

- Coal is predicted to last only till approximately the year 2225
- Oil till 2030
- Natural gas till 2050



Other problems?

- They also cause many environmental problems such as *global warming*.
- Global warming is an average rise in the world's temperature that is happening due to gases in the atmosphere that trap heat energy on Earth. This is called the *greenhouse effect*.
- Burning fossil fuels creates many of these gases!!
- Also accidents like the Exxon Valdez oil spill can have huge harmful impacts on the environment!



Oil Rig off the coast of Malta



Part 2

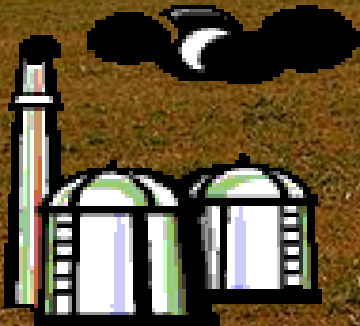
Alternative Energy Sources

NON-RENEWABLE ENERGY SOURCES

NUCLEAR FUEL

Mined from ore, used in power stations and submarines.

**Advantage: High
energy density,
Efficient**



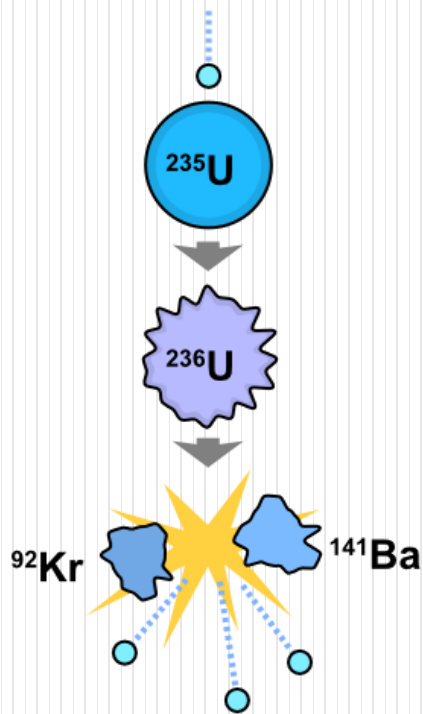
**Disadvantage:
Difficult to store
(pollutant)**

Nuclear Energy

- Energy is created when atoms are split (*fission*) or when atoms are joined together (*fusion*)
- The sun produces energy by *fusion*
- Nuclear power stations use *fission* to create electricity. The heat energy released from fission is used to heat water and create steam. This steam is used to create electricity

Nuclear energy

- Common fuel: Uranium.
- Uranium breaks down naturally to produce a lot of heat energy.



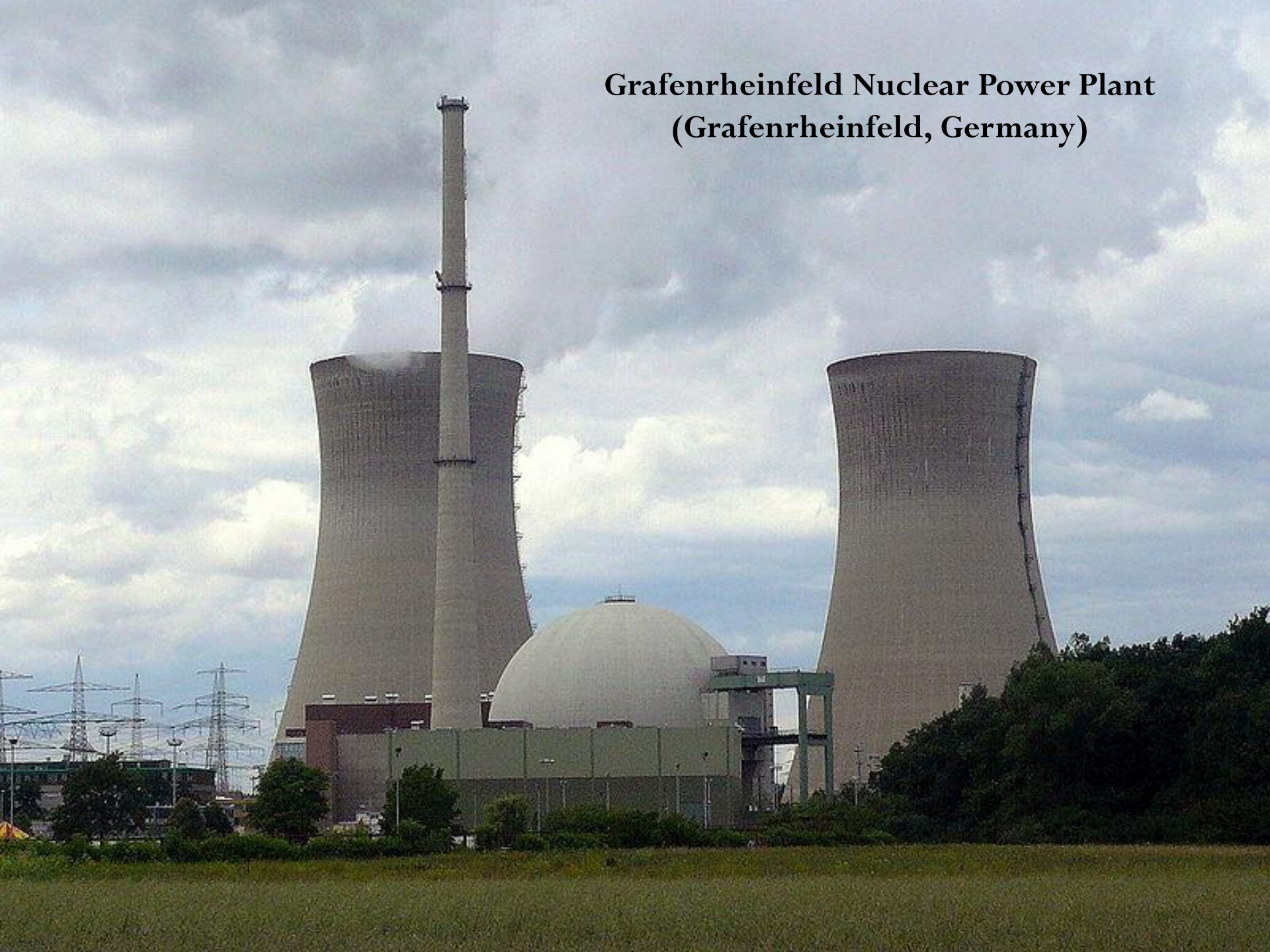
However...

- A major problem with nuclear energy is that it is difficult to control, and it makes very dangerous waste products.



RADIOACTIVE

**Grafenrheinfeld Nuclear Power Plant
(Grafenrheinfeld, Germany)**



1986 Chernobyl Accident

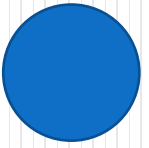


2011 Fukushima Nuclear Meltdown



Renewable Alternative Energy Sources

Renewable alternative sources of energy



- Some sources of energy are *renewable*.
- Renewable Sources of energy can be used over and over again without them finishing.
- They also do not pollute and are environmentally friendly!
- Examples: ?

RENEWABLE ENERGY SOURCES

SOLAR ENERGY

Advantage:

Free Energy
Does not Pollute

Disadvantage:

Expensive technology
Low Energy Density
Lower Efficiency when
cloudy.

1. Solar Energy



- Light energy from the sun is converted into heat energy or electrical energy
- Heat energy can be used to heat water (e.g. in homes/pools) or air (e.g. in greenhouses)
- Electrical energy is created using *photovoltaic cells*

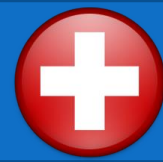


Nellis Solar Power Plant





Stade de Suisse



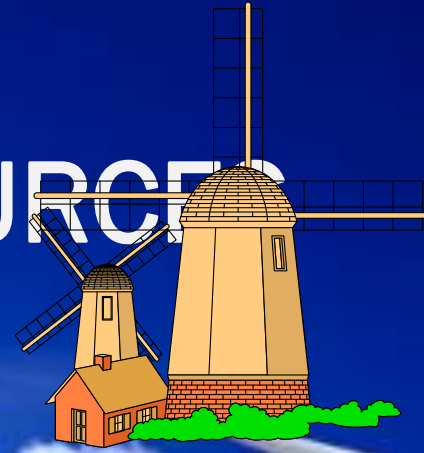




WORLD SOLAR CHALLENGE



WIND RENEWABLE ENERGY SOURCES ENERGY



Advantage:

Free Energy
Does not Pollute

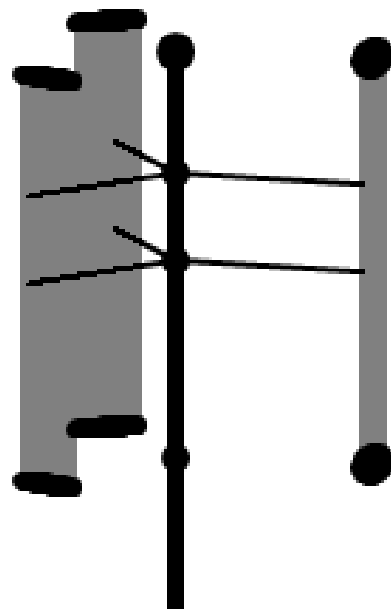
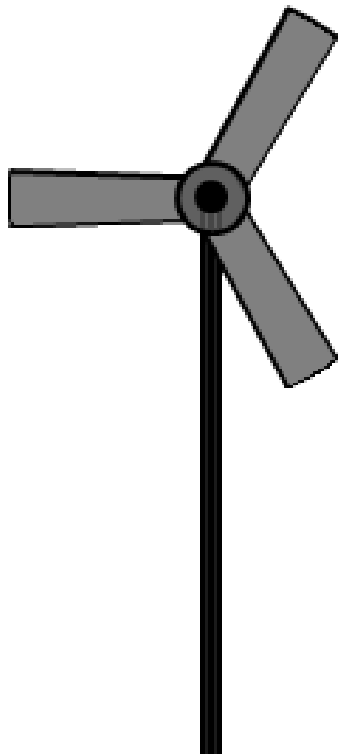
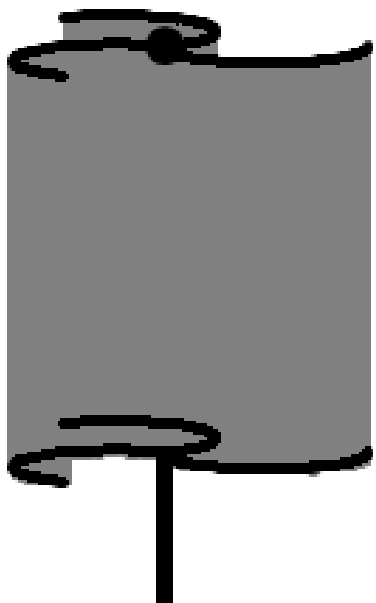
Disadvantage:

Wind farms can be an
eyesore and cause noise
pollution.
Dependent on windy
days.



2. Wind Energy

- In wind turbines, wind flows over the blades causing them to turn.
- The blades are then connected to a drive shaft that turns an electric generator to produce electricity.





Mojave Desert, California

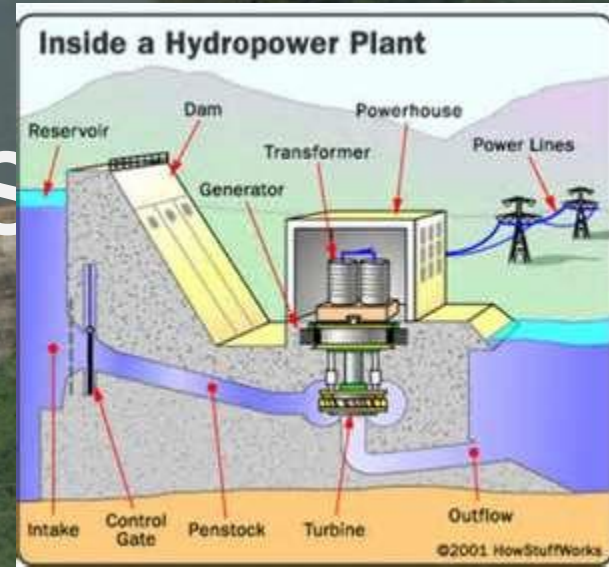




Wind Turbines in Copenhagen



HYDRO RENEWABLE ENERGY S ENERGY



Advantage:

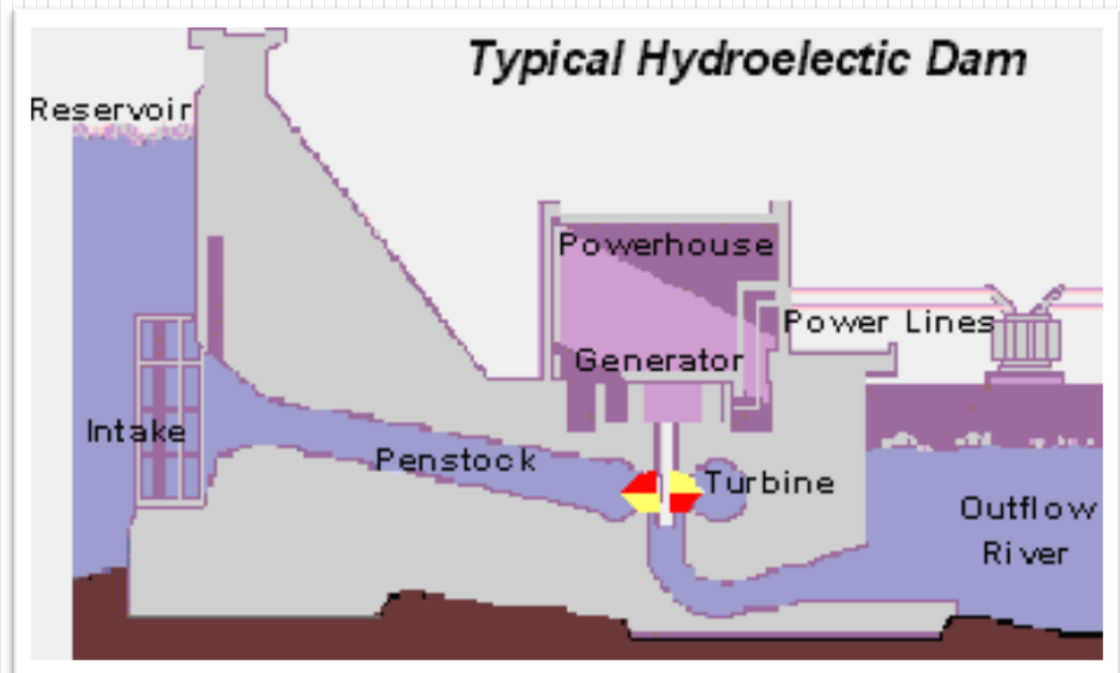
Free Energy.
Does not Pollute.

Disadvantage:

Dams cause
environmental problems
by shifting natural water
flow.

3. Hydroelectric Power (HEP)

- In HEP, electrical energy is produced from the gravitational force of falling or flowing water
- Dams are very important for HEP



What do we call the energy
which is stored high up?

Gravitational potential
energy!

4. Tidal Energy

- Like air, the tide can move blades in a turbine to create electricity.
- A tide refers to the rise and fall of water levels



Bay of Fundy (North America)

High tide



Low tide

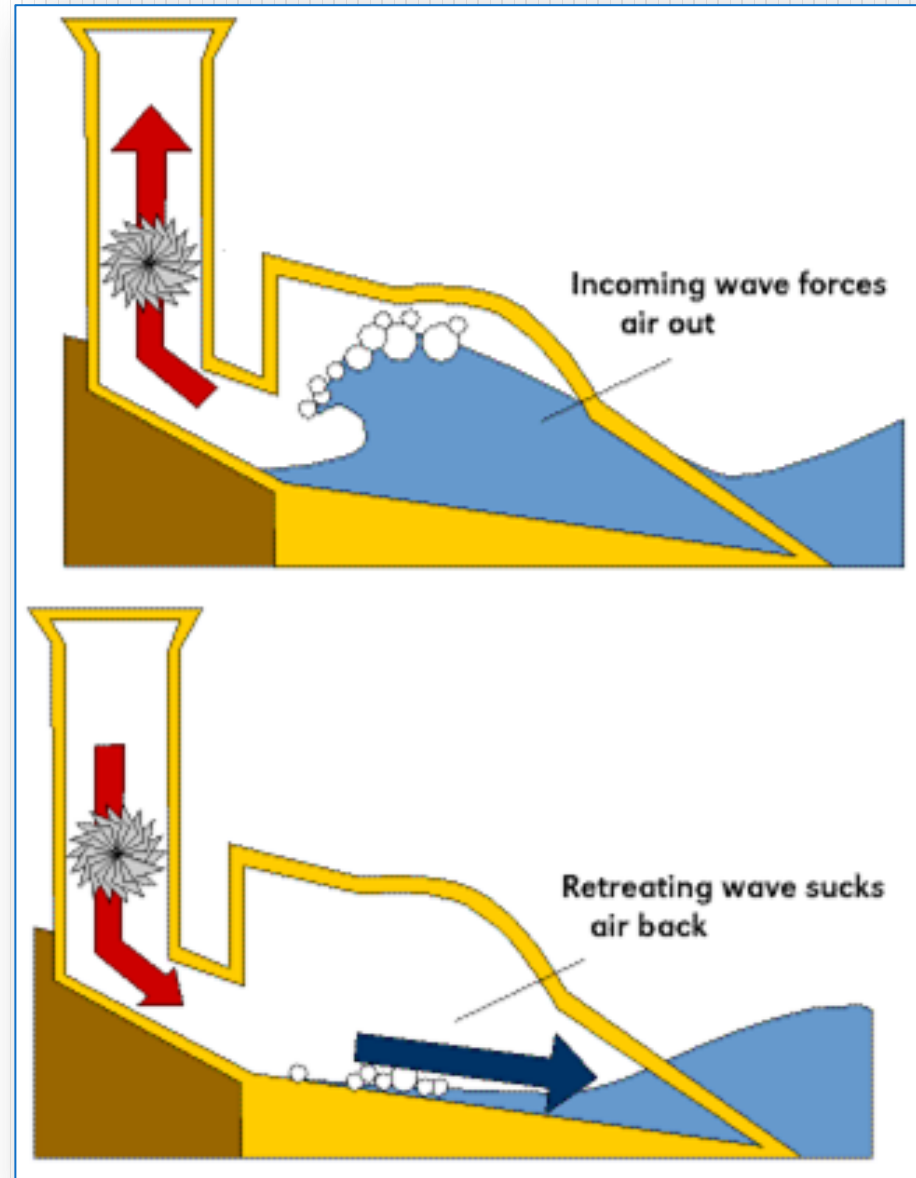


Tidal power plant (France)



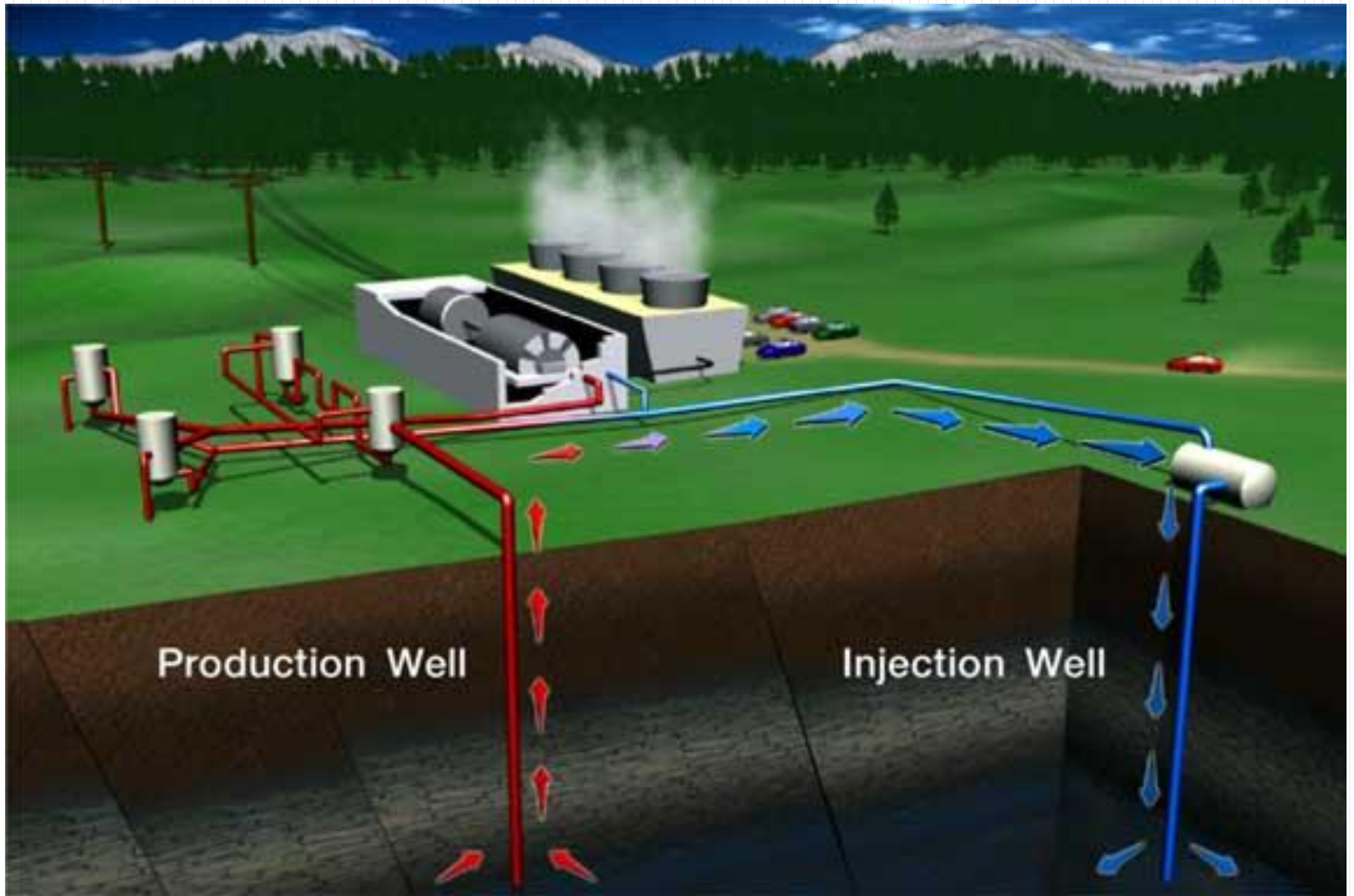
5. Wave Energy

- Movement of waves can be used to create electricity



6. Geothermal

- Geothermal energy comes from heat coming from inside the earth
- Hot high-pressure water from deep inside the Earth is converted to steam which turns turbines and produce electricity
- When the steam cools, it condenses to water and is injected back into the ground to be used again.



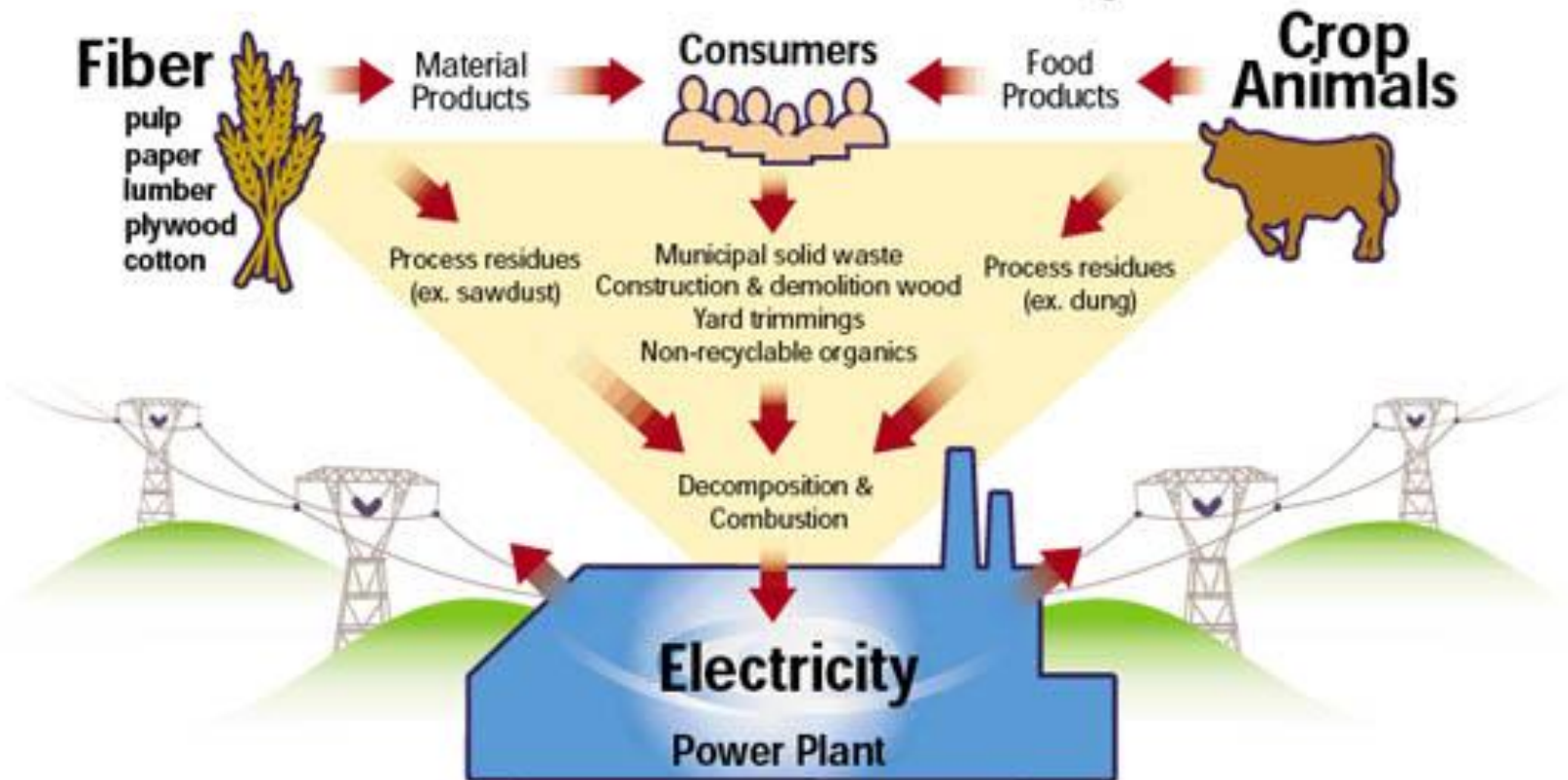


Geothermal Power Plants

Australia	Indonesia	Portugal (Azores)
China	Italy	Russia (Kamchatka)
Costa Rica	Japan	Taiwan
El Salvador	Kenya	Thailand
Ethiopia	Mexico	Tibet
France (Guadeloupe)	New Zealand	Turkey
Guatemala	Nicaragua	United States
Iceland	Philippines	Zambia

BIOMASS RENEWABLE ENERGY SOURCES

Biomass to Electricity



7. Biomass (Plant Material- sugar)

- Through the process of photosynthesis, plants capture solar energy and when they are burned, energy they contain is released.
- Biomass can be converted to a fuel- biodiesel
- As plants grow they use carbon dioxide from the air to build sugar. When the plants are burnt they release the same amount of carbon dioxide back it can be reused and no extra pollution.
- There are two ways of using biomass *sustainably*:
 - growing plants specifically for energy use OR
 - using the residues from plants that are used for other things

8. Biogas, Bioalcohols & Biodiesel

- *Biogas*: natural decomposition of rubbish produces natural gas and can be used as fuel
- *Bioalcohols*: fuel produced from alcohol
- *Biodiesel*: fuel made from animal fats and vegetable oils



Drilling a Biogas Well, Magħtab





Vehicles running on Biodiesel





Bioalcohol Station, São Paulo



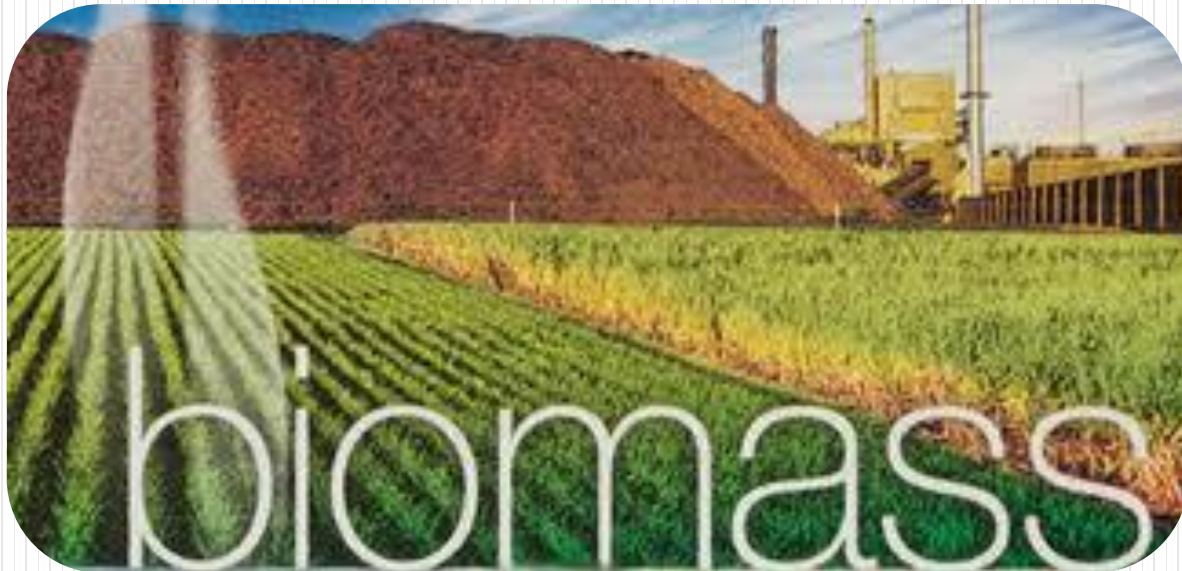
Are fossil fuels renewable or non-renewable? Why?

- Non-renewable.
Once we burn them, we cannot get the material back to use again!



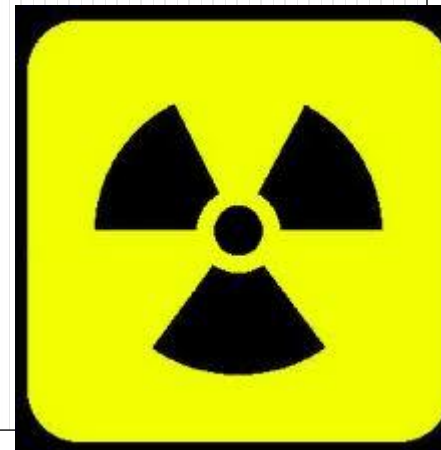
Biomass is a type of renewable energy. Why?

- Its use involves a natural process which can be replenished with time... once being used there is more biomass being created.



Is nuclear energy renewable? Why?

- Nuclear energy is non-renewable because once all e.g. Uranium is used, there will be no more remaining.



Part 3



Energy in Malta

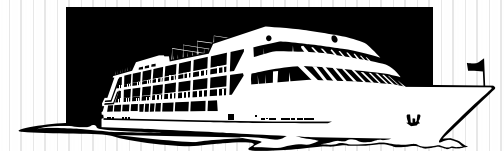
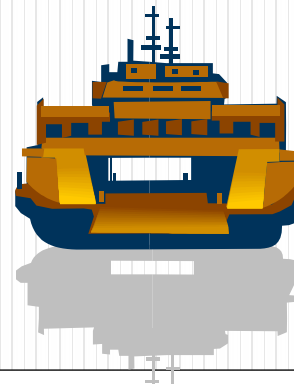
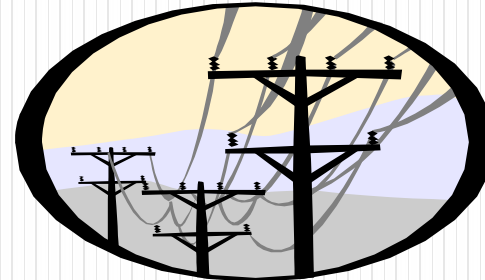
Energy in Malta

- Malta gets all its energy from *imported* fossil fuels. The fossil fuels are used for:

Electricity 60%

Transport 34%

Other Uses 06%



Electricity

- Oil is burnt to generate electricity for all Malta and Gozo in two power stations:

Delimara Power Station

Built: 1992

Electricity Generation: 53%

Marsa Power Station

Built: 1953

Electricity Generation: 47%





Delimara Power Station, Malta

Energy Transfer Diagram

- The energy transfer for these power stations is:

Chemical Energy (Fuel)



Electrical Energy

Xrobb I-Għagin

(Nature Park and Sustainable Development Centre)

- First place in Malta that works on renewable energy only
- Opened in January 2011
- Run by Nature Trust (Malta)

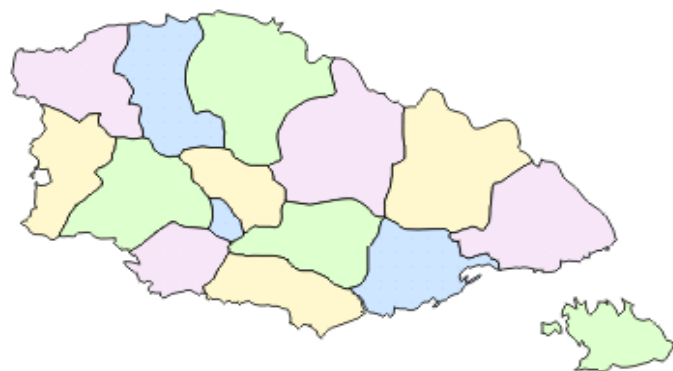
<http://www.naturetrustmalta.org/>



XROBB I-GHAGIN
NATURE PARK
SUSTAINABLE LIVING

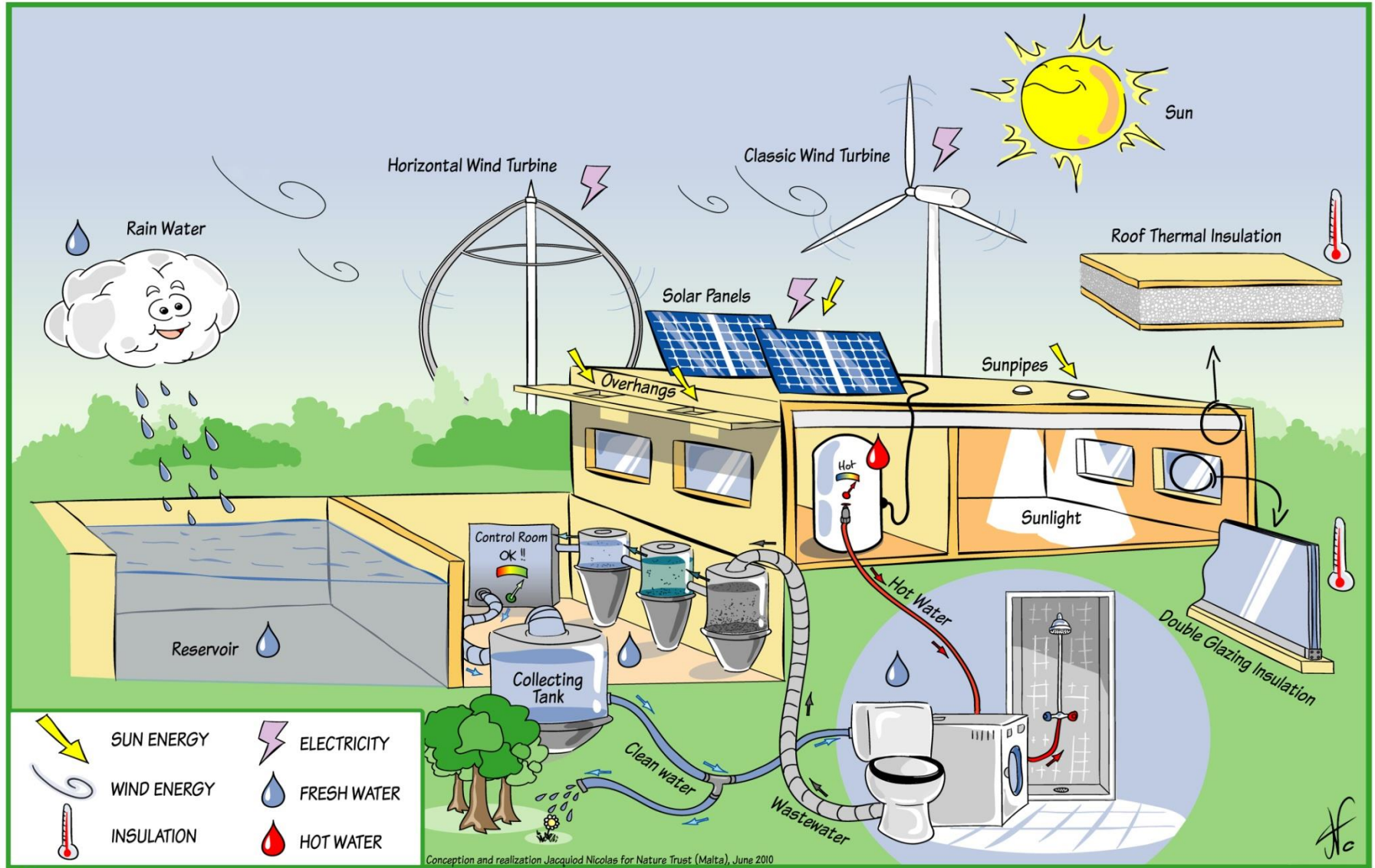
Xrobb I-Għagin

(Location Map)

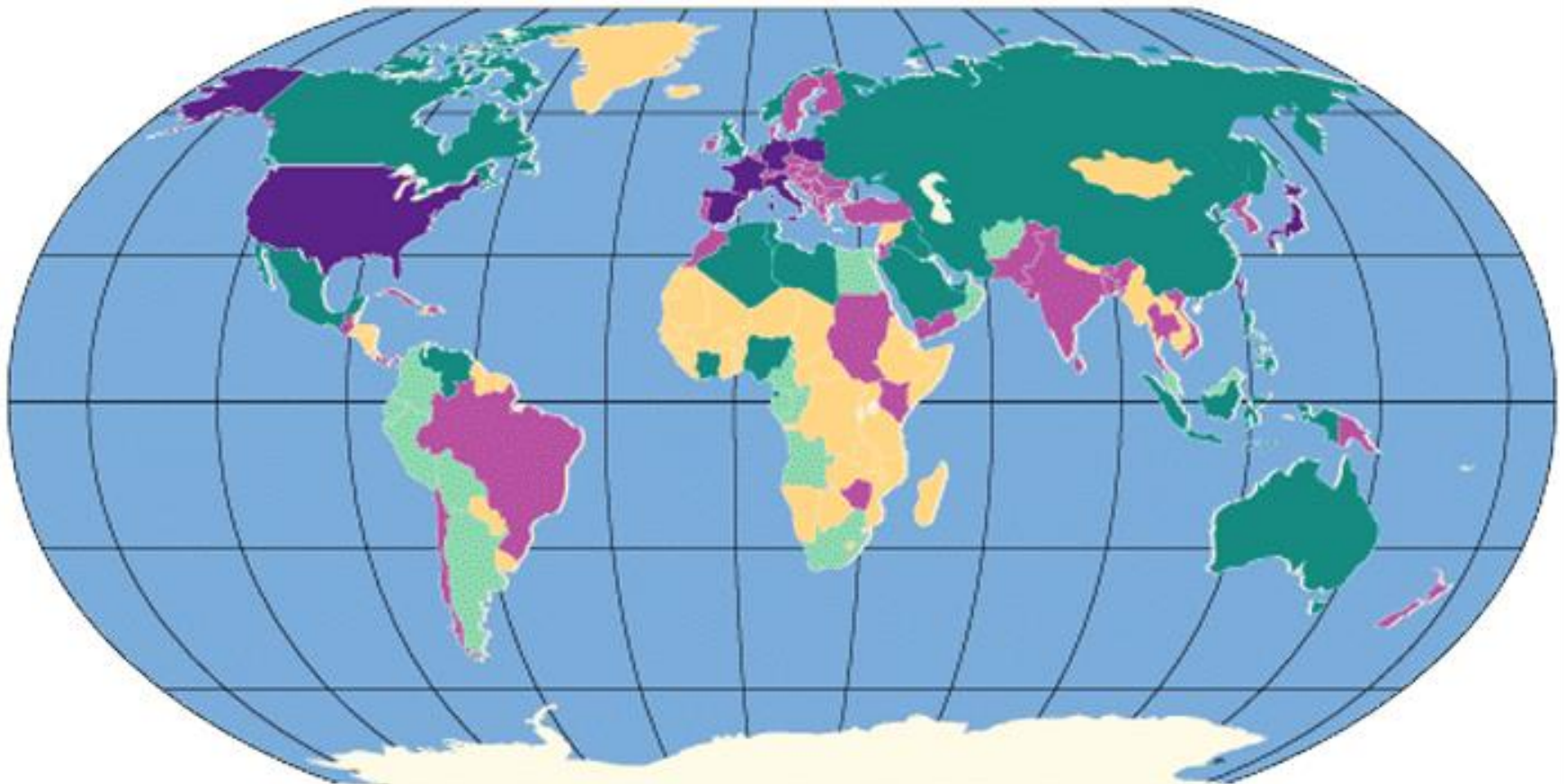


50 km

30 mi



World Energy



Difference between energy production & consumption in millions of tonnes of oil equivalent (1989).

 Significant Energy Exporter	 Moderate Energy Exporter.	 Significant Energy Importer	 Moderate Energy Importer	 Aprox. Balance
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Part 4

Saving Energy

- We should find cleaner fuels.
- We should also conserve energy.
- Scientists are trying to help, by developing efficient power stations and cars.
- Every citizen can help in small ways by conserving electricity.
- How?
- We can turn lights off at home and at school and turn the TV off rather than using standby buttons!

