What is Electricity?

Electrical energy: the energy of moving charged electrons . Allows electric devices to function

Chemical: gasoline, food, fireworks

Thermal: fire

Sound: voice, vibriation

Radiant: sunlight, fire

Mechanical: wind, running water

Electrical: lightning, electricity

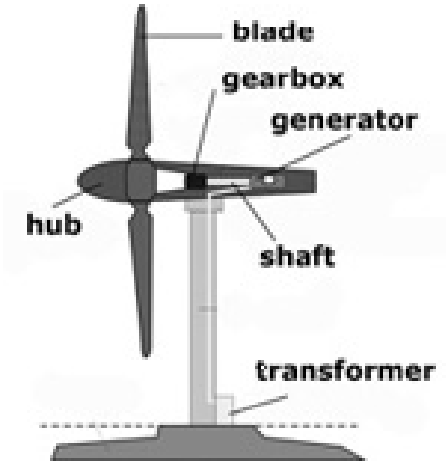
Energy Transformations

Energy must be converted into a useable form

Wind turbine changes wind energy into electrical energy

Electric appliances transform electric energy into usable energy for specific tasks (motor for blender)

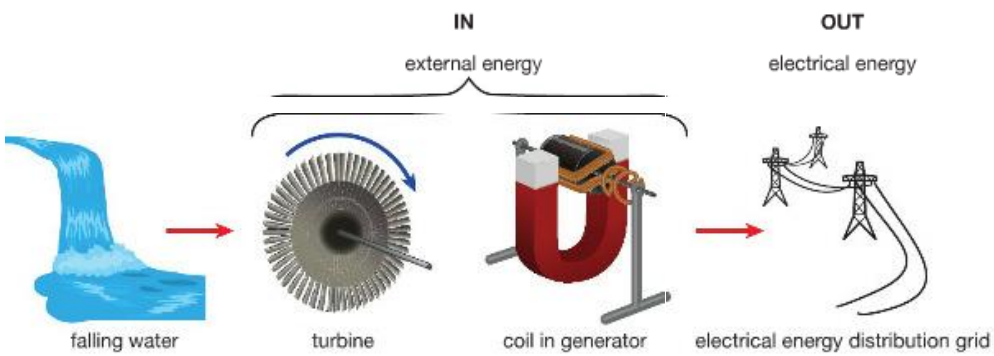
Wind turbine



Generating Electrical Energy

Electrical energy distribution grid: carries electricity from energy generating station to your home

Generator:



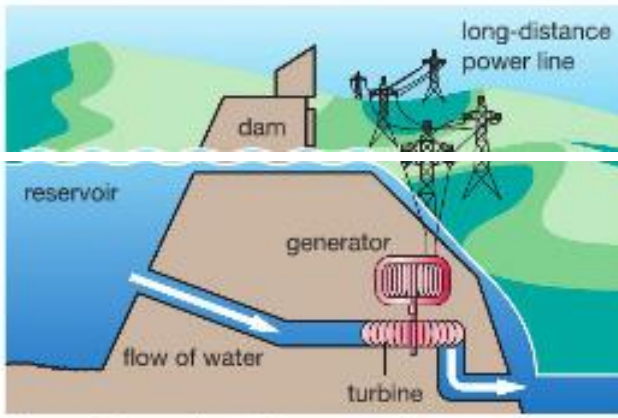


Figure 4 Some electrical energy stations use the movement of flowing water to generate electrical energy

Converts kinetic energy into electrical energy

Water turns turbine, spins coil in magnetic field, energizes electrons

Measuring electrical energy

Energy measured in Joules (J)

Joule per second is called a watt (W)

Higher watts the more electric energy is used per second.

20W bulb x 20J/second = 1200J/minute

Non-Renewable Energy Sources: Fossil Fuels

Non-renewable energy source: of limited supply and takes millions of years to renew naturally

- Burning fossil fuels (coal, oil, natural gas)
- Heats Water
- Rotates Turbine

- Fossil Fuel Generation

Pros: Fossil fuels are much less expensive then other sources

Cons:

- non-renewable
- Air pollution CO2
- Disturbs environment

Non - Renewable Energy Sources: Nuclear

Using Nuclear Energy:

Use uranium as fuel

Atoms break apart causing nuclear energy to transfer into thermal energy

Produces energy to turn a turbine

Nuclear generator

Pros: does not cause air pollution directly

- Does not emit greenhouse gasses directly (CO_2)

Cons:

- Produces dangerous biohazzaraous waste
- Expensive$$

Renewable Energy Sources

Renewable energy sources are resources that are virtually limitless or can be replenished by natural processes in a short period o time

Hydro-electric Generation

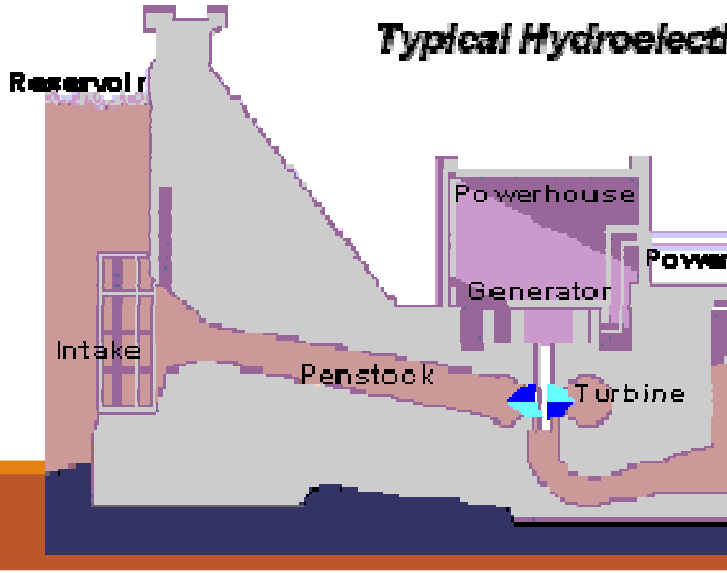
- Energy of moving water turns large blades of a turbine
- Turbine attached to generator spin magnetic field around copper coil

- Hydro-Electricity

Pros: no pollution release into air or water

Cons:

- disrupt natural water flow
- habitat loss
- Expensive to build



Renewable Energy Sources

Wind Generation: Wind turns large blade on tall towers

Blades of the turbine rotate which is connected to a generator

Wind generation

Pros:

- Free, no noise
- Building and maintenance is less expensive then fossil fuel mining
- Can be build anywhere

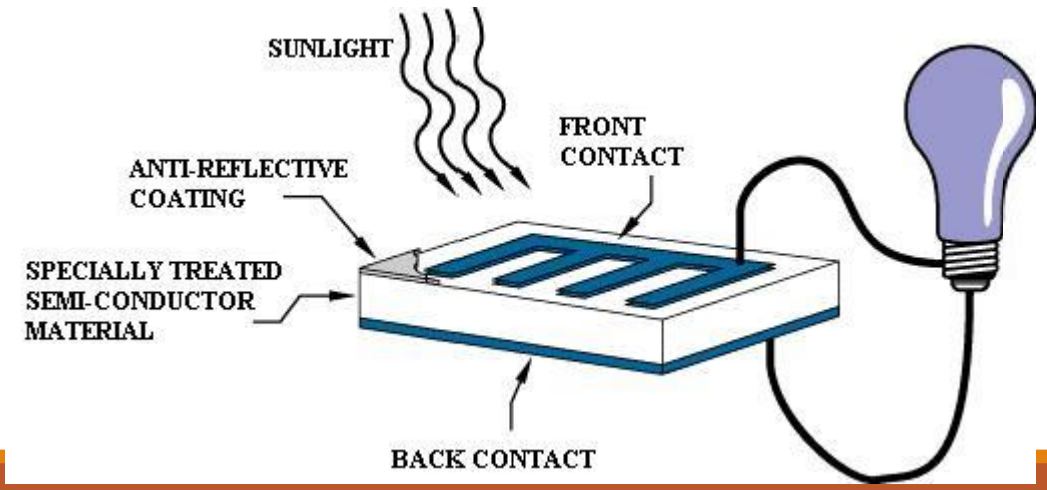
Cons:

- Change scenic views
- Dangerous for birds and bats

Renewable Energy **Sources**

Photovoltaic Generation (solar):
Changes light energy from sun directly into electrical energy

Sunlight excites charged particles which create an electric current



Pros:

- Free and readily available
- Install anywhere with enough sunlight
- No air or water pollution

Cons:

- Expensive and inefficient
- Only works during the day (however can be stores

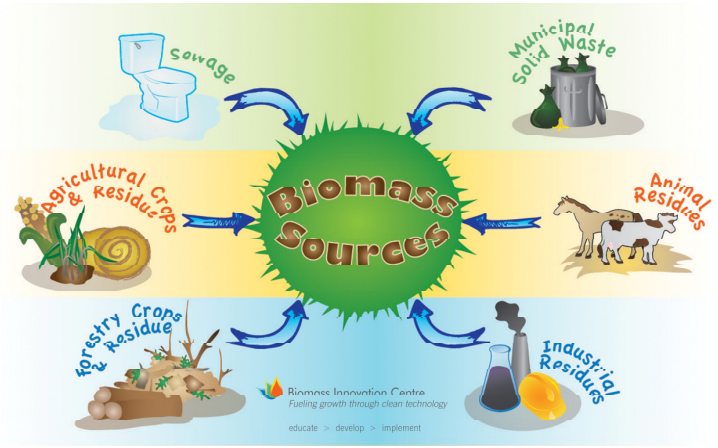
Renewable Energy Sources

Thermal Energy using BIOMASS:

Biomass is the use any organic, plant or animal matter.

Burned to produce thermal energy

connected to a generator



Pros:

- Always renewable – trees and plants are always planted

Cons:

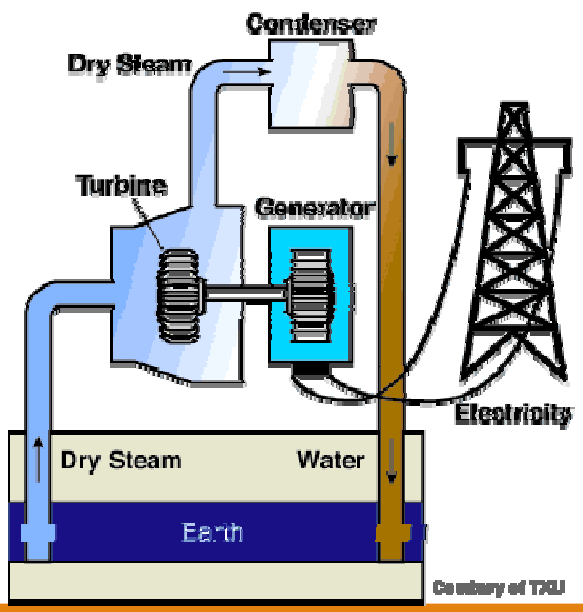
- Produces greenhouse gasses although less than fossil fuels
- Using biomass to burn fuel lowers crops for food

Renewable Energy Sources

Geothermal Generation:

Underground pipes filled with liquid heat up due to Earth's hot core temperature

Steam causes turbine attached to generator to turn



Pros:

- Always present in Earth's deep crust
- No production of pollution or greenhouse gasses

Cons:

- Suitable areas are rare
- Generating stations are expensive and difficult to build