A DEFINITION

- Energy's unwelcome partner, is often pollution.
  - Fossil fuels release greenhouse gases.
  - Nuclear energy produces radioactive wastes that need to be stored.

- **Alternative energy** sources are sources of energy based on research to reduce the negative impact on the environment.

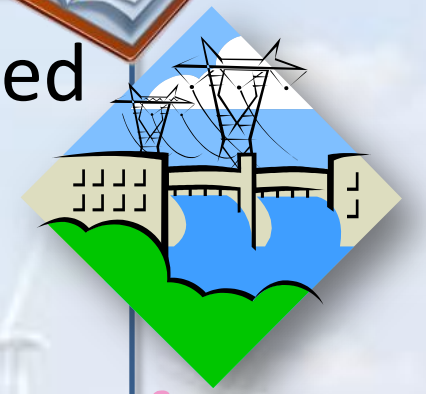
EXAMPLES OF ALTERNATIVE ENERGY SOURCES

Following are some alternative energy sources:

- Hydroelectricity
- Solar Energy
- Geothermal Energy
- Tidal Energy
- Wind

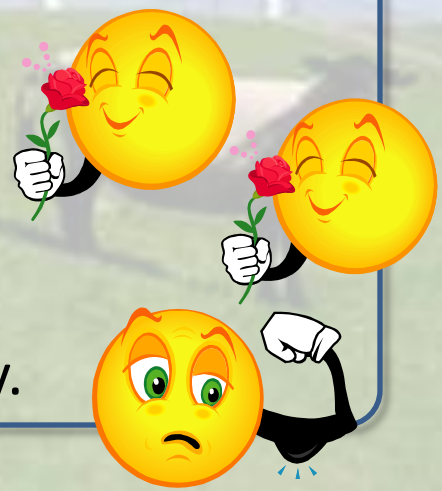
HYDROELECTRICITY

- Energy in moving water is transformed into electricity by turning a turbine which turns a generator.
- Pros and Cons
  - It's a renewable resource because it is replenished continuously.
  - It's pollution free.
  - It disrupts the lives of aquatic organisms, primarily because it depends on dams.



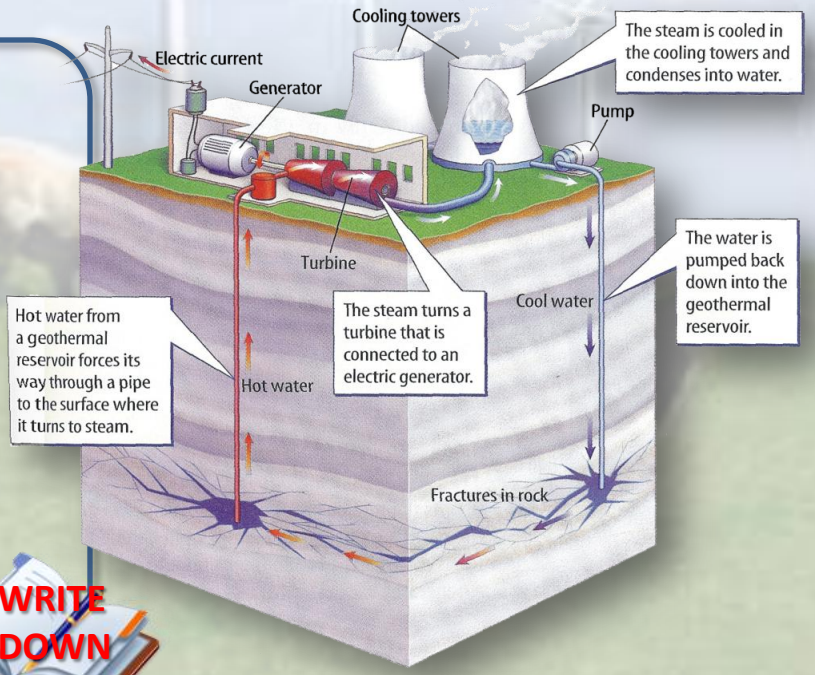
SOLAR ENERGY

- Solar energy is radiant energy from the sun.
- It is collected with black panels called **solar collectors** that absorb sunlight.
- Mechanism of action
  - Panels act as a thermal collector by absorbing sunlight and heating water that is sent through pipes for heat, washing, and bathing.
  - Panels may be photovoltaic and transform radiant energy directly into electricity.
- Pros and Cons
  - Inexhaustible resource that can't be used up by humans.
  - Nonpolluting (except for manufacturing solar collectors).
  - Difficult to store for night time or a rainy day.



GEOTHERMAL ENERGY

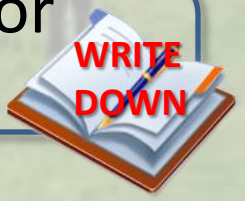
- Geothermal energy comes from the earth.
  - The interior of the earth is hot due to radioactivity.
  - The heat can melt rock forming magma.
- Geothermal reservoirs
  - Magma comes close enough to the surface in some places to heat water that seeps through cracks and form steam.
  - Hot water and steam that becomes trapped in cracks and pockets is called a **geothermal reservoir**.
- Geothermal power plants – in places where geothermal reservoirs are only several kilometers deep, wells can be drilled to tap them.



MORE ON GEOTHERMAL ENERGY

Heat pumps

- The temperature several meters below ground is a constant 10°C to 20°C due to geothermal energy.
- A heat pump contains a water filled loop that passes through a region of the ground where the temperature is nearly constant.
- Water is pumped through the loop to the region of constant temperature where it either gains or loses heat underground depending on its temperature.
- Then the water is pumped back up where it is either used for heating or cooling.
- Geothermal heat pumps can be used for heating or cooling.



TIDAL ENERGY

- High tide and low tide occur about twice each day.

- In places where the difference in the level of the high and low tide is large, the tide can be used to generate electricity.
  - As the water comes in, it moves through a turbine.
  - The incoming water is trapped behind a dam.
  - As the tide goes out, the water is released through the turbine.

WIND ENERGY

- Wind is an inexhaustible supply of energy.
- The propeller of a windmill is connected to a generator so it produces electricity.
- Advantages
  - Inexhaustible
  - Nonpolluting

- Disadvantages
  - Requires large tracts of flat land
  - Noisy
  - May accidentally kill birds