Energy & Power

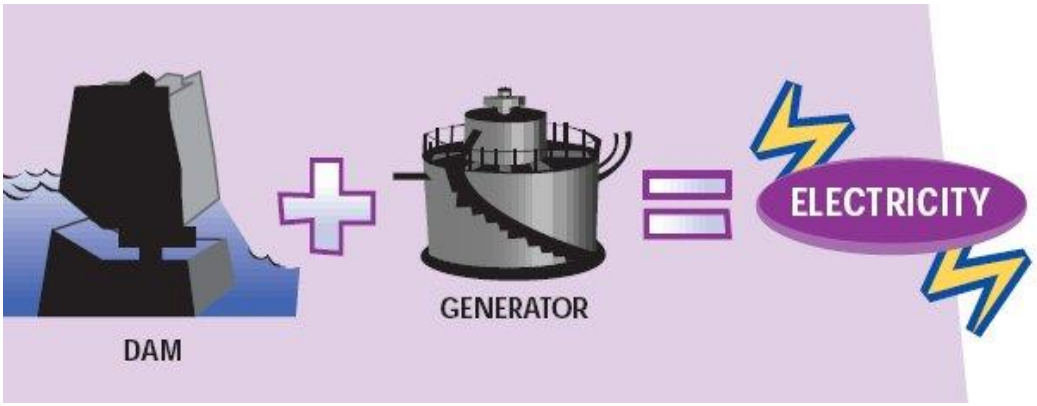
Topic 4 - Sources of Energy for Electrical Generation

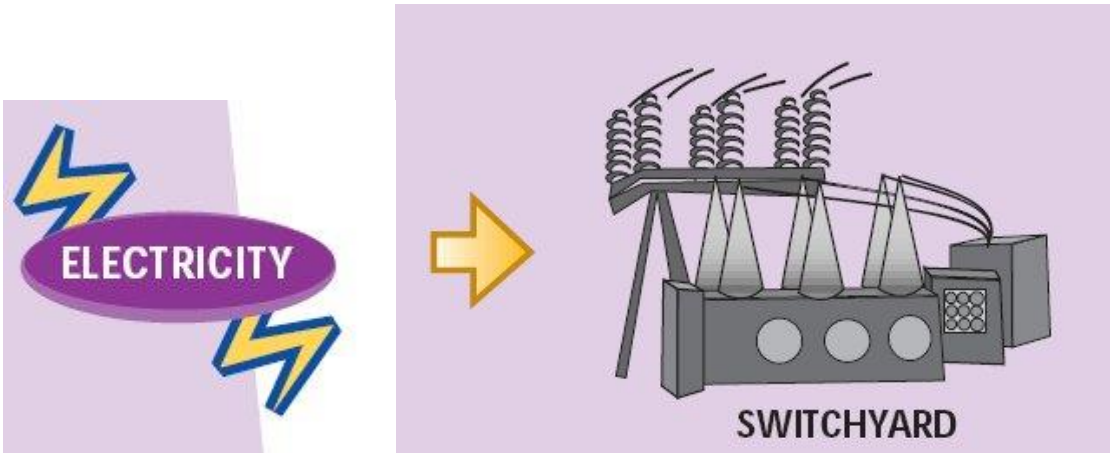
Students will be expected to:

1.14	identify how electrical energy is distributed from the source to the consumer.
1.16	examine new technologies that are evolving for more efficient conversion, transmission, and consumption of electrical energy.
1.17	develop personal rules of conduct for dealing with energy conservation.

Electrical Energy and It's Distribution

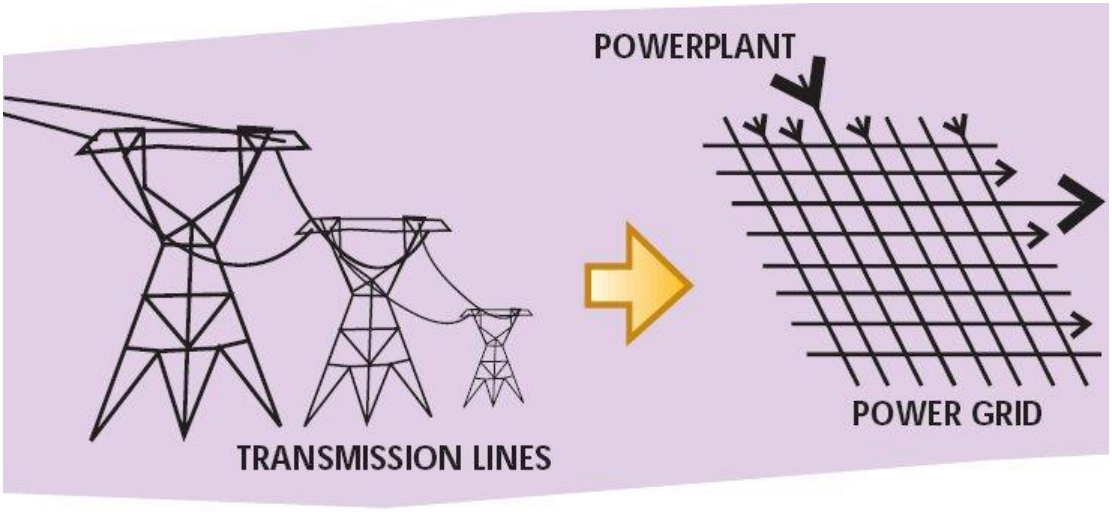
In the case of electricity, a generator uses fuel to create mechanical energy that in turns produces electricity. That fuel can be coal, oil, natural gas, nuclear, or falling water.



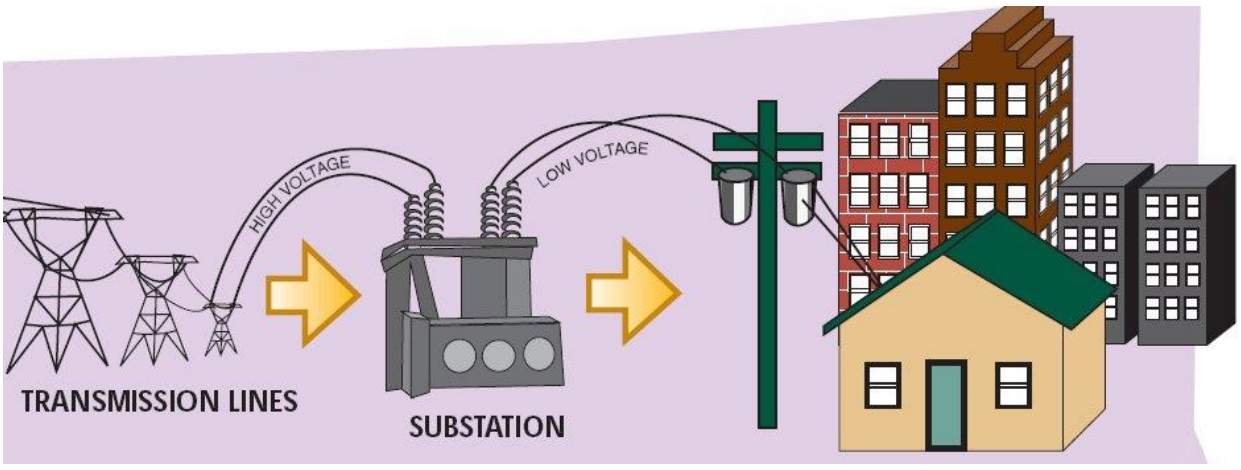


The electricity moves from the generator to a switchyard at the power plant. There it is transformed to a higher voltage and sent on its way via a transmission line. Transmission lines generally are rated at 69,000 to 500,000 volts (compared to 120 - 240 volts in your home)

From here it is sent along transmission lines. The transmission line quickly joins a grid - a network of transmission lines from various power plants. This allows a continuous flow and shifting of power from one area to another to make sure there is adequate power for customers at all times.



Near towns, the transmission line enters a substation where the electricity is transformed to a lower voltage ready for distribution lines that serve homes and businesses in neighbourhoods. Distribution lines typically are rated at 34,500 volts or less. So the voltage is still higher than in your home. The electricity must pass through a distribution transformer to drop the voltage to a level suitable for home use.



Assignment4

New Technologies

Do you know about any new or evolving technologies that available for more efficient conversion, transmission, or consumption of electrical energy?

- Hybrid vehicles
- Miniaturizing of electronic circuitry (ipods, MP3 players)
- Quantum computers (No...we don't have any!)
- Fluorescent and LED technologies
- Photovoltaic solar cells
- Windmills

Are you surprised that you have some of these in your home?

Complete an Ecological Footprint go to:

http://www.earthday.org/footprint-calculator

- How was your score compared to the other students in your class?
- How can you change your energy consumption to make a difference?
- Do you use any new technologies in your everyday life?

Save this as *Conservation* in your digital portfolio.

1.15 discuss legal, ethical, and environmental consequences related to the generation, conversion, transmission and consumption of energy for individuals and society.

Without major changes in the way we use energy to meet our needs and the use efficient equipment and measures, there is little hope of reducing the impact of energy production and use to reasonable levels. Changes can be made on a personal level as well as a national/global level. Some examples of this are:

- disposing of batteries
  - Do you just throw yours in the garbage or do you dispose of them properly? What is the proper way?
- use of inefficient incandescent light bulbs
  - How much energy can you save by using newer fluorescent and LED bulbs?

Many look to renewable energy resources to reduce our impact on the environment. When we look at renewable energy resources what are we looking at:

- bioenergy (energy derived from biomass resources, ie, plant or animal based organic matter).
- geothermal (heat produced from naturally occurring steam and hot water trapped in reservoirs under the surface of the earth)
- hydropower (energy from falling water)
- ocean thermal (taking advantage of the differences in temperature in deep oceans between the warm surface waters, heated by sunshine, and the deeper cold waters. This is used to generate power.)
- solar energy (energy comes to us from the sun as high intensity radiation (light energy). As it falls on the earth, it is transformed into heat by any surface or material.)
- tidal power (generating electricity by capturing the energy contained in moving water mass, ie tides, much the same way that hydro power plants capture energy from falling water.)
- wind energy (energy from the wind can be harnessed to generate electricity or to provide mechanical energy to pump water.)

Even alternative energy sources can have negative environmental effects.

- Wind Farms
  - affecting wildlife (rare species of bats, birds in Western Canada), humans (low frequency noise damage), aesthetics, ice buildup on blades during winter months flying off and causing property damage or injury, destruction of natural vegetation, displacement of communities, television interference.
- Hydroelectric facilities
  - problems with rotting vegetation produces significant amounts of green house gases, destruction of native grounds, land claim issues
  - Three Gorges Dam, China
  - James Bay Project, Quebec
- Geothermal
  - noise pollution, dissolved solids in steam quickly erodes pipes, natural steams contain many green house gases, not easily transported