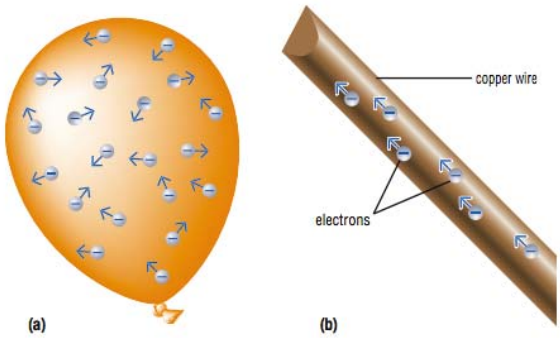
Grade 9 Science

Electricity

Class 11

Current Electricity

- Static electricity – electricity that builds up on a surface
- Current electricity – electricity that flows through a conductor in a controlled way

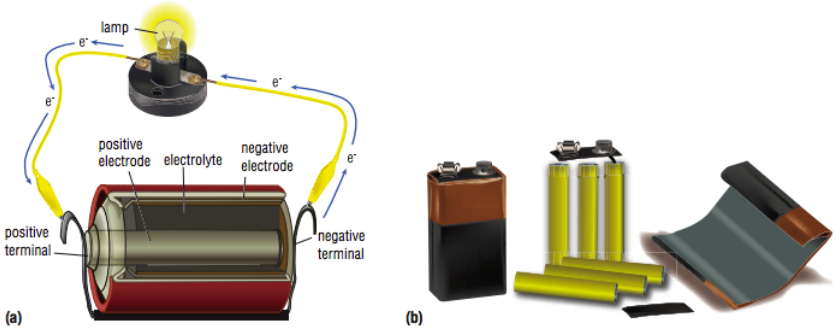


Electric Circuits

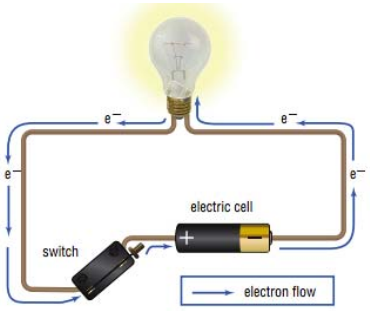
- Electric circuit – a continuous path in which electrons can flow
- Contains:
  - Energy Source – a battery
  - A Load – a device that converts electrical energy into other forms of energy ex: lightbulb, appliance
  - Conducting Wires – made of copper or aluminum
  - Switch – turns appliances on/off by opening or closing a circuit

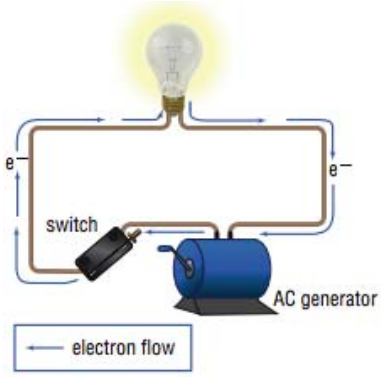
Sources of Electrical Energy

- Battery
  - Consists of cells that convert chemical energy into electrical energy
  - 2 electrodes in an electrolyte; electrons flow through the battery when it is connected in a circuit



- Primary Cell – electric cells that cannot be recharged (ex: zinc chloride, alkaline, lithium cells)
- Secondary Cell – rechargeable cells; electrical energy can reverse the chemical reactions (ex: lead-acid batteries in cars, lithium secondary cells in your electronics)
- Fuel Cell – requires a continuous supply of chemicals to operate (ex: hydrogen and oxygen in electric cars)



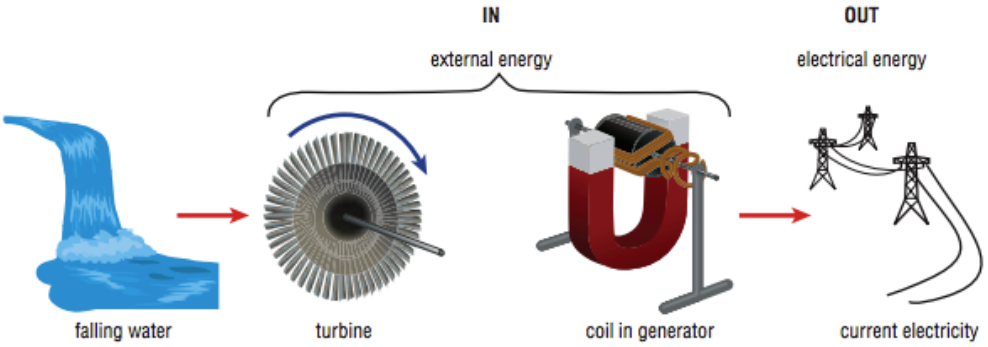


AC/DC

- Direct Current (DC) – electrons flow in one direction
- Alternating Current (AC) – electron flow alternates in direction
  - Produced by electric generators because it is more efficient over long distances

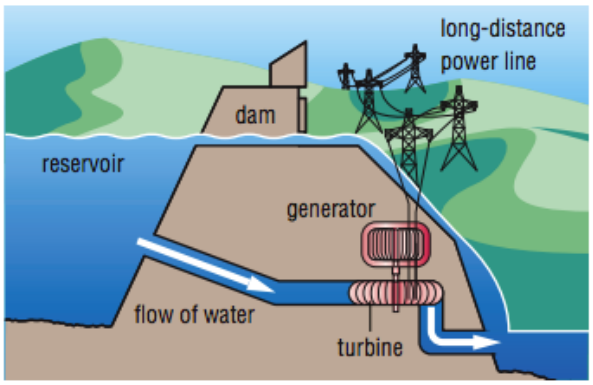
Generating Electricity

- Mechanical energy is converted into electrical energy
  - Mechanical energy – steam, wind, water



Hydro-electric Generation

- Hydro-electric generators use the fast moving motion of a waterfall or river to move the turbine
- Dams use the motion of the stored water in the reservoir
- Renewable Resource



- Advantages/Disadvantages of using hydro-electric generators

Pros	Cons
• Does not pollute air or water • Develop small-scale hydro-electric generators	• Changes water movement and the ecology of the watershed • Disrupts movement of fish • Flooding • Lack of available locations

Tidal Energy

- Tidal energy harnesses the energy of moving ocean water to rotate a turbine
- Occurs twice daily at specific times

Pros	Cons
• Does not pollute air or water	• Can only be built near coastlines • Only on for 5h, off for 7h

Steam

- Water heated from fossil fuels or radioactive materials create steam that rotates a turbine
  - Fossil fuels – coal, oil and natural gas formed from plants, animals and microorganisms that lived millions of years ago
  - Radioactive materials – the nuclei of uranium breaks apart (nuclear fission), which release large amounts of energy – nuclear power plants

- Biomass – burning of biodegradable waste to create steam to generate electricity
- Geothermal Energy – thermal energy from the Earth's crust (hot springs and geysers) to create steam

Pros	Cons
• Produces a large amount of energy • Coal is inexpensive to mine	• Global Warming • Air Pollution and Smog • Acid Precipitation and Water Contamination • Radioactive wastes can cause cancer • Reduce land for food

Wind

- Wind turbine is connected to a generator
- 1 turbine = 250 homes

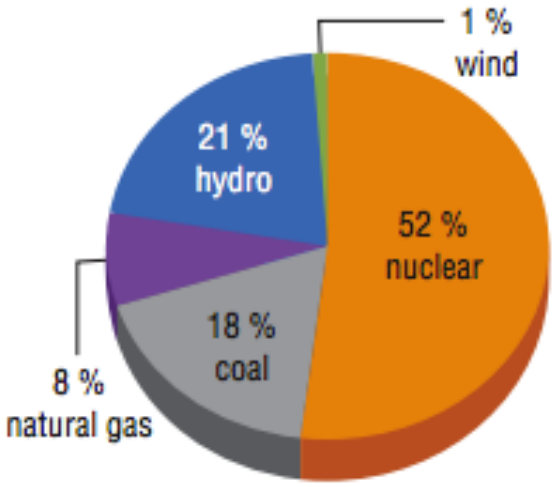
Pros	Cons
• Inexpensive to set-up • Can be located close to homes • No pollution	• Wind speed changes, require 5m/s • Wind farms are required • Noisy and dangerous to birds

Solar Energy

- Photovoltaic cell converts solar energy directly into electrical energy

Pros	Cons
• Last for over 40 years • No pollution except for their production and disposal	• Only 30% efficient • Require several hours of sunlight to produce a large amount of electricity

Ontario's Energy Production



- 26% Coal and Natural Gas
- 52% Nuclear

= 78% non-renewable energy