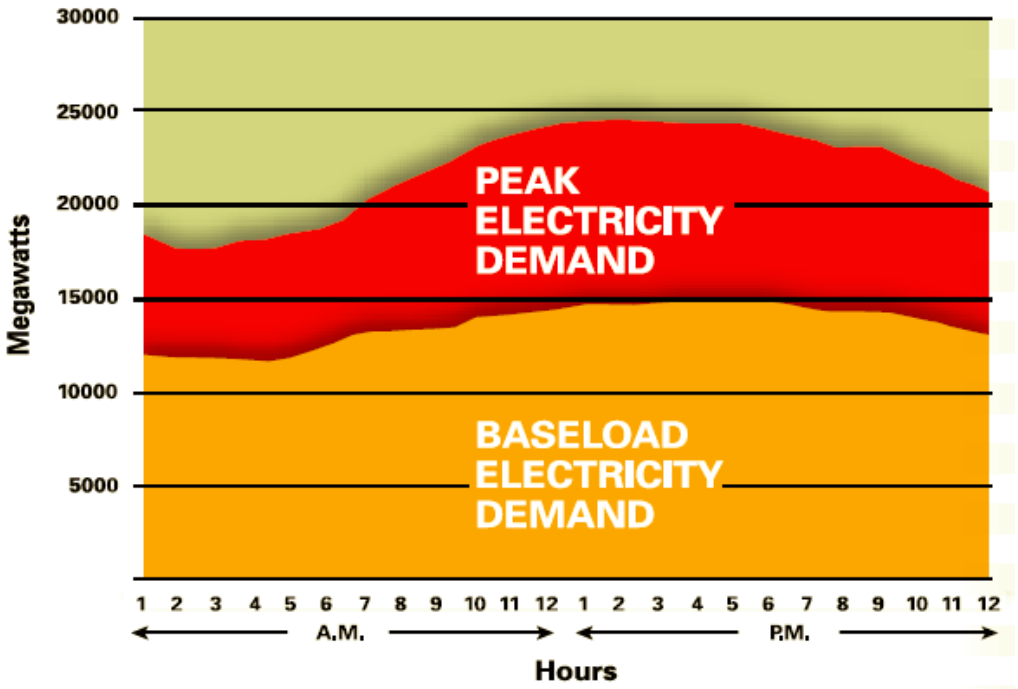
Meeting the Demand for Electricity

Sections 12.1 and 12.3

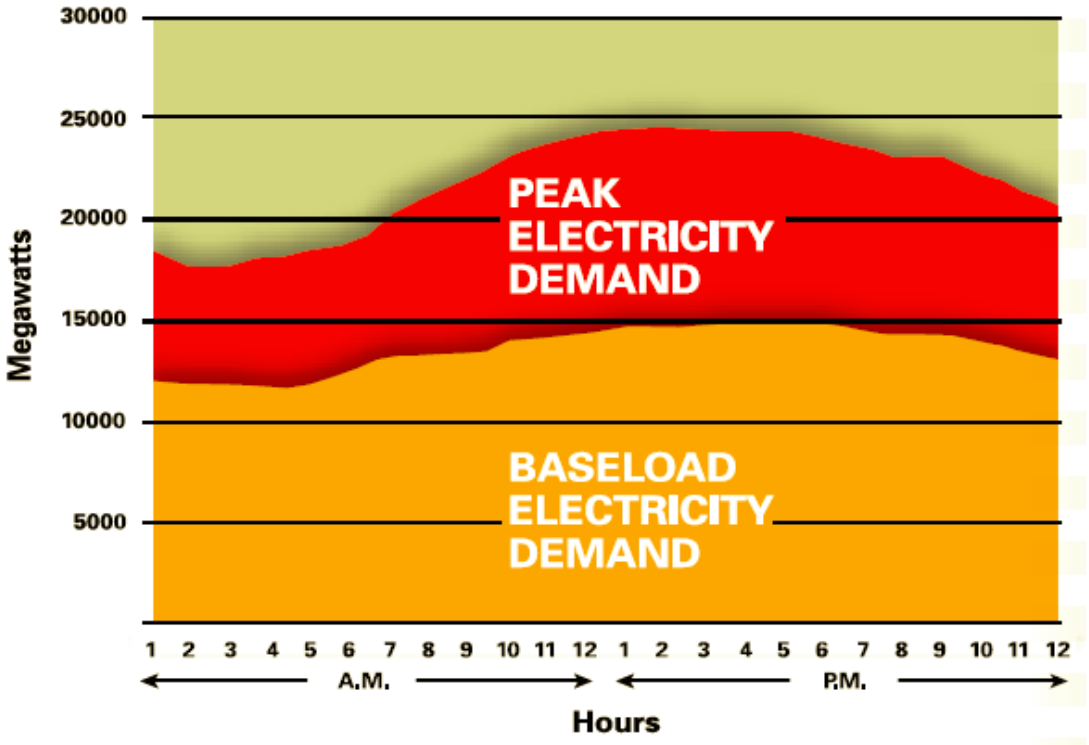
Electrical Demand in Ontario



Electrical demand refers to the amount of electricity that is used.

- **Baseload demand:** is the continuous minimum demand
  - about 12 000 megawatts
- Demand is met using using large **nuclear** and **hydroelectric** generators
  - can produce electricity at a constant, reliable rate.

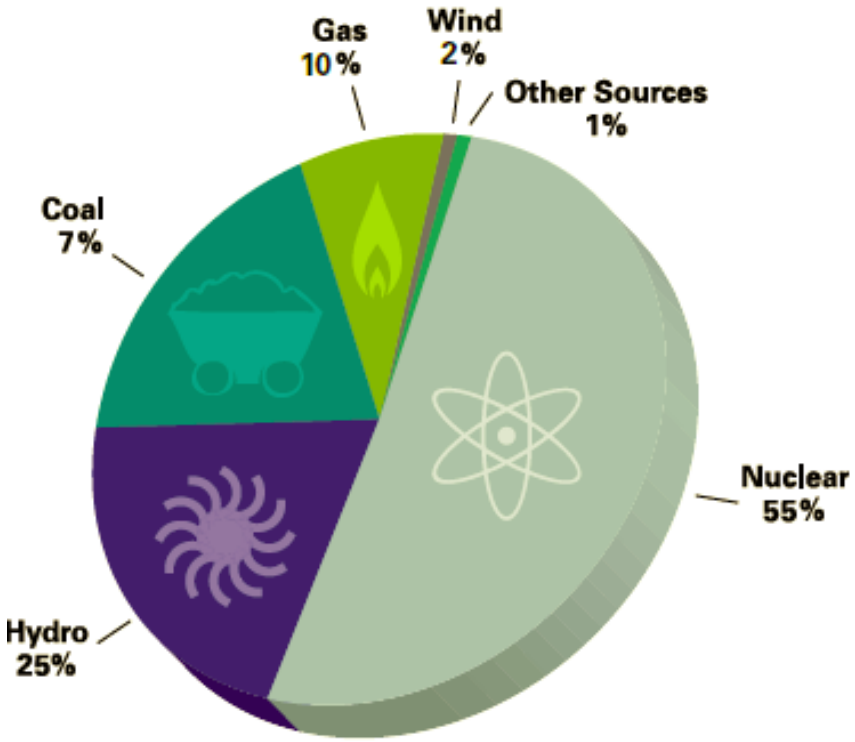
- Demand for electricity changes throughout the day:
  - **intermediate demand** and **peak demand**
  - *Why do you think demand fluctuates depending on the time of day?*

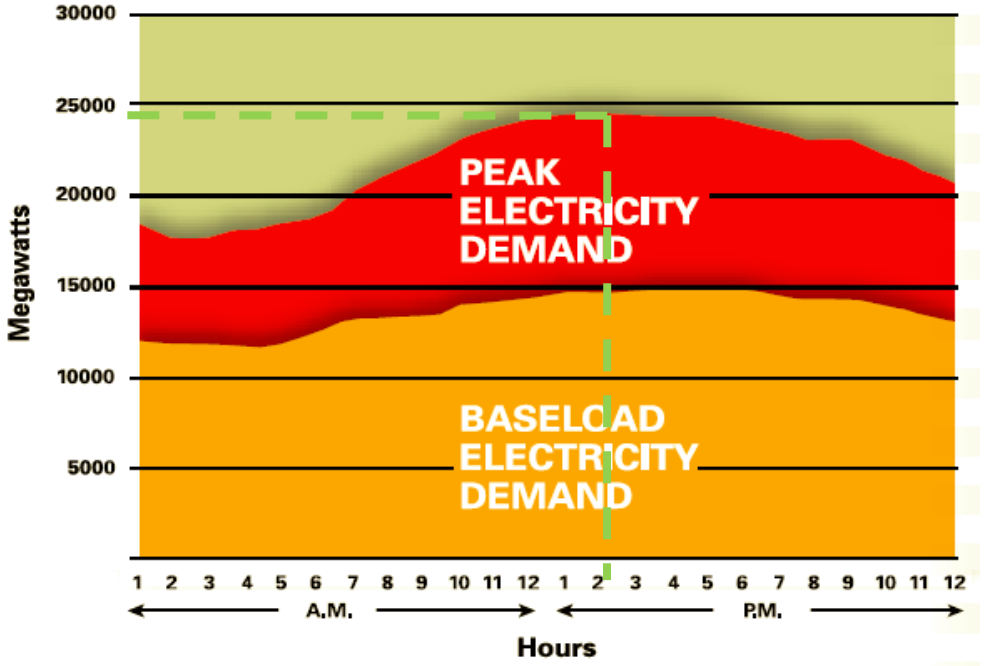


- increasing demands are met by using smaller generators that can be turned on or off quickly

- Ontario's electrical energy:
  - nuclear, hydroelectric, fossil fuels

- Changes in fuel cost lead to changes in the amount that the consumer is charged.





Interpret the graphic

a) Describe how the demand for energy changes, throughout the day.

It increases over the course of the day.

b) At what time is the peak electricity demand reached?

About 2 PM

c) What is this demand, in megawatts?

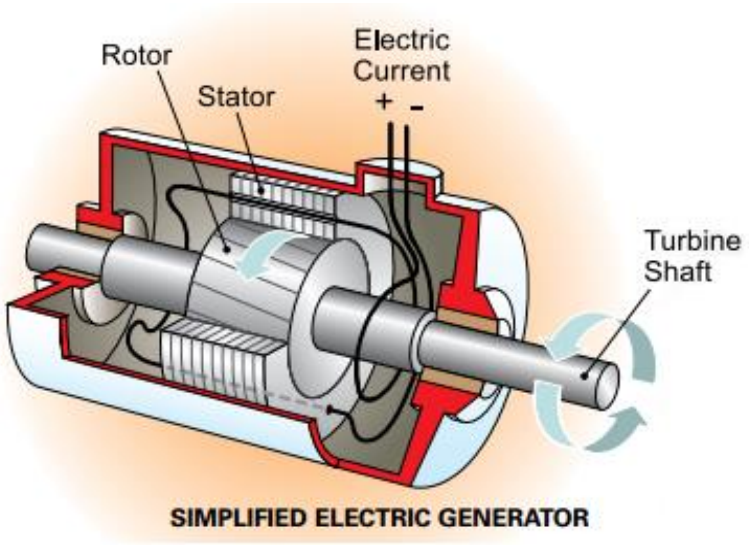
24 000 MW

Generating Electrical Energy

All power generation plants rely on the same general mechanism for generating electrical potential energy:

giant **wheels** ("**turbines**") spin the magnet → a **magnet** (a "**rotor**") spins inside a coiled **copper** wire (a "**stator**") → electrons are pulled from the copper atoms → electrons are sent where they are needed

Energy input is required!



- It takes a lot of energy to spin the turbine.
- The different kinds of power plants get that energy from different sources:

Type of Station	Source of Power
hydroelectric	falling water
nuclear	nuclear fission
thermal	burning fossil fuels

Video: Electricity Generation (5:18)

Two Types of Current

Direct Current (DC)

- the type of current produced by a **battery**
- current in a circuit flows in only **one** direction

DC Source

AC Source

Alternating Current (AC)

- the type of current produced and transmitted from **electrical generation stations**
- current in a circuit constantly switches direction
- electrons move back and forth, but there is **no** net movement

Advantage of AC:
voltage can be easily changed by **transformers**…

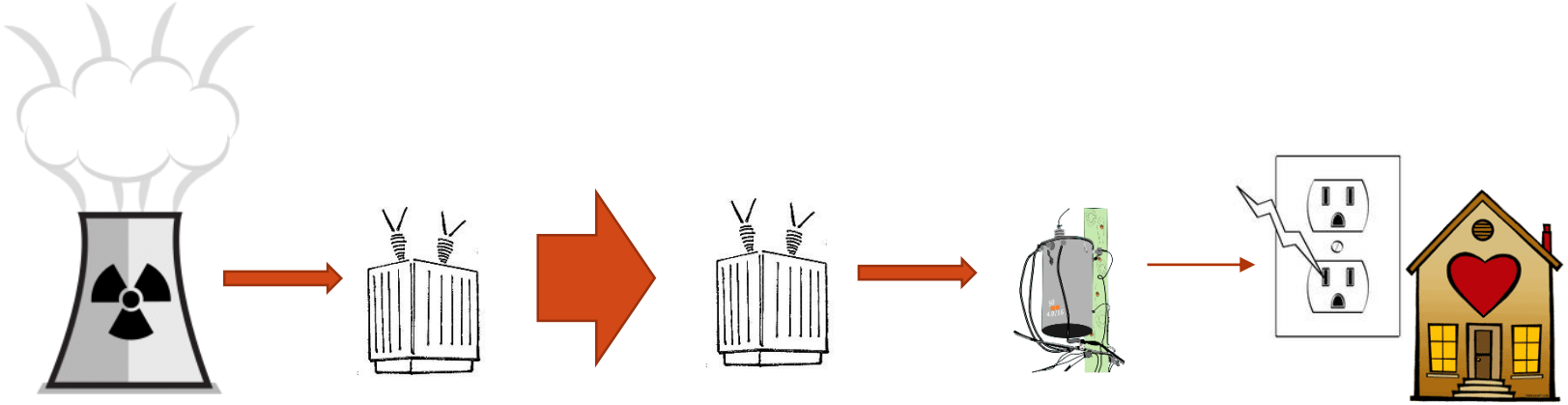
From the Power Plant to Your Home

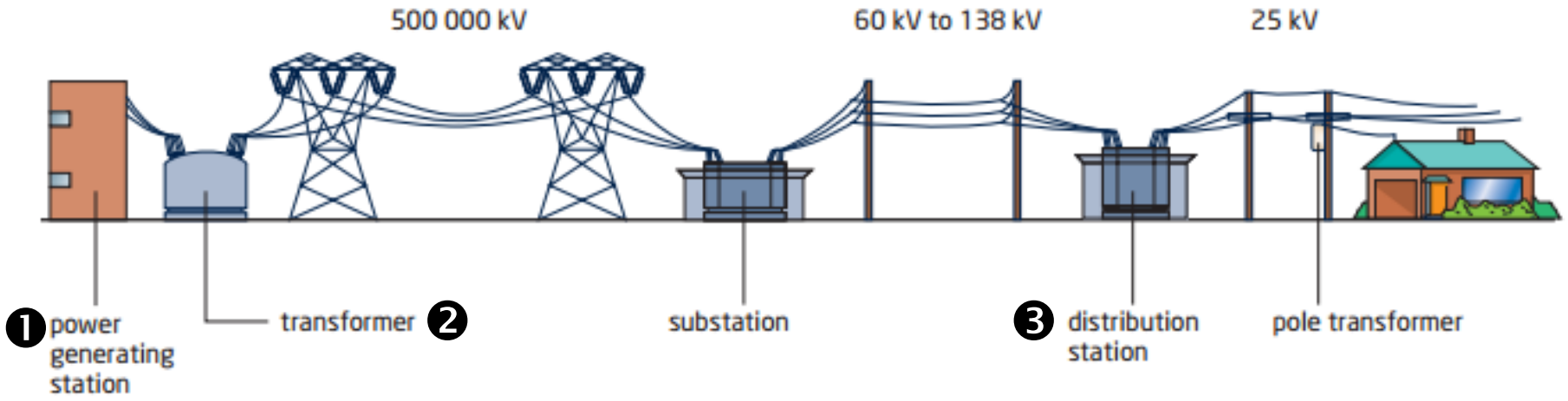
Electrical energy is transmitted over long distances.

- This requires large potential differences to be effective.
- But these high voltages are unsafe to the consumer!

Transformers are devices that can change the potential difference of an electric current:

- **step-up** transformer: **increases** the voltage
- **step-down** transformer: **decreases** the voltage





❶ The spinning magnet produces voltages of ~20 000 V.

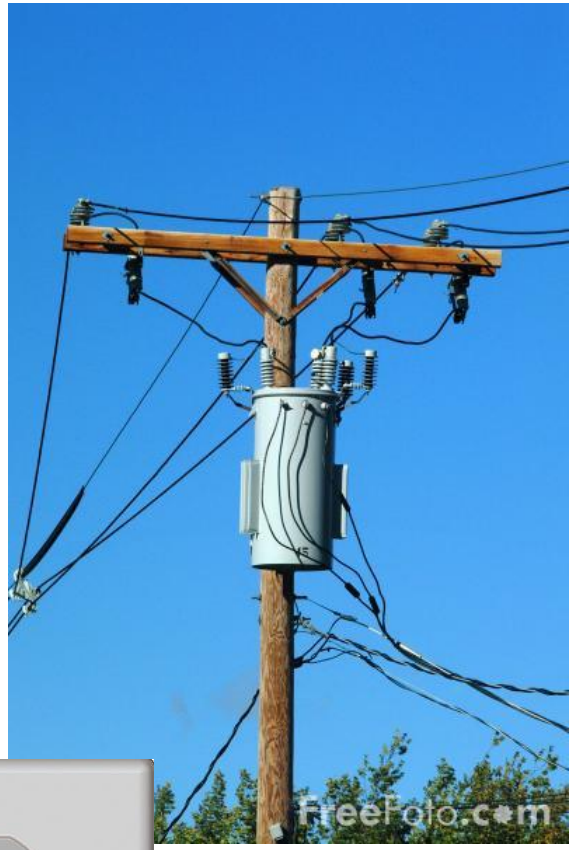
❷ A **step-up** transformer **<u>increases</u>** the potential difference to values of up to 500 000 V before sending the current to transmission lines

❸ At local distribution stations a **step-down** transformer **<u>decreases</u>** the potential difference to about 7 200 V.

Electricity In Your Home

- Box or pole transformers in your outside your home step **down** the voltage once more.

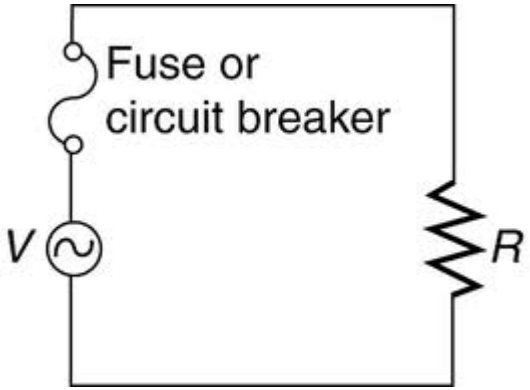
- By the time it enters your home, current has a potential difference of 120 V.



Inside your home, the current passes to a distribution panel that consists of **circuit <u>breakers</u>**, or **<u>fuses</u>** (in older homes)

- these are **safety devices**
- they break the circuit whenever the current reaches a dangerous level

Fuse box



Breaker box

Homework

- Pg. 487 #1, 2
- Pg. 491 #2
- Pg. 505 #1a, 4, 5, 6, 7