

The Transmission and Distribution Process

Objective:

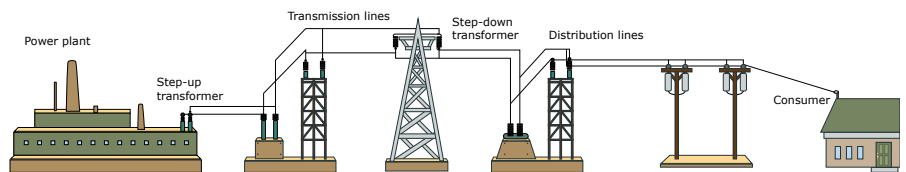
Students will understand electric power distribution processes and systems.

Materials and Curriculum
Correlations ▼

► Introduction

To solve the problem of sending electricity efficiently over long distances, scientists developed a device called a transformer.

It's job is to change the voltage of electricity in power lines. Transmission and distribution lines also have different roles in supplying electricity to homes and businesses located far from electricity generating plants.



- Electricity is generated at the power plant.
- A step-up transformer increases voltage to be more efficient for traveling long distances.
- Transmission lines carry electricity over long distances.
- A step-down transformer decreases voltage so that it will be safer for use in homes and businesses.
- Distribution lines carry electricity shorter distances to the consumer.

Procedure

1. Teach the information in the introduction above.
2. Have students complete student sheet

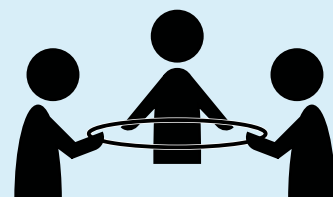
To Know and Do More

Line Loss

Each year in the U.S., about 5% of the electricity transmitted and distributed is lost! Resistance of the conductor materials in the power lines are the main reason for the loss because they convert electrical energy to heat energy.

Resistance Model

- Three or four students hold a loop of rope or a hula hoop to represent electrons in the wires of a transmission or distribution system.
- One student begins to move the rope clockwise at a consistent pace while the other students let it glide through their loose grips.
- Another student begins to grip the rope more tightly, causing “resistance”.



Is it more difficult for the rope to move?

Where does the “resisting” student feel energy being transformed into heat just like electricity transforms to heat during line loss?

Materials Needed:

- Internet
- Marbles or Toy Cars
- Local area maps

Curriculum Correlations

K-ESS2 - 2
3-PS2 - 3
4-PS3 - 2
4-PS3 - 4
4-ESS3 - 1

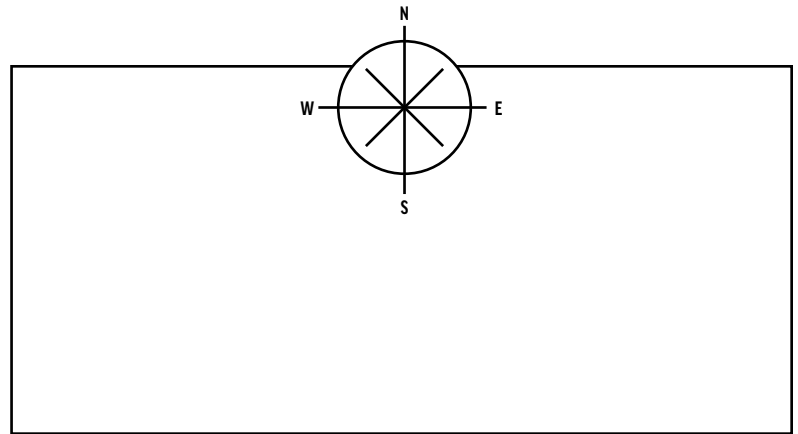
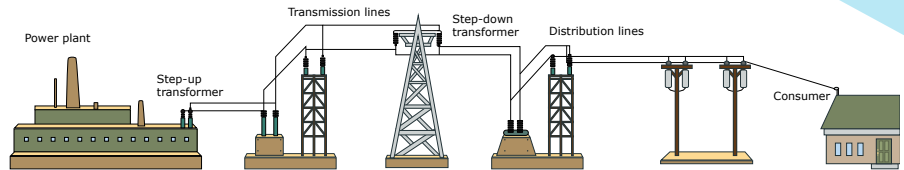
4-ESS3 - 2
5-ESS3 - 1
MS-PS2 - 3
MS-PS2.B
MS-PS3 - 2

MS-PS3 - 5
HS-PS3 - 1
HS-PS3 - 5

The Transmission and Distribution Process

Use mapping tools like Google Maps or the power plant maps on epa.gov to find the power plant nearest to your home. In the space below, add:

1. Your home
2. The nearest power plant
3. The distance between your home and the power plant
4. Major mountain ranges, bodies of water or landmarks
5. Step-up transformer
6. Transmission lines
7. Step-down transformer
8. Distribution lines



If you worked for the electric company, what challenges might you face in building the system on your map?

Extra challenge!

Research one of the topics below.

1. Research step-up and step-down transformers for use at various locations: leaving the power plant, high voltage transmission, substation, pad mount and residential pole.
2. Research how transformer coils are kept cool to dissipate heat while working.
3. Research how transformers are replaced when they fail.
4. Discuss with: What are brownouts and blackouts? What are the various causes?
5. Research how transmission lines and transformers are sited. Sited means to understand the parameters involved in placing high voltage transmission lines, substations and transformers in residential and industrial areas, high population areas, low population and rural population areas. Discuss with: How do cost, property lines, roads, etc. influence decisions? Research how huge transmission towers are built in desolate areas, mountains, mesas, deserts or swamps?