5 Electricity Generation and Transmission

TASK:
To investigate how electricity is generated?

A hands-on lesson to discuss and **explore** the generation and movement of electricity.

Teacher Background Information

The fundamental principles of electricity generation were discovered in the 1820's by British scientist Michael Faraday. He generated electricity by moving a loop of wire between the poles of a magnet. This method is still used today.

Modern power plants generate electricity in a variety of ways. It is most often generated by heat engines fuelled by burning fossil fuels or radioactive elements, but it can also be generated by water, wind, solar and geothermal power.

Power plants generate steam to power a turbine which spins a huge magnet inside a copper wire, producing electricity. The electricity flows from the power plant through wires to the transformer. The transformer raises the pressure so it can travel long distances – it is raised as high as 500,000 volts in Australia.

The electric current then runs through the power lines to the substation transformer where pressure is lowered to between 11,000 and 132,000 volts. Electricity is then taken through the lines to a pole transformer and pressure is lowered again to between 240 and 415 volts. From here electricity comes into your home through a meter box. Wires take electricity around your home powering your lights and appliances.

Assessment

Formative assessment – monitoring students' learning and developing understanding via observation and providing feedback to extend learning.

Equipment

- Power transmission cards (1 set per group)
- Hand generator
- Light bulb and connecting wires
- SciTech journals

Activity Steps:

- Have students sit in a circle on the floor.
- Revise the information gathered in lesson 1 and ask the students where they think electricity comes from.
- Place picture cards in the circle and ask students to comment on each one. What are the pictures of? How are they included in our power supply?

- Divide the class into groups and give each group a copy of the pictures.
- Ask the groups to discuss and order their set of pictures to show the supply of electricity from the plant to our homes.
- Hand each group the power transmission word cards and ask them to sort them into their correct order.
- Encourage groups that are struggling to refer to their picture cards.
- Ask the students to return to the circle and discuss their results.
- Show the students the hand generator and explain that the magnet and copper wire inside is just like the generator in the power station. Your hand is providing the energy.
- Connect the light bulb to the hand generator and let the students generate electricity.
- Students draw an annotated drawing of the transmission grid, in their SciTech journals.
- Finally, take students through the interactive 'energy cycle diagram' located on SMART Notebook Lesson 1.

Interactive Resources

Ausgrid's interactive whiteboard lesson 3

- Slides 2 to 3 – Videos on generating electricity
- Slides 4 to 7 – Electricity generation
- Slide 8 – Video about solar energy
- Slide 9 – Flash activity about energy cycle to home
- Slide 10 – Picture match activity
- Slide 11 – Transportation of electricity

5 Power Transmission Cards

Attachment

Power Plant to the Home

The cards are currently in order. Jumble them and hand a set to each group.

The steam is sent through pipes to the turbine, which is a big fan. (Mechanical energy)

When the magnet spins 3,000 times a minute the generator makes electrical energy.

Inside the power plant, coal, oil or gas is burned in a furnace which heats water in a big boiler to create steam. If the plant is hydro-electric, the potential energy stored in the water is used to drive the turbine.

The steam goes through the turbine blades making them spin 3,000 times in one minute.

Power stations put the fuel into a boiler and set fire to it. (Heat energy)

The turbine is connected to the generator; this is a large magnet and lots of wire.

The chemical energy in the fuel is changed into heat energy in the form of steam.

The electricity generated at the power station is fed through transmission lines to zone substation transformers.

The electrical energy then travels along the distribution power lines to our homes, schools, hospitals, offices, factories, street lamps, traffic lights, cinemas, restaurants, fire stations and everything else that needs electrical energy to work.

It passes through an electricity meter that measures how much energy your family uses.

The electricity travels through wires inside the walls to outlets and switches all over your house.

Big high-voltage transmission lines carry electricity to your city or suburb.

It passes through zone sub-stations, where the voltage is lowered, then to transformers which lower it again to make it safe to use in our homes.

It travels through smaller power lines to your house.

You can use the electricity to switch on lights, watch TV, listen to music and cook dinner!