ECO-ENERGY
ÉCO-ÉNERGIE

Lesson Plans for EOS

Electricity and Conservation

By Grey Hackett, 2015

Goals:

1. To give participants a greater understanding of different sources of electricity
2. To give participants a greater understanding of the way electricity works
3. To give participants a greater understanding of the effects and consequences of electricity production and usage

Materials:

Descriptive cards for activity, poster-sized sheet of paper

Part 1 – Introducing Concepts!

Gather group together. Have participants turn to those around them to discuss how electricity works, from source to use. Give them a few minutes and then have volunteers attempt to give an explanation. Write down the alleged process on one side of your poster and save it for the end of the lesson, during which you can compare the previous knowledge of participants to their newly advanced understanding.

You can go through this same process with the question of how electricity generation and use affects the environment. Again, record the answers to compare at the end of the lesson.

Part 2 – Illustrative Activity!

First you will need to create a series of descriptive cards, one for each of the most well known sources of electricity generation. If you have more cards than groups, decide which ones you would like to use to show a good spread of sources. (You can use the descriptions I provided at the end of this document if you think they're adequate, or simplify them/enrich them for your specific audience.) Each group has the task of illustrating the particular process used for their source via a short skit involving several actors and a narrator, who will read out the description written on the card while the skit goes on. Give the groups as long as you think they'll need to create their skits, making them

more or less elaborate based on age and ability. Once they're finished, have everybody perform in front of the whole group.

Part 3 – Discussion!

Use the new information from the skits to facilitate discussion. Either leave discussions in small groups or come back together as a large group.

Some sample questions to stimulate discussion:

What source does the electricity in your home come from?

What source do you think is best?

Are any of the sources perfect?

Which source surprised you the most?

Would you be okay with having a wind turbine in your back yard?

Would you be okay with having a coalmine in your neighborhood?

Would you be okay with having solar panels on your house?

Do you know of any other sources that weren't mentioned?

Part 4 – A Game!

This game is intended to provide basic explanation and definition of concepts like watts, amps, electrons, and so on by demonstrating their relationships to one another.

Separate the participants into two groups, one group representing the people living in a house and one group playing the part of the electric current itself. The electric current group will have the job of running through "wires" to reach and power appliances. These appliances will have varying levels of wattage, requiring more or fewer amps. For each round participants will have a certain electricity budget they cannot exceed, forcing them to choose which appliances to use and which to avoid using. To make it more interesting, you can *require* that some appliances and utilities be used – light, heat, stove, fridge, etc. – so that the participants will have to budget more carefully.

At the end of each round, discuss what changes could be made to the available appliances and utilities to make things easier. The concept of saving money to buy more efficient appliances could be introduced, as could saving money to install solar panels or investing money in wind turbines for the local area.

You can use pictures of appliances or actual appliances if you have access to them. The wires the current moves through can be delineated with rope, sticks, or even actual crawling play tubes if you have them.

Part 5 - Wrap Up!

Leave your participants with some reflective work to complete.

Option A: Have participants keep track of the appliances and utilities they and their family use throughout the day or the week. Have them use this information to make a plan for reducing or changing their usage. They could collaborate with their parents to reduce the monthly electricity bill and use the saved funds to replace inefficient appliances or invest in local renewable energy sources, just like in the game.

Option B: Have participants keep an eye on the energy use in the town of Sackville. They can classify uses as necessary or unnecessary and give suggestions for improvements in town infrastructure. Give them the opportunity to create a basic energy plan for Sackville's future – one that could even be sent to town council when it is complete.

Option C: Have participants keep track of energy use within the classroom, or within the school in general. They can take note of when lights are turned/left on unnecessarily, or when appliances are left plugged in. They can present the results and suggestions to the class at the end of the research period.

Descriptions for Cards:

Coal

Coal is found in deposits beneath the earth's surface. It is extracted from large, deep mines and taken up to the surface to be processed. Chunks of extracted coal are broken down and crushed into a fine powder. The powder is burned to heat large quantities of water until it becomes steam. The steam is used to spin a turbine attached to a generator, which produces electricity when the turbine is in motion. The coal powder emits carbon dioxide and other gases into the air as it burns, and leaves soot and ash behind when it's finished. While nobody knows exactly how much coal there is, we do know that we cannot create more when it is gone, meaning that it is a non-renewable resource.

Oil

Formed from ancient plants and animals, oil is found in underground reservoirs deep beneath land and sea. Engineers drill deep into the earth until they hit a reservoir, at which point they begin to pump the oil up towards the surface. This oil is then put through a refining process until it is suitable to be used. Refined oil is then burned to heat water and create steam, which in turn is used to spin a turbine. The turbine is attached to a generator, which produces electricity when the turbine is in motion. Burning oil releases carbon dioxide and other gases. There is a limited amount of oil on earth, meaning it is a non-renewable resource.

Nuclear Energy

Nuclear energy is based around the use of uranium ore. Uranium is extracted from the earth through mining. Once mined, the uranium ore is transported to a processing plant to be turned into "enriched fuel" in the shape of small pellets. These pellets are then sent to a nuclear power plant. At the power plant, the pellets are placed in a nuclear reactor. In the reactor, neutrons from within the atoms of the pellets collide with one another. This collision creates heat and steam, which powers a turbine. The turbine connects with a generator, which produces electricity as the turbine moves. Uranium does not release any

harmful gases or chemicals when it is used. There is only a certain amount of uranium on earth, making it a non-renewable resource.

Municipal Waste

"Municipal waste" refers to the garbage collected from the people living in a town or city. To generate energy, this garbage is taken from dumps and land fills to facility where it is processed and shredded into much smaller pieces. These smaller pieces are then burned to create heat, which boils water to create steam. The steam goes through a turbine, which is attached to a generator that produces electricity when the turbine moves. Some garbage can emit potentially harmful gases when it is burned, and it can be difficult to predict and keep track of these gases when the garbage is mixed together. Because humans continuously produce garbage, it could be seen as a renewable resource.

Hydroelectricity

As water flows downhill it produces energy - hydroelectricity harnesses this energy to create electricity. Engineers change the pattern of rivers by creating dams. These dams help control the water, allowing people to decide when and how much to use. When released, the water pours down into a power plant placed below the dam. There the water flows through turbines, which are connected to a generator that produces electricity when the turbines move. Afterwards, the water leaves the power plant and goes back to its stream. Hydroelectricity works well in areas with lots of hills and valleys, so the water can move fast enough to produce enough energy. While water changes form, it never disappears entirely – meaning it is a renewable resource. The process of hydroelectricity does not release any carbon dioxide or other gases.

Solar

Solar power is based on the energy of the sun, which is collected through solar panels. Solar panels are usually built out of mostly silicon or a similar conductive material, and contain many small compartments called "solar cells". A chemical reaction occurs within the solar cells when the sunlight hits the surface of the panel with enough strength and duration. Electrons within the panel begin to move, creating a flow that results in electricity. This process does not release carbon dioxide or other gases, and can be

considered renewable because it relies on the power of the sun. Solar panels are most efficient in areas with lots of flat space and sun exposure, but they work well even in Sackville.

Wind Power

Wind power harnesses the energy of air movement to create electricity. Like giant pinwheels, wind turbines have blades that move in the wind and a long stem or stalk connecting them to the ground. The purpose of the stem is to position the turbine at a height that will expose it to constant or nearly constant wind currents. The turbine is connected to a generator, and as the wind turns the blades the generator produces electricity. Wind turbines do not release carbon dioxide or other gases, and rely on the wind (a renewable resource) to create electricity. Wind turbines require regular wind currents and gusts to work properly, and for that reason they work better in some areas than in others.