Alternative Energy Conversion Kit

P6-2080

BACKGROUND:

Energy exists in many forms, which include mechanical, chemical, radian (light),and others. Many of these are renewable and reduce the emission of greenhouse gasses. Society, today, is turning to alternate renewable forms of energy to meet the increasing demand. The Energy Conversion Kit allows students to experience the transformation of these renewable energies into forms used by society. In each of the experiments in this kit, students will identify the forms of energy that are being transformed, such as, mechanical to electrical or electrical to sound.

ACTIVITIES:

In each of the following activities, one more energy transformation is taking place. At the end of each activity the student should identify each energy form be transformed and indicate whether the energy source for the activity is renewable. Be sure to list all transformations in each activity.

Activity I: The Hand Generator.

One available source of energy is in the form of moving objects or fluids such as wind or flowing water. This energy is known as mechanical (kinetic) energy.

Students should hook a pair of leads from the generator to the motor. Next, a student can crank the handle on the generator causing energy mechanically that is channeled through the leads and into the motor. ***Note: The faster the student cranks the more power the motor provides!***

To prove the power produced by the motor, students can attach another set of leads from the motor to the windmill (in this case representing a fan). Now the faster the student cranks the generator, the more power the motor provides to the fan and the faster the fan spins. The same thing can be seen if you have a light source you can hook the leads to; then the faster the crank, the more from the motor and the brighter the light.

Energy Transformations: Mechanical > Electrical

Activity 2: The Battery.

In another scenario, if you already have a battery as a power source, you can use it to generate a load of electricity to make a tool do some work. Students can attach leads from the battery to the generator. This makes the generator act as a motor. Now it can be hooked to the windmill to make it turn, or a light bulb to make it light.

This happens because the chemical reaction in the battery is freeing electrons, therefore causing them to flow, or creating electrical current. If wires are connected to an object to create a circuit (the flow goes out of the battery toward the generator and back to the other end of the battery in a circuitous route) this flow causes what is attached to it to work. This flow goes from positive polarity to a negative one.

Students can also attach the battery to the LED light or buzzer with the leads. The light should light and the buzzer should sound.

Energy Transformations: Chemical > Electrical

Activity 3: The Solar Cell.

To turn light energy, from the sun or a lamp, into electricity, the solar cell absorbs light into a semiconductor, which knocks electrons loose. These electrons flow freely, helped along by electric fields that exist in the cell. Students can access that flow or current by attaching leads from the cell to an item to do work. Often this is done in a calculator, so it would be logical to attach to the LED included in the kit. This is what is going on inside a solar calculator. Notice that the brighter the light source, the easier to see the LED readout. Next, attach the solar cell to the buzzer and face the solar cell toward the sun or *bright* light source.

Energy Transformations: Light > Electrical

Activity 4: The Windmill.

To capture the power of wind, and make it a usable energy, windmills turn their fans free of charge with the wind. This mechanical energy created by the spinning of the paddles is channeled into a generator inside the shaft of the windmill. That is what converts the power to electricity. Students can place the windmill into a wind, or in front of a fan, and attach leads from the windmill to any item to do work. The faster the windmill spins the more power available, and the louder the buzzer, the brighter the LED, or the more mechanical motion (and therefore power) generated by the motor. If there is no wind to make the windmill move, a generator could be attached to make it spin.

In the real world, these options are valuable in dealing with the limitations of various situations when electricity is needed. If while living out west people rely on a windmill for power, but the weather does not supply any wind, they can power the generator another way. Students can use this knowledge to get through many such needs. Students can also question which generator of electricity works best for which user of electricity. Is one pairing better then another? They can answer this after finishing the lab.

Energy Transformations: Wind > Electrical