Energy LAB

A LEGOLAND® Malaysia Educational Resource Guide

Educational Objectives

- Learn about renewable resources, such as solar and wind energy
- Experiment with production, storage, and transfer of mechanical, solar, and wind energy
- Test and compare energy sources
- Define and experience potential and kinetic energy
- Relate hands-on activity to LEGOLAND attractions

Background Information

Energy comes from many sources

Most of our energy supply comes from fossil fuels, such as oil, coal, and gas. Since fossil fuels take millions of years to form, they are effectively non-renewable. Every time we use oil, coal, and gas, there is less for future use. Also, burning fossil fuels produces waste products that pollute the atmosphere.

Energy also occurs naturally in wind, flowing water, and sunlight. Using these renewable energy sources may offer an alternative power source.

Collecting and Storing Energy

Energy that is naturally available needs to be collected to be useful. Sometimes energy can be stored up which is known as Potential Energy. When the energy is used, it is known as Kinetic Energy, which is energy in motion. When energy is transferred from where it is stored to where it is used, some energy escapes as heat.

Power is a measure of how fast you transfer energy. You can lift an object slowly and work at a low power. Lift it quickly and you work at a high power.

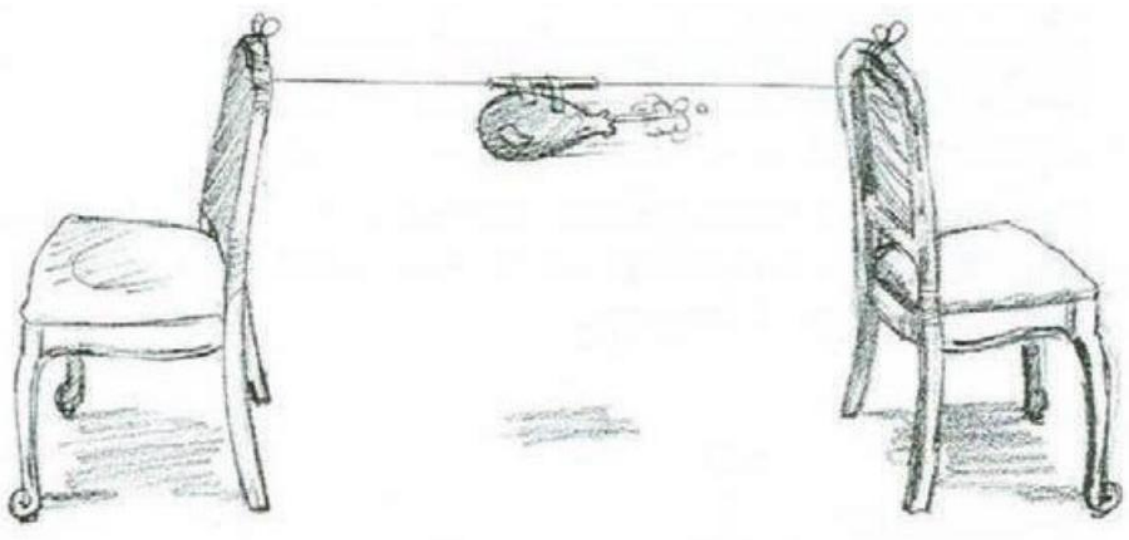
Renewable Resources: Wind, Water, and Solar Power

Windmills, grouped into wind farms, can generate electricity. Large rotors have pitched blades to collect wind energy. Windmills convert about 30% of the wind's energy into electricity.

Turbines are powerful waterwheels used in hydroelectric power stations. Water is stored behind a dam. As the water is released, it drives the turbines and generates electricity. Worldwide, water power is the major source of energy, after fossil fuels.

Solar panels collect energy from the sun. One type of solar panel contains a liquid that absorbs the heat energy. Hot liquid passes to a heat exchanger to heat the water in a swimming pool or a home's water heater.

Before and After the Visit: Minds-On Investigations



Balloon Power!
Use renewable energy: air! Store potential energy, and change it to kinetic energy. Find out how weight affects how fast and far the balloon travels.

Remember:
Potential energy is energy stored and ready to be used. Kinetic energy is the energy of motion.

Materials:
1. Long balloons
2. Pennies
3. Fishing line 6-ft. long
4. Masking tape
5. 1 Drinking straw
6. 2 chairs

Procedure:
1. Thread the drinking straw on the string. Tie each end of the string to the back of a chair.
2. Move chairs apart until the string is taut. Slide the straw to one end.
3. Inflate the balloon, but do not tie it.
4. Hold the balloon with the opening facing the chair. Tape the balloon to the straw.
5. Let the balloon go!

Discussion:
1. How far did the balloon go?
2. What renewable energy source powers the balloon?
3. Where is potential energy stored? When is kinetic energy released?
4. Is any energy wasted? If so, how?

Now try this:
1. Tape a penny to the balloon or straw. How does weight affect the speed and distance the balloon travels? Try it with two pennies.
2. Use a different size or shape of balloon. Can you increase the potential energy stored and the kinetic energy released?

Discovery Worksheet

THE GREAT LEGO® RACE



Ride the TECHNIC Coaster at The Great LEGO® Race.

Think about how the TECHNIC Coaster makes the most of potential energy, kinetic energy, and gravity, to speed up and slow down.

Potential energy is energy stored up and ready to be used.
Kinetic energy is the energy of motion.

Questions:

1. Where does TECHNIC Coaster have the most potential energy - at the lowest or highest point of the track?

2. How does TECHNIC Coaster gain more and more potential energy - by going up or down the track?

3. How does the height of the track affect the amount of potential energy that can be stored?

4. When is potential energy changed to kinetic energy?

5. How does the dip at the end of the ride help the TECHNIC Coaster slow down? How does this help the brakes?

Answer Key:

1. Highest point.
2. Up the hill.
3. The higher the track, the more potential energy.
4. Changes to kinetic energy as gravity pulls the coaster downhill.
5. Climbing the dip gains gravity takes more power. Since the coaster naturally slows down, the brakes do not have to work as hard, and do not wear out as quickly.

Hands-On Investigations

Discover energy and where we find it!

Energy is the capacity to do work or the ability to make things move. Think about where energy comes from. What is the difference between renewable and non-renewable energy? Can you give several examples of each?

Generate energy

Use the hand crank, solar panel, motor and energy meter to compare the power generated from solar and mechanical energy sources.
Discover how to use the LEGO® capacitor to collect, store, and transfer energy. When energy is stored in the capacitor, it is called potential energy. When energy is released, it changes to kinetic energy, the energy of motion.

Collect and store solar energy to power up!

1. Use energy to power a model of a LEGO car, with a motor attached.
2. Explore the power of two different energy sources: mechanical and solar.
3. Observe mechanical energy with a motor. Store the mechanical energy into a capacitor - potential energy.
4. Collect solar energy into the solar panel.
5. Transfer the power to the motor to make the ride run - Kinetic energy.
6. Which energy source gives the most power?

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