




1

**Renewable Energy**




Engineering with LEGO Bricks  
Brain Builders Educational Programs

**What is renewable energy?** – energy that comes from natural sources. The 3 most common types of renewable energy are from the sun, wind, and water.

SOLAR ENERGY
WIND ENERGY
HYDRO ENERGY


There are different ways to harness renewable energy to produce electricity.


**Sun energy** known as solar power is harnessed through the use of solar panels.


**Wind energy** is harnessed through the use of a windmill.

**Water energy** also known as Hydropower is usually harnessed through use of a dam.



Renewable energy can also be used to help us do other things besides producing electricity. For example, the sun can help us heat up a room when its cold and wind can propel a sail boat or fly a kite!






*Over the next few weeks, we will be engineering wind and solar powered machines and learning how to change mechanical energy into electricity! You will be faced with many challenges. Some will be easy and some will be difficult, so get ready!*

2

**Renewable Energy**

Engineering with LEGO Bricks  
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Windmills use wind to turn their large blades and in turn, the blades are used to turn a generator. The generator then produces electricity. So before we engineer a windmill, we need to learn what a generator is.




A generator is a motor that creates electrical energy. Any motor that can be powered by an electrical source can also be used to create electricity. Some of you might have used a battery to power a LEGO motor. We can use the same motor as a generator.

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**Challenge! - Engineer a Hand Cranking Generator**


In order to make a Hand Cranking Generator work, we will use mechanical energy to turn the generator, creating electricity.

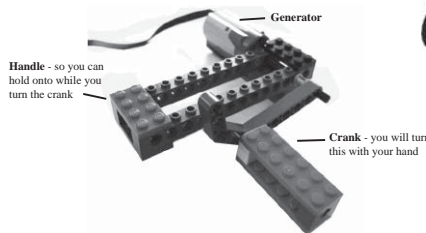


**What in the world is mechanical energy?!**

Mechanical energy is energy that does not use electricity but uses physical movement, like riding a bike.

**Your Challenge :** Engineer a Hand Cranking Generator to power the different electrical machines that the teacher has brought. Remember, this is your project, so you can design it however you want. Here is one example below!





**Generator**

**Handle** - so you can hold onto while you turn the crank

**Crank** - you will turn this with your hand

## Pass out worksheet 1

-Go over and have students read through the worksheet in class.

*-Interactive questions-*

- How many of you guys have ever seen a windmill? Have you seen a dam?
- Have you ever flown a kite with no wind? What happens?

## Pass out worksheet 2

-Go over and have students read through the worksheet in class.

- Show students the generator they will be working with.

*-Interactive questions-*

-How many of you know how to ride a bike? How do you ride it?

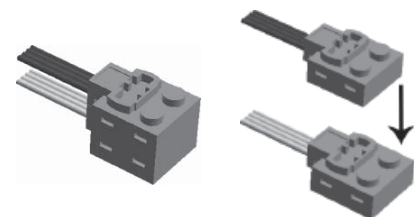
*-Point to be discovered: they are not using electricity but their own strength to turn the pedals, producing mechanical energy.*

## Introduce Challenge

-Show students your example of the hand crank generator and how it works.

-Show students how to connect the motor so it does not move while you are turning it. This is done by inserting pins on the sides of the motor.

-Show students how the electrical connectors connect.



### Challenge 1 - Individual build

-Have students engineer a hand cranking generator and light up the lego house to see what's going on inside.

### Challenge 2 - Individual build

-Have students use their hand generator to lift the heavy weight. The weight should at least be lifted up to the horizontal position. Start with less weight and increase it as students complete the challenge.