

STEM KIT

BUILD & LEARN
GUIDE

SOLAR RACER



SUSTAINABLE
MATERIAL



NO GLUE
OR MESS



SAFE AND
EASY USE

12+

AGES

PROJECT OVERVIEW

For this project students will be working with the power of the sun otherwise known as solar energy to power a solar car. There is a wide variety of renewable energies including biomass, tidal, wind, hydroelectric, geothermal, and solar. Students will learn the basics of renewable energy, solar power, how solar cars work, and the advantages and disadvantages of solar cars. They will then construct their solar car and take it for a drive.

SAFETY WARNINGS:

Please read all safety warnings before use:

Choking Hazard: Small parts not for children under 6 years or any individual who have a tendency to place inedible objects in their mouths.

Surfaces may be hot, handle with caution and care.

Adult supervision required.

MATERIALS

Durable wooden construction pieces

Generator Motor

Solar Panel

Wheels

Metal Axle

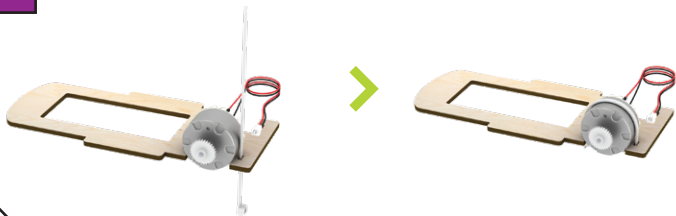
Gear Medium

Gear Large

Ziptie

1

NOTE: If you can not break out the pieces by hand, use a blunt tool or a small knife to cut or punch them out. If you have no experience with tools or use a knife, get help from an adult. If there are any burrs, points or rough spots due to breaking or cutting, smooth them with a piece of sand paper.

2**3**

4



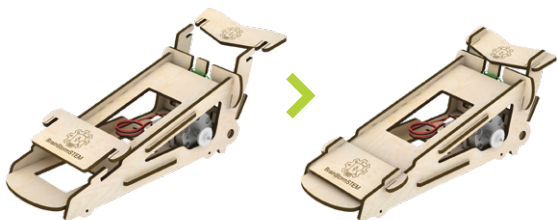
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6



7



8



9



10



11



12



13



HOW TO USE



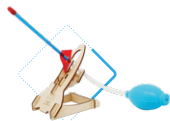
1. PLACE KICKSTAND IN THE DOWNWARD POSITION.
2. PLACE THE SOLAR RACER IN DIRECT SUN LIGHT.
3. CAREFULLY PUSH THE SOLAR RACER TO DISENGAGE THE KICKSTAND.



If you enjoyed this STEM Kit, check out some of our other Kits!



CATAPULT



AIR-POWERED
ROCKET



EARTHQUAKE
ENGINEER



AND
MORE!

TERMINOLOGY

RENEWABLE ENERGY

Often referred to as clean energy, comes from natural sources or processes that are constantly replenished.

NON-RENEWABLE ENERGY

Often referred to as “dirty” energy, this energy is made of resources that are only available in limited amounts and take a very long time to replenish. Common examples of non-renewable energy are fossil fuels and coal. These sources of energy, often carbon-based, release particles that pollute the air, water, and land. The release of these particles also plays into the Earth’s “carbon budget,” which is an overall budget for the distribution of carbon among the land, sea, and air. Because of the use of these carbon-based energies, the Earth’s carbon budget is unbalanced.

PHOTOVOLTAIC

The process of converting light energy into electricity through the use of semiconducting materials. (photo meaning light and voltaic meaning electric)

PHOTOVOLTAIC CELLS

Also known as solar cells, convert the sun’s energy into electrical power by absorbing sunlight. While it is easier said, the way these cells convert sunlight to electrical power is through something called the Photovoltaic Effect. This effect uses semiconducting material to convert sunlight to electrical power. Semiconducting materials, such as silicon, are often used in these cells.

SEMICONDUCTOR

Material that can sometimes act as a conductor, or sometimes act as an insulator.

FOSSIL FUELS

Carbon-based materials formed through Earth’s crust acting on organic matter, such as that produced through photosynthesis. Examples include coal, oil, and natural gas.

RENEWABLE ENERGY 101

What is Renewable Energy?

Often referred to as “clean energy”, it comes from natural sources or processes that are constantly replenished. The idea of renewable energy has been around for many years, for example, Ancient Rome was the first to use geothermal energy to heat their homes. Now there are entire countries where nearly 100% of their energy use is in renewable energies, such as Iceland. There are 6 types of renewable energy with the most notable being solar and wind energy:

Solar - Energy produced by sunlight

Wind - Energy produced through harnessing wind power.

Water - Also known as hydroelectric power, is energy produced through harnessing the natural flow of water.

Tidal - Energy produced from the rise and fall of water due to tides.

Geothermal - Energy produced through pumping heat and steam from below Earth's surface.

Biomass - Energy produced through living and non-living organisms.



SOLAR



HYDRO



WIND



TIDAL

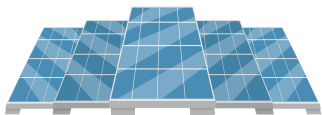
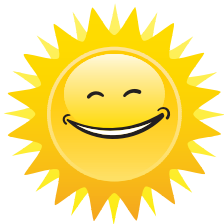
Why is Renewable Energy Important?

Renewable energy is using resources that are constantly being replenished. The alternative to using renewable energy is using nonrenewable or “dirty” energy such as fossil fuels or coal. These dirty energies cause pollution and are a finite resource. Although some renewable energy sources impact the planet, they are overall much less harmful than using nonrenewable resources. Scientists are working on constantly improving renewable resources to make them more effective and available to the general population. The increase in renewable energy production also creates more jobs and statistically sees more jobs for women than the fossil fuel industry. As renewable resources improve over time, humans need to start using them to make sure we all take care of our planet so it can thrive for years to come.

SOLAR ENERGY

WHAT IS SOLAR ENERGY?

Solar energy is light, heat, and other forms of energy that are given off by the sun. Solar energy is collected using an electronic instrument called a solar cell to convert light energy into electricity. When the solar cells are connected they form a module that can be placed together in a solar array called a solar panel.



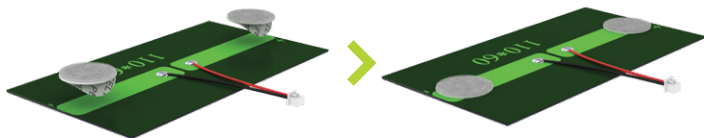
Solar Panels also known as photovoltaic (PV) panels are often composed of silicon (a semiconductive material). When sunlight hits the panels, electrons in the silicon break free and can become part of an electrical current, creating electrical power. Solar panels work best in strong sunlight and provide the most power when the Sun is at its highest point. More electricity can be produced during the middle of a summer day, and less during early and late points on a winter day. Solar energy is used for more than just supplying electricity to a house, but can also be used to power food trucks, boats, office buildings, and spacecrafts!

HOW DOES A SOLAR CAR WORK?

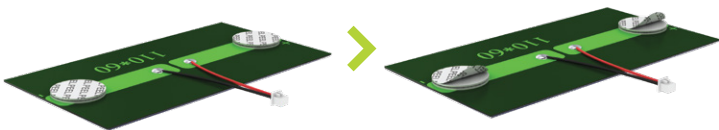
A solar car is a vehicle that features photovoltaic cells, that are linked together, to convert sunlight into electrical energy. This electrical energy is converted into volts by a controller located in the battery of the vehicle. The battery is a vital part of a solar vehicle, as it stores the electrical energy, and allows the vehicle to be driven once the Sun goes down. The electrical energy is what fuels the vehicle and allows the motor to turn. There are some instances where the electrical energy generated by the Sun is directly transferred to the motor.



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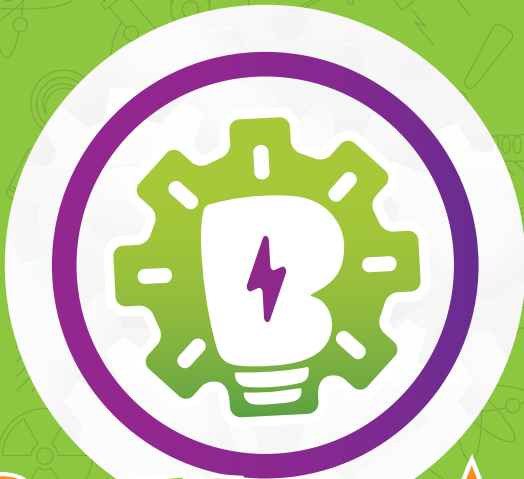


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12





STEM KIT

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 **STEM EDUCATION**

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