

# POWER UP!

A VISUAL EXPLORATION  
OF ENERGY



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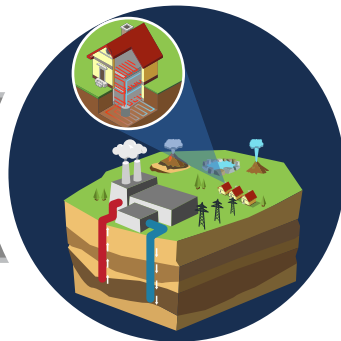
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# WHAT IS ENERGY?

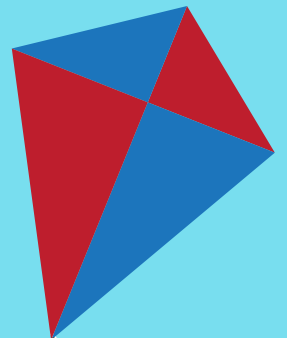
THE WORD "ENERGY" CAN MEAN A LOT OF DIFFERENT THINGS.



Your body needs energy to get out of bed, walk, and even think.



Energy lights up your house and makes things work.



The food you eat for breakfast gives you energy.



The bus that takes you to school needs energy from fuel to make it go.

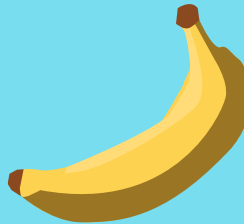
There's energy in sunlight and in the motion of wind and water.

ENERGY IS THE ABILITY TO DO WORK.

Energy can't be created or destroyed, but it can be transferred from one place or thing to another, or changed from one form to another. Your body does this every time it breaks down food into energy you can use.



Plants absorb energy from the sun and convert it into **chemical energy**, which is stored in the plant's molecules.



Your system breaks down food molecules to release energy, which you use any time you move. Any object that moves has **kinetic energy**, the energy of motion.



SOLAR ENERGY



CHEMICAL ENERGY



KINETIC ENERGY

## WHAT DO WE USE ENERGY FOR? \*US, 2012

Energy comes from many sources. We use it—in all its different forms—to make our lives easier and better.



**BUSINESS:** heating, cooling, and lighting for buildings where people work



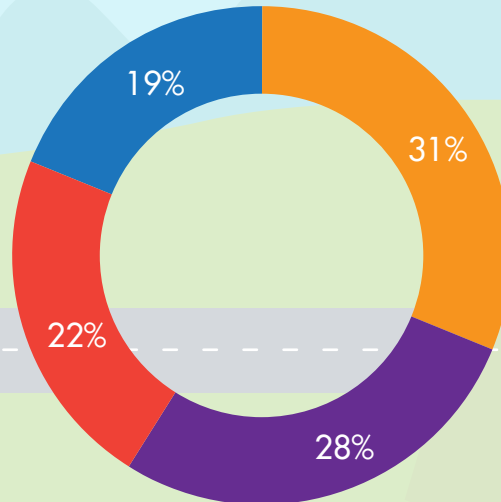
**INDUSTRY:** energy for making, extracting, and refining things—like metals, wood, plastics, and glass



**TRANSPORTATION:** fuel for vehicles of all kinds



**HOMES:** heating, cooling, and lighting for buildings where people live



# WHERE DOES ENERGY COME FROM ?



## SOLAR

The **sun** produces a huge amount of light and heat energy, only some of which eventually hits the earth. Solar panels or cells help us grab the sun's energy to use for heating, or to convert into **electricity**.



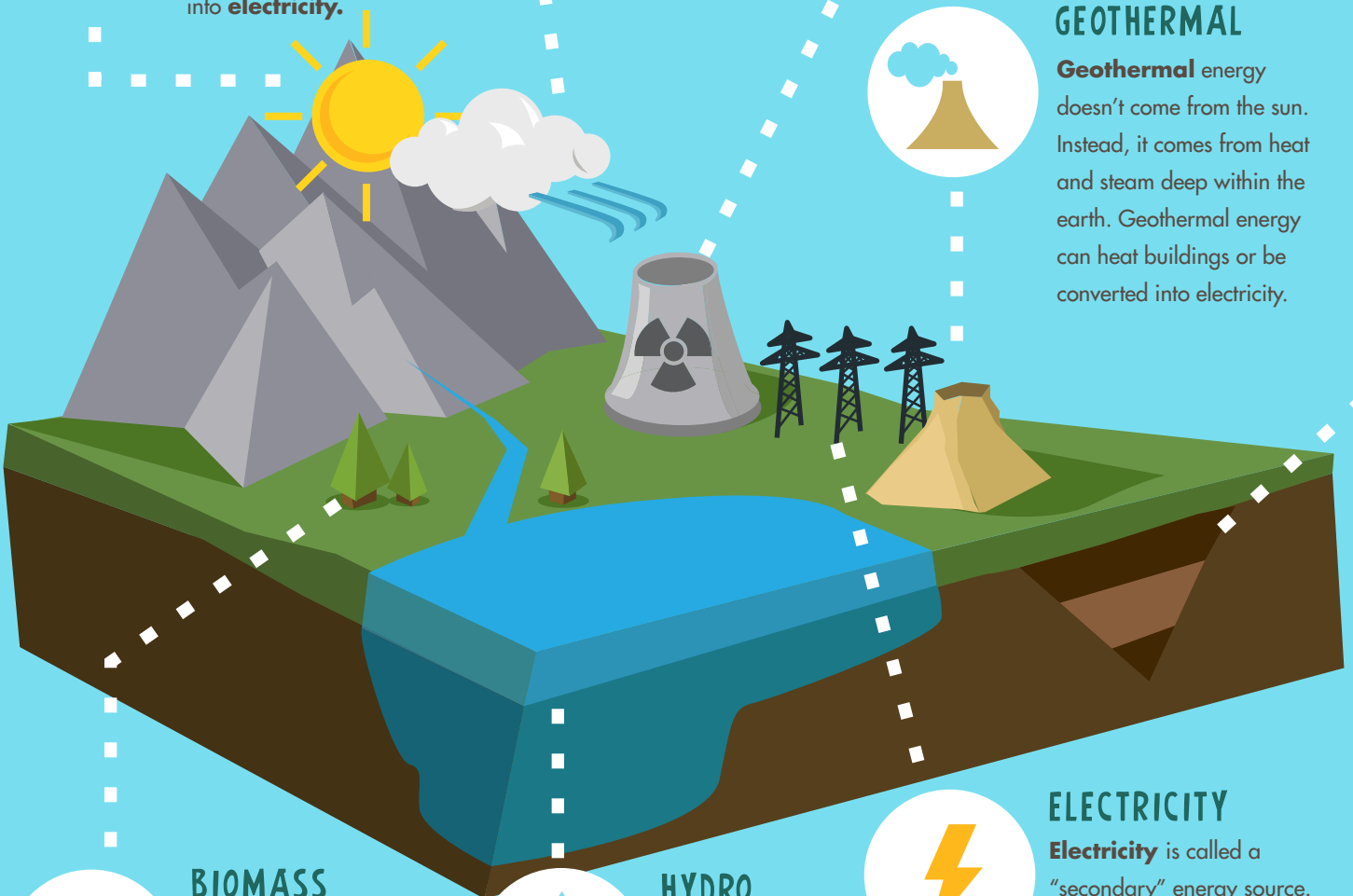
## WIND

**Wind** comes from heat and pressure changes that occur when the sun warms the surface of the earth. Rotating machines called **turbines** can convert the kinetic energy of the wind's motion into electricity.



## NUCLEAR

**Nuclear** energy comes from the power of atoms—tiny pieces of matter. When an atom of uranium is split, massive amounts of energy are released. This energy can be used to generate electricity.



## BIOMASS

**Biomass** can be wood, grass, manure, corn, or even food scraps—all things that once absorbed the sun's energy to grow. It can be burned to produce heat and generate electricity, or turned into a liquid (biofuel) that can power vehicles.



## HYDRO

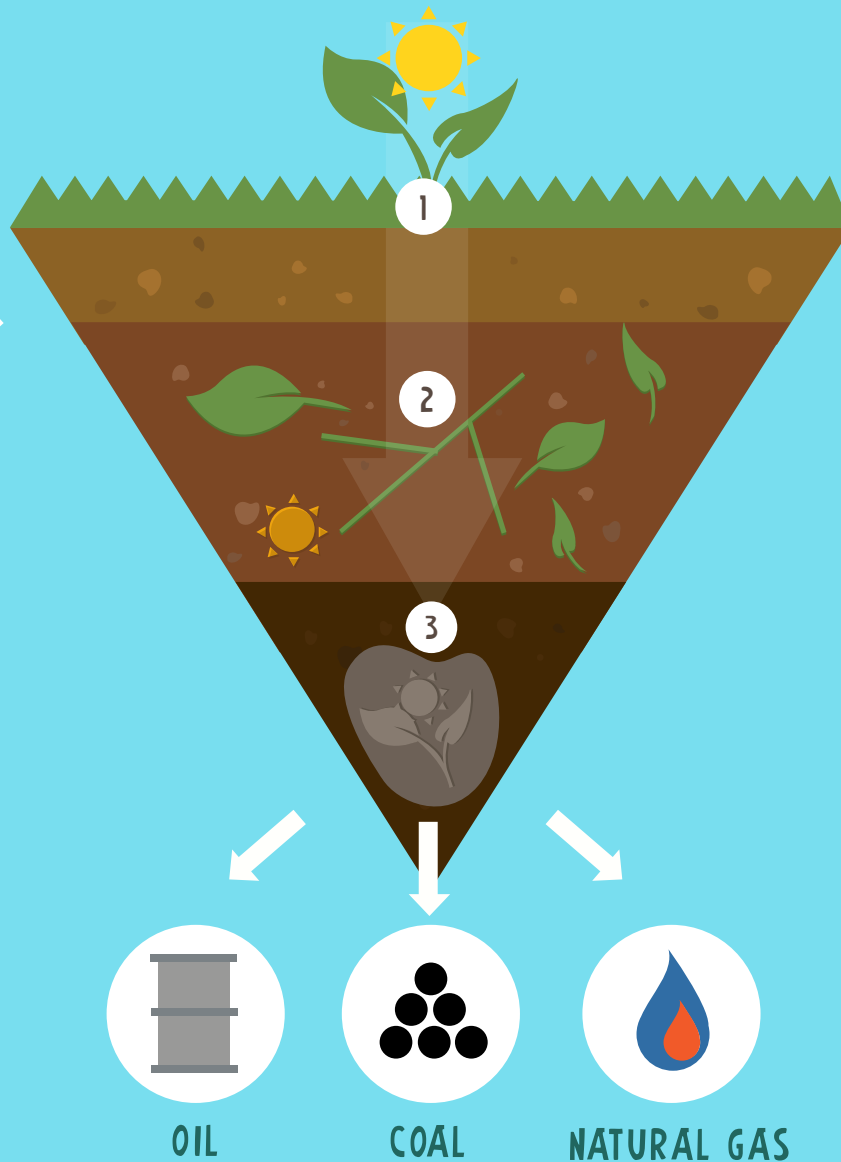
The sun's heat creates the cycle of evaporation and rain that makes water flow. The movement of water through spinning turbines creates **hydroelectricity**. ("Hydro" means water, in Greek.)



## ELECTRICITY

**Electricity** is called a "secondary" energy source. That's because it has to be generated from a "primary" energy source—like moving water, the sun's rays, wind, nuclear power, or fossil fuels—before being carried into houses and buildings to provide light and power.

The energy we use to make cars and buses go, light our houses, and power our devices comes from different places and things. But if you look back far enough, you'll see that most of it originally came from the power of the sun.



- 1 Most of the energy that powers our vehicles and supplies our electricity comes from **fossil fuels**. Millions of years ago, even before dinosaurs, these fuels were living things—ancient plants and animals fed by energy from the sun's rays.
- 2 When these living things died, they were buried under layers of mud, sand, and rock. Heat, pressure, and bacteria helped them decompose. The sun's energy, stored inside them, became more and more concentrated.
- 3 Eventually, they were converted into **oil** (a thick black liquid, also called petroleum), **coal** (a black rock), and **natural gas** (a clear gas).

# RENEWABLE ENERGY

You can't use up things like sun, wind, and water, because they're naturally replenished, or renewable. Different technologies can convert these natural types of energy into forms we can use.



SOLAR



WIND



HYDRO



BIOMASS



GEOTHERMAL

**28.3 MILLION**

PEOPLE WORLDWIDE USE HYDROPOWER

**1.5 MILLION**

US HOMES ARE POWERED BY BIOMASS

**24** COUNTRIES USE GEOTHERMAL POWER

**1 hour** of sunlight (if we could capture it all) could power the world for **1 year**



**300 homes** can be powered by **1 wind turbine**



IS NUCLEAR ENERGY RENEWABLE?

**DEPENDS WHO YOU ASK!**

**Yes.** With better technology to find new sources of uranium and get it out of the ground, we'll have enough to last for the rest of time.





# NON-RENEWABLE ENERGY

Fossil fuels take millions of years to form from ancient plant matter under the surface of the earth. When this kind of energy is used up, it's gone for good. That's why we call it non-renewable.



OIL



COAL



NATURAL GAS

## HOW MUCH PLANT MATTER DOES IT TAKE TO PRODUCE FOSSIL FUELS?



23 TONS

PREHISTORIC PLANT MATTER

=



GASOLINE

=



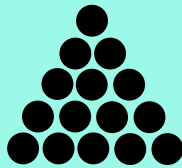
DISTANCE IN AN AVERAGE CAR

Oil that comes from the ground needs to be processed—or “refined”—to turn it into the gasoline that fills up cars. Three barrels of oil produces about two units of gasoline.



10 KG (22 LB) PREHISTORIC PLANT MATTER

=



1 KG (2.2 LB) COAL

=



ELECTRICITY TO POWER 8 LIGHT BULBS FOR 10 HOURS



1 YEAR'S WORTH OF PLANT GROWTH ON EARTH

=



AMOUNT OF FOSSIL FUEL USED WORLDWIDE IN 1 DAY

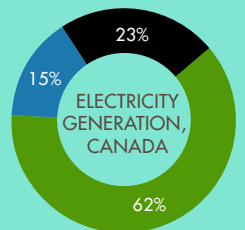
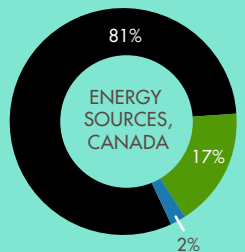
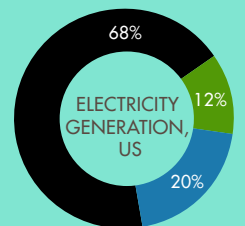
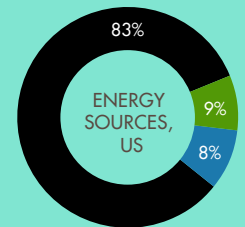
**No.** Nuclear energy comes from splitting uranium atoms, and there's a limited amount of uranium on earth.

## WHAT'S OUR ENERGY MIX?

FOSSIL FUEL

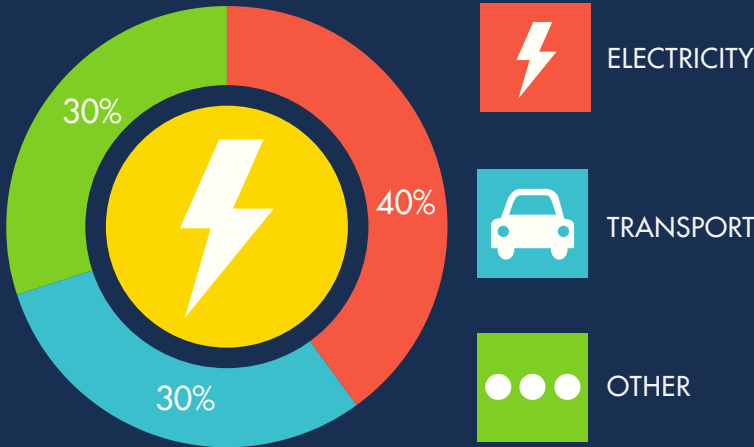
RENEWABLE

NUCLEAR



# ⚡ ELECTRICITY

## US ENERGY CONSUMPTION (2012)



**21% OF PEOPLE  
WORLDWIDE HAVE  
NO ACCESS TO  
ELECTRICITY**

## WHAT'S THE TOP SOURCE OF ELECTRICITY IN YOUR STATE/PROVINCE? \*US, CANADA 2010

