

Boost your Power Smarts

Week 1: Science of energy



Next Boost your Power Smarts quiz:

“Science of energy”

Tuesday, October 1 to
Thursday, October 3

8:00am – 3:00pm



Potential vs kinetic energy

Let's watch a video to find out about these 2 forms of energy



What is potential energy?



What is potential energy?

Potential energy is energy stored to be used later.



What is kinetic energy?



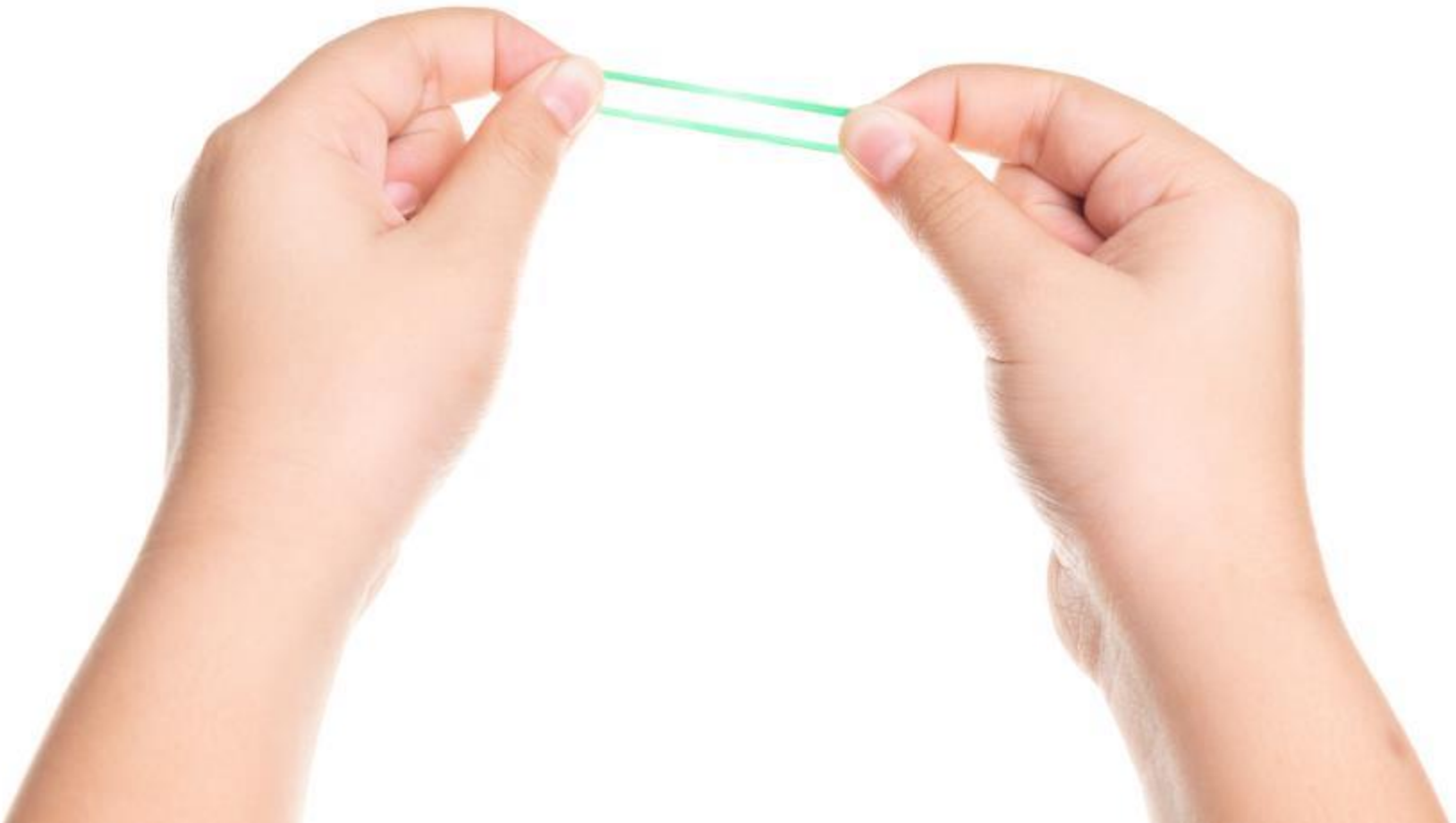
What is kinetic energy?

Kinetic energy is the energy an object has because it is moving.



Elastic band demo

Let's see the difference between kinetic and potential energy in action.



Spring-loaded game

Is the energy potential or kinetic?



Crouch if it's potential



Jump if it's kinetic

We use energy to make electricity

What natural resource is used to make most of the electricity in B.C.?



A) Wind



B) Water



C) Food waste

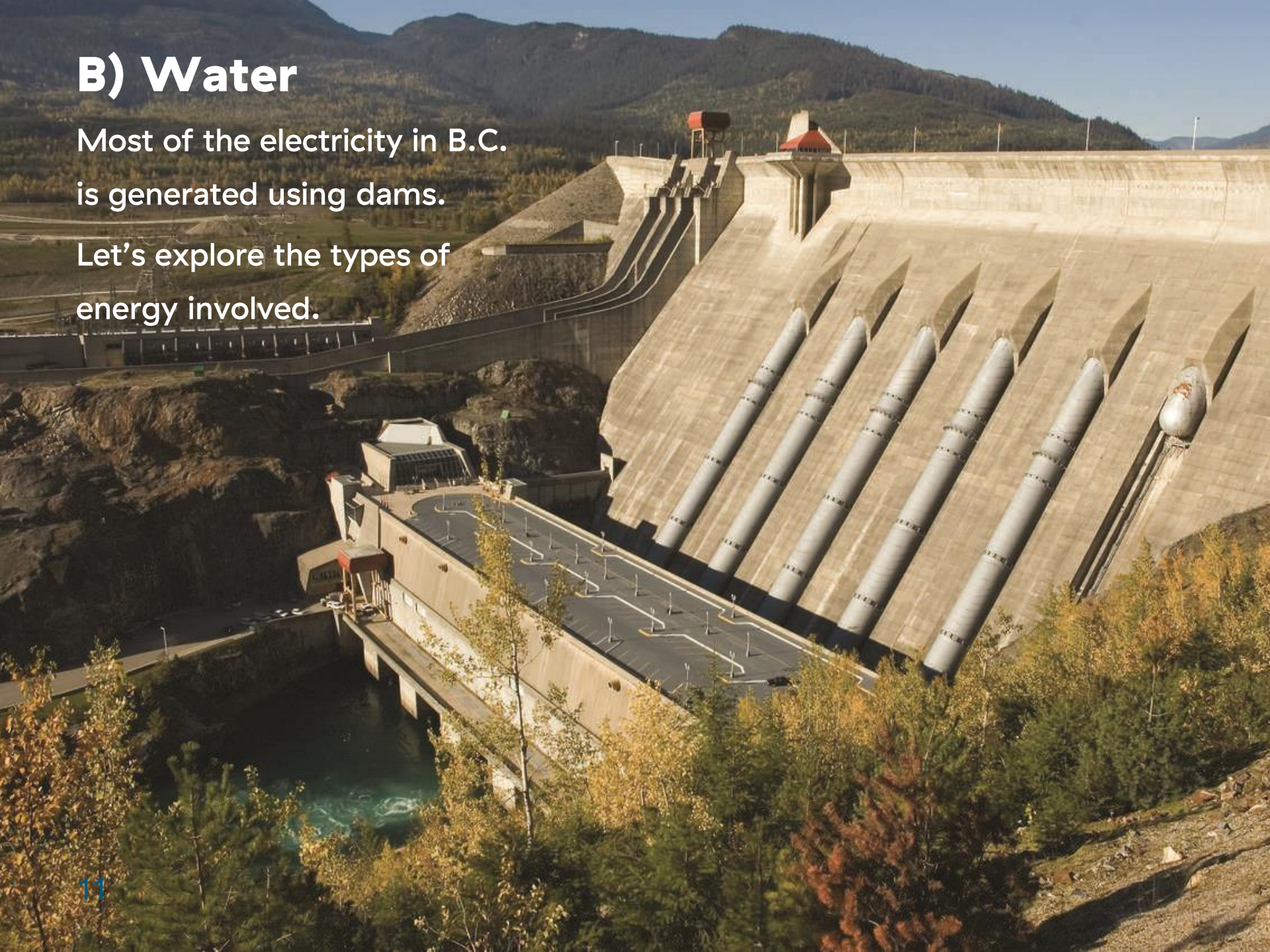


D) Sun

B) Water

Most of the electricity in B.C.
is generated using dams.

Let's explore the types of
energy involved.



There are 10 main types of energy

Potential	
Chemical energy	Energy stored in food and fuel
Elastic energy	Energy stored in objects that are stretched
Nuclear energy	Energy stored in the centre of particles
Gravitational energy	Energy stored in an object above the Earth's surface

Kinetic	
Thermal energy	Energy of moving particles (heat)
Mechanical energy	Energy of objects in motion
Electrical energy	Energy of particles moving through a wire
Magnetic energy	Energy caused by push or pull

Energy we experience different ways	
Sound energy	Energy caused by vibrating objects and that we can hear
Light energy	Energy our eyes can detect

Gravitational (potential) energy

Energy stored in an object when it's above the Earth's surface



The bigger I am and the taller the tree, the more gravitational energy I have stored.

The energy of water



Water trapped above a dam has gravitational potential energy due to its height above the dam and the volume of water in the dam.

The higher the dam and the greater the volume, the more gravitational energy the water possesses.

Mechanical (kinetic) energy

Energy of objects in motion



A water wheel is a simple turbine.

As the water (the object) flows, the water wheel is mechanically turned.

The energy of water

As the water flows down the dam and through the pipes it has mechanical kinetic energy.

This energy turns the turbines in these generators creating electricity.



Ruskin Dam generators

Hydroelectric generating stations use huge and complex turbines to create energy for electricity.

Rain video

Let's watch a quick video about the path of electricity in B.C.

Read the questions on your worksheet and answer them after watching the video.



Here are the 10 main types of energy again

We'll now explore electrical, thermal, light and sound energy

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Electrical energy

Energy created by the flow of an electric charge



In B.C., electricity travels from the hydro dams and generating stations, through transmission lines and distribution lines.

Electrical energy

The electricity flows through the wires into our homes to heat our rooms, power our lights and play our music.



Thermal energy

Thermal energy (also called heat energy) is produced by moving particles due to a rise in temperature.



Some everyday examples of thermal energy:

- Heat from a heater
- Warmth from the sun
- A hot shower

Did you know that lights can create thermal energy (heat) too?

Light energy

Energy that our eyes can detect

Filament



- Incandescent light bulbs heat up a filament to produce light.
- We can feel this thermal energy or heat.
- About 90% of the energy is wasted and lost as heat energy in order to make the bulb light up.

LED lights are the most efficient

LED (light emitting diode) bulbs use less energy to create the same amount of light as incandescent bulbs. They are much more efficient at turning energy into light and produce a lot less heat.

LEDs use at least 75% less electricity than an incandescent.



CFL

Incandescent

LED

Sound energy

Sound energy is produced when an object vibrates. It is energy we can hear.

What sounds can you hear in the classroom right now?



Now that we have electricity...

How do we measure our everyday electricity use?



Watts (W) and kilowatts (kW)

Measuring how much electricity we use



Watts (W) are a measurement of power, describing the rate at which electricity is being used at a specific moment.

For example: a 15-watt LED light bulb draws 15 watts of electricity at any moment when turned on.

One kilowatt (kW) equals 1,000 watts.

Kilowatt-hours (kWh) and cost (cents)

Measuring and paying for our electricity

One kilowatt-hour (kWh) is the electrical energy consumed when a 1 kW appliance is used for 1 hour.



For example: a 3kW clothes dryer on for 2 hours uses 6kWh.

The cost of electricity is often calculated by kWh used.

Let's do an example together



I have a 1000 watt oven.

I use it to cook a meal for 2 hours.

If electricity costs 8 cents per kWh, how much did the electricity-use cost to cook this meal?

1000 watts = 1 kW

Using my 1kW oven for 2 hours = $1 \text{ kW} \times 2 \text{ hours}$
= 2 kWh (kilowatt-hours)

Cost = 8 cents per kWh \times 2 kWh = 16 cents

Your turn

Let's figure out the electricity cost for each of these lights.

Remember: 1,000 watts = 1 kilowatt; 1 kWh costs 8 cents



- I have 100 incandescent lights on for 3 hours
- Each incandescent light bulb uses 40W



- I have 100 LED lights on for 3 hours
- Each LED light bulb uses 10W

Your turn

Let's go through the answer together.

Incandescent lights	Answer
<ul style="list-style-type: none">I have 100 incandescent lights on for 3 hoursEach incandescent light bulb uses 40W	<ul style="list-style-type: none">100 incandescent lights using 40 watts each = 4000 watts4000 watts = 4 kWLeaving the lights on for 3 hours = 4 kW x 3 hours = 12 kWh <p>Cost = 12 kWh x 8 cents per kWh = 96 cents</p>

LED lights	Answer
<ul style="list-style-type: none">I have 100 LED lights on for 3 hoursEach LED light bulb uses 10W	<ul style="list-style-type: none">100 LED lights using 10 watts each = 1000 watts1000 watts = 1 kWLeaving the lights on for 3 hours = 1 kW x 3 hours = 3 kWh <p>Cost = 3 kWh x 8 cents per kWh = 24 cents</p>

Switch off

What can we do to power down and save electricity in our schools and homes?



