

Express

Magazine for Grades 5 and 6

A collage of four black and white photographs. The top-left shows a man in a suit and tie. The top-right shows a woman in a red dress. The bottom-left shows a man in a tuxedo. The bottom-right shows a woman in a blue dress. Overlaid on the images are several pieces of text in different colors and fonts: 'TRANSMISSION' in purple, 'DISTRIBUTION' in pink, 'SUDOKU' in red, 'GAMES' in teal, 'BOOKLET' in orange, and 'GENERATION' in green. The text is arranged in a diagonal or overlapping fashion across the images.

Think you're an expert on electricity?

Try these games and riddles, and put yourself to the test!

The great puzzle rally

Start

Manolo has some advice for Mr. Mongeau. To find out what it is, do the puzzle rally! Read the first question (under "Start") and search for a picture that shows the answer. Solve the puzzle that appears in the same box as that picture, and then find the picture that matches the answer. Keep going until you've solved all the puzzles. If you do them in the right order, the last one will reveal Manolo's advice!

Q:

"Hydro" is a Greek word that means

FIND THE PICTURE THAT SHOWS THE ANSWER AND SOLVE THE PUZZLE YOU FIND THERE.

Where do you plug in your TV?

Copy the words from the list into the spaces below. The letters on a white background will spell out the answer.

computer – fridge – kettle –
stereo – television – toaster

LOOK FOR THE MATCHING PICTURE AND CONTINUE THE RALLY FROM THERE.



Fill in the blank

You should always unplug a lamp before changing the _____.

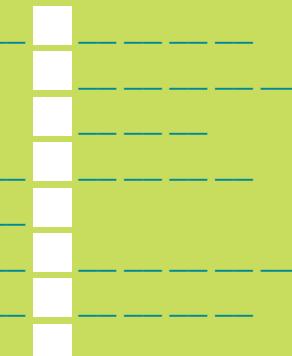
LOOK FOR YOUR NEXT QUESTION BESIDE A PICTURE OF THE MISSING WORD.



Hydropower can require large reservoirs of water.

To find out what it takes to create a reservoir, copy the words from the list into the spaces below. The letters on a white background will spell out the answer.

conductor – meter – safety –
generate – outlet – watt –
consumption – transmission



ONCE YOU'RE DONE, LOOK FOR THE PICTURE THAT MATCHES YOUR ANSWER, AND CONTINUE THE RALLY FROM THERE.

Amp

Q:

Whenever it can, electricity flows into the ...

HUNT FOR A PICTURE OF THE ANSWER TO FIND THE NEXT QUESTION.

What am I?

My first syllable is the first-person form of "to be."

My second syllable is the sound that cats make when they're happy.

My whole measures current intensity.

FOR THE NEXT STOP IN THE RALLY, FIND THE SHORT FORM OF THE WORD YOU JUST DISCOVERED.



The mechanical energy of water flowing through a turbine is transmitted to the generator, which converts it into electricity. What brings that electricity to users?

Create a pyramid with the words matching the definitions provided. Each word is formed by adding a letter to the one before. The letters may not be in the same order every time.

The 5th letter of the alphabet



A verb meaning "to exist"



Short form of Abraham



Having the capacity to do something



This is what transmits electrical power

THE WORD AT THE BASE OF THE PYRAMID WILL POINT YOU TO THE NEXT PUZZLE.



Q: In a generating station, what does the water spin?

THE ANSWER WILL GUIDE YOU TO THE NEXT ITEM.

Q: To find out what drops voltage levels one last time before electricity enters your home, fill in the missing vowels in the word below.

TR ___ NSF ___ RM ___ R

FIND THE RIGHT PICTURE AND CONTINUE WITH THE RALLY!

Q: What helps to carry electricity and rhymes with flower?



FIND THE SOLUTION, AND CARRY ON!

DANGER

This is a serious hazard! Combine the following syllables to make four two-syllable words. The syllable left over will tell you what our careless person may be in for!

NET	VOLT	WORK
AGE	CUR	CUIT
RENT	SHOCK	CIR

1st word: _____
 2nd word: _____
 3rd word: _____
 4th word: _____
 Answer: _____

THE WOMAN FILLING THE IRON WHILE IT'S STILL PLUGGED IN ILLUSTRATES THE ANSWER.

Q: Combining these two things is guaranteed to be a shocking experience!

Fill in the blank.

WATER + ELECTRICITY = _____

FIND A PICTURE WITH THE WORD YOU FILLED IN AND CONTINUE.



Riddle

My first is a box that keeps valuables from thieves.
 My second's a drink made with water and leaves.
 My third rhymes with "worst", but comes at the start.
 We should live by my whole, which means "Be alert!"

USE THESE CLUES TO FIND OUT MANOLO'S ADVICE, SYLLABLE BY SYLLABLE.

Finish

Manolo's advice:



In a generating station, what does the water spin?

THE ANSWER WILL GUIDE YOU TO THE NEXT ITEM.

To find out what drops voltage levels one last time before electricity enters your home, fill in the missing vowels in the word below.

TR ___ NSF ___ RM ___ R

FIND THE RIGHT PICTURE AND CONTINUE WITH THE RALLY!



To find out how electricity gets to your neighborhood, fill in the missing vowels in the words below.

P ___ W ___ R ___ L ___ N ___

FOR THE NEXT ITEM, FIND THE PICTURE OF YOUR ANSWER.

Q: What keeps track of your power consumption at home?

To find out, read the following statements. If you think the statement is true, write the letter from the "True" column in the circle to the right. If you think it's false, write the letter from the "False" column in the circle to the right. If you get every question right, you'll solve the puzzle!

True False

The electricity you use comes from a single generating station.	P	M	<input type="radio"/>
The human body is a good conductor.	E	A	<input type="radio"/>
Major appliances and smaller electrical devices use the same amount of energy.	M	T	<input type="radio"/>
An electrical device with a three-prong plug has to be plugged into a three-hole outlet.	E	R	<input type="radio"/>
Since most hydroelectric generating stations are located far away, the electricity takes a long time to get to your home.	S	R	<input type="radio"/>

Jumble grid

Find the words listed at the bottom of the page in the grid below, crossing out the letters and words as you go. Here are the rules. The letters of a word never appear next to each other in order. You can use each letter only once. The color and symbol of each letter match those of the word it belongs to.



DAM  | WATERWAYS  | STATION  | SURGE PROTECTOR  | GUITAR  | RESERVOIR 
CONSUMPTION  | SERIOUS  | DISTANCE  | TRANSPORTATION  | POOL  | LADDER 
MANOJO  | CAUTION  | LAWNMOWER  | SEÑAL  | SAFETY  | TOWER  | SIMON 

At the end, put the leftover letters in order so they form a word and draw the symbol associated with the answer in the upper right corner of the page.

Symbol



TURBINE  **ENERGY**  **SHOCK**  **CURRENT**  **WIRE** 

CIRCUIT  ATTENTION  LIGHTBULB  WATT 

SYSTEM **METER** **TRANSMISSION** **AMPERE**



Are you

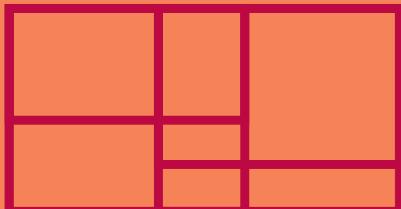
Word Search (9 letters)

Find the words from the list in this grid. Cross out the letters as you go. Some letters are used in more than one word. At the end, the leftover letters will spell out something that uses electricity at home.



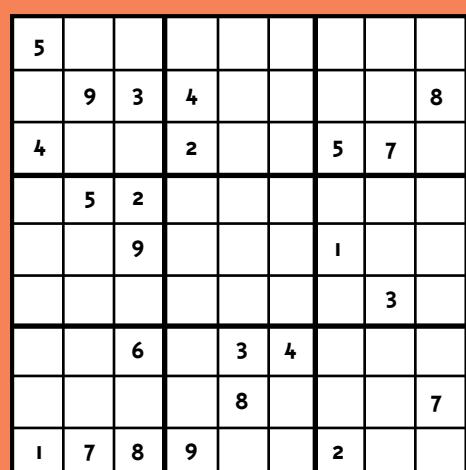
AIR CONDITIONER	MEGAAMP
BATHROOM	MICROWAVE
BATTERY	OVEN
CABLE	PLANT
CALCULATOR	PLUG
CD PLAYER	POLE
CHARGE	POWER
CIRCUIT	RIDDLE
CLEAN	SHOCK
COMPUTER	SWIM
DISHWASHER	SYSTEM
FLOW	TELEVISION
FREEZER	TOWER
FRIDGE	TURN OFF
GLOW	VACUUM
GRID	VOLTAGE
HEATER	WATER
LAMP	WIND
LAWNMOWER	WIRE
LIGHTBULB	ZAP

How many rectangles
can you find in this figure?



Sudoku

The object of the game is to place the digits from 1 to 9 correctly in the nine-by-nine grid below. All nine digits must appear in each column, row and three-by-three box once and once only.



Crossword

**Write your answer to each clue
at the corresponding number
in the crossword grid.**

ACROSS

1. Water + electricity = _____
2. Unit used to measure electric pressure
3. Thick wall built on a river to hold back water
4. Device that breaks a circuit when current is too strong
5. Satellite, source or transformer _____
6. Hydro _____
7. Metal structure that holds up power lines
8. Bundle of wires used to carry electricity
9. Flow of electric charge



DOWN

10. Object at the end of a power cord
11. "Factory" that generates electricity (two words)
12. Greek word meaning "water"
13. Atomic particle
14. Machine that spins due to the force of water
15. Popular French-language TV show
16. Unit used to measure electrical power

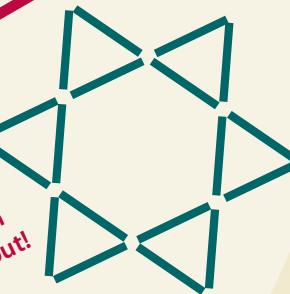
How many times can you find the word "noon" in the shape below? The letters have to be in a straight line from left to right, from top to bottom or diagonally, but never in more than one direction!

N
NONON
NOOOOOON
NOONOOONOOON
NOOOOOON
NONON
N

Add three lines
of the same length as each
side of this hexagon to produce
three identical parallelograms.



These 18 lines form a total of eight triangles: six small triangles and two bigger ones. By moving only two of the lines, you can get a total of six triangles. There's only one way to do it. Can you find it? Try using wooden sticks or toothpicks to figure it out!



Maze

Help!

Selina, Manolo, Simon and Mr. Mongeau
need your help to find their way
to the power bar with surge protection.



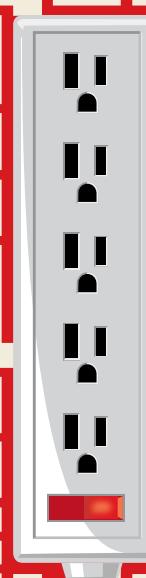
My band's
giving a show
tomorrow.
I've got to
rehearse!



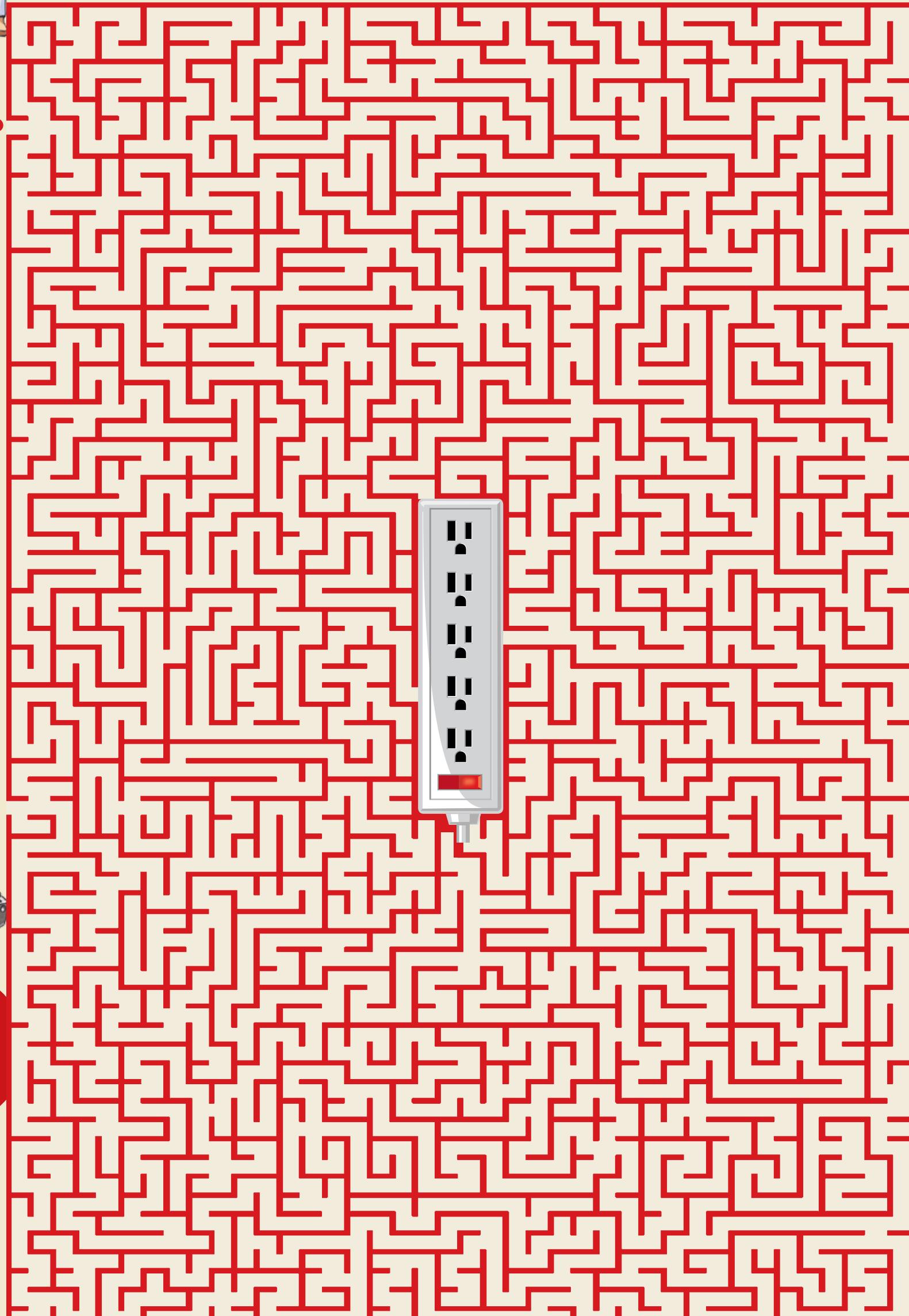
I've got
a deadline
coming up.
I need the
computer!



I don't want
to miss tonight's
hockey game!



As they say,
"Good hedges
make good
neighbors."
Or at least
I think that's
what they say!
But good
hedges need
to be trimmed!



 **Hydro
Québec**

Pop quiz!

1 • Which appliance in your home uses the most electricity? _____

2 • It takes as much electricity to run a hot bath as it takes to light a 60-watt lightbulb for _____ hours.

3 • True or false? Using a 1,190-watt microwave oven for four minutes takes as much electricity as lighting a 60-watt lightbulb for one hour. _____

4 • True or false? If 15 people hold hands and the first one receives an electric shock, the 15th person will also feel a shock. _____

5 • I proved that lightning is static electricity. My name is _____.

6 • I am considered the inventor of the 735-kilovolt transmission system. My name is _____.

7 • My name is Alessandro Volta and in 1800 I invented _____.

8 • At what time of day do we use the most power? _____

9 • If Hydro-Québec's transmission and distribution lines were laid end to end, how many times would they circle the globe? _____

10 • How many watts are in a megawatt? _____

11 • In what year did the Québec government create Hydro-Québec? _____

12 • The word "electron" comes from a Greek word that means _____.

13 • True or false? Montréal's Place Ville-Marie skyscraper could fit under the main arch of the Daniel-Johnson dam. _____

14 • True or false? The world's largest underground power plant, Robert-Bourassa generating station, is longer than four soccer fields laid end to end. _____

15 • If you want to save energy, what dishwasher function should you avoid? _____

16 • What is the most economical way to boil water? _____

17 • In Québec, we typically use electricity for heating, hot water, lighting and operating appliances. However, over 50% of our electricity bill is for just one of these uses. Which one? _____

18 • Many towers that carry high-voltage lines stand 60 metres tall. That's the height of a _____-story building!

19 • _____ + _____ = DANGER!

20 • The best way to protect yourself from lightning is _____.

Vocabulary

CIRCUIT

A circuit is a path along which electricity can travel. For a circuit to work properly, the electricity must leave one end of the power source and return to the opposite end in an unbroken loop, or "circle" of electricity. For example, a simple circuit can be made by running a copper wire from a battery to a light bulb and then back to the battery.

CIRCUIT BREAKER

A circuit breaker is a safety device in your distribution panel that controls the amount of current sent through the electrical wiring. If there's an overload, the breaker will flip from the "on" position to the "off" position and stop electricity from flowing through the wires. This is called tripping, and it can prevent fires and damage to your appliances.

CONDUCTOR

A conductor is a body or a material that allows electric current to pass through it. Electricity moves easily through good conductors such as copper or aluminum wire, but can't move through substances like glass and plastic. Other good conductors are saltwater, steel and the human body (which is about 65% water). The wire that carries electricity in an electric distribution or transmission system is also called a conductor.

CURRENT INTENSITY

Current intensity is the amount of current flowing through a conductor over a period of time. It's like the amount of water that flows from your hose every second. Current intensity is measured in amperes.

$$\text{Current intensity (in amperes)} = \frac{\text{voltage}}{\text{resistance (in ohms)}}$$

DAM

A dam is a thick wall built on a river to hold water in a reservoir. This water is used to turn the turbines in the generating station and produce electricity. If a river has a strong flow, the generating station does not necessarily require a reservoir.

ELECTRIC ARC

Electricity always seeks a path to the ground. With a live power line, the surrounding air and the insulators attached to the line prevent the current from reaching the ground. If you get close, however, there is less insulating air between you and the current. And if you get too close, the electricity can jump directly to you, giving you a shock even if you don't touch the conductor. This "jump" is an electric arc.

ELECTRIC CURRENT

An electric current is the movement of electrons (see "electron") through a conductor (see "conductor"). Electrons move through a conductor by jumping from atom to atom. When an electron jumps off one atom it leaves a hole for the next electron to jump into, and so on down the line.

ELECTRON

Electrons are part of an atom. They rotate around the centre or nucleus of the atom like the planets move around the Sun. Electricity is essentially the movement of electrons.

FUSE

A fuse does the same job as a circuit breaker (see "circuit breaker"). It protects the wiring in your home and prevents fires. A fuse contains a metal wire or strip that melts when the current gets too strong, cutting off the flow of electricity. Newer homes and buildings use circuit breakers, which are safer and easier to use than fuses.

GENERATING STATION

A generating station is the place where electricity is produced. It can also be called a power plant or power station. There are different types of generating stations depending on the source of energy used. For instance, hydroelectric generating stations use water, thermal generating stations use heat produced by burning coal or gas, and wind farms use wind power.

GENERATOR

This is the machine that actually produces the electricity. Generators have two main components: a moving part (the rotor) and a part that stays still (the stator). The rotor is actually a big magnet, and the stator is coils of wire. When the rotor spins inside the stator, electrons are set in motion in the stator wires and this creates an electric current.

GROUNDING

Grounding means providing a path from an electrical circuit to the earth. This path is called a "ground." Grounding is very important for electrical safety, because electricity is always looking for the easiest path to the ground. The ground carries current from faulty wiring, tools, or equipment to the earth or a conductor touching the earth, where it can be safely discharged. Grounded tools and equipment help to prevent you from becoming the means of channeling electricity back to earth.

INSULATOR

An insulator is an object or material that does not allow electricity to pass through. Common examples of good insulators are dry air, glass, plastic, porcelain and rubber.

KILOWATTHOUR

A kilowatthour, as its name suggests, means using 1,000 watts of electricity for one full hour. A 100-watt lightbulb burning for 10 hours uses one kilowatthour.

PENSTOCK

A penstock is a large pipe or channel that carries water from the reservoir to the turbine. The water rushes through the penstock and hits the blades of the turbine, causing it to spin.

POWER

Power is the force or energy used to do work. It is measured in watts and it is the product of the voltage (see "voltage") and the current (see "current"). It can refer to the amount of power a motor requires to run or the amount of power an appliance, machine or system requires to do its work. It can be compared to the strength of a jet of water, which depends on both its pressure and its flow rate.

RESISTANCE

Resistance is the opposition of an object or material to electricity passing through it. Resistance is measured in ohms and it varies depending on the size, the length and the type of conductor.

SATELLITE SUBSTATION

This is the last stop before electricity is sent along wires to homes or businesses. Substations are located throughout cities to serve areas and neighborhoods. They decrease or "step down" the voltage so the electricity can be used in homes and businesses.

SOURCE SUBSTATION

A source substation receives power from a high-voltage line, lowers or "steps down" the voltage and then distributes the electricity to several power lines.

SURGE PROTECTOR

A surge protector protects electronic equipment such as TVs and computers from power surges and spikes. It does this by diverting extra electricity into the ground. Most power bars, but not all, are equipped with surge protectors.

TOWER

A tower is a metal structure on which power lines are strung.

TURBINE

A turbine is a machine that spins when its blades are hit by wind, water or steam. The turbine is connected to the rotor in a generator (see "generator"). When the turbine spins, the rotor whirls inside the stator and generates electricity.

VOLT

A volt is the unit used to measure voltage or electric "pressure" (see "voltage").

VOLTAGE

Electricity flowing through a wire can be compared to water flowing through a hose. The water pressure in the hose depends on the size of the hose and the amount of water flowing through it. In a small garden hose, there isn't much pressure. But in a bigger hose, like the ones firefighters use to put out fires, the pressure is much greater. In electricity, this pressure is called voltage, and it is measured in volts.

WATT

A unit of power (see "power").

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