# STAYING SAFE AROUND ELECTRICITY with ZAP!

**A fun activity workbook that's all about electricity!**

northpower.com 0800 66 78 47

Northpower

# HI I'M ZAP!

I'm here to tell you all about electricity and how it helps us every day.

I'll show you where electricity comes from, how it is made and some of the different ways that we use it.

Electricity is awesome, but it can also be very dangerous. It's important to stay safe around it so no-one gets hurt. Check out some of the fun activities in this book which show you and your family and friends how to stay safe.

I've got my eye on the future and there are so many cool things coming our way that electricity will bring. You guys will be lucky enough to see it happen. Let's go on a trip into the future to see what it might be like!

With all these changes, it's important that we look after our planet too. We need to make sure that we're using electricity wisely, and not wasting it.

**Want to learn how to bend water by using electricity?**

**Or some fun magic tricks using electricity that you can show your friends?**

Check out some of my electricity experiments on page 17 that you can try at home.

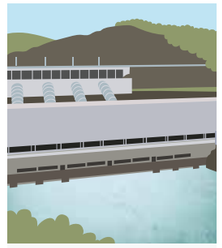
# WHERE DOES OUR ELECTRICITY COME FROM?

**When you flick a switch, electricity is ready and waiting for you to use. But have you ever thought about where it comes from?**

Most of the electricity we use is made at power stations – sometimes hundreds of kilometres from your home and school! It travels over long distances, through substations, transformers and powerlines before it reaches us, and all at super-fast speeds.

This diagram shows how electricity is made and you can find out more on the Northpower website at:

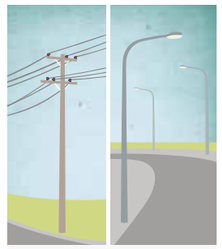
northpower.com/electricity/electricity-in-new-zealand



1 POWER STATION

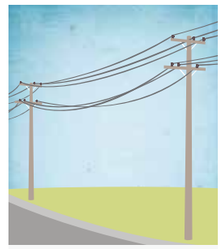
2 TRANSPOWER TRANSMISSION LINES

3 NORTHPOWER SUBSTATION

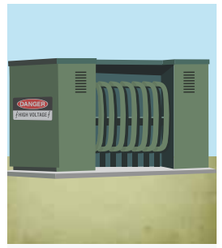


4 OVERHEAD LINES AND UNDERGROUND ELECTRICITY CABLES


5 ZONE SUBSTATION

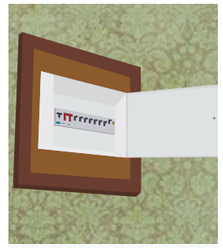


6 NORTHPOWER ELECTRICITY LINES




7 TRANSFORMER/ SERVICE PILLARS

8 SERVICE LINES TO HOMES, SCHOOLS AND BUSINESSES



9 THE MAIN POWER SWITCH FOR A HOME IS ON THE ELECTRICITY SWITCHBOARD

## Activity

### How electricity gets to us

Find out how electricity gets to your place! Use the words in the box at the bottom of the page to fill in the blanks. The first letter is filled in for each word to help get you started.

Electricity is produced at a P _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ .

P _ _ _ _ _ _ _ _ _ _ _ _ on tall towers (Pylons) carry very high voltages of electricity over long distances to S _ _ _ _ _ _ _ _ _ _ _ _ , where T _ _ _ _ _ _ _ _ _ _ _ _ reduce the voltage (strength).

The electricity travels over smaller power lines to T _ _ _ _ _ _ _ _ _ _ _ _ on poles and on the ground, where the voltage is reduced again so we can use it safely.

Finally, electricity flows through wires into our H _ _ _ _ _ and to P _ _ _ _ _ _ _ _ _ _ _ _ _ _ , where it waits to be used.

- Homes
- Power points
- Powerlines
- Transformers
- Substations
- Power station

**Hints!**

# HOW DO YOU USE ELECTRICITY EVERY DAY?

We all take electricity for granted. We turn on our lights and appliances and it's there.

## At Home

1. What electricity did you or your family use this morning at home?

_____

_____

_____

_____

2. What will use electricity at your home tonight?

_____

_____

_____

_____

## At School?

3. What is in your classroom that uses electricity?

_____

_____

_____

## Imagine that you live in a place without electricity...

What are 10 things you would not be able to do

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

# IT'S IMPORTANT TO BE CAREFUL AROUND ELECTRICITY!

If you are careless electricity can hurt or kill you. Don't play near overhead lines.

**ELECTRICITY WILL ALWAYS TAKE THE EASIEST PATH TO THE GROUND.**

If you touch electricity and the ground (or something that is touching the ground) at the same time, you become the easiest path. Electricity will flow through you to the ground. You could be seriously hurt or even killed.

## Activity

Using a pen or marker, draw where the electricity will go if the boy touches the kite tail, kite or powerline.

**?** Why can birds sit on the powerline?

Because they can _ _ _

The insulators on top of the power pole stops the electricity from travelling to the G _ _ _ _ _ .

# ELECTRICITY CONDUCTORS AND INSULATORS

A conductor is something that electricity flows easily through. Metal, water and even people are conductors! Electricity can't flow easily through things called insulators. Special types of rubber and glass are examples of insulators.

## Activity

### Conductor or insulator?

Take a look at the images below.

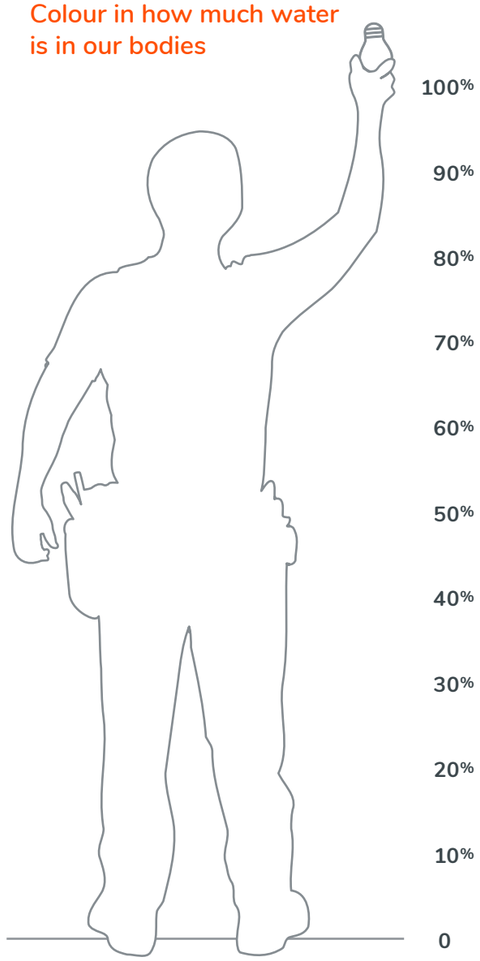
If the item is a conductor, write **C** in the box next to the picture. If the item is an insulator, write **I** in the box next to the picture.

## Activity

### Your body can conduct electricity!

Did you know that people are good conductors of electricity because our bodies are **70% water**. This is why we need to be careful around electricity.

Colour in how much water is in our bodies




# SUBSTATIONS AND TRANSFORMERS

It's important that you don't fly kites or kick a ball near powerlines or substations.

A Substation is a place where transformers lower the electricity voltage before it's sent over powerlines to our homes. They contain dangerous electrical equipment, so when you see a danger sign, stay away!


### Transformers

Transformers carry lots of electricity, so they are not for playing around. It's very dangerous, you must not sit on, climb up or jump off transformers.

Transformers can look like this:


## Activity

### Finish the story about transformers

*Add in the vowels – (a, e, i, o, u) to the spaces to finish this story about transformers.*

Transf _ rmers change electr _ city's voltage. If distribution w _ res are undergr _ und, electricity goes to a ground-mounted transf _ rmer.

If wires are overh _ ad, electricity goes to a pole-mounted tr _ nsformer.

Transformers carry a l _ t of el _ ctricity.

Don't pl _ y on or near transform _ rs.

If you see one that is dam _ ged or unlocked, tell an adult or call your el _ ctric _ ty s _ pplier.

**N _ rthp _ w _ r Faults**

**0800 10 40 40**

# IF LIVE WIRES FALL

**You should always treat fallen wires as if they are 'live'.**

Electricity is always looking for the easiest path to reach the ground – this can also be through something touching the ground like trees and fences.

A live wire can spark and whip around as it looks for a 'ground'. That's why it's important to stay away from live wires, so you don't become the 'ground'.

## In a car accident

If you're in a car and wires fall down, the safest place to stay is in the car until help arrives.

If you have to leave the car because of an emergency like a fire starting, you should jump clear so that you don't touch any part of the car and the ground at the same time.

Jump as far away from the car as you can with both feet landing on the ground at the same time. Once you're away from the car, hop away keeping your feet together.


**Quiz**

### Fallen powerlines quiz

See how many answers you can answer correctly in Zap's fallen powerlines quiz!

1. If powerlines fall on the car you should:
   - ☐ Get out of the car
   - ☐ Stay inside the car as long as it's safe to do so and wait for help
   - ☐ Wind the window down to have a look
2. If you have to get out of the car because of an emergency like a fire you should:
   - ☐ Open the door and put both feet on the ground
   - ☐ Hold onto the door and put one foot on the ground
   - ☐ Jump clear so you don't touch any part of the car and ground at the same time.
3. When leaving a car with a power line on it, it is safe to touch the car and the ground at the same time:
   - ☐ True
   - ☐ False
4. If you see a power line on the ground you should NOT:
   - ☐ Stay far away
   - ☐ Touch it
   - ☐ Call Northpower to report the fallen line
   - ☐ Warn others to stay away

If you see a fallen power line anywhere you should always leave it and do not touch. Call the emergency number **111** to report it and tell others to stay away.

**111**

**ALWAYS REMEMBER:**

**111** is the emergency number in New Zealand for Fire, Police and Ambulance



# UNDERGROUND CABLES

## Powerlines are often buried underground.

For your safety and those around you, it's important to know where the underground power cables are located BEFORE you dig. Remember you could be seriously hurt or killed if you interfere with electricity above or below ground.

▲ Our crew installing underground cables.

**Activity**

Unscramble the words below to show what other household services could you find underground?

1. SAG _ _ _
2. TWARE _ _ _ _ _
3. POEEETLHN _ _ _ _ _ _ _ _ _
4. BEFIR _ _ _ _ _ BROADBAND

Power or gas lines are often buried underground. **Before you dig, find out where they are.**

**ALWAYS CALL OR CHECK:**

**0800 B4 U DIG**

0800 248 344

www.beforeudig.co.nz

**Question**

What could happen if your spade hits an electricity cable?


# SPOT THE HIDDEN HAZARDS!

Find the hidden dangers and discuss what would be the safe thing to do in each situation.

What could happen in your neighbourhood?

# HOME SAFETY

## Electricity and water don't mix!

1. Water conducts electricity. Never use appliances around water. And remember - don't switch power points on with wet hands.
2. If you have an electrical fire never use water use a F _ _ _ EXTINGUISHER
3. When using electrical tools outdoors always use an RCD (residual current device)
4. What are some examples of electric tools or appliances that may be used near water either inside or outside the home?

a **Vacuuming the car**

b. _____

c. _____

d. _____


## Questions

**Answer the questions to find the letters of the missing word in the sentence below.**

1 Which letter is in **HOUSE** but not in **SHOE**? __

2 Which letter is in **LINE** but nor in **YIELD**? __

3 Which letter is in **POWER** but not in **SHOWER**? __

4 Which letter is in **LIGHT** but not in **HEIGHT**? __

5 Which letter is in **BURNT** but not in **LEARNT**? __

6 Which letter is in **BIG** but not in **BIKE**? __

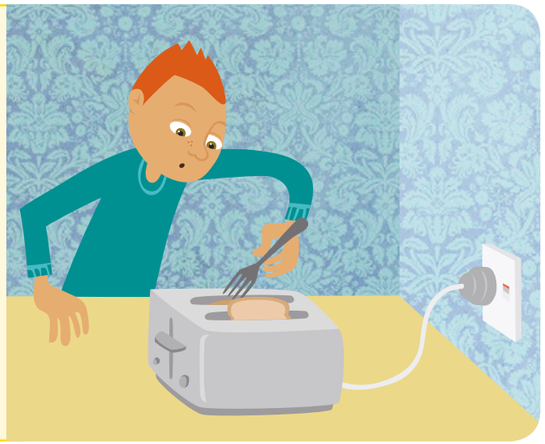
If toast gets stuck in the toaster never use a knife or fork to get it out - you could be seriously hurt!

**What's a better way to get the toast out if it gets stuck in the toaster?**

_ _ _ _ _ _ the toaster first.

Unplugging safely means turning off the switch and holding the plug.

**Don't pull the cord.**



# IS YOUR HOME SAFE?

## Home safety inspection

Take this home and do your own electrical safety inspection with an adult. If you find any hazards, tick "yes" and "needs fixing" and ask an adult to have them fixed.

| Look out for: | No | Yes | Needs fixing |
|---|---|---|---|
| Electric power points overloaded? | ○ | ○ | ○ |
| Power cords under rugs or furniture legs? | ○ | ○ | ○ |
| Electric heaters too close to furniture? | ○ | ○ | ○ |
| Radios, speakers or other electrical appliances used near bathtubs, spas or pools? | ○ | ○ | ○ |
| Worn or frayed cords on appliances? | ○ | ○ | ○ |
| Device chargers left plugged in and turned on when not in use? | ○ | ○ | ○ |
| Trees growing close to service lines on your property? | ○ | ○ | ○ |

# OUR ELECTRICITY FUTURE

## The future is exciting and electricity will help new inventions come to life.

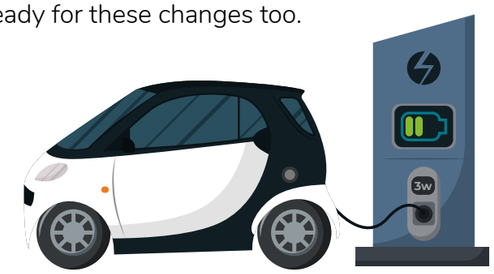
**The way we make electricity is changing – with more use of electricity made by the sun (solar power), wind and water, and being able to store power in batteries in our homes, school and businesses for when we need it. This will help people save money, and will be better for our environment and the planet.**

At Northpower we're getting ready for all the different ways that we'll use electicity in the future, and helping our customers to get ready for these changes too.

### Electric vehicles

Did you know there are already lots of cars on our road that are powered by electricity? Instead of filling them up with petrol, they get plugged in to charge up a battery – the same way as you charge up a mobile phone!

It costs a lot less money to run a car on electricity than it does on petrol, and it's a much cleaner energy source which is better for our environment.



**Activity**

### What might the future look like?

Imagine that you might soon have a robot in your home, your fridge automatically re-orders when you run out of milk, and that your car can drive itself!

Draw an electric battery powered robot and think about the jobs it might do around the house? Or an electric driverless car of the future – what might it do and where could it go?

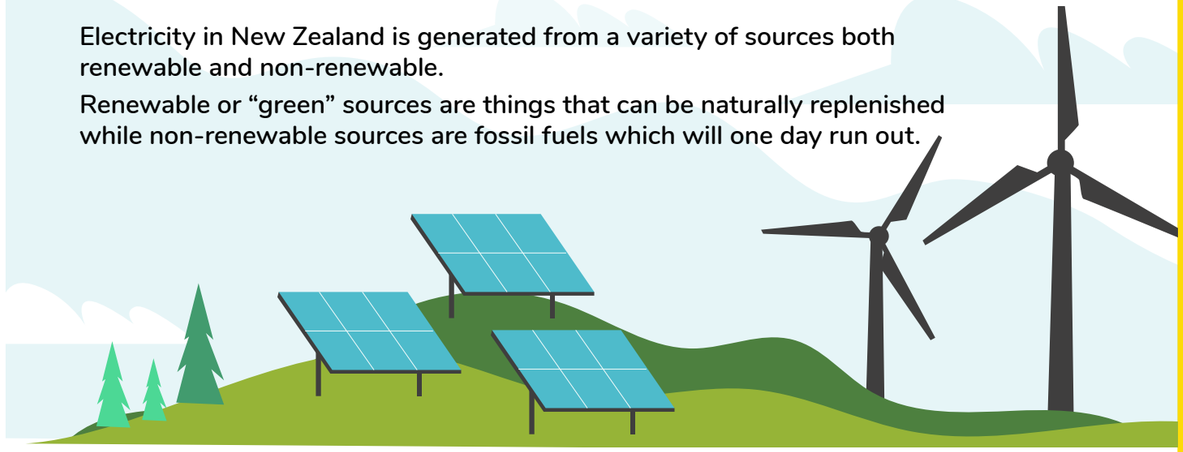
ROBOT MASTER PLAN



# ELECTRICITY SUSTAINABILITY

Electricity in New Zealand is generated from a variety of sources both renewable and non-renewable.

Renewable or "green" sources are things that can be naturally replenished while non-renewable sources are fossil fuels which will one day run out.



**Activity**

### Research the following to become "bright sparks"

- What percentage of New Zealand's electricity generation is from renewable sources?
- Name some large New Zealand hydro power stations?
- What is the name of Northpower's hydro power station at Titoki?
- Where in Northland is a geothermal power station and who owns it?
- The big wind farms are in the North or South Island of NZ?
- Where are the non-renewable power stations in NZ?

## WORD FIND

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| r | v | b | c | u | h | m | i | q | s |
| b | a | i | g | k | f | k | a | x | b |
| g | e | o | t | h | e | r | m | a | l |
| w | m | e | j | y | c | o | a | l | r |
| a | e | n | s | d | t | n | r | y | o |
| p | s | e | o | r | v | o | i | l | t |
| a | o | r | l | o | w | i | n | d | n |
| e | q | g | a | s | b | l | e | i | p |
| t | k | y | r | b | d | c | a | o | u |

| Find 6 renewable energy sources: | Find 3 non-renewable energy sources: |
|---|---|
| hydro | gas |
| wind | coal |
| solar | oil |
| geothermal | |
| bioenergy | |
| marine | |

# POWER BUSTERS!

**Electricity is behind every power point and light switch just waiting to be used but it isn't free. We pay for what we use so saving energy also saves money.**

Every time you turn off a light, shut down your computer or close the fridge door you're saving energy.

- Use the fresh air and sunshine to dry your clothes. Drying your clothes outside can save you $200 a year.
- Use your heated towel rail only when it is needed and you could save more than $100 a year.
- If you're after a snack, don't keep the fridge door open too long while deciding. This is a big waste of electricity.

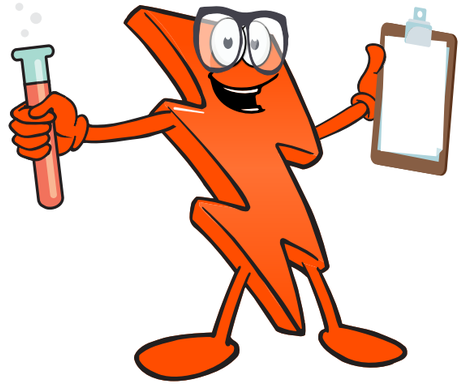
## Research ways your family could save energy to reduce your power bill.

**Activity**

Spot the ways this family could be saving power.

# EXPERIMENTS WITH ELECTRICITY

**Here are some cool fun experiments to try at home or in your class!**



**Activity**

## Flying salt and pepper

A fun experiment using the power of static electricity!

You will need:

- Two teaspoons of salt
- One teaspoon of pepper
- A small bowl
- A plastic comb
- A head of clean, dry hair

**Instructions**

1. Mix two teaspoons of salt and one teaspoon of pepper together in a small bowl.
2. Rub the comb through your hair 10 times and hover it close to the top of the bowl.
3. You should see the pepper fly up into the air and stick to the comb!

**Activity**

## Water magic

Amaze your friends by bending water in front of their very eyes!

You will need:

- A plastic comb
- A tap with running water
- A head full of clean, dry hair

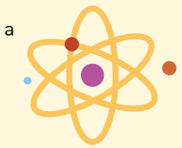
**Instructions:**

1. Brush the comb through your hair around 10 times.
2. Turn on the tap so a very slow trickle of water is coming out.
3. Slowly bring the comb towards the water (but without touching it).
   You should see the water start to magically bend towards the comb!

## How does this work?

These experiments use static electricity – an electric charge normally caused by friction or rubbing against something (like the comb in your hair).

Tiny atoms called ELECTRONS collect on the comb, and they have a NEGATIVE charge.



Things with a negative charge are attracted towards those with a POSITIVE charge.

When you hold the comb near the water, it is attracted towards the POSITIVE charge of the water, pulling it towards the comb – a bit like a magnet.

## Other fun things to try:

Tear up some tissue paper into tiny pieces, then rub the comb through your hair 10 times again.

Try to lift up the paper by hovering the comb over the top. The paper should jump up and stick to the comb!

Try using a blown-up balloon instead of a comb – rub it in your hair and see what happens.

**You might find it a bit 'hair-raising'!!**

# SNAKES AND LADDERS

## SAVING $ AND THE ENVIRONMENT GAME

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 100 Throw the exact number to be a winner! | 99 | 98 | 97 Fridge door is left open letting all the cold air escape | 96 | 95 | 94 You have dripping hot taps wasting water and energy | 93 | 92 | 91 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 80 The heater is on but doors and windows are open wasting energy | 79 | 78 | 77 | 76 | 75 | 74 | 73 | 72 | 71 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 You're replacing standard bulbs with energy efficient LED's | 70 |
| 60 | 59 | 58 | 57 | 56 | 55 | 54 Computers and other electrical appliances are turned off when not in use | 53 | 52 | 51 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 All the lights are left on when you're not in the room | 49 | 50 |
| 40 | 39 | 38 | 37 | 36 | 35 | 34 You went out and left the air conditioning on | 33 | 32 | 31 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 20 You have short showers to use less hot water than running a bath | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 |
| 1 First person to throw a 6 starts the game | 2 | 3 You hang washing on the line instead of using the dryer | 4 | 5 | 6 | 7 | 8 | 9 | 10 Device chargers are turned off and unplugged when not in use |

# Look up, look down, look out!

## Kids - Remember to keep safe around electricity!

No power? No hot water?

**Call our 24 hour faults line:**

**0800 10 40 40**

Northpower