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GRID DEFENDERS

THE CIRCUIT SQUAD

Teaching Resource Pack

powerdiscoveryzone.nationalgrid.co.uk

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HELLO

GOOD DAY AND WELCOME MY TEACHER FRIEND TO THE NATIONAL GRID ELECTRICITY DISTRIBUTION EDUCATIONAL RESOURCE OR NGEDER FOR SHORT.....ERRR MAYBE NOT EH?

National Grid Electricity Distribution is the regional electricity distribution division of National Grid. It is the UK's largest electricity distribution network and serves nearly eight million customers in the East and West Midlands, South West and Wales, delivering essential power to millions of homes and businesses across its regions.

Electricity is distributed by a network of pylons, poles, cables, substations and transformers that carry high voltage electricity from the power plants, solar and wind farm sources and transform it down to a useable voltage before it reaches your home, school or business.

What this means is that extremely high voltage electricity can be all around us when we are outside of the home. At National Grid Electricity Distribution, safety is our number one priority so this teaching resource will provide the necessary information to your pupils on how to stay safe around this electricity in our communities and around the country.

Now we could just give you a bunch of information, but we all know that wouldn't be much fun for you to deliver and not much fun for your pupils either. So, we've created this exciting code breaking challenge where your class will have to directly help our Circuit Squad superheroes in preventing the mischievous Short Circuit from disrupting the electricity distribution network. If they can break the code and solve the mystery then they may just be able to save the day.

We also know how hard you teachers work and the last thing you need is another resource pack where you have lots of work to do in order to prepare a lesson. So, all you have to do is play the accompanying video, pausing occasionally to guide your class through the activities using the instructions provided in this teachers' pack.

We've tried to do everything else for you so this pack will deliver all the necessary safety information without you having to do anything else, meaning you can also get involved and enjoy the resource too.

Have fun!

Chief Grid

Chief Grid
Leader of the Circuit Squad.

GRID DEFENDERS

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Instructions on how to operate and engage with the resource

We don't want you to have to do anything before you and your class sit down to enjoy this resource - you can simply press play on the video and pause when instructed to do so on screen. Instructions for all the activities are in the teachers' pack.

There are even activity instructions you can print off for the pupils and instructions will be on the screen too.

We know you guys are smart but if there is a bit of terminology you don't understand there is a glossary at the back of this pack which explains all the specific terms used in this resource. Most of them are also explained in the video.

So how does it all work?

Simple really. You will have downloaded one of two versions of this resource.

If you downloaded the larger version then you now have both the teachers' pack and the accompanying video.

All you need to do is put the video on the computer you will be playing it from and hit play. At certain points you will be asked to pause the video whilst your class perform an activity.

If you wish to read the notes in advance on how to deliver the activity, this may assist in helping your pupils to get the most from it but if not then the instructions will also be on screen for your class to follow. If you want to give your class a break from looking at the screen, there are also printable instructions for the pupils to look at when it is time to do an activity.

If you downloaded the smaller version of the teacher's pack then you will need to follow this link to access the video. **powerdiscoveryzone.nationalgrid.co.uk/activities/circuit-squad-grid-defenders**

Ideally you can deliver the whole resource over an hour lesson. There are suggested times for each activity and this limited time will add an air of jeopardy for your pupils as they rush to gain the clues needed to stop Short Circuit in time.

However, you are the ones in charge, so you may wish to spend longer on each activity meaning that you spread the resource out over a morning or afternoon or even over several days.

Alternatively, you may wish to perform one or two of the activities outside the classroom and take even more time enjoying them. We also have suggestions on how you can change delivery of some activities to better suit your class.

Of course you don't have to follow the instructions to the letter. It's about whatever you think works best to get this vital safety information across to your pupils whilst they also have lots of fun.

At the end of the story if the class solve the clues and save the day there is a Safety Ambassadors Certificate for the class to receive to induct them into the Circuit Squad. If you can print this certificate and take some photos and post them on your socials that would be great. Do tag us in as we'd love to see the fun you've been having.

Have fun and if there is anything else that you need then get in touch with our education team. They are really nice people and always happy to help. Or you can just let us know what you think of the resource.
Email: **nged.education@nationalgrid.co.uk**

Activity instructions for teachers

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ACTIVITY 1

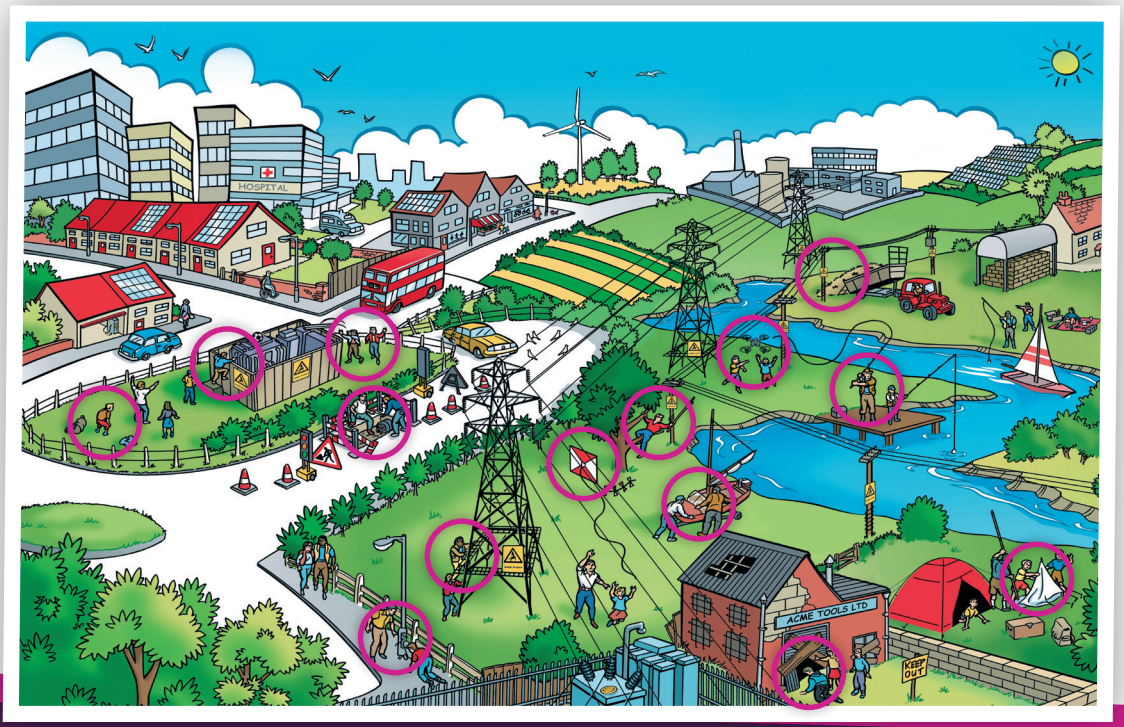
Spot the Hazards

Activity time:
3 – 5 minutes

When instructed pause the video

- This is best performed as a group activity so split your pupils into groups of 3-5 pupils.
- The groups then have to spot as many potential hazards on the screen as possible within the amount of time that you pause the video for.
- At this point you don't need to do anything else, (there is no need to explain more about the hazard or what they should do to avoid it – that comes later). This activity is simply to determine if pupils can recognise where the potential hazards might be around the electricity distribution network.
- We suggest 3-5 minutes for this activity depending on the age and ability of the class.
- Ask each group to record each hazard as they find them by writing it down so they can check their list against the hazards as they are revealed.
- After the amount of time that you have allocated has passed, ask the groups to stop writing and pay attention to the screen again. They will then be instructed to check off any hazards they have also spotted as they are highlighted on the screen.
- If you wish you can award the teams a point for each hazard they spot and award the team with the highest number of points a prize, (team point, house point, merit etc).

Press play on the video



Activity instructions for teachers

ACTIVITY 2

Warning Signs

Activity time:
Part 1: 3 – 5 minutes.
Part 2: 10 – 20 minutes.

When instructed pause the video

- For this activity pupils are to work in groups of 3-5.
- Read this script to the pupils. The highlighted parts in brackets do not need to be read out but contain a bit more information in case pupils ask any questions.

  "Warning signs are all around us outside of our homes to warn us of any potential dangers. Can you think of the sorts of things that make an effective warning sign? For example, what colour could it be and why would this colour be used? (it will need to stand out in a busy environment)

  Should it have text on it and if so what sort of thing should the text say? (it will need to relay exact information instantly and clearly)

  Should it be simple text or enough to fully explain the danger? Should a warning sign have pictures (graphics) on it?

  Is this better than text or could you use both? Why might pictures be preferable to text? (some people may not be able to read the text but they still need to be warned)

  If we use graphics on a warning sign then what are the things to consider? (simplicity, universally recognised graphics that have pre-determined meanings for us all)

  What other things might it contain, (things like consequences, whether that be death or fines etc)."

- Now ask your class to think what sort of thing would need to be contained on a National Grid Electricity Distribution warning sign that might be placed near some street works or a substation where high voltage electricity may be present.
- Pupils within their groups are to make a list of the sort of things that should be included on a warning sign for National Grid Electricity Distribution. We suggest 3-5 minutes for this part of the activity.
- At the end get the groups to share with the rest of the class what they have included.
- **Additional suggestion for a longer activity:** Using their list, pupils are to design and create their warning sign. We suggest 10–20 minutes for this part of the activity.
- The best sign could be awarded a prize, (team point, house point or merit etc)

If you can please take some pictures of pupils with their best warning signs and post on social media tagging in National Grid Electricity Distribution, **X: @gridcustomersuk**. Use hashtag **#warningsigndesign**

Press play on the video

Activity instructions for teachers

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ACTIVITY 3

Look Up

Activity time:
According to video

Pause the video

Explain these rules to the class.

- This is an individual activity where we will be looking at the scenarios when you should look up whilst outside to be aware of overhead cables.
- Each pupil will have two lives in this game.
- Each pupil whilst seated is to place each hand on the table in front of them, this is the resting state for pupils in between answering and allows the teacher to see which pupils have lives left.
- Each hand on the table represents a life, if they lose a life then they are to remove a hand from the table during the resting state until they have no hands left on the table. At this point then they are out of the game.
- When you press play Jen Erator will appear onscreen and introduce an activity that the pupil might be doing whilst outside. The pupils will then have 5 seconds in which to decide whether this is an activity where they need to look up before they begin.
- If they need to look up before they begin this activity then they are to stand up and perform the look up sign. If it is an activity for which there is no need to look up then they are to stay seated and fold their arms.
- After 5 seconds Jen Erator will reveal whether it is an activity where they need to look up or not. If a pupil is incorrect then they lose a life. If a pupil is the last one to answer then they lose a life, (teacher to judge and this is to prevent pupils from copying each other).
- The last pupil in the game is the winner or those left with lives by the end of the activity are winners and can be awarded a prize, (e.g. team point, house point, merit etc)

Unpause the video and play the activity

For extra fun or jeopardy in this activity or for older KS2 year groups you might vary the rules so that the last two or three people to answer lose a life. Or if the hand signal is not performed, or if arms are not folded properly then the pupil loses a life.

Or if they raise themselves from the seat just a little during the activity or remove a hand from the table when it is not necessary then they lose a life.

Feel free to be as strict as needed in order to make the activity more difficult.

Activity instructions for teachers

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ACTIVITY 4

How far is 3 metres?

Activity time:
10 minutes or more depending on location.

- The aim of this activity is to show the pupils how far 3 metres is and if they can jump this distance, (this is the distance that high voltage electricity found in the electricity distribution network can jump from its source).
- Create a clear space in the classroom and mark a line or distance of 3 metres.
- Each group is to nominate one pupil with the nominated pupils lining up at one end of the line.
- Pupils are instructed to place their feet together and then take it in turns to see how far they can jump.
- Pupils are to return to their seats after they have jumped.
- The class are then to have a quick discussion about how far the furthest pupils have managed to jump and how could this be made further, (i.e. not starting with your feet together).
- Each group then nominates a second pupil to participate, and all nominated pupils line up at the start of the line.
- Pupils are then instructed that they can place their feet apart this time and then take it in turns to see how far they can jump.
- Pupils are to return to their seats after they have jumped.
- The class are then to have a quick discussion about how far the pupils have managed to jump.
- Now ask the class if they think they could out-jump high voltage electricity if they were in a place that they shouldn't be near it.
- You can also discuss if you think they could jump any further if they had a run up to the start.
- Inform the class that electricity can travel around the world seven times in one second.
- Ask the class now if there is any chance that they can jump out of the way of this high voltage electricity.

As a whole this activity should take no more than 10 minutes.

Suggested variations:

If you are not performing the activity in the classroom then you can allow every pupil to perform the jumps and also allow all pupils a run up prior to their jumps.

Activity instructions for teachers

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ACTIVITY 5

Spot the Hazard Part 2

Activity time:
5 – 10 minutes

When instructed, pause the video.

- This is a group activity, split your class into groups of 3-5 pupils.
- Like activity 1, the groups have to spot as many potential hazards on the screen as possible within the amount of time that the video is paused.
- When a group spot a hazard they have to write down:
  - what the hazard is.
  - how they would avoid the hazard.
  - which of the three Look up, Look Out, Stay Out concepts does it apply to.
  - if they see the hazard in real life who should they call, either 105 or the police?
- We suggest 5 – 10 minutes for this activity depending on the age and ability of the class.
- After the amount of time that you have allocated has passed, ask the groups to stop writing and pay attention to the screen again.
- Now instruct them to check off any hazards they have also spotted as they are highlighted on the screen.
- One point is awarded for each hazard they spot correctly, how to avoid that hazard, which of the three concepts it aligns to and who they should call if they see the hazard in real life. If you wish you can get groups to swap answers whilst marking this part.
- When ready press play on the video and the onscreen instructions will run through each hazard individually.
- The group with the highest score can be awarded a prize, (team point, house point, merit etc).

Press play on the video.

Activity instructions for pupils

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ACTIVITY 1

Spot the Hazards

Activity time:
3 – 5 minutes

- Look at the picture on the screen try and spot as many potential hazards as possible regarding electricity outside of your home.
- When you have spotted a hazard write it down so that we can check it off later.
- Keep your eyes peeled and see how many you can spot before the story continues.
- You will get a point for every hazard you spot and the group with the most points may be awarded a prize by the teacher, whether it is a team point, house point or merit.

Activity instructions for pupils

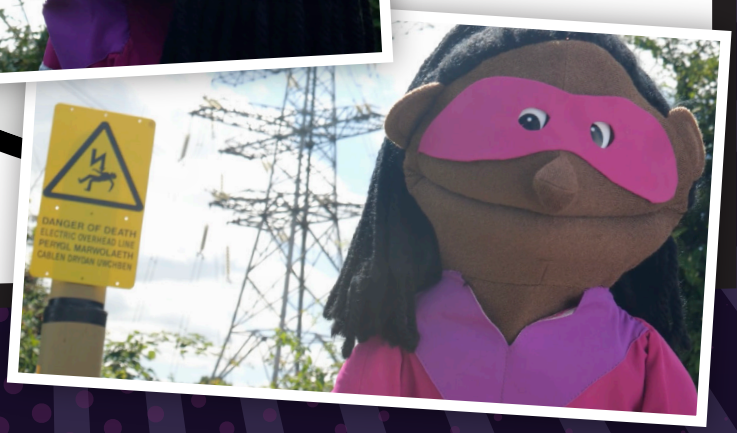
nationalgrid

ACTIVITY 2

Warning Signs

Activity time:
Part 1: 3 – 5 minutes.
Part 2: 10 – 20 minutes.

- Listen to your teacher list the sort of information, parts and characteristics that might make up a National Grid Electricity Distribution warning sign.
- To help, you should think about:
  - What colour might it be?
  - Will it have writing on it and if so what should the writing do/say?
  - Will there be pictures on it?
  - What other sort of information might be on the sign? e.g., consequences.
- Now take this list and create your own warning sign which you might see at some National Grid Electricity Distribution street works or outside of a substation.



Activity instructions for pupils

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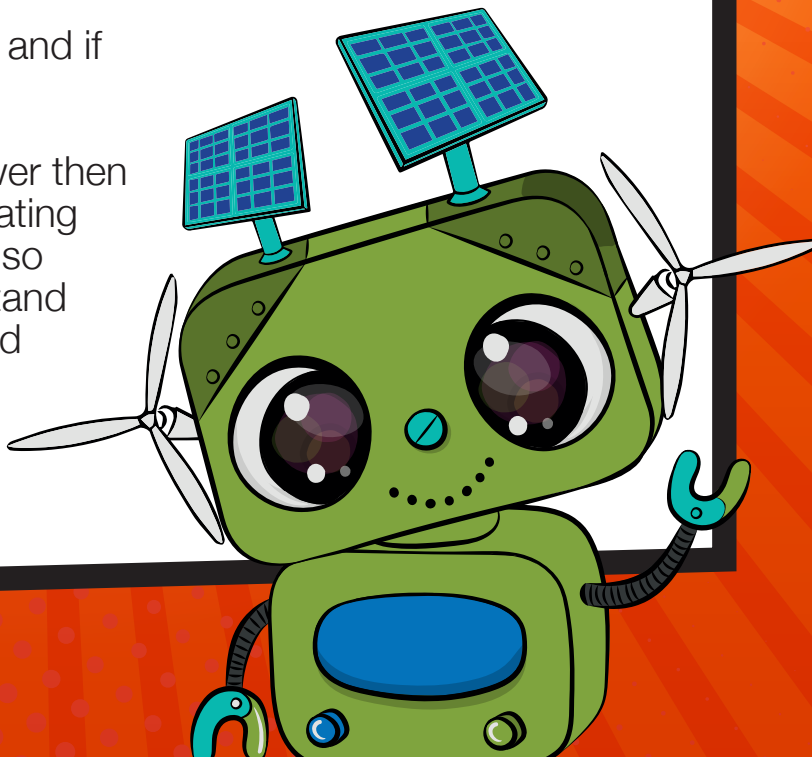
ACTIVITY 3

Look Up

Activity time: According to video

- In this activity you will have to decide whether an activity you are doing outside of the home is one where you need to look up before you start doing it to check for overhead cables.
- You have two lives in this game and if you lose both lives then you are out. The last person in the game is the winner.
- Sit on a chair with two hands face down on the table. Each of your hands represents one of your two lives. If you lose a life then the next time you sit down you remove one of your hands from the table until you have no hands left on the table and you are out of the game.
- Jen Erator will introduce an activity you might be doing whilst outside of the home and you will then have five seconds to decide whether this is an activity for which you must look up before you start. If so then you need to stand up and perform the 'look up' sign. If it is not an activity for which you look up first before starting then you are to stay seated and fold your arms.
- The answer will then be revealed and if you are incorrect you lose a life.
- If you are the last person to answer then you will also lose a life so no cheating and waiting for others to answer so that you can copy them. If you stand up when you don't need to or fold your arms when you don't need to then you also lose a life.



Activity instructions for pupils

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ACTIVITY 4

How far is 3 metres?

Activity time:
10 minutes or more depending on location.

- If high voltage electricity – the sort that you will find in substations and around the electricity distribution network – can jump up to 3m in length from its source, do you think that you can jump out of the way of this?
- Your teacher has marked a 3m line on the floor. Nominate one person from your group to stand at the start of the 3m line.
- This person is to place their feet together and when told to do so by the teacher they jump to see how far along the 3m line they reach. When they have jumped, they can return to their seat.
- Why do you think you could only jump a short distance? Do you think you could have jumped further with your feet apart?
- Each group is to nominate a second person who stands at the start of the 3m line. This person is to stand with their feet apart, when told to do so by the teacher, see how far down the line they can jump.
- Were people able to jump further this time? Was it a lot further and did anybody get nearer to 3m?
- Do you think if you had a run up you could jump 3m and avoid high voltage electricity?
- Remember electricity can travel around the world seven times in one second. Do you think you can jump faster than this even with a running jump? Do you think there is any way that you could jump out of the way of high voltage electricity?

Activity instructions for pupils

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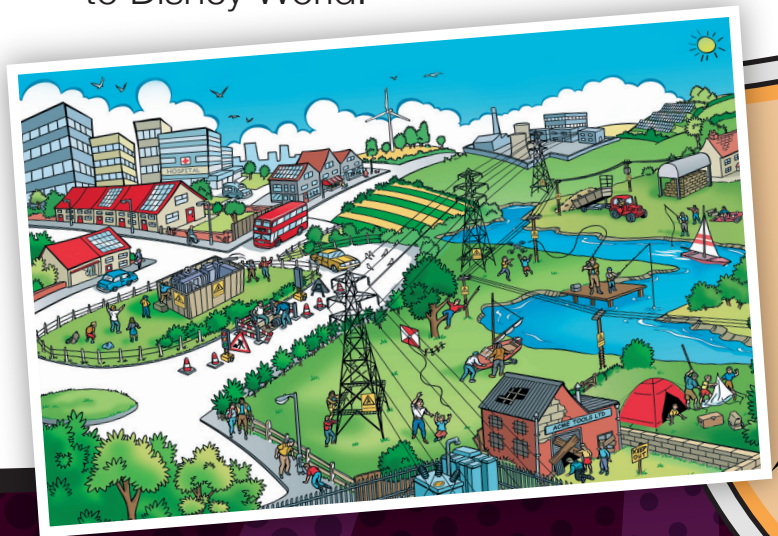
ACTIVITY 5

Spot the Hazard Part 2

Activity time:
5 – 10 minutes

- Look at the picture on the screen, try and spot as many potential hazards as possible regarding electricity outside of your home.
- This time when you have spotted a hazard you will need to write down:
  - what the hazard is.
  - how would you avoid this hazard.
  - which of the three Look up, Look Out, Stay Out concepts does it apply to.
  - if you see this hazard in real life who would you call, either 105 or the police?
- One point is given for each hazard you spot correctly, how to avoid that hazard, which of the three concepts it aligns to and who you should call if you see the hazard in real life. At the end it will be marked.
- The team with the most points may be awarded a prize by the teacher, whether it is a team point, house point, merit or a holiday of a lifetime to Disney World.



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WE ARE ALL

SAFETY AMBASSADORS

THE

CIRCUIT

SQUAD

THIS CERTIFICATE IS PRESENTED TO

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Glossary

Bingo
Pylonman's favourite game. Also, his main cry of realisation. Bingo!

Conductor
an object or type of material that allows the flow of charge in one or more directions. Materials made of metal are common electrical conductors. Human bodies are also very good conductors.

Circuit Squad
a group of superheroes all of whom have a special job making sure electricity reaches your home safely and smartly. They're brimming with energy, and here to teach you all about electricity.

Disrepair
a poor condition of a building or structure usually due to neglect. The electricity within this type of building may still be live and the electrics in poor condition.

Disused Building
when a building is no longer being used for a purpose. This can also often mean the building will be in disrepair.

Electricity Distribution Network
electric power distribution is the final stage in the delivery of electricity where electricity is carried from the transmission system to individual consumers. Electricity leaves the power plants, solar and wind farms at incredibly high voltages and is transported around the country within this distribution network before being converted down to a useable voltage for your home.

Energy Saving
something designed to make economical use of electricity or other forms of energy.

Engineer
a person trained and skilled in the designs, build or maintenance of engines, machines or structures.

Guffed
something Pylonman will deny having ever done. It wasn't him anyway. Whoever smelt it dealt it.

GPS Coordinates
a unique identifier of a precise geographic location on the earth, usually expressed in alphanumeric characters. Coordinates, in this context, are points of intersection in a grid system. GPS coordinates are usually expressed as the combination of latitude and longitude.

Hazard
a potential source of harm.

National Grid
the system operator of Great Britain's electricity and gas supply. This includes England, Scotland and Wales. It is the company that manages the network and distribution of electricity and gas that powers all our homes and businesses.

National Grid Electricity Distribution Network
the UK's largest electricity distribution network operator which serves nearly eight million customers in the East and West Midlands, South West and Wales, delivering essential power to millions of homes and businesses across its regions.

Overhead Wires
term used for any electricity distribution wires that are mounted on pylons or poles.

PDZ
acronym for Power Discovery Zone. National Grid Electricity Distribution's website which is full of fun activities and games to further aid your learning about electricity.

Power Cut
a power outage resulting in the loss of the electrical power network to the end user.

Power Plants
an industrial facility that generates electricity from a primary energy source.

PPE
protective clothing, helmets, goggles or other garments or equipment designed to protect the wearer's body from injury or infection.

Pylons
tall tower like structures used for carrying electricity wires high above the ground.

Renewable Energy
energy from renewable resources that are naturally replenished on a human timescale. Renewable resources include sunlight, wind, the movement of water, and geothermal heat. They usually have a low or zero carbon footprint.

Shirley
not Chief Grid's name!

Street Furniture
a collective term for public use objects and pieces of equipment installed along streets and roads for various purposes. Can include things that contain electricity such as street lights.

Street Works
works that take place in the street to maintain our utility networks.

Substation
an electrical installation where power is transformed from one voltage to another.

Transformer
a device that transfers electrical energy from one alternating-current circuit to one or more other circuits, either increasing or reducing the voltage.

Transporting
to move or take something from one place to another.

Trespass
to go onto private land or enter a private building without permission.

Utility Network
The assets that comprise the infrastructure by means of which electricity, gas, water and telecommunications services are distributed.

Voltage
the measure of how strong the current is in a circuit. It is the force that makes electrons flow, what 'pushes' the current through the circuit to a device.

Warning Sign
a sign which indicates a potential hazard, obstacle or condition requiring special attention. Usually designed to visually stand out, contain recognisable symbols and easy to understand information.

YouTube Sensation
One of Pylonman's many accolades.

Learning aims and objectives

Objective

Overall resource
To develop pupils' awareness of electricity safety, (outside of the home), its issues and some basic terminology.

Pupils
- Pupils can explain how there is electricity when they are outside of their homes and identify certain terminology around the electricity distribution network.
- Pupils can identify where electricity might be present outside their homes and how to be safe in regards of this.
- Pupils can explain each of the 'Look up, Look out, Stay out concepts.'
- Pupils can identify who to call if there is an issue around the electricity distribution network.
- Pupils are able to recall the NGED 105 number at the end of the resource.
- Pupils' can respond to questions and discuss electricity safety issues outside of their homes.

Activity 1
To introduce the electricity distribution network and how it interacts with us when outside of the home. To develop awareness that this electricity distribution network presents potential hazards if they interact with it.

Pupils
- Pupils recognise and are able to identify where potential hazards are if they interact with the electricity distribution network.

Activity 2
To introduce the role of safety signs in warning the public in regards of potential hazards or danger. To develop awareness that safety signs contain certain generic themes in their design and the reasons for this.

Pupils
At the end of the session, all pupils will:
- Understand the relevance and importance of warning signs in regards of warning the public of hazards and dangers
- Be able to identify certain themes regarding the design of warning signs and the reasons behind these generic themes.
- Be able to list what should be contained within a National Grid electricity warning sign.

Activity 3
To introduce the concept that you may need to look up and be aware of overhead electricity wires when performing certain activities outside of the home.

Pupils
- Be able to identify and explain why they would need to look up before performing certain activities outside of the home.
- To be able identify specific examples of activities for which they would need to look up before starting the activity outside of the home.

Activity 4
To develop pupil's knowledge about electricity and introduce the concept that higher voltage electricity can jump from its source to another conductor.

- Pupils are able to recognise that high voltage electricity can jump from its source towards another conductor.
- Pupils understand that within the electricity distribution network that this jump can be up to 3m in length.
- Pupil's to understand how far 3m is in length in terms of how far they can move independently.
- Pupil's to understand that this 3m in length is further that they can jump and therefore they cannot escape high voltage electricity if they were within a 3m range and it jumped from its source.

Activity 5
To revisit how the electricity distribution interacts with us when outside of the home. To develop awareness that this electricity distribution network presents potential hazards if they interact with it.

To be able to identify how to avoid these potential hazards.

To be able identify that these hazards can relate to one of the three 'Look up, Look out, Stay out' safety concepts.

To understand who they should call if they saw one of the hazards happening in real life.

Pupils
- Pupils recognise and are able to identify where potential hazards are if they interact with the electricity distribution network.
- Pupils are able to identify how to avoid these hazards.
- Pupils are able to relate which of the three 'Look up, Look out, Stay out' safety concepts relates to each hazard.
- Pupils understand that there is somebody who they can call if they see the hazard happening in real life.
- Pupils know who to call if they see the hazard happening in real life.

After the resource is completed
To make teachers aware of opportunities for further learning and reinforcement of key issues.

To make teachers aware of mechanisms for recording their involvement with the resource and for opportunities to supply feedback.

Pupils
- Teachers and pupils to be aware of NGED's Power Discovery Zone website.
- Teachers and pupils to be aware of NGED's educational presence on YouTube.
- Teacher's aware that they are encouraged to share their experiences of interacting with the resource on social media and to tag in NGED.
- Teacher's are aware of the process for contacting the NGED education team and leaving feedback.

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GOODBYE

THANK YOU SO MUCH FOR ENGAGING WITH OUR TEACHING RESOURCE AND WE HOPE THAT YOUR CLASS GAINED A LOT OF VALUABLE INFORMATION FROM IT AS WELL AS HAVING LOTS OF FUN TOO.

Please do share pictures of your class's experience engaging with this resource and we really would love to see pictures of your class with their Safety Ambassador's certificate too.

It makes Chief Grid so proud to see new recruits so tag us in your pictures on your socials using the hashtag **#safetyambassadors** via:

X: **@gridcustomersuk**

Facebook: **@gridcustomersuk**

Instagram: **@gridcustomersuk**

If your pupils want to further their training in electricity safety and other topics concerning electricity then they can join Pylonman, Jen Erator and the rest of the Circuit Squad for lots more fun and educational resources at **powerdiscoveryzone.nationalgrid.co.uk**

You can check out Pylonman and his electricity safety videos on YouTube by searching for 'Pylonman'.

If you could take a minute or so to leave some feedback via our survey then we would be ever so grateful as your feedback really does shape our future educational resources.

Find the survey here: **Teachers' Survey**

Finally, always remember to stay safe and to 'Look up, look out, stay out. 105 stay alive.'

Chief Grid

Chief Grid
Leader of the Circuit Squad.