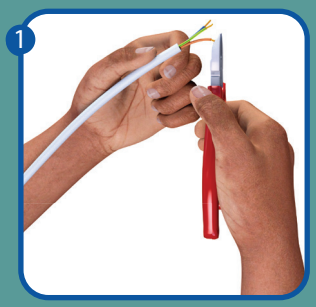
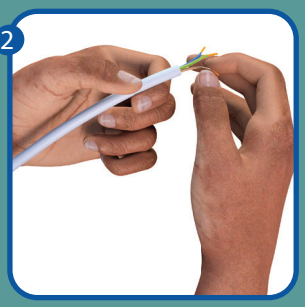
The value of our electricity

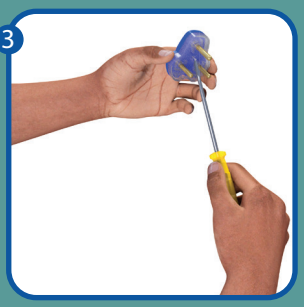
Senior Phase (Grade 9)

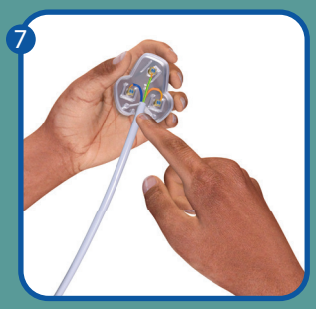
Educator Guide

Natural Science and Technology









1. Trim wire insulation
2. Twist copper wire strands
3. Remove the plug cover
4. Unscrew plug pin screws
5. Insert wires into correct pin holes
6. Tighten pin screws
7. Check cord is gripped by arrestor clips
8. Replace plug cover

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How to save energy

Electricity is produced from fuel such as coal, water, diesel and uranium which are limited resources. An alternative to building new power stations to supply the increase in demand for electricity is to use what we have more efficiently (i.e. without wasting), one of the ways is to change the way we use electricity. Eskom's Integrated Demand Management (IDM) Energy Education programme motivates people to change the way they use electricity. Eskom has taken the approach of integrating energy educationwithin the school curriculum.

The energy education programme is being introduced in the Senior Phase so that learners can see energy-saving as integral to their lives and put into practice as they grow. The activities are simple and can be adapted by the educator. The activities are within the context of the Curriculum and Assessment Policy Statement (CAPS) of the Department of Basic Education (DBE).

Note: The Eskom guides are in English. The educator will need to translate them into the Home Language.

Educators need to consult the Department of Education's CAPS policy guides for details of the skills, content and assessment within the relevant Phase and Grade.

Teaching Natural Sciences (Department of Basic Education, 2011, p13)

Careful selection of content, and use of a variety of approaches to teaching and learning Science, should promote understanding of:

- Science as a discipline that sustains enjoyment and curiosity about the world and natural phenomena
- The history of Science and the relationship between Natural Sciences and other subjects
- The different cultural contexts in which indigenous knowledge systems have developed
- The contribution of Science to social justice and societal development
- The need for using scientific knowledge responsibly in the interest of ourselves, of society and the environment
- The practical and ethical consequences of decisions based on Science.

Natural Sciences at the Senior Phase level lays the basis of further study in more specific Science disciplines, such as Life Sciences, Physical Sciences, Earth Sciences or Agricultural Sciences. It prepares learners for active participation in a democratic society that values human rights and promotes responsibility towards the environment. Natural Sciences can also prepare learners for economic activity and self-expression.

For the educator to take note:

- The energy-wise message is integral to all the activities.
- You may use the activities as they are.
- You can adapt or change the activities.
- You can use other resources where you see appropriate.
- Adapt the activities to suit the grade you teach.
- Adapt the activities according to the level of the learners (consider language or any other barriers).
- Share and discuss the activities with other educators in the same phase and grade.
- You can design your own activities that best suit the level of learners and grade you are teaching.
- Practice the energy-saving behaviour so you become an example of what is expected.
- Share your knowledge and practice on energy-wise education with everyone at school, at home and in the community.
- Saving energy means we don't have to produce so much, using our limited natural resources and limiting the amount of pollution we create, thus taking better care of our envirnment.

Thank you for taking care of our earth

Energy-saving

Grade 9

The activity which follows has reference to the content from the Department of Education (2011) CAPS policy document - Natural Science Senior Phase (Grades 7, 8, 9)(p75).

Term 3

Strands: Energy and change

Topic: Safety with electricity

Time	Topic	Content & Concepts	Suggested Activities: Investigations, Practical work, and Demonstrations	Equipment and Resources
1 ½ Week	Safety with electricity	Safety practices • Parallel connections can cause overload on mains circuits • Circuit breakers, fuses and earth leakage systems are used as safety devices • Many appliances have a 3-pin plug as a safety device to connect to the main circuit • The 3-pin plug live wire, neutral wire and an earth wire • The earth wire is connected to the metal case of the appliance, such as a kettle. The earth wire is connected via the wall plug to an earth cable in the ground • The earth cable has almost zero resistance, so if the metal casing of an appliance becomes charged due to a fault, the charge is safely discharged to the ground • Illegal connections to the ESKOM mains supply can be dangerous, and are regarded as energy theft	• Identifying fuses, circuits breakers, earthing and earth leakage systems in real circuits, or on circuit diagrams • Practicing how to connect 3-pin plugs • Drawing the plan for wiring a house • Each room should have its own light with a switch • The house should have a main switch and a fuse (to prevent overload) *[Note: it is not necessary to conduct a model house]*	• Pictures or diagrams of wiring showing fuses, circuits breakers and earthing • Three-pin plugs • Screwdrivers

Strand: Energy and change

Topic: Safety with electricity

Content: Safety practices

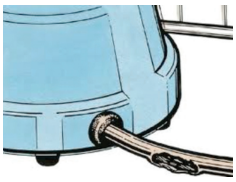
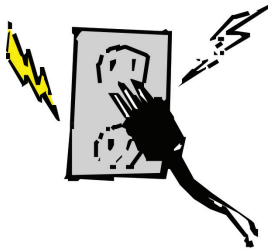
- Parallel connections can cause overload on the mains circuits.
- Circuit breakers, fuses and earth leakage systems are used as safety devices in electrical circuits.
- Many appliances have a 3-pin plug as a safety device to connect to the main circuit.
- The 3-pin plug has a live wire, neutral wire and an earth wire.
  - The earth wire is connected to the metal case of the appliance, such as in a kettle.
  - The earth wire is connected via the wall plug to an earth cable in the ground
  - The earth cable has almost zero resistance, so if the metal casing of an appliance becomes charged due to a fault, the charge is safely discharged to the ground.
- Illegal connections to the ESKOM mains supply can be dangerous, and regarded as energy theft.

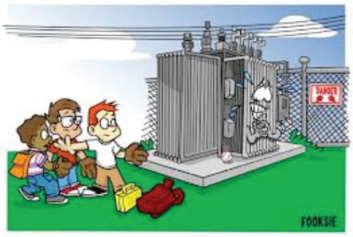
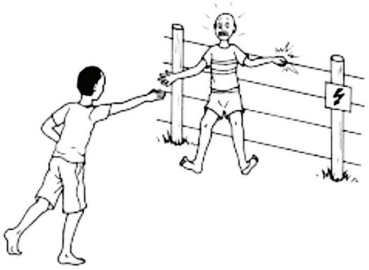
Activity 1: Safety practices

- Emphasise the importance of safety practices when using electricity. Serious injury or death may result from being careless with electricity.
- The learners can discuss the pictures in the worksheet in groups of four/in pairs.
- Ask learners for feedback.
- For question 2 – bring an example of a 3 pin plug – show the connection of the wires to the plug. Emphasise that this should only be done under the supervision of an adult.
- For question 3 – bring examples of fuses – you can also use a car fuse to show the role of a fuse.
- Question 5 – Get learners to read the extracts aloud – explain any terms/ words that the learners may have difficulty with. Then get the learners to complete the worksheet on their own.

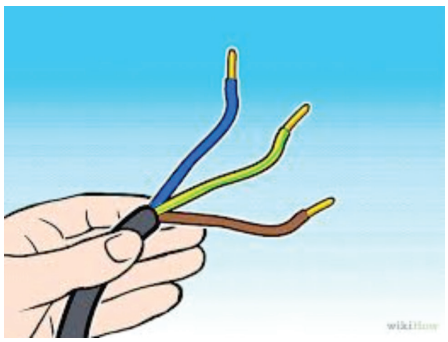
1. Identify the dangers /incorrect behaviour related to electricity in the following pictures and then write down the correct behaviour.

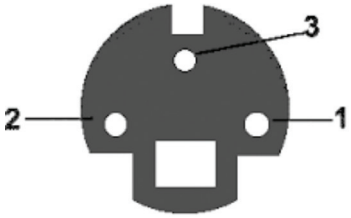
	Picture	dangerous/ incorrect behaviour	Correct behaviour
1.		Overloading of plug points	Ideally use one plug point per appliance. Maximum two with an adaptor depending on the voltage.
2.		Holding live wires (the main switch is on).	Do not hold any live wires. When working with wires switch off the main switch.

	Picture	dangerous/ incorrect behaviour	Correct behaviour
3.		Using electrical appliances in water or close to water.	Electrical appliances should be kept dry at plugs and plug points. Electrical appliances should not be used near or in water.
4.		Inserting your fingers in plug points.	Plug points supply electricity – do not insert any part of the body into plug points.
5.		Children having access to electrical cords or appliances.	Electrical cords or appliances should be out of reach of children.
6.		Exposed or uncovered live wires.	Live wires should be insulated (taped).
7.		Cutting out plugs of electrical appliances to insert wires with other plugs.	Each electrical appliance should have its own plug. Wires should not be inserted with other plugs directly into the socket.
8.		Fixing or installing electrical appliances with the main supply on.	The main supply should be off when fixing or installing electrical appliances. This should never be done by children.

	Picture	dangerous/ incorrect behaviour	Correct behaviour
9.		Inserting objects in plug points.	Plug points supply electricity – do not insert any objects into plug points.
10.		Playing near or in electrical substations.	Play in safe areas like a park or ground under supervision of an adult. Never play near or in electrical substations.
11.		Pulling or touching a person who is being electrocuted.	Do not touch a person who is being electrocuted. – you will also get shocked! Switch off the mains using a wooden stick.
Note: It is not safe to use electrical appliances during a lightning storm – switch off appliances like the TV.			

2. There are usually 3 colours of wire in appliances that require a 3 pin plug – brown (live wire), blue (neutral wire) and yellow/green (earth wire).



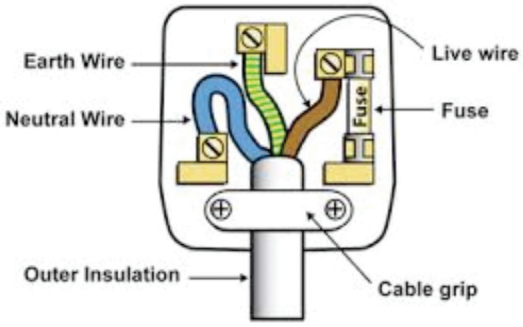


Label the diagram of the plug to show how to correctly wire the 3-pin plug. Remember the open end of the plug is facing you. [Hint: Brown – the r can stand for right hand side/Blue – the l can stand for left hand side].

[1- brown wire/2 – blue wire/3 – green or yellow wire].

3. Appliances (or some plugs) generally have a fuse. A fuse is a short length of wire designed to melt easily.

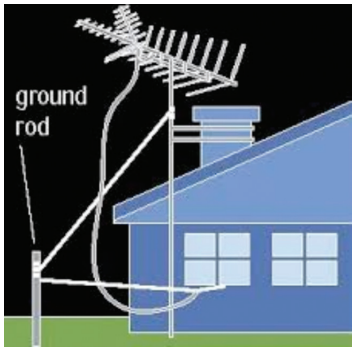
   Why do you think a fuse is important in an electrical circuit or appliance? [A fuse melts easily. In the case of a short circuit, overload or fire the fuse melts breaking the circuit – fuses can prevent fires or damage to an appliance].



What is the function of a fuse?

- To prevent short circuit that can cause fire and damage to electrical appliances
- A short circuit occurs when there is a low resistance and a large amount of current flowing in the circuit

4. An earthing system or grounding system is a circuit which connects parts of the electric circuit with the ground.



4.1 Why do you think it is important for the earthing rod to be connected to the television aerial? [To protect the house and appliance from lightning strikes, by directing the lightning through the earthing system (rod) into the ground rather than passing through the house, appliance or structure].

A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by an overload or a short circuit.

A circuit breaker monitors and controls the amount of current in a circuit. Its function is to detect a fault condition and interrupt current flow.

An earth leakage refers to the unwanted flow of electrical current from the live wire (red wire) to the earth wire (green/yellow wire). Earth leakage in uncontrolled amounts can be potentially dangerous. It can damage an appliance. To detect and control ground leakage, electricians install an earth leakage circuit breaking device. If a leak is detected, the device automatically cuts of the power supply to the appliance.

4.2 Draw a floor plan of house with two bedrooms, a kitchen and a lounge. In the plan show how you would wire the house to take into account electricity safety just in case there is an overload of the circuit or an electrical fire.

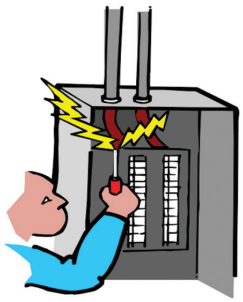
[Each room should have its own plug point or switch].

[Each switch should have its own fuse].

[There should be a circuit breaker switch at the main box].

[The main box should also have a fuse].

5. Read the extracts below.



1.

This little girl woke up on her first day of school, excitement and nervousness in her belly. Sadly, she never made it to school that day, because an exposed electrical wire took her life, **www.operationkhanyisa.co.za**

Not only is it illegal, it is also dangerous. Vandalised electricity meters and illegal connections do not only drive up the cost of electricity, but could also kill children, Eskom has warned.

2.

The Khanyisa campaign will contain a simple, direct and hard-hitting message that aims to mobilise community attitudes against illegal use and theft of electricity by isolating and exposing criminal elements and their behaviour. The campaign aims to change consumer behaviour and encourage the legal use of power. The word "khanyisa" means "enlighten" or "light up" in isiZulu.

3.

Electricity theft costs South Africa R4,4 billion annually in lost revenue. Municipalities, collectively lose another R3,2 billion and Eskom R1,2 billion - Eskom

4.

"All South Africans should begin to own the problem and stop pointing to the government when something goes wrong," said Makwana (Eskom spokesperson)

5.

An article appearing on Independent Online tells the story of Duduzile Hlanganani, a Diepkloof resident who spent at least 20 nights without electricity because of illegal connections, www.operationkhanyisa.co.za

6.

"We need to move away from the bad culture of illegal connections. We have to work hard on changing the mindset of our communities so that people know that they have to pay for the electricity they use at all times," Mokonyane told media after a meeting with Eskom chairperson said Makwana (Eskom Spokesperson)

You are a qualified electrician. A person you know from a nearby settlement asked you to please draw electricity from a power box close to his house. He was prepared to pay you a fee. Explain why you would make the connection or not.

[Do not do the connection. It is illegal – it amounts to theft/illegal connections put lives at risk/do the right thing – pay for what you use/overloaded circuits – rob other people who pay for their electricity].

Strand: Energy and change
Topic: Energy and the national electricity grid

The topic: Energy and the national electricity grid/nuclear power

The activities 1, 2, 3 which follow have reference to the content from the Department of Education (2011) CAPS policy document – Natural Science Senior Phase (Grades 7, 8, 9) (p80/p81).

Time	Topic	Content & Concepts	Suggested Activities: Investigations, Practical work, and Demonstrations	Equipment and Resources
1 week	Energy and the national electricity grid (continued..)	**Electricity generation** • A power station is a system for generating electricity • Most power stations in South Africa use coal as a fuel to boil water • The steam from the water turns a turbine which turns a generator, which produces electricity • There are other alternative sources of energy besides coal, that can be used to drive turbines and generators including wind,falling water (hydroelectric) sun-heated steam, nuclear fission, waves in the sea **Nuclear power in South Africa** • A nuclear power station such as Koeberg in the Cape, uses radioactive fuel, radioactivity produces heat by nuclear fission. The heat is then used to boil water to produce steam • The steam from the water turns a turbine which turns a generator, that produces electricity. The electricity is then channelled into the national electricity grid • Spent nuclear fuel (nuclear waste) is still radioactive and remains so for many hundreds years, therefore it needs to be properly disposed of so it is not a danger to life for years to come. **National electricity grid** • The national grid is a network of interacting parts(a system): Change in one part of the grid affects other parts of the grid • Power stations feed electrical energy into the national grid at high voltages • Power lines carry electricity at high voltages • Transformers step down the voltage for local distributors and consumers: 15% of energy is wasted due to heating of transmission lines and transformers (No details are required for alternating current or step-down transformers) • Power surges and grid overload can disrupt the power supply	• Researching about alternative sources of energy that can be used to drive generators for the national grid. Compare them in terms of sustainability and environmental impact	• Picture of the power stations in southern Africa • Picture of components of a power station • Video clips from the internet • Diagram showing the national electricity grid with main power stations

Content: Electricity generation

- A power station is a system for generating electricity.
- Most power stations in South Africa use coal as a fuel to boil water.
- The steam from the water turns a turbine which turns a generator, which in turn produces electricity.
- There are other alternative sources of energy besides coal that can be used to drive turbines and generators. These sources include wind, falling water (hydroelectric), sun-heated steam, nuclear fission and waves in the sea.

Activity 2: Electricity generation

- The learners have done electricity generation in Grade 7.
- Do not take anything for granted.
- Get the learners to work in groups of three.
- They need to discuss the question and note their ideas on a sheet of paper (A3 might be useful).
- Ask a few groups to come to the front of the class to present their ideas.
- Build on their new knowledge and correct misconceptions.

1. Most power stations in South Africa use coal (a natural resource) in the process of producing electricity.

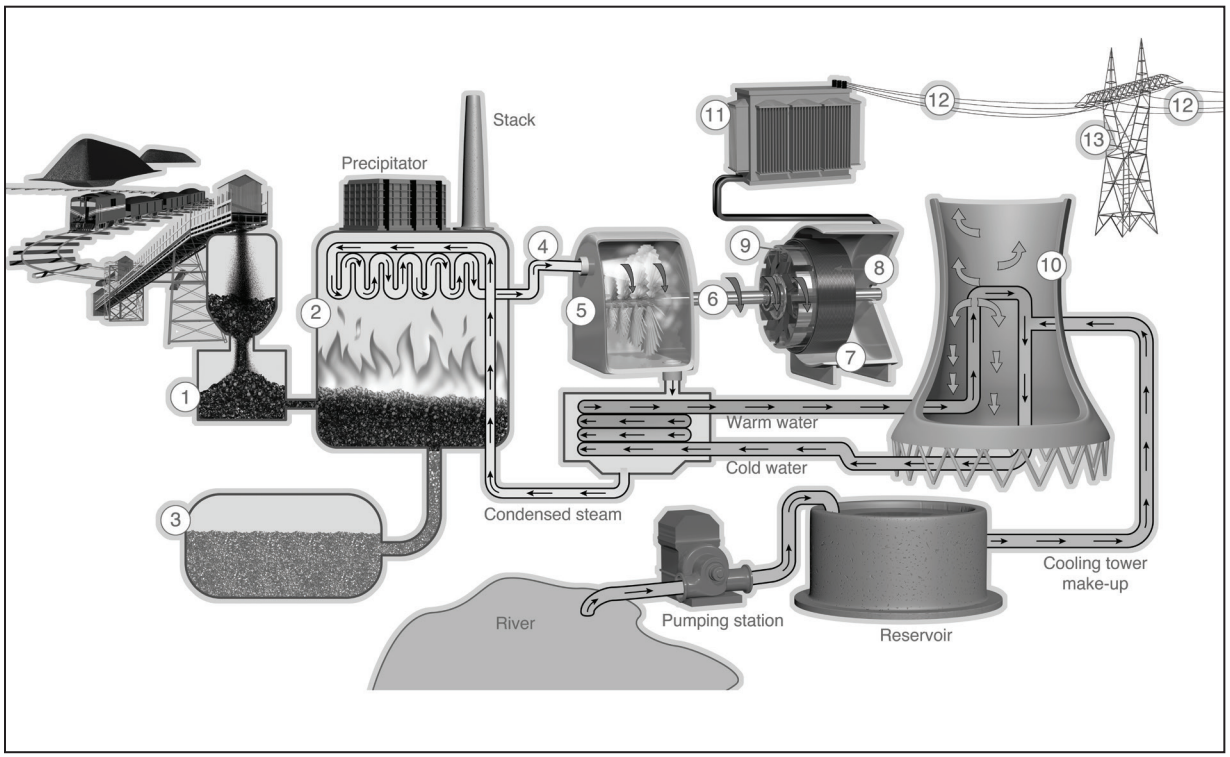
1.1 Discuss the following question in groups of three: Explain how electricity is generated using coal?

1.2 Put to: Write down your ideas on a sheet of paper. You can use flow diagrams, pictures or drawings to show the process on your sheet of paper. Here is a bank of words to help you.

• Coal pulveriser (coal mill) • Boiler • Ash (burnt coal) • Rotating shaft linking the turbine and generator • Coil of copper wire • Magnet inside a coil of copper • Cooling tower • Step-up transformer	• Water to steam • Turbine • Generator made up of a spinning rotor • Coil of copper wire • Magnet inside a coil of copper • Transmission cables/lines • Pylon

1.3 One learner from the group will need to present the group's ideas to the class.
[Use the diagram below and the explanation as consolidation].

1. Coal pulveriser (coal mill) 2. Boiler 3. Ash (burnt coal) 4. Water to steam	5. Turbine 6. Rotating shaft linking the turbine and generator 7. Generator made up of a spinning rotor 8. Coil of copper wire	9. Magnet inside a coil of copper 10. Cooling tower 11. Step-up transformer 12. Transmission cables/ lines 13. Pylon

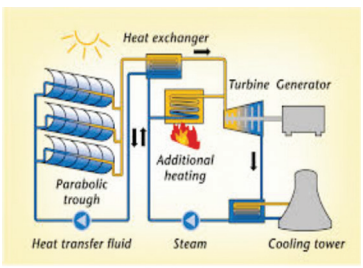


- coal is burnt
- heat from the burning coal to heat water
- water turns to steam
- steam turns a turbine
- turbine turns the shaft
- the shaft turns the generator
- the magnet rotates inside the generator within a coil of copper wire
- an electrical field is set up
- electricity flows in the copper wire

Activity 3: Alternative sources of energy

- The learners have covered alternative sources of energy in Grade 7.
- Do not take anything for granted.
- Do a recap on terms like renewable and non-renewable resources.
- Discuss nuclear energy (content given below).
- Define the term sustainability in a very simple way.
- Talk about environmental impact (use the example of burning of coal – causes pollution).
- Build on their new knowledge and correct misconceptions.
- Give the learners a worksheet as consolidation.
- Review the worksheet.
- You can choose to approach the activity in any other way.

There are other alternative sources of energy besides coal that can be used to drive turbines and generators. These sources of energy include:

• Falling water (hydroelectric)	• Wind	• Waves in the sea
		
• Sun-heated steam	• Nuclear fission	Natural gas
		

Nuclear power in South Africa

- A nuclear power station such as Koeberg in the Cape, uses radioactive fuel, the radioactivity produces heat by nuclear fission. The heat is then used to boil water to produce steam.
- The steam from the water turns a turbine which then turns a generator. Electricity is produced in the generator.
- The electricity is then channelled into the national electricity grid.
- Spent nuclear fuel (nuclear waste) is still radioactive and remains so for many hundreds of years, therefore it needs to be properly disposed of not be a danger and for years to come.

The table shows a list of alternate sources of electricity that can be used to drive the dynamos (generators) to generate electricity for the national grid.

Conduct research (find out more about) each of the alternate resources. Evaluate each alternative resource in terms of sustainability and environmental impact.

Sustainability in simple words means using the resources we need in a way that ensures future generations will also have sufficient resources for their needs.

Impact on the environment means - how does the resource in the process of it being used affect the environment (plants, animals, people, the air, the ground…)?

Alternate Source	Sustainability	Impact on the Environment	Challenges, debates or difficulties of using the source.
1.Wind	- depends on the frequency of the wind	- little impact – clean energy	- turbines are costly - may be insufficient for high demands
2. Waves in the sea	- sustainable	- clean energy - impact on life in the ocean	- costly - may be insufficient for high demands
3. Falling water (hydro-electric)	- dependent on the availability of water/water flow	- clean energy - impact on surrounding ecology	- may be insufficient for high demands
4. Solar (sun's) energy	- suitable for countries with regular sunny days	- clean energy - impact during making of the panels	- costly - may be insufficient for high demands
5. Nuclear Fission (Nuclear energy)	-sustainable but debatable	-need to dispose spent waste which is radio active -could be disastrous if there is a leak	-debatable due to the risk to human, plant and animal life if there is a leak
6. Natural gas	- fossil fuel - does not last forever.	- burns cleaner than coal and oil - also produces emissions - need to drill deep in the earth's surface	- leakage of natural gas can have serious consequences as methane is more toxic than carbon dioxide. - installation can be expensive - "fracking" – digging into the earth's surface is debatable

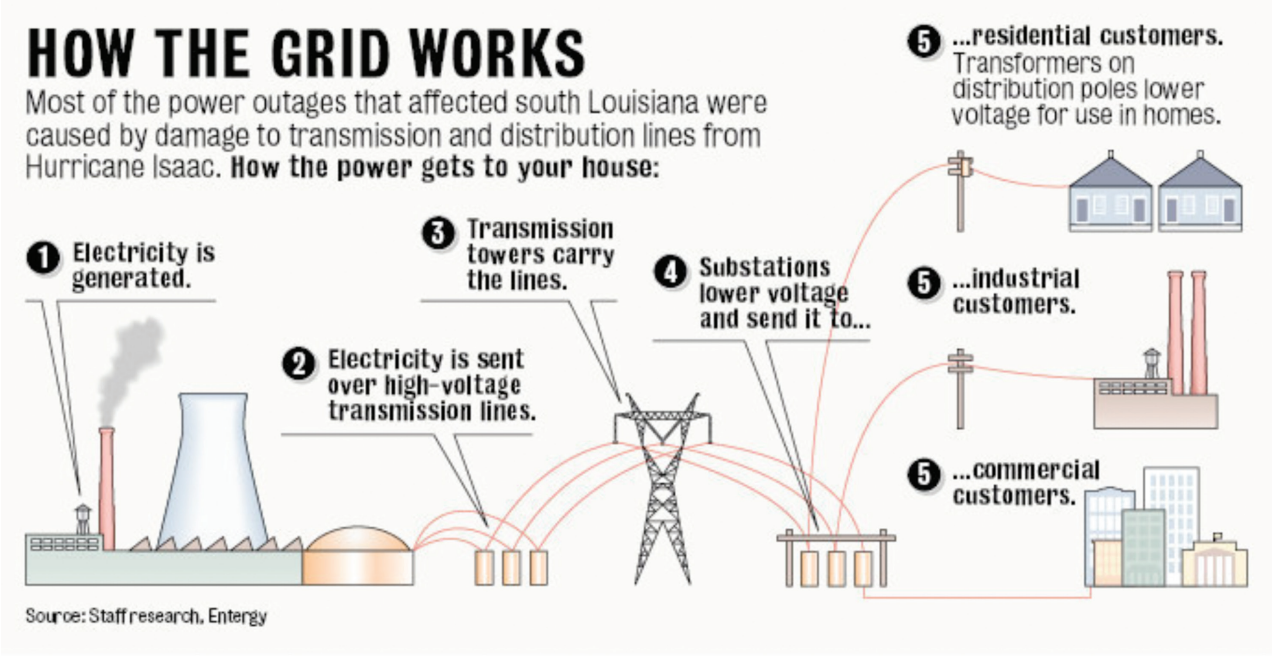
Activity 4: National electricity grid

- Do a quick recap on how electricity is generated.
- Ask learners what happens to the electricity after it is generated? They can draw a quick sketch in their books as "written thoughts".
- Introduce the concept of the national electricity grid.
- Ask learners to complete the activity sheet.
- Review the activity sheet.
- You can add more questions to the activity.

Notes:

- The national electricity grid is a network of interacting parts (a system): A change in one part of the grid affects other parts of the grid.
- Power stations feed electrical energy into the national grid at high voltages.
- Power lines carry electricity at high voltages.
- Transformers step down the voltage for local distributors and consumers.
- 15% of energy is wasted due to heating of transmission lines and transformers.
- Power surges and grid overload can disrupt the power supply.

A change in one part of the grid affects other parts of the grid. Study the diagram and answer the questions.



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1. List some factors that can affect the electricity grid. [Overload due to demand or wastage of energy/shortage of the initial resource e.g. coal/ maintenance issues in the system/natural factors like floods or lightning that can damage parts of the system/mismanagement of the system/illegal connections]

2. What are the possible causes of the electricity grid-overload? [Seasonal – winter more people use heaters; summer more people use fans and air-conditioners/wastage of electricity/damage to parts of the system/ illegal connections].

3. Explain what is meant by a power surge? [Power surges occur when something boosts the electrical charge at some point in the power lines like when the flow of electricity is interrupted, then started again, or when something sends electricity flowing back into the system. This can happen when there is an unexpected overload on the grid. This can damage appliances].

4. What are the possible consequences of an electricity grid overload? [Key services like hospitals are affected/people may go without electricity for long periods/daily activities may become an inconvenience/businesses lose revenue/communication networks (like the internet) depending on electricity can be affected]

5. Write down possible ways an electricity grid-overload can be reduced by the consumers of electricity? [Use electricity sparingly during peak and off-peak hours/follow any energy alerts immediately/use clean alternate sources where possible and affordable – solar energy/use energy-efficient appliances – CFLs, LEDs].

Strand: Energy and change
Topic: Cost of electrical power

The topic: Cost of electrical power

The activity which follows has reference to the content from the Department of Education (2011) CAPS policy document - Natural Science Senior Phase (Grades 7, 8, 9) (p81).

Time	Topic	Content & Concepts	Suggested Activities: Investigations, Practical work, and Demonstrations	Equipment and Resources
2 weeks	Costs of electrical power	**The costs of power consumption** • Electrical power is the rate of electrical energy supply • Electrical power is measured in units called watts (W) or kilowatts (kW) [one watt of power is equal to one joule of energy supplied in a second (1 watt = 1 joule per second)] • Consumers pay for the quantity of power they use • Quantity of electrical power used is measured in kWh (kilowatt hours) • The cost to the consumers calculated in the following way: cost = power rating of the appliance x the number of hours it was used x the unit price of electricity • The energy consumption of different appliances (such as incandescent and compact fluorescent lamps) varies • There are also alternative appliances/ systems such as solar heating panels for heating water	• Examining labels (in adverts, or real electrical appliances such as an iron, stove, TV, radio, refrigerator), and • Record in a table the power rating printed on the devices • Calculate and record the units of power consumed by these different appliances in a given time period (kWh) [different learners can calculate the consumption of different appliances] • Sequence the appliances from those which require the most power to those which require the least power • Calculating how much money it will cost the consumer to run one of the appliances above for a given period [show how to calculate the cost by multiplying the kWh by the unit cost of electricity] • (Note: The unit cost of electricity increases from time to time. Find out what the current unit cost of electricity is in your municipality for this calculation) OR • Selecting one appliance from the above appliances. Calculate how long a particular prepaid card will last if only that appliance is used • Discussing the many careers in the energy sector, including electricians, electrical engineers, artisans, IT specialists for maintaining and improving the power grid	• Examples of electricity accounts that show electricity usage and costs

- This activity can be approached in different ways.
- Bring a few appliances like an iron or kettle to show the learners the power rating shown on the appliance (e.g. 300W).
- Use advertisements of items that show the power ratings.
- Ask the learners to bring old electricity accounts.
- Go over the conversion of watts to kilowatts (iron – 1200watts will be 1,2kW)
- Go over the formula to calculate the kWh. Demonstrate using the kettle = kilowatts x time left on.
- Go over calculation of cost: kWh x amount (tariff as set by the municipality).
- Ask the learners to complete the worksheet.
- Review the worksheet.

Content: The cost of power consumption

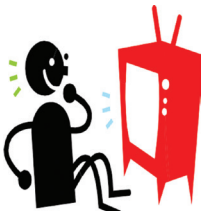
- Electrical power is the rate of electrical energy supply.
- Electrical power is measured in units called watts (W) or kilowatts (kW) [one watt of power is equal to one joule of energy supplied in a second *(1 watt = 1 joule per second)]*.
- Consumers pay for the quantity of power they use.
- The quantity of electrical power used is measured in kWh (kilowatt hours).
- The cost to the consumer is calculated in the following way:
  Cost = power rating of the appliance × the number of hours it was used × the unit price of electricity.
- The energy consumption of different appliances (such as incandescent and compact fluorescent lamps) varies.
- Instead of using electricity as a source there are also other alternative sources/appliances/systems e.g. solar heating panels for heating water.

- Watt (W): Watt is a unit of power marked on the electrical appliance e.g. 100watts or 100W.
- We convert watts to kilowatts by dividing the Watt value by 1000 (1000W = 1kW)
- Kilowatt. Hour (kWh): kWh is the unit used to calculate how much of electrical energy has been used. Households are charged according to the kWh units used (e.g. R1.00 / 100cents per kWh)

Energy used (kWh)	=	The rating of the appliance	X	The total time the appliance used

Activity 1: Calculating the energy consumption (kWh) of different appliances

Study the information below and answer the questions which follow.

1. Stove 	Watt rating: 1500 watts Usage: 24 hours kWh:	2. Refrigerator 	Watt rating: 1200 watts Usage: 24 hours kWh:	3. Television 	Watt rating: 300 watts Usage: 24 hours kWh:
4. Lights(CFLs) 	Watt rating: 1500 watts Usage: 24 hours kWh:	5. Air-Conditioner 	Watt rating: 3500 watts Usage: 24 hours kWh:	4. Geyser 	Watt rating: 2200 watts Usage: 24 hours kWh:

Questions:

1. Calculate the energy use of each of the appliances according to the information provided.

	Appliance	kWh used
1.	Stove	1500W x 24 = 1,5kW x 24h = 36kWh
2.	Refrigerator	1200W x 24 = 1,2kW x 24h = 28.8kWh
3.	Television	300W x 24 = 0,3kW x 24h = 7.2 kWh
4.	Lights	15W x 24 = 0.015k W x 24h = 0.36kWh
5.	Air-conditioner	3500W x 24 = 3,5kW x 24h = 84kWh
6.	Geyser	2200W x 24 = 2,2kW x 24h = 52.8kWh

Questions:

1. Calculate the energy use of each of the appliances according to the information provided.
2. Why do you think it is scientifically correct to compare the kWh use of the appliances? [The time the appliances were left on is constant/remind learners in reality appliances like refrigerators are on 24 hours, while others are used when needed e.g. lights].
3. Work out what amount of prepaid electricity one needs to buy for the month (30 days) to use the refrigerator and geyser if energy use costs R1.00 per kWh? [Refrigerator + geyser = 28.8kWh + 52.8kWh = 81.6kWh/amount of prepaid electricity needed: 81.6 x R1.00 = R81.60]
4. Discuss in groups how one can reduce the consumption of electricity through using each of the appliances in a wise way. Then write down your group's response for each appliance in the table below.

	Appliance	Energy wise tips
1.	Stove	- Switch on the stove when you are ready to cook. - Initially turn the stove high, once there is sufficient heat to cook – turn the heat down. - Use alternate sources like a wonder cushion for cooking. - Have meals as a family so there is no need to reheat the meals for individual members.
2.	Refrigerator	- Close the door immediately after use. - Decide what you want to take out before you open the door – do not leave the door open for long.
3.	Television	- Select programmes you want to watch – it saves time and electricity. - Switch off when not in use. - Switch off at the switch and main switch and not with the remote control.
4.	Lights	- Use energy-saving lights like CFLs and LEDs - Switch off when not in use. - Use fewer lights, one if possible per room.
5.	Air-conditioner	- Use the air-conditioner when necessary. - Close windows and doors when the air-conditioner is on –prevents cool air from escaping. - Seal leaks under doors and windows to prevent the cool air from escaping.
6.	Geyser	- Switch the geyser off after use in the morning and switch on in evenings. - Use a timer switch that automatically switches the geyser on and off. - Use a geyser blanket to insulate to reduce heat loss. - Use alternate sources like a solar panels for heating.

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For more information on the schools programme, please visit www.eskom.co.za/idm.