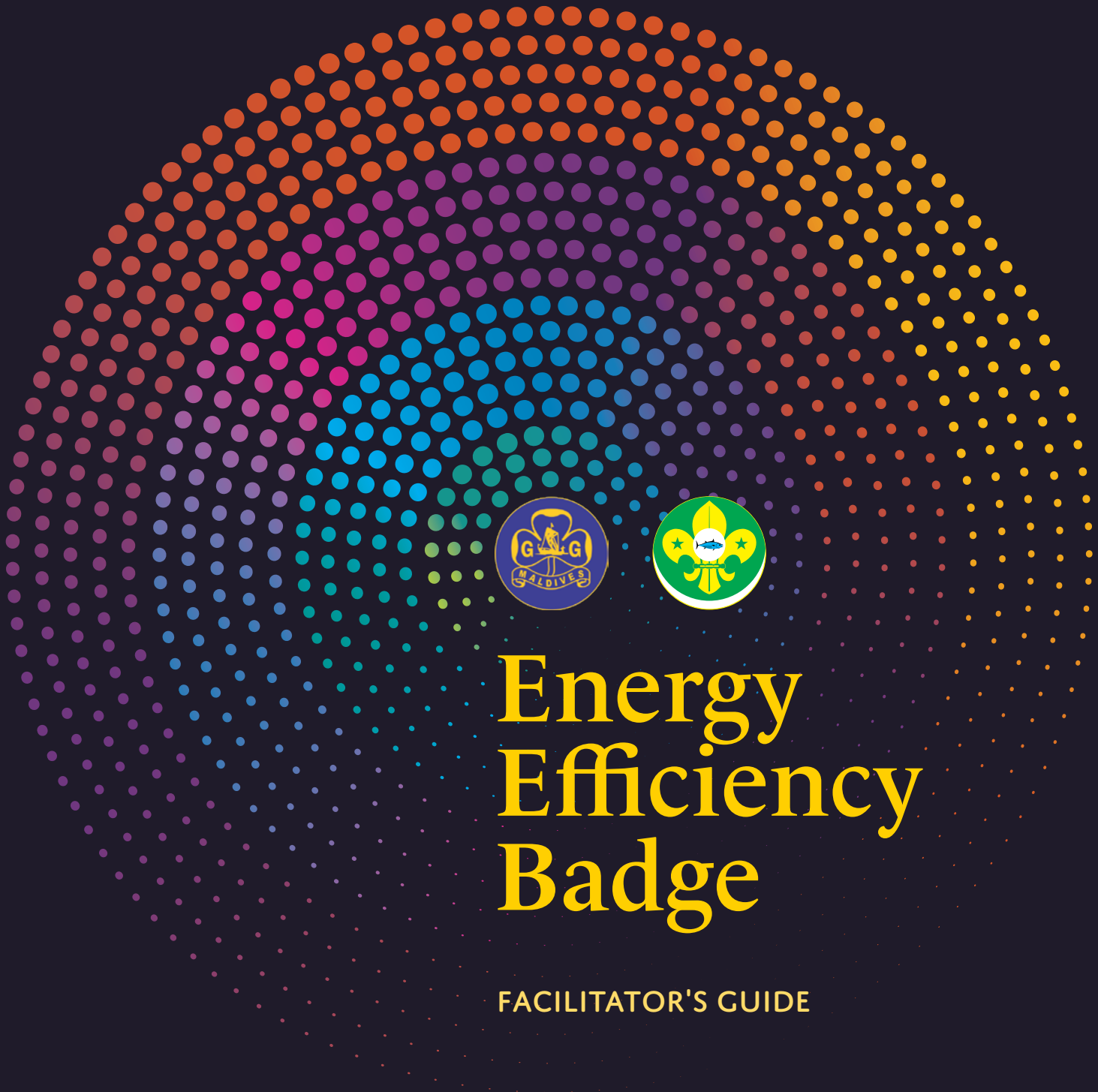
Ministry of Environment



Energy Efficiency Badge

FACILITATOR'S GUIDE

Strengthening Low Carbon Energy Island Strategies (LCEI) Project

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Energy Efficiency Badge

FACILITATOR'S GUIDE

Ministry of Environment

Strengthening Low Carbon Energy Island Strategies (LCEI) Project

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This facilitator's guide is designed and formulated for the leaders of the Maldives Girl Guide Association (MGGA) and The Scout Association of Maldives (SAM). This guide will be instrumental for members to come up with the Energy Efficiency Awareness Badge.

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About the Badge

The Energy Efficiency (EE) Awareness Badge is designed to create awareness about climate change and energy efficiency within the Girl Guides and Scouts of Maldives. The members will be able to understand how electrical energy is produced and how it affects the environment and economy, as well as how to take appropriate actions to become more energy efficient and to act towards reducing emissions and fight climate change.

AGE CATEGORIES

The Energy Efficiency Awareness Badge has four categories, based on age groups. Each member from any of the four categories can obtain the badge upon completion of the tasks given under their age category.

Level 1	Level 2	Level 3	Level 4
5 to 7 years	8 to 11 years	12 to 17 years	18 to 25 years

THE BADGE DESIGNS

The badge designs for the four categories are selected from the best submissions from the Energy Efficiency Art Competition 2016, an art competition organized by Ministry of Environment and Energy, to increase awareness about climate change and energy efficiency. The competition was open for students between 6 and 25 years, under four categories.

Selected design for Level 1 of Energy Efficiency Badge

Artwork submitted by:

Mariyam Shaura Samir

9 years
Thinadhoo School

Selected design for Level 2 of Energy Efficiency Badge

Artwork submitted by:

Naaih Ilyas Ahmed
11 years

Aminiyya School

Selected design for Level 3 of Energy Efficiency Badge

Artwork submitted by:

Eshal Ahmed Naseer
10 years

Iskandhar School

Selected design for Level 4 of Energy Efficiency Badge

Artwork submitted by:

Abaan Mohamed Zahir
18 years

Villa International
High School

LEVEL 1

LEVEL 2

Introduction

With the increase in population and more people entering the middle class, demand for more energy to fuel their improved standard of living is rising throughout the world. In addition, increased urbanization (as rural populations migrate to cities) is also adding to this demand for energy. Even in the Maldives, the demand for energy is rising every year. Maldives relies heavily on imported oil to meet its energy requirements. In 2012, about 23% of the GDP (USD 470 million) was spent on importing fossil fuels. A large portion of this is diesel, which is used for generating electricity and for transport. The total primary energy consumption was around 340,311toe in 2009, and the energy sector is growing at a rate of around 10% per year.

Every product that we use requires energy for manufacturing it, and often for using it too. Things such as food also require energy. If we look at plants – they need to be planted, harvested and transported. In some cases, processed and packaged too. Everything we do – from birth until death – depends on energy. All the activities that take place around us requires some form of energy. Hence, energy efficiency may be referred to as the most important issue of our time. Energy is not cheap and thus proper energy management becomes key to saving energy in our daily life. The cost of energy depends on the production and demand for energy.

The global need for energy not only effects energy prices, but also emissions that affect us. Increasing carbon dioxide emissions leads to global warming and contributes to global climate change.

Published figures show that the overall contribution to, and per capita emissions of greenhouse gases by Maldives is relatively small, 3.3 tons per person per year, compared to many other emerging economies. This relatively low level of emissions is in spite of the widely dispersed small islands making up the country and the high fossil fuel dependency of tourism (35% of imported oil) and fisheries (10% of imported oil), much of it for transport. These compelling reasons have made many countries to work towards energy management.

This guide is designed to help instructors successfully implement the activities to achieve the objectives of the Energy Efficiency Badge. The activities that the members complete to achieve this badge will help them to be more aware of the energy sector in the Maldives and to be able to take appropriate actions toward minimizing spending on energy. It is the responsibility of the instructor to ensure that each member under their guidance meets all the requirements for this badge. You can achieve this by helping the members overcome their difficulties and making their learning experience more enjoyable. You can share your own experiences, helping them positively reinforce the content.

It is important that the members carry out the tasks by themselves. You can guide and instruct them. As the members complete each task, you will check their performance and, when all the requirements are accomplished, you acknowledge it.
Some helpful suggestions that you as an instructor should keep in mind:

1. Make sure the members feel welcomed and enjoy completing the tasks.

2. Do not overwhelm the members.

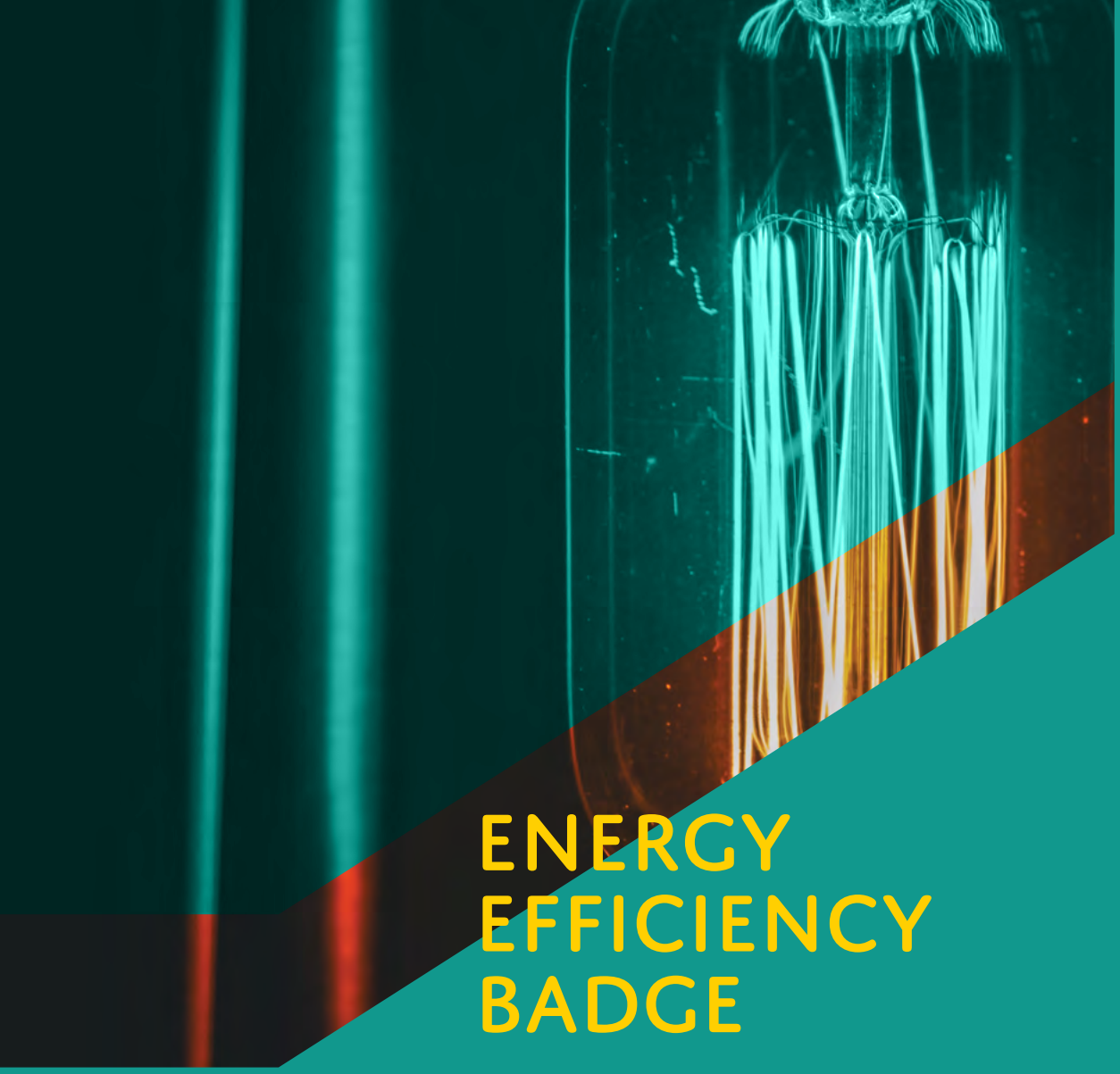
3. Carefully study the ability of the members and the requirements of each activity, and start with the activities which are the easiest.

4. Encourage the members to practice and participate.

5. Do not make the requirements easier or more difficult.

6. Encourage the members to conduct self-evaluations and self-reflection.

7. Encourage the members to complete the tasks and show a genuine interest in their work.



ENERGY EFFICIENCY BADGE

Level 1

5 TO 7 YEARS

Like all other living organisms, human beings need energy too. We use energy to do work. We obtain energy from the food we eat. In addition, we use different forms of energy that we obtain from several different energy sources. This energy is used to operate various machinery that is used for various activities. Light and heat energy from the sun enables living things to thrive on Earth. Fossil fuels are another source of energy that is used throughout the world.

AIM

The main aim of the activities for this badge is to provide members with a very broad perspective on some basic concepts related to energy.

OBJECTIVES

By the end of the activities, members will be able to:

1. Identify 1 source of energy
2. State 3 different uses of energy
3. State 3 different forms of energy
4. Carry out 2 actions that can contribute to energy conservation
5. Recognise the dangers of electricity

Activity 1

OBJECTIVE

By the end of this activity, members will be able to identify 1 source of energy.

Facilitators can conduct any one of the following activities to achieve the objective.

Activity 1A

FOOD AS A SOURCE OF ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This is a group activity. Use photos/labels of different types of food that members eat. The instructor can gather these before starting the activity. Show these materials and discuss with the members.

Discussion could be focused on the following points:

1. The reason for eating various types of food.
2. The number of times they consume food each day.
3. Consequences of not having enough food.
4. Unlike humans and animals, plants make their own food.
5. Food as a source of energy for the members to do various activities.

At the end of this part of the activity (in their books), ask the members to circle the food items that they eat every week.

Discuss with the members about the importance of eating adequate food.

INFORMATION FOR THE INSTRUCTOR

The food we eat provide us with the nutrients that we need to survive. These foods include protein, carbohydrates and fats which provide energy and have important roles in maintaining our health. If we do not eat adequate amounts of the right kinds of foods we will not have enough energy to do the daily tasks.

Additionally, not getting enough nutrients could effect the number of red blood cells in our body, leading to anemia. This can cause fatigue, irregular heartbeat, dizziness and headaches. The sun provide light and heat for the animals and plants living on Earth. Plants can make their own food using sunlight, but animals must eat other organisms for food

(For more information read the section on additional information.)

HOW DO WE GET ENERGY?

We get energy from the food we eat.

1A. Circle the food items that you eat each week.

Flour/Roshi

Rice

Potato

Chicken

Fish

Banana

Carrot

Egg

Cabbage

Apple

Orange

Flour/Bread

Activity 1B

LET'S GO ON A PICNIC

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This is a group activity. Ask the members to bring some food to go on a picnic. You can take the them to the beach or to another island. If that is not possible you can have a picnic inside the school too.

The instructor can also bring photos of different food items to the picnic. Try to bring photos covering all the main food groups – carbohydrates, protein, fats, minerals and vitamins.

At the picnic, make the members sit in a circle and display their food. Discuss with them about food in general and the food in front of them.

Discussion could be focused on the following points:

1. The purpose of eating different types of food.
2. The number of times they consume food each day.
3. The consequences of not eating enough food.
4. Unlike humans and animals, plants make their own food.
5. Food as a source of energy for the members to do various activities.

6. Try to group the food into the 5 main food groups. Some of the food will fall into more than one category.
7. Discuss with them

At the end of this part of the activity (in their books), ask the members to draw food items from five major food groups by looking at the food they have brought and the photos that the you brought.

Colour their drawings.

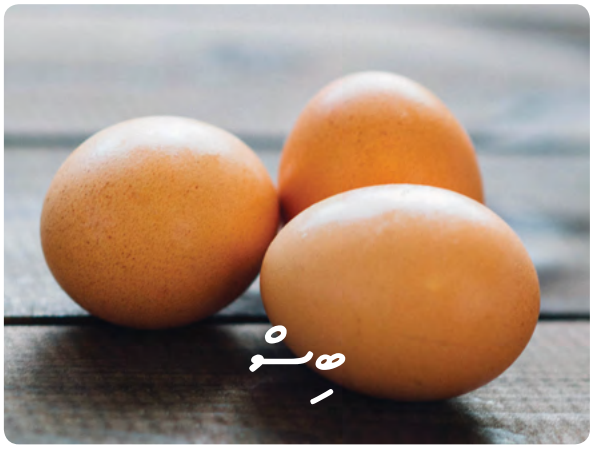
To conclude, emphasise on the importance of healthy eating (balance diet). Discuss the importance of eating an adequate amount of food and the right kind of food.

Activity 1C

A FOOD GAME

SUGGESTIONS ON CONDUCTING THE ACTIVITY

To prepare for this activity, the instructor must make some food cards. Food cards will have photos of food items on them with its name written on it. An example is shown below.



Make the cards large so that they can be seen from far too. Include different food items from the five food groups. For each item make two cards.

Make the members sit in a circle, and distribute the cards.

Select a member to show a card. Once the card has been shown, the other members need to look at their cards to determine who has a similar card. They must switch positions when the other member with the same card has been located.

The instructor should read the names on the card and encourage the members to repeat after them. Once all of the members have exchanged their positions in the circle, the instructor can start a discussion on the items of food.

Discussion could be focused on the following points:

1. The purpose of eating different types of food.
2. The number of times they consume food each day.
3. The consequences of not eating enough food.
4. Unlike humans and animals, plants make their own food.
5. Food as a source of energy for the members to do various activities.
6. Try to group the food into the 5 main groups. Some food items will fall into more than one category.
7. Discuss with them

At the end of this part of the activity (in their books), ask the members to paste their card into their book and draw food items that provide them with energy.

Colour their drawings.

To conclude, emphasise on the importance of healthy eating (balance diet). Discuss the importance of eating an adequate amount of food and the right kind of food.

Activity 2

OBJECTIVES

By the end of this activity, members will be able to:

- state three different uses of energy.
- state three different forms of energy.

Facilitators can conduct any one of the following activities to achieve the objective.

Activity 2A

USES OF ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity could be conducted outside the school, or if it is a small island with only very few vehicles, near the harbor where members may easily see different types of vehicles and vessels. Make it an interactive activity where members get the opportunity to express their views while sharing what they learn.

1. Discuss with the members how they obtain energy for daily activities such as walking, running, talking, etc. Some types of food provide more energy than others. For example, banana, yoghurt and raisins can provide more energy.

2. Make them run around for a while and let them get tired. Explain to them how energy is used for their daily activities and why they need to have food. Food provides them with the energy they require to do different activities.

3. Discuss with the members what provides energy to operate dhoanis, motor cycles and computers. Discuss the use of diesel oil, petrol and electricity (use the photos on the next page).

INFORMATION FOR INSTRUCTOR

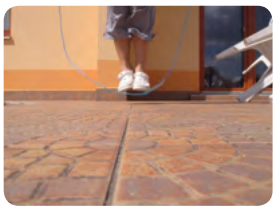
The food we eat provides us with chemical energy. Through a process called respiration, energy from food is made available for living things. All living things, including humans need a minimum intake of food to ensure their metabolism and muscle function. Chemical energy is mainly derived from proteins, fats and carbohydrates that are found in different types of food that we eat every day.

2A . Circle the activities that you do every day.

Running

Walking

Playing



Skipping

Cycling

Painting

Reading

Writing

Sleeping

Eating

Swimming

Praying

Using computer

Talking

Traveling by boat

Playing video games

Watching TV

Riding motorcycle

Activity 2B

USES OF ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

The following activity requires members to see/experience the different uses of electrical energy. To make this an interactive activity, it will be good if some of the following electrical appliances are made available or, alternatively, their photos are used for this activity.

Explain to the members that all of the following appliances use electrical energy, but they do different things. Electricity is also easily converted to other forms of energy – sound, light, heat, and wind.

To assess this activity, ask the members to draw by looking at the real appliances and colour at least three of those items. Also, with the help of their parents, ask them to write the names and uses of those items.

Activity 2C

TRANSFORMING ELECTRICAL ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

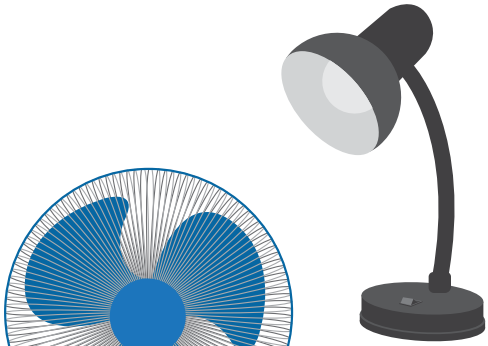
To conduct this activity, the instructor must have a table lamp, fan, electric kettle and a small radio.

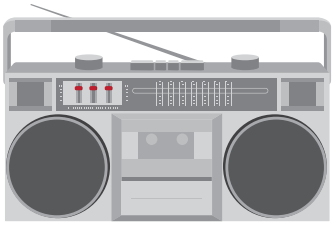
- Use the table lamp to show that electrical energy can be converted to light energy. Connect the lamp to the electrical socket and discuss with the members what can happen electricity passes through the light in the lamp. Encourage the members to comment without the instructor directly providing the answer. Explain to the members what is happening in the lamp.

- Pass electricity to the fan by switching on the fan. Discuss with the members what is happening to the fan and how the fan helps to move the air creating wind. Change the speed of the fan, using the control switch. Discuss with the members what is happening. Explain to them about the change in flow of electricity.

- Use the electric kettle to warm some water. Show the members the warm water and explain to them how electricity is used to boil water.

- Use the radio to listen to some music or a conversation. Discuss with the students how electrical energy is transformed into sound energy.



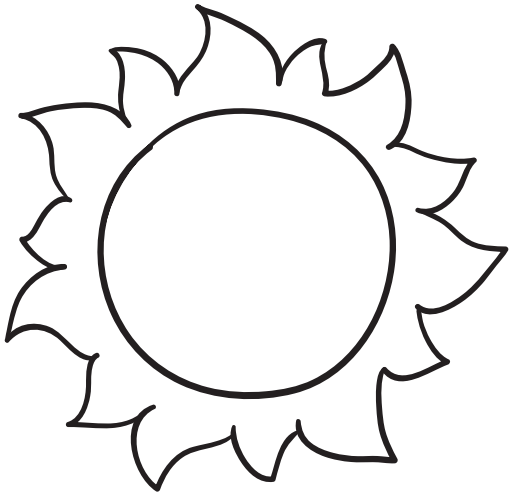


To assess the objectives, ask the members to talk about one of the items they observed.

Different forms of energy discussed in this activity include:

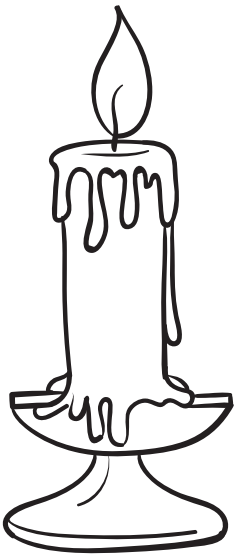
- Light
- Wind
- Heat
- Sound

2C . Colour those that give out both Heat and Light.

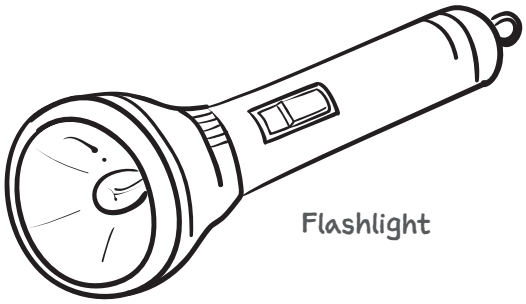


Sun

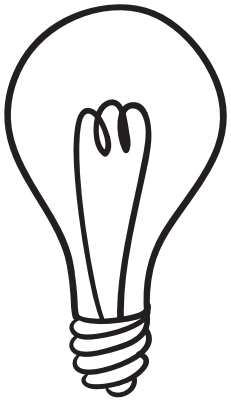
Fire



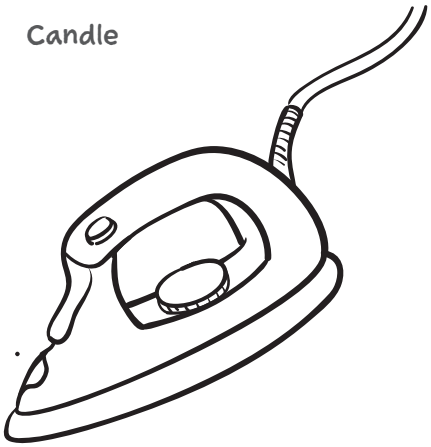
Candle



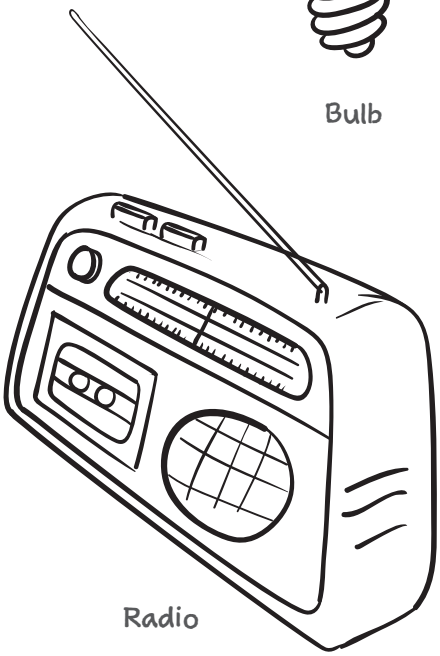
Flashlight



Bulb



Iron



Radio

2C . Circle the words hidden in the word puzzle.

1. Fan
2. Toaster
3. Iron
4. Bulb
5. Computer
6. Television
7. Lamp
8. Radio
9. Laptop
10. Phone

R	A	B	L	O	A	F	T	E	N
A	B	C	A	D	R	T	N	O	A
D	U	M	P	Q	G	S	I	J	F
I	D	I	T	O	A	S	T	E	R
O	R	A	O	H	I	T	S	B	E
L	A	M	P	V	I	S	I	T	M
I	M	P	E	E	P	H	O	N	E
B	U	L	B	B	O	S	P	L	M
I	E	Y	Z	I	J	O	H	E	B
T	O	C	O	M	P	U	T	E	R

Activity 3

OBJECTIVES

By the end of this activity, members will be able to:

- carry out 2 actions that can contribute to energy conservation.
- recognise the dangers of electricity.

Facilitators could conduct any one of the following activities to achieve the objective.

Activity 3A

ELECTRICITY IS EXPENSIVE AND DANGEROUS

SUGGESTIONS ON CONDUCTING THE ACTIVITY

1. **Discuss with your members that energy production costs money. Like buying food for the energy that our body uses costs money – the production of energy to make machines work also cost money.**

   Electricity is used for lighting and operating many simple appliances (machines) at school and at home. If we reduce the use of electricity, we can save money.

   To operate vehicles we need fuel – petrol or diesel. We spend money to buy fuel. If we walk or ride a bicycle to go from one place to another it will cost less.

2. **What are some of the things that we could do to reduce use of electricity?**

   Switch off lights, fans and other electrical items when not in use. If we reduce the use of electricity, how will it benefit? Then we can have more money to spend on other things. Make the members realise that they could do simple things, such as switching off lights, fans, TV and other electrical appliances (when not needed) and this can help their parents/family save too. In addition to saving electricity, they could also reduce the use of fuel by walking, cycling or travelling together in the same vehicle, in larger islands where they have to travel long distances.

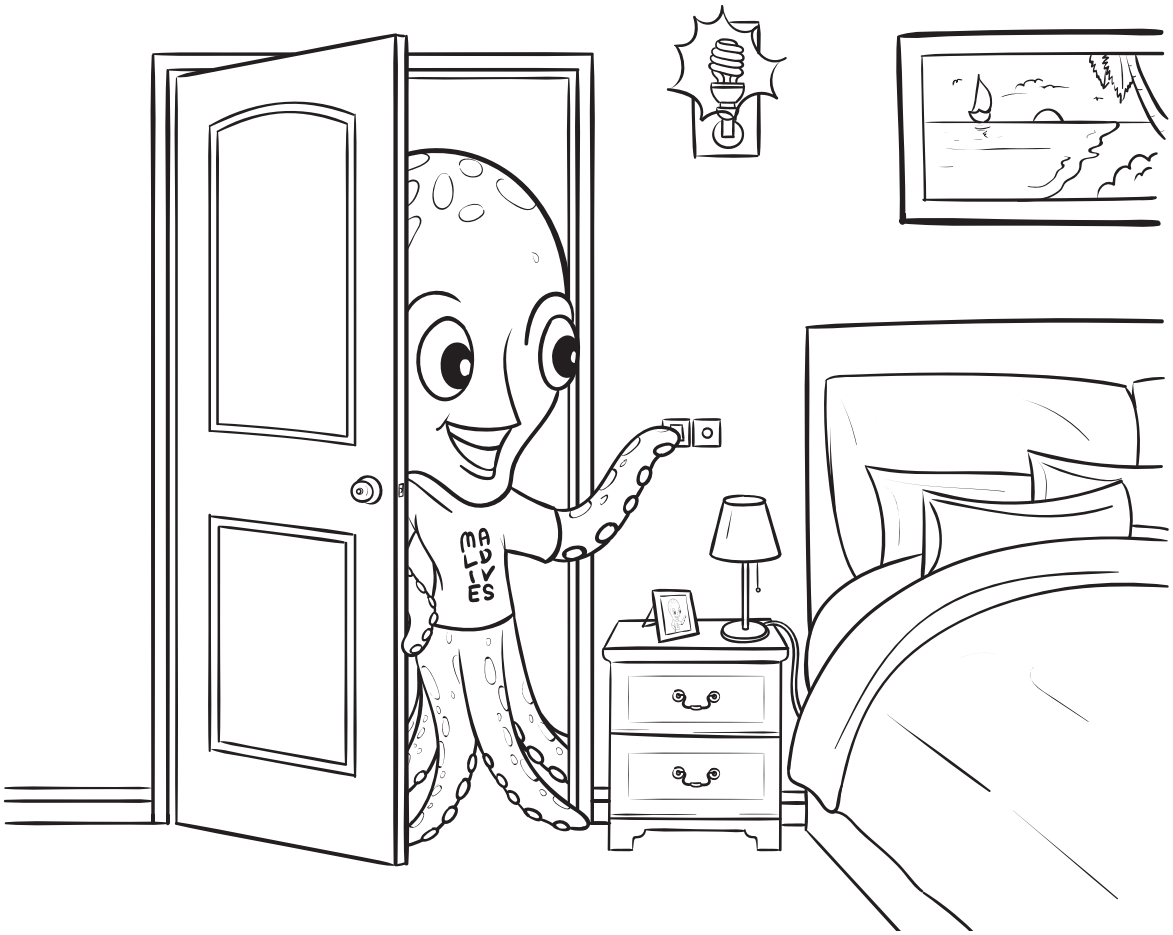
   Ask the members to carry out energy saving practices for a week and report back to the instructor. At the end of the week, the instructor could meet with the group of members and find out from them what they did during the week to save energy. One of the main purposes of this activity is to encourage the members to be on the look out for situations where energy is wasted, and to take positive action to minimize the waste of energy.

ELECTRICITY IS **EXPENSIVE.**

Your parents pay a lot of money for electricity each month.

3A. Colour the drawing below.

Switch off lights to save energy



3A. Colour the drawing below.

Close the fridge door to save energy

SUGGESTIONS ON CONDUCTING THE ACTIVITY

1. Discuss with the members what the consequences of coming into contact electricity can be.

2. Show the members sockets and extension cords. Advise them not to play around or touch them as they may get electrocuted.

INFORMATION FOR INSTRUCTOR

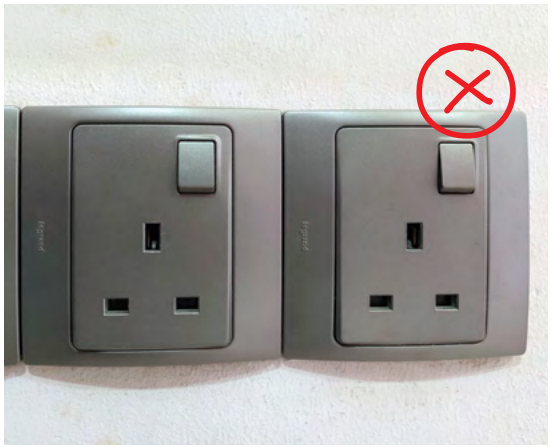
Safety tips for kids.

- Never pull a plug by its cord
- Keep metal objects away from toasters
- Never put your finger or any other objects into an outlet
- Never use any device with electricity around water
- Stay away from power lines and substations
- Do not climb lamp posts
- Do not climb or touch trees that are near power lines
- Obey warning signs
- Do not open distribution boxes
- Do not fly kites near power lines

ELECTRICITY IS **DANGEROUS.**

Electricity can harm us.
It can even KILL us.

We should never touch things that could pass electricity to our body.



Activity 3B

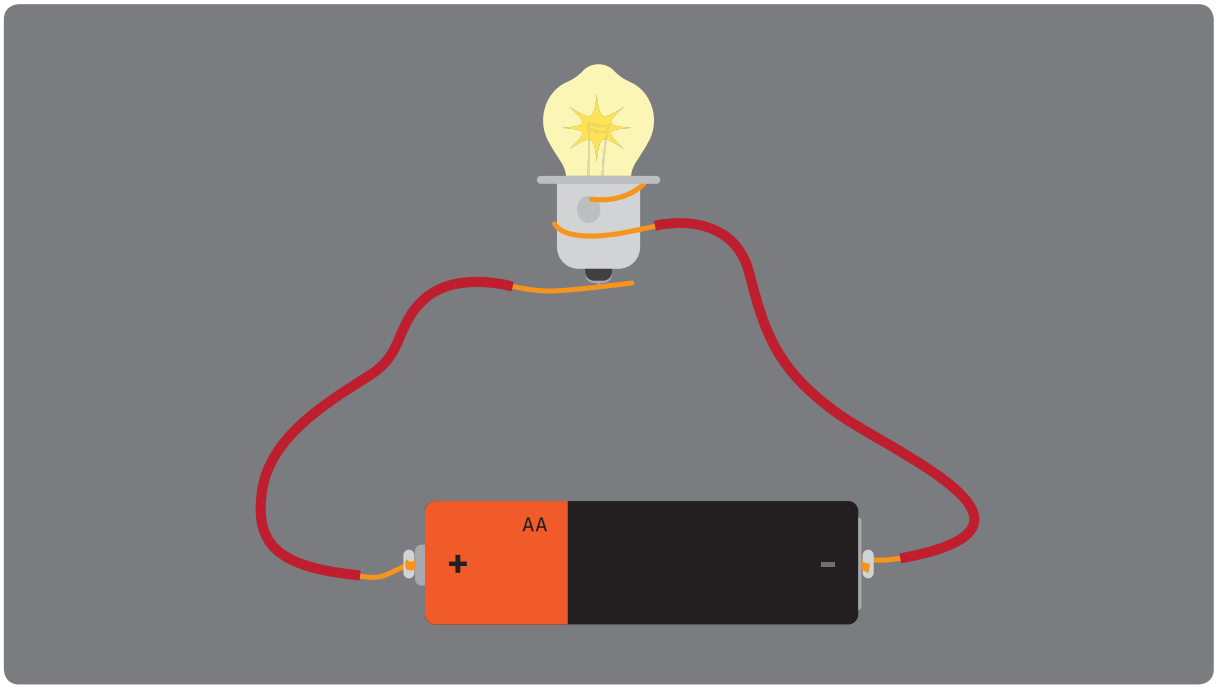
ELECTRICITY IS EXPENSIVE AND DANGEROUS

SUGGESTIONS ON CONDUCTING THE ACTIVITY

1. Obtain some wire, 3 bulbs and 5 small batteries.

2. Construct a simple circuit to light the bulbs.

    a. First make a circuit using one bulb and one battery, as shown below.



    b. Keep adding bulbs and batteries whilst discussing with the members the changes that they see.

    c. Explain to them that lighting more lights requires more energy (battery).

    d. Explain to them that buying more batteries is costly. Similarly, at home, using more electrical appliances means more money has to be spent on electricity.

    e. Discuss with the members how to reduce spending on electricity.

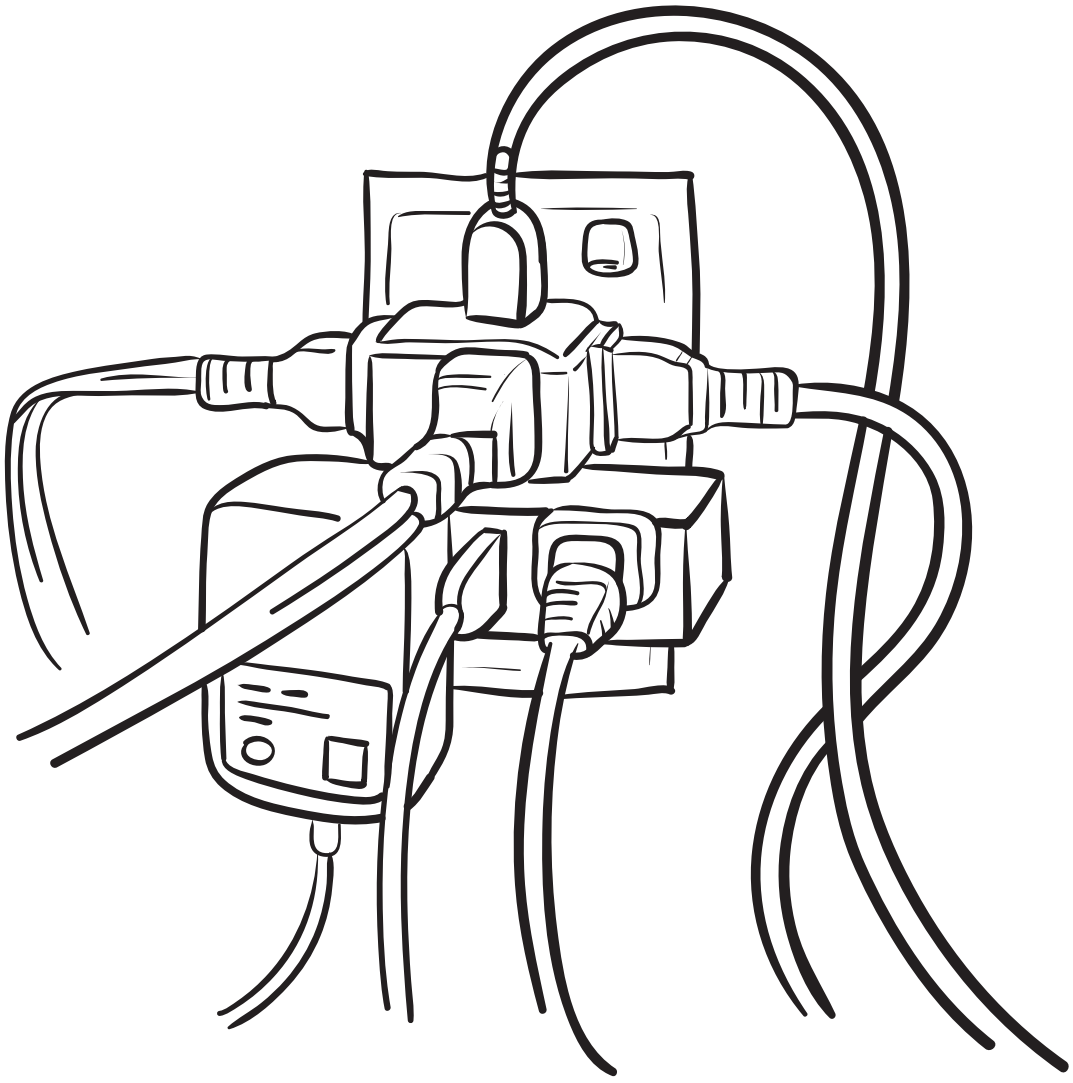
    f. Discuss with the members what direct benefits they will get if they help their parents to save on electricity.

    g. Discuss how the members will indirectly help make their environment a better place by reducing electricity use.

    h. Ask the members to colour the drawing on page 24 and discuss with them the dangers of electricity.

3B. Colour the drawing below.

Never overload outlets with too many plugs.



Activity 3C

DO YOU HELP YOUR FAMILY SAVE ENERGY?

SUGGESTIONS ON CONDUCTING THE ACTIVITY

1. This activity will help the members to evaluate their practices towards energy saving.

   Talk to the members and help them complete the questions on page 26. If they are unable to answer, facilitator could ask the members to get help from their family.

2. Discuss with the members what the dangers of electricity are and what actions should be taken when plugging equipment into sockets.

3C. How do you contribute to saving energy?

Tick the appropriate box.	Yes	No
1. Do you switch off the lights when you leave the room?		
2. Do you switch off the TV when you leave the room?		
3. Do you switch off the computer / laptop when you leave the room?		
4. Do you take a shower using hot water?		
5. Do you and your family clean and defrost the freezer regularly?		
6. Do you close the fridge doors as quickly as possible?		
7. Do you and your family use energy saving bulbs / LEDs?		
8. Do you often use air conditioner to cool the room?		
9. Are the rooms in your house well insulated / are there any leaks?		
10. Do you keep the windows open to let light and breeze into your house?		
11. Do you walk to school?		
12. Do you prefer going for drives / rides than walking?		

If your answers to most of the questions are YES you are helping save lot of energy.

If your answers to most of the questions are NO then you need to take some actions to help save energy.

ADDITIONAL INFORMATION

One of the most important sources of energy for our planet and us is the sun. The energy from the sun is the source of most of the energy found on Earth. Solar radiation that reaches the Earth acts in many ways:

- Warms surface of the Earth
- Regulates weather on Earth
- Provide habitable environments for all living things on Earth.

Solar energy helps form hydrocarbons, such as different forms of oil and gas that people use as secondary forms of energy.

Light – that comes to the earth from the sun is pure energy. Organic matter, such as plants, convert solar energy into food, to grow leaves, flowers and fruits. Animals that eat organic matter convert the energy into body mass (helping them grow). When plants and animals die, the stored chemical energy is transformed into fossil fuels.

Food – is the source of energy used by people and living things. When the food humans eat is digested, the energy can be stored and later converted for the body to use. The body needs to eat and process energy all the time so that it can continue working, playing and growing.

Vegetable and animal oils – have played an important role in human history. Olive, corn and canola are some of the vegetable oils we commonly use for cooking. Animal oils from whales, seals and livestock were used in the past for lighting lamps, waterproofing and in cosmetics. Today bio-oils can even be used to power cars.

Wood – is an organic plant material that has stored energy originally derived from sunlight. When trees are cut down and burned, they release that energy in the form of heat. In the past, wood was predominantly used for cooking and heating. It continues to be used today as a source of cooking or smoking fish in a few homes. We still rely on wood for barbecues.

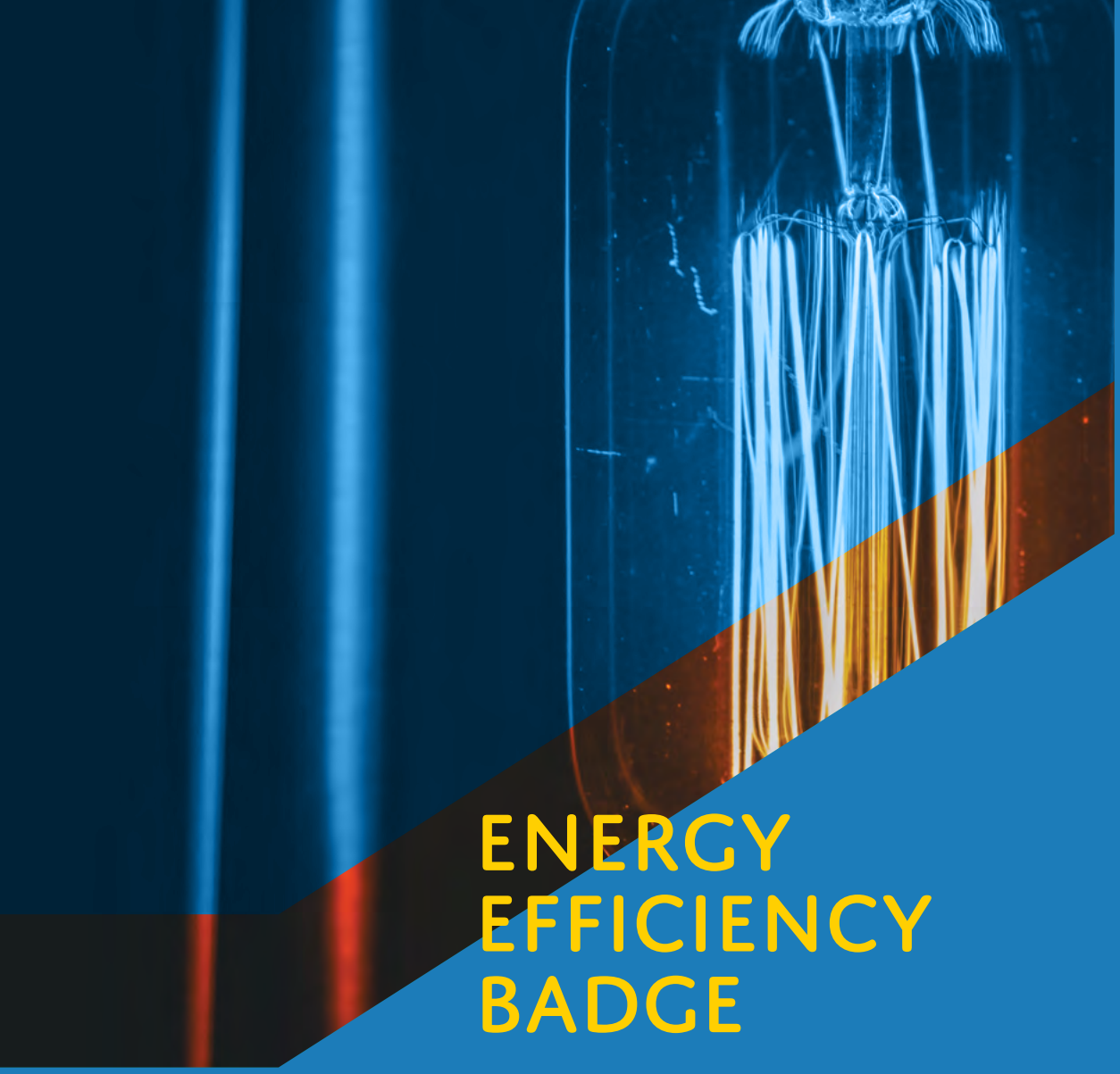
Wind – is an energy source originally generated from the sun. As the sun heats up the earth, the warm air rises and cool air rushes in to fill the space left behind. These currents circulate air masses around the atmosphere. Wind turbines are used to harness this energy and convert it into electricity. Wind is a great example of a renewable energy source.

Water – also originates from the sun. Through heating and cooling of air masses, condensation forms as clouds and is precipitated into the ground, rivers, lakes, and oceans. Wave, tidal and hydropower are three different types of renewable technology that put water to work to generate electrical energy.

Coal, oil and natural gas – are the sources of energy that are known as fossil fuels. The stored chemical energy is initially derived from plant and animal remains, and the sun. They take millions of years to form, and cannot be replaced quickly. When these fuels are burned at power stations, they release carbon dioxide into the atmosphere. Increase in carbon dioxide levels in the atmosphere is causing global warming and climate change.

SAFETY RULES FOR USING ELECTRICITY

1. Do not plug in several appliances into one power outlet. It may damage the electrical wiring or may even may cause a fire.
2. Keep all the electric cords neat and tidy. If they are left all over on the floor people may trip and fall.
3. Do not touch or climb the fence around electrical substations. If something (ball, kite, etc.) falls inside the fence, ask a grown-up to retrieve it.
4. Do not pull electrical cords from the wall socket.
5. Do not fly kites near substations or electrical wires.
6. Always ask adults for help if you want to use electrical appliances.
7. Do not climb trees during stormy weather.
8. Make sure electrical appliances do not come in contact with water.



ENERGY EFFICIENCY BADGE

Level 2

8 TO 11 YEARS

Electricity one of the most useful energy source. It is used for powering almost all modern appliances. It can be used for cooking, operating vehicles, cooling homes, charging batteries and more. It is an energy source that is readily available and easy to use. Generating electricity is costly, hence consumers are charged based on the amount of electrical energy they use for various activities in their homes and businesses. Electricity is also very dangerous. Electricity at home can kill, therefore use it with caution. It is not safe to play with household power sockets or other electrical appliances.

AIM

The main aim of these activities is to make members aware of the contents of an electric bill and the dangers of electricity used at home.

OBJECTIVES

By the end of the activities members will be able to:

1. Interpret an electricity bill
2. Recognize the dangers of electricity
3. Make their friends aware of the dangers of electricity
4. Identify conventional and non-conventional sources of energy
5. State conventional and non-conventional sources of energy used in the Maldives.

Activity 1

OBJECTIVE

By the end of this activity, members will be able to interpret an electricity bill.

Facilitators could conduct any one of the following activities to achieve the objective.

Activity 1A

READING THE ELECTRICITY BILL

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity can be conducted at school. Before conducting the activity, it is important to teach the members how to carry out some simple calculations.

The following formula can be used for calculating energy:

Energy = Power x Time

If we know the power in watts of an appliance and how many seconds it is used for, we can calculate the number of joules of electrical energy consumed.

E.g. If a 100 watt lamp is turned on for 1 hour, the amount of electrical energy consumed by the lamp is:

Energy = Power x Time

Energy = 100 x 3600 = 360,000 joules

1 hour is equal to:
1 x 60 x 60 = 3600 seconds

Since the joule is such a small unit, quantities of energy are often given in kilojoules (thousands of joules). Therefore the answer to the question above can be written as 360 kJ.

The Kilowatt Hour (kWh)

Because the joule is so small, electrical energy supplied to consumers is bought by the UNIT. The UNIT is the kilowatt hour (kWh). One kWh is the amount of energy that would be converted by a one thousand watt appliance when used for one hour.

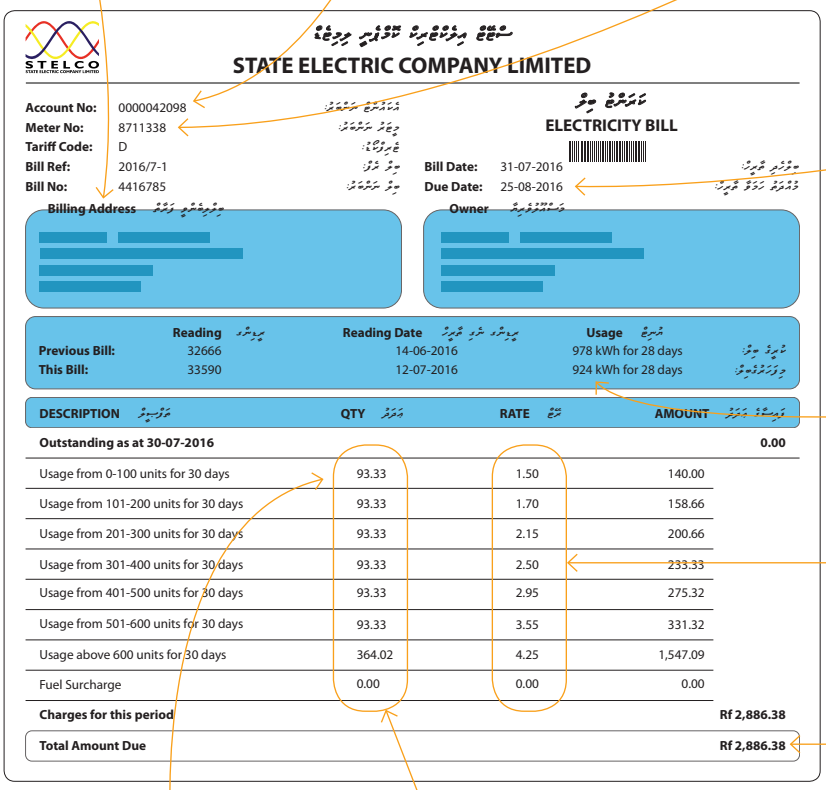
READING THE ELECTRICITY BILL

Ask one member from each group to bring an electricity bill from home and work with them to figure out the calculations. OR the instructor provides the members with an electricity bill and helps them interpret the figures. You can use an electricity bill from a household or the school. It may be a good idea to use the school electricity bill so that by the end of this activity, members will realise how much the school is spending on electricity.

This is the address to which bill is sent.

This is a unique number using which the payment can be made to this account using Internet.

Unique number for every meter - the same number is visible on the outside of the meter.



STELCO

STATE ELECTRIC COMPANY LIMITED

ELECTRICITY BILL

Account No:	0000042098	Bill Date:	31-07-2016
Meter No:	8711338	Due Date:	25-08-2016
Tariff Code:	D		
Bill Ref:	2016/7-1		
Bill No:	4416785		

Billing Address | Owner

	Reading	Reading Date	Usage
Previous Bill:	32666	14-06-2016	978 kWh for 28 days
This Bill:	33590	12-07-2016	924 kWh for 28 days

DESCRIPTION	QTY	RATE	AMOUNT
Outstanding as at 30-07-2016			0.00
Usage from 0-100 units for 30 days	93.33	1.50	140.00
Usage from 101-200 units for 30 days	93.33	1.70	158.66
Usage from 201-300 units for 30 days	93.33	2.15	200.66
Usage from 301-400 units for 30 days	93.33	2.50	233.33
Usage from 401-500 units for 30 days	93.33	2.95	275.32
Usage from 501-600 units for 30 days	93.33	3.55	331.32
Usage above 600 units for 30 days	364.02	4.25	1,547.09
Fuel Surcharge	0.00	0.00	0.00
Charges for this period			Rf 2,886.38
Total Amount Due			Rf 2,886.38

This is the date before which the payment should be made.

924kwh or 924 units of electricity were consumed in 28 days.

Different rates are set for different bands.

This is the total amount for this bill that the consumer needs to pay.

(100/30 days) x 28 days = 93.33
This bill is for 28 days.

When you add all these values it will add up to a total of 924kWh

Note: Electricity bills made by different utility companies or service providers can be different and the rates charged for different bands can also vary depending on the service provider and the community or island.

1A. Reading the electricity bill.

ANSWERS

Let's see whether you can read the electricity bill below.

Try and answer the questions below. Work in pairs or as a small group.

STELCO
STATE ELECTRIC COMPANY LIMITED

ސްޓޭޓް ތިލަގަސްދާ ކުންފުނި ލިމިޓެޑް

STATE ELECTRIC COMPANY LIMITED

ELECTRICITY BILL ކަރަންޓް ބިލް

Account No:	0000042098	ގަނޑުނަންބަރު:	
Meter No:	8711338	ފިޔަނަ ނަންބަރު:	
Tariff Code:	D	ގޮތްކުރުމުގެ:	
Bill Ref:	2016/7-1	ބިލް ނަމްބަ:	
Bill No:	4416785	ބިލް ނަންބަރު:	
Bill Date:	31-07-2016	ބިލުގެ ތާރީޚު:	
Due Date:	25-08-2016	ދައްކަންޖެހޭ ތާރީޚު:	

Billing Address ބިލުގެ ލިޔުން

Owner ގަނޑުވެރިން

	Reading ކިޔުން	Reading Date ކިޔުން ނެގި ތާރީޚު	Usage ބޭނުން	
Previous Bill:	32666	14-06-2016	978 kWh for 28 days	ކުރީގެ ބިލް:
This Bill:	33590	12-07-2016	924 kWh for 28 days	ފުރަތަމަ ބިލް:

DESCRIPTION ތަފްޞީލް	QTY ތަކެއް	RATE ދަށް	AMOUNT ފައިސާ ތަކެއް	
Outstanding as at 30-07-2016				**0.00**
Usage from 0-100 units for 30 days	93.33	1.50	140.00	
Usage from 101-200 units for 30 days	93.33	1.70	158.66	
Usage from 201-300 units for 30 days	93.33	2.15	200.66	
Usage from 301-400 units for 30 days	93.33	2.50	233.33	
Usage from 401-500 units for 30 days	93.33	2.95	275.32	
Usage from 501-600 units for 30 days	93.33	3.55	331.32	
Usage above 600 units for 30 days	364.02	4.25	1,547.09	
Fuel Surcharge	0.00	0.00	0.00	
Charges for this period				**Rf 2,886.38**
Total Amount Due				**Rf 2,886.38**

1. How many kWh were used for the month the bill was prepared? 924
2. What is the total cost of the bill? MVR 2,886.38
3. Was the energy used more or less than the previous month? Less
4. How long is the billing period? 28 days
5. Explain why 93.33 is written under quantity (QTY).
   Since the billing period is 28 days and not 30 days, the quantity is not 100 but 93.33. How the 93.33 is arrived at is by doing a simple calculation as shown. (100/30) x 28 days = 93.33
6. Try and read an electricity bill from your school or home that you brought.

1A. Reading the electricity bill.

Let's see whether you can read the electricity bill below.

Try and answer the questions below. Work in pairs or as a small group.

STELCO
STATE ELECTRIC COMPANY LIMITED

ސްޓޭޓް ތެރެކްޓްރިކް ކުންފުނި ލިމިޓެޑް

STATE ELECTRIC COMPANY LIMITED

ELECTRICITY BILL ކަރަންޓް ބިލް

Account No:	0000042098	ގަނޭގުންތެ ނަންބަރު:	
Meter No:	8711338	ފިޔަރ ނަންބަރު:	
Tariff Code:	D	ދަރުފާ ކޯޑް:	
Bill Ref:	2016/7-1	ބިލް ރެފް:	
Bill No:	4416785	ބިލް ނަންބަރު:	
Bill Date:	31-07-2016	ބިލް ދީފި ތާރީޚް:	
Due Date:	25-08-2016	ދައްކަންޖެހޭ ތާރީޚް:	

Billing Address ބިލް ލިޔެވޭ ލިންކް

Owner ގެ ހޮޅުވާ ފަރާތް

	Reading ކިޔެވި	Reading Date ކިޔެވި ދުވަސް	Usage ބޭނުން	
Previous Bill:	32666	14-06-2016	978 kWh for 28 days	ކުރީގެ ބިލް:
This Bill:	33590	12-07-2016	924 kWh for 28 days	ވަގުތީ ބިލް:

DESCRIPTION ތަފްޞީލް	QTY ޢަދަދު	RATE ދަރަ	AMOUNT ފައިސާ ޢަދަދު	
Outstanding as at 30-07-2016				**0.00**
Usage from 0-100 units for 30 days	93.33	1.50	140.00	
Usage from 101-200 units for 30 days	93.33	1.70	158.66	
Usage from 201-300 units for 30 days	93.33	2.15	200.66	
Usage from 301-400 units for 30 days	93.33	2.50	233.33	
Usage from 401-500 units for 30 days	93.33	2.95	275.32	
Usage from 501-600 units for 30 days	93.33	3.55	331.32	
Usage above 600 units for 30 days	364.02	4.25	1,547.09	
Fuel Surcharge	0.00	0.00	0.00	
Charges for this period				**Rf 2,886.38**
Total Amount Due				**Rf 2,886.38**

1. How many kWh were used for the month the bill was prepared?
2. What is the total cost of the bill?
3. Was the energy used more or less than the previous month?
4. How long is the billing period?
5. Explain why 93.33 is written under quantity (QTY).
6. Try and read an electricity bill from your school or home that you brought.

An example of another electricity bill is shown below.

STELCO
STATE ELECTRIC COMPANY LIMITED

ސްޓޭޓް ޢިލެކްޓްރިކް ކުންފުނި ލިމިޓެޑް

STATE ELECTRIC COMPANY LIMITED

Account No: 1400000035 ގަނޭގުމުގެ ނަންބަރު:
Meter No: 7596641 މީޓަރ ނަންބަރު:
Tariff Code: D ގޮތްފުށުގެ:
Bill Ref: 2016/12-1 ބިލް ނަމްބަ:
Bill No: 1400072620 ބިލް ނަންބަރު:

ކަރަންޓް ބިލް
ELECTRICITY BILL

Bill Date: 02-01-2017 ބިލުދޫކުރި ތާރީޚް:
Due Date: 12-01-2017 ދެއްކުމުގެ ކުރިން ދުވަސް:

Billing Address ބިލުދޫކުރާ ލިޔުންތެރި: **Owner** ފަރާތްތެރިޔާ:

[redacted]

	Reading ކިޔުން	Reading Date ކިޔުން ނެގި ތާރީޚް	Usage ބޭނުން
Previous Bill:	71524	25-11-2016	425 kWh for 31 days ކުރީގެ ބިލް:
This Bill:	71845	25-12-2016	321 kWh for 30 days ވިޔަފާރި ބިލް:

DESCRIPTION ތަފްޞީލް	QTY ތަކެއް	RATE ދަށް	AMOUNT ފައިސާ ތަކެއް	
Outstanding as at 01-01-2017				**0.00**
Usage from 0-100 units for 30 days	100.00	3.00	300.00	
Usage from 101-200 units for 30 days	100.00	3.30	330.00	
Usage from 201-300 units for 30 days	100.00	3.40	340.00	
Usage from 301-400 units for 30 days	21.00	3.50	73.50	
Credit	0.00	0.00	-0.85	
Fuel Surcharge	0.00	0.00	65.80	
Fuel Discount (usage based)	0.00	0.00	-135.00	
Charges for this period				**Rf 973.45**
Total Amount Due				**Rf 973.45**

Discuss with the members how some electricity bills are higher than others.

1. Using more electrical appliances can increase the consumption of electricity

2. Using electrical appliances for longer periods can also increase the consumption of electricity

3. Using appliances with higher electrical power ratings will also result in an increase in the consumption of electricity

All of the above can lead to a higher electricity bill.

Activity 1B

COMPARING HOUSEHOLD ELECTRICITY BILLS

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Two electricity bills from two households are provided below. Compare the two bills and make them answer the following questions for each bill.

For Bill - A

1. How many kWh were used for the month the bill was prepared? 1460 kWh
2. What is the total cost of the bill? MVR 5,090.00
3. Was the energy used more or less than the previous month? More
4. How long is the billing period? 30 days
5. Ask the members to compare the two bills and discuss possible reasons for the difference in total amounts indicated on the two bills.

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STATE ELECTRIC COMPANY LIMITED

ELECTRICITY BILL

Account No: 0000000850
Meter No: T-0702253
Tariff Code: D
Bill Ref: 2017/10-1
Bill No: 4989166

Bill Date: 23-10-2017
Due Date: 02-11-2017

Billing Address

Owner

	Reading	Reading Date	Usage
Previous Bill:	114518	05-09-2017	1444 kWh for 31 days
This Bill:	115978	05-10-2017	1460 kWh for 30 days

DESCRIPTION	QTY	RATE	AMOUNT	
Outstanding as at 22-10-2017				**0.00**
Usage from 0-100 units for 30 days	100.00	1.50	150.00	
Usage from 101-200 units for 30 days	100.00	1.70	170.00	
Usage from 201-300 units for 30 days	100.00	2.15	215.00	
Usage from 301-400 units for 30 days	100.00	2.50	250.00	
Usage from 401-500 units for 30 days	100.00	2.95	295.00	
Usage from 501-600 units for 30 days	100.00	3.55	355.00	
Usage above 600 units for 30 days	860.00	4.25	3,655.00	
Fuel Surcharge	0.00	0.00	0.00	
Charges for this period				**Rf 5,090.00**
Total Amount Due				**Rf 5,090.00**

For Bill - B

1. How many kWh were used for the month the bill was prepared? 1068 kWh
2. What is the total cost of the bill? MVR 3,525,82
3. Was the energy used more or less than the previous month? More
4. How long is the billing period? 30 days

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ސްޓޭޓް ޢިލެކްޓްރިކް ކުންފުނި ލިމިޓެޑް

STATE ELECTRIC COMPANY LIMITED

Account No: 0000042098 ތަކެތި ނަންބަރު:
Meter No: 8711338 ސިޓި ނަންބަރު:
Tariff Code: D ދަރަނި ކޯޑު:
Bill Ref: 2017/7-1 ބިލް ނަމްބަ:
Bill No: 4876213 ބިލް ނަންބަރު:

ELECTRICITY BILL

Bill Date: 24-07-2017 ބިލް ދީފި ތާރީޚް:
Due Date: 08-08-2017 ދައްކަންޖެހޭ ތާރީޚް:

Billing Address ބިލް ފޮނުވާ ލިޔުން

[redacted]

Owner ވަސީލުވެރިޔާ

[redacted]

	Reading ކިޔެވި	Reading Date ކިޔެވި ތާރީޚް	Usage ބޭނުން	
Previous Bill:	43078	06-06-2017	843 kWh for 30 days	ކުރިން ބިލް:
This Bill:	44146	06-07-2017	1068 kWh for 30 days	ވިޔަސް ބިލް:

DESCRIPTION ތަފްޞީލް	QTY ޢަދަދު	RATE ދަރަ	AMOUNT ވަޒަފާ ޢަދަދު	
Outstanding as at 23-07-2017				**0.00**
Usage from 0-100 units for 30 days	100.00	1.50	150.00	
Usage from 101-200 units for 30 days	100.00	1.70	170.00	
Usage from 201-300 units for 30 days	100.00	2.15	215.00	
Usage from 301-400 units for 30 days	100.00	2.50	250.00	
Usage from 401-500 units for 30 days	100.00	2.95	295.00	
Usage from 501-600 units for 30 days	100.00	3.55	355.00	
Usage above 600 units for 30 days	468.00	4.25	1,989.00	
Fuel Surcharge	0.00	0.00	0.00	
Charges for this period				**Rf 3,525.82**
Total Amount Due				**Rf 3,525.82**

1B. Comparing household electricity bills.

Two electricity bills from two households are provided below.

Compare the two bills and answer the following questions for each bill.

Bill – A

STELCO
STATE ELECTRIC COMPANY LIMITED

ސްޓޭޓް ޢިލެކްޓްރިކް ކުންފުނި ލިމިޓެޑް

STATE ELECTRIC COMPANY LIMITED

ELECTRICITY BILL ކަރަންޓް ބިލް

Account No:	0000000850	ގަބޫލުކުރާ ނަންބަރު:	
Meter No:	T-0702253	މީޓަރ ނަންބަރު:	
Tariff Code:	D	ޓެރިފް ކޯޑް:	
Bill Ref:	2017/10-1	ބިލް ރެފް:	
Bill No:	4989166	ބިލް ނަންބަރު:	
Bill Date:	23-10-2017	ބިލުގައި ދީފައިވާ:	
Due Date:	02-11-2017	ދައްކަންޖެހޭ ތާރީޚް:	

Billing Address ބިލްދޭންޖެހޭ ލިބެންވާ

Owner ފަސްޓުގެ ވެރިޔާ

	Reading ކިޔުން	Reading Date ކިޔުން ނެގި ތާރީޚް	Usage ބޭނުން	
Previous Bill:	114518	05-09-2017	1444 kWh for 31 days	ކުރިން ދިން:
This Bill:	115978	05-10-2017	1460 kWh for 30 days	ވަރަށްދޫ ވިލް:

DESCRIPTION ތަފްޞީލް	QTY ދަރަޖާ	RATE ދަށ	AMOUNT ފައިސާ ދަރަޖާ	
Outstanding as at 22-10-2017				**0.00**
Usage from 0-100 units for 30 days	100.00	1.50	150.00	
Usage from 101-200 units for 30 days	100.00	1.70	170.00	
Usage from 201-300 units for 30 days	100.00	2.15	215.00	
Usage from 301-400 units for 30 days	100.00	2.50	250.00	
Usage from 401-500 units for 30 days	100.00	2.95	295.00	
Usage from 501-600 units for 30 days	100.00	3.55	355.00	
Usage above 600 units for 30 days	860.00	4.25	3,655.00	
Fuel Surcharge	0.00	0.00	0.00	
Charges for this period				**Rf 5,090.00**
Total Amount Due				**Rf 5,090.00**

1. How many kWh were used for the month the bill was prepared?

2. What is the total cost of the bill?

3. Was the energy used more or less than the previous month?

Bill – B

STELCO
STATE ELECTRIC COMPANY LIMITED

ސްޓޭޓް ތިލަގުޅަވެރި ކުންފުނި ލިމިޓެޑް

STATE ELECTRIC COMPANY LIMITED

Account No: 0000042098 ތަކެތީގެ ނަންބަރު:
Meter No: 8711338 ސިޓީގެ ނަންބަރު:
Tariff Code: D ގާތްރަށ:
Bill Ref: 2017/7-1 ބިލް ނަމްބަ:
Bill No: 4876213 ބިލް ނަންބަރު:

ކަރަންޓް ބިލް
ELECTRICITY BILL

Bill Date: 24-07-2017 ބިލްދުވި ތާރީޚ:
Due Date: 08-08-2017 ދައްކަންޖެހޭ ތާރީޚ:

Billing Address ބިލްލިން ލިބޭ ތަނ:

[redacted]

Owner ފަސްޓުގަވާ:

[redacted]

	Reading ކިޔުން	Reading Date ކިޔުން ހިފި ތާރީޚ	Usage ބޭނުން	
Previous Bill:	43078	06-06-2017	843 kWh for 30 days	ކުރީގެ ބިލް:
This Bill:	44146	06-07-2017	1068 kWh for 30 days	ވަރަށްދެ ބިލް:

DESCRIPTION ތަފްޞީލް	QTY އަދަދު	RATE ދަށ	AMOUNT ފައިސާ އަދަދު	
Outstanding as at 23-07-2017				**0.00**
Usage from 0-100 units for 30 days	100.00	1.50	150.00	
Usage from 101-200 units for 30 days	100.00	1.70	170.00	
Usage from 201-300 units for 30 days	100.00	2.15	215.00	
Usage from 301-400 units for 30 days	100.00	2.50	250.00	
Usage from 401-500 units for 30 days	100.00	2.95	295.00	
Usage from 501-600 units for 30 days	100.00	3.55	355.00	
Usage above 600 units for 30 days	468.00	4.25	1,989.00	
Fuel Surcharge	0.00	0.00	0.00	
Charges for this period				**Rf 3,525.82**
Total Amount Due				**Rf 3,525.82**

4. How long is the billing period?

5. There are several reasons that contribute to high electricity bills. Discuss possible reasons for the difference in the total amounts indicated on the two bills and list them.

6. What are possible ways to reduce spending on electricity?

Activity 1C

DESIGNING YOUR OWN ELECTRICITY BILL

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Ask the members to look at the tariff rates (RATE column on the bill) on the electricity bill and to design their own electricity bill for a household that consumes 500 kWh and 1000 kWh.

For 500 kWh

Description	Qty	Rate	Amount
Usage from 0-100 units for 30 days	100	1.50	150.00
Usage from 101-200 units for 30 days	100	1.70	170.00
Usage from 201-300 units for 30 days	100	2.15	215.00
Usage from 301-400 units for 30 days	100	2.50	250.00
Usage from 401-500 units for 30 days	100	2.95	295.00
Total amount			**1080.00**

For 1000 kWh

Description	Qty	Rate	Amount
Usage from 0-100 units for 30 days	100	1.50	150.00
Usage from 101-200 units for 30 days	100	1.70	170.00
Usage from 201-300 units for 30 days	100	2.15	215.00
Usage from 301-400 units for 30 days	100	2.50	250.00
Usage from 401-500 units for 30 days	100	2.95	295.00
Usage from 501-600 units for 30 days	100	3.55	355.00
Usage above 600 units for 30 days	400	4.24	1700.00
Total amount			**3135.00**

Ask the members to design a complete electricity bill with all of the features in the existing sample you provide.

In addition, ask the members to get an existing electricity bill (possibly from their home) and make it again with a 150 kWh less amount. See how much money they can save.

Activity 2

OBJECTIVES

By the end of this activity, members will be able to:

- Recognize the dangers of electricity
- Make their friends aware of the dangers of electricity

Facilitators can conduct any one of the following activities to achieve the objective.

Activity 2A

ELECTRICITY CAN BE DANGEROUS

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Ask the members to design small messages that will help everyone at school to be more careful in handling electrical appliances. It is hoped that during this activity, members will become more aware of the safety measures related to electricity. Discuss with the members what the dangers of electricity are.

Some questions for discussion:

1. What will you do if you see a live wire on the ground?

2. What will you do if there is a fire and a live wire is about to catch fire?

3. What will be the best way to connect several electrical appliances to one outlet?

4. If there is a power outage in the house what can you do?

5. What would you do if you came upon someone who may have been electrocuted?

To evaluate the achievement of objectives, ask the members to present the messages they have made to a group or to the pack *(Instructor could decide to whom members should present the message they have prepared).* If it is a larger group, and if there is no time for all the members to present their messages, the instructor could select the presenters by drawing lots.

INFORMATION FOR INSTRUCTOR

Electrical Safety

Most of the time electricity is safe. We need to watch for dangerous electrical situations and know what to do. We have to be smart or we could be in for a big shock! Things to discuss:

- Electricity travels along powerlines
- Electricity travels in circuits
- Be careful around electricity poles and wire when you play
- Do not go near fallen powerlines and stay at least 25 feet away from them
- If you see a dangerous situation, tell an adult
- Electricity and water do not mix
- Do not touch an electric hair dryer if it falls in the water.
- Do not put your finger or any other object into a power socket
- Stay away from substations or you may get electrocuted
- Metal is a conductor of electricity and can be dangerous
- Know what to do in an electrical emergency

Examples of such messages:

Source: Safety Messages. (n.d.). [image] Available at: https://midtownatlantaelectric.com/2017/11/02/electrical-safety-tips/ [Accessed 6 Dec. 2018].

Activity 2B

HOW DANGEROUS IS ELECTRICITY?

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Ask the members to design a short questionnaire and implement the questionnaire to 10 people (adults – 5 women and 5 men).

The questions could be the following:

1. What would you do if you saw a live wire on the ground?

2. What would you do if there was a fire and a live wire was about to catch fire?

3. What is be the best way to connect several electrical appliances to one outlet?

4. If there is a power outage in the house what would you do?

5. What would you do if you came upon someone who may have been electrocuted?

You can also include other questions.

To evaluate the achievement of objectives, ask the members to present the findings they have made to a group or to the pack *(The Instructor could decide to whom members should present the message they have prepared).*

If it is a larger group and if there is no time for all the members to present their messages, the instructor should select the presenters by drawing lots.

Based on the findings, ask the members to make a single page flyer to make the public aware of the dangers of electricity.

Activity 2C

HOW DANGEROUS IS ELECTRICITY?

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Ask the members to design a short 1 to 2 minute video clip to show some “dos and don’ts” related to electricity.

Members could work in groups and act out the “dos and don’ts” while others do the shooting. Narration could be carried out during the acting out of “dos and don’ts”. Here are some:

Do	Don’t
1. Check wiring to make sure it is properly insulated	1. Overload motors, circuits, or outlets.
2. Check that electrical connections are tight	2. Run cords along the floor.
3. Match plugs and outlets (three-pronged plugs go in three-pronged outlets only)	3. Put anything but a plug into an electrical outlet.
4. Read and follow manufacturer’s instructions for electrical equipment.	4. Touch anything electric with wet hands.
5. Obey warnings to stay away from electrical circuits and locked-out equipment.	5. Let cords get twisted or tangled.
6. Wear rubber gloves and any other assigned protective clothing and equipment.	6. Get too close to power lines.
7. Keep the work area clean	7. Use a power tool that smokes, sparks, smells, or shocks.

To evaluate the achievement of objectives ask the members to present the video clip they have made to a group or to the pack (Instructor could decide to whom members should present the message they have prepared). If it is a larger group and if there is no time for all the members to present their messages instructor could select the presenters by drawing lots.

Activity 3

OBJECTIVES

By the end of this activity, members will be able to:

- Identify conventional and non-conventional sources of energy
- State conventional and non-conventional sources of energy used in the Maldives.

Facilitators can conduct any one of the following activities to achieve the objective.

Activity 3A

ENERGY SOURCES IN THE MALDIVES

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Explain to the members the difference between conventional and non-conventional sources of energy (Gather information from Internet – record the information in their book). Discuss with them the different types of energy sources that can be used in the Maldives to generate electricity. Ask the members to complete the table. You can also ask the members to use the Internet to do more research on conventional and non-conventional sources of energy throughout the world. Once they have completed the task, discuss their findings with them.

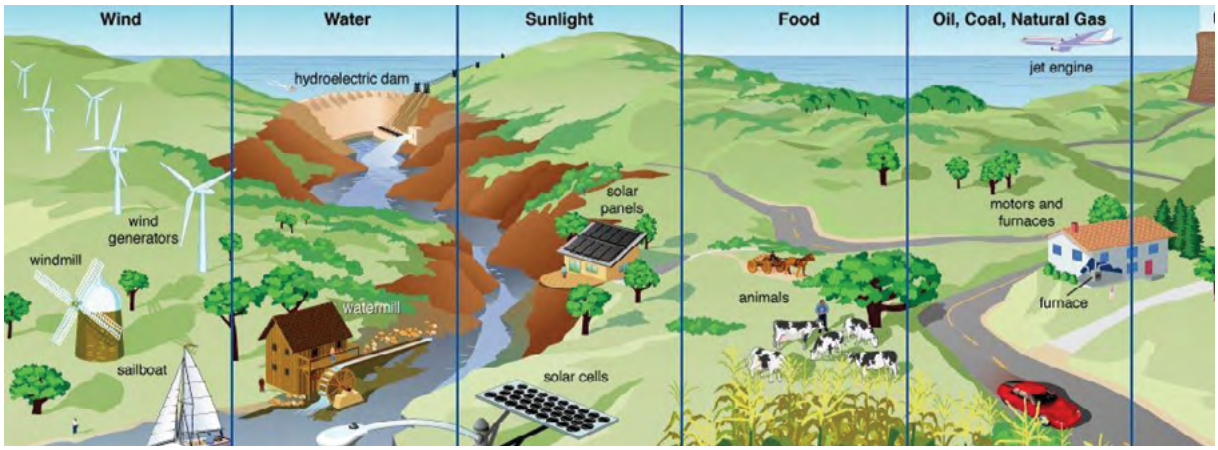
INFORMATION FOR INSTRUCTOR

The Maldives has no conventional energy sources that it can utilize to meet its energy needs. Therefore, the Maldives currently gets most of its energy from imported petroleum fuels, particularly oil, that is imported from oil exporting countries. The main fuel imported is diesel.

The Maldives depends on imported petroleum-based fuels to provide for generation of electricity, maritime transportation, aviation, and road transport. LPG is mainly used for cooking and the dependency on diesel for desalinated water production is growing. The dependence on imported fossil fuels represents around one fifth of our GDP. This dependency will increase in the future under a business as usual scenario. This will make the Maldives more energy insecure, economically vulnerable and burden the society. These sources will run out one day, so it is important to use other sources of energy.

Several renewable sources of energy, such as solar, wind and water currents, can be used to generate electricity in the Maldives. Some renewable energy sources (wind and solar) do not emit smoke or create pollution when they are used. Others, such as biomass, almost always cause less pollution than fossil fuels or nuclear alternatives. Renewable energy can be used for power generation, hot water, heating, as transport fuels and off-grid energy services.

Energy Sources



Source: Encyclopædia Britannica, Inc (n.d.). Sources of Energy. [image] Available at: https://kids.britannica.com/kids/article/energy/353100 [Accessed 6 Dec. 2018].

3A. Identifying energy sources

In the table, list the energy sources and state whether they are conventional or non-conventional sources of energy.
Also identify the types of energy sources used in the Maldives.

Source	Type	Used in the Maldives (✓)

Activity 3B

RENEWABLE ENERGY IN THE MALDIVES

SUGGESTIONS ON CONDUCTING THE ACTIVITY

1. Explain to the members the difference between conventional and non-conventional sources of energy (Gather information from Internet – record the information in their books).

2. Ask the members to design a questionnaire in preparation for their visit to a place where renewable sources of energy is used to generate electricity.

3. Arrange a field trip to one of the sites where solar panels or wind vanes are used to generate electricity.

4. After completing the visit, working in pairs or in small groups, members should write a report on the site they visited and their opinions on the use of conventional and non-conventional sources of energy for generating electricity. The report should have photos and information provided during the visit and additional information obtained from other sources.

Activity 3C

RENEWABLE OR NON-RENEWABLE ENERGY GAME

SUGGESTIONS ON CONDUCTING THE ACTIVITY

1. Make several cards that show energy sources similar to the one below.

Ocean (Tidal & Wave Energy)

Petrol

Other words that you could be used include:

a. Geothermal energy
b. Biogas
c. Diesel
d. Kerosene
e. Solar energy
f. Wind energy
g. Oil
h. Coal
i. Hydropower energy
j. Natural gas
k. Ocean current energy
l. Nuclear energy

2. Divide the members into groups of 5.

3. Provide each member with a small ball (a tennis ball will be good)

4. Place two buckets, labelled renewable and non-renewable energy, about five feet in front of the groups.

5. A card is picked by the instructor and displayed to the groups.

6. The member quickly decide and throw their ball the ball into the appropriate bucket (labelled renewable and non-renewable energy).

7. The group that gets the most correct wins the game.

8. Discuss with the members what types of renewable and non-renewable energy are used in the Maldives.

To assess the members – use the cards. Ask the members to randomly draw a card and place under renewable or non-renewable energy used in the Maldives.

ADDITIONAL INFORMATION

CONVENTIONAL SOURCES

Sources of energy are classified as conventional sources and non-conventional sources. The conventional sources of energy are further classified as commercial and non-commercial.

Commercial conventional energy sources are coal, oil, and natural gas. These are called commercial energy because they have a price and consumers have to pay the price to purchase them. Non-commercial sources include fuel wood, straw and dried dung.

Coal, oil and natural gas are known as 'fossil fuels' because they come from plants and animals that died millions of years ago. Fossil fuels are found deposited in rock formations. They formed between 50 to 350 million years ago when decayed remains of ancient plants and animals were buried by sediments. Over time, heat and pressure within the earth chemically altered the sediments and remains, leaving behind the products of oil, coal and natural gas.

Oil and natural gas are found in beds of sedimentary rock. These sediments were deposited by shallow seas millions of years ago. The remains of plants and animals living in the sea settled to the bottom and were buried under layers of sediment. These layers were subjected to heat and pressure, transforming into beds of rock. The plant and animal remains went through a process of slow chemical change, forming pockets of oil and natural gas.

Oil is mainly used to power motor vehicles and at power stations. Other uses of refined oil include medicines, plastics, glues, detergents, cosmetics and paints. Gas is also used to power vehicles and generate electricity. Many homes and industries use gas as their main source of cooking and heating.

Coal was formed from the remains of ferns, trees and grasses that grew in swamps around 345 million years ago. The plant material continued to decay in layers, forming beds of peat, a soft brown substance that is up to 30% carbon. Peat is the earliest stage of coal formation. Later, shallow seas covered the swamps, depositing layers of sand and mud over the peat. These sediments exerted pressure and over thousands of years, the chemical changes transformed the peat into lignite or brown coal, which is around 40% carbon. Millions of years later, increasing

pressure and heat changed the lignite into bituminous or soft coal that contains around 66% carbon. Finally it became anthracite or hard coal that has over 90% carbon. Coal is mainly used to generate electricity at power stations, however it is also used to produce fertilisers, drugs, dyes, soap, tar, disinfectant and pesticides.

It takes millions of years to create fossil fuels. Because it takes so long, fossil fuels are known as 'non-renewable' energy sources. They can't be replaced in a short time (for example, our lifetime), so once they have been used up, that's it. Fossil fuels can harm the environment. The process of mining them can damage plants and animals, and the process of converting them to electricity can cause pollution. The use of fossil fuels leads to increased greenhouse gas emissions and other environmental damage.

RENEWABLE ENERGY

We use a lot of energy every day so we need good supplies. Mostly, we get energy from non-renewable or conventional sources, such as oil, natural gas, or coal. We extract them from the ground and burn them to power our computers, televisions, cars and planes. Unfortunately, all of this energy use puts a lot of stress on the Earth's natural balance. Furthermore, after we use up the non-renewable sources of energy, it is NOT replaced within our lifetime.

So, what can we do? Luckily, there are many sources of energy in nature that are renewable or can be replaced. They are called non-conventional sources of energy. They are free and will last forever. The sun and wind are two examples. We can harness them to create energy. What's more, they don't cause pollution, and there will always be more.

What does 'renewable' mean?

"Renewable energy is natural energy that can be used again and again and will never run out". Energy from renewable sources means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases."

Source: EU Directive 2003/54/EC

Renewable means that it will not run out. If the sun does not stop shining the wind will keep on blowing. On a windy day, we can capture the wind energy. There are more and more wind farms being used to power towns and cities.

The sun gives us solar energy, the original source of most energy on earth. Without the sun's energy, life as we know it wouldn't exist.

There are five commonly used renewable energy sources. Along with solar and wind energy, the other three common types of renewable energy include hydro, geothermal and biomass energy (wood, wood waste, municipal solid waste, biogas, landfill gas). Other types of renewable energy include the energy from ocean (energy from tide); osmotic power (salinity gradient power) is the energy retrieved from the difference in the salt concentration between seawater and river water; cellulosic ethanol - process of producing enzymes which could enable a cellulosic ethanol, instead of building refineries that can process biomass and turn it into ethanol.

Advantages of Renewable Energy

⊕ It can be used without depleting it.

⊕ All forms of energy are expensive, but as time and technologies progresses, renewable energy generally gets cheaper, while fossil fuels generally get more expensive.

⊕ Renewable energy is healthy and environmentally friendly.

⊕ There is no green gas emissions, no pollution emissions - no contribution to global warming. For example coal emits smoke and chemicals when it is burned to make electricity. Nuclear power plants create radioactive waste that is dangerous for thousands of years. Petrol burned in motorcycles and cars causes emit greenhouse gases and cause pollution. Even natural gas contributes to the pollution problems.

⊕ Some renewable energy sources (wind and solar) don't emit smoke or create pollution when they are used. Others, such as biomass, almost always cause less pollution than fossil or nuclear alternatives.

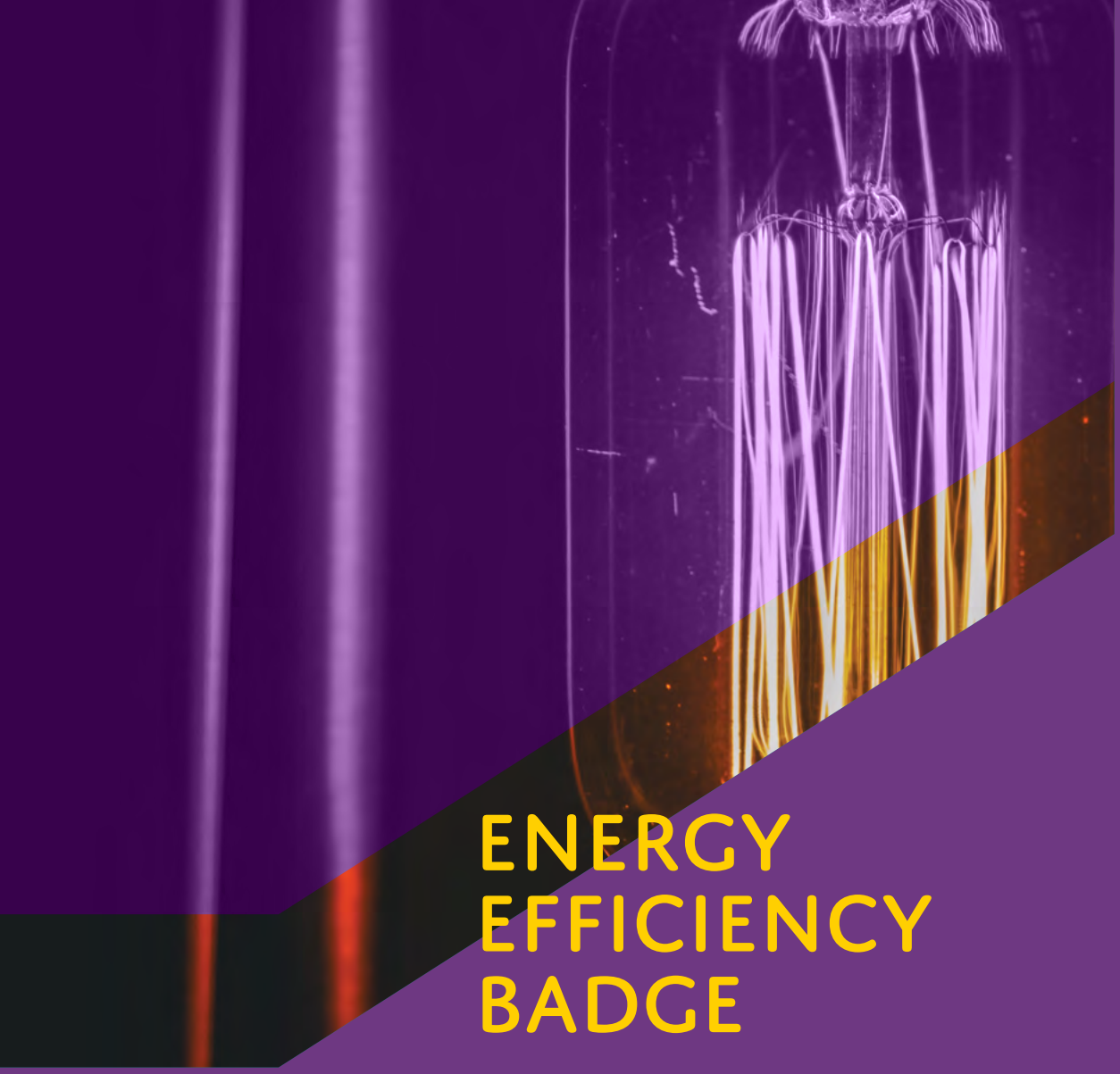
⊕ Renewable energy can be used for power generation, hot water, heating, transport fuels, off-grid energy services.

Disadvantages of renewable energy

⊖ All forms of energy are expensive. This is because it is a new technology and as such has extremely large capital cost.

⊖ It is difficult to generate the quantities of electricity for example that are as large as those produced by traditional fossil fuel generators. So if we use renewable energy we will need to build more energy facilities. The best solution is to have a balance of many different power sources.

⊖ The reliability of supply. Renewable energy often relies on the weather for its source of power: hydro generators need rain to fill dams to supply flowing water; wind turbines need wind to turn the blades; solar collectors need sunshine to collect heat and make electricity. This can be unpredictable.



ENERGY EFFICIENCY BADGE

Level 3

12 TO 17 YEARS

By 2008 people living across the Maldives had access to electricity. The diesel generators across the inhabited islands of Maldives have a combine capacity of about 150 MW. About 60% of the electricity generated in Maldives is for Male' and the Greater Male region. As the population expands and the development activities increases, the demand for electricity rises too. The Government incessantly works towards meeting the consumers' demand for electrical energy.

AIM

The main aim of the activities included in this badge is to enable members to understand possible reasons for increase in energy consumption and how they could effectively reduce energy consumption by using modern technology.

OBJECTIVES

By the end of the activities members will be able to:

1. Estimate the cost of electrical energy used
2. Estimate the electrical energy consumed at a household or business
3. Identify alternative energy saving appliances
4. Calculate the reduction in cost due to energy efficient practices
5. Design a tool to share information on alternative energy saving appliances and practices

Activity 1

OBJECTIVES

By the end of this activity members will be able to:

- Estimate the cost of electrical energy used
- Estimate the electrical energy consumed at a household or business
- Identify alternative energy saving appliances
- Calculate the reduction in cost due to energy efficient practices

Facilitators can conduct any one of the following activities to achieve the objective.

Activity 1A

ESTIMATING THE ELECTRICAL ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity could be conducted in the school. If it is a large school with many classrooms members could work in small groups. Assign few classrooms for each group to gather information. Make it an interactive activity where members work together.

1. Ask the members to collect information on
    a. Number of lights in the classroom and their power rating.
    b. Number of fans in the classroom and their power rating.
    c. Number of hours the lights are kept on every day.
    d. Number of hours the fans are kept running every day.
    e. If there are other electrical appliances in the classroom find their power rating and how long it is used for every day.

2. Calculate
    a. The amount of energy each bulb use every day.
    b. The amount of energy used by each fan every day.
    c. If other appliances are in the classrooms the amount of energy used by each of these appliances.

The following formula can be used for calculating the energy:

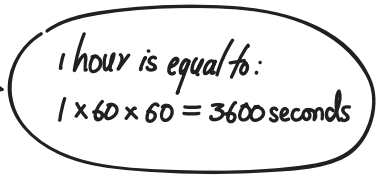
Energy = Power x Time

If we know the power in watts of an appliance and how many seconds it is used we can calculate the number of joules of electrical energy.

E.g. If a 100 watt lamp is turned on for 1 hour, the amount of electrical energy consumed by the lamp is:

Energy = Power x Time

Energy = 100 x 3600 = 360,000 joules



Note: If an electrical appliance has a rating of one watt it means it converts one joule of electrical energy to some other form every single second.

Since the joule is such a small unit, quantities of energy are often given in kilojoules (thousands of joules). Therefore the previous answer could be written as 360 kJ.

The Kilowatt Hour (kWh)

Because the joule is so small, electrical energy supplied to consumers is bought by the UNIT. The UNIT is the kilowatt hour (kWh). One kilowatt hour is the amount of energy that would be converted by a one thousand watt appliance when used for one hour.

E.g. In a class room two fans of 75 W and four 100 W lamps are kept on for 6 hours. How many units (kWh) of electrical energy have been converted?

Total power in kilowatts = {(2x75)/1000} + {(4x100)/1000) = 0.55kW

Energy in kilowatt hours = Power in kilowatts x time in hours

= 0.55 x 6 = 3.3 kilowatt hours (kWh)

3.3kWh is also equal to 3.3 Units.

Hence if the 2 fans and 4 lights are kept on for 6 hours every day for 5 days in a week, the total electrical energy consumed for a week will be:

3.3kWh x 5 days = 16.5 kWh or 16.5 Units

Assuming that each electricity unit cost MVR 4.25, the cost for operating the 2 fans and 4 lights for a week will be:

16.5 Units x 4.25 Rufiyaa = MVR 70.13

Assuming that in a month there are 4 weeks the cost of lighting one classroom for a month will be:

70.13 Rufiyaa x 4 weeks = MVR 280.50

1A. Estimating the Electrical Energy

The following activity will help you estimate the amount of electrical energy that is required to keep a classroom lit and cool over a month and how much it costs.

Working in groups complete the following table of appliances for a single classroom in your school. Calculate the energy consumed.

One Classroom	Total Number	Power of each (W)	Total Power of all (W)	Total Power of all (kW)	Number of hours it is used every day (hrs)	Number of hours it is used for a month (hrs)
Bulbs						
Fans						
Air Conditioners						
Projector						
TV						
Smart board						

Add more rows depending on the different electrical appliances used in the classroom of your school.

Ask the members to calculate the electrical energy used for a single classroom by finding the total energy consumed by each appliance over a month separately and by adding all together.

Total energy consumed by each appliance = total wattage of the appliance (kW) x total number of hours they were used over a month

The calculated values would give you the amount of energy consumed in kWh which is also equal to a Unit - i.e.: 1 kWh = 1 Unit of electricity.

After finding this for each appliances separately add and use the total to calculate cost of operating a single classroom in your school.

Ask from your instructor the cost for 1 Unit of electricity. Using this figure calculate the cost of operating a single classroom for one month.

You can calculate by using the equation:

Total cost (MVR) = Cost of 1 Unit of electricity (MVR) x total number of Units of electricity used during a month.

Once you have calculated the cost for operating the lights and fans estimate the total cost for keeping the classrooms lit and cool by finding the sum of the two values. Share your estimated values with your instructor and peers.

Discuss ways to reduce electricity consumption and options to reduce the spending on electricity.

SAVING ELECTRICAL ENERGY

1. Identify what types of lights are used in the school.

2. Estimate how much money could be saved if the school lights are replaced with energy saving or LED lights.

At the end of this activity ask the members to conduct an energy audit of the classrooms and make a proposal indicating how much money could be saved by the school management by just following some energy saving practices.

INFORMATION FOR INSTRUCTOR

Ways to save on the school electricity bill.

1. Turn off lights and fans when not needed.

2. Use energy saving or LED lights instead of ordinary lights. LED and CFL bulbs use much less electrical energy and lasts much longer. LED bulbs last over 10 times longer than incandescent bulbs and use 20% less electricity.

3. Only switch on the lights that are required.

4. Keep the doors and windows to allow maximum light into the classroom and air to circulate – that is if the room is not air conditioned.

5. Use fans when necessary only.

6. Use dimmer switches for both lights and fans.

Activity 1B

ESTIMATING MY ELECTRICAL ENERGY FOOTPRINT

By the end of this activity members will have an idea of approximately how much energy they consume over a week, a month and then a year. This activity will also help them recognize the amount of money their parents spend on energy.

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity can be conducted as a pair activity or an individual activity. In pairs they can discuss and help each other to complete the tables.

1. Distribute copy of the grid or use graph paper to make a floor plan of the member home. Include in the floor plan all the electrical items that they use in different rooms. Eg: in the toilet they may have lights, exhaust fan and water heater. Similarly include electrical items they use in other rooms as well.

2. Once the floor plan of electrical items are completed ask them to list the items they use at school and home in the table. Complete the table.

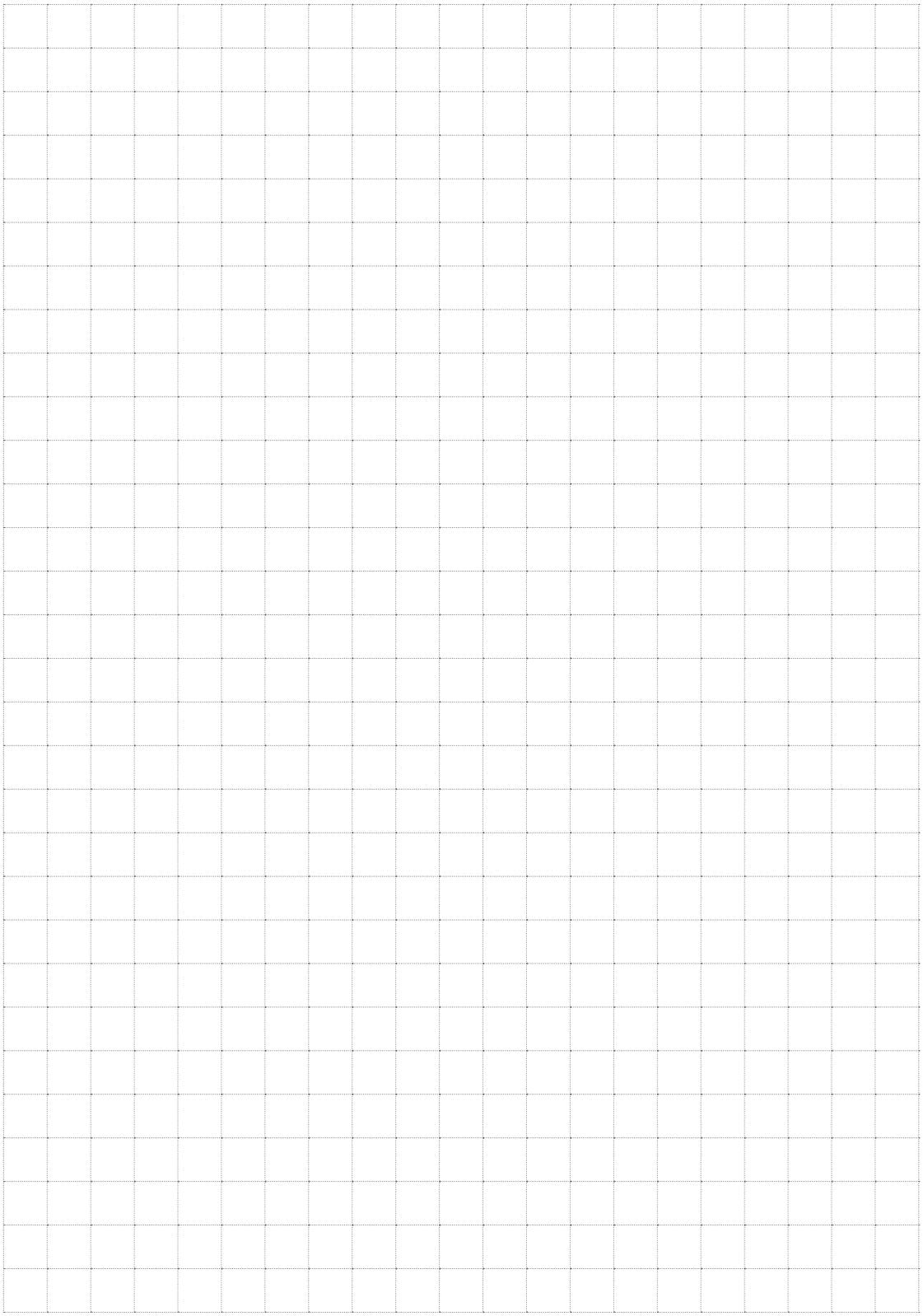
3. Using the completed table calculate the total amount of energy (Number of Units) used per week.

4. Find the amount of electrical energy used by the member for a week.

5. Estimate how much it will cost for their parents to buy the calculated amount of energy.

1B. Estimating your electrical energy footprint

Draw the floor plan of your home in the grid below and include the electrical items that you use in different parts of your home.



List out all the electrical items you use every day for a week and complete the table below. (An example is provided below).

Electrical Items	Power	Su	Mo	Tu	We	Th	Fr	Sa	Total
	W	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs
At School									
2 Fans	75x2= 150	6	6	6	6	6	0	0	30
At Home									
Fridge									
Tv									
Computer									
Bedroom lights									

Answer the following questions based on the information you have gathered:

1. What is your electrical energy usage for one week?

2. What is the cost of energy for one week?

3. At the above energy consumption rate for one week, estimate how much is spent on electrical energy for a year.

4. How is energy usage at home different from energy usage in school?

5. What three appliances consume the most electrical energy at your home?

6. Does an appliance or device that has a high wattage always use most electrical energy over one week? Explain your findings.

7. List 5 things that you observed from your home that contributes to waste of energy.

8. List 5 things that you could do to reduce the amount of electrical energy used in your home.

Below are 4 different kinds of light that you could use for lighting your house.

Incandescent Bulb

Energy Used	60 Watts
Brightness	850 lumens
Life of Bulb	1,000 hours

Halogen Bulb

Energy Used	43 Watts
Brightness	850 lumens
Life of Bulb	3,000 hours

Compact Fluorescent (CFL)

Energy Used	13 Watts
Brightness	850 lumens
Life of Bulb	10,000 hours

Light Emitting Diode (LED)

Energy Used	12 Watts
Brightness	850 lumens
Life of Bulb	25,000 hours

1. **Compare the cost of the four different types of bulbs of similar brightness with its lifetime, wattage and price in the Maldives.**

Bulb Type	Incandescent	Halogen	CFL	LED
Brightness				
Wattage				
Price				
Lifetime				

2. **Assuming that you have to keep a room lit for 6 hours every day for one month using a bulb of 850 lumens calculate how much it will cost for you to keep the room lit using the four different types of bulbs. Complete the table below as you proceed with the calculations.**

   Assume that each electricity Unit cost MVR 3.00.

Bulb Type	Incandescent	Halogen	CFL	LED
Brightness	850 lumens	850 lumens	850 lumens	850 lumens
Wattage	60 Watts	43 Watts	13 Watts	12 Watts
Total Hours (6hrs x 30 days)	180 hours	180 hours	180 hours	180 hours
Total electricity consumption (kWh)				
Total number of electricity in Units				
Cost of keeping the light on for 6 hours for 1 month				

3. How many lights (bulbs and tubes) are used at your home?

4. Check the types of lights that you have at home and complete the table below.

Bulb Type	Incandescent	Halogen	CFL	LED
Number				

5. If you replace all the lights in your home with LED lights calculate how much money your family could save every month.

Activity 1C

ENERGY CONSUMED AT A HOUSEHOLD OR A BUSINESS

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity could be conducted for households or businesses such as retail shops, cafes, restaurants, etc. Members should work in groups to meet the requirement for this activity. Make it an interactive activity where members work together to achieve the objectives. Help them to become more socially responsible people. There are two main parts to this activity.

1. Ask the members to collect information on

    a. Electrical appliances used at the households and/or businesses and fill the table. (An example is provided)

Electrical appliances	Wattage (kW)	Hours used / week	Energy consumed (kWh)	Alternative appliances Wattage (kW)	Energy consumed (kWh)	Energy saved (kWh)
1. 8 bulbs	8x(75/1000) =0.6	56	0.6 x 56 =33.6	8 energy saving bulbs - 15W = 0.12	0.12 x 56 = 6.72	33.6 - 6.72 = 26.88

    b. Alternative energy saving appliances that could be used.

    c. How much energy could be saved in using these alternative appliances?

    d. The average cost for a unit of electricity and estimate how much the household/or business could save every month

Sample sheet for appliances

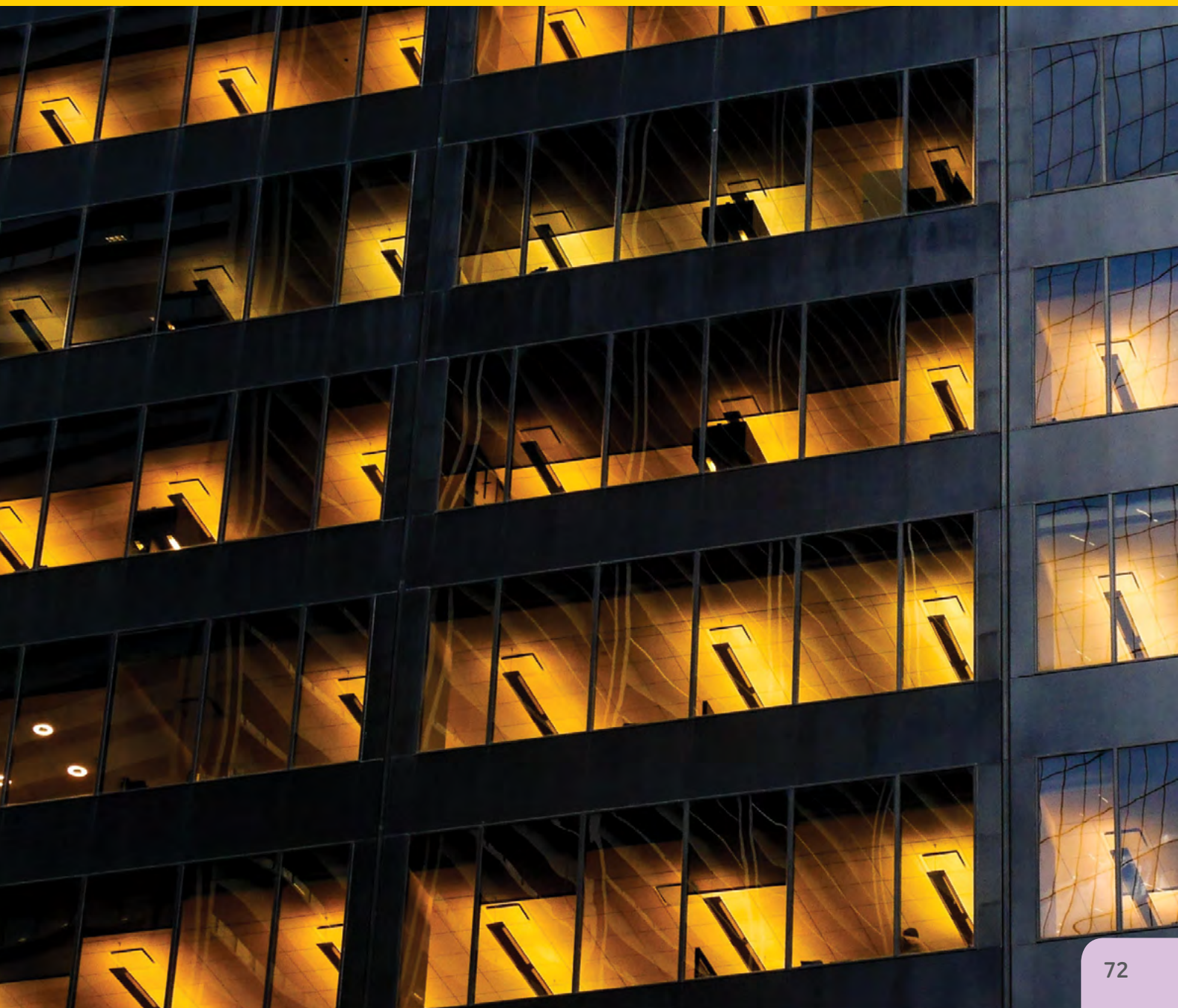
You could use this sample to make the list of items used at home or businesses.

Appliances	Number of appliances	Average wattage	Hours used per day	Number of days used per year
Office light fitting		65		
Small air conditioner		2000		
Large air conditioner		6500		
Ceiling fan		100		
Computer		300		
Laser printer		850		
Photocopier		250		
Fax machine		700		
Water cooler				
Stove		6000		
Commercial fridge		500		
Domestic fridge		320		
Boiling water		2400		
Hot water		3600		
Electronic Whiteboard				
Data projector				
Other				

Activity 2

OBJECTIVE

By the end of this activity members will be able to design a tool to share information on alternative energy saving appliances and practices.



Facilitators could conduct any one of the following activities to achieve the objective.

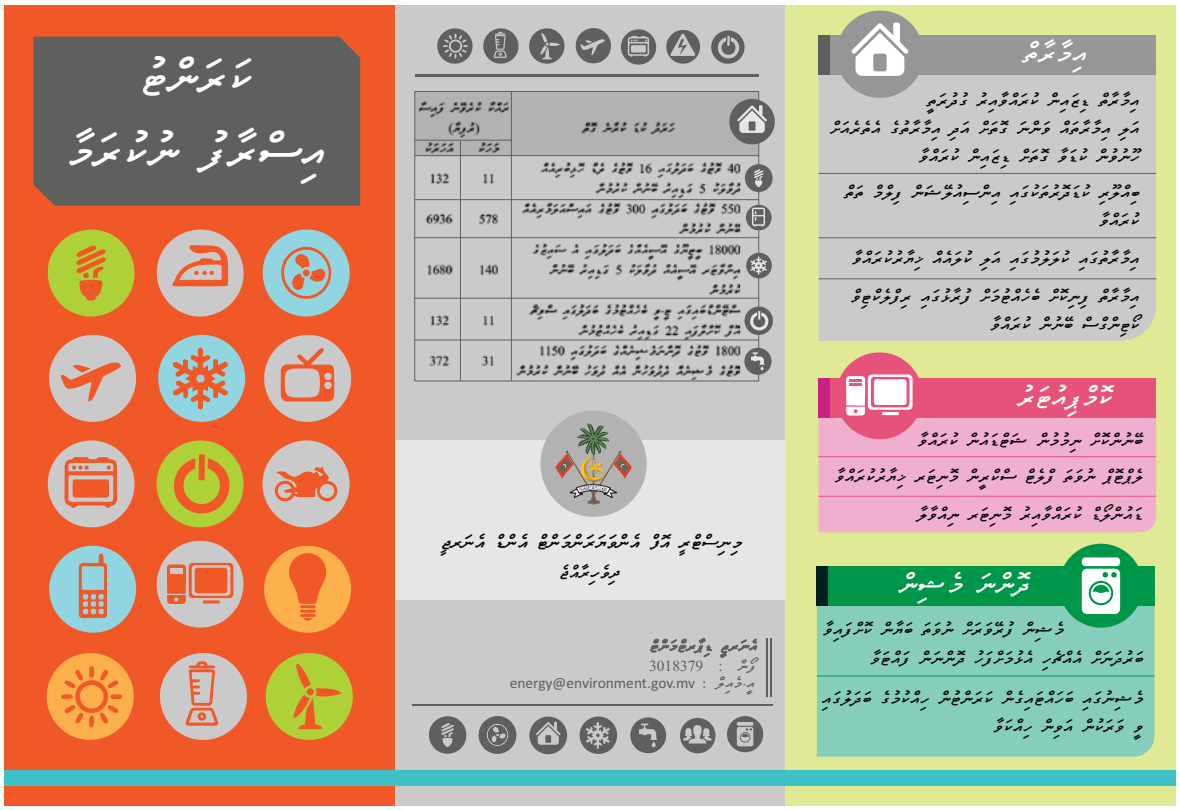
Activity 2A

ESTIMATING THE ELECTRICAL ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Design a leaflet or poster or billboard showing how energy efficient appliances and energy conservation could save money for the consumers. This information can be distributed to community with the help of printed leaflets, billboards put up outside the school, through social media or any other media that is most appropriate and accessible for the members. Ask the members to make the materials in Dhivehi.

Examples of such awareness materials



Install energy measures for further savings

The Nest scheme (see overleaf) has been launched in Wales to support those in fuel poverty through installing measures to keep warmth in the home, such as:

Cavity Wall Insulation: CWI significantly reduces the amount of energy you need to heat your home and saves around £110 a year on fuel bills.

Solid Wall Insulation: Insulating solid walls with external or internal insulation saves around £375 a year on your energy bills

Loft Insulation: If you don't already have insulation in your loft you could save around £145 a year on your bills by installing it, or top up your existing loft insulation to 270mm.

Tanks and pipe insulation: Both tank and pipe insulation keep your water hotter for longer by reducing the amount of heat that escapes.

Double Glazing: Creates an insulating barrier that reduces heat loss, noise and condensation.

Micro renewables to generate your own energy: Installing solar panels, wind turbines, and heat pumps in your own home has never been easier and there are grants available to help fund their installation. Some energy companies and installers are offering to install free micro renewables AND you'll receive free energy! Contact your energy company to find out if you are eligible for a free micro renewable scheme.

Find out more about energy efficient installations and grants by contacting your energy company or visiting:
www.torfaenhomes.co.uk
www.energysavingtrust.org.uk

Grants and information

Nest is the Welsh Assembly Governments flagship scheme to combat fuel poverty in Wales. If you are finding it difficult to pay your energy bills you may eligible to access free energy efficiency improvements including loft and cavity wall insulation, draft proofing and boiler replacement. Nest also provides callers with guidance on benefit entitlement, energy tariffs and money management. For energy advice and eligibility for the Nest scheme visit: **www.nestwales.org.uk** or telephone **0800 512 012**

Resident of Torfaen? Complete a home energy use survey

There are a number of ways to improve the energy efficiency of your home and Torfaen County Borough Council is keen to support residents to achieve this. As part of this on-going process, the Council are gathering information about the energy efficiency of homes throughout the borough. If you are a resident of Torfaen you can help by completing an online survey.
Visit:
http://www.forms.torfaen.gov.uk/homeenergy/survey.htm

Useful Contacts

For free, independent and local energy saving advice and to find out more about energy efficient installations including insulation, micro renewables and grants:
Energy Saving Trust: 0800 512 012
www.energysavingtrust.org.uk

For information on Nest, Wales's New Fuel Poverty Scheme grant and advice:
Nest: 0800 512 012
www.nestwales.org.uk

For further information on energy saving, installations and to fill out a home energy use survey visit:
Torfaen Homes:
www.torfaenhomes.co.uk

Make your home energy efficient

Save energy
Save money
Save your environment

Why should my home be energy efficient?

Simple changes to your daily habits can save you money each month and help the environment. Using energy from fossil fuels (oil, gas, and coal) in the home releases carbon dioxide into the environment—the gas most responsible for climate change. Climate change will bring more extreme weather to the UK, including stormier and wetter weather with more widespread flooding. It will effect everybody in the UK.

Fossil fuels wont last forever and prices will increase as supplies dry up. In contrast, **renewable energy** – such as wind, water, solar and geothermal energy are clean non-pollutant sources of energy and will never run out!

Micro renewable installations such as solar panels, wind turbines and heat pumps generate free renewable energy for your own home. With the deals and grants currently on offer (in some cases free) it is worth considering installing these in your own home.

What can I do?

We can all act now to reduce the effects of climate change! By taking on one of the following energy saving tips you will help to reduce your **carbon footprint** and save money on your energy bills!

Become energy efficient and save money

That's right, you can save energy and money at no additional cost to yourself! The biggest long-term savings come from changing your energy habits and being more energy efficient around the home.

- **Switch OFF lights** and appliances when they are not needed. Stand-by still uses energy.
- **Don't fill the kettle** with more water than you need, it wastes money, time and energy.
- **Turn DOWN your heating-** Turning down your thermostat by 1 degree can save up to 10%
- **Reduce your hot water temperature** to 60 degrees, which is adequate for washing and bathing.
- **Only wash full loads** in washing machines and dishwashers - saving detergent, energy, money and water.
- **Fix leaking taps**– a dripping hot water tap wastes energy and in one week wastes enough hot water to fill half a bath.
- **Use energy saving light bulbs–** they last up to 10 times longer than ordinary bulbs, and using one can save you around £45 over the lifetime of the bulb.
- **Do a home energy check.** By answering a few questions about your home the Energy Saving Trust will give you a free, impartial report telling you how you can save money and energy

Visit: www.energysavingtrust.org.uk

How can I change my energy supplier?

Changing your energy supplier can also save you hundreds of pounds a year.

Step 1
Find out your how much you spent on gas and electricity in the past year by looking at your previous bills.
Decide if you want to change both your gas and electricity supplier– duel fuel deals are often cheaper.

Step 2
Enter your details into a price comparison website which is approved by the **Consumer Focus Confidence Code** to compare energy supplier prices and tariffs. Visit **www.consumerfocus.org.uk** for a list of approved sites. Some comparison sites also offer discounts and rewards for switching through them.

Step 3
Choose a new energy supplier/tariff and begin saving! There will be no interruption to your gas or electricity supply while you are switching.

Make changes to your tariff

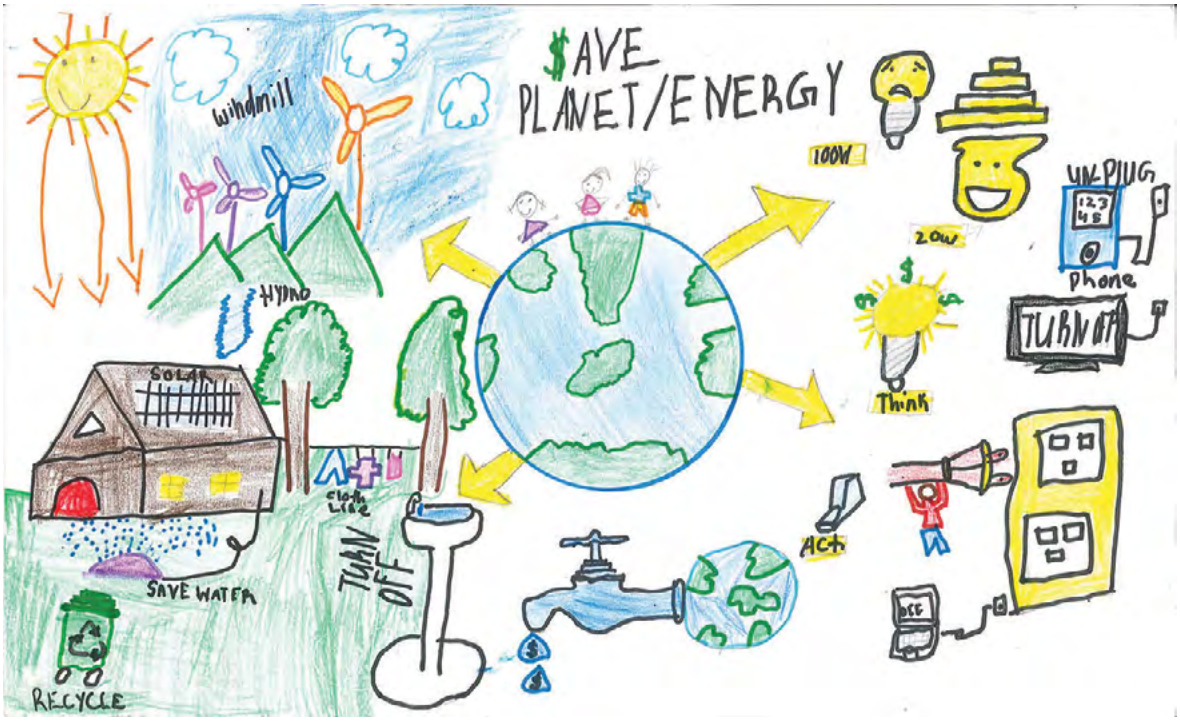
Switch to monthly direct debit: fixed monthly direct debit payments can save you 5-10%

Read your meter every time you receive a bill. Your energy provider's estimate may be wrong.

Switch to your companies internet tariff: save up to 10% for having your bills e-mailed to you.

Speak to your energy company: special tariffs are available for those in financial hardship and your company can provide you with advice on saving energy.

Source: Make your home energy efficient. (n.d.). Torfaen Homes, pp.1-2. Available at: https://bit.ly/2GaqGf3 [Accessed 6 Dec. 2018].



Source: Save energy poster. (2015). [image] Available at: https://stories.pplelectric.com/2015/02/05/powerful-artwork/ [Accessed 6 Dec. 2018].

Activity 2B

APPLIANCES THAT HELP SAVE ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Make a 2 to 3 minutes video clip on energy efficient appliances that helps save money for the consumers. This information can be distributed to community by sharing the video clip on social media or any other media that is most appropriate and accessible for the members. Ask the members to make the video clip in Dhivehi.

Examples of some Youtube video links are below.

How to Save Energy In Your Home
https://youtu.be/bVYNmc_Q8Bc

How to Conserve Energy at Home
https://youtu.be/iMx-0Sz3Afo

Making Your Home More Energy Efficient
https://youtu.be/t_HVvbej3aI

Energy Saving Tips: 5 quick ways to stop air leaks
https://youtu.be/qogOn-IQrjc

Activity 2C

APPLIANCES THAT HELP SAVE ENERGY

SUGGESTIONS ON CONDUCTING THE ACTIVITY

For this activity members choose one house hold (it can be their own, relative or a friend's household).

- Conduct a quick study of the electrical appliances used at the selected household. Ask questions about how the electrical appliances are used too.
- Make a two page report on the appliances used at the selected household and the alternative energy efficient electrical appliances available that could help reduce the energy bill.
- After completing the two page sheet – present it to the selected household and explain to them how they could reduce their spending on energy.
- As further activity members could check on the household (after 2 to 3 months) to see whether there have been any positive impact towards reducing energy usage.

ADDITIONAL INFORMATION

SAVING ENERGY

Lighting

- Turn off the lights when not in use
- Take advantage of daylight by using light-colored, loose-weave curtains on your windows to allow daylight to penetrate the room. Also, decorate with lighter colors that reflect daylight
- De-dust lighting fixtures to maintain illumination
- Use task lighting; instead of brightly lighting an entire room, focus the light where you need it
- Compact fluorescent bulbs are four times more energy efficient than incandescent bulbs and provide the same lighting
- LED light use much less energy that most energy saving bulbs that you find in the shops

Fans

- Replace conventional regulators with electronic regulators for ceiling fans
- Install exhaust fans at a higher elevation than ceiling fans

Electric iron

- Select iron boxes with automatic temperature cutoff
- Use appropriate regulator position for ironing
- Do not iron wet clothes
- Do not put more water on clothes while ironing

Mixers

- Avoid dry grinding in your food processors (mixers and grinders) as it takes longer time than liquid grinding

Microwaves ovens

- Consumes 50% less energy than conventional electric/gas stoves
- Do not bake large food items
- Unless you're baking breads or pastries, you may not even need to preheat
- Don not open the oven door too often to check food condition as each opening leads to a temperature drops

Electric stove

- Turn off electric stoves several minutes before the specified cooking time
- Use flat-bottomed pans that make full contact with the cooking coil

Gas stove

- When cooking on a gas burner, use moderate flame settings to conserve LPG
- Remember that a blue flame means your gas stove is operating efficiently
- Yellowish flame is an indicator that the burner needs cleaning
- Use pressure cookers as much as possible
- Use lids to cover the pans while cooking
- Bring items taken out of refrigerators (like vegetables, milk etc) to room temperature before placing on the gas stove for heating
- Use Solar Water Heater – a good replacement for an electric water heater

Electronic Devices

- Do not switch on the power when TV and Audio Systems are not in use i.e. idle operation leads to an energy loss of 10 watts/device

Computers

- If your computer must be left on, turn off the monitor; this device alone uses more than half the system's energy.

- Turn off your home office equipment when not in use. A computer that runs 24 hours a day, for instance, uses - more power than an energy-efficient refrigerator.

- Setting computers, monitors, and copiers to use sleep-mode when not in use helps cut energy costs by approximately 40%.

- Battery chargers, such as those for laptops, cell phones and digital cameras, draw power whenever they are plugged in and are very inefficient. Pull the plug and save.

- Screen savers save computer screens, not energy. Start-ups and shutdowns do not use any extra energy, nor are they hard on your computer components. In fact, shutting computers down when you are finished using them actually reduces system wear – and saves energy

Refrigerator

- Regularly defrost manual-defrost refrigerators and freezers; frost buildup increases the amount of energy needed to keep the motor running.

- Leave enough space between your refrigerator and the walls so that air can easily circulate around the refrigerator

- Do not keep your refrigerator or freezer too cold

- Make sure your refrigerator door seals are airtight

- Cover liquids and wrap foods stored in the refrigerator. Uncovered foods release moisture and make the compressor work harder.

- Do not open the doors of the refrigerators frequently

- Do not leave the fridge door open for longer than necessary, as cold air will escape.

- Use smaller cabinets for storing frequently used items

- Avoid putting hot or warm food straight into the fridge

Washing machines

- Always wash only with full loads

- Use optimal quantity of water

- Use timer facility to save energy
- Use the correct amount of detergent
- Use hot water only for very dirty clothes
- Always use cold water in the rinse cycle
- Prefer natural drying over electric dryers

Air Conditioners

- Prefer air conditioners having automatic temperature cut off depending on the activities/persons in the room
- Keep regulators at “low cool” position
- Operate the ceiling fan in conjunction with your window air conditioner to spread the cooled air more effectively throughout the room and operate the air conditioner at higher temperature
- Seal the doors and windows properly
- Leave enough space between your air conditioner and the walls to allow better air circulation
- A roof garden can reduce the load on Air Conditioner
- Use windows with sun films/curtains
- Set your thermostat as high as comfortably possible on hot days. The less difference between the indoor and outdoor temperatures, the lower will be energy consumption.
- Do not set your thermostat at a colder setting than normal when you turn on your air conditioner. It will not cool your home any faster and could result in excessive cooling.
- Do not place lamps or TV sets near your air-conditioning thermostat. The thermostat senses heat from these appliances, which can cause the air conditioner to run longer than necessary.
- Plant trees or shrubs to shade air-conditioning units but not to block the airflow. A unit operating in the shade uses as much as 10% less electricity than the same one operating in the sun.

ENERGY EFFICIENCY BADGE

Level 4

18 TO 25 YEARS

Maldives heavily depend on imported oil to meet its energy demand. In 2012 about 481,577 metric tons of fuel was imported. About 40% of the imported diesel is used for generating electricity in the inhabited islands. The energy that is used for daily activities costs a lot of money. In 2016 about 3.5 billion rufiyaa was spent on fuel. An energy efficient lifestyle will not only help save money but also help the environment as less greenhouse gases will be released into the atmosphere. Burning of fossil fuel releases carbon dioxide – a greenhouse gas that has been around on Earth for as long as there has been an atmosphere. The greenhouse gases in the atmosphere help to keep the Earth warm making it possible for living things to thrive. But when these gases increase and trap too much of the Sun's heat it can cause global warming. Maldives, being a low lying island state, is one of the countries' that will be most affected by global warming.

AIM

The main aim of the activities included in this badge is to enable members to conduct an energy audit and to estimate the amounts of greenhouse gas released into the atmosphere. This would enable them take positive steps towards reducing energy consumption and in turn minimizing the release of carbon dioxide into the atmosphere.

OBJECTIVES

By the end of the activities members will be able to:

1. Conduct an energy audit for a complete household
2. Suggest ways to reduce energy usage by members of the household
3. Promote energy conservation within the community
4. Calculate amount of greenhouse gas emission from their home
5. Suggest ways to reduce greenhouse gas emission
6. Describe effects of increasing greenhouse gases in the atmosphere
7. Write a research report based on information gathered by the members

Activity 1

OBJECTIVES

By the end of this activity, members will be able to:

- Conduct an energy audit
- Suggest ways to reduce energy usage
- Promote energy conservation within the community
- Calculate amount of greenhouse gas emission
- Suggest ways to reduce greenhouse gas emission
- Describe effects of increasing greenhouse gases in the atmosphere
- Write a research report based on information gathered by the members

Facilitators can conduct any one of the following activities to achieve the objective.

Activity 1A

HOUSEHOLD ENERGY AUDIT

PART 1

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity will look at energy usage at home and during their work and other activities. There are several parts to this activity. Each part is linked to the next activity. To successfully achieve the objectives members need to complete all the activities. It is also hoped that by the end of this activity those conducting the activity and the household will become more aware of wastage of energy and ways to save energy, in turn reduce their spending on energy.

- This activity can be carried out as a group activity.
- Select any one household. It can be one of the members' home.
- Study the energy usage by the family members of the household and propose ways to reduce energy consumption and save on energy spending.
- Once a household is selected ask the members to collect information on the electrical appliances and other devices/ equipment/vehicles that use energy.

1. The electrical appliances used at home. Their type, rating and usage.

Appliances	Power Rating	Operating hours / day	Unit per month	Monthly Cost
Bulbs				
Tube lights				
LEDs				
Table lamps				
Fans				
Air conditioners				
Refrigerator				
Mixer / blender				
Oven				
Toaster				
Hot plate				
Microwave				
Insect repellent				
Electric kettle				
Immersion heater				
Electric iron				
Washing machine				
Appliances				
Water pump				
Water heater				
TV				
Audio system				

Appliances	Power Rating	Operating hours / day	Unit per month	Monthly Cost
Game station				
Computer				
Others				

2. Collect information on how the appliances and equipment are used. Include information such as

   a. How often are the appliances used?

   b. Do they leave it running even if no one is using the appliances?

   c. If rooms are air conditioned – are the rooms properly insulated?

   d. How is the refrigerator used?

   e. Are the computers left on even if no one is using them?

   f. Are there any appliances on standby?

PART 2

SUGGESTIONS ON CONDUCTING THE ACTIVITY

The level of greenhouse gas emissions varies depending on the type of fuel that is used. If you use renewable resources, the emissions can be much lower.

1 kilogram of greenhouse gas would take up the space of a family fridge.

1 tree takes up approximately 268 kilograms of CO_2 per year.

It is quite easy work out how much greenhouse gas is emitted from the use of various fuels. Use the following figures as an average coefficient for the Maldives.

Electricity I kWh = 0.96 kg CO_2

Gas I MJ = 0.07 kg CO_2

Transport: I litre petrol = 2.3 kg CO_2

Calculate the greenhouse gas emissions from energy use at home.

A watt (W) is a unit of measurement used for calculating energy use. To calculate the energy used in one kilowatt hour (kWh) the watts are divided by 1000. For example, if an appliance uses 2400W constantly for one hour then the energy used is 2.4 kWh. In the Maldives, for every 1kWh of electricity used from diesel generators, around 1kg of carbon dioxide is released into the atmosphere.

Use the sheet below to calculate how many kilograms of CO_2 would be produced by using these appliances for 1hr.

Electrical Appliance	Watts	Kilowatt Hour (kWh)	Greenhouse Gas Emission per kWh	Total Greenhouse Gas Emissions (kg)
Stereo				
Printer				
Hair Dryer				
Oven				
Air Conditioner				
Electric Hot Water System				
Washing Machine				
Other				

INFORMATION FOR INSTRUCTOR

CLIMATE CHANGE

What is climate change?

The global average temperature has increased by around 0.6°C during the past 100 years. The recent warming trend is greater than any other 100 year change recorded in the past 1000 years. During the last ice age sea levels were much lower as most of the water was contained in ice.

If the amount of greenhouse gases currently released into the atmosphere are not significantly reduced, scientists expect dramatic rises in temperature over the next century. It is projected that average temperature by 2070 will be between 1-6°C higher. A warming of the world climate will have enormous consequences for humans, economies and the environment. Some of the projected changes are;

- Continued melting of ice sheets- resulting in rising sea levels
- Change in ecosystems- plants and animals may become extinct
- Extreme weather patterns and events- more intense rainfall, floods, landslides and storm surges; increased droughts and wildfires.

Many factors influence the earth's climate however there is a lot of evidence to suggest that the more recent warming is directly linked to human activities enhancing the greenhouse effect. Reducing greenhouse gas emissions will help to minimise the extent of climate change.

What is the Greenhouse Effect?

The greenhouse effect is a natural occurrence where gases in the atmosphere regulate the surface temperature on earth. These greenhouse gases act like a blanket trapping heat from the Sun's energy that would otherwise be lost in space. The greenhouse gases keep the temperature on Earth at an average of 16°C. Without these gases the earth's surface temperature would be the same as on the Moon, about -18°C, too cold to sustain life on our planet.

How the Greenhouse Effect Works?

The atmosphere is like an open window to the Sun's energy. When solar radiation reaches the surface of our planet some of the radiation is reflected but most is absorbed by the land and ocean causing the Earth to warm. The warmth is then released back into the atmosphere in three ways;

1. By warming the surrounding air
2. Evaporating surface moisture
3. Reflecting infrared radiation back into the atmosphere.

The greenhouse gases in our atmosphere water vapour, carbon dioxide, methane, chlorofluorocarbons and nitrous oxide also absorb the Sun's energy and re-emit it in all directions. The increase in gas emissions results in more radiation being trapped and redistributed leading to an increase in the atmosphere's temperature. This is known as an enhanced greenhouse effect and is one factor contributing to global warming.

Greenhouse gases

The greenhouse effect is enhanced by the emission of too many greenhouse gases. Although there are only small amounts of such gases in the Earth's atmosphere, they trap a significant part of the heat that is radiated from the earth's surface. Water vapour, which is simply water that has evaporated, is the most abundant and important greenhouse gas. It is responsible for about 60% of the total greenhouse effect. Most of the remaining 40% of greenhouse gases build up and remain in the atmosphere for years after they have been emitted. Some of them include;

Carbondioxide (CO_2) is produced when fossil fuels such petroleum, coal and natural gas is burnt. CO_2 is also increased as more trees are cleared, this is because trees usually take up CO_2 to produce oxygen. CO_2 accounts for about 73% of greenhouse emissions. Next to water vapour CO_2 is the most abundant greenhouse gas.

Methane (CH_4) is released from biological processes such as the digestive systems of grazing animals, bacteria in swamps, from rice paddies and even rubbish dumps. Methane accounts for around 22.9% of emissions.

Chlorofluorocarbons (CFC's) are gases that have been used for refrigeration, air conditioning and propellants (aerosol cans). They have been banned from imports or production in the Maldives. However, they are still found in many older products. Although they only represent 0.6% of greenhouse gas emissions, CFC's trap the suns energy 10,000 times more than CO_2 and contribute to the depletion of the ozone layer.

Nitrous oxide (NOx) is released from the use of nitrogen fertilisers, agricultural burning and chemical reactions in car engines and power stations. There are a number of different forms of Nitrogen oxides such as NO_2, NO_3, N_2O so it is often written as NOx. NOx accounts for 3.1% of greenhouse gases.

PART 3

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Ask the members to compile a report on ONE of the following.

1. Based on the findings in Activity 1 write a report on the energy audit and propose ways to save energy for the household or business they have studied. In their report they could include calculations, graphs, figures and other information that could support their arguments. For example use of alternative appliances/equipment, changes to way of life, better insulation for air conditioned rooms, or more efficient use of appliances/ equipment.

2. Based on the findings in Activity 2 write a report on greenhouse gas emissions. Present the findings in a report with appropriate graphs or make a wall chart / poster to display the findings.

3. Conduct a literature review and write a report on climate change impacts to small island states OR on energy efficiency.

Activity 1B

FACTORY ENERGY AUDIT

PART 1

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity will look at energy usage at a small factory. There are several parts to this activity. Each part is linked to the next activity. To successfully achieve the objectives members need to complete all the parts. It is also hoped that by the end of these activities those conducting the activities and the owner will become more aware of wastage of energy and ways to save energy, in turn reduce their spending on energy.

- This activity can be carried out as a group activity.
- Select any one factory. It can be a medium size facility on an island or a larger factory such as a fish processing plant.
- Study the energy usage by the factory by looking at different activities carried out at the factory.
- Once a factory is selected ask the members to collect information on the electrical appliances and other devices/ equipment/vehicles that use energy. If the factory produces their own electricity it may be easier to collect this information from the power plant.

The electrical appliances used at the factory. Their type, rating and usage.

Appliances	Power Rating	Operating hours / day	Unit per month	Monthly Cost
Bulbs				
Tube lights				
LEDs				
Table lamps				
Fans				
Air conditioners				
Refrigerator				

Collect information on how the appliances and equipment are used. Include information such as

a. How often are the appliances used?

b. Do they leave it running even if no one is using the appliances?

c. If rooms are air conditioned – are the rooms properly insulated?

d. How is the refrigerator used?

e. Are the computers left on even if no one is using them?

f. Are there any appliances on standby?

Discuss and develop the questions to gather information depending on the situation. Conditions and use of appliances will vary from size and location of the factory.

PART 2

SUGGESTIONS ON CONDUCTING THE ACTIVITY

The level of greenhouse gas emissions varies depending on the type of fuel that is used. If you use renewable resources, the emissions can be much lower.

1 kilogram of greenhouse gas would take up the space of a family fridge.

1 tree takes up approximately 268 kilograms of CO_2 per year.

It is quite easy work out how much greenhouse gas is emitted from the use of various fuels. Use the following figures as an average coefficient for the Maldives.

Electricity 1kWh = 0.96 kg CO_2

Gas 1 MJ = 0.07 kg CO_2

Transport: 1 litre petrol = 2.3 kg CO_2

Calculate the greenhouse gas emissions from energy use in the factory.

A watt (W) is a unit of measurement used for calculating energy use. To calculate the energy used in one kilowatt hour (kWh) the watts are divided by 1000. For example, if an appliance uses 2400W constantly for one hour then the energy used is 2.4 kWh. In the Maldives, for every 1kWh of electricity used from diesel generators, around 1kg of carbon dioxide is released into the atmosphere.

Use the sheet below to calculate how many kilograms of CO_2 would be produced by using these appliances for 1hr.

Electrical Appliance	Watts	Kilowatt Hour (kWh)	Greenhouse Gas Emission per kWh	Total Greenhouse Gas Emissions (kg)
Bulbs				
Tube lights				
LEDs				
Fans				
Air Conditioner				
Refrigerators				
Washing Machine				
Other				

PART 3

SUGGESTIONS ON CONDUCTING THE ACTIVITY

Ask the members to compile a report.

1. Based on the findings in Activity 1 write a report on the energy audit and propose ways to save energy for the household or business they have studied.

   In their report they could include
   - calculations,
   - graphs,
   - figures and
   - other information that could support their arguments.

   For example use of alternative appliances/equipment, changes to way of life, better insulation for air conditioned rooms, or more efficient use of appliances/equipment.

2. Include in the report the impact of this factory on the climate change and how environment friendly are the products made at the factory. For example the carbon footprint of the factory.

Activity 1C

TOURIST RESORT/HOTEL ENERGY AUDIT

SUGGESTIONS ON CONDUCTING THE ACTIVITY

This activity will look at energy usage at a small resort/hotel. There are several parts to this activity. Each part is linked to the next activity. To successfully achieve the objectives members need to complete all the parts. It is also hoped that by the end of these activities those conducting the activities and the owner will become more aware of wastage of energy and ways to save energy, in turn reduce their spending on energy.

- This activity can be carried out as a group activity.
- Select a tourist resort/hotel. Speak with the management to obtain their cooperation.
- Once a resort/hotel is selected ask the members to collect information on the electrical appliances and other devices/ equipment/vehicles that use energy.
- Study the energy usage by the resort/hotel by looking at different activities carried out at the resort.
- Calculate the total amount of greenhouse gas emissions from the resort.
- Write a research report on the studied resort and suggest ways to reduce emissions.

Ministry of Environment

Strengthening Low
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