

# 04

## Energy in Day-to-Day Life

Some events of the Sinhala-Hindu New Year festival and a procession are given in the following pictures.



Fig. 4.1 ▲ Events of the Sinhala-Hindu New year festival and a procession



### Assignment 4.1

List the different games and special activities taking place in these events.

Now, think about these activities. It is clear, that some work is done in all these activities. Now, let's focus on some activities done in our day-to-day life. Pulling a log using a rope, carrying a heavy load of soil by a wheel barrow, loading of goods to a vehicle are some common examples. We understand that energy is needed to do all these activities. What is energy ? Energy is defined as **the ability to do a work or produce a change.**

### Use of energy to do work

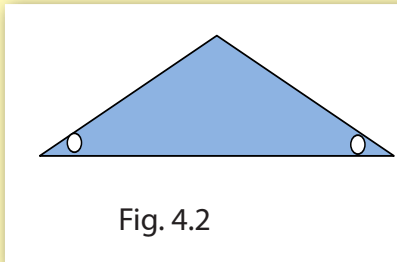
Let's do Activity 4.1 to understand how energy can be utilized to do work.



## Activity 4.1

### Let's make a wind propeller

**You will need :-** Oil papers with different colours, a thin wire, a used bolt - point pen, a small piece of cardboard, a pair of scissors



- Cut 10 pieces of coloured oil papers into triangles as shown in Fig. 4.2.
- Make two holes in each piece as shown in Fig. 4.2.
- Insert the wire into one hole of each paper and fix all pieces to the wire.
- After fixing the pieces insert rest of the holes into the wire to make the wind propeller (Fig. 4.3).
- Now, insert two small cardboard circles from top and bottom of the wire.
- Now, bend the top edge of the propeller.
- Finally, fix the other end of the wire tightly to the barrel of the bolt-point pen.
- Now hold it to the blowing wind. See what happens.

The wind propeller rotates when there is wind. When the wind speed is higher, the propeller rotates faster.

The rotation of the wind propeller indicates a task. How did the wind propeller get the energy ? It was provided by the blowing wind.

Now let's focus on a "solar thermal stove / cooker" shown in Fig. 4.4. What is a solar thermal cooker? It can be used to cook food and boil water. Do you know how does the cooker get energy ? To find the answer let's do the following activity.



Fig. 4.4 ▲ Solar thermal stove / cooker



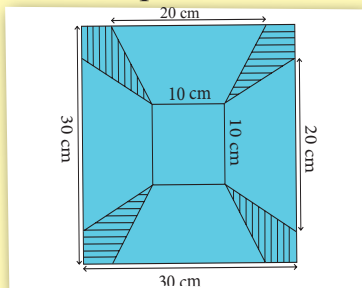
## Activity 4.2

### Demonstrate the function of a solar thermal box stove

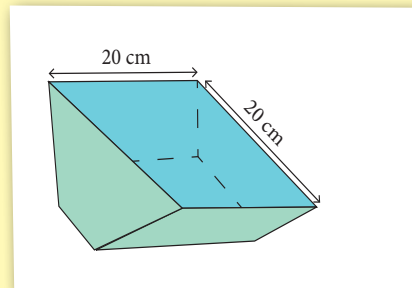
**You will need :-** A piece of cardboard of the size 30x30 cm, a pair of scissors, binder gum, a piece of aluminium foil of the size 30x30 cm, two beakers of 50 ml, a thermometer, some pieces of paper, a sheet of glass of the size 20x20 cm

#### Method :-

- Paste the aluminium foil one side of the cardboard with binder gum.
- Draw lines on the cardboard as shown in Fig 4.5 and cut off the four shaded parts.



Picture 01



Picture 02

Fig 4.5

- Fold the parts of the cardboard and make a box as shown in Fig 4.5. Paste the edges with paper stripes. (The aluminium foil should go inside the box)
- Put 30 ml of water into each beaker and record the temperature of water.
- Keep the box at a place with good sunlight and keep one beaker inside the box and the other outside the box. Close the box with the sheet of glass.
- Remove the sheet of glass and measure the temperature of water in the two beakers after 15 minutes.

The beaker inside the cooker absorbs more solar energy than the beaker kept outside due to the special arrangement of the cooker. Therefore, the temperature of the beaker inside the box is higher than the beaker kept outside the box. This happens due to solar energy.

Thermometers are used to measure the temperature. Temperature is measured in Celcius or Fahrenheit. Temperature is measured in Celcius ( $^{\circ}\text{C}$ ) in day-to-day applications.

When you cook using a solar thermal stove / cooker, solar energy is used. Solar energy is used in many day-to-day activities. For example, drying of chillies / clothes, grains and for making “Lunu dehi”.

Activity 4.1 demonstrates the use of wind energy to rotate a wind propeller. Activity 4.2 shows the use of solar energy to heat water and cook food. There are a large number of energy sources.

e.g : Sun, biomass, fossil fuel, wind, running water, sea waves, tidal waves, geothermal and nuclear power

Table 4.1 summarises the examples of different activities that use energy and the respective energy source.

Table 4.1- Examples of use of energy and respective energy source.

Activity	Source of Energy
Drying of chillies	Sun
Running a vehicle	Petrol /diesel(fossil fuel)
Cooking a meal	Fire-wood (biomass) / L.P. gas
Ironing clothes	Coconut shell (biomass)
Heating water	Liquid petroleum (L.P gas) / Electricity/ bio-mass / fossil fuel

Now, let’s study about other sources of energy.

## 4.1 Energy Sources and Their Applications

### ▶▶ Sun

Think of some of the activities you did today. If you do not have sufficient energy, can you do them? How did you get the energy? Energy needed for these activities are supplied from food you eat.

Food for all living beings is produced in green plants. Sunlight is needed for the process of producing food in green plants.

Therefore, energy in food is derived from solar energy.

Sun is the main natural energy source on the earth. It is essential for the existence of life on earth. This energy can be utilized in many ways as in drying grains and drying wet clothes.



Fig 4.6 ▲ Sun



Fig. 4.7 ▲ Solar hot water heater



Fig. 4.8 ▲ Solar panel

Fig. 4.7 shows a solar hot water heater which is located on the roofs of some houses. This can be used to heat water. Solar panels are used in some occasions where electricity cannot be obtained from the main electricity supply to power some electric appliances. Solar panels obtain

their energy from sunlight. Even satellites obtain power from solar panels containing many solar cells.



### Assignment 4.2

Prepare a list of instances where solar energy is used.

## ▶▶ BioMass

Living materials can produce energy. Think of a wild fire which occurs commonly during drought seasons. Controlling of such fire is very difficult because dried leaves catch fire easily. Such fires release large



Fig. 4.9 ▶ BioMass (Firewood)

amount of heat. This proves that living parts can be used to produce energy. Such plant or animal materials which can be used as a fuel, are known as “biomass”.

Firewood is one of the commonly used biomass. Other examples of biomass are coconut shells, coal,

rotten vegetables, hay, saw dust, rice bran, rotten food materials and agricultural waste. Biomass also contains solar energy.

Saw dust stove or "kudu lipa" / "thool aduppu" is one example, where biomass is used. Here, rice bran or saw dust is used as biomass. Make a saw dust stove with the help of your teacher .



### Activity 4.3

**Let's make a saw dust stove or “kudu lipa”/ "thool aduppu".**

**You will need :-** A tin without a lid, long nail or alis bodkin, tin cutter, PVC tube (4 cm diameter and 30cm long), hacksaw blade, saw dust or rice brans

### Method :

- Make a circular hole of 4cm diameter close to the bottom edge of the tin.
- Insert the PVC tube from the prepared hole into the tin as shown in the figure. Push it to the centre of the tin and cut it leaving 4 cm outside the tin.
- Then, put another PVC tube vertically inside the tin and fill the tin with saw dust or rice brans.
- This should be packed thoroughly by using a piece of wood.
- Now, remove the two PVC tubes carefully.
- An “L” shaped hole is made inside the tin. Light the stove by inserting a flame from the lower end.

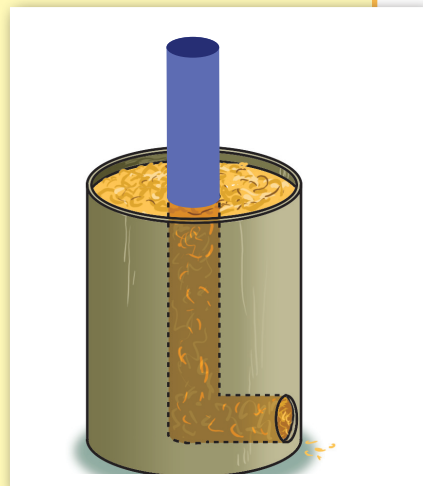


Fig. 4.10 ▲

This is a very simple economical hearth which can be used to cook meals and to boil water.



### Assignment 4.3

Let's find examples where biomass is used to obtain energy. Copy the table given below into your writing book. Complete it with more examples.

Biomass	Instances where it is used to obtain energy
Firewood	
Coal	
Hay	
Sugar cane	
Waste matter from the kitchen	

## ▶▶ Fossil Fuel

Do you know how did the old train engines get energy? It was produced by burning coal. The heat emitted during the burning of coal was used to convert water to steam. The energy generated by steam was used to operate engines. Coal, petroleum oil and petroleum gases are

considered as fossil fuel. These fossil fuels are accumulated under different parts of the earth surface. These fuels are made from the buried plants and animals. They are produced when this buried matter is subjected to high pressure and temperature. This process takes millions of years. Solar energy is the stored energy in the fossil fuel too.



Fig. 4.11 ▲ Petroleum oil well



### Assignment 4.4

Some examples for the use of fossil fuels are given below. Name a fuel / fuels used in each of these occasions.







## Assignment 4.5

Petroleum is imported to Sri Lanka from foreign countries. Prepare a list of countries where fossil fuel is available. You can get this information from the world wide web or from any other source.

### ▶▶ Wind

Have you seen how farmers separate unfilled or half filled rice grains from the harvest? Wind power is used for this purpose even today in rural areas. Wind power can also, be used to dry different materials. Let's do the following activity to see whether we can use wind energy to do work.



Fig 4.12 ▲ Winnowing paddy



### Activity 4.4

#### Let's use wind energy to do work

**Materials** :- two "spoke" wires, used bolt-point pen, a pair of scissors/paper cutter, a small round shaped metal (with a diameter of 5 cm), twine thread, a small weight

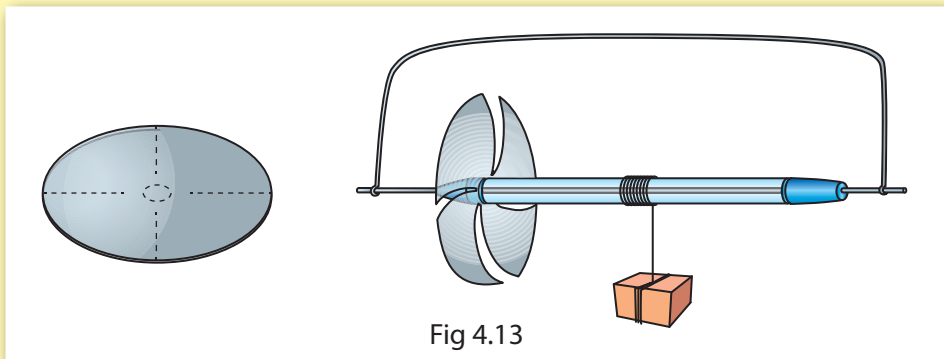


Fig 4.13

#### Method :

- Prepare a wind propeller from the circular metal piece as shown in the figure.

- Now, make a hole in the middle of the wind propeller.
- Now, remove the ink rod of the pen and pass the spoke wire through the barrel of the pen. Then, fix the wind propeller to the barrel of the pen as shown in the figure.
- Tie the weight with a thread and fix the other end of the thread to the pen tightly.
- After that, use the other spoke wire to hang the prepared equipment and take it to a place where wind is available. Observe how the weight is lifted with the help of the wind.

You will observe the rotation of the wind propeller and the lifting of the weight, when wind blows. Thus, it is obvious that we can do work with the help of wind. Large wind mills are operated using wind energy. In ancient times, people used this energy to grind



Fig. 4.14 ▲ A wind mill used to grind grains



Fig. 4.15 ▲ Generation of electricity using wind energy

grains and to pump water. When the wind mill operates, we can rotate the parts of a generator. This can be used to generate electricity, too. These types of energy power plants are available in Sri Lanka as well. (Hambanthota, Puththalam)



### Assignment 4.6

Prepare a list of activities where wind energy is used.

## ▶▶ Energy Stored in Water

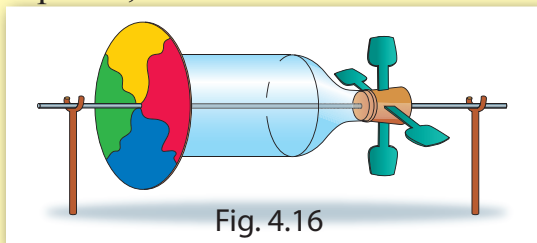
During ancient times, people used running water to do certain work such as to grind grains and to operate saw mills. They used water to rotate a turbine and thereby generate energy. Let's do Activity 4.5 to make a turbine.



### Activity 4.5

#### Let's make a model of a turbine

**You will need :-** A small plastic bottle, cork stopper, spoke wires, few yoghurt spoons, a cardboard circle and binder gum.



#### Method :-

- Paste the cardboard circle at the bottom of the plastic bottle.
- Make a small hole at the center of the bottom which is similar to the size of the spoke wire.
- Make another hole at the center of the cork stopper also.
- Now fix the yoghurt spoons to the cork at similar distances.
- Fix the cork to the bottle.

You have completed making a model of a turbine. Now, test whether it rotates by holding it to a running water.

E.g:- You may also draw, designs on the cardboard circle and see how they move.

Energy stored in running water is utilized in hydropower stations to generate electricity. When water is at a higher position, it contains more energy. It is called potential energy. Normally power stations are located at a lower position. The running water is carried in pipes at a high speed. This water is used to rotate the fans of the turbine and operate the generators.

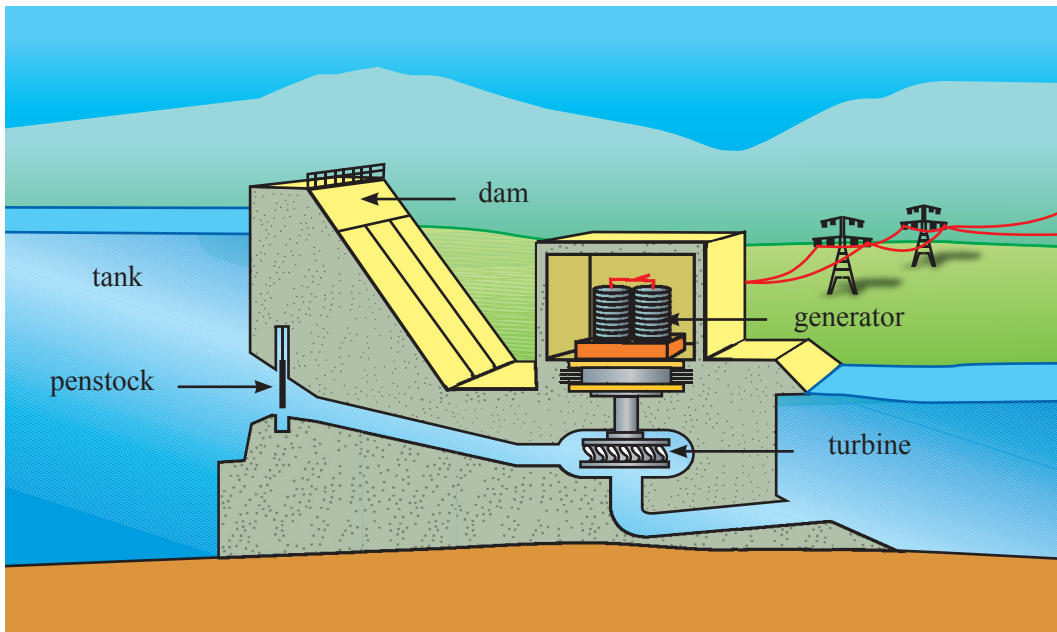


Fig. 4.17 ▲ Structure of a hydropower station



### Assignment 4.7

#### Let's make a mini hydropower station

For this activity, you can use the turbine model which you have already prepared. Fix a 2 cm long bolt-point pen to the axis of the spoke wire. Then, fix an axle of a small motor to the other end of the pen and connect a circuit of a birthday card (available only in some cards) to the terminal of the motor. Now, you can activate the turbine.

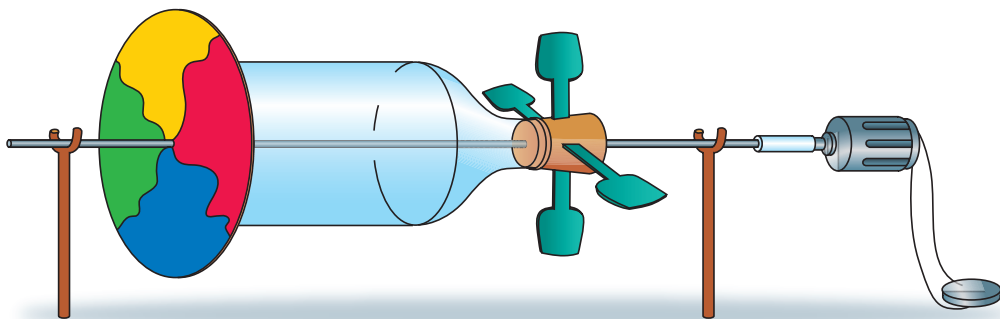


Fig. 4.18 ▲ Circuit of a Birthday card

## ▶▶ Sea Waves

Sea waves are strong. They can generate a large quantity of energy. This will be a very valuable source of energy in the near future. This energy can be converted into electric energy by building floating power plants in the sea. A flow of air is used to rotate the fans of the turbine. In some instances, the stored energy of the sea waves causes destructions. One good example is the occurrence of Tsunami in 2004. Due to this situation, we lost millions worth properties and invaluable lives of humans. It also caused great harm to nature.



Fig. 4.19 ▲ A power station operated by sea waves

## ▶▶ Tidal Waves

The water level of the sea changes due to the effects of the sun and the moon. It is called as the occurrence of the high tides and the low tides.

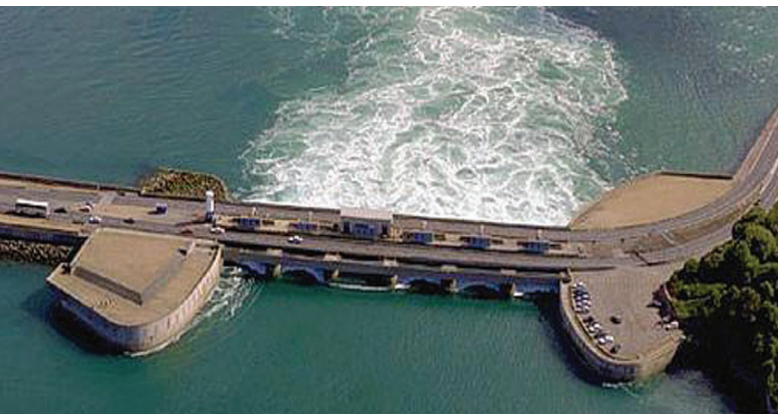


Fig. 4.20 ▲ A power station

The rise of the sea water level is named as the high tide, and the fall of the sea water level is named as low tide. When there is high tide, sea water can flow into a tank on the land. When there is low tide, water can flow back to the sea. During both these actions, energy is generated. This tidal energy can be used to rotate

the plates of a turbine, thereby it is possible to generate continuous supply of electricity. To use tidal energy efficiently, it is essential to have a significant difference of heights of the water levels of the sea. In some countries, this difference is more than 3m.

## ▶▶ Geothermal Energy

The temperature of some regions of inner earth crust is very high. This high temperature can be used to generate electricity. Steam is generated by sending water through pipes to such high temperature regions. This steam is subsequently brought to the surface of the earth and is used to rotate the turbines of the power plants. This source of energy is used in some countries of the world to generate electricity.



Fig. 4.21 ▶ A plant functions by Geothermal Energy

## ▶▶ Nuclear Energy

Have you ever thought how does the sun generates its energy? The energy of the sun is generated due to nuclear reactions. A very high amount of energy is emitted during these reactions. If nuclear reactions are performed under controlled conditions, nuclear energy can be generated. This energy is emitted as heat or thermal energy. Heat is thus generated used to produce steam. Steam produced by this process is then used to rotate turbines and to produce electricity. Some countries use this technique to produce electricity.



Fig 4.22 ▶ Nuclear power plant



Organize a field trip to see hydropower stations, wind mills, thermal power plants and hot water springs to get a better understanding about the sources of energy and their uses.

## ▶▶ Sustainable Use of Energy Sources

Now you are aware that energy is needed to do work. Energy helps us in many ways. It helps us to maintain our body temperature, provides light, and helps to cook your meals. It is also used to operate television and radio. Not only that, energy supplies power to move vehicles and for body functions and movements.

In ancient times (200 year ago), the major energy sources were the sun, fire-wood and wind. People used solar energy to dry things, and fire wood to cook meals. Wind energy was utilized for sailing boats.

With the increasing complexity in lifestyle, new energy sources were discovered. Many of them are now used to generate electricity.



### Assignment 4.8

Make a small booklet containing images and information on different energy sources and their uses.

The world population rises day by day. Energy requirements also, increase accordingly. The use of some energy sources are increasing at a high rate. For example, fossil fuel is a non renewable energy source. What will happen when all sources of coal, petroleum gases and petroleum oil are over? It will take millions of years for them to regenerate. Therefore, it is our responsibility to use these energy sources mindfully.

We have to protect them for our future generations.



## Assignment 4.9

Assume that you are born in an area, where no more fossil fuels are available. List the problems that you will encounter and suggest remedies.

We can conserve energy sources by using them carefully. Our ancestors used them carefully and protected them for us. Therefore, it is our responsibility to protect these sources for future generations, too.



## For your Extra knowledge

Bio gas can be produced by using biomass. All types of waste matter gathered in urban areas and agricultural waste can be used to make biomass.

Ethanol is a kind of alcohol which is produced as a bio-product in sugar cane industry. It can be used as a fuel to run vehicles.

Some countries in the world use maize plants to produce fuel.



Fig. 4.23 - An areoplane which Uses alcohol as a fuel





## Summary

- Energy is needed to do work.
- The ability to do work is referred to as energy.
- Energy is produced by energy sources.
- The sun is the primary source of energy.
- Wind, biomass, fossil fuel, water, tidal waves, geothermal energy and nuclear energy are some of the examples of energy sources.
- Some of them are non - renewable.
- Energy sources should be conserved for future generations.

## Exercise

- i. What is biomass?
  - ii. What is the similarity between bio mass and fossil fuel?
- i. What are the energy sources suitable to generate electricity in Sri Lanka?
  - ii. What are the fossil fuels that are used in power stations in Sri Lanka?
- i. Suggest some measures to minimize the energy consumption in your home?
  - ii. What are the energy sources that will be used to a large extent in the future?

## Project

Mention occasions of energy waste in your home and make a report of your suggestions to minimize the wastage.

## Technical Terms

Energy	- ஊக்கிய	- சக்தி
Work	- கார்ப்பய	- வேலை
Bio mass	- சேவ சீகநீட	- ஁யிர்த்திணிவு
Sea waves	- ஁று஁ ரல	- கடல் அலைகள்
Tidal waves	- ஁஁஁ ரல	- வற்றுப்பெருக்கு அலைகள்
Geothermal	- ஁ தாபய	- புவிவெப்பம்
Nuclear	- நயசீ஁க	- கருச்சக்தி
Fossil fuels	- ஁஁஁ ஁஁஁஁	- சவட்டு ஁ரிபொருள்
Wind mill	- ஁஁஁ ஁஁஁	- காற்றாலை
Sources of energy	- ஁஁஁ ஁஁஁	- சக்தி முதல்