

Good day to you.

This video is designed for first year engineering students taking courses in thermodynamics. It may also be applicable to physics students who have a general background in various forms of energy and energy conversion processes.

In activity one, teachers should take the time to let students understand that Shadow Play is a form of entertainment and one of Malaysia's heritage cultures. A few children were seen trying to re-enact a play using an old bicycle, a bedsheet and several self-made characters.

The objective of this segment is to understand the concept of energy and its source. The concept presented here are the various forms of energy. You may want to get your students to enlist the various forms of energy, not just from the video but from their everyday activities.

Depending on the heat of discussion, you may want to extend the discussion further to differentiate between force, energy and work done and its respective S.I units.

It is prudent that we let students understand the forms of energy and its source or how it is being produced. This comprehension will take them to activity two, where the objective is realizing the process of energy conversion.

In activity two, teachers may do any forms of activity that would allow your students to connect that activity with conversion of energy. We provide several suggestions for your use.

Suggestion 1 is a physical activity, such as a walk across the room, dropping a ball, and holding a cloth to a fan. There are usable energy around us that your students can identify and discuss its conversion processes.

Suggestion 2 is through the utilization of stored energy in a battery. Teachers will need two brand new batteries of size AA, a short copper wire coiled or shaped as in Fig 1, a magnet (the more powerful the magnet the better). Stack them as in Fig 2. The wire will rotate indicating there is a flow of electrical energy from the battery through the copper wire and cuts through a magnetic field.

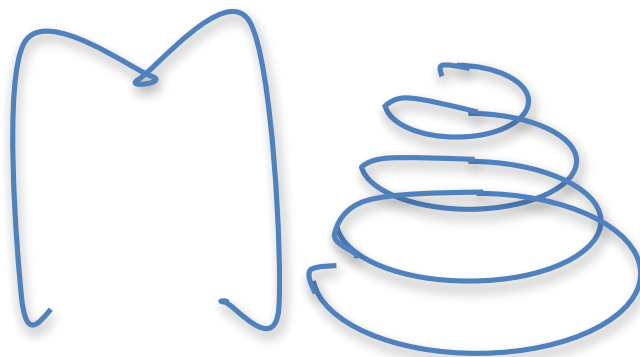


Fig 1

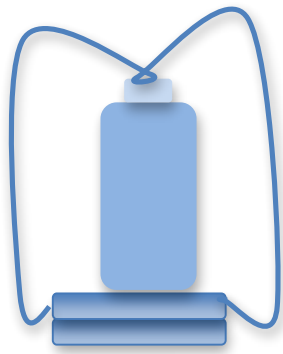
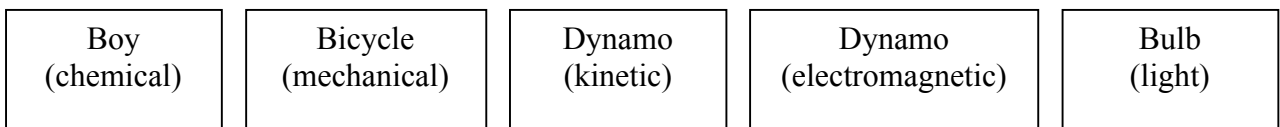


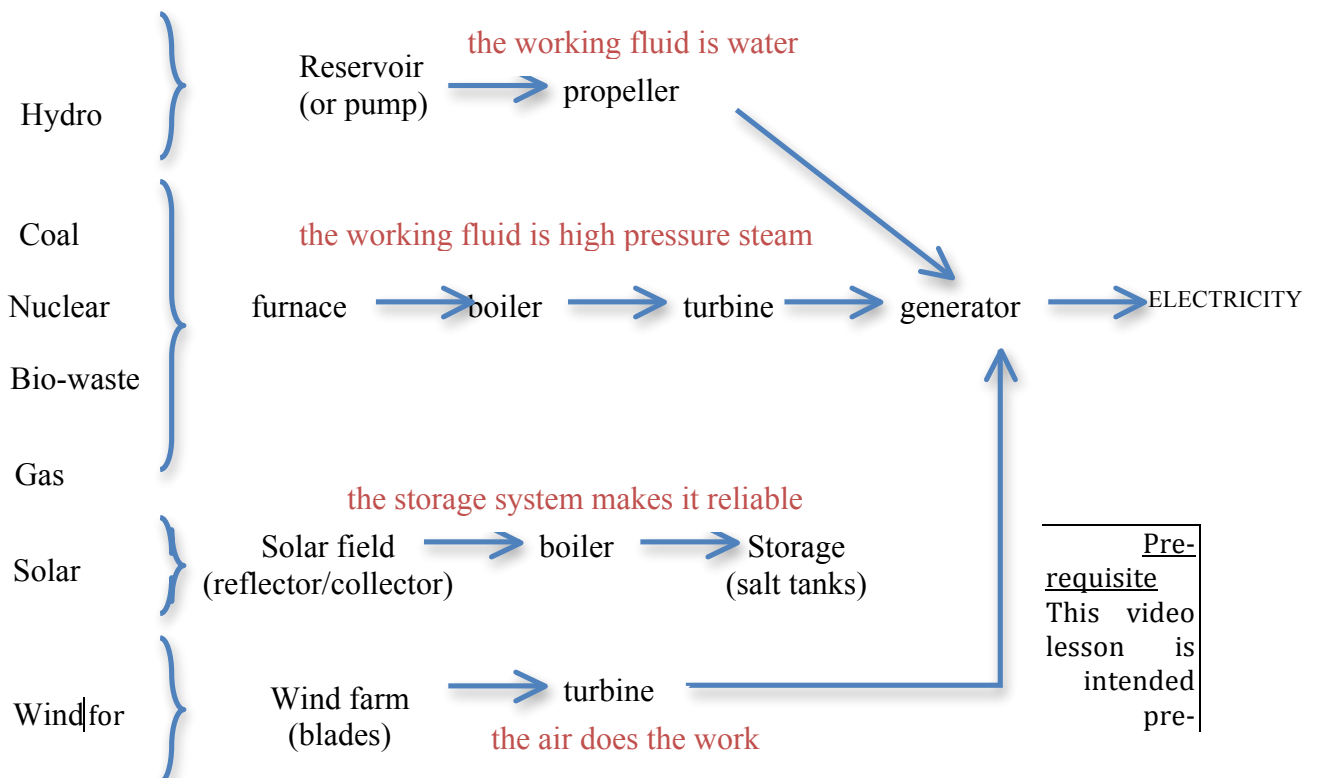
Fig 2

Your students need to understand that energy is utilized to get things done and by virtue of such conversion, there are energy that is considered waste or undesired output such as excessive heating, light and sound.

Segment 3 reviews the chain conversion process of generating electricity. For the activity, teachers should get students to present the chain of processes to assess their understanding of concept. Students are encouraged to identify the energy being converted, its processes and what are needed for the process to occur.



The visit to a power station is another way of providing students the connection between concepts learned to real world application. Just like a dynamo, the generator is the main converter of energy to electricity; the other energy conversion processes are means to an end product. Although the concept of electricity generation is the same, there exist issues that need special considerations for each type of power plant, be it a thermal plant, a combined cycle, a hydro plant or a wind farm.



university or undergraduate students taking thermodynamics course as part of program requirement. It may suit a 50-minute class or lab session, although the in-class teacher is the ultimate time manager for the lesson by assessing the progress of activities to ensure students capture the objective of each segment.

Students should have high-school physics and have basic knowledge in forms of energy, its units and formula. However, teachers are advised to invoke students' memory and provide scaffolding at times of need.

#### Learning objectives

The objective of having video lessons as a classroom tool is to provide real world perspective to learning. This video is meant to assist teachers in providing interesting aspect of thermodynamic applications through the experiments, multimedia presentation and the video tour.

It is hoped that the students can better understand

1. the various forms of energy,
2. the concept of energy conversion processes,
3. the conservation of energy.

#### ACTIVITY 1 (5 minutes)

Class teacher should take the time to let students understand the plot. The scene was from a time and place where electricity has not reached the village. The teacher may also relate to any personal experience or any known stories of personal experiences.

Allow students some time to ponder on the question presented by the Presenter. Exchange these thoughts and initiate discussion.

Divide the class into groups of 3 or 5 students per group. Each of them is given the task to discuss and answer the questions voiced by the Presenter;

Note to teacher:

Presented concept: The various forms of energy. (light, heat, wind, electric, kinetic etc).

Extended fact: Differentiate between force, energy and work done. The possible use of energy and its processes.

Objective: Understand the concept of energy and its source.

#### ACTIVITY 2 (10 minutes)

Allow students some time to try simple experiments. The suggested demonstration is listed. The classroom teacher may use other experiments that can contribute to this topic.

Physical activity:

Request a student to walk across the room.

Ask another student to take a ball and stand on a chair. Drop a ball onto the floor.

Hold a piece of cloth (eg: a handkerchief) in front of a table fan that is turned on.

Discuss the energy and conversion involved in these activities. The teacher can also ask students examples of other activities that involve energy conversion, or ask students to think of variations of the activities. For example, if the ball is rolled on the floor, what is the difference in the energy involved compared to a ball that is dropped?

Demonstration:

Stack two small magnets below an AA battery. Coil a copper wire into the shape shown (Fig 1). Adjust the wires so as it sits on the battery loosely with ends connected to the magnet (Fig.2). You will see that the wire rotating.

Fig. 1

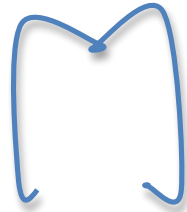


Fig. 2



Discuss the energy and energy conversion involved in this demonstration. Why is this important for us?

Note to teacher:

Presented concept: Energy conversion.

Extended fact: Energy is spent to get a product.

Objective: Able to realize that energy is converted from one form to another

### ACTIVITY 3 (10 minutes)

Give student the following diagram to fill. Ask them to explain the chain of conversion processes that is occurring. Remind students that this diagram had been shown earlier in the video in Segment 2. Instruct students to individually fill out the diagram on their own first (1 minute), then allow them to discuss with the person sitting next to them (3 minutes) to compare and correct their answers. After that, have an overall discussion. It is recommended that the teacher select a student to come up and fill in the boxes one at a time in front at the board, and ask the student to explain the answer.

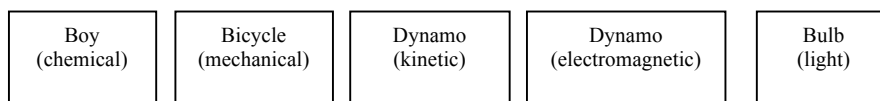


Note to teacher:

Presented concept: Chain of conversion processes.

Extended fact: Characteristics of different forms of energy, what is needed for each conversion.

Objective: Students are able to explain the processes that are taking place. Although this diagram had been shown earlier in the video, the purpose of this activity is to check for students' understanding, and catch any misconceptions. It is recommended that the teacher move around the class and discreetly listen in as students discuss the answer.



### ACTIVITY 4 (5 minutes)

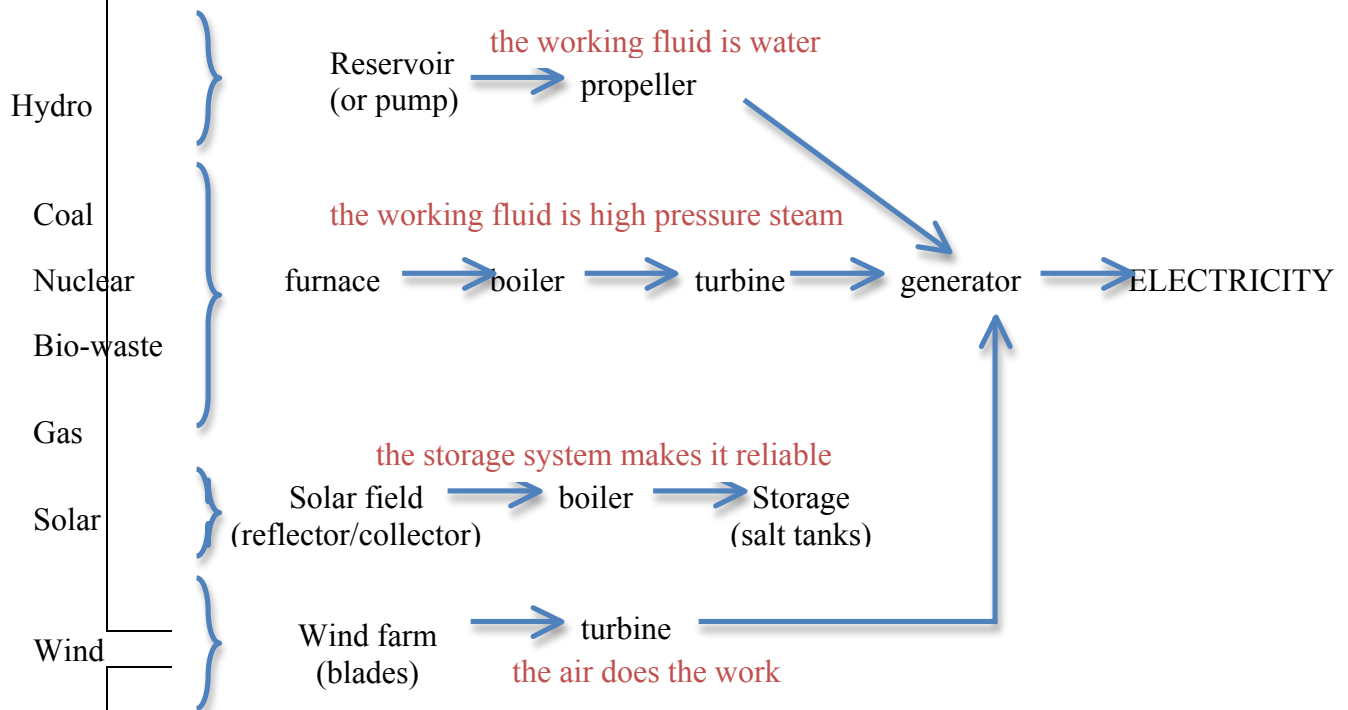
Get students to discuss the sequential tree to demonstrate their understanding on the generation of electricity. Display the sequential tree and ask different students to explain part by part to the whole class.

Discuss the answer to the questions post at the end of Segment 4. Guide students to come up with alternative sources of energy other than fossil fuel.

Presented concept: Generation of electricity and conversion of energy involved.

Extended fact: Electricity as a product.

Objective: Able to relate the electrical energy generation to fuel.



**ACTIVITY 5 (5 minutes)**

Teacher summarizes and discusses the overall lesson by:

- ask students to volunteer answers on different forms of energy
- explains the conversion of energy from one form to another
- asks students to discuss the process of energy conversion in generating electricity.
- Discuss why it is important to find other sources of energy. Ask students to think of ways that they can contribute as engineers in the near future.