

# BASIC 7

## WEEKLY LESSON PLAN – WEEK 2

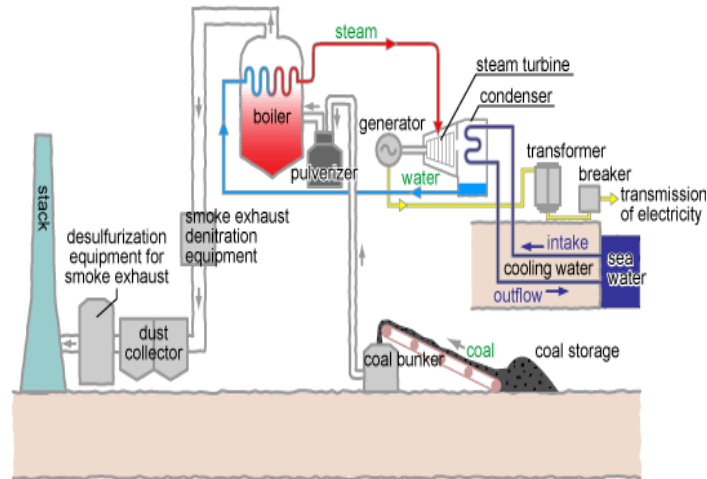
Strand:	Forces and Energy		Sub-Strand:		Electricity and Electronics	
Content Standard:	B7.4.2.1 Demonstrate understanding of forms of electricity, its generation and effects on the environment.					
	B7.4.2.2 Demonstrate knowledge of how to assemble and explain the functions of basic electronic components and their interdependence in an electronic circuit					
Indicator (s)	B7.4.2.1.1 Describe the various forms of electricity generation			Performance Indicator : Learners can test electric circuits.		
	B7.4.2.1.2 Explain the impact of electricity generation on the environment					
	B7.4.2.2.1 Demonstrate how to assemble basic electronic components in an electronic circuit					
Week Ending	21-07-2023					
Class	B.S.7		Class Size:		Duration:	
Subject	Science					
Reference	Science Curriculum, Teachers Resource Pack, Learners Resource Pack.					
Teaching / Learning Resources	Power Point Presentation, Poster, Battery, wire, switch, Diagrams and Charts.			Core Competencies:		<ul style="list-style-type: none"><li>Digital Literacy</li><li>Critical Thinking and Problem Solving</li></ul> Communication and Collaboration.
DAY/DAT E	PHASE 1 : STARTER		PHASE 2: MAIN			PHASE 3: REFLECTION
MONDAY	Discuss the meanings of keywords and terminologies in the Lesson with the Learners.  Keywords/Terminologies; <ul style="list-style-type: none"><li>Electricity</li><li>Energy</li><li>Renewable</li><li>Fossil Fuel</li><li>Nuclear</li><li>Biomass</li><li>Geothermal</li></ul>		1. Using a Presentation, explain the concept of “electricity generation” with the Learners. 2. Assist Learners to identify the methods of electricity generation. 3. Discuss with learners on the various types of electricity generation. 4. Learners brainstorm to explain the methods of electricity generation.  Electricity generation Electricity generation is defined as electricity generated from fossil fuels, nuclear power plants, hydro power plants (excluding pumped storage), geothermal systems, solar panels, biofuels, wind, etc. It includes electricity produced in electricity-only plants and in combined heat and power plants. Both main activity producer and autoproducer plants are included, where data are available. Main activity producers generate electricity for sale to third parties as their			Assist Learners to describe the stages in electricity generation.  Exercise;  1. What is Electricity Generation? 2. State 3 types of Electricity generation. 3. Explain 2 methods of generating electricity.

primary activity. Autoproducers generate electricity wholly or partly for their own use as an activity supporting their primary activity. Both types of plants may be privately or publicly owned. This indicator is measured in gigawatt hours and in percentage of total energy generation.

### Methods of Electricity Generation;

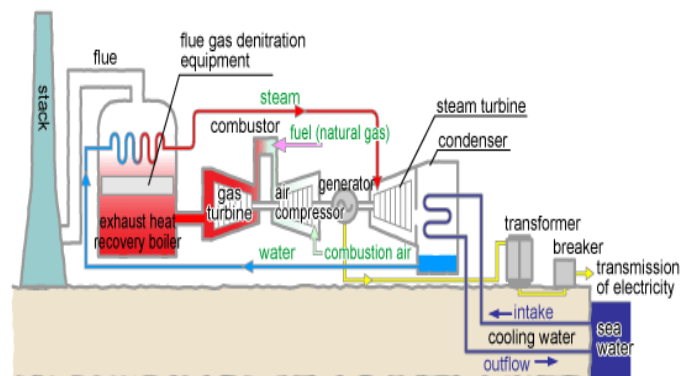
- Thermal Power

#### Pulverized Coal-fired Power Generation



Pulverized coal-fired power generation is currently the major method of coal-fired power generation. Coal is pulverized to fine powder and is burned in the boiler. Heat in the boiler boils the water into steam. The steam pressure turns the steam turbine and the generator generates electricity.

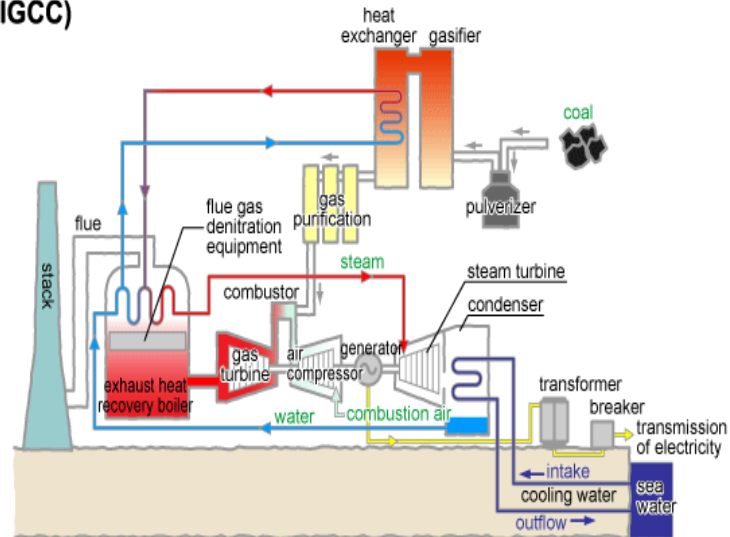
#### Combined Cycle Power Generation



A combined cycle power first generates gas by burning fuel in the compressed air. Pressure of the gas rotates the gas turbine and the generator creates electricity. Pressure of the gas rotates the gas turbine and the generator creates electricity.

Moreover, exhaust heat from gas turbine is utilized for boiling water to generate steam, which rotates turbine to generate.

### Integrated coal Gasification Combined Cycle (IGCC)

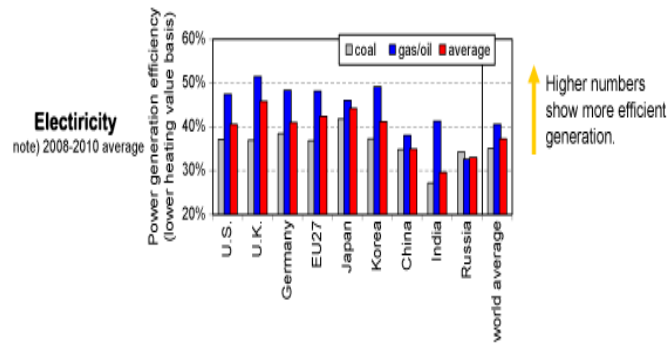


Integrated coal gasification combined cycle (IGCC) gasifies the fuel coal in the gasifier. Gasified fuel is burnt in the compressed air to generate gas. Pressure of the gas rotates the gas turbine to generate electricity. Furthermore the exhaust gas heat from gas turbine is utilized to boil water into steam to generate electricity.

International comparison of energy efficiencies of thermal power generation

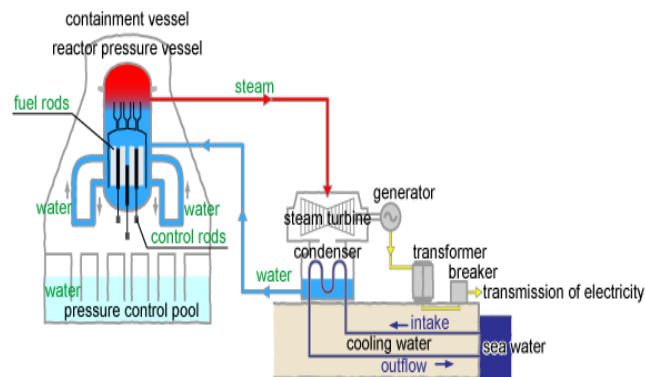
International comparison of thermal power generation efficiency (fossil fuels). Coal fire plants in Japan achieve highest efficiency, generating much electricity with less fuels. Although generation efficiency can be increased by utilizing power generation facilities (or technologies) with newest and highest efficiency, it is important to do maintenance of facility or to keep or increase of operation quality as well.

### International comparison of energy efficiency



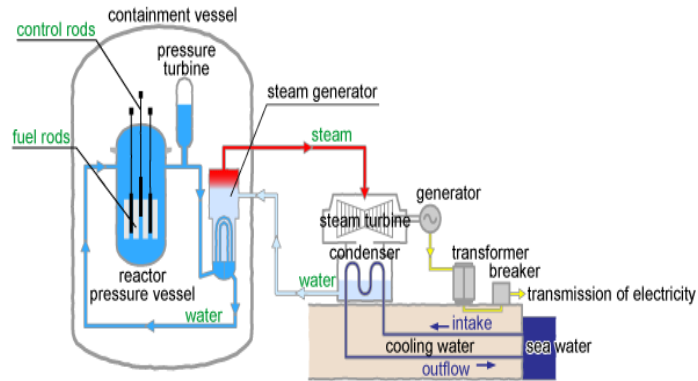
### ➤ Nuclear power

#### Boiling water reactor (BWR)



Lightwater means normal water, opposite to heavy water. Heat is produced by nuclear fission in the reactor core, then causes the water to boil, producing steam. The steam is used to rotate the turbine to generate electricity, then is cooled in the condenser by sea water and converted back to liquid water. This water is then returned to the reactor core.

### Pressurized water reactor (PWR)



Lightwater means normal water, opposite to heavy water. Heat is produced by nuclear fission in the reactor core but heated water is suppressed before boiling by applying a high pressure. This water with high temperature and pressure is sent to the steam generator, boils the water into steam, and then rotates the turbine to generate electricity in the generator, after that it is cooled in the condenser by sea water and converted back to liquid water. This water is then returned to the steam turbine.

**THURSDAY**

Review Learners knowledge on the previous lesson.

1. Learners brainstorm to identify the positive and negative impacts of electricity.
2. Using a Presentation, explain the impact of renewable energy-based power generation on environmental issues.
3. Learners in small groups to discuss and report to the class on the factors that affects renewable energy generation.

#### **Renewable energy;**

Renewable energy describes a collection of energy technologies, i.e., solar, wind, geothermal derived from sources that are never-ending and can be replenished time after time. Most countries across the world heavily depend on fossil fuels (oil, coal and natural gas) as sources of energy to power their economies. Renewable sources are renewable, sustainable, abundant and environmentally friendly. Unlike fossil fuels, they are not going to expire soon as they are constantly replenished.

Fossil fuels are non-renewable forms of energy, meaning they utilize limited resources that will ultimately deplete, hence, driving up overall energy costs. These countries have responded to the threat by stepping up campaigns to embrace renewable forms of energy like solar and wind.

#### **Sources of Renewable Energy**

Through questions and answers, conclude the lesson.

#### **Exercise;**

1. What is renewable energy?
2. State 5 impacts of renewable energy-based power generation on environmental issues.

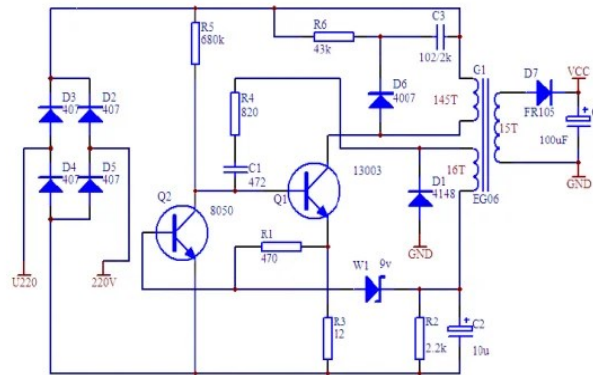
		<p>The most widespread sources of energy include:</p> <p><b>Wind:</b> This takes advantage of wind motion to generate electricity. Wind motion is brought about by the heat from the sun, and rotation of the earth, mainly via the Coriolis Effect.</p> <p><b>Solar:</b> It taps heat from the sun to produce energy for the generation of electricity, heating, lighting homes and commercial buildings.</p> <p><b>Hydropower:</b> Utilizes moving water to produce electricity. Moving water creates high energy that can be harnessed and turned into power.</p> <p><b>Biomass:</b> Together with snow and rain, sunlight is essential for plant growth. Organic matter that constitutes plants is referred to as biomass, which can be utilized to generate electricity, chemicals or fuels to power vehicles.</p> <p><b>Ocean:</b> Takes advantage of rising and falling of tides to generate electricity</p> <p><b>Geothermal:</b> Leverages heat from underneath the earth to generate electricity.</p> <p>While the advantages and disadvantages of renewable energy exist, the advantages of using renewable forms of energy far outweigh the disadvantages, more so moving to the future.</p> <p><b>Advantages of Renewable Energy</b></p> <p>1. Renewable Energy is Eco-friendly</p> <p>Renewable energy is considered clean energy since it doesn't cause grave environmental pollution, and it has low or zero carbon and greenhouse emission.</p> <p>Fossil fuels emit high levels of greenhouse gas and carbon dioxide, which are greatly responsible for global warming, climate change, and degradation of air quality. Fossil fuels also contribute to sulfur emission to the atmosphere leading to acid rains. Acid rains can cause damage to buildings.</p> <p>Solar and wind power are considered eco-friendly because they emit zero toxic gases to the environment. The use of renewable energy dramatically reduces the dependence on</p>	
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		<p>fossil fuel as a source of energy, hence, cutting back on air pollution.</p> <p><b>Disadvantages of Renewable Energy</b></p> <ul style="list-style-type: none"> <li>• The Electricity Generation Capacity is Still Not Large Enough.</li> <li>• Renewable Energy Can be Unreliable.</li> <li>• Low-efficiency Levels.</li> <li>• Requires a Huge Upfront Capital Outlay.</li> <li>• Takes a Lot of Space to Install.</li> <li>• Expensive Storage Costs.</li> <li>• Not Always a Commercially-viable Option.</li> <li>• It Still Generates Pollution.</li> </ul>	
<b>FRIDAY</b>	Discuss with Learners on the meaning of “Electronic circuit assembly”.	<ol style="list-style-type: none"> <li>1. Learners brainstorm to identify the components of electric circuit.</li> <li>2. Using a Poster displaying the electronic assembly process, assist Learners to identify the steps in electronic assembly process.</li> <li>3. Discuss with Learners on the functions of various basic electronic components.</li> </ol> <p><b>Steps in the Electronic Assembly Process</b></p> <p>Step 1: Printed Circuit Board. In electronic assembly, you start with a printed circuit board and the components that go on it.</p> <p>Step 2: Add Solder Paste.</p> <p>Step 3: Pick-and-Place.</p> <p>Step 4: Inspection.</p> <p>Step 5: Soldering.</p> <p>After Printed Circuit Board Assembly.</p> <p><b>Components and materials</b></p> <p>To assemble an electrical circuit, you will need the following apparatus and materials:</p> <ol style="list-style-type: none"> <li>1. <b>Breadboard</b> – used for mounting and connecting electronic components</li> <li>2. <b>Jumper Wires</b> – used for making connections between components on the breadboard</li> <li>3. <b>Resistors</b> – used to limit the flow of current in the circuit</li> <li>4. <b>Capacitors</b> – used to store and release electrical energy</li> <li>5. <b>Diodes</b> – used to allow current flow in only one direction</li> <li>6. <b>LEDs</b> – used as visual indicators in the circuit</li> <li>7. <b>Transistors</b> – used to amplify or switch electronic signals</li> </ol>	Learners in small groups to discuss and report to the class on how to test for electric circuit.

8. **Power supply** – used to provide the voltage required for the circuit to operate
9. **Oscilloscope** – used to measure and display electronic signals in the circuit
10. **Multimeter** – used to measure voltage, current, and resistance in the circuit

Make sure to handle these components with care and follow proper safety procedures when working with electrical circuits.

### Electric Circuit Diagram



### Assembling Procedure

#### ***Identifying the components of an electrical circuit***

The first step in assembling an electrical circuit is to identify the components that are required for the circuit. Depending on the type of circuit, the components may include resistors, capacitors, transistors, and inductors. Once you have identified the components, you will need to determine the values for each component. This is done by looking at the specifications in the circuit design.

#### ***Choosing the right components for your circuit***

The next step is to choose the components that are suitable for your circuit. It is important to choose components that are of good quality and are rated for the desired voltage and current. This ensures that the circuit will perform as expected. Additionally, the components should be compatible with the circuit board and with each other.

#### ***Connecting components to the circuit board***

Once the components have been chosen, the next step is to connect them to the circuit board. This is done by soldering the components to the board. The components should be connected in accordance with the circuit design and be placed in the correct orientation. Additionally, it is important to



		<p>ensure that the components are securely placed on the board and that the solder joints are clean and secure.</p> <p><b><i>Wiring the components of the circuit</i></b> Once the components have been connected to the circuit board, it is time to wire them together. This involves connecting the components in the correct order and in the right way to ensure that the circuit works properly. This is done by connecting the components in series or in parallel, depending on the design of the circuit.</p> <p><b><i>Troubleshooting your electrical circuit</i></b> Troubleshooting is an important part of assembling any electrical circuit. This involves identifying any problems that may arise and then fixing them. It is important to check for any loose connections, incorrect wiring, and other issues that may affect the functioning of the circuit. Additionally, it is important to test the circuit to ensure it is working properly.</p> <p><b><i>Testing your electrical circuit</i></b> Once all the components have been connected and wired, it is time to test the circuit. This is done by connecting a power source to the circuit and then measuring the output of the circuit. This will help to determine whether the circuit is working properly or not. Additionally, it is important to check for any issues such as incorrect wiring, incorrect connections, or other problems.</p>	
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***Name of Teacher:***

***School:***

***District:***