LESSON 5.- RENEWABLE ENERGY RESOURCES (II)

WIND ENERGY, HYDROPOWER AND GEOTHERMAL ENERGY: Activity in groups of three students A, B, C (handout 5)

Activity 1.- The teacher splits the class in groups of 3 students. The three students of the same group work with the same handout (A, B or C). Each group of 3 students has handouts with information about one of the above energy resources. The students have to complete their worksheets working in group. They have to complete the following table.

<table>
<thead>
<tr>
<th>Energy resource</th>
<th>Wind energy</th>
<th>Hydropower</th>
<th>Geothermal power</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Primary energy</td>
<td>Wind</td>
<td>Water source (ocean, river, waterfall)</td>
<td>Geothermal energy (Earth’s heat)</td>
</tr>
<tr>
<td><strong>2</strong> Final energy/energies</td>
<td>Electricity / movement</td>
<td>Electricity / movement</td>
<td>Heat and electricity</td>
</tr>
<tr>
<td><strong>3</strong> Name of the device</td>
<td>Wind turbine / wind mill</td>
<td>Dam (hydroelectric power station) / Water wheel</td>
<td>Geothermal power station</td>
</tr>
<tr>
<td><strong>4</strong> How electricity is generated</td>
<td>The wind turns the rotor of the wind turbine. The rotor turns a generator (a dynamo), which makes electricity.</td>
<td>Dams are built to trap water, usually in a valley where there is an existing lake. The water flows through tunnels and turns the turbines which drive generators which make electricity.</td>
<td>The water is heated by the earth. It goes into a special turbine. The turbine blades spin and the shaft from the turbine is connected to a generator to make electricity.</td>
</tr>
<tr>
<td><strong>5</strong> Some years ago this energy was used for...</td>
<td>Sailing, grinding grain, pumping water and for irrigation</td>
<td>Grinding cereals such as wheat to produce flour</td>
<td>Hot springs for bathing and cooking food</td>
</tr>
<tr>
<td><strong>6</strong> Examples of today’s use</td>
<td>Electricity production</td>
<td>Electricity production</td>
<td>- Heating swimming pool water, - growing plants in greenhouses, - drying crops, - heating water at fish farms, - pasteurizing milk.</td>
</tr>
<tr>
<td><strong>7</strong> Location</td>
<td>Places where the wind is strong and reliable: coastal areas, hills,…</td>
<td>Water source</td>
<td>Volcanically active places</td>
</tr>
</tbody>
</table>
d) They have to write six questions which can be answered with the information they have in the table:

1. What does a wind turbine / hydroelectric power station / geothermal power station use to make electricity?

2. Which is the final energy?

3. How is wind energy / water energy / geothermal energy transformed into electricity? By means of generators which are driven by turbines / wind turbines / dams / geothermal power stations.

4. How is electricity generated?

5. What was wind energy / hydropower / geothermal energy used for many years ago?

6. Write examples of today’s uses of this energy.

7. Where are wind farms / dams / geothermal power plants built?

e) They already know how to draw a flow diagram (lesson 1). They have to extract the key words from the information they have been given in order to draw the flow chart.

The three flow diagrams would be:

- Wind power diagram:
  - Wind → Rotor (turns) → Generator → Electricity → Transformer → High Power Lines

- Water power diagram:
  - Water → Pipe → Turbine → Generator → Electricity → High Power Lines

- Geothermal power diagram:
  - Hot water steam → Turbine → Generator → Electricity → High Power Lines
f) The students have to think about advantages and disadvantages related to the energy resource they are studying.

<table>
<thead>
<tr>
<th>Energy source</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td>• No air pollution</td>
<td>• Noisy</td>
</tr>
<tr>
<td></td>
<td>• Does not produce CO₂</td>
<td>• Depends on the weather</td>
</tr>
<tr>
<td></td>
<td>• No risk of greenhouse effect</td>
<td>• Unreliable if there is no wind</td>
</tr>
<tr>
<td></td>
<td>• No risk of acid rain</td>
<td>• Unsightly</td>
</tr>
<tr>
<td></td>
<td>• Renewable and free</td>
<td></td>
</tr>
<tr>
<td>Hydropower</td>
<td>• No air pollution</td>
<td>• Floods a large area</td>
</tr>
<tr>
<td></td>
<td>• Reliable in wet regions</td>
<td>• Expensive to build</td>
</tr>
<tr>
<td></td>
<td>• Does not produce CO₂</td>
<td>• Affects the ecology of the area</td>
</tr>
<tr>
<td></td>
<td>• No risk of greenhouse effect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No risk of acid rain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Renewable and free</td>
<td></td>
</tr>
<tr>
<td>Geothermal</td>
<td>• No air pollution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Good for remote locations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Does not produce CO₂</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No risk of greenhouse effect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No risk of acid rain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Renewable and free</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Only reliable in volcanic areas</td>
<td></td>
</tr>
</tbody>
</table>

**Activity 2.-** The teacher makes new groups of three students with different handouts (one student A, one student B and one student C) and they have to share their information to complete the activities in their worksheets:

a) By asking and answering the questions they wrote in part I, they have to complete the grid with their partners' information. The solutions are in the grid in the previous page.

b) Each student has to explain the process with the flow diagram they have drawn. They have a writing frame to help them.

**Activity 3.-** The teacher can use the PowerPoint presentation `renewableII.ppt` to summarize the most important content of the lesson and it will help the students to correct their flow diagrams.
# LESSON PLAN 5.- RENEWABLE ENERGY RESOURCES (II)

## KEY SKILLS
Students will be able...
- To work in group and share knowledge.

## TRANSFERABLE SKILLS

- **Communicative skills**: Students will be able...
  - To understand a written document and extract the most important information.
  - To interact with other students by asking and answering questions to find out some information.
  - To select from their knowledge and communicate in a variety of ways: talking, writing...

- **Methodological skills**: Students will be able...
  - To transform information they are given into knowledge activating thinking skills.
  - To memorize, process and assimilate new knowledge and skills.

- **Personal skills**: Students will be able...
  - To solve problems in a reflective way by using their previous knowledge.

## Aim
Students will learn about wind energy, hydropower and geothermal energy and they will study how electricity is produced in power stations and what the advantages and disadvantages of those energies are.

## TEACHING OBJECTIVES

### CONTENT
- Basis of wind energy, hydropower and geothermal energy.
- History.
- Examples of use.
- Electricity production in power stations.

### COGNITION
To offer opportunities for students to work in expert groups and make the effort to understand information and explain it with their own words.

### COMMUNICATION
- Knowing all the uses of wind energy, hydropower and geothermal energy.
- Understanding the advantages and disadvantages of renewable energy resources.
- Remembering how power stations work.

## LEARNING OUTCOMES

### CONTENT
- Knowing all the uses of wind energy, hydropower and geothermal energy.
- Understanding the advantages and disadvantages of renewable energy resources.
- Remembering how power stations work.

### COGNITION
- Deducing how a power station works from an explanation.
- Summarizing some information for a partner.
- Drawing a flow diagram of a process from a written explanation.

## COMMUNICATION

- **Language of learning**
  Specific vocabulary about renewable energy resources (wind farm, wind turbine, dam, heat, hot spring, parts of a power plant).

- **Language for learning**
  Asking and answering questions, explaining a process step by step.

- **Language through learning**
  Language that comes out when completing tasks, i.e. new vocabulary and expressions.

## CULTURE

- Advantages and disadvantages of renewable energy resources.

## ASSESSMENT CRITERIA
Students should be able to remember key words related to different renewable energy resources and explain electricity production by means of flow diagrams.