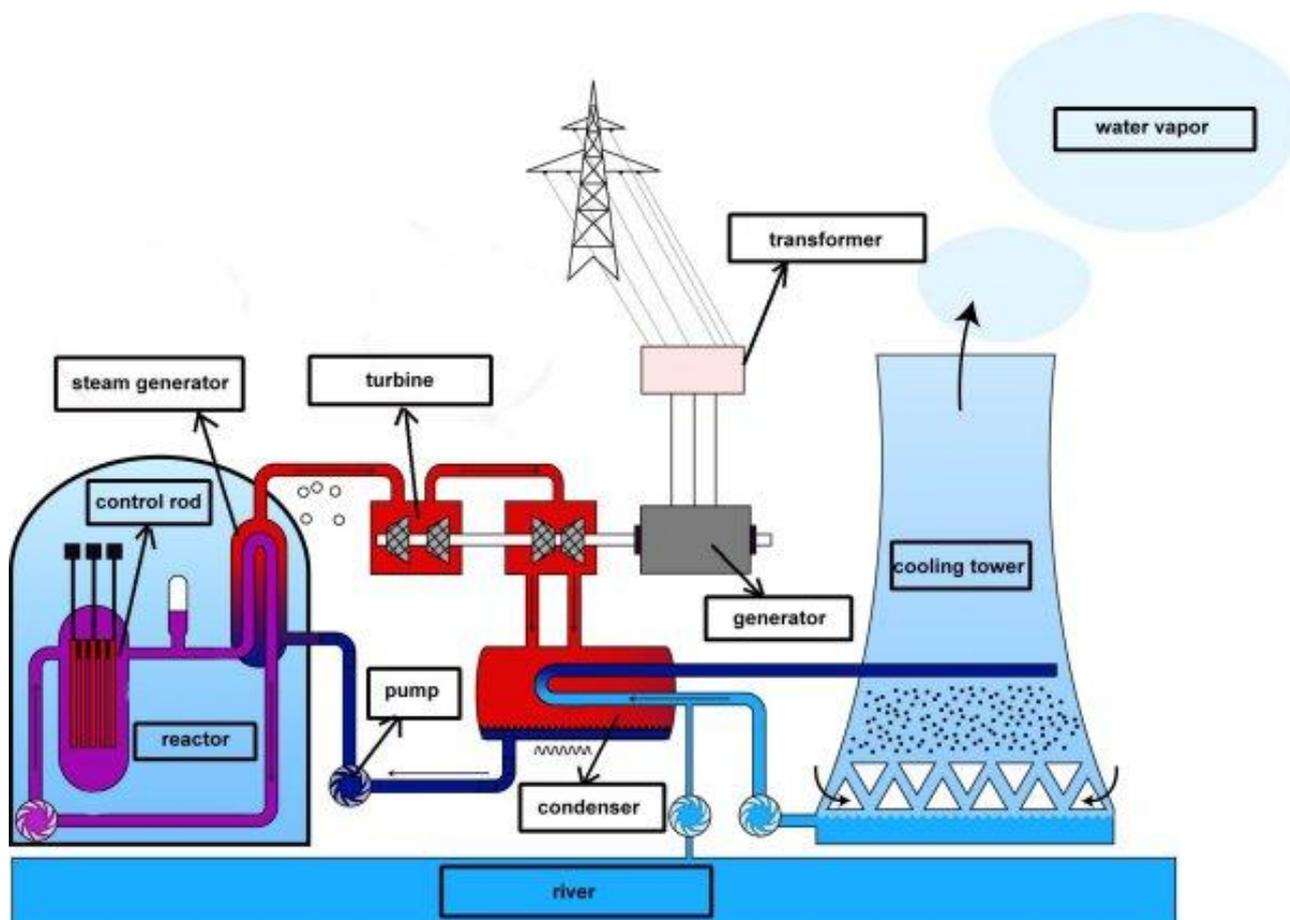


LESSON 3.- NUCLEAR POWER

This lesson is done with the PowerPoint presentation *nuclear_power.ppt*. The teacher explains the theory about nuclear energy by means of the PowerPoint. The students have a worksheet with different activities to do. The activities will be done after the teacher's explanation.

1. The students can visit a website about nuclear energy and answer the questions they have in their worksheet. This activity can also be done without computers, since the teacher has already explained all the key words with the PowerPoint presentation.
 - a) Is nuclear power renewable? **No**.
 - b) Nuclear power stations use **uranium** as fuel. They need very little, compared to a "fossil" power station because there is much more **energy** in nuclear fuel.
 - c) The **chain** reaction inside the **reactor** creates heat, which turns **water** into steam to drive **turbines**, which drive generators to make electricity.
 - d) **Nuclear** power stations do not create atmospheric pollution, because they do not **burn** anything. However, the small amount of **waste** that they do produce is very **dangerous**.
2. The students have to label the picture of the nuclear power station with the words in the box. The result would be:



- **Here you have some help for the explanation:**

Nuclear Fission

An **atom's nucleus can be split apart**. When this is done, a tremendous amount of energy is released. The energy is both heat and light energy. Einstein said that a very small amount of matter contains a very LARGE amount of energy. This energy, when let out slowly, can be harnessed to generate electricity. When it is let out all at once, it can make a tremendous explosion in an atomic bomb.

A nuclear power plant uses **uranium as a "fuel"**. Uranium is an element that is dug out of the ground in many places around the world. It is processed into tiny pellets that are loaded into very long rods that are put into the power plant's reactor.

The word fission means to split apart. Inside the reactor of an atomic power plant, uranium atoms are split apart in a controlled **chain reaction**.

In a chain reaction, particles released by the splitting of the atom go off and strike other uranium atoms splitting those. Those particles given off split still other atoms in a chain reaction. In nuclear power plants, control rods are used to keep the splitting regulated so it doesn't go too fast.

The reaction also creates **radioactive material**. This material could hurt people if released, so it is kept in a solid form. The very strong concrete dome is designed to keep this material inside if an accident happens.

This chain reaction gives off **heat energy**. This heat energy is used to boil water in the core of the reactor. So, instead of burning a fuel, nuclear power plants use the chain reaction of atoms splitting to change the energy of atoms into heat energy.

This water from around the nuclear core is sent to another section of the power plant. Here, in the heat exchanger, it heats another set of pipes filled with water to make steam. The steam in this second set of pipes turns a turbine to generate electricity.

Information source: <http://www.energyquest.ca.gov/story/chapter13.html>

3. They have to write down the process using the words in the box and the connectors they learnt in previous lessons.
4. In pairs they have to explain what they know about 4 different aspects of nuclear energy.
 - a. Pollution: nuclear power plants cause very little pollution compared with using fossil fuels to generate the same amount of electricity.
 - b. Radioactivity: Radioactive waste. Much of the waste produced by the nuclear power industry is radioactive and some of it is extremely radioactive and therefore extremely dangerous.
 - c. The Chernobyl disaster: In April 1986 the world's worst ever nuclear accident happened at Chernobyl in the north of Ukraine, close to the border with Belarus.

Late at night on 25th April 1986 engineers at the Chernobyl nuclear power station carried out unauthorised tests on one of the four reactors and set off an uncontrolled

chain reaction. Cooling water in the reactor began to react with hot metal, releasing hydrogen gas which exploded early the next morning, exposing the reactor core which then caught fire. The explosion at Chernobyl was not a nuclear explosion: it was a chemical explosion which caused the release of radioactive material.

Several tones of radioactive material were released into the atmosphere. Officials in the USSR did not admit what had happened until instruments in Sweden detected radioactive fallout. Fire-fighters and workers at the power station worked heroically to seal off the reactor core.

Most reports agree that 31 people died because of radiation exposure during the Chernobyl incident but it is very difficult to know how many may have died later. Some people believe that thousands of people may eventually die because they have been exposed to fallout from the accident.

- d. Greenhouse effect and global warming: The actual operation of a nuclear power station does not release carbon dioxide into the atmosphere. This is important because carbon dioxide is an important greenhouse gas. Nuclear power plants do not contribute neither to the greenhouse effect nor to global warming.

LESSON PLAN 3.- NUCLEAR POWER

<p>KEY SKILLS: Students will be able...</p> <ul style="list-style-type: none"> To use their knowledge about facts to predict consequences. 			
<p>TRANSFERABLE SKILLS</p> <ul style="list-style-type: none"> ➤ Communicative skills: Students will be able... <ul style="list-style-type: none"> To acquire specific vocabulary. To interact with other students by describing processes from diagrams. To select from their knowledge and communicate in a variety of ways: talking, writing... ➤ Methodological skills: Students will be able... <ul style="list-style-type: none"> To look for information on the internet and select key words. To process and assimilate new knowledge and skills. ➤ Personal skills: Students will be able... <ul style="list-style-type: none"> To use their initiative and previous knowledge. 			
<p>Aim: Students will learn how nuclear power stations work and the consequences of using nuclear energy.</p>			
TEACHING OBJECTIVES	LEARNING OUTCOMES	COMMUNICATION	CULTURE
CONTENT	CONTENT	<ul style="list-style-type: none"> ➤ Language of learning Key vocabulary about nuclear energy (uranium, fission, chain reaction), parts of nuclear power stations and environmental problems (radioactive waste). ➤ Language for learning Understanding nuclear power station diagrams. ➤ Language through learning Language that comes out when completing tasks, i.e. new vocabulary and expressions. 	<p>- Clichés about nuclear energy.</p>
<ul style="list-style-type: none"> - Uranium and nuclear fission. - Electricity production in nuclear power stations. - Radioactive waste and environment. 	<ul style="list-style-type: none"> - Knowing what a chain reaction is. - Understanding the electricity generation in nuclear power stations. - Understanding the environmental effects of nuclear energy. 		
COGNITION	COGNITION		
<p>To offer opportunities for students to synthesize knowledge and evaluate nuclear energy.</p>	<ul style="list-style-type: none"> - Distinguishing between advantages and disadvantages of fossil fuels. - Drawing a flow chart of the process of producing electricity in a power station. - Explaining a process by means of a diagram. 		
<p>ASSESSMENT CRITERIA: Students should be able to explain electricity production from a diagram of a nuclear power station and know the safety measures which are necessary.</p>			