Sequence 6: Nuclear energy

Sommaire des activités ETLV :

ACTIVITY 4: Nuclear plant

Objective: Acquiring information on nuclear plants

DOCUMENT 2: How does a nuclear power plant work?

https://www.youtube.com/watch?v=jpDRfaWYk3I
Source: ENGIE Belgium: How does a nuclear power plant work?

Gathering information:

Watch the video carefully. Write down the keywords/expressions/definitions you heard on a piece of paper.

_____
_____
_____
_____
_____
_____

Acquiring vocabulary:

Fill in the blanks using the following words:

- thermal steam coal fuel pellets control rods
- reactor vessel steel sealed nuclei boil device
- ascending shaft end-users

English	French
	scellé
	arbre
	noyaux
	dispositif
	granulés
	vapeur
	utilisateurs finaux
	thermique
	bouillir
	cuve du réacteur
	barres de contrôle
	combustible
	acier
	ascendant
	charbon

Going into details:

Watch the video and find the missing words (numbered from 1 to 15):

Electrabell has ***(1)*** nuclear power plants, four in *Doel* and three in *Tihange* covering half of the electricity consumption in Belgium without producing ***(2)***. But how exactly does a nuclear power plant work?
A nuclear power plant works to a large extent like a conventional thermal power plant.
Water is converted into steam which drives a turbine connected to a generator.
This generator converts the mechanical energy into ***(3)*** energy.

The only difference is that the heat, which converts water into steam, is produced by nuclear ***(4)*** and not by burning coal, natural gas or biomass. The nuclear power plants of *Doel* and *Tihange* use fissile uranium oxide
Uranium oxide is compressed into fuel pellets and packed into sealed fuel rods.
Multiple rods in turn form fuel elements which are immersed in ***(5)*** within a reactor vessel made of 20 centimeter thick steel.
The reactor vessel is subsequently hermetically sealed. The fission of the uranium can now begin by ***(6)*** it with neutrons. In each fission two or three neutrons are released.
They in turn cause new fissions and thus creating a chain reaction.
In a nuclear reactor, it's important that this chain reaction is controlled.
After each fission, only one released neutron should cause a new fission.
Boric acid in the water of the reactor vessel and lowered control rods ***(7)*** the oversupply of neutrons.
By lowering all the control rods at the same time the chain reaction is stopped within 1.3 seconds.
A nuclear power plant with a pressurized ***(8)*** reactor such as *Doel* and *Tihange* has three completely separated water circuits: a primary circuit, a secondary circuit, a tertiary circuit.
In the primary circuit, the heat released during the fission of the uranium nuclei heats up the water in the reactor vessel to the temperature of 320°C. The pressure regulator keeps everything ***(9)*** high pressure, so the water does not boil or form steam. Hence the name high pressure reactor.
The hot water passes via the primary circuit to a heat exchanger or steam ***(10)***.
This is a cylindrical device with thousands of pipes in reverse U-shape.
The water runs through these pipes and gives the heat to the water of the secondary circuit, which flows alongside the ***(11)*** of the pipes. The water in the secondary circuit heats up and turns into steam. The steam from the steam generators drives one or more steam turbines. These turbines consist of a series of blades installed on a shaft. The high pressure of the steam causes the shaft to ***(12)*** very fast. This in turn drives a generator which ultimately produces electricity. Somewhat like a dynamo on a bicycle.

Transformers increase the voltage of the electricity produced by the generator, allowing transportation of the electricity to the end-users with as little loss as possible. To cool down, the steam coming from the turbines passes through a condenser. The ***(13)*** water from the tertiary circuit passes through the tubes of the condenser. In *Doel* this cooling water comes from the *Scheld,* in *Tihange* from the *Maas.*
The steam from the secondary circuit condenses to water and is returned to the steam generator, to be heated again to steam. The warmed cooling water is brought to the cooling ***(14)***.
There it cools through contact with an ascending air flow. The natural chimney effect, as it were.
The majority of this water is collected in a basin at the bottom of the cooling tower and then returned to the condenser. Almost all the water is subsequently discharged back into the *Scheld* or the *Maas*.
Only a small part leaves the cooling tower as water ***(15)***.

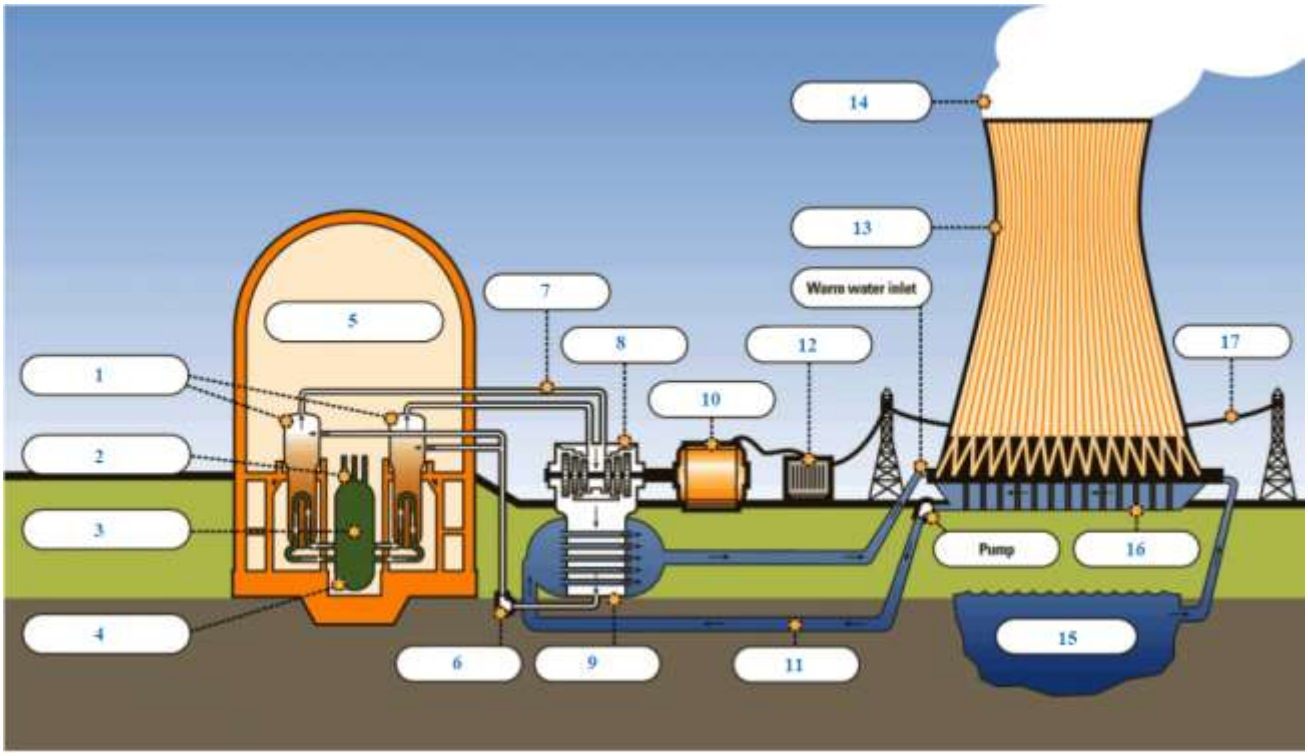
- **Write your answers in a Google Form or below:**

1. _____	**2.** _____
3. _____	**4.** _____
5. _____	**6.** _____
7. _____	**8.** _____
9. _____	**10.** _____
11. _____	**12.** _____
13. _____	**14.** _____
15. _____	

- **Learning more vocabulary:**

Label the following items on the diagram:

- Containment building
- Pump
- Electricity
- Steam generators
- Transformer
- Generator
- Cooling tower
- Cool water source
- Uranium fuel
- Steam lines
- Turbine
- Control rods
- Water vapor
- Reactor vessel
- Condenser
- Cold water basin
- Cooling water



Source: https://www.nuclear-power.com/nuclear-power-plant/
Write your answers in a Google Form or below:

1. _____	**2.** _____
3. _____	**4.** _____
5. _____	**6.** _____
7. _____	**8.** _____
9. _____	**10.** _____
11. _____	**12.** _____
13. _____	**14.** _____
15. _____	

Activities summary

What you must remember:

- **nuclear plant**
- **reactor**
- **turbine, condenser**

Skills linked to the curriculum**:**

Compétences	Capacités à maîtriser	Où dans cette séquence ?
APP	Utiliser du vocabulaire spécifique	Activités 1 à 6
	Lire et comprendre des documents scientifiques	Activités 1 à 6
COM	S'exprimer à l'écrit et à l'oral en utilisant le vocabulaire adapté	Activités 1 à 6

Objectifs de la séance :

- *Compétences linguistiques* : Améliorer la capacité des élèves à parler en anglais sur un sujet technique.
- *Compétences techniques* : Renforcer les connaissances sur l'énergie nucléaire.
- *Compétences de présentation* : Développer les compétences en communication et présentation en anglais.

Durée : 2 séances de 1 heure

Matériel nécessaire :

- Support visuel (vidéo courte).
- Accès à internet (pour recherches rapides si nécessaire notamment un Google form)