



Sequence 6: Nuclear energy



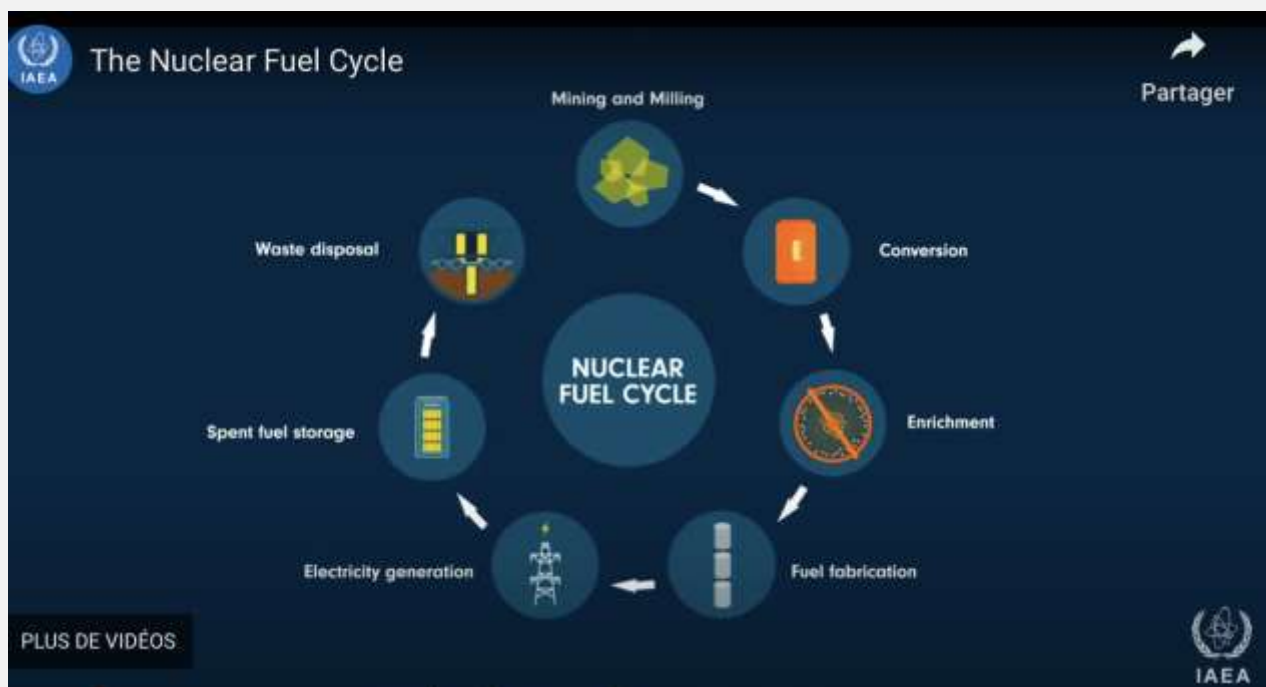
Sommaire des activités ETLV :

- ACTIVITY 1: History of nuclear energy (level 1)
- ACTIVITY 2: History of nuclear energy (level 2)
- ACTIVITY 3: History of nuclear energy (level 3)
- ACTIVITY 4: Nuclear plant
- **ACTIVITY 5: The nuclear fuel cycle**
- ACTIVITY 6: Nuclear accidents

ACTIVITY 5: The nuclear fuel cycle

Objective: Acquiring information on the nuclear fuel cycle

DOCUMENT 3: The nuclear fuel cycle



<https://www.iaea.org/newscenter/multimedia/videos/what-is-the-nuclear-fuel-cycle>

Source: IAEA Department of Nuclear Energy

The nuclear fuel cycle is an industrial process involving various steps to produce electricity from uranium in nuclear power reactors. The cycle starts with the mining of uranium and ends with the disposal of nuclear waste.



■ 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:

- mining ore milling enrichment pressure
- shielding casks deep disposable

English	French
	broyage
	pression
	enrichissement
	jetable
	extraction
	profond
	minerais
	fûts
	blindage

■ Going into details:

Watch the video and find the missing words (numbered from 1 to 16):

The nuclear fuel cycle is an industrial (1) to produce electricity from uranium in nuclear power reactors. The cycle starts with the mining of uranium and ends for the disposal of spent fuel and other (2) waste. As the first step of the nuclear fuel cycle, uranium recovery focuses on mining (3) uranium ore from the earth. The mined uranium (4) is crushed and chemically treated to separate the uranium which is called milling. This process leaves us with « yellowcake » the powder form of uranium (5) U_3O_8 . In general, conversion is a process in which the uranium is converted to a form suitable for enrichment. Natural uranium only contains 0.71% of uranium-235 the (6) that maintains a nuclear reactor's chain reaction. To increase the concentration of uranium-235 the yellowcake must be converted (7) uranium hexafluoride UF_6 gas. As most nuclear reactors require fuel with the uranium-235 concentration of 3 to 5%, the proportion of the uranium-235 isotope must be (8). This process is known as enrichment. This is done by introducing the UF_6 gas into fast spinning cylinders, known as centrifuges, where heavier isotopes are pushed out to the cylinder (9). Enriched UF_6 is converted to uranium dioxide powder and formed into small solid cylindrical (10). These are packed in long metal tubes which are grouped in fuel assemblies.



Controlled fission, or splitting of U-235 atoms, generates (11).

The heat produces steam at extremely high temperatures and pressure.

The steam then spins the turbine to generate electricity.

Nuclear fuel is typically used in the reactor for three to five (12).

After removal, it is stored underwater, which provides both cooling and radiation shielding.

Later, it can also be stored dry in (13) buildings or casks

Material and spent fuel can also be recycled to produce more energy.

Some countries chemically reprocess spent (14) to separate the usable material from unusable waste.

For this, plutonium and natural uranium are mixed to make a new type of fuel and can be reused in existing reactors or in fast-neutron reactors.

Spent nuclear fuel or high-level (15) can be safely disposed of deep underground, in stable rock formations.

Waste is packed in long lasting containers and buried deep in the geological formations chosen for their favourable stability and geochemistry.

The first such disposable facility is expected to be operational in the (16) future.

The IAEA supports its member states and using nuclear technologies in a safe, secure, and sustainable manner

■ Write your answers in a Google Form or below:

1. _____	2. _____
3. _____	4. _____
5. _____	6. _____
7. _____	8. _____
9. _____	10. _____
11. _____	12. _____
13. _____	14. _____
15. _____	16. _____

■ Going further:

1. What is the “yellow cake”?

2. The energy of a 7g uranium pellet is equivalent to how much energy in coal?



Activities summary

What you must remember:

- **nuclear fuel cycle**
- **enrichment**
- **ore**

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)