Sequence 3: Different energies

Fiches de synthèse mobilisée (collection en français) :

- Fiche n°10 ETLV Terminale PCM : Stockage et transfert d'énergie

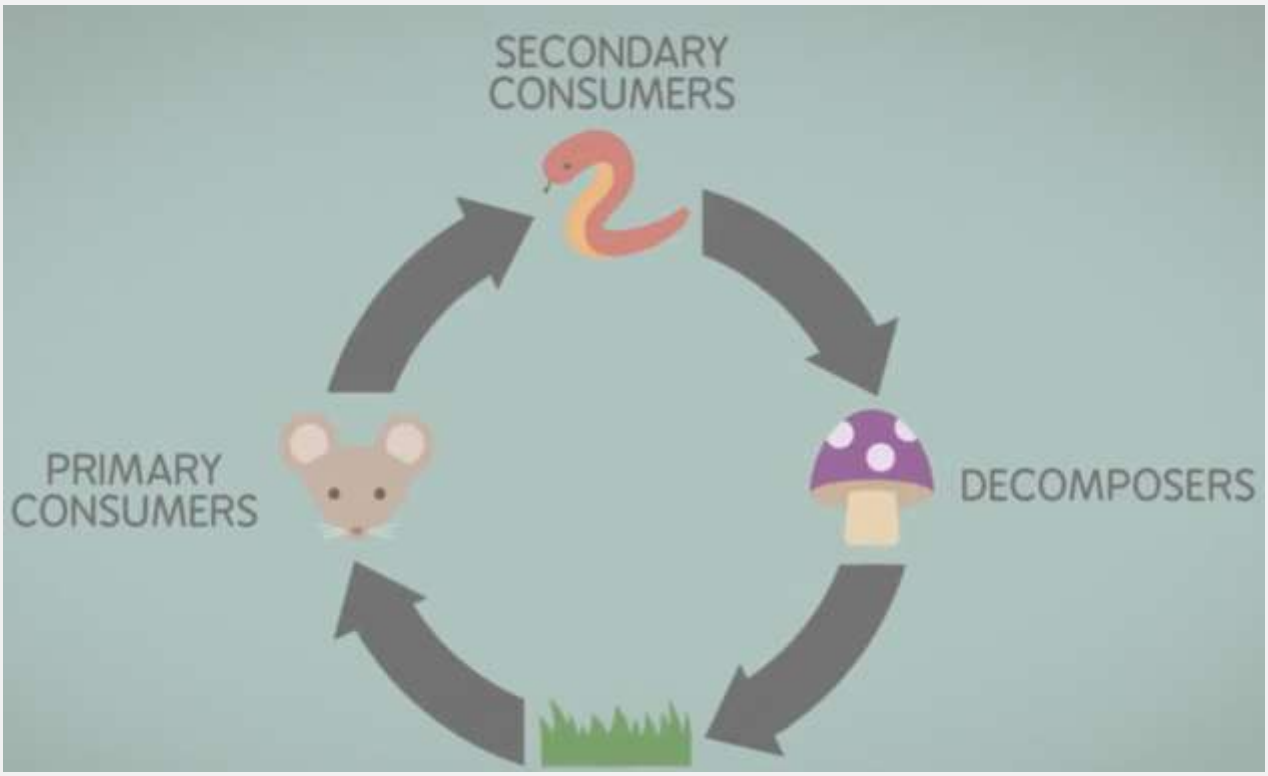
Sommaire des activités ETLV :

- ACTIVITY 1: Different types of energy (level 1)
- ACTIVITY 2: Different types of energy (level 2)
- ACTIVITY 3: Different types of energy (level 3)

ACTIVITY 1: Different types of energy (level 1)

Objective: Acquiring the English vocabulary of the different forms of energy used for electricity production and district heating.

DOCUMENT 1: A guide to the energy of the Earth TED Ed video



https://www.youtube.com/watch?v=fHztd6k5ZXY
Source: Ted Ed

Gathering information:

Listen to the video carefully. Work as a pair and write down the keywords/expressions/definitions you heard on a piece of paper. Then write your answers on the board.

_____
_____
_____
_____
_____
_____

As a group, then summarize what you learned:

_____
_____
_____
_____
_____
_____

Testing your knowledge:

General Energy vocabulary

1. What is the term for the amount of energy used by a process or system?
    - a) Energy production
    - b) Energy consumption
    - c) Energy efficiency
    - d) Energy transfer
2. What is the process of moving energy from one place or object to another?
    - a) Energy infrastructure
    - b) Energy efficiency
    - c) Energy transfer
    - d) Energy production
3. Which term refers to the improvement of the efficiency of energy use?
    - a) Energy consumption
    - b) Environmental impact
    - c) Energy efficiency
    - d) Energy transition

Geothermal Energy

4. What is geothermal energy derived from?
    - a) Sunlight
    - b) Wind
    - c) Earth's internal heat
    - d) Water flow
5. What is an underground pool of hot water called?
    - a) Solar panel
    - b) Geothermal reservoir
    - c) Wind turbine
    - d) Hydroelectric plant

Solar Energy

6. Which system converts sunlight into electricity?
    - a) Wind turbine
    - b) Solar cell
    - c) Photovoltaic system
    - d) Nuclear reactor
7. What do solar panels capture to produce energy?
    - a) Wind
    - b) Water
    - c) Sunlight
    - d) Fossil fuels

Wind Energy

8. What generates energy by capturing the flow of wind?
    - a) Solar panel
    - b) Wind turbine
    - c) Hydroelectric plant
    - d) Coal mine
9. What is a group of wind turbines located in the same area called?
    - a) Wind farm
    - b) Solar cell
    - c) Nuclear plant
    - d) Geothermal field

Hydroelectric Energy

10. What type of plant uses flowing water to generate electricity?
    - a) Wind farm
    - b) Hydroelectric plant
    - c) Nuclear reactor
    - d) Geothermal plant
11. Which structure is built to control the flow of water and generate electricity?
    - a) Wind turbine
    - b) Solar panel
    - c) Dam
    - d) Coal mine

Nuclear Energy

12. What type of energy is produced by nuclear reactors?
    - a) Solar energy
    - b) Wind energy
    - c) Nuclear energy
    - d) Hydroelectric energy
13. What is the term for the byproducts of nuclear energy production?
    - a) Carbon footprint
    - b) Nuclear waste
    - c) Fossil fuels
    - d) Energy grid

General Knowledge

14. Which term describes energy sources that can be naturally replenished?

- a) Non-renewable energy
- b) Fossil fuels
- c) Renewable energy
- d) Energy infrastructure

15. What is the environmental term for the total amount of greenhouse gases produced by human activities?
    - a) Energy efficiency
    - b) Energy consumption
    - c) Carbon footprint
    - d) Environmental impact

Summing up vocabulary:

Fill in the blanks and find an equivalent in French.

These tables can be handed out to pairs of students and each pair can work on one or two at a time.

Geothermal energy

Geothermal energy	
Geothermal reservoir	
District heating	
Heat pump	
Geothermal plant	

Solar energy

Solar energy	
Photovoltaic system	
Solar panels	
Solar farm	
Solar thermal energy	

Wind power

Wind power	
Wind turbine	
Wind farm	
Wind speed	
Wind energy conversion system	

Hydroelectric power

Hydroelectric power	
Dam	
Hydroelectric power station	
Reservoir	
Water turbine	

Fossil fuels

Natural gas	
Coal	
Refined oil	
Crude oil	
Carbon footprint	

Nuclear energy

Nuclear energy	
Nuclear power plant	
Nuclear reactor	
Nuclear waste	
Enriched uranium	

Energy

Energy grid	
Energy demand	
Renewable energy	
Non-renewable energy	
Biomass	

Energy efficiency	
Sustainable energy	
Energy consumption	
Energy production	
Environmental impact	

■ **Rephrasing:**

Choose one type of energy and produce one or two sentences using at least three expressions you just learned:

_____

_____

_____

ACTIVITY 2: Different types of energy (level 2)

Objective: reinvesting the vocabulary you acquired in the previous activity so that you can fuel a discussion on energies with documented arguments.

Work in pairs and choose one specific type of energy (from documents 1 to 6), then answer the different questions that follow.

At the end of the lesson, present you work to the class.

DOCUMENT 1: information sheet on geothermal energy

1. **Advantages:**
   - **Renewable:** Uses Earth's natural heat, an inexhaustible resource.
   - **Low CO_2 Emissions:** Emits very little greenhouse gases compared to fossil fuels.
   - **Stable and Reliable:** Provides a constant source of energy, regardless of weather conditions.
2. **Disadvantages:**
   - **High Initial Cost:** Drilling and installation costs can be high.
   - **Location Specific:** Requires suitable geological sites to be effective.
   - **Environmental Impact:** Can cause minor earthquakes and alter natural landscapes.
3. **Key Arguments:**
   - "Geothermal energy is a sustainable and reliable source of power with minimal carbon emissions."
   - "Initial investment costs are high, but the long-term benefits and savings make it a viable option."

DOCUMENT 2: information sheet on solar energy

1. **Advantages:**
   - **Renewable:** Solar energy is inexhaustible and abundant.
   - **Zero CO_2 Emissions:** No greenhouse gases are emitted during energy production.
   - **Scalability:** Can be installed on a small or large scale, from individual homes to large solar farms.
2. **Disadvantages:**
   - **Weather Dependent:** Less effective on cloudy days or at night.
   - **High Initial Cost:** Solar panels and photovoltaic systems can be expensive to install.
   - **Space Requirement:** Requires large areas for solar panels.
3. **Key Arguments:**
   - "Solar energy is clean and inexhaustible, contributing significantly to reducing carbon footprints."
   - "While initial costs are high, advancements in technology are rapidly lowering expenses."

■ **Reinvesting and argumenting:**

Geothermal Energy

1. What are the main benefits and drawbacks of using geothermal energy?

_____

2. Is geothermal energy worth the high initial cost? Why or why not?

_____

3. Where is geothermal energy most effective and why?

_____

4. What are the environmental impacts of geothermal energy?

_____

5. How can technology improve geothermal energy?

_____

6. How does geothermal energy impact local communities?

_____

Solar Energy

1. Discuss the pros and cons of solar energy.
_____

2. How do the costs of solar panels impact their use?
_____

3. How does location affect solar energy production?
_____

4. How does solar energy impact the environment?
_____

5. What technological advancements are improving solar energy?
_____

6. What are the political implications of adopting solar energy?
_____

DOCUMENT 3: information sheet on wind energy

1. Advantages:

- **Renewable:** Uses wind, an unlimited resource.
- **Zero CO_2 Emissions:** No direct greenhouse gas emissions.
- **Low Operational Cost:** Once installed, operating costs are low.

2. Disadvantages:

- **Weather Dependent:** Energy production varies with wind strength.
- **Visual and Noise Impact:** Wind turbines can be perceived as a visual and noise nuisance.
- **Space Requirement:** Wind farms require large areas of land.

3. Key Arguments:

- "Wind energy is a cost-effective and sustainable option that reduces greenhouse gas emissions."
- "Although weather-dependent, wind energy complements other renewable sources for a balanced energy mix."

DOCUMENT 4: information sheet on hydroelectric power

1. **Advantages:**
   - **Renewable:** Uses moving water, a renewable resource.
   - **Low CO_2 Emissions:** Emits very few greenhouse gases.
   - **Reliability:** Can provide stable and continuous energy production.
2. **Disadvantages:**
   - **Environmental Impact:** Can disrupt aquatic ecosystems and fish habitats.
   - **High Initial Cost:** Building dams and hydroelectric facilities is expensive.
   - **Risk of Disaster:** Dams can pose a risk if they break.
3. **Key Arguments:**
   - "Hydropower is a reliable and efficient source of renewable energy with low greenhouse gas emissions."
   - " Environmental impacts are a concern, but modern technology can mitigate these effects."

■ **Reinvesting and argumenting:**

Wind Energy

1. What are the advantages and disadvantages of wind energy?
   _____
2. Are wind turbines a good investment? Discuss.
   _____
3. Where are the best places for wind farms and why?
   _____
4. Discuss the environmental effects of wind energy.
   _____
5. How can technology make wind energy more efficient?
   _____
6. How do communities feel about wind farms?
   _____

Hydroelectric Energy

1. Discuss the benefits and downsides of hydroelectric power.
   _____

2. Is building dams for hydroelectric power cost-effective?

_____

3. Which locations are best for hydroelectric power?

_____

4. What are the environmental concerns with hydroelectric power?

_____

5. What new technologies can reduce the environmental impact of hydroelectric power?

_____

6. How do hydroelectric projects affect local populations?

_____

DOCUMENT 5: information sheet on fossil fuels

1. Advantages:

- **Economically viable:** Currently cheaper than many renewable energy sources.
- **Established Infrastructure:** Production and distribution systems are already in place.
- **High Energy Density:** Provides a large amount of energy per unit volume.

2. Disadvantages:

- **Non-Renewable:** Fossil fuel reserves are limited and depleting.
- **High CO_2 Emissions:** Contributes significantly to greenhouse gas emissions and climate change.
- **Environmental Pollution:** Extraction and use cause significant air, water, and soil pollution.

3. Key Arguments:

- "Fossil fuels are currently a cost-effective and high-density source of energy."
- "The significant environmental impact and finite nature of fossil fuels necessitate a transition to cleaner energy sources."

DOCUMENT 6: information sheet on nuclear power

1. **Advantages:**
   - **High Energy Density:** Produces a large amount of energy from a small amount of fuel.
   - **Low Greenhouse Gas Emissions:** Emits very low amounts of CO_2 compared to fossil fuels.
   - **Reliable and Stable:** Provides a continuous and stable supply of energy, not dependent on weather conditions.
2. **Disadvantages:**
   - **Nuclear Waste:** Produces radioactive waste that needs to be carefully managed and stored for thousands of years.
   - **High Initial Cost:** Building nuclear power plants is very expensive and time-consuming.
   - **Risk of Accidents:** Potential for catastrophic accidents, such as Chernobyl and Fukushima.
3. **Key Arguments:**
   - " Nuclear energy is a powerful and low-emission source of electricity that can significantly reduce our carbon footprint."

■ **Reinvesting and argumenting:**

Fossil Fuels

1. What are the key advantages and disadvantages of fossil fuels?
_____

2. Why are fossil fuels considered economically viable?
_____

3. How does the location of fossil fuel reserves impact their use?
_____

4. How do fossil fuels affect the environment?
_____

5. How can technology reduce the environmental impact of fossil fuels?
_____

6. What are the political issues related to fossil fuel use?
_____

Nuclear Energy

1. Discuss the pros and cons of nuclear energy.
_____

2. Are the costs of building nuclear plants justified?
_____

3. Which factors determine the location of nuclear power plants?
_____

4. What are the environmental risks of nuclear energy?
_____

5. Which advancements could make nuclear energy safer?
_____

6. What are the social and political debates around nuclear energy?
_____

ACTIVITY 3: Different types of energy (level 3)

Objective: reinvesting the vocabulary you acquired in the two previous activities so that you can prepare a presentation on energies using documented arguments.

- Choose one type of energy from the previous studied.
- Prepare a 2-3min presentation in order to answer a question you choose amongst the ones below:

Geothermal Energy

1. Discuss the benefits of geothermal energy being a renewable resource and its low CO_2 emissions.
How do these benefits compare to other renewable energy sources?

2. Analyse the high initial costs of geothermal energy.
How do the long-term benefits justify the initial investment?

3. Discuss the location-specific nature of geothermal energy.
How do geological conditions impact its effectiveness?

4. Discuss the potential environmental impacts of geothermal energy, such as minor earthquakes.
How can these risks be managed?

5. Explore the future potential of geothermal energy with advancements in drilling and extraction technology.

6. Discuss the socioeconomic impact of geothermal energy projects in local communities.
How does it affect employment and development?

Solar Energy

1. How does the scalability of solar energy impact its adoption in different regions?
Discuss the environmental benefits of zero CO_2 emissions.

2. Discuss the high initial costs of solar panels and photovoltaic systems.

How do advancements in technology impact these costs?

3. Explore the weather-dependent nature of solar energy.
   How do different climates affect its efficiency and adoption?

4. Examine any health and safety concerns related to the installation and maintenance of solar panels.

5. Discuss how technological advancements are reducing the costs of solar energy.
   What future innovations could further improve efficiency?

6. Explore the political and economic implications of adopting solar energy on a large scale.
   How does it impact energy independence?

Wind Energy

1. Explore the advantages of wind energy in terms of renewability and low operational costs.
   Compare its environmental impact to that of other energy sources.

2. Examine the high initial costs of wind turbines. How do the low operational costs balance this out?

3. Examine how the variability of wind impacts energy production.
   What are the best locations for wind farms?

4. Explore the visual and noise impact of wind turbines.
   How do these factors affect local communities?

5. Examine the potential for technological improvements in wind turbine design.
   How can these advancements increase energy production?

6. Discuss the social acceptance of wind farms.
   How do community opinions influence the development of wind energy projects?

Hydroelectric Energy

1. Discuss the reliability and continuous energy production from hydroelectric power. What are the environmental impacts, and how can they be mitigated?

2. Explore the economic implications of building dams and hydroelectric facilities. How does the long-term reliability and efficiency justify these costs?

3. Discuss the geographical requirements for hydroelectric power. How do water sources and terrain affect its viability?

4. Discuss the risk of disaster from dam failures. What safety measures can be implemented to mitigate these risks?

5. Discuss modern technologies that can mitigate the environmental impact of hydroelectric power.

6. Examine the impact of hydroelectric projects on local populations and ecosystems. How do governments balance development with environmental protection?

Fossil Fuels

1. Highlight the economic viability and established infrastructure of fossil fuels. Discuss the significant environmental pollution they cause.

2. Discuss the economic benefits of fossil fuels being currently cheaper than many renewable sources. What are the hidden costs in terms of environmental damage?

3. Explore the global distribution of fossil fuel reserves. How does location impact accessibility and cost?

4. Analyse the health impacts of pollution from fossil fuels. How does air, water, and soil pollution affect human health?

5. Explore the role of technology in reducing the environmental impact of fossil fuel extraction and use.

6. Discuss the geopolitical implications of fossil fuel dependency. How does it influence international relations and conflicts?

Nuclear Energy

1. Discuss the low greenhouse gas emissions and high energy density of nuclear power. Compare the environmental impact to that of fossil fuels.

2. Analyse the high initial costs and long-term economic benefits of nuclear power. Discuss the financial implications of managing nuclear waste.

3. Discuss the site selection for nuclear power plants. What factors need to be considered to ensure safety and efficiency?

4. Discuss the risks of nuclear accidents and radioactive waste. How can these risks be minimized?

5. Discuss the potential of next-generation nuclear reactors. How can advancements in technology improve safety and efficiency?

6. Explore the political and social debates surrounding nuclear energy. How do public perceptions and policies shape its development?

Activities summary

What you must remember:

- **Solar energy, wind power**
- **Geothermal energy, nuclear energy**
- **Fossil fuels**

Skills linked to the curriculum**:**

Compétences	Capacités à maîtriser	Où dans cette séquence ?
APP	Utiliser du vocabulaire spécifique	Activités 1 à 3
	Lire et comprendre des documents scientifiques	Activités 1 et 2
ANA	Mettre en lien des documents pour émettre des hypothèses en réponse à une question scientifique	Activités 2 et 3
COM	S'exprimer à l'écrit en utilisant le vocabulaire adapté	Activités 2 et 3