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Renewable Energy in Selected European Countries

Teacher's Guide

September, 2025

Project Partners

CONTEXT

The scope of this teacher's guide

This teacher's guide addresses how energy use has evolved in Europe, focusing on Greece, Turkey, Portugal, and North Macedonia.

It presents one lesson plan to be used in conjunction with a students' worksheet, developed to support a 60-minute class.

The target Group is secondary school students aged 15–17 years old.

Some general information, followed by the lesson plan, is provided for the lesson.

The subjects involved are Science, Technology, Geography, and English.

The keywords that describe the lessons are: renewable energy use, sustainability, STEM, Europe energy use.

Summary

This interactive STEM lesson engages students in exploring how energy use has evolved in Europe, focusing on Greece, Turkey, Portugal, and North Macedonia. Students analyze infographics, play a movement-based quiz game, predict future energy scenarios, and propose creative energy policies.

Aims of the lesson

By the end of the teaching and learning sequence, students are expected to show **knowledge** of the relationship between energy and the environment, namely to:

- Interpret simple energy trend charts for selected European countries.
- Compare renewable energy growth rates between countries.
- Develop creative strategies for future energy use.

During the sequence, students will develop **21st-century** skills in the following areas:

- Creativity and innovation
- Critical thinking and problem-solving
- Communication and collaboration
- Information, media, and technology literacy
- STEM Literacy

Methodological approach

The methodological approach relies on the following **strategies**:

- Collaborative learning (small group work, role-play)
- Gamification (interactive quiz with movement)
- Visual learning (maps, infographics, charts)
- Project-based exploration (energy councils)
- Formative assessment (observation, sticky notes)

The methodological approach acknowledges a **STEM orientation** by assuming:

- **Personalisation of learning:** reflection on energy choices.
- **STEM topic integration:** Links between renewable energy, geographical conditions, energy technology, and societal issues.
- **Formative assessment:** Continuous formative assessment through reflection and peer review.

Assessment guidelines

Assessment is continuously done based on formative practices to personalize learning and enhance the overall teaching and learning experience.

Formative assessment is embedded in the lesson activities. It should be done during class discussions, group work, role-playing, etc. Students' worksheets include a variety of tasks to be performed by the students that allow the teacher to observe progression on knowledge, reasoning, behavior, communication skills, social-relational skills, creativity, etc. They also allow students to express their understanding in different ways, providing evidence of how deeply they understand and can use the content. Formative assessment should consider issues like accuracy of scientific content, creativity in presentation, collaboration and teamwork, critical thinking and clarity of reasoning, communication and argumentation, and engagement with the tasks.

To strengthen active participation, both self-assessment and peer assessment play a central role. Therefore, students are asked to reflect on their learning and contribution to the group, to evaluate their group's collaboration, and the performance of the different groups, etc. In addition to teachers' questions, worksheets include questions with this aim.

Together, these assessment practices provide a holistic view of each student's progress, enabling the teacher to adapt instruction to individual needs while helping students become reflective, self-directed participants in their own education.

Theoretical background

Europe has doubled its renewable energy share since 2005, reaching approximately 25% of gross final energy consumption in 2023, with a goal of **42.5% by 2030**. European countries are using accessible renewable energy sources to fulfil this target at their own pace.

More scientific and technical information on these issues can be found at:

https://www.projectgreenlighteu.com/Home/ePlatform?section=Renewable

Additional information available at: https://www.projectgreenlighteu.com/Home/Resources

LESSON PLANS ON RENEWABLE ENERGY IN SELECTED EUROPEAN COUNTRIES (REEC)

Time: 60 minutes

Teacher's materials: 1 lesson plan

Students' materials: 2 worksheets

Lesson Plan REEC1 (60 minutes)

This lesson introduces students to how energy use has evolved in Europe, focusing on Greece, Turkey, Portugal, and North Macedonia, and stimulates students' curiosity through multimedia, and gamification and engages them in collaborative activities.

1. Kick-off (10 min): Ask students: "*Imagine you are the energy minister of your country. How would you power your city? With coal, wind, solar, or something else? Why?*"

   Quick show of hands: "Who would pick renewable energy?"

   Introduce the countries (Greece, Turkey, Portugal, North Macedonia) and show a map. Discuss the use of different types of energy sources and which prevail in each country:

   Possible answers (not a single one)

   Possible choices from students:
   - Coal → Cheaper in some areas, but high emissions of greenhouse gas.
   - Wind → Clean, abundant in coastal areas (Portugal, Greece).
   - Sun → Sunny climates (Greece, Turkey) make this ideal.
   - Hydro → Works well in mountainous regions with rivers (Portugal, North Macedonia).

   Key point to emphasize: Different geography and policies influence choices.

2. Mini "Energy Quiz Game" (10 min): Ask students to solve the questions in worksheet REEC1. Students have to choose one of the four possible answers for each question. They should answer by moving to the corners of the room labeled A, B, C, D (like the possible answers). Keep it fast, interactive, and playful. In the end, correct students' answers.

   Correct answers

   1. B) Portugal ☑ (Correct: Portugal's renewables are ~63%, with wind a major contributor)
   2. B) Turkey ☑ (Turkey uses significant coal for electricity)
   3. C) 45% ☑ (Approx. 45.3%)
   4. D) North Macedonia ☑
   5. B) Solar ☑

3. Data Detective Activity (20 min): Ask small groups of 3 to 5 students to carry out the tasks in the Worksheet REEC2.

   Afterwards, promote a class discussion of the groups' answers.

Indicative answers

Fastest-growing renewable energy:
- Greece: Wind and solar energies (especially solar installations).
- Portugal: Wind energy (plus solar expansion).
- Turkey: Solar and wind energies.
- North Macedonia: Small-scale hydro, and some solar energy.

Country lagging behind:
- North Macedonia (lowest renewable share).

Sample energy predictions for 2030:
- "Portugal could reach 70% renewables by 2030 if trends continue."
- "Turkey might balance 50–55% renewables but will still use natural gas."
- "Greece could phase out most coal and rely on solar + wind."
- "North Macedonia may double its renewable share if investment increases."

4. Energy Council activity (10 min): Introduce the following scenario to students and ask them to answer the questions in small groups (3 to 5) and prepare a short presentation for their class.

Scenario

Your group is invited to pick up one Partner country (Greece, Turkey, Portugal, North Macedonia) and to become its "energy council.".

For the chosen country, the group should decide:
- Which energy source to invest in next
- One fun policy to encourage renewable energy (e.g., free solar panels for houses, wind-energy powered schools).

Ask the groups to present their country's "energy plan", in 1 minute, to the class, explaining why their choice is best.

Possible energy plans and slogans

Country	Energy Choice	Fun Policy Example	Slogan Example
Portugal	Expand wind farms	Tax breaks for communities hosting turbines	"Portugal: Wind to Win!"
Greece	Invest in solar power	Free rooftop solar panels for schools	"Greek Sun, Bright Future!"
Turkey	Combine solar + wind	Subsidies for local solar businesses	"Turn Up the Sun, Power the Future!"
North Macedonia	Small hydro + solar	EU partnership grants for renewable infrastructure	"North Macedonia: Powering Progress!"

5. Wrap-up discussion (5 min): Ask students:

- about the key ideas they learned during the class, and
- if they were a member of the government, what would be their first step toward renewable energy?"

Guidelines for the discussion

Key points to highlight:
- Renewable energy is increasing everywhere, but progress differs.
- Geography matters: Sunny climates → solar; windy coasts → wind.
- Economic and political factors (e.g., investment, EU targets) shape progress.

Encourage reflections like:
"Invest in rooftop solar panels."
"Subsidize wind farms in coastal areas."
"Upgrade energy grids for renewables."

6. Self-assessment (5 minutes): Invite students to play the games available at https://www.projectgreenlighteu.com/Home/ePlatform?section=renewGames

Assessment

Assessment across the lesson is **continuous** and combines **teacher evaluation** with **student self- and peer-assessment**.

Suggested **Teacher Assessment** Strategies:

- Participation in quizzes and activities
- Ability to interpret simple data charts
- Creativity in scenario role-play

Suggested **Student's Assessment** Strategies:

- Use **one simple checklist** (for both self- and peer-assessment) after group activities to reflect on understanding, contribution, and constructive feedback.
- Apply the **Fist-to-Five** technique as a quick formative check during presentations to gauge understanding and engagement.

This streamlined approach ensures meaningful feedback without overloading class time, while encouraging reflection, collaboration, and ownership of learning.

Interdisciplinary Connections of the Topic

The lessons have connections with several subjects, as follows:

- Science: Classification and analysis of energy sources
- Geography: Geographic availability of energy sources and use
- Technology/Art: Use of digital tools for visual communication
- English: analysis of infographics

ADDITIONAL SUGGESTIONS

PLEASE MAKE THESE APPLICATIONS BEFORE THE FINAL EVALUATION PHASE.

Video/Activity	Planning Part	Integration Format	Outcomes
Short: "Mini Solar Farm in a Box"	**Kick-off(10 min) or energy council**	A small demonstration of a real-life solar energy application. Groups can discuss which technology is appropriate for each country.	Relating real technological examples to geographical conditions.
Short: "Wind Turbine Model"	**Data detective activity (20 min)**	It can be used in conjunction with wind potential in countries. Students discuss the question, "Which country should invest in wind turbines?"	Analyzing renewable resources according to country conditions.
Short: "Hydropower in a Bottle"	**Energy Council Scenario (10 min)**	It can be used as a model technology for countries that use hydropower (e.g., Portugal, North Macedonia).	Comparing different types of renewable energy.