

Learning about energy

Learning scenario



About this learning scenario

"Learning about energy" is one of four learning scenarios developed as part of the adaptation of the **WindEurope Teacher Toolkit for Primary Schools**, carried out by **European Schoolnet (EUN)** in partnership with **WindEurope**, within the framework of the **Scientix® STEM Alliance** initiative. [Learn more about this partnership here.](#)

WindEurope's teachers' toolkit: Learning wind energy in primary schools

The **WindEurope Teacher Toolkit for Primary Schools** is an educational resource developed by **WindEurope**, in partnership with **Singelijn Primary School in Brussels**, to help primary school teachers, particularly those teaching the final years of primary education, introduce students to the fundamentals of wind energy. The toolkit provides practical materials that connect renewable energy topics with classroom learning and aims to make wind energy accessible to young learners without requiring any prior background knowledge from teachers or students.

The toolkit comprises **four cross-disciplinary modules**, each structured as a lesson plan with interactive activities and supplementary resources. The modules link subjects such as science and technology, mathematics, history, geography, and language learning with real-world wind energy topics, helping students understand how renewable energy relates to everyday life and global sustainability challenges.

The toolkit was **piloted with a class of 12-year-olds (6th grade) at Singelijn Primary School in Brussels between November 2020 and April 2021**. The curriculum was co-designed by the teacher and a class of 20 students and adapted to match their learning objectives and interests. The resource is available in **Danish, Dutch, English, French, Polish, and Spanish**, and was reviewed by the **Science Communication Committee of the European Academy of Wind Energy**.

[Access the Toolkit here.](#)

From toolkit to learning scenarios: The adaptation

The four original modules have been reviewed and adapted using the Scientix® methodology – a pedagogical quality review process that supports the development of high-quality STEM resources for teachers across Europe. The original toolkit provides engaging classroom activities about wind energy. The adapted learning scenarios retain these activities while enriching them with pedagogical guidance, curriculum mapping, assessment strategies, and links to European STEM and sustainability education frameworks. **As a result, teachers receive not only ready-to-use classroom activities, but also complete, curriculum-ready teaching resources that are easier to integrate into classroom practice across different European education contexts.** The adaptation also introduces three key enhancements:

1. Integration of GreenComp: Each learning scenario has been mapped to relevant competences from GreenComp, the [European Sustainability Competence Framework](#) developed by the European Commission's Joint Research Centre. GreenComp defines 12 competences organised into four areas –



Embodying Sustainability Values, Embracing Complexity in Sustainability, Envisioning Sustainable Futures, and Acting for Sustainability – to help learners of all ages develop the knowledge, skills, and attitudes to think, plan, and act sustainably.

2. Integration of industry involvement: Real-world industry applications have been embedded into each learning scenario. This includes profiles of wind energy professionals and the diverse roles they play – from engineers and environmental scientists to project developers and grid specialists – as well as references to real wind energy sites and technologies, examples of how wind turbines are designed, built, and tested, and connections to the broader challenge of the energy transition and Europe's path to climate neutrality. This aims to inspire curiosity, demonstrate the relevance of STEM subjects, and motivate young learners to imagine their future in these fields.

3. Mapping to the Scientix STEM School Label (SLL) criteria: The adaptation includes mapping activities to the SLL criteria, allowing school leaders and teachers to see how each learning scenario addresses key STEM areas and competencies and how it can fit into their school's STEM strategy. To learn more about the Scientix STEM School Label, [visit this page](#).

European Schoolnet (EUN) developed the pedagogical adaptation of this resource and takes full responsibility for the pedagogical adaptation and the pedagogical and STEM-educational content introduced through this adaptation.

The four learning scenarios

The learning scenarios are intended to be used in sequence but can also be used as stand-alone resources. They can be accessed below.

1. Learning about energy.
2. Constructing an anemometer and taking measurements.
3. Understanding wind turbine technology.
4. Learning about wind.

Project partners

This learning scenario has been made possible through the collaboration of key partners. [WindEurope](#) is the voice of the wind energy sector in Europe, promoting wind energy as a key part of the transition to a sustainable energy system. By joining the Scientix® STEM Alliance, WindEurope connects classrooms with real-world renewable energy examples, supporting STEM learning, inspiring young learners, and highlighting potential career pathways in the sector. [European Schoolnet \(EUN\)](#) is a network of over thirty Ministries of Education across Europe, supporting schools and teachers in the adoption of innovative teaching practices, professional development, and evidence-based approaches to learning for the 21st century. [Scientix®](#) is Europe's largest STEM education community, connecting teachers, researchers, and policymakers through training, resources, and collaborative projects. The [Scientix® STEM Alliance](#) enables industry partners to actively contribute to STEM education, engage directly with educators, and support the development of innovative teaching practices across Europe.



Learning scenario ID

Title

Learning about energy

Summary

This learning scenario introduces upper-primary students (ages 11–12) to the concept of energy: what it is, how it transforms, where it comes from, and what energy choices mean for our planet. Over four connected lessons, students build a class definition of energy, investigate how energy changes form through four hands-on stations, classify renewable and non-renewable energy sources through card sorting, explore the link between fossil fuels, CO₂, and climate change through real European data, and take on the roles of engineers, planners, economists, strategists, and ecologists in a collaborative wind farm project.

Keywords

Energy, kinetic energy, potential energy, energy transformation, renewable energy, non-renewable energy, wind energy, wind turbine, sustainability, STEM careers, energy transition, climate change, CO₂ emissions, greenhouse effect.

Aim of the learning scenario

By the end of this learning scenario, students will be able to:

- Understand what energy is and how it transforms from one form to another.
- Distinguish between renewable and non-renewable energy sources and explain why the difference matters.
- Understand the link between fossil fuel use, CO₂ emissions, and climate change.
- Understand how wind energy works and its role in Europe's energy transition.
- Experience interdisciplinary teamwork through real-world roles in wind energy development.

Licence

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Note for Educators: You are welcome (and encouraged!) to translate, adapt, and customise the worksheets and text for use in your own classroom.



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Overview

Subject(s)	Science, Technology, Geography, Mathematics, Social Studies / Citizenship, Language		
Topic(s) and curriculum connections	This learning scenario connects to curriculum areas commonly found in upper-primary education across Europe. The curriculum connections were developed through a review of representative upper-primary curricula from several European countries to identify shared learning objectives and curriculum strands, rather than align the resource to a single national curriculum. Teachers can use these strand descriptions to identify the relevant sections of their own national or regional curriculum and adapt the activities accordingly ¹ .		
	Subject	What is covered	Curriculum connections across European countries
	Natural Science (Lessons 1, 2, 3, and 4)	- Forms and types of energy. - Energy transformation. - Kinetic and potential energy. - Renewable and non-renewable sources. - How wind turbines generate electricity. - Environmental impact of energy use.	1) Forces and energy: understanding that energy causes change and that different forms of energy exist. 2) Earth and space / environment: the relationship between human energy use and environmental impact. 3) Scientific enquiry: observing, recording, classifying, and communicating findings.
	Technology (Lessons 3 and 4)	- Design and function of wind turbines. - Energy systems and infrastructure. - Renewable energy technology.	1) Understanding how technological systems work and are designed to meet human needs. 2) Making connections between scientific principles and their technological applications.
	Geography (Lessons 2, 3, and 4)	- Distribution of energy resources in Europe. - Human-environment interaction.	1) Natural resources: distribution, use, and sustainability.

¹ Subject boundaries vary across European education systems. At upper-primary level, areas such as Technology, Geography, or Citizenship may be taught either as standalone subjects or as part of broader integrated learning areas (for example, combined science, environmental studies or social studies). The curriculum connections presented in this learning scenario reflect the intended learning outcomes and curriculum strands, regardless of how these are organised within a particular national or regional curriculum.



		- Land use and spatial planning of wind farms. - Local and global environmental change.	2) Human-environment interaction: how energy decisions shape landscapes and communities. 3) Environmental change: local and global effects of energy choices.
	Mathematics (Lesson 4)	- Estimation. - Comparing quantities. - Reading and discussing numerical information in real-world contexts.	1) Data handling and interpretation: reading, comparing, and discussing numerical information in real-world contexts.
	Social Studies / Citizenship (Lessons 2, 3, and 4)	- Sustainability and environmental responsibility. - Community decision-making and planning. - Fairness in the energy transition. - Local and global connections.	1) Environmental education: understanding the link between human choices and environmental outcomes. 2) Education for sustainable development (ESD): evaluating trade-offs; considering future generations. 3) Democratic participation: understanding how decisions about energy and infrastructure are made.
	Language (Lessons 1, 2,3, and 4)	- Subject-specific vocabulary. - Structured written responses. - Oral presentation and argumentation.	1) Vocabulary development: acquiring and using subject-specific language in context. 2) Writing for purpose: completing structured worksheets; writing explanatory sentences. 3) Speaking and listening; presenting findings; responding to questions; class discussion.
A full assessment framework linked to these curriculum strands – including subject-specific rubrics at three levels of achievement – is provided in the Assessment section .			
Age of the learners	11–12 years old.		
Preparation time	Approximately 1 hour across the four lessons.		
Total implementation time	4 lessons of 45 minutes each.		
Teaching material	Lesson 1 – What is Energy? Annex 1: Energy stations investigation – student worksheet. - Station materials: rubber band + small box (The Snap); toy car + 3 books (The Ramp); balloon + small pieces of tissue paper (The Balloon); paper pinwheel + straw (The Storm).		



Lesson 2 – Energy sources: renewable or not?

- [Annex 2: Energy sources](#) – eight cards. You can view the Canva template here: <https://canva.link/asrnn72wqrpzmhd>

Lesson 3 – Energy sources, climate change and careers in clean energy

- Interactive energy maps (e.g., [Energy Monitor's Live EU Electricity Generation Map](#) or [the Joint Research Centre Energy Atlas](#)).
- Video – Vestas (2021, April 22). *How is wind energy produced?* – *Sustainability for Kids, Part 1*. YouTube. <https://youtu.be/-8-9j3mXIYE?si=CeTuF1X2BSbhpVCG> (02:06, English, Spanish, Portuguese, Italian, Arabic, Greek, Turkish, French, transcript available).
- Video – Vestas (2021, April 22). *How does a wind turbine work?* – *Sustainability for Kids, Part 2*. YouTube. <https://youtu.be/gHUJqTT3THU?si=wzzTcCWHMhlsOcMy> (02:46, English, Spanish, Portuguese, Italian, Arabic, Greek, Turkish, French, transcript available).
- Book – Guidoum, Y., Bartosik, M., Jones, P. N., Lee, J., & Fyfe, V. (2021). *When I grow up: Inspiring stories from people working in clean energy* (C. Swiegers, Illus.). WindEurope & GWEC. <https://whenigrowupstories.org/the-book/>.

Lesson 4 – The wind farm project meeting

- [Annex 3: Wind energy group worksheets](#) – five project briefs.

The learning scenario activities

Activity plan

Name & subjects	Procedure	Duration	STEM & GreenComp alignment ²
Lesson 1: What is energy? Science Language	<u>Activity 1: Word association (5 min)</u> Ask each student to spend 2 minutes writing, individually and without discussion, every word or image that comes to mind when they hear the word energy. The teacher collects all answers on the board without filtering or correction. Students copy the words into their notebooks. <u>Activity 2: Building a definition together (5 min)</u>	45 min	SSC 1.3 SSC 2.1 SSC 2.2 SSC 2.3 SSC 7.2 GC 1.1 GC 2.2 GC 3.3

² Each lesson is tagged with codes referring to the STEM Strategy Criteria (SSC) and GreenComp (GC) competences it addresses. SSC codes relate to the Scientix STEM Strategy Criteria, a framework used to identify and support high-quality STEM teaching practice across schools in Europe. GC codes relate to GreenComp, the European Sustainability Competence Framework developed by the European Commission's Joint Research Centre. A full explanation of each code, along with how this learning scenario addresses it, is provided in the "Reflection on Practice" section at the end of this document.



Name & subjects	Procedure	Duration	STEM & GreenComp alignment ²								
	Look at the word cloud on the board. Ask: <i>What do all these things have in common?</i> Guide students towards building their own definition. Key ideas to draw out: • Energy is invisible – but we can see what it does. • We need energy to make things work or move. • Energy can change from one form to another. Write the agreed definition on the board and leave it visible for the rest of the lesson. Activity 3: Kinetic vs potential energy (10 min) Ask: <i>Before you came to school today – did you eat breakfast? Where do you think that energy is now?</i> Take two or three answers, then say: <i>It did not go anywhere. It changed. Food became movement. Movement became heat. Not one bit was lost – it just kept changing shape.</i> Write on the board and leave it visible: <i>Energy is never created. Energy is never destroyed. It only changes form.</i> Draw a simple bow-and-arrow on the board. Ask: <i>Is there energy here if nothing is moving?</i> Let students discuss, then explain: • Potential energy = stored energy, waiting to be released (the pulled-back bow). • Kinetic energy = energy that is already moving (the flying arrow). Give quick examples from the room – potential: a battery, a lunchbox, a book on the edge of the desk; kinetic: a moving car, a bouncing ball, a spinning fan. Emphasise: these are not two separate boxes – they are the same energy at different moments. Activity 4: Energy stations investigation (20 min) Divide the class into three groups. Each group starts at a different station and rotates every 4–5 minutes on a signal. The ideal number of students per station is 2–3. Depending on your class size, you can set up multiple stations of the same activity around the classroom to ensure all students cycle through in approximately 20 minutes. Hand out Annex 1 (student worksheet). <table border="1"> <thead> <tr> <th>Station</th><th>Materials</th><th>What to do</th><th>Energy change</th></tr> </thead> <tbody> <tr> <td>The Snap</td><td>Rubber band</td><td>Stretch it between two hands. Hold still 3 seconds.</td><td>Elastic potential → Kinetic</td></tr> </tbody> </table>	Station	Materials	What to do	Energy change	The Snap	Rubber band	Stretch it between two hands. Hold still 3 seconds.	Elastic potential → Kinetic		
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The Snap	Rubber band	Stretch it between two hands. Hold still 3 seconds.	Elastic potential → Kinetic								



Name & subjects	Procedure				Duration	STEM & GreenComp alignment ²
			Release safely into a box.			
	The Ramp	Toy car + 3 books	Stack books as a ramp. Hold the car at the top. Let go.	Gravitational potential → Kinetic		
	The Storm	Straw + paper pinwheel	Blow through the straw onto the pinwheel from different distances.	Kinetic (wind) → Kinetic (spin)		
	The Balloon	Balloon + small pieces of tissue paper	Rub the balloon on your hair. Hover it slowly over the tissue pieces and observe.	Static electrical potential → Kinetic		
	Activity 5: Wrap-up (5 min) Return to the word cloud and the definition on the board. Ask: <i>Now that you have visited the stations – would you add anything?</i> Guide students to add the idea of transformation. Final definition: <i>Energy is the ability to make something happen. It cannot be created or destroyed – only changed from one form to another.</i>					
Lesson 2: Energy sources – renewable or not? Science Geography Social Studies / Citizenship Language	Activity 1: Recall – Energy stations revisited (5 min) Begin the lesson by returning briefly to the energy stations from Lesson 1. Set up one or two stations at the front of the class. Ask: <i>What energy change was happening here? Can you remember the names – kinetic and potential?</i> Allow 2–3 students to demonstrate and explain. Activity 2: What energy sources do we know? – Prior knowledge activation (5 min) Before introducing any materials, ask the class: <i>What kinds of energy sources do you already know? Where does the electricity in your home come from?</i> Write their answers on the board without correcting anything. Activity 3: Card sorting – Renewable or non-renewable? (30 min) Hand out the Energy Source Cards (Annex 2). Draw two columns on the board: RENEWABLE ENERGY and NON-RENEWABLE ENERGY. Ask: <i>What do these terms mean?</i> Take 2-3 answers and write the definitions on the board. In groups, students place each card in the correct column and note their reasoning. After 15-20 minutes of group work, bring the class together. Ask each group to identify one card they found hardest to place and explain their reasoning. Use these moments to surface and correct misconceptions as a class.				45 min	SSC 1.2 SSC 1.3 SSC 2.1 SSC 2.2 SSC 2.3 SSC 6.5 SSC 7.2 GC 1.1 GC 1.2 GC 1.3 GC 2.1 GC 2.2 GC 2.3 GC 3.1 GC 3.3



Name & subjects	Procedure	Duration	STEM & GreenComp alignment ²
	Close with: <i>Looking at these two columns – which sources do you think we should be using more of in the future, and why?</i> Take 2–3 responses and leave the question open. The next lesson will bring in real data from across Europe to answer it. Activity 4: Word cloud – New learnings (5 min) Ask students to open their notebooks to the word cloud from Lesson 1. Give them 2 minutes to add new words in a different colour – anything they have learned today about energy sources that was not there before. Take 2–3 examples from the class: <i>What did you add, and why?</i>		
Lesson 3: Energy sources, climate change and careers in clean energy Science Technology Geography Social Studies / Citizenship Language	Activity 1: Recall – Europe's energy mix (10 min) Ask students to close their notebooks and, from memory, name as many energy sources as they can. Run this as a quick whole-class verbal round – each student names one source without repeating what someone else has said. For each source named, ask students to go beyond the label: they should explain not only whether it is renewable or non-renewable, but also how the energy is generated and why that makes it finite or replenishable. Use this moment to correct any misconceptions before moving on. Then display an interactive electricity map such as Energy Monitor's Live EU Electricity Generation Map or the Joint Research Centre Energy Atlas. Before asking any questions, give students 1 minute to look at the map silently. Then ask: <i>During the last lesson you said we should be using more renewable energy in the future – let's see where Europe stands today.</i> Locate your country on the map together, then ask: <i>What differences do you notice between countries? Which countries seem to rely more on renewable energy, and which still depend on non-renewable sources?</i> <i>Some countries produce far more CO₂ per unit of electricity than others. Why do you think that is?</i> <i>What might happen if CO₂ keeps building up in the atmosphere?</i> Use students' responses to introduce – or consolidate – the concepts of CO₂ emissions, the greenhouse effect, and climate change. Write these three terms on the board and leave them visible for the rest of the scenario. Close by pointing to the non-renewable column still on the board from Lesson 2: <i>When countries rely heavily on fossil fuels such as</i>	45 min	SSC 1.2 SSC 1.3 SSC 2.1 SSC 2.2 SSC 2.3 SSC 6.1 SSC 6.5 SSC 7.2 GC 1.1 GC 1.2 GC 1.3 GC 2.1 GC 2.2 GC 2.3 GC 3.1 GC 3.2 GC 3.3



Name & subjects	Procedure	Duration	STEM & GreenComp alignment ²
	<i>coal, oil, and natural gas, they usually produce more CO₂ emissions. These emissions contribute to climate change. One way to reduce those emissions is to generate more electricity from renewable sources. The rest of today's lesson is about one example: wind energy.</i> Activity 2: Introduction to wind energy (15 min) Return to the pinwheel from Lesson 1. Ask: <i>Do you remember the energy chain from the Storm station? Let's build it together.</i> Write on the board: Wind (kinetic) → Spinning blades (mechanical) → Generator → Electricity. Play the recommended wind energy videos (see Overview table). After watching, ask the class: <i>The first video shows wind turbines powering homes, schools, and hospitals – what do you think would change in your town or city if all the electricity came from wind?</i> <i>The second video showed what happens inside the turbine. At what point does the energy change from movement into electricity – and which part of the turbine makes that happen?</i> Activity 3: Careers in wind energy (15 min) From the book When I Grow Up: Inspiring Stories from People Working in Clean Energy, prepare in advance the following five career profiles: • Swarna Priya Natarajan (p. 8) • Mercia Grimbeek (p. 12) • Alessandro Boschi (p. 16) • Rabia Ferroukhi (p. 33) • Katrina Swalwell (p. 15) Display the five profiles and briefly describe each role. Briefly discuss: <i>What does each professional actually do? Which of these roles sounds most interesting to you?</i> Students note their preferred profile and why. Explain that in the next lesson they will take on one of these professional roles and work together on a proposed wind farm project. Emphasise that all these professionals contribute in different ways to the shared challenge of producing clean energy while addressing climate change.		



Name & subjects	Procedure	Duration	STEM & GreenComp alignment ²												
	Activity 4: Word cloud closure (5 min) Ask students to open their notebooks to the word cloud. Give them 2 minutes to add new words in a different colour – this time specifically related to wind energy, added to a separate side of the word cloud with lines connecting to related words in the main space. Close with two sentences written individually in notebooks: • <i>Before this scenario I thought energy was _____ , and now I understand that _____ .</i> • <i>The most surprising thing I learnt about wind energy is _____ .</i>														
Lesson 4: The wind farm project meeting Science Technology Geography Mathematics Social Studies / Citizenship Language	Activity 1: Setting the scene (5 min) Begin by revisiting the previous lesson. Ask students: <i>Why does Europe need more renewable energy?</i> Then remind students of the wind energy career profile they explored in the previous lesson. Ask 2–3 students to share which role they chose and what interested them about it. Based on students' preferred profiles, divide the class into five groups – one per professional role. Ensure a balanced distribution across groups before the lesson begins, adjusting where needed so that no group is too large or too small. Once students are in groups, set the scene: <i>You are now the development team for Northgate Wind Farm – a wind farm proposed near your town. Each group will work as the professionals you just chose: engineers, planners, economists, strategists, or ecologists. You have 20 minutes to answer the questions about your part of the project and prepare one key finding to share with the team.</i> Write on the board: <i>Your mission: find the single most important thing the team needs to know about your area.</i> <table><tr><th>Profile</th><th>Role</th><th>Your job in the project</th></tr><tr><td>1 (Swarna Priya Natarajan)</td><td>The Engineers</td><td>Explain how the wind farm works: technology, scale, energy output.</td></tr><tr><td>2 (Mercia Grimbeek)</td><td>The Planners</td><td>Explain the planning process and how to win community support.</td></tr><tr><td>3 (Alessandro Boschi)</td><td>The Economists</td><td>Explain the costs, revenues, and economic benefits for the local area.</td></tr></table>	Profile	Role	Your job in the project	1 (Swarna Priya Natarajan)	The Engineers	Explain how the wind farm works: technology, scale, energy output.	2 (Mercia Grimbeek)	The Planners	Explain the planning process and how to win community support.	3 (Alessandro Boschi)	The Economists	Explain the costs, revenues, and economic benefits for the local area.	45 min	SSC 1.2 SSC 1.3 SSC 2.1 SSC 2.2 SSC 2.3 SSC 3.1 SSC 3.2 SSC 6.1 SSC 6.5 SSC 7.1 SSC 7.2 GC 1.1 GC 1.2 GC 1.3 GC 2.1 GC 2.3 GC 3.1 GC 3.2 GC 3.3 GC 4.1 GC 4.2 GC 4.3
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Name & subjects	Procedure			Duration	STEM & GreenComp alignment ²
	4 (Rabia Ferroukhi)	The Strategists	Explain why Europe needs more wind energy and where this project fits in.		
	5 (Katrina Swalwell)	The Ecologists	Identify the main impacts on wildlife and how they can be managed.		
	Activity 2: Group research (25 min) Hand each group their worksheet (Annex 3). Groups complete their worksheet and prepare a 2-minutes presentation of their single most important finding for the project meeting. Teacher's Note: The Engineers and Economists worksheets involve more complex technical and numerical questions. If these groups struggle to complete their work within the time available, the teacher can provide key figures or information directly so students can focus on applying them. Activity 3: The wind farm project meeting (15 min) Rearrange the classroom into a meeting layout. The teacher chairs as project director. Each group presents their key finding in 2 minutes. After all five groups have spoken, open the floor: <i>What are the two or three most important challenges this project faces – and how does the team propose to address them?</i> Take 3–4 responses and draw connections between groups where you can.				

Assessment

Assessment in this learning scenario is continuous and integrated across all four lessons. Rather than relying on a single final task, students demonstrate their learning through practical investigations, collaborative activities, written reflections, discussions, and presentations.

How to use this rubric. The assessment framework below is organised by subject and aligned with the curriculum strands presented in the [Overview table](#). For each competence, the table identifies the lesson activity or student artefact that provides evidence of learning, together with descriptors for three levels of achievement – **Beginning (1)**, **Developing (2)**, and **Proficient (3)**. The rubric is intended to support ongoing observation, provide structured feedback, and evaluate students' progress across the full learning scenario.

Competence	Beginning (1)	Developing (2)	Proficient (3)
NATURAL SCIENCE (Lessons 1, 2, 3, and 4)			
Understand energy and energy transformation Lessons 1 and 3: Annex 1 worksheet; closing sentences in notebooks (L3 Activity 4)	Recognises energy in simple examples but cannot explain what it is or how it changes form	Describes energy changes using examples from the station activities; uses some scientific vocabulary	Explains energy transformation using correct vocabulary; applies the principle that energy is never created or destroyed



Competence	Beginning (1)	Developing (2)	Proficient (3)
Distinguish energy forms and sources Lesson 2: group card sorting and reasoning (Activity 3); Lesson 3: recall round (Activity 1)	Identifies some sources with support; does not consistently distinguish renewable from non-renewable	Classifies most sources correctly; states the basic difference between renewable and non-renewable with some reasoning	Classifies all sources accurately and explains the differences using scientific reasoning, including reference to environmental impact
Apply scientific enquiry skills Lesson 1: Annex 1 worksheet (Activity 4); oral contributions during wrap-up (Activity 5)	Observations unclear or incomplete; little independent thinking	Records observations with some structure; identifies what happened but does not always link observation to energy change	Records and explains observations clearly, linking cause and effect; communicates findings accurately
TECHNOLOGY (Lessons 3 and 4)			
Understand technological systems Lesson 3: discussion after videos (Activity 2); Lesson 4: Engineers group presentation (Activity 3)	Recognises that turbines produce electricity but cannot describe how	Describes the basic parts of a turbine and states their function	Explains how turbine components work together as a system designed to convert wind into electricity
Link science to real-world technology Lesson 3: energy chain on board (Activity 2); Lesson 4: Engineers worksheet and presentation	Makes limited connection between science and technology	Identifies some links between energy concepts and wind turbine design	Clearly connects scientific principles (kinetic energy, mechanical energy, electricity generation) to wind turbine design and function
GEOGRAPHY (Lessons 2, 3, and 4)			
Understand energy as a resource in Europe Lesson 2: card sorting (Activity 3); Lesson 3: electricity map discussion (Activity 1)	Recognises that energy is used in society but cannot name or locate different sources	Identifies different energy sources used across Europe	Describes that Europe uses a mix of energy sources and that some are more common than others
Human–environment interaction Lesson 3: climate change discussion (Activity 1); Lesson 4: Ecologists worksheet and presentation	Shows basic awareness that energy production has an environmental impact	Identifies simple impacts of energy production (e.g. emissions, land use, habitat loss)	Explains the links between energy choices, land use, and environmental change at local and European scale
Local and global connections Lesson 4: Strategists and Ecologists worksheets; closing question (Activity 3)	Mentions local examples only, without making wider connections	Makes some links between the local wind farm and national or European energy patterns	Clearly connects the local wind farm project to the European energy transition and wider sustainability goals
MATHEMATICS (Lesson 4)			
Read and interpret numerical information Lesson 4: Economists and Strategists worksheets (Activity 2); group presentations (Activity 3)	Recognises numbers in context with limited understanding	Reads and describes numerical data related to energy with some accuracy	Reads, compares, and explains numerical information (e.g. energy output, costs) clearly in real-world energy contexts
CITIZENSHIP AND SOCIAL STUDIES (Lessons 2, 3, and 4)			



Competence	Beginning (1)	Developing (2)	Proficient (3)
Sustainability awareness Lesson 2: card sorting discussion; Lesson 3: climate change discussion (Activity 1) and career profiles (Activity 3)	Recognises that the environment matters	Identifies some environmental consequences of energy use	Explains why energy choices matter for present and future generations, with reference to climate, community, and fairness
Fairness and perspectives Lesson 4: Planners worksheet (Activity 2); project meeting cross-group question (Activity 3)	Recognises that different people have different opinions	Identifies who may benefit from or disagree with an energy decision and gives at least one reason	Explains different stakeholder perspectives (community residents, industry, local government, environmental groups) and why they differ
Decision-making and reasoning Lesson 4: all group worksheets (Activity 2); project meeting discussion (Activity 3)	Gives opinions without justification	Gives at least one reason to support an opinion	Justifies decisions using evidence and considers multiple perspectives, including trade-offs
LANGUAGE (Lessons 1, 2, 3, and 4)			
Use subject-specific vocabulary All lessons: oral contributions and written work throughout; word cloud additions (L2 Activity 4, L3 Activity 4)	Uses limited or everyday language; few energy-related terms	Uses some correct energy-related terms (e.g. renewable, transformation, turbine) in context	Uses accurate scientific and subject-specific vocabulary confidently and in context throughout written and oral work
Oral communication Lesson 2: card sorting discussion; Lesson 4: group presentations and project meeting (Activity 3)	Shares brief ideas with limited structure	Explains ideas with some structure and relevant content	Communicates ideas clearly and logically in group discussion and presentations, responding to questions appropriately
Written communication Lesson 1: Annex 1 worksheet; Lesson 3: closing sentences (Activity 4); Lesson 4: group worksheets (Annex 3)	Writes short or unclear responses; meaning is sometimes lost	Writes structured sentences with some support; explanations are partially developed	Writes clear explanations and reflections using correct terminology; responses are well-structured and complete

Reflection on practice

This section explains how the learning scenario connects to established quality frameworks for STEM education ([Scientix STEM School Label](#)) and sustainability competences ([GreenComp, the European Sustainability Competence Framework developed by the European Commission's Joint Research Centre](#)). For each criterion or competence addressed, you'll find a short explanation of where and how it is reflected across the four lessons. Teachers can use this section to understand the pedagogical reasoning behind the activities, identify the competences their students are developing, and see how the scenario can support their school's wider STEM or sustainability strategy.



STEM Strategy Criteria (SSC)

1. Instruction

- ☐ 1.1 Personalisation of learning
- ★ 1.2 Problem- and project-based learning (PBL)
- ★ 1.3 Inquiry-based science education (IBSE)

1.2 The group wind farm briefs (Lesson 4) present a genuine real-world challenge requiring research and decision-making.

1.3 The energy stations (Lesson 1) and card sorting (Lesson 2) both ask students to observe, reason, and classify before the teacher confirms or corrects.

2. Curriculum implementation

- ★ 2.1 Emphasis on STEM topics and competencies
- ★ 2.2 Interdisciplinary instruction
- ★ 2.3 Contextualisation of STEM teaching

2.1 Science, Geography, Mathematics, Technology are all addressed.

2.2 All four lessons integrate multiple subjects. Lesson 4 brings all subject areas together through the five wind energy roles.

2.3 Scientific concepts are consistently anchored in real-world applications: energy stations (Lesson 1), real energy source classification (Lesson 2), live European energy data and wind turbine technology (Lesson 3), and a simulated wind farm project (Lesson 4).

3. Assessment

- ★ 3.1 Continuous assessment
- ★ 3.2 Personalised assessment

3.1 Assessment is embedded across all four lessons through worksheets, notebook reflections, group research outputs, and oral contributions rather than a single test.

3.2 The variety of task formats allows students to demonstrate understanding in different ways.

4. Professionalisation of staff

- ☐ 4.1 Highly qualified professionals
- ☐ 4.2 Existence of supporting (pedagogical) staff
- ★ 4.3 Professional development

4.3 No specialist science knowledge is required. Detailed teacher notes, step-by-step instructions, and background resource links support confident delivery.

5. School leadership and culture

- ☐ 5.1 School leadership
- ☐ 5.2 High level of cooperation among staff



★ 5.3 Inclusive culture

5.3 A variety of task types supports engagement across different learning styles. Gender inclusivity is addressed through diverse career profiles in the wind energy sector.

6. Connections

★ 6.1 With industry

☐ 6.2 With parents/guardians

☐ 6.3 With other schools and/or educational platforms

☐ 6.4 With universities and/or research centres

★ 6.5 With local communities

6.1 Lesson 3 connects to the wind energy sector through the When I Grow Up career profiles and the five professional roles in the Lesson 4 wind farm project.

6.5 Group discussion questions throughout Lessons 2 and 3 prompt students to consider their own school and community's energy situation. The Northgate Wind Farm scenario in Lesson 4 is explicitly framed as a project proposed near students' own town.

7. School infrastructure

☐ 7.1 Access to technology and equipment

★ 7.2 High quality instruction and classroom materials

7.2 All worksheets and cards are provided as print-ready, editable annexes.

GreenComp (GC)

1. Embodying sustainability values

★ 1.1 Valuing sustainability

★ 1.2 Supporting fairness

★ 1.3 Promoting nature

1.1 Through the word cloud arc, card sorting, and climate change discussion, students reflect on how energy choices relate to sustainability values and environmental outcomes.

1.2 The Planners, Economists, and Strategists (Lesson 4) consider how the benefits and costs of energy decisions are distributed across community members and future generations.

1.3 The Ecologists (Lesson 4) explore how wind farm development may affect wildlife and ecosystems and what mitigation measures can protect them.

2. Embracing complexity in sustainability

★ 2.1 Systems thinking

★ 2.2 Critical thinking

★ 2.3 Problem framing



- 2.1 The wind farm project (Lesson 4) makes visible the interdependencies between technological, economic, environmental, and social dimensions of a single energy decision.
- 2.2 Students assess and justify reasoning throughout: classifying energy sources (Lesson 2), questioning why European countries differ in CO₂ emissions (Lesson 3), and evaluating trade-offs in the wind farm project (Lesson 4).
- 2.3 The card sorting and map activities (Lessons 2 and 3) frame the sustainability problem before students explore responses and trade-offs in Lesson 4.

3. Envisioning sustainable futures

- ★ 3.1 Futures literacy
- ★ 3.2 Adaptability
- ★ 3.3 Exploratory thinking

- 3.1 The Strategists (Lesson 4) connect the wind farm project to EU energy targets and a preferred future for Europe's energy system.
- 3.2 Students respond to open-ended questions involving environmental, economic, and social considerations.
- 3.3 Hands-on investigations and collaborative tasks encourage students to explore ideas creatively across subjects.

4. Acting for sustainability

- ★ 4.1 Political agency
- ★ 4.2 Collective action
- ★ 4.3 Individual initiative

- 4.1 By taking on professional roles (Lesson 4), students engage with the actors and processes that shape energy decisions and consider how different perspectives contribute to a shared outcome.
- 4.2 The wind farm project meeting (Lesson 4) is the scenario's culminating collective action: five groups collaborate and present findings to address a shared challenge across different areas of expertise.
- 4.3 Individual written responses throughout require students to identify and express their own contribution to the shared learning.



Annexes

Annex 1: Energy stations investigation

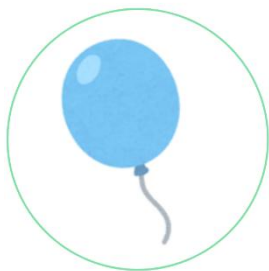
Name: _____

At each station, energy changes form. Watch carefully. Fill in the table below.

Station	Energy at the start	What it changes into	What did you observe? (in your own words)
The Snap 			
The Ramp 			
The Storm 			



The Balloon



Reflection: Which station surprised you the most, and why?



Annex 2: Energy source cards

You can view the Canva template for the Energy Source Cards [here](#).

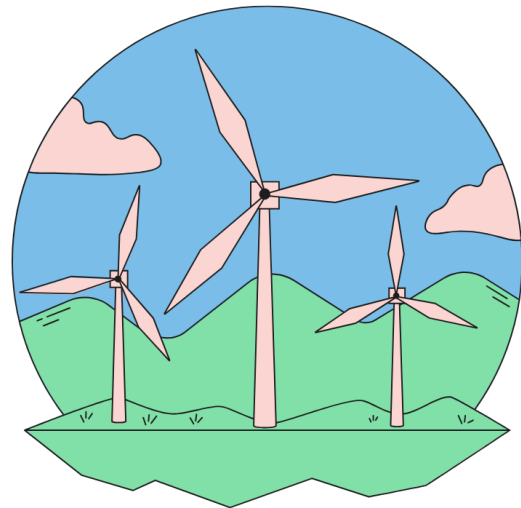
WIND

Wind is moving air. It forms because the Sun heats different parts of the Earth by different amounts. Warm air rises and cooler air moves in to replace it, creating wind.

Wind turbines use large blades to capture this movement. As the blades spin, they turn a generator, which produces electricity.

Energy chain: Wind (kinetic energy) → Spinning blades → Generator → Electricity.

Wind is one of Europe's fastest-growing sources of electricity.



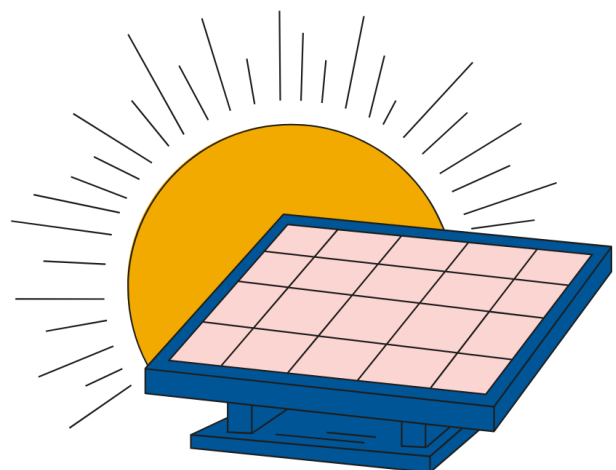
SOLAR

Solar energy comes from sunlight. The Sun gives Earth light and heat every day.

Solar panels capture sunlight and convert it directly into electricity. Some solar systems use the Sun's energy to heat water instead of producing electricity.

Energy chain: Sunlight → Solar panel → Electricity.

Solar panels can be found on the roofs of homes, schools and other buildings, as well as in large solar farms.



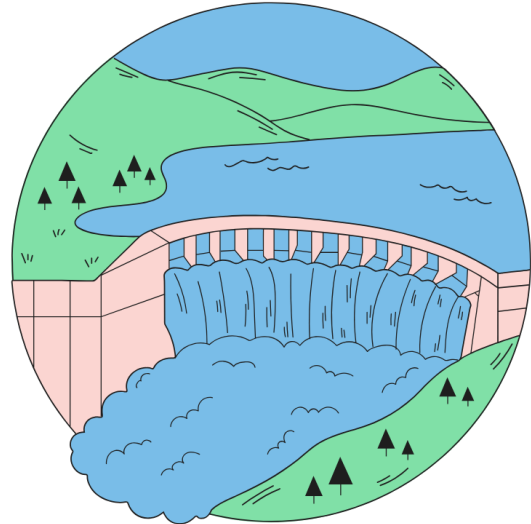
HYDROPOWER

Hydropower uses moving water to generate electricity. Water flowing through rivers or released from dams spins a turbine connected to a generator.

The water is replaced naturally through the water cycle, as rain fills rivers and reservoirs again.

Energy chain: Moving water → Turbine → Generator → Electricity.

Countries with many rivers and mountains often produce large amounts of hydropower.



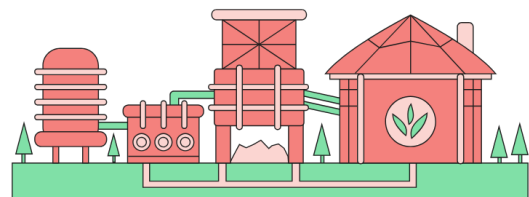
BIOMASS

Biomass comes from materials that were once living things, such as wood, crops, or food waste.

Plants store energy from the Sun as they grow. When biomass is burned or processed, this stored energy is released as heat or electricity.

Energy chain: Plants → Heat → Turbine (sometimes) → Generator → Electricity.

Biomass is widely used in Europe to heat homes and buildings.



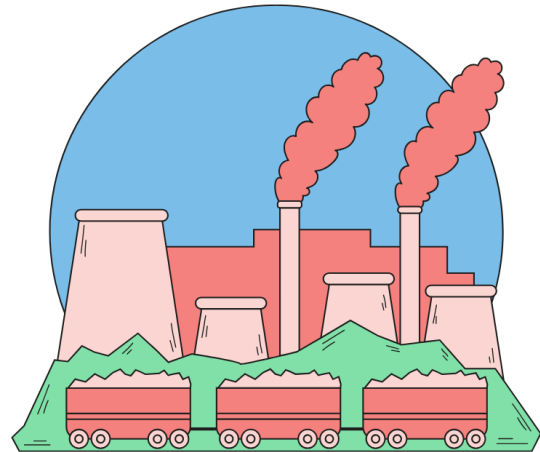
COAL

Coal is a black rock that formed from plants buried underground hundreds of millions of years ago.

Coal is burned to heat water. The steam spins a turbine connected to a generator, which produces electricity.

Energy chain: Coal → Heat → Steam → Turbine → Generator → Electricity.

Burning coal releases large amounts of carbon dioxide (CO₂), a gas that contributes to climate change.



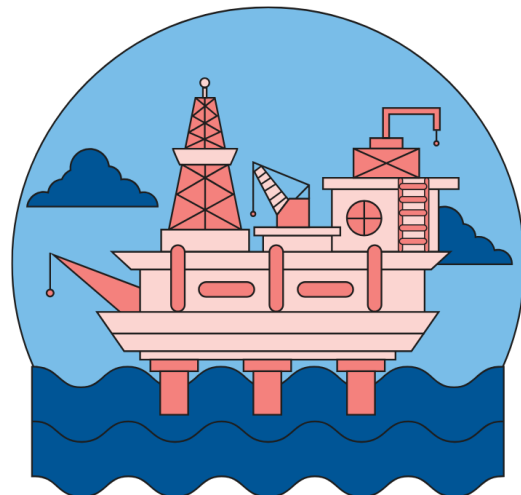
OIL

Oil is a liquid fuel found deep underground. It formed from tiny plants and animals that lived in ancient seas millions of years ago.

Oil is mainly refined into fuels such as petrol, diesel and jet fuel, which are used to power cars, ships and aeroplanes.

Energy chain (transport): Oil → Fuel → Engine → Movement (kinetic energy).

Europe uses large amounts of oil, but most of it is imported from other parts of the world.



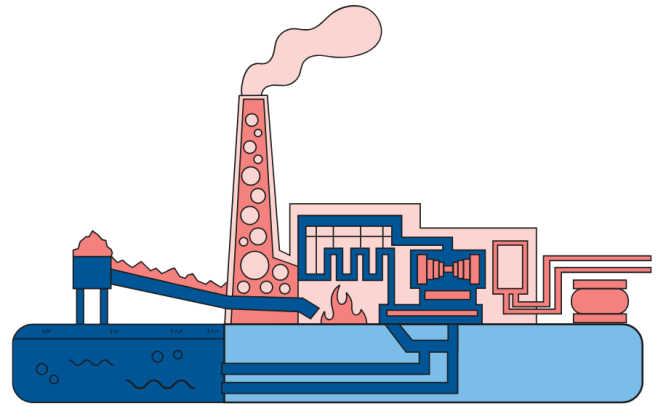
NATURAL GAS

Natural gas is a fossil fuel found underground. It formed over millions of years from the remains of ancient plants and animals.

Natural gas is burned to produce heat or electricity. It is also used in many homes for cooking and heating.

Energy chain (electricity): Natural gas → Heat → Steam → Turbine → Generator → Electricity.

Burning natural gas releases less CO₂ than coal, but it still contributes to climate change.



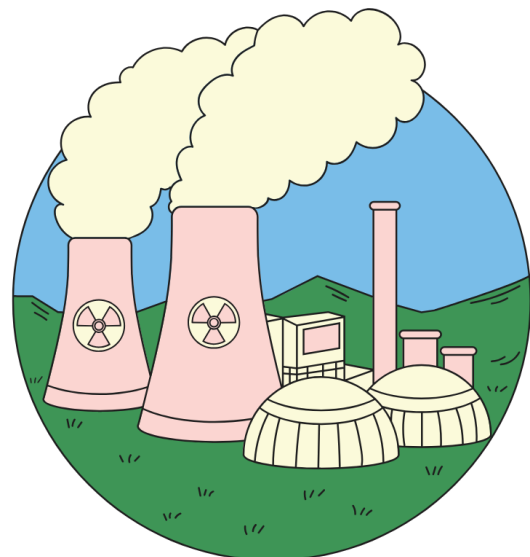
NUCLEAR

Nuclear energy is produced in a power station using a fuel called uranium.

Inside the reactor, tiny uranium atoms are split apart. This releases a large amount of heat, which turns water into steam. The steam spins a turbine connected to a generator that produces electricity.

Energy chain: Uranium → Heat → Steam → Turbine → Generator → Electricity.

Some European countries produce a large share of their electricity from nuclear power.



Annex 3: Wind energy group worksheets

GROUP 1 – THE ENGINEERS



Question 1: How does a wind turbine turn wind into electricity?

Complete the energy chain below. Fill in steps 2, 3, and 4.

Step	What happens
1	Wind hits the blades
2	
3	
4	
5	Electricity travels through cables to the grid

Question 2: What is inside the nacelle – the box at the top of the tower?

Name at least two parts and explain what each one does.

Part	What it does

Question 3: What happens when the wind does not blow for several days? How does the electricity supply continue?

Your 2-minute presentation should cover:

- How a wind turbine works – explain the energy chain in your own words.
- What is inside the nacelle and what each part does.
- What the biggest technical challenge of wind energy is.



GROUP 2 – THE PLANNERS



Question 1: Who has a stake in this project?

For each stakeholder below, note what their main concern or interest is likely to be.

Stakeholder	Their main concern or interest
Local residents living near the site	
Farmers whose land might be used	
Local environmental groups	
The town's energy supplier	

Question 2: Two sides of the same argument

Choose two concerns from your stakeholder map. Write the strongest version of that concern – as if you were the person raising it. Then write how the planning team would respond.

Concern 1	What they would say
What the stakeholder would say:	
What the planning team would respond:	

Concern 2	What they would say
What the stakeholder would say:	
What the planning team would respond:	

Your 2-minute presentation should cover:

- Who the key stakeholders are and what their main concerns are.
- One concern and how the planning team would respond to it.
- Why community support matters for a wind farm to succeed.



GROUP 3 – THE ECONOMISTS



Question 1: How much does it cost to build a wind farm?

Question 2: Why might wind energy save money in the long term?

Question 3: What could this project mean for the local area?

Fill in the table with your estimates. If you cannot find exact figures, use your best guess and explain your reasoning.

Feature	Your estimate
Number of jobs created during construction	
Number of permanent jobs once the farm is running	
Estimated lifespan of the investment	
One other economic benefit for the local community	

Your 2-minute presentation should cover:

- How much a wind farm typically costs to build and what the biggest expenses are.
- Why wind energy may save money in the future.
- What economic benefits Northgate Wind Farm could bring to the local area.





GROUP 4 – THE STRATEGISTS

Question 1: Where does wind energy stand in Europe today?

Fill in the table with what you find.

Question	Your answer
Share of EU electricity from wind today	
EU wind energy target for 2030	
Country with the most wind energy in Europe	

Question 2: Why is Europe expanding wind energy?

Write one reason and explain why it matters.

Question 3: Your country's energy picture

Find out:

Question	Your answer
How much electricity in your country comes from wind energy	
How much still comes from fossil fuels	

How could Northgate Wind Farm help Europe and your country move towards cleaner energy?

Your 2-minute presentation should cover:

- A few key facts about wind energy in Europe today.
- Why European countries are investing more in wind energy.
- How Northgate Wind Farm connects to your country's energy future.



GROUP 5 – THE ECOLOGISTS



Question 1: How can a wind farm affect wildlife?

Question 2: Impact assessment for Northgate Wind Farm

For each species or habitat, note the potential impact and how it could be reduced or monitored. For the last row, choose a species found in your own region.

Species or habitat	Potential impact	How to reduce or monitor it
Birds		
Bats		
Local vegetation or grassland		
A species from your region – find it yourself		

Your 2-minute presentation should cover:

- The two most important ways Northgate Wind Farm could affect local wildlife.
- One concrete measure that could reduce or monitor that impact.
- Which species or habitat your group believes should be protected most carefully, and why.



"Learning about energy" is one of four learning scenarios developed as part of the adaptation of the WindEurope Teacher Toolkit for Primary Schools, carried out by European Schoolnet (EUN) in partnership with WindEurope, within the framework of the Scientix® STEM Alliance initiative.

[Learn more about the partnership and discover the other learning scenarios.](#)