

## Energy Resources and Global Consumption Lesson Plan

This lesson aligns with Unit 6 in AP Environmental Science and can be used to cover a majority of the unit content. The lesson can be used in its entirety or adapted to best fit the needs of the teacher. Below is the College Board Unit 6 Guide, outlining the Learning Objectives and Essential Knowledge covered by this lesson.

### Learning Objectives & Essential Knowledge

**BIG IDEA:** Why are fossil fuels the most widely used energy resources if they are nonrenewable?

6.1 - Identify differences between nonrenewable & renewable energy sources.	6.2 - Describe trends in energy consumption.	6.3 - Identify the types of fuels and their uses.	6.4 - Identify where natural energy resources occur.	6.5 - Describe the use and methods of fossil fuels in power generation.
<p>Nonrenewable energy sources are those that exist in a fixed amount and involve energy transformation that cannot be easily replaced.</p> <p>Renewable energy sources are those that can be replenished naturally, at or near the rate of consumption, and reused.</p>	<p>The use of energy resources is not evenly distributed between developed and developing countries.</p> <p>The most widely used sources of energy globally are fossil fuels.</p> <p>As developing countries become more developed, their reliance on fossil fuels for energy increases.</p> <p>As the world becomes more industrialized, the demand for energy increases.</p> <p>Availability, price, and governmental regulations influence which energy sources people use and how they use them.</p>	<p>Wood is commonly used as fuel in the forms of firewood and charcoal. It is often used in developing countries because it is easily accessible.</p> <p>Peat is partially decomposed organic material that can be burned for fuel.</p> <p>Three types of coal used for fuel are lignite, bituminous, and anthracite. Heat, pressure, and depth of burial contribute to the development of various coal types and their qualities.</p> <p>Natural gas, the cleanest of the fossil fuels, is mostly methane.</p> <p>Crude oil can be recovered from tar sands, which are a combination of clay, sand, water, and bitumen.</p> <p>Fossil fuels can be made into specific fuel types for specialized uses (e.g., in motor vehicles).</p>	<p>The global distribution of natural energy resources, such as ores, coal, crude oil, and gas, is not uniform and depends on regions' geologic history.</p>	<p>The combustion of fossil fuels is a chemical reaction between the fuel and oxygen that yields carbon dioxide and water and releases energy.</p> <p>Energy from fossil fuels is produced by burning those fuels to generate heat, which then turns water into steam. That steam turns a turbine, which generates electricity.</p> <p>Humans use a variety of methods to extract fossil fuels from the earth for energy generation.</p>

### Background Information:

To help students better understand the role and status of energy resources and consumption in today's society, this lesson gives students the opportunity to engage with AP Environmental Science content that is directly tied to their daily lives. Students are future adult consumers who will make decisions that will influence the consumption of natural resources and the consequences tied to those decisions.

This lesson is divided into three parts:

- Part 1 introduces energy resources, the importance of energy in our daily lives and society, and includes a kinesthetic activity to help students comprehend what it takes to generate energy. Students will also evaluate energy usage in different countries and how the economic status of countries influences choices in energy resources used.
- Part 2 is a design challenge where students become the decision makers and are tasked with evaluating the current energy mix and make changes to this mix to reduce greenhouse (GHG) emissions. Students conduct research to learn more about the primary energy resources used in the U.S. and must make decisions as to how they would adjust the energy mix to reduce GHG emissions.
- For Part 3, student groups conduct presentations where they explain their plan for adjusting the energy mix in the U.S. and how it will reduce GHG emissions. Included in their presentation will be strategies for consumers to reduce their usage to strive to be energy efficient and help reduce GHG emissions related to energy production.

The culminating assignment gives students the chance to evaluate energy resources currently being used to provide their energy and students will use data to create a strategic plan for adjusting the energy mix in an effort to reduce GHG emissions. The goal is for students to

	<p>understand the complexity of tracking consumption and adjusting the mix of energy resources to produce enough energy to meet daily demands.</p> <p>These classroom activities were designed using the Energy Excursion Course – <i>Energize the Future</i>. This online course was created for students to learn about energy resources, energy production, and the complications related to government policies and climate change. Each activity provides a framework for increasing student knowledge and understanding of the energy production and the critical role energy plays in society.</p>	
<b>Total Time Requirements:</b>	3 Block Periods (1.5hrs/Block)	5 Class Periods (55min/Class)
<b>Sources of Data:</b>	<ul style="list-style-type: none"> <li>• <a href="#">Energy Excursions - Energize the Future</a></li> <li>• <a href="#">kWh use in the United States</a></li> <li>• <a href="#">US Energy Facts</a></li> </ul>	
<b>LESSON ACTIVITIES</b>		
<b>PART 1</b>	<b>One 90-min block period; 1.5 class periods</b>	
<b>Introduction to Energy</b>	<p><b><u>TEACHER PRESENTATION</u></b> – Feel free to use and make changes/modifications as needed.</p> <p>This introductory activity is designed to give students a foundation for learning about energy resources and energy production. Provide students a copy of the handout “Introduction to Energy”.</p> <p><u>Options for facilitating this activity include:</u></p> <ul style="list-style-type: none"> <li>• Assign students a specific portion of the activity to complete and they must create a visual that provides an overview of their section. Once the visuals have been created, students present/teach their portion of the activity or students can conduct a gallery walk.</li> <li>• Group students together to collaborate on completing the entire handout. Groups create a visual explaining the information and answers they documented.</li> <li>• This activity can also be given to students as part of a flipped classroom assignment and a brief formative assessment is given to check for student knowledge and comprehension.</li> </ul>	
<b>Energy Exercise (Literally) and Energizing Our Planet</b>	<p><b><u>TEACHER PRESENTATION</u></b> – Feel free to use and make changes/modifications as needed.</p> <p>This activity is to be completed in class and will help students understand energy generation and the quantity of energy needed to meet their daily needs.</p> <p>Divide students into small groups (at least 3 people to a group) and each group member has a role to perform – timer, counter, “energy producer”. Each group will receive the “potato” bag and each person completes the handout and the required calculations.</p> <p>Facilitate discussion of the results of the activity and correlate to the Introduction to Energy activity. Discuss how the access to reliable energy varies based on where people live and discuss how the sources of energy vary.</p>	
<b>PART 2</b>	<b>One 90-min block period; 1.5 class periods</b>	

<p><b>Creating Your Own Energy Mix Design Challenge</b></p>	<p>This design challenge gives students the opportunity to learn more about specific energy resources, their capacity for providing energy on a daily basis, and how the diversification of energy resources can help reduce greenhouse gas emissions.</p> <p>Divide students into groups of 3-4. Each group must first complete an audit of specific nonrenewable and renewable energy resources, how each provides electricity, and their pros and cons. Once students have all the facts about each energy resources, they can collaborate on designing an energy mix aimed at reducing greenhouse gas emissions.</p> <p><b><u>Part 1 – Energy Audit</u></b></p> <ul style="list-style-type: none"> <li>• Provide each group with a copy of the document <a href="#">Energy Audit</a>.</li> <li>• Students will use the topic pages in the Energize the Future Lesson <a href="#">Design Challenge: Filling the Power Gap</a> to organize facts and information about each energy resource. This portion of the activity must be submitted to the teacher before receiving the Design Challenge.</li> </ul> <p><b><u>Part 2 – Design Challenge</u></b></p> <p>Provide each group with a copy of the instructions for <a href="#">Part 2</a>. A link to the Google Sheet the group will complete is provided in this document. Each group must complete the information in the document, thoroughly answer the questions provided on the document, and create a brief presentation with their plan and recommendations.</p> <p>A sample rubric is provided here and is linked in the Part 2 document. The rubric can be modified/altered.</p>
<p><b>PART 3</b></p>	<p><b>One 90-min block period; 1.5 class periods</b></p>
<p><b>Design Challenge Presentations &amp; Sustainable Energy Solutions</b></p>	<p>Each presentation needs to be limited to 4-5 minutes. If time permits, questions can be posed to each group.</p> <p>To conclude the activity, have each group design a PSA for educating the public about how they can reduce energy consumption and strive to be more energy efficient. Their PSA must be attainable and reasonable for an every-day-person to achieve. Be sure to have students include WHY it is important to reduce wasteful energy consumption and focus on how reducing energy use can benefit everyone, especially in relation to personal energy bills/costs.</p>