

Instructional Scenario

Powering the Valley: Choosing the Best Energy Future



Course/Duty Area: Introduction to Natural Resources / Exploring Energy Resources and Consumption

Scenario:

The Shenandoah Valley is experiencing rapid growth, and local leaders are concerned about rising energy demand, increasing costs, and environmental impacts. Localities in the Valley have formed an advisory panel to research and recommend the best mix of energy sources to meet future needs, and you have been asked to serve on the panel.

The region currently relies heavily on fossil fuels, but there is growing interest in renewable energy options such as solar farms, wind turbines, and biofuels from local agriculture. However, each option comes with trade-offs related to cost, land use, environmental impact, and reliability.

The advisory panel has been tasked with analyzing different energy sources, comparing renewable and nonrenewable options, and evaluating the economic and environmental impacts. You will present a recommendation to the regional leaders that balances sustainability, cost, and community needs.

Big Question:

What is the best combination of energy sources for the Shenandoah Valley to meet future energy demands while balancing cost, sustainability, and environmental impact?

Focused Questions:

Energy Analysis

- What are the advantages and disadvantages of each energy source (biomass, wind, solar, geothermal, hydrogen, hydroelectric, nuclear, methanol, fossil fuels)?
- How is ethanol produced, and what crops are used (e.g., corn, soybeans)?
- How can animal waste be used as a fuel source (biogas)?
- What are the benefits and concerns of biofuels (food vs. fuel debate)?
- How can solar energy and agrivoltaics be used in agriculture?

Comparison of Energy Sources

- What is the difference between renewable and non-renewable energy?
- How do energy sources compare in terms of:
 - Cost
 - Accessibility
 - Geographic distribution
 - Sustainability

- Equity
- What are the pros and cons of
 - coal, oil, and natural gas?
 - nuclear energy?
 - wind and hydroelectric power?
 - geothermal systems?

Environmental and Agricultural Impact

- What environmental effects come from extracting and using fossil fuels?
- How can agriculture benefit from renewable energy (wind leases, solar grazing, biomass)?
- What are the environmental concerns of wind turbines and hydroelectric dams?

Economic and Global Impact

- What happens to the economy if non-renewable resources run out?
- Who are the largest consumers of energy (industries, agriculture, data centers)?
- How does energy use affect carbon emissions and climate?
- What is a carbon footprint, and how can it be reduced?
- How can individuals, agriculture, and the nation reduce energy consumption?

Student Project or Outcome:

Students will work in teams to create an Energy Recommendation Plan for localities in the Shenandoah Valley that includes

- a comparison chart of at least five energy sources
- a recommended energy mix (with justification)
- agricultural connections (biofuels, agrivoltaics, waste-to-energy)
- economic and environmental impact analysis
- a visual (map, infographic, or diagram)
- a short presentation to the regional leaders.

Project-Based Assessment:

Product Options

- Slide presentation (Google Slides/PowerPoint)
- Poster or infographic
- Written report (1–2 pages)
- Group presentation or role-play

Rubric Categories

- Accuracy of energy analysis
- Comparison of renewable vs. non-renewable sources
- Use of real-world data and examples
- Connection to agriculture
- Economic and environmental reasoning

- Clarity and professionalism of presentation

Teacher Resources:

- U.S. Energy Information Administration (EIA) energy data
- USDA biofuel and biomass resources
- Local examples (farms, solar installations, poultry waste)
- Agriscience Demonstration ideas:
 - Small solar panel demo
 - Wind turbine model
 - Biogas digestion simulation

Suggested Extensions:

- Calculate personal carbon footprints
- Debate: *"Food vs. Fuel"*
- Case study: Agrivoltaics in Virginia

Scenario submitted by Brian Fisher, Strasburg High School, Shenandoah County Public Schools