

**Curriculum Unit  
Title**

Using Basic Chemistry to Study Energy Resources

**Author**

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**KEY LEARNING, ENDURING UNDERSTANDING, ETC.**

Students will apply basic chemistry principles to survey the energy portfolio of the United States. Students will identify the types of reactions involved in each energy source, and use stoichiometry to analyze their efficiency and potential contribution to climate change. Students will study the power grid and its relationship to energy sources. Students will use models to show how energy in fuels or other sources is converted to electricity and distributed throughout the country. Finally, students will address the inherent inefficiencies of the grid and its compatibility with some alternative fuels.

**ESSENTIAL QUESTION(S) for the UNIT**

How can basic chemistry be used to study the many different types of energy sources used in the United States?  
How does the chemistry of the energy source dictate its efficiency and contribution to climate change?  
Why aren't all energy sources compatible with the current US energy grid?

**CONCEPT A**

Major Energy Sources

**CONCEPT B**

Reaction Type and Stoichiometry

**CONCEPT C**

Electricity Generation

**ESSENTIAL QUESTIONS A**

What are the major sources of energy in the United States?  
What is the difference between fossil and alternative fuels?  
How do geography and geology influence the distribution of energy sources?

**ESSENTIAL QUESTIONS B**

What are the different chemical reactions involved in electricity generation from various energy sources?  
How can stoichiometry be used to study the efficiency of specific energy sources?

**ESSENTIAL QUESTIONS C**

How is power generated in the United States?  
How does the current grid favor traditional sources of energy?  
What are the limitations to the integration of new energy sources to the grid?

**VOCABULARY A**

Natural Gas, Oil, Coal, Solar, Solar Thermal, Nuclear, Biofuel, Fossil Fuel, Alternative Fuel

**VOCABULARY B**

Combustion, REDOX, Electrolysis, Mole, Mole Ratio, Stoichiometry, Efficiency

**VOCABULARY C**

Turbine, Generator, Alternating Current, Direct Current, Electric Grid

**ADDITIONAL INFORMATION/MATERIAL/TEXT/FILM/RESOURCES**

Video Resources: Energy 101 video clips on Youtube.com, plus additional short videos from PBS and other sources.

Text Resources: Excerpts from Vaclav Smil's *Power Density* book, *Natural Approach to Chemistry* text.

Online Resources: United States Department of Energy website. Students will use the internet to research information regarding their specific energy source.