

ENERGY SUPPLY VS. DEMAND: WHICH ROAD SHOULD WE TAKE?



Grades 9–12

In this lesson, students will be introduced to energy supply vs. demand. They will brainstorm solutions to meeting growing energy demand while considering the environmental and economic implications and the benefits and trade-offs of one possible solution.

Lesson Printable: Meeting Future Energy Needs

Objectives:

- Students will understand the definitions of supply and demand.
- Students will analyze graphs and draw conclusions about current and projected global energy supply and demand.
- Students will research the benefits and trade-offs of potential solutions to address projected energy supply vs. demand.

Alignment with National Standards: Science, Technology, Engineering, Math

Skills: Research and investigation, synthesis, reasonable prediction, data interpretation and analysis, evaluation

MATERIALS

- Internet access
- Printable, "Energy Supply vs. Demand" (PDF), one per student
- 20 tokens (e.g. beans) per student
- An image of an item that would be considered valuable to students, e.g., MP3 player, smartphone, trendy pair of sneakers, video game, etc.

Time Required:

Introductory activity: 15 minutes

Research/Printable: 90 minutes (involves Internet research)

Presentation: 60 minutes

DIRECTIONS

1. Distribute 20 tokens to each student. Tell them that they will have an opportunity to use their tokens to bid on items in a silent auction.
2. Display the image of an item that would be considered valuable to students, e.g., a pair of the newest sneakers, MP3 player, popular video game, etc. Tell them that the item is a one-of-a-kind

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limited edition and that they can bid as many tokens (up to 20) as they want on it. The highest bidder will get the item. Direct students to write down the number of tokens they want to bid.

3. Have student volunteers disclose and explain their bids. Then tell them that you just realized you have 10 more of the same item. Does that change the amount that students are willing to bid? Why or why not? How would their bid change if a new model came out? How would it change if their item was signed by a famous person?
4. Ask students to define supply and demand independently and then do a pair/share or turn-and-talk to share definitions and explain how the exercise they just participated in relates to the topic. Supply is how much of something that you have. Demand is how much of something people want or need. Supply and demand often determine price. For example, ask:
 - How would the price of an item change if more people want or need it?
 - How would the price of an item change if fewer people want or need it?
 - How would the price of something change if there were a limited number (supply)?
 - How would the price of something change if there were an unlimited number (supply)?
 - How does your willingness to pay change if supply is low or high? What if demand is low or high?
5. Ask students what they know about energy supply and demand. Do they know if global energy supplies are increasing or decreasing or if global energy demand is increasing or decreasing? Distribute the printable and direct small student groups to analyze the graphs in Part 1 and answer the questions that follow.
6. Have each group present their answers and justify the conclusions they reached. Guide students to conclude that all three of the most powerful drivers of our current energy world —demand, supply, and effects on the environment—are set to undergo significant changes in the coming decades. (Facts students may use to support their conclusions include: Demand for energy will dramatically increase due to population increases, urbanization, China and India's projected energy-intensive economic growth and increased GDP in non-OECD countries. In order to meet increased demand, there will need to be greater supply and greater efficiencies. But environmental responsibility and current reliance on imports must be considered as we expand and diversify resources. You may also want to introduce how the current economic recession plays a part. Visit the resources in the list below for additional information.)
7. Divide students into small groups and direct them to read Part 2 of the printable. This part challenges student groups to brainstorm solutions that could help meet energy demand while considering environmental and economic factors. It's important to remind students that there is no one perfect solution! Depending on your class makeup, you may want to do the brainstorming as a class. Guide students to consider solutions such as biofuels, natural gas, solar, wind power, electric/hybrid cars, carbon capture and storage, and environmental regulations. They can find additional ideas in the resources listed below.
8. Once student groups brainstorm a list, have them select one solution to research using the questions in Part 2 of the printable as a guide.
9. Have each group present the solution they researched along with its benefits and trade-offs.
10. Finally, discuss and debate as a class which solutions seem most practical for meeting global energy demand and why.

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ADDITIONAL RESOURCES

- Shell Energy Scenarios to 2050
- Shell Energy Scenarios to 2050/Signals and Signpost

PRINTABLE: ENERGY SUPPLY VS. DEMAND

Part One: Global Supply and Demand

Analyze the charts below. Then answer the questions that follow.

Note: Insert the following graphs from the corresponding Shell resources:

From Shell Energy Scenarios:

World population, p. 9

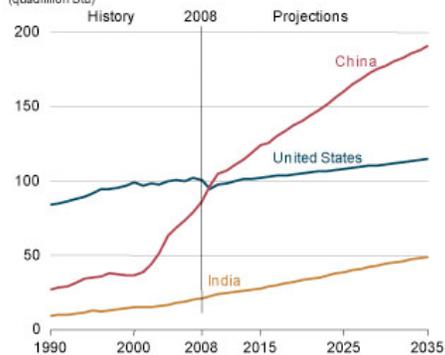
Climbing the energy ladder, p. 9

From Signals and Signposts:

Chart 2. World-Total Primary Energy Demand- By Region (p. 25)

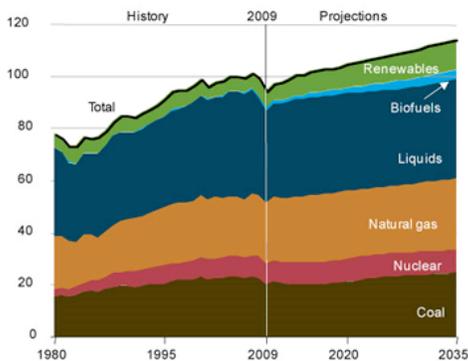
Chart 3. World-Total Primary Energy Supply (p. 25)

Figure 13. Energy consumption in the United States, China, and India, 1990-2035 (quadrillion Btu)



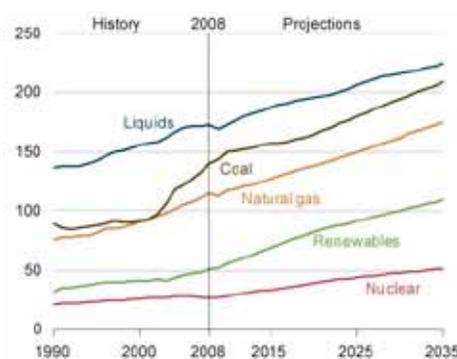
Source: <http://www.eia.gov/forecasts/ieo/world.cfm>

Figure 57. Primary energy use by fuel, 1980-2035 (quadrillion Btu)



Source: <http://www.eia.gov/forecasts/ieo/world.cfm>

Figure 15. World energy consumption by fuel, 1990-2035 (quadrillion Btu)



Source: U.S. Energy Information Administration, Annual Energy Outlook 2011, April 26, 2011.

1. How much is the world population projected to increase from 1950 to 2050? How will this increase impact energy supply and demand?
2. Which country uses the most energy? Which countries are just starting their journey on the energy ladder? How will these countries' growth impact energy supply and demand?
3. Is energy demand increasing or decreasing? How will this impact energy supply?
4. How are energy sources/supply projected to change from 2000 to 2030?

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5. What conclusions can you draw about projected global demand for energy?
6. What conclusions can you draw about projected global supply of energy?

Part 2: Which Road Should We Take?

Create a list of several ideas for how we can meet growing global energy demand while remaining environmentally and economically responsible. Consider new sources of energy, energy mixes, and technologies and processes to increase efficiency. Remember there is no perfect solution! Once you have brainstormed several options, select one of your ideas to research further and respond to the phrases below:

One solution to help meet growing energy demand is:

Describe the solution:

We think this could help meet energy demand because:

Benefits of the solution:

Trade-offs of the solution:

After researching this solution, we would/would not recommend that we invest in this solution because:

Visit www.shell.us/energizyourfuture to learn more about how alternative energy resources will help provide energy for the future..

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