



Explore More: The Future of Energy

From fossil fuels to biomass, there are several options in our current mix of energy resources. The benefits and downfalls of each fuel must be considered, and issues surrounding consumption, efficiency, infrastructure, and environmental consequences must be resolved in order to determine how we will meet our energy needs in the future. Students viewing *Explore More: The Future of Energy* will examine the issues, survey the experts, and make their own decisions about the right energy mix for our future.

This 30-minute video program outlines several issues surrounding the future of energy topic, surveys stakeholders and experts in the field, and presents thoughtful questions to challenge your students. The program can be used as a stand-alone piece or used in conjunction with the in-depth Web site and the interactive *Explore More: The Future of Energy* DVD. Each Explore More program allows your students to investigate important issues in your classroom. The videos are designed to be flexible and are organized around clear segments for pausing for classroom discussion. Watch a five-minute clip to jump-start classroom discussion. Watch the entire program to go in-depth on the issues.

The Explore More feature videos give the big picture, increase awareness, and facilitate discussion with thought-provoking issues and expert interviews. Each 30-minute video introduces compelling issues, surveys stakeholders and experts in the field, and presents thoughtful questions to challenge students. The Viewpoint Extras, following each feature VHS program, are 15-20 short interview segments of in-depth analysis of issues. Companion viewing guides with pre-viewing and post-viewing questions, timecodes for easy accessibility, and key vocabulary words, as well as video scripts help students examine and evaluate perspectives and arguments.

PROGRAM INFORMATION

Companion Web site at www.iptv.org/exploremore

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Series: Explore More

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Video Discussion Questions

Explore More: The Future of Energy is a 30-minute feature video that outlines several issues surrounding the topic, surveys stakeholders and experts in the field, and presents thoughtful questions to challenge your students. Following the main feature are five additional Viewpoint Extras. The feature video and Viewpoint Extras have a set of pre-viewing and post-viewing questions for classroom discussion.

EXPLORE MORE: THE FUTURE OF ENERGY FEATURE VIDEO

Timecode

- 00:00** **Introduction to Energy Basics**
Kevin Waetke, MidAmerican Energy; Corporate Communications, Des Moines, IA; Brent Barker, Electric Power Research Institute, Palo Alto, CA
Pre-Viewing Questions
Brainstorm a list of ways you use electricity in your daily life. • What would one day without electricity be like?
Post-Viewing Questions
Check off from your list those items mentioned in the video. • Choose the most important impact electricity has on your daily life and explain how you could overcome the loss of electricity. • Think of daily ways your community uses energy and describe a day without it. How would you compensate? • What fuel sources generate the power in your area? • What fuel does your power company use?
- 06:13** **Fossil Fuels**
Professor Tony Kavscek, Petroleum Engineering, Stanford University, CA; Kevin Waetke, MidAmerican Energy, Corporate Communications, Des Moines, IA; Brent Barker, Electric Power Research Institute, Palo Alto, CA
Core Questions
Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?
Pre-Viewing Questions
What are three ways you use fossil fuels on a daily basis?
Post-Viewing Questions
What do you see as the future for fossil fuels? • Can fossil fuels be environmentally-friendly? How?
- 10:00** **Nuclear Energy**
Bruce Lacy, Duane Arnold Energy Center, Palo, IA; Brent Barker, Electric Power Research Institute, Palo Alto, CA
Core Questions
Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?
Pre-Viewing Questions
What do you think of when you hear of “nuclear” energy? • How did you get these impressions?
Post-Viewing Questions
Do the benefits of nuclear power outweigh the potential harms? • How should the management of nuclear waste be handled?
- 11:44** **Solar Power**
Frank Jeffrey, Iowa Thin Film Technologies, Ames, IA; Mike Kappus, Rosebud Agency, San Francisco, CA
Core Questions
Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?
Pre-Viewing Questions
Have you personally used the sun’s energy?
Post-Viewing Questions
Propose a way that solar power could be used that would increase its popularity and its ability to meet our energy needs? • If solar energy is unlimited and environmentally clean, why isn’t it used more?

15:10

Wind Power

Tom Wind, Energy Consultant, Storm Lake, IA

Core Questions

Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?

Pre-Viewing Questions

What recreational sports harness the power of the wind? • Historically, how have we used the wind to do work?

Post-Viewing Questions

What are the benefits of wind power? • What makes wind power unpredictable and unreliable?

17:20

Hydropower

David Elschlager, Ameren Hydropower Plant, Keokuk, IA

Core Questions

Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?

Pre-Viewing Questions

How does a water wheel work in an old fashioned mill? a river boat?

Post-Viewing Questions

Find an example of hydropower in action nearest you. How has its presence influenced the local economy? the environment?

18:55

Biomass

Norm Olson, Biomass Energy Conversion Facility (BECON), Nevada, IA

Core Questions

Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?

Pre-Viewing Questions

Where does the ethanol in gasoline come from? • How does ethanol work?

Post-Viewing Questions

How does biomass create energy? • How can we take advantage of biomass?

20:10

Geothermal

Sandy Turner, The Geysers, CA

Core Questions

Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?

Pre-Viewing Questions

What is needed to produce geothermal power?

Post-Viewing Questions

Using the data provided, calculate the savings in fossil fuel if geothermal power could contribute 5% of all our electricity. • What drawbacks do hydropower and geothermal power share?

21:40

Hydrogen

Tom Wind, Energy Consultant, Storm Lake, IA; Senator Tom Harken, IA; Brent Barker, Electric Power Research Institute, Palo Alto, CA

Core Questions

Is the resource abundant? • Is it available? • Is it cost effective? • What are the effects on the environment?

Pre-Viewing Questions

What is hydrogen? • Where do we find it?

Post-Viewing Questions

How is hydrogen currently viewed as an energy source? • How can hydrogen revolutionize energy production and use?

24:15

The Energy Mix

Bruce Lacy, Duane Arnold Energy Center, Palo, IA; Kevin Waetke, MidAmerican Energy, Corporate Communications, Des Moines, IA; Frank Jeffrey, Iowa Thin Film Technologies, Ames, IA; Senator Tom Harkin, IA

Pre-Viewing Questions

What types of energy do you think are used in your state?

Post-Viewing Questions

Create your own pie chart of an optimal energy mix. Why did you choose those percentages? • What barriers exist? • Create a plan to conserve energy in your home. Calculate the savings of implementing your conservation plan.

EXPLORE MORE: THE FUTURE OF ENERGY VIEWPOINT EXTRAS

Timecode

- 28:46** **At Issue: Consumption – What factors influence energy consumption?**
Brent Barker, Electric Power Research Institute, Palo Alto, CA; Frank Jeffrey, Iowa Thin Film Technologies, Ames, IA; Kevin Waetke, MidAmerican Energy, Corporate Communications, Des Moines, IA
Pre-Viewing Questions
Make a list of energy conservation strategies you currently use. • Brainstorm a list of energy conservation strategies you could use. • List the way you use energy. What energy do you use at home, school, or work?
Post-Viewing Questions
How can the the United States, as an industrialized nation, help countries without electricity? Should we? • What fuel-efficiency regulations should be established for manufacturers? industries? businesses? households?
- 32:50** **At Issue: Efficiency – How does efficiency affect our future energy needs?**
Brent Barker, Electric Power Research Institute, Palo Alto, CA; Angela Chen, Energy Bureau, Iowa Department of Natural Resources; David Hurd, Iowa Energy Policy Task Force, Co-chair
Pre-Viewing Questions
What does energy efficiency mean? • How does efficiency differ from conservation? • How does your school waste energy?
Post-Viewing Questions
Plan a building-wide energy efficiency plan for your school. Project the energy and cost savings. • How could initial costs for alternative energy sources be addressed without passing the cost on to the consumer?
- 37:00** **At Issue: Environment – How does energy use affect the environment?**
Angela Chen, Energy Bureau, Iowa Department of Natural Resources; Brent Barker, Electric Power Research Institute, Palo Alto, CA; Senator Tom Harkin, IA
Pre-Viewing Questions
How has our search for energy sources affected the environment? • How has our current energy use affected the environment?
Post-Viewing Questions
Cleaner, more environmentally-friendly fuels cost more. How can this cost be addressed? • Energy use often adversely affects the environment. How much is too much?
- 39:55** **At Issue: Infrastructure – What is the relationship between energy and infrastructure?**
Brent Barker, Electric Power Research Institute, Palo Alto, CA; Tony Kavscek, Petroleum Engineering, Stanford University, CA; Kevin Waetke, MidAmerican Energy, Corporate Communications, Des Moines, IA; Senator Tom Harkin, IA
Pre-Viewing Questions
How could laws change to support alternative energy source development? What needs to be done? • Should private citizens be rewarded for using alternative energy sources? Why?
Post-Viewing Questions
What governmental changes are needed to promote the use of cleaner and more efficient fuel types? • How would this affect the private citizen, industry, and energy producers?
- 44:05** **At Issue: The Energy Mix – What is the optimal energy mix? Why?**
Bruce Lacy, Duane Arnold Energy Center, Palo, IA; Brent Barker, Electric Power Research Institute, Palo Alto, CA; Professor Tony Kavscek, Petroleum Engineering, Stanford University, CA
Pre-Viewing Questions
What energy sources are available in your state? • How do different generations view energy use and the environmental impact?
Post-Viewing Questions
What could wind power, solar power, hydropower, biomass, or geothermal do for your state?

Key Words THE FUTURE OF ENERGY FEATURE VIDEO

nuclear fission	The process of splitting a heavy atom into two or more lighter atoms upon absorption of a neutron. This process generates a large amount of energy in the form of heat.
grid	An electricity transmission and distribution system.
transformers	Equipment that changes electrical current into different voltages and currents.
acid rain	Sulfur gases given off by burning fossil fuels, coal in particular, mix with water vapor in the clouds. This water/sulfur mix is acidic. It is called acid rain.
CO2	Carbon dioxide. A greenhouse gas. It traps heat in our atmosphere.
EPA	Environmental Protection Agency. This agency oversees our environment.
decarbonating	Removing carbon.
renewables	A group of energy resources that replenish themselves. They include geothermal, solar, wind, and hydropower.
PV-cell system	Photo-voltaic cell systems absorb sunlight and turn it into electrical current.

Key Words THE FUTURE OF ENERGY VIEWPOINT EXTRAS

standard of living	The type of housing, food, and consumer goods you are able to purchase based on your income.
efficiency	Under the First Law of Thermodynamics, efficiency is the ratio of work or energy output to work or energy input, and cannot exceed 100%. The closer the ratio is to 100%, the more efficient the work.
consumption	Using consumer goods to fulfill the satisfaction of wants.
infrastructure	A system that allows goods to move from one place to another.
greenhouse gases	Gases that absorb and trap heat in the earth's atmosphere (CO ₂ , water vapor, methane, chlorofluorocarbons).
reliability grid system	There are many electrical grids in North America. These regional grids share energy among states and provinces. At issue is how reliable these grids are. Computer programs are being developed that make these grids less susceptible to power outages—making the grids more reliable for the people who depend on them.
power tools	Used in construction, these tools require electricity (table saws, pneumatic hammers, drills, screwdrivers).
ethanol	Ethyl alcohol. It is added to fuels to increase the amount of available oxygen for combustion. Ethanol from feedstock is often called bio-ethanol.