



General Energy Project

Reference e² energy episodes:

“Harvesting the Wind”

“Paving the Way”

“Growing Energy”

“Energy for a Developing World”

“Coal/Nuclear: Problem or Solution?”

1) Research one source of energy from the list below and prepare to defend its merits to your classmates in one of the following ways:

1a) Create a presentation to “sell” this form of energy.

1b) Prepare for a classroom debate where you will have to defend your form of energy.

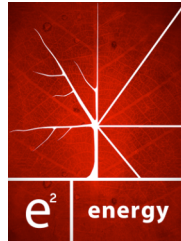
1c) Make a commercial (TV or radio) or an advertisement to sell your form of energy.

2) You may choose from this list or find your own.

- Coal energy
Watch e² energy episode “Coal & Nuclear: Problem or Solution?”
- Nuclear energy (pebble bed reactor)
Watch e² energy episode “Coal & Nuclear: Problem or Solution?”
- Oil (for transportation)
Watch e² energy episode “Evolution of the Automobile”
- Wind energy
Watch e² energy episode “Harvesting the Wind”
- Solar energy
Watch e² energy episode “Energy for a Developing World”
- Hydrogen energy (for transportation)
Watch e² energy episode “Evolution of the Automobile”
- Ethanol energy (for transportation)
Watch e² energy episode “Growing Energy”
- Biomass energy
Watch e² energy episode “Energy for a Developing World”

3) Some helpful hints for your project:

- Look into:
 - The costs – initial vs. long-term



- Environmental effects – short-term vs. long-term. Does it emit greenhouse gases? Pollutants?
 - Accessibility - How much is there? Is it easy to get? Is it renewable?
 - Timeline for starting production – Is it available now? When will it be?
- Make a pros and cons list. You can't defend your energy source if you don't know what the cons are.
 - Listen to your opponent, take notes, refer to his/her statements in your response.
 - What do the experts say? Find quotes and statistics. Be sure to get a few sources to avoid biased information.
 - Use visual aids, charts, graphs, videos, etc.

4) Share your work with your peers and community. Videotape your presentation, commercial or debate. Post it on teachertube.com and/or schooltube.com!

Online Resources/Links:

National Resources Defense Council - www.nrdc.org/energy/default.asp

California Energy Commission - www.energyquest.ca.gov/story/index.html

Environmental Defense – www.environmentaldefense.org/home.cfm



e² energy “Energy for a Developing World”

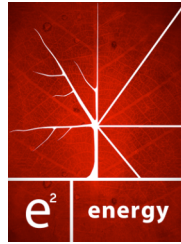
Background Essay

Since 1976 Muhammad Yunus has been dedicated to fighting poverty and empowering women in Bangladesh and the world over. After earning his Ph.D. in Economics from Vanderbilt University in 1969 and working for a few years in the United States, he returned to Bangladesh to accept a chair in economics at the University of Chittagong in 1972. He was shocked by the poverty and famine in his home country and decided that economic theories alone were not going to pull the people of Bangladesh out of poverty. But what would?

He recognized that because many people were too poor to qualify for traditional bank loans, they were not being given the opportunity to improve their own economic situation. He decided that he would give them that opportunity and in doing so invented the concept of micro-credit. He started by giving a small loan of 27 dollars to a group of craftsmen to help them grow their business. After several years, several loans and a near-perfect repayment rate, he decided to make it official and founded Grameen Bank in 1983. Since then, micro-credit has spread to several countries and has pulled countless people out of desperate poverty. Not only has he created a bank that is self-financing, makes a profit and has almost 7 million borrowers, but over 95% of those borrowers are women. In this way, he has empowered women to start their own businesses in countries with traditionally repressive social and economic conditions for women.

In 2006 Muhammad Yunus and Grameen Bank were awarded the Nobel Peace Prize for their work towards creating economic and social development from the bottom up. But Muhammad Yunus did not stop with micro-credit. He has since recognized the importance of energy as a factor in economic growth for the poor people of Bangladesh. With over 100 million people without access to electricity, rural Bangladeshis are literally energy-starved. The few who do have access to energy use kupi or hurricane lamps fueled by kerosene, the fumes from which present significant health hazards. Since 1996, Muhammad Yunus started Grameen Shakti, a not-for-profit company, to promote, develop and popularize renewable energy technologies in remote areas of Bangladesh. By focusing on solar, biogas and other forms of renewable energy, Grameen Shakti sees a future where rural households of Bangladesh will have access to environmentally friendly and pollution-free energy at affordable costs.

Muhammad Yunus' long-term vision is to eliminate poverty in the world. Whether it's through micro-credit or renewable energy, he continues to find new ways to empower poor people, giving them the opportunities they need to improve their own situations.



For more information about Muhammad Yunus and the Grameen Family of Enterprises, visit www.muhammadyunus.org or www.grameen-info.org

To find out more about renewable energy, visit www.nrel.gov or www.nrdc.org/energy

To find out more about the Nobel Peace Prize and Muhammad Yunus, visit http://nobelprize.org/nobel_prizes/peace/laureates/2006/yunus-interview.html



e² energy “Energy for a Developing World”

PRE-VIEWING QUESTIONS

1. What is micro-credit? What are the benefits and challenges?
 2. How is the importance of energy a factor in economic growth?
 3. What are some renewable, alternative forms of energy to create electricity and heat?
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POST-VIEWING QUESTIONS

1. What is the problem with using kerosene to fuel lamps? What are the alternatives for Bangladeshis?
2. How did access to renewable energy help the economic growth of the poorer communities of Bangladesh?
3. The United Nations stated that sustainable development “implies meeting the needs of the present without compromising the ability of future generations to meet their own needs”. Given this definition do you think the programs of Grameen Bank and Grameen Shakti (the non-profit organization) are promoting sustainable development? Why or why not? Use specific examples.



e² energy “Paving the Way”

Background Essay

The largest share of oil consumed in the United States – nearly 70% -- is used by transportation. In America alone in 2007 cars will burn through 143 billion gallons of gasoline and, at current retail prices, fueling up will cost Americans up to \$360 billion a year. Cars are not just an American problem; they’re also a global one that’s only likely to grow. Currently there are 850 million cars and trucks traveling on the earth’s highways and it’s projected that by 2020 the global number of automobiles is going to grow to about 1.1 billion. If you took those cars, parked them end-to-end and wrapped them around the earth, they would go around it 125 times.

Because it is unlikely that the demand for automobiles will decrease, we need to find ways to make them more efficient and find alternatives to gasoline. Rising oil prices, hiking global temperatures caused by the emission of greenhouse gases, and growing conflict in the Middle East are three of the main problems caused, in part, by the world’s addiction to automobiles. While carpooling, relying on public transportation or simply driving less and walking more could help to solve these problems, they won’t take us far enough. In order to slow the negative effects of the transportation industry, we need to design with the future in mind; we need to design ourselves out of oil dependence.

In this episode, General Motors unveils *The Volt*, a super-hybrid vehicle and the fuel cell-powered *Sequel*, while technology firm Fiberforge shows off the latest in ultra-lightweight materials for car manufacturing. These are only a few of the advanced technologies being developed for the future of the automobile industry. Which solution or solutions will emerge as the most cost-efficient, energy-efficient and ultimately the most popular cars of the future?

For more information about the GM Volt, visit www.chevrolet.com/electriccar

For more information about the GM Sequel, visit www.gm.com/company/gmability/adv_tech/400_fcv/index.html

For more information about FiberForge, visit www.fiberforge.com



e² energy “Paving the Way”

PRE-VIEWING QUESTIONS

1. What types of energy currently power cars? What types of energy show promise for powering cars in the future?
 2. What are the challenges of fueling cars on gasoline, both from an environmental and political perspective?
 3. What percentage of the gasoline in a car do you think is used to move it forward?
 4. It is often said that people “love their cars”. What do cars represent in our society? How dependent are you, your family and your city/town on automobiles? Do you use other forms of transportation?
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POST-VIEWING QUESTIONS

1. What is a hybrid vehicle and how does it function? What are the positive aspects of owning one? Negative aspects?
2. What problems do we currently face due to our society’s dependence on oil? Are there benefits behind our current system?
3. How could using lightweight materials to manufacture cars help the environment?
4. Why wouldn’t every car manufacturer want to use lightweight materials right now? What are some of the risks with being the first company to use a new technology? What are some of the benefits of being the first?



e² energy “Growing Energy”

Background Essay

During the oil crisis of the 1970s, Brazil recognized the vulnerability of its economy, because of its dependence on foreign energy sources. Since that time the country has implemented an ethanol industry that is thriving on all levels, from production, to distribution at gas stations, to nationwide adoption of flex-fuel cars.

Changing the entire automobile industry wasn't easy, but through consistent policies and a dedication to building an infrastructure, Brazil was able to emerge as an energy independent country with a thriving flex-fuel automotive industry. Because of Brazil's tropical climate, large expanses of land, and an already established sugar-cane industry, it was able to use sugar cane to produce ethanol fuel without creating a shortage of sugar cane for other uses. In the early eighties, the public was buying ethanol cars, gas stations were providing ethanol fuel, and the industry seemed to be responding well to the country's energy needs. But in the late eighties the ethanol industry nearly perished when oil prices dropped significantly, leaving owners of ethanol cars with higher fuel prices and no choice but to pay them. Ethanol fuel production dropped, resulting in shortages and forcing consumers to think twice before buying ethanol cars. However, Brazil's policies, ranging from tax incentives to mandates for government vehicles, continued to encourage the establishment of a vibrant ethanol industry and the market responded.

Recognizing that consumers didn't want to be limited to one fuel choice when they purchased a car, Volkswagen was the first company to introduce a flex fuel car that would run on gasoline or ethanol. After the introduction of flex fuel cars, consumers felt more comfortable purchasing new cars, and the ethanol industry was given a second chance. According to Newsweek, as of July of 2007, flex fuel cars make up more than 80% of new car sales in Brazil.

Strong federal policies, infrastructure, manufacturing, and consumer acceptance were the keys to longevity that led to the remarkable success of Brazil's ethanol industry. What can the United States learn from this model?

For more information about Flexible Fuel Vehicles, visit www.fueleconomy.gov/feg/flextech.shtml



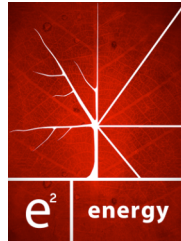
e² energy “Growing Energy”

PRE-VIEWING QUESTIONS

1. What do you know about ethanol? Where does it come from and what is it used for?
 2. Where does most of the oil that we use in the United States come from? What problems do we currently face due to our society’s dependence on oil?
 3. Why do you think farmers in the United States are sometimes paid to not grow on their land?
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POST-VIEWING QUESTIONS

1. Should the United States consider pursuing ethanol as a fuel for cars? Why or why not?
2. Describe the difference between ethanol made from corn and ethanol made from cellulosic sources. Is one preferable to the other? Why or why not?
3. Even though the United States doesn’t have the climate to duplicate how Brazil created ethanol, can the United States gain knowledge from the success that Brazil has had with ethanol?



e² energy “Harvesting the Wind”

Background Essay

Wind is the fastest growing renewable energy resource in the world. Denmark, which gets 20% of its electricity from wind, is leading the world right now, but Germany may soon surpass Denmark in that regard. So where does the United States stand when it comes to wind energy? Right now the United States gets less than half of 1% of its energy from wind, but at the same time there is enough wind in the United States to provide 1½ times the energy demand of the country. Shouldn't more communities be utilizing this clean, renewable energy resource?

In the Southwest corner of Minnesota, the Buffalo Ridge region, there is a productive and progressive wind industry that is not only providing clean energy, but also economic development and prosperity to the local community. Often times communities are resistant to the implementation of wind farms on their local land because of the aesthetic effects on the natural environment. In Minnesota this hasn't been the case, because it's the community itself that is building and benefiting from the wind farms. In many cases, an outsider will enter a community with his/her own contractors, build a wind farm and leave taking most of the financial benefits with him/her. How can this model be changed to ensure that the local community not only supports the building of wind farms but also reaps most of the benefits?

Dan Juhl, President of the Woodstock Wind Farm, will describe the process by which he leased land to create a wind farm in the Buffalo Ridge region of Minnesota. When the landowners noticed the profits that he was gaining with his wind turbines, they enlisted his help and expertise to build their own. They installed two wind turbines and became the first farmer-owned commercial wind farm in the state. They certainly weren't the last. Now other farmers have joined forces to bear the financial burden of installation together and within a year recovered their initial investment. The community wind industry has grown so much in Minnesota in the last ten years that Suzlon – India's #1 blade manufacturer – has opened its first U.S. blade manufacturing facility in Pipestone, Minnesota in the heart of Buffalo Ridge. The facility employs over 300 people right now, a number that will surely continue to grow as the current demand for blades in Minnesota is greater than Suzlon can produce.

For more information about community wind, visit www.windustry.org/community

For more information about Dan Juhl and Woodstock Wind Farm, visit www.danmar.us/windfarm.html

For more information about Suzlon, visit www.suzlon.com



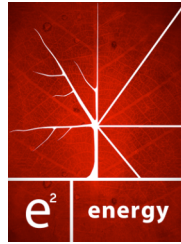
e² energy “Harvesting the Wind”

PRE-VIEWING QUESTIONS

1. What were some of the economic effects on rural areas after the Industrial Revolution?
 2. What are the benefits of building a business (such as a wind farm) locally versus from outside the community?
 3. What percentage of the power in the United States do you think comes from wind energy?
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POST-VIEWING QUESTIONS

1. What is a community wind farm? How is it different than any other wind farm?
2. Dan Juhl says that community wind is a “trifecta,” what are the three reasons that he thinks this is true? Do you agree? Why or why not?
3. In what ways has the blade manufacturing facility benefited the community of Pipestone?
4. If we used all of the wind energy available what percentage of our energy needs could it power?



e² energy “Coal and Nuclear: Problem or Solution?”

Background Essay

Energy, one of the most fundamental parts of our universe, is defined as the ability to do work. We use energy to light our cities, power our vehicles, warm our homes, and cook our food, among many other uses. There are many sources of energy, including biomass energy (energy from plants), fossil fuels (coal, oil and natural gas), hydropower energy, nuclear energy, solar energy and wind energy.

Some energy sources are renewable and some are not. Fossil fuels, like coal, oil and natural gas, are hydrocarbon deposits that were formed many hundreds of billions of years ago. Fossil fuels cannot be replaced, they are a non-renewable source of energy because once they are gone, they are gone. A renewable energy source is one that is so abundant that we will never exhaust the supply or one that can easily be replaced. Solar energy is a renewable resource because the sun provides us with an inexhaustible supply of solar energy. Biomass energy, which can be created from dead trees, sawdust or even livestock manure, is also a renewable resource because it can easily be replaced.

When fossil fuels are burned to release the chemical energy that is stored within, carbon dioxide (CO₂) as well as other gases are released into the atmosphere. Since the onset of the Industrial Revolution, the burning of fossil fuels and deforestation have caused the concentration of “greenhouse gases” in our atmosphere to significantly increase. These gases trap heat in our atmosphere, which has led to a phenomenon called global warming, a term used to describe the average rise in temperature of the Earth’s atmosphere near the surface, specifically in the troposphere. This increase in temperature can cause changes in the Earth’s climate patterns as a whole, which has effects on people’s health as well as the natural environment. Scientists have observed some of these effects already, such as rising sea levels, shrinking glaciers and changes in the range and distribution of plants and animals.

In order to reduce the emission of greenhouse gases, we need to find new ways of creating energy that don’t pollute, while also trying to update the old methods. Two such updates of old methods are coal-burning plants using Carbon Capture and Sequestration (CCS) and pebble-bed nuclear reactors. If CCS proves to be effective, coal could be burned and used for energy without emitting greenhouse gases. If pebble-bed reactors prove to be as cost effective as Andrew Kadak, Professor of the Practice, Nuclear Engineering at MIT, hopes nuclear energy could make a resurgence and be part of the solution to the energy problem.



Should coal-burning plants using CCS be part of the solution? Are pebble-bed nuclear reactors the answer? Or should we focus all of our energy on renewable resources? Learn if the experts are hopeful that the energy problem can be solved or pessimistic about our future energy needs.

To find out more about CCS visit:

www.fossil.energy.gov/programs/sequestration/capture/ or <http://sequestration.mit.edu>

To find out more about Andrew Kadak, visit www.nwtrb.gov/board/kadak.html or <http://web.mit.edu/nse/people/faculty/kadak.html>

To find out more about Pebble-bed nuclear reactors, visit <http://web.mit.edu/pebble-bed> or www.iaea.org/inisnkm/nkm/aws/htgr



e² energy “Coal and Nuclear: Problem or Solution?”

PRE-VIEWING QUESTIONS

1. What type of energy do you think pollutes the natural environment the most? The least? Why? Are there any energy sources that don't pollute the environment at all?
 2. What are the major contributors to global warming?
 3. What issues have we had with nuclear energy in the past? How is nuclear energy perceived by the public today? Why? How might that change?
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POST-VIEWING QUESTIONS

1. What is Carbon Capture Sequestration (CSS)? Could it be a solution to our current energy problems? Why?
2. What are pebble-bed nuclear reactors?
3. What are long-term goals in terms of energy production and CO₂ emissions?
4. How can the government contribute to helping solve the energy issues in the United States?