

Unit Plan

Developing a National Energy Strategy

Arkansas School for Mathematics and Sciences

Hot Springs, Arkansas

1999-2000

(This unit contains a series of lessons/strategies which may be done as stand alone activities, as part of a larger unit on Energy Production vs. Environmental Protection, or as a unit unto itself. The time frame envisioned can be from several days to two weeks or more, depending on the discretion of the instructor. It is suitable for inclusion in the following courses: *World History, American History, American Government, Civics, Current Issues, Environmental Science, Economics, and Gifted & Talented Seminar.*)

AN ENERGY STRATEGY FOR AMERICA

OVERVIEW

Meeting the energy needs of our nation is an increasingly difficult problem. This lesson explores the dilemma of balancing the energy demands of the American economy with legitimate concerns for protecting the environment. Students will assume the roles of Senate advisors for a panel charged by the President with the responsibility of “developing a national energy strategy” to provide for the economic and environmental welfare of future generations.

CONNECTION WITH THE CURRICULUM

Gifted & Talented, Geography, Civics, History, Science, Economics

TEACHING LEVELS

Grades 8-12

GEOGRAPHIC THEMES

Human/Environment Interaction, Place, Movement

CONNECTION TO THE NATIONAL GEOGRAPHY STANDARDS

Standard 14 – Human actions modify the physical environment

Standard 16 – Changes in the meaning, distribution, and importance of resources

Standard 18 – Applying geography to interpret the present and plan for the future

Also . . . Standards 6 and 11

MATERIALS

- Handout 1 – “The Great Energy Search” (optional)
- Handout 2 – “Defining a National Energy Strategy”
- Handout 3 – “Timeline – U.S. Energy Policy”
- Resources – 200-300 marbles to represent oil and natural gas (for optional activity)
- Chart paper / Markers

OBJECTIVES

Students will be expected to

- Define the terms: opportunity cost, trade-off, supply and demand, quad, OPEC
- Analyze U.S. energy policies for the past 25 years
- Evaluate the problems of finding new sources of energy balanced against concerns about damage to the environment
- Recognize the impact of human choices on the environment and American lifestyles

VOCABULARY

Opportunity cost, trade-off, supply and demand, quad, OPEC

PROCEDURE

- Introduce the topic, divide class into groups, and distribute the handouts
- Review terminology and U.S. Energy Policy (Handout #3)
- Conduct the “Energy Strategy” simulation
- Groups report (and justify) their recommendations
- Whole class debriefing / discussion

OPENING THE LESSON

On the board or overhead write “Energy Solutions.” Let students brainstorm for a few moments about ways to produce or conserve more energy than we now doing. Do not discuss at this time. Tell the students that they will be asked to serve as U.S. Senators charged with the task of developing the “National Energy Strategy” for America through the year 2010. Environmental and economic concerns must be considered, and any “poor decisions” will affect the “Senators” chances for re-election.

Divide the students into groups, distribute the handouts, and briefly review the vocabulary for the lesson. (It would be helpful if the students were already familiar with the economic terms.) Also review the ‘Timeline’ (H-O #3) to help provide additional background information for the simulation.

CONDUCTING THE SIMULATION

Each group may represent a different state (i.e. – AR, TX, LA, AK, WY, NY), or their worn state. Remind them that their proposals must produce 15 QUADS of energy while considering the environmental and economic consequences of their decisions. Each group should choose a chairperson and a person to record (written or in pictures) on chart paper the recommendations for presentation to the class. Each “Senator” should **I. Set Priorities** and review **II. Energy Policy Choices** before beginning the group interaction. It may be advisable for the teacher to guide the students through their Priorities and Choices. The groups are now ready to begin developing “an energy strategy for America.”

CONCLUDING THE LESSON

After the groups have completed their deliberations allow each “panel” to present and defend their recommendations. (This may require an entire class period to complete.)

Debrief the activity and give students the opportunity for any relevant observations they may wish to make. Emphasize to the students that these are the types of decisions made by our government leaders (some of them will soon be), as well as individuals, supporting or opposing those decisions, on a daily basis.

OPTIONAL ACTIVITY

“The Great Energy Search” (Handout #1) Note: You may wish to allow the students to ‘search’ in teams, each representing one of the “Seven Sisters” (major oil companies). This can be a good introductory activity to this lesson.

An Energy Strategy for America

You are U.S. Senate advisors for the National Energy Strategy (NES). The Secretary of the Department of Energy has compiled a list of proposals for America's future energy policy. It is your job to choose a combination of these proposals for submission to President Clinton.

They must:

- 1. Guarantee a reliable supply of energy sufficient to meet the demands of the American economy through the year 2010.**
- 2. Promote continued economic growth (between 3%-7% per year).**
- 3. Provide for the environmental welfare of future generations.**

Prioritize and evaluate your choices based on the needs of the state you represent and your own best judgment. Remember that you must represent the needs of all your constituents—especially your supporters (primarily business and industry).

YOUR INSTRUCTIONS

- 1. Rank your individual priorities (see next page).**
- 2. Read the proposals.**
- 3. Within your group (of Senators) elect a Chairperson to lead the discussion and a Spokesperson to record the choices and report the group's decisions.**

***All Senators should be prepared to answer questions or to defend their individual choices!**

--Thanks to Debbie Niichel of Close Up for her contributions to this strategy

525-0288 make this Attention Bradley

I Setting Priorities

What should our priorities be in choosing a National Energy Strategies?

Remember that energy policy has a multitude of powerful consequences:

- If you adopt a program, you will increase government spending.
- For many people, government action means government interference.
- If you approve a tax, this will hurt businesses and consumers.
- If you raise energy prices, this may take the steam out of the economic recovery.
- Urban oriented policies may hurt rural constituents and vice versa.
- If you anger powerful lobbies, you may not be re-elected (then you would not be able to carryout actions in other areas).

Please rank, as an individual within the group, the following concerns that should be kept in mind when developing a national energy policy (one being the highest priority given and nine the lowest).

- _____ promoting economic growth
- _____ job creation
- _____ environmental preservation and protection
- _____ economic security and national defense/energy independence
- _____ decreasing government spending/reducing the budget deficit
- _____ keeping energy prices for consumers low
- _____ maintaining the 'American lifestyle'
- _____ making sure the costs of energy policy are shared by all parts of society
- _____ providing help to selected industries or regions

II. Energy Policy Choices

Directions:

You must meet the energy demands of the American economy while at the same time keeping in mind the goals you identified on the previous page. To meet this demand you must increase the energy supply by 15 quads of energy over the next 15 years (a quad is a unit for measuring energy and is equal to a quadrillion BTUs). You must choose a combination of the following proposals to reach this amount. Many of the proposals have been taken from President Bush's National Energy Strategy.

For each of the following proposals, there are listed pros and cons that accompany the decision. Weigh them carefully and then make your energy decision. If your group agrees to accept a proposal, write the appropriate number of quads produced in the space before the proposal number. Keep a running total of the quads you have produced. Remember, your final total must be at least 15. You may not alter the number of quads produced by each proposal. Remember, you are part of a 'team' and your group must reach a consensus.

Energy Proposal Options

1. Open up the Arctic National Wildlife Refuge (ANWR) for oil exploration and production. This will produce 1 quad of energy.

Pros:

- *ANWR can potentially increase American oil production and decrease imports from unstable world areas
- *will stimulate our economy and provide jobs in Alaska

Cons:

- *there is a risk of environmental damage (ex. Exxon Valdez)
- *result in continued American dependence on oil and oil products
- *increase in oil production will be relatively minimal because 90% of Alaskan territories are already open for exploration

2. Provide tax incentives to producers of American oil and natural gas. This is worth 1 ½ quads of energy.

Pros:

- *will increase Americas use of own resources by helping with the high cost of oil extraction in our country (America has already used its cheapest reserves and therefore the remainder of the oil must be pumped from deeper within the earth which costs more money)
- *will keep the oil industry (one America's most powerful lobbies) satisfied
- *will provide economic relief to depressed oil producing states (LA, OK, TX, CA, AK)

Cons:

- *will increase our nation's budget deficit by reducing taxes collected from oil companies.
- *government may raise personal taxes to help pay for the subsidy
- *will artificially tilt the market away from alternative energy resources (conservation and renewables) by artificially lowering the cost of oil

3. Continue aid and military protection to Middle Eastern and other oil-rich countries to ensure access to their cheap oil. This will produce 6 quads of energy.

Pros:

- *oil prices will be kept low
- *inflation will be kept low (if energy is cheap, other goods remain cheap)
- *will keep US military interests happy
- *will help the economy recover from recession more quickly

Cons:

- *continued dependence on Middle East and other unstable nations
- *keeps defense spending high (money that could aid the domestic economy)
- *discourages energy efficiency because oil is cheap
- *oil prices could still rise for other reasons

4. Provide technical assistance to the oil and gas industries of the former Soviet Union. This will produce 2 quads of energy.

Pros:

- *keep world oil prices low (the former Soviet Union was the world's largest single producer of oil and provided the Eastern Block countries with oil. If their oil production continues to dwindle, the world's supply will fall and prices will rise)
- *will help stabilize the economies of Russia and other new nations
- *will provide new opportunities for American oil companies

Cons:

- *billions of dollars in aid would be necessary
- *high risk of failure because of political instability
- *in the long run Russia and other new countries will benefit the most from our tax dollars

5. Change government regulations to increase imports of Canadian natural gas. This will produce 1 quad of energy.

Pro:

- *natural gas is cleaner and cheaper (this means lower gas bills for American consumers and less pollution)
- *natural gas is a very safe and stable supply (Canada is extremely unlikely to cut off our supply)

Cons:

- *creates competition for American gas and oil companies (this will cost jobs)

6. Remove regulations on the natural gas industry to stimulate competition among natural gas producers. This will produce 1 quad of energy.

Pros:

- *if competition works, gas prices will be cheaper
- *lower prices will encourage people to switch to clean-burning natural gas

Cons:

- *removing regulations on natural gas could lead to a monopoly situation which would raise prices

7. Provide additional support for clean coal technologies and encourage production and use of coal. This will produce 4 quads of energy.

Pros:

- *coal is America's most abundant fuel (America has enough coal to last 300 years)
- *will create thousands of jobs in the Appalachia region (KY, WV, TN, OH, PA)
- *coal is cheap

Cons:

- *government spending to develop this technology would be large. Costs are estimated in tens of millions of dollars.
- *even clean coal will pollute (this will increase acid rain, global warming, and smog)
- *the jobs created are low skill, low paying, and unsafe
- *mining is very damaging to the environment

8. Simplify the process for nuclear power plant approval and construction as well as fund research for safe reactors. This will produce 2 quads of energy.

Pros:

- *will increase our energy security by decreasing our dependence on foreign oil
- *there will be very low pollution levels (help reduce acid rain, smog, and global warming)
- *creates jobs and utilizes American expertise

Cons:

- *danger of nuclear accidents
- *there is no accepted method for permanently storing radioactive waste
- *electricity from nuclear plants is more expensive than from other fuels
- *the public does not support nuclear energy

9. Raise standards for energy efficiency in buildings, appliances, machines etc. This will produce 4 quads of energy.

Pros:

- *reduces energy waste
- *cheapest way to produce energy (remember, saving a unit of energy is as good as producing a unit of energy)
- *reduces our need for foreign supplies of energy
- *better for the environment because less fuel is burned

Cons:

*raises the prices American pay for energy using products (ex: refrigerator prices may go up by 25%)

*may cause some inflation

*may hurt established industries such as oil, coal, etc.

10. Give aid to producers of renewable energy (wind, solar, hydro, geothermal) to encourage use by consumer. This will produce 2 quads of energy.

Pros:

*renewable energy is unlimited

*environmentally safe

*many technologies are pollution free

*makes America less dependent on foreign oil

*stimulating a new industry creates more jobs

Cons:

*costly for consumers, would raise electricity bills in foreseeable future

*would cause decline of oil, gas, coal, and nuclear industries (loss of jobs)

*would slow America's economic growth

11. Pass legislation requiring that 10% of all cars sold in 2010 be electric cars. This will produce 1/2 quad of energy.

Pros:

*reduce urban smog and certain other pollutants

*possibly more energy efficient

Cons:

*could cost jobs in auto industry

*higher initial costs for consumers when buying an electric car

*limited performance (ex: limited traveling range)

*battery disposal may become a solid waste issue

12. Implement a mandatory recycling program for businesses and homes. This will produce a1 quad of energy.

Pr
os:
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- ould reduce waste of resources
- *would reduce energy consumption since making recycled products uses less energy than making an original product
- *would help preserve the environment

Cons”

- *enforcement and administrative costs could be high
- *this represents government interference in people’s lives

13. Push standards for auto mileage from . . .

A) 2
6

miles per gallon (mpg) to 31 mpg. This will produce 1 quad of energy.

Pros:

- *would reduce America’s fuel use (this would decrease our dependence on foreign oil)
- *would help make our air cleaner, especially in cities
- *might make American cars more attractive to consumers in other countries where gasoline prices are very high

Cons:

- *almost all cars and trucks would become slightly more expensive
- *would be strongly opposed by the auto industry
- *would require new investments in production by car manufacturers which might encourage factories to move to other countries where costs are lower

B. raise standards from 26 mpg to 41 mpg. This will produce 3 quads of energy.

Pros:

- *could almost eliminate need to import any oil
- *would have significant benefits for the environment

Cons:

- *could make cars smaller and less safe
- *would slow economic recovery of auto industry
- * cars which get more miles per gallon may encourage people to drive. This would increase traffic congestion

14. Gradually implement a gas tax of . . .

A) 25¢ per gallon. This will produce ½ quad of energy.

Pros:

- *would encourage production of cars with higher mileage per gallon
- *would be a major source of revenue for the government (help decrease the budget deficit)
- *would encourage conservation and public transportation

Cons:

- *would increase gas prices for consumers
- *would hurt oil companies by reducing sales
- *would encourage businesses to move to countries with low-priced fuel
- *would discriminate against people in rural areas and those without access to public transportation

B. tax of 75¢ per gallon. This will produce 1 ½ quads of energy.

Pros:

- *would provide incentive to switch to other fuels for vehicles (ex: electric and natural gas powered cars)
- *would encourage adoption of agricultural based fuels (ex: ethanol which would help the corn producing states)
- *would be a large source of revenue for the government

Cons:

- *would cause inflation
- *would increase prices for consumers and make goods less competitive in world markets
- *would hurt oil companies by reducing sales
- *would encourage companies to move to other countries with low priced fuel
- *would discriminate against people in rural areas and those without access to public transportation
- *would hurt the poor the most

15. Implement transport planning for urban areas. This would include funding for economic and technical research for mass transit systems (buses and subways), development of infrastructures for mass transit, promoting carpooling, bicycling, etc. This will produce 2 quads of energy.

Pros:

- *would reduce fuel use and pollution from cars
- *would relieve traffic congestion in urban areas
- *provide better access to cities of those unable to afford cars

Cons:

- *would increase government spending
- *would require Americans to change their lifestyles (ex: Would you be willing to ride the bus to work? Don't impose on others what you would not do)

Total Quads of Energy Gained

Timeline – US Energy Policy

Pre 1970	7 oil companies (7 sisters) controlled oil market and set prices at 10 times production costs
1970	Oil producing countries took control from 7 sisters and formed OPEC
1970	US oil production peaked
1973	First oil shock, prices quadrupled because of fear of being cut off from Middle East oil reserves. In response, Nixon began planning an energy policy for America. World-wide recession.
1974-76	Ford begins implementing measures to reduce our energy dependence on the Middle East.
1976-80	Carter made energy his top priority with an emphasis on energy efficiency, conservation, and research and development (R&D). Created Department of Energy (DOE).
1979	Second oil shock because of revolution in Iran. Oil prices triple, would recession.
1980	Reagan seeks to end government intervention in the energy market. Attempts to abolish the DOE and greatly reduces R&D for efficiency renewables (solar, wind, etc.)
1986	Oil prices collapse because OPEC breaks down. Oil becomes cheap and abundant, encouraging consumption and forcing domestic competitors out of the market.
1988	Bush begins preparation of a National Energy Strategy.
1990	Iraq invades Kuwait, oil prices increase
1991	Persian Gulf War
1992	Energy Bill passes
1993	Clinton . . .
1999	Mobil/Exxon Merger

The Great Energy Search

This is a fun filled learning experience that should help your students to understand the causes of rising energy costs and the need for alternative sources of energy.

Without the class knowing where, distribute 300 marbles on the playground. Concentrate 200 marbles in one area near the center and distribute the remainder along the edges. Place some under bushes and leaves and in tall grass to make them more difficult to find. These marbles represent oil and natural gas deposits in America. In the classroom, hold a discussion of supply and demand. Ask for reasons why energy costs are rising, including the fact that energy sources are becoming more difficult to find and obtain. Next, tell the students that they are going to go back into time and become early energy explorers. During this activity they will go through three time periods (five minutes each) in which to hunt for oil and gas deposits.

The first period corresponds to 1857-1930, the years our country had vast supplies of energy, but lacked the scientific know-how to locate and extract it. The second time period represents 1930-1980, a time when resources were abundant because our country had perfected the technology to extract huge amounts of oil and natural gas. The third time period represents the one we are in now. The demand is high, but oil and natural gas are becoming more difficult and costly to obtain. We use a lot of energy in our efforts to obtain new energy. Explain that all fossil fuels are finite and at some point it will no longer be worthwhile to search for them. We need to be looking for alternative sources (solar, nuclear, etc.).

Take the students outside to the edge of the area and begin the first five-minute search. Tell them to yell when they discover a marble, this represents a nationwide announcement that oil and gas have been found and others will flock to that area. Point out that where there is one deposit there are often more. After the first five minutes, call the students together, count and record the total marbles found. Continue with the second and third rounds. Return to the classroom and have a discussion and review. Find the total amount of marbles found. How many still await discovery? This is similar to our nation because some oil and gas deposits remain intact because they are either impossible to locate or too expensive to procure. Re-emphasize the fact that we need to be searching for alternative sources of energy.

The Millennium Energy Web Search Project

Arkansas School for Mathematics and Sciences

The purpose of this project is for you to explore and evaluate exemplary Web Sites on a variety of important topics related to meeting our nation's energy needs while helping to conserve the environment at the same time. As a student at ASMS you have almost certainly visited numerous Web Sites, and you will likely see many more before you depart. Quite often, your instructors will ask you to evaluate or report on what you find on the Net. They may ask (when in nasty moods) ask you to construct your own Web pages on various topics, at least somewhat related to the curriculum you are studying. How do you recognize an exemplary Web Site? What criteria could you utilize to assess its value? This project will help provide you with answers. Hopefully, it will also serve as the beginnings of an Internet archive which future ASMS students may want to consult in their research.

Your task is to produce a thorough evaluation of a minimum of two – three Web Sites from your selected category. You are to rate them with the familiar A – F hierarchy using the criteria below as a rubric for your ratings. Select sites/pages which are the “crème-de-la-crème” for your topic. Sites may cover general topics such as *Alternative Sources of Energy* or *Environmental Protection*, or they may be as specific as the *Exxon/Mobil Web Site*, *ARAMCO*, or the *EPA*. Remember, if the site does not positively impress you, the DO NOT include it as one of your chosen sites to evaluate. You may have to sort through quite a few sites to find good ones.

Your evaluation for each site should include:

1. Your title/topic (centered) followed by a brief introduction of the topic you have chosen, describing its importance/significance (no more than 1 Page).
2. The name/title of each site (centered) followed by its URL (also centered 2 spaces below the title).
3. A two-paragraph assessment/evaluation of the site written in a similar fashion to the **example on the following page**. The first paragraph should contain a brief, although thorough, summary of what is contained within the site; the second paragraph should give an evaluation.
4. The final portion of your Review will be the A – F ratings for the specified categories below (again, **see the example**). Your evaluations should resemble an annotated bibliography and rely on the questions in each criterion below as a guide. If you are working with a partner, you will need only one introduction, but please indicate who has evaluated each individual Web Site. Note that you will **each** be responsible for evaluating 2 – 3 sites.
5. **Attach a printout** of at least the first page of each Web Site you evaluate. Place these at the end of the paper, in the order you evaluate them.
 6. Of course you are expected to follow standard conventions of writing style, mechanics, formatting, etc. If you work with a partner, each of you should use the same font/type size for your assessments. Place your name(s), the date due, the class, and your teacher's name in the upper right-hand corner of the first page of your paper as usual.

DUE DATE: _____

POINT VALUE: 100 (extra points may be awarded for outstanding production).

REVIEW CATEGORIES

CONTENT & HOTLINKS (Top Priority in Overall Rating) A – F

How much historical/geographic content is there and of what quality is it? Would it be sufficient to satisfy someone interested in this topic and seeking to learn more about? Is the content good enough to bring you back to this site? What about links to other helpful sites? In other words, is it rich and robust in content, or would you go hungry here? Are there any real problems with this site - misspelled words, inaccuracies of fact, lack of documentation and authoritative sources, etc.?

AESTHETIC & TECHNOLOGICAL MERIT (Important, but not as much as Content) A – F

How pleasing to the eye is the Site? What is the layout like? The graphics? Does it pull the viewer in, or is it repulsive? Does it excite your interest? Are the navigational tools effective and easy to use? Does the Site have so many graphics and technological thing-a-ma-jugs that it takes a long time to load? Does it make you want to return soon? So . . . is it a visual 10 or a real dog?

OVERALL RATING (Combine the above ratings) A – F

(The following example should give you a general idea of how to write your evaluation and rating for each Web Site. You **may** include a Title Page and a Table of Contents if you wish, however, neither are required.)

<Sample Web Site Evaluation>

Web Site #1: The Electric Library

[URL:http://www.k12.elibrary.com/classroom/](http://www.k12.elibrary.com/classroom/)

Search engines may be great for finding online information, but what if you are looking to do real research and not just surf? Enter *The Electric Library*, a comprehensive digital archive on the Internet that students of all ages can explore without time or usage limitations. Using the E-library students can pose questions in plain English and launch a comprehensive search through more than 150 full-text newspapers, over 900 full-text magazines, 2,000 newswires, 2,000 classic books, hundreds of maps, thousands of photographs, as well as major works of literature and art. For long-term use expect to pay \$9.95 per month, although educational discounts are available for students and teachers.

The site is lush in content with numerous links to a wide variety of historical and geographic categories. It utilizes excellent graphics, although it is a little slow to navigate due to the massive content. All-in-all *The Electric Library* is one of the richest, most complete, reference sources available on the Internet.

Content/Hotlinks: A+

Aesthetic/Technological Merit: B

Overall Rating: A