

Unit Plan

Title: National Energy Policy: Developing a Coherent Energy Plan

Description:

High school students assume the role of a senator serving on an energy subcommittee and develop a national energy plan that provides for the future economic and environmental welfare of our country. Using the *Visual Ranking Tool* students evaluate and rank several energy proposals before reaching consensus on a viable energy plan.

At a Glance	
Grade Level:	9-12
Subject(s) sort:	Social Studies
Subject(s)	Current Events, Economics, Government
Topics:	Energy Policy, American Economy, Environmental Protection, Alternative Energy
Higher-Order Thinking Skills:	Evaluation, Analysis, Cause and Effect
Key Learnings:	Distribution of Resources, Human Interaction, Place, Movement, Opportunity and Cost Trade-Offs
Time Needed:	approx. 10 class sessions, 60 minutes each

Unit Summary

High school social studies students determine what measures to support in developing a coherent national energy plan. After teacher lecture, student research, and class brainstorming and discussion, students rank and justify their energy plan priorities. Next, students take on the role of a senator to begin formulating their energy plan. Using the *Visual Ranking Tool*, the senators work in small, like-minded groups to prioritize the types of energy development they are advocating. Proposals might include using renewable energy sources, levying gas taxes, and opening up parts of the country for oil exploration. They then compare their proposals to current policies. Finally, each team of senators presents a short summary of their findings (about 5 -10 minutes per team), in which they explain and justify their proposed energy plan.

Curriculum-Framing Questions

Essential Question

- How can we make a difference?

Unit Questions

- What should our priorities be in choosing a national energy plan?
- How can we ensure our energy resources are able to support our desired quality of life?

Content Questions

- What are the costs and trade-offs of resource extraction?
- What are some examples of renewable energy? What are their strengths and limitations?
- What is a quad of energy?

Assessment Processes

View how a variety of student-centered [assessments](#) are used in the National Energy Plan Unit Plan. These assessments help students and teachers set goals; monitor student progress; provide feedback; assess thinking, processes, performances, and products; and reflect on learning throughout the learning cycle.

Instructional Procedures

Prior to Instruction

In this project, students use the *Visual Ranking Tool* to evaluate energy choices and establish priorities. Examine [Visual Ranking](#) and its resources, and learn how to use it with your students.

Introduce the Project

This unit seeks to help students think about the impact of energy on the world they live in, including their environment and their pocketbooks. Begin the lesson by writing the Essential Question on the board, *How can we make a difference?* Have students brainstorm in small groups what they or their families have done recently that have impacted their use of natural resources. Use this discussion to assess the students' knowledge and understanding of energy resources in their everyday life.

Discuss the savings of combining trips around town to save on gasoline costs. Calculate out the miles per gallon with current gas prices. Have students calculate the savings of a combined trip. Although the savings per family may seem minimal, have students multiply the amount for each week for 52 weeks, and then per person for the population of your city. Here we see individuals making a difference in a seemingly small scale, but together they can significantly impact their community. Discuss how there are also individuals who make decisions that impact the community on a large scale. Explain that our community, state, and federal leaders make decisions every day that impact our future.

Tell the students that they will assume the roles of senators serving on an energy subcommittee that has been charged with developing a viable national energy plan for the near future. They must consider the balance between environmental and economic concerns, and remember that poor decisions will affect the lives of millions of people, as well as their chances for re-election. Write the words "Energy Solutions" on the board. Let students brainstorm for a few moments about ways to produce or conserve more energy since an energy plan will need to encompass all energy resources—not just gasoline.

Distribute the [Project Overview and Checklist](#) for specific directions to the students and briefly review vocabulary for the unit. Describe the details of their assignment: Students first research the energy consumption patterns and potential energy resources in their assigned state. Then in teams, they establish priorities for choosing an energy plan. They use those priorities and other criteria for selecting a set of energy options and compare those energy options with past and current government policies. Throughout the project, they keep a reflection journal. Lastly, they present their decisions to the class. Help them focus on two main Unit Questions: *What should our priorities be in choosing a national energy plan?* and *How can we ensure our energy resources are able to support our desired quality of life?*

Research a State's Energy Consumption Patterns and Potential Energy Resources

Have each student represent a senator from one state. Assign or let students choose which state they will represent making sure that different regions of the U.S. are represented. Have them explore and take notes on the energy data at the [Energy Information Agency](#)* state energy page. Specifically, they should use the [State Energy Information](#) document to note their state's strengths and weaknesses in regards to energy availability and energy consumed. Students use this document to help them analyze their state's energy consumption and resources, compare the data with other states, and make decisions specific to their assigned state. Provide appropriate instruction in analysis skills as students use this document.

After completing the [State Energy Information](#) document, students complete a [journal entry](#) responding to the following prompt: *What did you find surprising or interesting about your state's energy consumption and potential resources? How do you think the people of your state could be more involved in ensuring a healthy use of energy resources?*

Establish Teams

Assign students to teams, each representing one senator on the energy subcommittee. Establish teams by choosing a mix of senators whose states represent different energy production and consumption patterns and environmental interests, such as Alaska, Texas, Hawaii, and your home state. Instruct each team to choose a chairperson and a person to record recommendations for presentation to the class. Have students share and compare their individual state's data from the [State Energy Information](#) document.

Rank Priorities

Have teams meet to discuss the priorities that matter most to their individual states in choosing energy options. These will likely vary based on students' understanding of the state's natural resources, energy consumption, and values of the citizenry of each team's "home" state. Have each team decide on at least five priorities for choosing energy options.

Meet for a class discussion, and discuss all the priorities for all teams. Collapse and combine items as necessary to create one list that reflects all priorities. (In the sample project, students narrowed the list to: economic growth, job creation, environmental protection, economic security, reducing the deficit, keeping prices low, maintaining 'American lifestyle', and providing help to industry.) Try to keep the list between eight and sixteen items so they can be reasonably ranked and justified. Before you begin the next activity, click [here](#) to set up the Energy Priorities project in your workspace. Revise the list based on your class list.

Have teams log in to their [Visual Ranking student workspace](#). Explain the prompt they respond to is: *What should our priorities be in choosing a national energy plan? Rank priorities based on the needs and interests of your assigned state with the most important priority ranked first.* As teams begin, remind them to rank priorities based on the needs and interests of their team members' states and to use the comment feature of the tool to describe the value and importance of that item to their states and why it is ranked at that particular spot. As students work, they need to explain and justify their thinking and ultimately seek agreement on the final order of their list.

Examine the *Visual Ranking Activity*

The space below represents one team's ranking using the *Visual Ranking Tool*. The view you see is functional. You can roll over the red triangle to see the team's comments and click the compare button to see how different teams ranked the items.

After teams have finished ranking their lists, have them compare their rankings and comments with other teams and discuss differences and similarities. The tool displays a correlation coefficient when team lists are compared. Explain that the coefficient expresses the degree to which groups agree or disagree on ranking order. A coefficient of 1.0 is absolute agreement in ranking, and a coefficient of -1.0 is absolute disagreement.

After completing the ranking, have students complete a [journal entry](#) responding to the following prompts: *Looking at the comparison of your rankings with those of other teams, why do you think your list of priorities is different? Did reading the comments of other teams make you reconsider your own ranking? How did your perspective of the priorities change as you discussed them with your teammates or with other teams?*

Evaluate Energy Options and Create an Energy Plan

Using their team's priorities for evaluating energy choices, each team of senators studies 15 energy options to draft a national energy plan. Each option has the potential of producing between one-half and six "quads" of energy over the next 10 years, and each has unique costs and benefits in economic and environmental terms. Explain that a quad is a very large unit of energy equivalent to one quadrillion British Thermal Units (1,000,000,000,000,000 BTU's). In more practical terms, it is enough to serve all annual energy needs for about 3,000,000 Americans. Many medium-sized states like Colorado and Arizona consume a total of one quad of energy per year (Source: [Texas Renewable Energy Assessment Summary*](#)). Provide additional examples and comparisons to help students understand the size of this measurement of energy.

Students need to select and rank the best options and devise a plan that produces 13 quads of energy over the next 10 years. Their senator teams explain and defend their choices to the subcommittee, which then seeks consensus on a final, national energy plan.

Pose the question, *How do we balance energy needs and environmental concerns?* Discuss the various cause-and-effect issues surrounding that question. Encourage students to use higher-order thinking skills to hypothesize effects and consequences of various actions. Below are some possible questions to help start the discussion.

- *If you adopt a government program, what are some of the consequences?* (Example: You will increase government spending.)
- *How do some people respond to government action and policy?* (Example: They consider it government interference.)
- *If you approve a tax, who might that hurt?* (Example: It could hurt businesses and consumers.)

- *What can result in listening to only one perspective?* (Example: Both environmentalists and energy developers can use statistics and data to “prove” their conflicting positions. It is important to hear all sides before making a decision.)
- *What are some consequences of raising energy prices?* (Example: It may take the steam out of the economic recovery.)
- *How can a policy be good for one area of the country and bad for another?* (Example: Urban-oriented policies may hurt rural constituents, and vice versa.)
- *Why would anyone argue against protecting the environment?* (Example: Environmental regulation can often represent a significant cost of doing business, sometimes outweighing the benefit.)
- *Why would you as a lawmaker be concerned about lobbyists?* (Example: If you anger powerful lobbies, you may not be re-elected—and then you would not be able to carry out actions in other areas.)

Before proceeding with the next activity, click [here](#) to set up the Energy Choices project in your workspace. Give students this [Energy Plan Choices](#) handout. Have them discuss each of the choices and determine associated costs and benefits. Costs and benefits depend on the priorities the teams set, as well as each state’s unique circumstances. Encourage additional research if they have questions about any of the summaries using [Energy Information Agency state energy page*](#), [Alliance to Save Energy*](#), [Annual Energy Outlook 2005 with Projections to 2025*](#), and other Web sites. Encourage students to add more “pro” and “con” comments to the cards as they learn more. If time warrants, have students conduct the research themselves instead of providing the document with all of the information filled in.

Once teams understand the energy plan options, have them use the [Visual Ranking Tool](#) again to order and justify (in the comments section) their energy plan choices. Have them sign into the second project and rank according to this prompt: *Rank the following energy plan proposals from best to worst based on your group’s previously -ranked priorities, as well as the proposals’ reliability, support of economic growth, and minimal enviromental impact.* Again, as students rank and defend, encourage discussion, debate, and negotiation. When ranked lists are complete, have teams compare their ranking with those from other teams. Encourage teams to discuss their choices. Use the following questions to help students analyze and compare the different teams’ rankings:

- *How did your team come to consensus on this ranked list?*
- *Are there any other energy plan options that you would have liked to see on this list?*
- *Why do you think your ranked list was different from the other teams’—or from the class average?*
- *Did your decisions change over time? For instance, after discussions with others or after more research?*
- *What team ranks most like you do? Why do you think that is?*

Examine the *Visual Ranking Activity*

The space below represents one team's ranking using the *Visual Ranking Tool*. The view you see is functional. You can roll over the red triangle to see the team's comments and click the compare button to see how different teams ranked the items.

After completing the ranking, students complete a [journal entry](#) responding to the following prompts: *What was the most difficult part of prioritizing the energy options? Did you or any of your team members have any significant differences of opinion that changed over time? How did you come to consensus?*

Compare with Previous Energy Policies

Have students review their teams' decisions against energy policies held in the past. *How are their policies different? How would their choice of policies improve the U.S. energy situation for the future over previous policies?* Students include at least five points for comparison on the [Energy Plan Comparison](#) document to help them plan their presentation. Provide the following resources:

American Energy Policy

www.esru.strath.ac.uk/EandE/Web_sites/01-02/RE_info/usa.htm*

Energy Timeline (View other time periods also from links at top)

www.energyquest.ca.gov/time_machine/index.php*

Jimmy Carter State of the Union Address 1980 (Last third of the speech)

www.jimmycarterlibrary.org/documents/speeches/su80jec.phtml*

More information on the history of U.S. energy policy and consumption can be found in the [Annual Energy Review – Perspectives 2004](#)* or [Energy in the United States, 1635-2000](#)*.

After completing the comparison, students complete a [journal entry](#) responding to the following prompts: *Looking back at previous energy policies, what didn't they take into account about the future? How can we make the best plans possible when we can't know what is in store for us in the future?*

Compare with the Energy Policy Act of 2005

Have students compare their teams' decisions to the policies that are planned in the [Energy Policy Act of 2005](#)*. (A [short overview](#)* is also available.) Students can also review the [Strategic Plan for Fiscal Years 2005 - 2008 for the Federal Energy Regulatory Commission](#)*, energy policies for their assigned state, and the [estimated costs](#)* for the enactment of the Energy Policy Act. Students use the [Energy Plan Comparison](#) document to keep track of their findings.

After completing the comparison, students complete a [journal entry](#) responding to the following prompt: *From what you've learned so far about possible energy resources and policies, what do you wish our government leaders would take more seriously? What underdeveloped resource do you think should be explored more? Do you think the provisions in the Energy Policy Act of 2005 will provide enough energy to support our desired quality of life in the future? Why or why not?*

Plan Presentation

Once teams have selected their top choices, they are ready to begin developing an outline for presenting their energy plan for America. Set expectations by discussing this [sample team presentation](#). Have students create an outline for their presentation, using the [Energy Plan Comparison](#) document and [Energy Plan Choices](#) handout to provide support for their plan. Remind students to use the [Project Overview and Checklist](#) and [scoring guide](#) to ensure they are including all the essential elements in their presentation; specifically they should be able to answer:

- *Does their decision guarantee a reliable supply of energy sufficient to meet the demands of the American economy over the next 10 years?*
- *Does it promote continued economic growth?*
- *Can it help to provide for the environmental welfare of future generations?*
- *Why should those specific choices be included in a national plan?*
- *How does their plan compare with past and future U.S. energy policies?*

Conduct conferences with each team to review their plans and presentation outline. Assess the outline to make sure students have a credible, well-reasoned proposal prior the next step of students creating the presentation.

Present Decisions and Findings

Provide time for student teams to plan a short presentation (5-10 minutes), in which they present their decisions to the rest of the class, as well as indicating which ideas are included in the government's past and future plans. For any ideas that are not included in the Energy Policy Act, specific state plans, or the [FERC Strategic Plan](#)* students argue why their ideas should be considered in the future.

Set aside a day for presentations. Encourage audience members to take notes and submit questions to the teams after each presentation. Facilitate discussion and debate, and encourage students to defend their reasoning using justification from research.

After all presentations have been presented, students complete a [journal entry](#) responding to the following prompt: *How have your opinions, attitudes, or understanding about how we use energy changed over the course of this project? Do you think we will be able to balance our energy needs and environmental concerns in the future? Why or why not? What can individuals do to make a difference? What can you do to make a difference?*

Extend the Unit (Optional)

Depending on the amount of time you want to allot to this project, you may have the groups develop additional materials, such as a Web site or secondary activity like a game. This may require additional class periods to complete. A possible additional activity could include coordination with the students' English teacher(s) for students to write a letter to their senator or representative supporting or opposing future or current energy plans.

Conclude the Lesson

Be sure to end the final activity with a comprehensive debriefing session. Circle back to the Essential Question: *How can we make a difference?* Give students the opportunity to express any relevant observations they may wish to make.

Prerequisite Skills

- Interactive communication skills and cooperative work skills
- Reading and writing in persuasive mode
- Oral communication
- Basic computer skills including:
 - Basic use of Web browser
 - Saving of information
 - Basic use of peripherals (printers, etc.)

Differentiated Instruction

Resource Student

- Special needs students will have the benefit of working in a cooperative situation for much of the project.
- Grade-level peers may be assigned within the groups to assist special needs students.
- A template for the presentation can be provided.
- Guidelines for the research component may be adjusted based on individual modifications for special needs students.

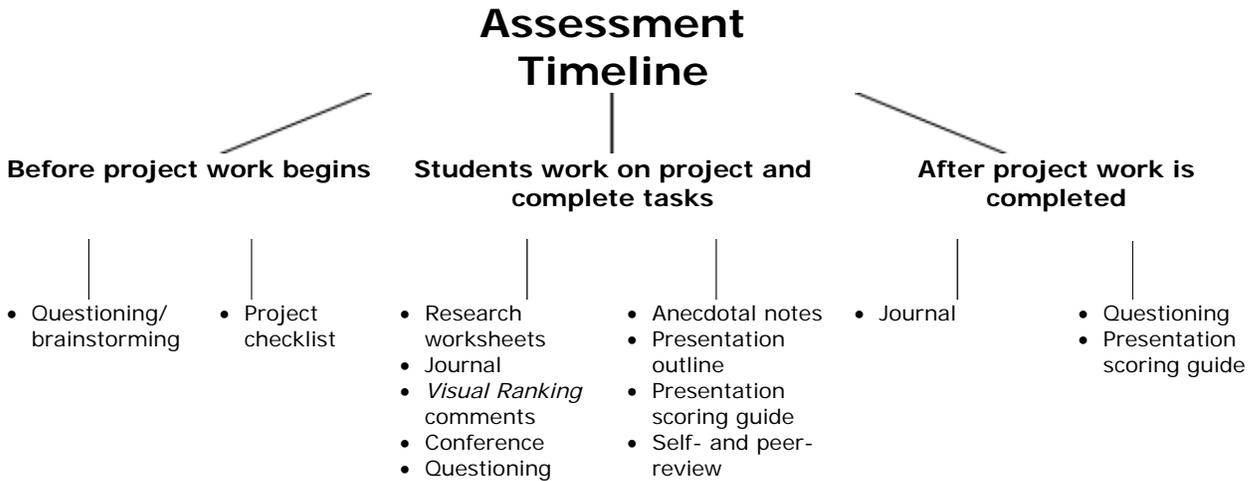
Gifted Student

- Gifted students may contribute to their group project by enhancing the presentations with additional information that targets objectives that go beyond project guidelines. For example, they could:
 - Explore more technical elements of the impact of energy acquisition on the environment (for example, the proposed drilling for oil in the Alaska refuge)
 - Add technical expertise in the development of multimedia, newsletter, and Web presentations for their groups
 - Interview experts
 - Visit and photograph energy resource sites in the area to include in the presentation

English Language Learner

- Provide support through the use of a language specialist.
- Provide a technical, translating dictionary for translating terms.
- Pair English language learners with more advanced bilingual students who share a common language.
- Provide some research resources in the native language.

Assessment Processes



Students use a [project checklist](#) to help guide their learning, stay on track, and self-assess their progress. Quality of [journal entries](#), comments in [Visual Ranking](#) projects, and research worksheets help both teacher and students to monitor progress and understanding of content. Questioning is used throughout the unit to help students develop their higher-order thinking skills and process content. Individual and team group conferences are used to help monitor progress and answer any questions. Ask students to use the [presentation scoring guide](#) to help them self- and peer-assess work prior to completion. Use this same [scoring guide](#) to assess and grade the final project.

Type of Assessments: - (check boxes of the assessment types)

<input checked="" type="checkbox"/> Questioning <input checked="" type="checkbox"/> Interview/Conference <input type="checkbox"/> Observation <input checked="" type="checkbox"/> Anecdotal notes <input checked="" type="checkbox"/> Journal <input type="checkbox"/> Learning Log	<input type="checkbox"/> Rubric <input checked="" type="checkbox"/> Checklist <input checked="" type="checkbox"/> Scoring Guide <input type="checkbox"/> Quiz <input type="checkbox"/> Test <input type="checkbox"/> Other: Explain:
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Assessment	Process and Purpose of Assessment
Questioning/ Brainstorming	The teacher uses questioning and student brainstorming to determine how much students know about energy resources prior to the start of the unit and to connect to their personal lives.
Project Overview and Checklist	Students use the project checklist to understand where they are in the unit and where they are going, as well as to self-assess their progress while working on the various components of the project. They revisit this

	checklist throughout the unit to help monitor their progress and check due dates.
Research Worksheets	Students use the State Energy Information , Energy Plan Comparison , and Energy Plan Choices worksheets to help guide and assess their research of energy policies, usage, and resources.
Project Journal	Students are prompted at the end of each project step to create journal entries in response to prompts provided by the teacher. The teacher reviews the project journal entries during conferences to provide feedback and clarify misunderstandings. Students use the journal to record new learnings and reflect on their thinking. Teacher also reviews journal entries at the end of the unit to assess understanding.
<i>Visual Ranking</i> Comments	Teacher uses the comments within the Visual Ranking projects to assess students' comprehension of the issues and ability to provide sound reasoning for their selections
Teacher Conference	The teacher meets with each team at least once during the project to assess the students' quality of research and understanding of content. The conference is also used to provide feedback on current work, clarify misunderstandings, and assist in locating other research resources, if necessary.
Anecdotal Notes	In this informal assessment, the teacher takes notes during team conferences. This assessment strategy allows the teacher to provide follow-up resources, check on progress, and monitor any issues. The teacher can refer back to these notes when conducting the final assessment.
Presentation Outline	Teacher reviews students' presentation outlines before they work on their multimedia presentations to provide feedback, suggestions, and corrections.
Presentation Scoring Guide	The scoring guide is used by the students to self- and peer-assess their presentations prior to completion. The teacher uses the scoring guide to assess the verbal communications skills, content and design of the presentation, and research.

Credits

This project is based on a unit plan developed by teachers at the Arkansas School for Mathematics and Sciences, Hot Springs, Arkansas. A team of teachers expanded the plan into the example you see here.

Targeted State Frameworks/Content Standards/Benchmarks:

National Council for Geography Education's National Geography Standards *Environment and Society*

- 14. How human actions modify the physical environment
- 16. The changes that occur in the meaning, use, distribution, and importance of resources

The Uses of Geography

- 18. How to apply geography to interpret the present and plan for the future

California SCORE History/Social Science Standards

12e.3 Students analyze the influence of the federal government on the American economy.

12e.3.1 Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.

12e.3.2 Identify the factors that may cause the costs of government actions to outweigh the benefits.

Student Objectives:

Students will:

- Evaluate the problems of finding new sources of energy balanced against concerns about damage to the environment
- Understand how energy requirements and resources have changed during the past 50 years
- Understand how national energy policies have changed during the past 25 years
- Understand the main components that help shape state and national energy policies
- Compare, analyze, and evaluate energy plans from various perspectives
- Understand the concepts: supply and demand, quad, OPEC, alternative energy
- Recognize the impact of human choices on the environment and lifestyles

Materials and Resources

Printed Materials

Christensen, J. W. (1984). *Global science: Energy resources, environment*. Dubuque, Iowa: Kendall/Hunt Publishing.

Internet Resources

Energy Information Agency: State Energy Page

www.eia.doe.gov/emeu/states/_states.html*

State-by-state energy production and consumption statistics

Annual Energy Review – Perspectives 2004

www.eia.doe.gov/emeu/aer/ep/ep_frame.html*

Energy in the United States, 1635-2000

www.eia.doe.gov/emeu/aer/eh/frame.html*

Alliance to Save Energy

www.ase.org/*

Promotes energy efficiency worldwide to achieve a healthier economy, a cleaner environment, and greater energy security. Also available in Spanish.

American Energy Policy

www.esru.strath.ac.uk/EandE/Web_sites/01-02/RE_info/usa.htm*

Energy Timeline

www.energyquest.ca.gov/time_machine/index.php*

View other time periods also from links at top of page

Jimmy Carter State of the Union Address 1980

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www.jimmycarterlibrary.org/documents/speeches/su80jec.phtml*

Last third of the speech deals with energy plan

Energy Policy Act of 2005

http://en.wikipedia.org/wiki/Energy_Policy_Act_of_2005*

A review of the highlights of the Energy Policy Act of 2005

President Bush Signs Into Law a National Energy Plan

www.whitehouse.gov/news/releases/2005/08/20050808-4.html*

Short overview of the Energy Policy Act of 2005

Energy Policy Act of 2005

http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_bills&docid=f:h6enr.txt.pdf*

The full-length Energy Policy Act of 2005

Strategic Plan for Fiscal Years 2005 - 2008 for the Federal Energy Regulatory Commission

www.ferc.gov/about/strat-docs/strat-plan.asp*

Letter to the Chairman for the Committee on Energy and Commerce

www.cbo.gov/showdoc.cfm?index=6581&sequence=0

Estimated costs for the Energy Policy Act of 2005

US Department of Energy Home Page

www.energy.us.gov*

Links, facts and information on US energy policy

US Department of Energy Office of the Environment Page

www.energy.gov/engine/content.do?BT_CODE=ENVIRONMENT*

Discusses impact of energy on the environment

US Environmental Protection Agency

www.epa.gov*

Resources, links, and documentation on the environment

George Mason University Tech Center Web site

<http://mason.gmu.edu/~montecin/powerpoint.html>*

Tips and information for building a good presentation

Arkansas School for Mathematics and Science Energy Unit Plan Page

<http://asmsa.org/FacultyStaff/CurrentStaffResources/TeachingUnits/Science/National%20Energy.pdf>

Unit plan on energy resources

Technology – Hardware

- Computer(s) for completion of Internet research and multimedia presentations
- Internet Connection for completion of Internet research
- Digital Camera (optional) to include pictures of energy resource sites in the area or interviews with experts

Technology – Software

- Internet Web Browser for completion of Internet research
- Multimedia for presentation
- Database/Spreadsheet (optional) to keep track of energy data
- Desktop Publishing (optional) for any optional handouts or other visual media to be used in the presentation
- Word processing (optional) to type the presentation outline