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Unit: Energies: Sources, Economics, and the Environment

Physics (Grade 11)

Length of Time: 10-12 days

Overview: This unit plan will be used to enable my students to explore different energy sources as well as the environmental and economic impacts that those sources have from the acquisition of raw materials to the distribution of the resulting energy. Throughout the unit, my students will conduct research and produce a wiki to showcase their learning. The culminating activity will be a persuasive writing piece that promotes the allocation of resources to further develop one particular energy source as a viable solution to the quest for a sustainable energy source for the future. The lesson is globalized by requiring the students to look at the environmental and economic impacts and relevant governmental regulations related to producing energy in certain regions of the world away from the United States. The main global competencies that are focused on are “Students investigate the world beyond their immediate environment,” and “Students translate their ideas and findings into appropriate actions to improve conditions.”

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| **Stage 1 Desired Results** | | |
| **ESTABLISHED GOALS**  ***From Pennsylvania Science & Technology Standards***  G1: S11.C.2.2 Demonstrate that different ways of obtaining, transforming, and distributing energy have different environmental consequences.  G2: S11.C.2.2.1 Explain the environmental impacts of energy use by various economic sectors (e.g. mining, logging, transportation) on environmental systems.  G3: S11.C.2.2.2. Explain the practical use of alternative sources of energy (I.e. wind, solar, and biomass) to address environmental problems (e.g. Air quality, erosion, resource depletion).  G4: S11.C.2.2.3 Give examples of renewable energy resources (e.g. Wind, solar, biomass) and non-renewable resources (e.g. coal, oil, natural gas) and explain the environmental and economic advantages and disadvantages of the use.  ***From Pennsylvania Reading, Writing, Speaking, and Listening Standards***  **G5: R11.B.3.1.1:** Explain, interpret, describe, and/or analyze the use of facts and opinions to make a point or construct an argument in nonfictional text.  **G6: R11.B.3.3.3:** Explain, interpret, and/or analyze graphics and charts, and/or make connections between text and the content of graphics and charts.  **G7: R11.A.1.3.1:** Make inferences and/or draw conclusions based on information from text.  **G8: R11.A.1.4.1:** Identify and/or explains stated or implied main ideas and relevant supporting details from text.  **G9: R11.A.1.3.2:** Cite evidence from text to support generalizations.  **G10: 1.4.11.C:** Write persuasive pieces. | ***Transfer*** | |
| *Students will be able to independently use their learning to…*    T1: Analyze and evaluate information to determine advantages and disadvantages of a subject.  T2: Formulate a defensible point of view based upon researched information.  T3: Outline steps in a process.  T4: Work with others to create a product. | |
| ***Meaning*** | |
| UNDERSTANDINGS  *Students will understand that…*  U1: Actions to produce the energy needed by one group of people impacts the environments and economies of people throughout the world.  U2: Every type of energy source has advantages as well as disadvantages.  U3: Each type of energy is more suitable for certain geographic locations than other types.  U4: Environmental problems can be caused and improved relative to the choice of energy source employed in a particular area.  U5: It is important to be able to analyze information before making a judgment about the subject. | ESSENTIAL QUESTIONS    E1: What are the environmental and economic advantages and disadvantages of various renewable and nonrenewable energy sources?  E2: How does the acquisition, processing, and distribution of various energy sources impact the environment?  E3: How can a change from the use of one energy source to another source cause a change in a certain environmental condition?  E4: How are you affected in Pennsylvania by the choice of energy source that is made on another continent? |
| ***Acquisition*** | |
| *Students will know…*    K1: Environmental problems are related to the acquisition, processing, and distribution of energy sources.  K2: Each type of renewable and nonrenewable energy has advantages and disadvantages.  K3: Actions taken by one group of people impact the environments and economies of other groups of people throughout the entire world.  K4: Persuasive arguments must have factual information to support them. | *Students will be skilled at…*    S1: Finding relevant and reliable information sources.  S2: Forming and defending a persuasive argument constructed from their research.  S3: Synthesizing research material to form meaningful answers to the Essential Questions.  S4: Making predictions based upon factual information. |
| **Stage 2 - Evidence** | | |
| **Evaluative Criteria** | **Assessment Evidence** | |
| 1. Creates a complete technological product that incorporates aspects of the entire unit. (Evaluate quality with a rubric, which is still to be designed, that will include categories for thoroughness of information, quality of information, use of reliable sources, and presentation.)  2. Assesses an issue from different viewpoints and from local/regional/global perspectives.  3. Provides a thorough economic analysis that involves looking at a topic in different geographical locations.  4. Provides a thorough persuasive argument that is supported by appropriate factual information. | TRANSFER TASK(S):   1. Using [www.wikispaces.com](http://www.wikispaces.com) or a similar site, create a wiki for your group’s energy source. As you complete your research, the next five assignments in this unit will become individual pages within your wiki. 2. Environmental Impact Assessment: Explore the impact that acquiring, processing, and distributing your type of energy has on the environment. Consider how various economic sectors (e.g. mining, logging, transportation, construction) contribute to these environmental impacts. List at least three ways in which each of those sectors impacts the environment. What governmental regulations exist to address these impacts? Find five countries and list 1-3 regulations enacted by each of them. Remember to include information on how the worldwide environment is impacted, not just the environment in the immediate area. Choose one geographical area that has been affected. Create a visual representation to show the effect there. Now, in a well-developed paragraph, expand that area to consider what regional effects would result (be sure to define the region), and then expand your discussion to include how the rest of the world would be impacted. Find at least three quotes to support your discussion. Are there impacts that might be acceptable in another area of the world, but not in the United States? List these impacts and the areas where they seem to be acceptable. Create a wiki page that shows obvious contributions of each group member to share your findings. Remember to keep it visually interesting. Below are some interesting links:   <http://www.need.org/Energy-Infobooks>  <http://energy.gov/science-innovation/energy-sources/renewable-energy>  <http://www.energy4me.org/energy-facts/environmental-protection/environmental-impact-by-source/>   1. Economic Impact: Determine the economic impact of using this type of energy. Consider the financial costs of all points in the process (acquisition, processing, and distribution). How has the use of this energy source changed over time in different locations, and how has that change affected the economy of the area? Would the implementation of this energy source be economically feasible for our area? Would it be feasible if we were living in Ethiopia? India? Russia? Create appropriate charts or tables to display the information you have gathered. Display the information on a page in your wiki. 2. Letter to the Executive Assembly: Visit the website of the World Energy Council (http://www.worldenergy.org/about\_wec/ ) to learn what their purpose is. Using the information that you have seen in the wikis prepared by your classmates, you are to prepare a letter to the Executive Assembly of the World Energy Council. You job is to convince them which one energy source they should focus their efforts and resources on developing in their quest for expanding the use of sustainable energy, given that organization’s purpose. Be sure to use factual information to support your position. | |
| Effectively uses time and resources and works well within the assigned group. (Use “Group Project” rubric.) | OTHER EVIDENCE:   1. Students work cooperatively within their groups. 2. Students effectively use technology to find information. 3. Deadlines are met for completing each step of the unit. | |
| **Stage 3 – Learning Plan** | | |
| *Summary of Key Learning Events and Instruction*   1. Introduction to the Unit: This is a teacher-led discussion of the goals of the unit, the unit requirements, and an introduction to using [www.wikispaces.com](http://www.wikispaces.com) for those students who might not have used it in another class. 2. Site Creation: Using [www.wikispaces.com](http://www.wikispaces.com) or a similar site, create a wiki for your group’s energy source. As you complete your research, the next five assignments in this unit will become individual pages within your wiki. (Stage 2, Transfer Task 1) 3. Process Flow Chart: For your assigned energy source, create a visual to explain how the raw materials are acquired and processed to produce energy. Be sure to include each step of the process including how the energy is distributed to consumers. Add captions to the images you use. Upload it to your wiki. 4. Energy Map: Using a blank world map, show where this type of energy is used. Upload it to your wiki. 5. Environmental Impact Assessment: *See Stage 2, Transfer Task 2 above* 6. Economic Impact: *See Stage 2, Transfer Task 3 above* 7. Advantages/Disadvantages Table: Create a table to summarize the advantages and disadvantages of this energy source that you have found. Create a second chart to show what a student living in a relatively poor country in Africa might view as advantages and disadvantages of this type of energy. Upload it to your wiki. 8. Peer Review: You must look at all wikis prepared for this course. For a minimum of three other wikis, you will leave comments that describe four areas in detail:    1. what you like about the way the information is presented,    2. what you dislike about the way the information is presented,    3. something that you have learned from the wiki and find to be interesting about that topic,    4. something that you have a question about. 9. Letter to the Executive Assembly: *See Stage 2, Transfer Task 4 above*   \*\*\*Prior to each step (3-9) of this stage, I will hold a brief discussion with the students, during which I will discuss specifics of the assignment as well as give them examples of the types of information to look at. | | |