Unit Overview:
Students will begin this unit by looking at renewable and non renewable resources. They will discover that fossil fuels are non renewable and will eventually be depleted, as well as the fact that fossil fuel extraction damages ecosystems and causes greenhouse gases (We have already completed a climate change unit). We will examine the alternatives to fossil fuels and the advantages and disadvantages of these alternatives. Lastly, we will focus on one alternative, biomass. Students explore the economic, social and environmental pros and cons of producing biofuels. This Science unit includes tie ins with reading, discourse and social studies in the hopes that our students will begin to think scientifically and globally about the future.

Sources Consulted: Sources are referenced and included with each lesson as well as in this section

http://www.altenergy.org/renewables/biomass.html

Children’s websites and books:

Children’s Books:

*How We Know What We Know About Our Changing Climate:*
Scientists and Kids Explore Global Warm by Lynne Cherry and Gary Braasch

*Rising Above Global Warming, What Global Warming is and how to Save Our Earth* by BJ DeFrancesco - Children’s Author

*Acting for Nature, What Young People Around the World Have Done to Protect the Environment* - by Sneed Collard III and Action for Nature
"The young people in this book are shining examples of what others, all over the world, can do." --Jane Goodall, Director of the Jane Goodall Institute for Wildlife Research, Education, and Conservation

*Gas Trees and Car Turds: Kids' Guide to the Roots of Climate Change* by Kirk Johnson, illus. Mary Ann Bonnell

*This Is My Planet: The Kids' Guide to Global Warming* by Jan Thornhill
Why Are the Ice Caps Melting?: The Dangers of Global Warming by Anne Rockwell, illus. Paul Meise

Teacher Resource Books:

A Teacher's Guide to "How We Know What We Know About Our Changing Climate": Lessons, Resources, and Guidelines for Teaching about Global Warming "How We Know What We Know About Climate Change," this guide helps teachers explore global warming through engaging lessons and classroom activities. Suggestions are provided to differentiate instruction and conduct project-based learning. Lessons and activities are correlated to science standards for grades 4-8

North Star Teacher Resource NST3033 Global Warming Bulletin Board Set: Link included to purchase


Learning Objectives:

State or National Benchmarks Addressed

S.IP.E.1 Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation.
S.IP.04.12 Generate questions based on observations.
S.IP.04.13 Plan and conduct simple and fair investigations.
S.IP.04.16 Construct simple charts and graphs from data and observations.

S.IA.E.1 Inquiry includes an analysis and presentation of findings that lead to future questions, research, and investigations.
S.IA.04.11 Summarize information from charts and graphs to answer scientific questions.
S.IA.04.12 Share ideas about science through purposeful conversation in collaborative groups.
S.IA.04.13 Communicate and present findings of observations and investigations.
S.IA.04.14 Develop research strategies and skills for information gathering and problem solving.

S.RS.E.1 Reflecting on knowledge is the application of scientific knowledge to new and different situations. Reflecting on knowledge requires careful analysis of evidence that guides decision-making and the application of science throughout history and within society.
S.RS.04.11 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
S.RS.04.17 Identify current problems that may be solved through the use of technology.
S.RS.04.18 Describe the effect humans and other organisms have on the balance of the natural world.

Grade 6
L.EC.M.4 Environmental Impact of Organisms- All organisms (including humans) cause change in the environment where they live. Some of the changes are harmful to the organism or other organisms, whereas others are helpful.
L.EC.06.41 Describe how human beings are part of the ecosystem of the Earth and that human activity can purposefully, or accidentally, alter the balance in ecosystems.
LEc.06.42 Predict possible consequences of overpopulation of organisms, including humans, (for example: species extinction, resource depletion, climate change, pollution).

Reading- Grade 4
R.CM.04.01 connect personal knowledge, experiences, and understanding of the world to themes and perspectives in text through oral and written responses.
R.CM.04.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

Discourse-Grade 4
S.DS.04.03 respond to multiple text types by reflecting, making connections, taking a position, and/or showing deep understanding.
S.DS.04.04 plan and deliver presentations focusing on a key question using an informational organizational pattern (e.g., descriptive, problem/solution, cause/effect); supportive facts and details reflecting and emphasizing facial expressions, hand gestures, and body language.

Five-days of Classroom or Field Activities:

Day 1- (The Hook)
Objective: SWBAT complete the pretest and discuss one creative alternative fuels.

Materials: Pre test, reading sheet

Procedure: Students complete the pretest without any prior knowledge or discussion. Teacher then introduces reading sheet (printed from the internet article). Students will then read and discuss guided questions.

We know that driving cars that run on petroleum add to greenhouse gases and contribute to global warming. What can we do about it? Teacher will list ideas on the board.

Print the following article (http://www.popsci.com/diy/article/2009-09/taking-chances) about a man that converts a car to run on vegetable oil. Some of the article may be a bit technical, you could use excerpts or read over it with the students. After reading the article have small groups discuss what this man did, why? Will it help? Was it worth it? Would you consider a car like this?

Evaluation: Post test is given at unit’s close for evaluation.

Days 2-4
Lesson: What’s the Alternative?

Objective: SWBAT create power point presentations after researching alternative energy sources from renewable resources.

Materials: Computers, background information sheets
Procedure: In six groups of four or five, the students will be given the background sheet and access to computers and the internet. The students will be responsible for creating a power point to present to the class that teaches the other groups about their alternative energy source. Students will be given the attached rubric with the desired criteria.

Evaluation: Teacher will grade the power points presentations using the attached rubric. The entire unit will also have a post test.

BACKGROUND INFORMATION FOR THIS LESSON:

Currently in the world the majority of energy for our electricity, heat, and transportation is generated from fossil fuels (for example: oil, coal, and natural gas). Fossil fuels were built up from the decomposition of carbon rich animals and plants this took millions of years. Because fossil fuels are not replenished on a human time scale they are considered non-renewable sources of energy that will run out. The world’s population and especially developed countries are using fossil fuels at a rate that is much faster than these resources were produced, therefore, the day when fossil fuels are gone is probably not that far away. We need to prepare ourselves for the eventual loss of fossil fuels by developing and using new methods of energy production.

Fossil fuels are not only non renewable they also are harmful to the environment. They all produce waste of by products that are damaging in some ways.

Some alternative methods currently in use or being considered for energy production are:

Solar power:
Solar power is using the power of the sun to generate electricity. Energy is produced from solar power by converting light into electricity through the use of semiconductors. When photons (particles of light) hit the semiconductor some of the energy is absorbed and causes some electrons to be bumped off the silicone atoms. This movement of these electrons first away from the atom and then back into it leads to an electrical current and the production of useable electricity. Solar power is used in small scale. solar power may become a more efficient source of energy but it is unlikely that it will ever produce as much energy as that which is produced from fossil fuels.

Geothermal power:
Geothermal power uses the heat of the earth’s core to produce electricity. Large power plants pump water into chambers deep in the earth. The heat from the earth’s core causes this water to boil and become steam. Next the steam turns turbines which in turn run generators that produce large amounts of electricity. Geothermal power is used sparingly in the United States. Some countries like Iceland use geothermal power a great deal and have lower dependence on fossil fuels.

Wind power:
Wind power refers to using the energy of moving air to produce electricity. Moving air (Wind) causes the blades of a windmill to spin, this turns a generator producing of electricity. Wind generated electricity would may not be practical in replacing fossil fuel consumption.
In addition to not being very efficient, wind generated electricity requires many windmills and sometimes causes damage to the ecosystem by accidentally killing birds and other animals.

Hydroelectric power:
Hydroelectric power refers to using the potential energy of moving water to produce electricity. A dam stops water behind it and raises the potential energy of the water behind the dam. This water is release causes a turbine to spin. The spinning turbine causes a generator to spin and produces electricity.
Although hydroelectric power is very clean, we simply do not have enough rivers to dam in order to completely replace fossil fuels. Building dams is harmful to the environment. When a dam is built it requires the flooding of hundreds of thousands of acres and displaces/kills millions upon millions of plants and animals.

Biomass:
Biomass has to be considered in the search for an alternative source of energy that is abundant in a wide-scale yet non-disruptive manner, since it is capable of being implemented at all levels of society.. Our current energy needs would require an area of one million square miles. That's roughly one-third of the area of the 48 contiguous states. There is no way that plantations could be implemented at this scale, not to mention that soil exhaustion would eventually occur. Biomass is not likely to replace our current dependence on coal, oil, and natural gas, but it can complement other renewables such as solar and wind energy.

Fuel Cells:
Fuel cell is an electrochemical energy conversion device that converts hydrogen and oxygen into electricity, heat, and water. It is very much like a battery that can produce electricity while being recharged continuously.

Basic fuel cells running on pure hydrogen are pollution free, giving off only electricity, water, and heat. The potential for fuel cells to provide zero or near-zero emissions has been a significant force in the development of the technology over the past 30 years, and is drawing increasing attention to the technology today. Because there is no combustion in a fuel cell, fuel is converted to electricity more efficiently than any other electrical generating technology available today.


Day 5
Lesson: Life Cycle of a CD or DVD

Objective: SWBAT be introduced to the fact that a product has a life cycle. Students will look at life cycles of items they use at school.

Materials: CD/DVD Life cycle poster found on this website:
http://www.epa.gov/osw/education/pdfs/finalposter.pdf
Procedure: Teacher shows DVD/CD lifecycle chart on computer using projector. Students discuss that we can control what we buy and the lifecycle of the products we consume every day. Students choose a product they use and create a lifecycle poster for their product. Can they make the lifecycle more environmentally friendly.

Evaluation: Teacher will assess the student’s life cycle posters to see if they understood the concept.

Unit Assessment:
Each lesson includes a built in assessment. The power points the students create will be evaluated as well the lifecycle posters. The students will complete a pre test prior to beginning the unit and the same post test at the unit's conclusion. Teacher will then assess by comparing the two assessments.
PRE and POST TEST
Future Fuels Unit

Name ________________________________

1) What is fossil fuel?

2) What is one disadvantage of using fossil fuels?

3) What is a non-renewable resource?

4) List at least three renewable resources?

5) What is meant by life cycle of a product?