The Future of Hydrogen–A Web Quest

Student Objective
The student:
- will be able to explain hydrogen's past history
- will be able to explain the current use of hydrogen
- will be able to explain the advantages and disadvantages of using hydrogen as a fuel source
- will be able to explain how hydrogen could be used in the future
- will be able to explain current and proposed future hydrogen production
- will be able to explain the societal impact of hydrogen use

Key Words:
Hydrogen Economy

Time:
15 minutes to explain assignment
1 class period for debate
(Students without home computer access will need 2 - 3 hours computer lab time)

Materials:
- computer with internet access

Procedure
1. If this is the class' first Web Quest, briefly explain to the students how it works
2. Tell the students that there will be a class debate on the material.
3. Write the starting page for the Web Quest on the board:
   http://energywhiz.com/games_and_activities/webquests.php
   The page may also be accessed through the front page of the Energy Whiz web site (http://energywhiz.com/), by clicking on the "Games and Activities" section**.**

Procedure–after individual research
1. You may want to collect the student's research for assessment prior to the debate/discussion, returning their notes to them for class participation.
2. Explain the debate scenario to the class:
   "You are a resident of a town in Florida located next to NASA and the Kennedy Space Center. As you know, hydrogen is one of the fuels that was used in the space shuttle program. In fact, every shuttle launch required 50 tanker trucks of hydrogen (over 300,000 pounds) to travel 600 miles from where it is produced near New Orleans to Kennedy Space

Center. This was a massive transportation job that cost hundreds of thousands of dollars for every launch. Currently, NASA, the Air Force and private contractors are working on a new generation of spacecraft, and NASA is seeking to develop new technology to produce the hydrogen much closer to the launch pad – in your town! Of course, this has stirred up much controversy in the town, so the mayor and town council have called a meeting so everyone may air their opinions."

3. Assign roles to the students. Some suggested roles are:
   - mayor
   - city council members
   - reporters
   - NASA representative/PR person
   - scientists
   - NASA technicians
   - truck drivers
   - consumers who are environmentally aware
   - consumers who are against raising taxes
   - town members who want to limit industrial growth
   - neighbors to the proposed site
   - developers/contractors

4 Remind the students that they should conduct themselves in an appropriate, professional manner (i.e. no name calling or personal derogatory comments).

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Energy	**Standard 1**	**SC.B.1.4-**	**X**				**X**			
	Standard 2	**SC.B.2.4-**								
How Living Things Interact With Their Environment	**Standard 1**	**SC.G.1.4-**								
	Standard 2	**SC.G.2.4-**	**X**				**X**			
The Nature of Science	**Standard 1**	**SC.H.1.4-**								
	Standard 2	**SC.H.2.4-**								
	Standard 3	**SC.H.3.4**		**X**	**X**	**X**	**X**	**X**		
Social Studies standards: SS.A.5.4.8, SS.B.2.4.3, SS.B.2.4.5, SS.B.2.4.7										

Benchmark SC.B.1.4.1 - The student understands how knowledge of energy is fundamental to all the scientific disciplines.

Benchmark SC.B.1.4.5 - The student knows that each source of energy presents advantages and disadvantages to its use in society.

Benchmark SC.G.2.4.1 - The student knows that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide.

Benchmark SC.G.2.4.5 - The student understands that the amount of life any environment can support is limited and that human activities can change the flow of energy and reduce the fertility of the Earth.

Benchmark SC.H.3.4.2 - The student knows that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science.

Benchmark SC.H.3.4.3 - The student knows that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.

Benchmark SC.H.3.4.4 - The student knows that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.

Benchmark SC.H.3.4.5 - The student knows that the value of a technology may differ for different people and at different times.

Benchmark SC.H.3.4.6 - The student knows that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.

Benchmark SS.A.5.4.8 - The student knows significant political events and issues that have shaped domestic policy decisions in contemporary America.

Benchmark SS.B.2.4.3 - The student understands how the allocation of control of the Earth's surface affects interactions between people in different regions.

Benchmark SS.B.2.4.5 - The student knows how human overcome 'limits to growth' imposed by physical systems.

Benchmark SS.B.2.4.7 - The student understands the concept of sustainable development.

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Hydrogen Economy - A "hydrogen economy" is an economy in which the primary source of stored energy is hydrogen. This may be gaseous, cryogenic liquid, or bound to other materials as hydrides. This is contrasted to the current world fossil fuel economy, which exploits geologic stores of coal, petroleum, or methane (natural gas).