

Nuclear power: Good vs bad

WebQuest Description: The town council has been meeting with a company involved with nuclear power to set up their facility on undeveloped land in the town. You and your team have been selected by concern residents to unbiasedly research the advantages and disadvantages to living near this nuclear facility. You are to report back to them with your information and a recommendation on whether they should support or oppose town council's interest in this company.

Grade Level: 9-12

Curriculum: Science

Keywords: radiation, fission, fusion, disasters, nuclear power

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WebQuest URL: <http://zunal.com/webquest.php?w=183738>

Introduction

In this web-quest, students will explore nuclear chemistry in real-world situations. Students will learn about fission and fusion, types of radiation, its effects on humans, and on how nuclear power is produced as well as its repercussions and disasters.

Tasks

YOUR TASK: Your team must do research in several areas to answer the questions of the residents. Your team will divide up the topics: one person gathering information on nuclear fission and fusion, another will explore how nuclear power is produced, while still another will look at its repercussions and disasters, and the fourth member researches the nuclear radiation and its effects on humans. You will turn in a written paper answering the questions for each topic. Also your group will discuss your information and create a report with a supported recommendation to either oppose or support the town council's effort. Your team will also make a brief presentation of your findings. Guidelines: Research: Use the websites and questions provided on the Process page to gather information in the various areas. Report: A clean and neat copy of the questions done in ink or typed. A one page report with your recommendations for or against the nuclear company. Your recommendations must be supported by your research. The paper must be typed using 12-font, double-spaced, 1-inch margins. Presentation: A 2-3 minute presentation on your recommendation. All team members must contribute to the presentation. Each team member must speak briefly on their area of research that supports the overall recommendation.

Process

The PROCESS: Follow the steps below to complete the webquest. This is a group assignment, each of you must contribute equally. Feel free to assist each other and ask your teacher if any problems arise. Step 1: Choose a topic. You can either select a topic or be assigned a topic to research for your group. Step 2: Research (Use websites and questions listed on this page) Step 3: Discuss your information with your group; come up with a recommendation. Step 4: Organize your information into a Report. (Requirements listed on Task page) Step 5: Plan your Presentation. (Requirements listed on Task page) There is a vast amount of information about nuclear power on the web. An organized list of some websites are listed below. Feel free to search the web for alternative websites, but only do so after you have viewed the websites below. The TOPIC

Topic 1: Nuclear radiation Go to: <http://www.howstuffworks.com/nuclear.htm>

- What are the nine naturally radioactive elements?
- What is meant by the half-life of a radioactive substance?
- What is spontaneous fission?
- Name two important applications of neutron radiation.
- What is ionizing radiation?

Go to: <http://www.world-nuclear.org/info/inf05.html>

- What are the types of radiation?
- How radioactive is a person?
- Where does most radiation come from and what are some of the sources?
- What is natural background radiation?
- What are 4 ways people are protected from radiation?

Topic 2: Nuclear power Go to: <http://library.thinkquest.org/17940/texts/fission/fission.html>

- What is a fissile isotope and why is it important to fission?
- What element/isotope is used in nuclear power plants?
- What is a chain reaction?

<http://www.howstuffworks.com/nuclear-power.htm>1. What is induced fission?2. Discuss the release of energy by fission.3. How does a nuclear power plant work?4. What is meant by uranium enrichment?5. Explain the role of control rods in a fission reaction.6. What is critical mass?7. What precautions are taken on the outside of a nuclear power plant?Go to: http://fusioned.gat.com/what_is_fusion.html1. What is fusion?2. What is necessary in order to make fusion happen?3. Why is fusion preferred over fission? Topic 3: Repercussions and disastersGo to: <http://science.howstuffworks.com/nuclear-power5.htm>1. What was the prime-worst nuclear disaster?2. What happen at Chernobyl?3. What happen in Japan in March 2011?4. Why didn't the safety measures stop radioactivity at the plant?Go to: http://library.thinkquest.org/3471/radiation_effects_body.htmlScroll down to section: Major Radiation Exposurein Real Life Events1. What did doctors see for the first time at Hiroshima?Nagasaki?2. What did people at Hiroshima/Nagasaki die from a week after the explosion?3. What physical ailments did the survivors suffer through?4. What happen at Three Mile island?5. What was the major result of the accident there?6. How much nuclear fuel and graphite were ejected at Chernobyl?7. How large was the radioactive release at Chernobyl?Go to: <http://www.howstuffworks.com/nuclear-power.htm>1. What are the pros of nuclear power plant?2. What are the cons of nuclear power plant?Topic 4: Radiation and its effectsGo to: http://www.windows2universe.org/earth/Life/cell_radiation_damage.html1. what does radiation do to a cell?2. What are the 2 major ways radiation damages DNA?3. What are the symptoms of radiation sickness?click on the related link: Can living cells repair damage of radiation?1. List the 3 types of damage and the possibility of repair.Go to: <http://www.atomicarchive.com/Effects/effects15.shtml>1. List at least 7 things that radiation can do to the human body?Go to: <http://www.atomicarchive.com/Effects/effects16.shtml>1. What are the 3 long term effects on the human body?Go to: http://library.thinkquest.org/3471/radiation_effects_body_body.html1. What are the units of radiation dosage commonly used?2. What are some signs of radiation exposure?3. What is considered a lethal dose of radiation?Go to: <http://www.bt.cdc.gov/radiation/prenatal.asp>1. What are 2 ways a fetus can be exposed to radiation?2. What does the possibility of seroius health effect depend on?3. When is the fetus most sensitive to radiaiton?4. What are some of the health issues facing a baby?OTHER SOURCES:<http://www.health.ny.gov/publications/4402/> <http://hyperphysics.phy-astr.gsu.edu/hbase/nucene/fusion.html><http://science.howstuffworks.com/fusion-reactor.htm><http://hyperphysics.phy-astr.gsu.edu/hbase/nucene/fission.html>

Evaluation

Your group will be graded based on the following rubric.

Category and Score	0-1 pt below average (D-F)	2pt- average (C)	3 pts-- above average (B)	4pts- exemplary (A)	Score
Research	0-pt: No information provided on topic. 1-pt: Information was not sufficient.	Information needs to contain more detail.	Information was sufficient.	Information was more than sufficient.	25%
Teamwork	0-pt: Team members failed to work together. 1-pt: Team members did not work well together.	Team members worked well together with few problems.	Team member worked well with each other.	Team members worked exceptionally well together.	15%
Recommendation	0-pt: The recommendation had no/little supporting info and lack organization. 1-pt: The recommendation had limited supporting data and was poorly organized	The recommendation had some supporting data and was organized.	The recommendation had supporting data and was well organized.	The recommendation was excellent, containing key information and strong organization.	40%
Presentation	0-pt: Presentation was not organized and not all members participated. 1-pt: Presentation limited organization and some members were unprepared.	Presentation was not well organized or informative. Some members were not well prepared.	Presentation was well done and team was prepared and met all requirements.	Presentation met and went beyond requirements. Team was organized, energetic and informative.	20%
				Total Score	

Conclusion

I thank you for all of your hard work. Hopefully, you cleared up a misconception, learned a new fact or two, and had some fun in the process. Upon completion of this activity students should be able to answer the following questions: Explain what fission and fusion are. How do nuclear power plants work? How do nuclear accidents impact their surroundings? What is radiation? What affect does radiation have on the human body? What steps are taken to protect us from radiation exposure?

Nuclear fission and fusion are part of state standards for introductory physical science and continue through chemistry and physics at the high school level. This activity is a way to teach the unit that is entirely student-centered. This is a task encourages student and teacher participation and collaboration. It requires access to technology and planning by both the student and the teacher. Time: This web-quest will vary in length depending on the ability of your students. Introductory Level 4-5 class periods for research and collaboration; 1 day for presentation; Upper level (2-3 class periods for research and collaboration, 1 day presentation); Time can be given in an out of class to complete this assignment. Problems may present themselves (ie. student understanding, computer / internet access, systems crashing), be flexible.

Standards

Through radioactive decay, the unstable nucleus emits radiation in the form of very fast-moving particles and energy to produce a new nucleus, thus changing the identity of the element. Nuclei that undergo this process are said to be radioactive. Radioactive isotopes have several medical applications. The radiation they release can be used to kill undesired cells (e.g., cancer cells).

Other examples of nuclear processes include nuclear fission and nuclear fusion. Nuclear fission involves splitting a large nucleus into smaller nuclei, releasing large quantities of energy. Nuclear fusion is the joining of smaller nuclei into a larger nucleus accompanied by the release of large quantities of energy. Nuclear fusion is the process responsible for formation of all the elements in the universe beyond helium and the energy of the sun and the stars

Credits

Other