

Researching Renewable Energy



Target Grade Levels

Eighth - Tenth

Time

Three to four 1-hour periods for research, one 1-hour period for group presentations

Materials

- computer with Internet access, Microsoft Power Point or other available presentation software
- list of relevant web sites research materials, journals, data (such as found in World Watch, newspapers, energy companies, and organizations)

Knowledge and Skills (TEKS)

- Science:
 - Organize, analyze, evaluate, make inferences, and predict trends from data;
 - Draw inferences based on data related to promotional materials for products and services;
 - Analyze the efficiency of energy conversions that are responsible for the production of electricity such as radiant geothermal fossil fuels and the movement of water or wind;
 - Choose valid evidence, proofs, or examples to support claims; and
 - Evaluate the significance of major technological innovations, describe the impact of new technologies, new markets and revised perception of resources.
- Language Arts:
 - Use information acquired from a variety of sources including electronic technology; and
 - Apply appropriate vocabulary and skills to present geographic information.

Overview

Students will discover the great potential for using renewable energy resources and compare utility residential rates in Texas. The growing use of renewable energy in Texas will encourage student interests. Students will conduct research on the Internet and make presentations regarding their findings, using technology to prepare their materials.

Background Information

There are some advantages and disadvantages to all sources of energy, and comparisons can be made. Advantages to using renewable energy sources include convenience, low or no cost for fuel, small environmental impact, sustainability, independence from reliance on other nations or regions for fuel, no dangerous end products to clean up as a major expense, safety factors, and reduced carbon dioxide emissions. Disadvantages of some energy sources include unstable cost, transportation of raw materials and fuel, inconvenience, utilization of public water for production, pollution, limited supplies of fuel, non-sustainability, high cost of disposal of residues, dependence on foreign nations or other regions for fuel, climate change with more extreme weather, decrease in agricultural productivity, possible sea level rise, and species loss.

Procedure

1) Vocabulary

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| a) biomass | f) renewable energy |
| b) carbon dioxide | g) solar energy |
| c) green pricing | h) sustainability |
| d) public utility | i) wind energy |
| e) fossil fuel | |

2) Activities

- a) Review background information with students.
- b) Divide the class into groups of three to five students and have them prepare presentations for the class.
- c) For presentations, students can be guided with numerous suggestions, such as:
 - i) each group can choose or be assigned a renewable energy resource to research, such as solar energy (passive and/or active), wind energy, biomass, geothermal energy, and hydroelectric power;
 - ii) oral presentations will be a product of student research with tables and graphs to be used during the presentation;
 - iii) each group can plan a division of labor;
 - iv) the class audience should be kept in mind, so the most important concepts are presented without lengthy details;
 - v) some generic questions might be raised, such as:
 - (1) How much energy does the assigned energy source currently produce in Texas, compared to its future potential production?
 - (2) How important is this source likely to become? Why?
 - (3) What are the assigned energy source's advantages/disadvantages?
 - (4) What position would the local electric company take regarding this source in your opinion? Why?
 - (5) Is the source constant and reliable? How?
 - (6) Will the technology be improved over the next 15 years? How?
 - (7) Is the resource affordable? *Describe associated consumer and total costs.*
 - (8) How does this energy affect the environment (greenhouse gases, air pollution, land, water)? *Groups should provide a one page handout as well as a complete source list.*
 - vi) the materials used and produced by each group for their presentation (i.e. their notes, outlines, summaries, transparencies, etc) are to be turned in after the presentation. Students could use a presentation software application, such as Microsoft Power Point, to make transparencies or to use in the presentation.
- d) Students will research from a variety of sources, including the Internet, to review the current status of electricity production in Texas. They will review the current fuels being used to generate electricity and the potential in their futures for using renewable energy sources. Texas has vast stores of potential alternative energy resources, but currently only a fraction of Texas' electricity comes from renewable sources. Students can research the forms of energy most feasible for Texas in the future. The web site addresses suggested in this lesson are just a few possibilities for students to begin their searches. There are many links from these sites and additional places to research.

- e) After all groups have completed their presentations, a discussion of what was learned could involve questions, such as what are:
 - i) the safest energy sources?
 - ii) the most efficient energy sources?
 - iii) the most environmentally benign sources?
 - iv) the most economical sources?
 - v) the most abundant sources in the surrounding geographical area?
- f) The teacher will direct you or your groups as to how the topic for research will be chosen and the work distributed among individuals and/or groups. You or your group should collect data on the current status of your renewable energy source, the benefits and disadvantages for its use, global impact and other topics of your choice.
- g) There are many printed information sources, as well as Internet sites to utilize. A list of possible sites follows:
 - i) Websites
 - (1) Alliance to Save Energy, www.ase.org
 - (2) American Council for an Energy Efficient Economy, aceee.org
 - (3) American Electric Power, www.aep.com
 - (4) American Solar Energy Society, www.ases.org
 - (5) American Wind Energy Association, www.awea.org, www.econet.org/awea
 - (6) Arizona Solar Center, www.azsolarcenter.com
 - (7) Center for Renewable Energy, www.caddet-re.org
 - (8) Center for Renewable Energy and Sustainable Technology, solstice.crest.org
 - (9) El Paso Solar Energy Association, www.epsea.org
 - (10) Florida Solar Energy Center, www.fsec.ucf.edu
 - (11) Integrated Water Services associates, www.wte.org
 - (12) Midwest Renewable Energy Association, www.the-mrea.org
 - (13) National Renewable Energy Laboratory, www.nrel.gov
 - (14) The National Hydropower Association, www.hydro.org
 - (15) North Carolina Solar Center, www.nesc.ncsu.edu
 - (16) Northeast Sustainable Energy Association, www.nesea.org
 - (17) Renewable Energy: The Infinite Power of Texas, www.infinitepower.org
 - (18) Renewable Energy Policy Project, www.repp.org
 - (19) Solar Energy Industries Association, www.seia.org
 - (20) Texas Solar Energy Society, www.txses.org

- (21) Union of Concerned Scientists, www.ucsusa.org/energy/brf.bene
- (22) US Department of Energy, www.eren.doe.gov,
www.eid.doe.gov/pub/energy.overview
- (23) U.S. Department of Energy (Bioenergy),
www.eere.energy.gov/RE/bioenergy.html
- (24) U.S. Department of Energy Efficiency and Renewables, www.eren.nrel.gov
- (25) U.S. Environmental Protection Agency, www.epa.gov
- (26) Worldwatch, www.worldwatch.org

ii) Addresses and Phone Numbers

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| <ul style="list-style-type: none"> (1) American Solar Energy Society
2400 Central Ave G-1
Boulder, Colorado 80301
(303) 443-3130 (2) American Wind Energy
122 C. Street NW
Washington, DC 20001
(202) 383-2505 (3) Austin Energy
721 Barton Springs Road
Austin, Texas 78704
(512) 322-6300 (4) City Public Service
P.O. Box 1771
San Antonio, TX 78296-1771
210) 353-2222 (5) El Paso Solar Energy Association
P.O. Box 25384 | <ul style="list-style-type: none"> El Paso, Texas 79926
(915) 772-7657 (SOLR) (6) Public Utility Commission of Texas
1701 N. Congress Ave.
Austin, Texas 78701
(512) 936-7120 (7) National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, Colorado 80401-3393
(303) 275-3000 (8) Texas Renewable Energy Industries Association
P.O. Box 16469
Austin, Texas 78761
(512) 345-5446 (9) Texas Solar Energy Society
P.O. Box 1447
Austin, Texas 78767-1447
(512) 326-3391 |
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3) Review

Students should be encouraged to take questions from classmates and teacher to foster open discussion of each energy source's benefits and drawbacks.

4) Evaluation

- a) Reports, Presentations, handouts, test on handout material
- b) Multiple Choice Questions
 - i) Consumers want their energy sources to be:
 - (1) clean

- (2) renewable
 - (3) affordable
 - (4) all of the above
- ii) The most costly source to produce electricity in Texas is:
- (1) wind
 - (2) biogas
 - (3) nuclear
 - (4) natural gas
- iii) Green pricing means:
- (1) paying extra money to use
 - (2) cost of trees
 - (3) prices in East Texas renewables
 - (4) none of the answers
- iv) Renewable energy resources include:
- (1) wind energy
 - (2) solar energy
 - (3) biomass
 - (4) all answers a, b, and c
- v) Regarding renewable energies:
- (1) you would strongly support
 - (2) they are of little importance
 - (3) they are important to the their use future
 - (4) a and c
- c) Answers to Multiple Choice Questions
- i) Question #1, 4
 - ii) Question #2, 3
 - iii) Question #3, 1
 - iv) Question #4, 4
 - v) Question #5, 4 (best answer)

5) Extension

- a) Have local utility representative present to the class on the utility's current alternative energy portfolio.
- b) Have class write letters supporting alternative energy to the utility board.
- c) Examine potential alternative energy applications for the school.