Lesson 1: Colorado Energy Source Webquest

Adopted/Revised From
NEED, Idaho National Laboratory

Grade Level
6-12

Objectives
- Recognize, appraise and debate bias in literature
- Examine the relevant literature on the internet to gather information about a specific energy source
- Construct a powerpoint (or other) presentation describing the findings from the literature search
- Discuss and debate the similarities and differences between renewable and non-renewable energy resources
- Evaluate resource development potential of renewable energy in Colorado

Overview
Students research different energy sources using the internet and prepare a powerpoint or other presentation to give to the class.

Materials
- Computers with internet access
- Powerpoint and projector optional

Estimated Cost of Materials
None

Computer Required?
Yes

Duration
1-2 full class periods for research and 1 class period for presentations

Primer References
1.2 Sources of Energy
1.4 Uses of Energy

Related Articles
- "Dark Side of Solar Cells Brightens" – Scientific American
- "Cost Works Against Alternative and Renewable Energy Sources in Time of Recession" – New York Times
- "A Plan to Power 100 Percent of the Planet with Renewables" – Scientific American
- "Colorado Boosts its RPS to 30% by 2020" – Renewable Energy World

Engagement
These questions should result in a list of energy sources named by the students, to include the ten sources of energy listed below:

Coal
Natural gas
Nuclear
Hydropower
Wind
Solar
Geothermal
Biomass
Biofuels
Oil

1. How do we use energy in our daily lives? In the classroom?
2. How do we generate the electricity used in this classroom or at home?
3. Are those renewable or non-renewable resources? Are there alternatives?
4. How do we heat this classroom or our homes?
5. Are those renewable or non-renewable resources? Are there alternatives?
6. What energy source do we use to fuel our vehicles?
7. Is this a renewable or non-renewable resource? Are there alternatives?
8. What other types of resources do we use in Colorado and throughout the world to generate energy?

Investigation
Now we're going to learn how to conduct an unbiased literature search in order to understand the advantages and disadvantages of different energy sources:

1. Divide the students into small groups of 2-3.
2. Have each group choose one of the ten listed energy sources to research via the internet and the related articles.
3. Read the students each of the following paragraphs and ask them to detect bias in each one:

    a. A new solar photovoltaic array was constructed in Colorado yesterday. The panels were an expensive local solution to global warming, which itself has not been proven. It remains to be seen how much electricity is actually generated by the panels and whether the neighbors object to the "new look" of their community.

    b. A new solar photovoltaic array was constructed in Colorado yesterday. The panels were tastefully installed to match the surrounding environment and will reduce energy costs for participating customers. "This technology benefits everyone – the customers, the environment, the economy, and the community", said Joe Schmidt, a local solar installer.

4. Explain to the students that their research should be unbiased and that they should cite a minimum of four unbiased websites in their presentations.
5. Hand out the lesson's List of Suggested Websites to all students to use in their research.
6. Each group should prepare a 5-10 minute powerpoint presentation to present to the class that includes the following (charts and graphs encouraged); citations should be placed on each slide as applicable:

    a. Energy source name.
    b. Is it renewable or non-renewable?
    c. If non-renewable, how many years of world/U.S. reserves are left?
    d. Is it used for electricity generation, heating, and/or transportation fuel?
    e. What percent of Colorado's electricity or heating does the source supply? What percent of the U.S.'s transportation fuel does the source supply?
    f. How is the source converted into usable energy?
    g. Can the energy source produce energy upon demand?
    h. Is the energy from the source commonly used where it is generated?
    i. Use resource maps or other data to comment on the abundance of the source in Colorado and in your region of Colorado.
    j. How does the cost of using the energy source compare to alternatives?
    k. What are the environmental costs and benefits of the energy source, including impacts on wildlife habitat, ecosystems, and the atmosphere?
    l. Do you believe the source is overutilized, underutilized, or utilized at the right level in Colorado? Why?

Class Review

Now we're going to compare the advantages and disadvantages of different energy sources and come up with a vision for Colorado's energy future.

1. Each group makes their presentation.

Elaboration

Students should at least read "Colorado Boosts its RPS to 30% by 2020" and as time allows the article "A Plan to Power 100 Percent of the Planet with Renewables".

1. Is a 30% Renewable Portfolio Standard too high, too low, or just right?
2. Project the "Colorado Electric Power Mix, 2009" (after this lesson plan) onto a screen or hand copies out to your students, and facilitate the class into agreeing on a vision for Colorado's energy source mix by 2020 and 2050.

Instructor Notes

- Should some of the links for the Suggested Websites become broken over time, ask students to reference the Source (i.e. U.S. Energy Information Administration) to find needed information.

Extensions and Variations

- Reports do not have to be done in Powerpoint – they can also be done as oral reports, with posters, etc.
- Debate the advantages and disadvantages of the energy sources, or selected energy sources.

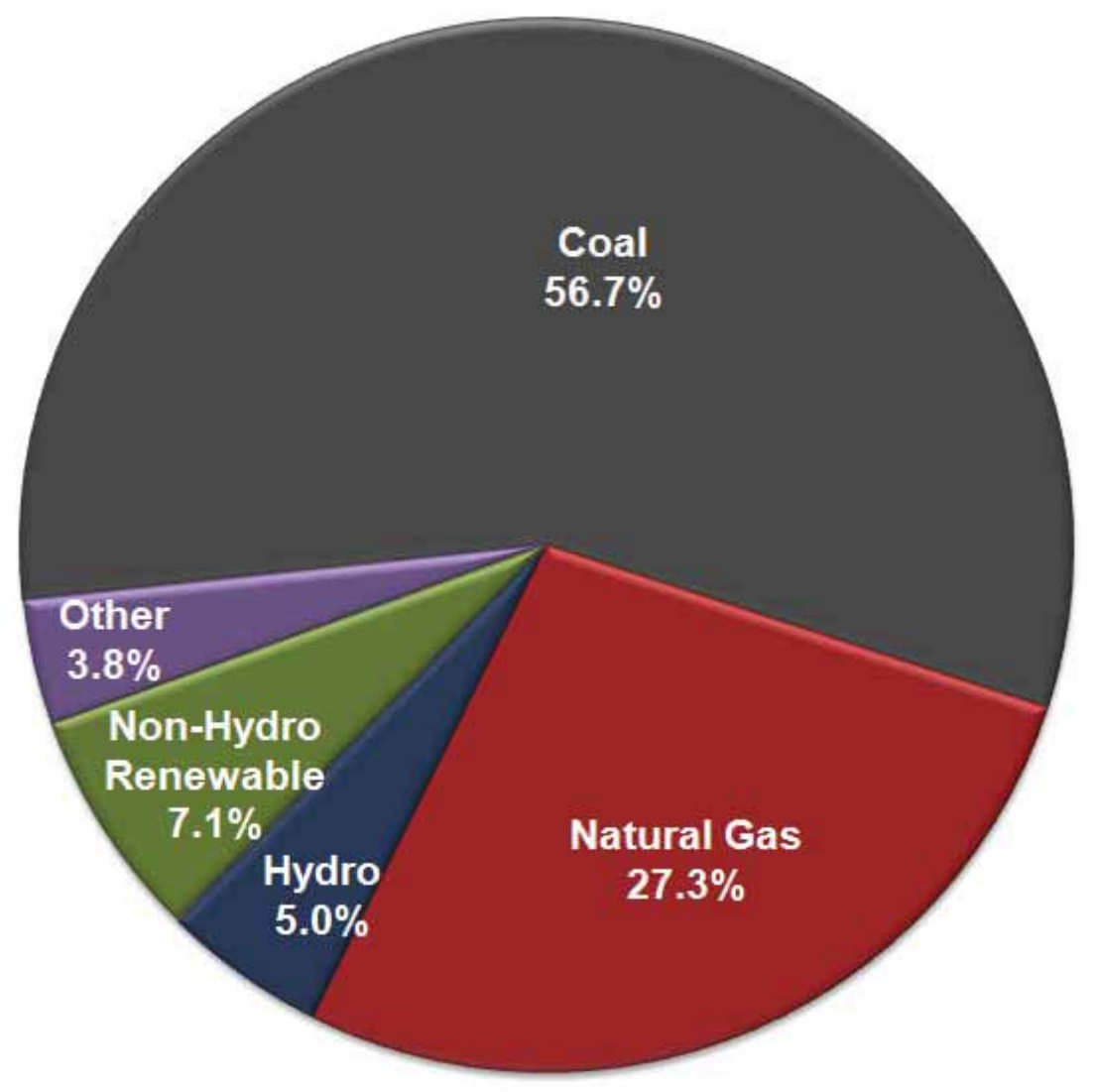
References/For More Information

2010 Colorado Utilities Report:
http://www.colorado.gov/energy under "Energy Information"

Colorado Energy Source Webquest: List of Suggested Websites

Source	Website	Topic	Description
U.S. Energy Information Administration	http://www.eia.doe.gov/kids/	All	Comprehensive overviews of each energy source
U.S. Energy Information Administration	http://www.eia.gov/cfapps/state/state_energy_profiles.cfm?sid=CO	All	Colorado energy production, consumption, cost data
U.S. Department of Energy	http://apps1.eere.energy.gov/states/state_specific_information.cfm/state=CO	All	Colorado-specific energy information under "Energy Summary" and "Energy Statistics"
Pace University	http://www.powerscorecard.org/technologies.cfm	All	Environmental analyses for different energy technologies
California Energy Commission	http://energyquest.ca.gov/story/index.html	All	Student-friendly overviews of each energy source
Electric Power Research Institute	http://mydocs.epri.com/docs/CorporateDocuments/SectorPages/GEN/ReferenceCard.pdf	Electricity generation	Comparison of financial, environmental, and practical considerations for different technologies
Colorado Governor's Energy Office	http://rechargecolorado.com/images/uploads/pdfs/2010_Colorado_Utilities_Report_7-26-10.pdf	Electricity generation and natural gas	Most recent and accurate breakdown of Colorado electricity sources and utility electricity generation and cost data
U.S. Department of Energy	http://www1.eere.energy.gov/geothermal/maps.html	Geothermal	Geothermal resource map
U.S. Energy Information Administration	http://www.eia.doe.gov/oiaf/ieo/index.html	Non-renewables	Energy reserve data for non-renewable resources
U.S. Department of Energy	http://www.energysavers.gov/renewable_energy/	Renewable energy	Overviews of renewable energy sources
National Renewable Energy Laboratory	http://www.nrel.gov/gis/	Renewable energy	Resource maps for Colorado and the U.S.
Wind Powering America	http://www.windpoweringamerica.gov/images/windmaps/co_50m_800.jpg	Wind	Wind resource map for Colorado

Colorado Electric Power Mix, 2009



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