

CURRENT ISSUE TOPIC
ALTERNATIVE/RENEWABLE ENERGY

RATIONALE

Decisions about the production and use of energy are critical issues of environmental, economic and social policies and of individual choice. Decisions about sources and uses of energy are made not only in the halls of national and local governments, and in corporate boardrooms, but in private homes and individual minds. The environmental, economic and social outcomes of these choices will shape the future of our nation and our planet.

Efficient use of energy generated from traditional sources and the development of renewable energy resources are two aspects of energy policy currently the focus of extensive research by state and federal government agencies, academic institutions and private companies. The fund of knowledge is great, continues to grow, and offers a wealth of resources for an Envirothon competition.

The present generation of high school students will be asked to make difficult decisions about energy both in matters of public environmental and economic policy and in matters of personal choices. Providing a structure and materials for intensive investigation into energy resources and alternatives would be a service to those students and their schools.

Sustainable, renewable energy is a crucial and intrinsic element of sustainable development. Until energy needs are met by affordable, environmentally sound means, sustainable development efforts will be greatly hampered.

LOCALE:

Hobart and William Smith Colleges, Geneva, New York, site of the 2007 [Canon Envirothon](#), is uniquely situated to offer access to sites demonstrating a wide variety of energy resources and uses. Within less than an hour's drive from Geneva, electrical energy generation from small-scale hydropower, nuclear, and coal-fired plants may be found. Natural gas production can be observed in the area, as can greenhouses heated by methane produced from a landfill. Trinity Hall on the HWS campus where the 2007 Steering Committee first convened is powered by a combination of solar and geothermal energy. Cornell University's unique lake-source cooling and heating installation is also within easy range and worthy of study.

Sites targeted for intensive development of wind-source generation of electricity are part of the local landscape. Two hours away from HWS are two of the largest wind farms east of the Mississippi. Proposals for off-shore wind farms in the Cape Cod area have been under study for several years. Canada is also experiencing growth of wind-energy installations.

**LEARNING OBJECTIVES:
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GOAL:

Students will comprehend long term and short term environmental, **social**, and economic considerations of energy production and usage.

ACTIVITIES:

- Students will research, compare and contrast traditional and emerging energy production resources and applications; focusing on the environmental implications of such production.
- Students will relate energy systems to corresponding natural resources in New York State.
- Students will identify the organizations (and their roles) and the processes involved in making energy decisions in New York and globally.
- Students will describe the interactions among society, technology, and use of energy sources.
- Students will identify technologies created as a result of society's concern for dwindling non-renewable energy resources (e.g., electric cars, biodiesel).

OUTCOMES:

Students will be able to evaluate appropriate energy resource choices for a specific application.

UNDERSTANDINGS AND TOPICS OF INVESTIGATION: TASKS

I Traditional energy uses and production

1. Identify and understand the traditional sources of energy generation of:
 - A. Electricity
 1. hydropower
 2. fossil fuel
 3. nuclear energy
 - B. Natural gas
 - C. Fossil fuels (vehicles)
2. Assess environmental impacts of the above
 - A. Consumption of resources
 - B. By- products (emissions/ waste)
 - C. Impacts on ecosystems
3. Assess social and economic factors and implications:
 - A. Infrastructure
 - B. Environmental justice
 - C. Conservation practices
 - D. Organizations and agencies active in energy policy decision making
 - E. Design of energy distribution systems

II Emerging energy technologies

1. Identify and understand sources and applications of renewable energy
 - A. Solar
 - B. Wind generation
 - C. Biomass
 - D. Geothermal
 - E. Hydrogen
 - F. Ocean (Tidal) generation
 - G. Ethanol/Methanol/methane
2. Assess the environmental impacts of the above.
 - A. Consumption of resources
 - B. By- products (emissions/ waste)
 - C. Impacts on surrounding ecosystems
3. Assess social and economic factors and implications of the above:
 - A. Infrastructure
 - B. Environmental justice
 - C. Conservation practices

- D. Organizations and agencies active in energy policy decision making
- E. Design of energy distribution systems

III Energy Issues Related to other Canon Envirothon Study Areas:

1. Soils:

A. Identify and understand issues of traditional and innovative energy sources related to

- 1. agricultural and forested lands
- 2. soil erosion control

2. Aquatics:

A. Identify and understand issues of traditional and innovative energy sources related to:

- 1. fish habitat and reproduction
- 2. changes in flow rates and water levels
- 3. biodiversity
- 4. groundwater/aquifer resources

3. Forestry:

A. Identify and understand issues of traditional and innovative energy sources related to:

- 1. biofuels
- 2. species diversity – plant and animal
- 3. pests and pesticides
- 4. forest management practices

4. Wildlife:

A. Identify and understand issues of traditional and innovative energy sources to:

- 1. migratory bird flyways
- 2. habitat loss/degradation

RESOURCES and CONTACTS:

General:

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy

www.eere.energy.gov

The Alternative Energy Institute

www.altenergy.org

U.S. Environmental Protection Agency, Green Communities website and links to many other websites: www.epa.gov/greenkit/q5_energ.htm

U.S. Energy Information Administration, website: www.eia.doe.gov

National Renewable Energy Laboratory

www.nrel.gov

New York state energy Research and Development Authority

www.nypa.gov/es.htm

Business Council for Sustainable Energy

www.bcse.org

Canadian Association for Sustainable Energy

www.newenergy.org

Solar Power:

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy – Solar Energy

www.eere.energy.gov/RE/solar.html

Kyocera Solar, Inc., solar systems manufacturer, www.trianglesystems.com 126 Ideaho Avenue, Plattsburge, NY 12930

International Solar Energy Society

www.ises.org

American Solar Energy Society

www.ases.org

Wind Power:

New York State Energy Research and Development Authority, Community Resources for Wind Development

www.powernaturally.com/programs/Wind/toolkit.asp

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy
Wind power

www.eere.energy.gov/RE/wind.html

Green Power Network

www.eere.energy.gov/greenpower

American Wind Energy Association

www.awea.org

Canadian Wind Energy Association

www.canwea.ca

Patel, Mukund. *Wind and Solar Power Systems*. CRC Press, 1999

Biofuels:

National Biodiesel Board

www.biodiesel.org

United States Department of Energy Biomass Program

www.eere.energy.gov/biomass

Commoner, Barry. *The Poverty of Power*. Bantam Books, July 1980.

Geothermal Energy:

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy –
Geothermal Energy

www.eere.energy.gov/RE/geothermal.html

Hydropower:

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy –
Hydropower

www.eere.energy.gov/RE/hydropower.html

Hydrogen power, Fuel Cells:

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy – Hydrogen power

www.eere.energy.gov/RE/hydrogen.html

Oceans:

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy – ocean energy

www.eere.energy.gov/RE/ocean.html

Biomass Energy:

U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy- BioPower Program

www.eere.energy.gov/RE/biomass.html

Alternative Fuel Vehicles:

Advanced Transportation Technology Institute

www.etvi.org

Alternative Fuels Data Center

www.afdc.doe.gov

Electric Auto Association

www.eaaev.org

Natural Gas Vehicle Association

www.ngvc.org

Society of Automotive Engineers. *Alternative Fuels: Technology & Developments*. 1997

