



# ENERGY TRANSFORMATION



## OUR SUPPORTERS



Progress Energy



E-Conservation  
power to control what you spend

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# Exploring the Table of Contents through the Science Essential Standards

## Energy Conservation and Transfer

### Essential Standard

Common Core Math 6.RP

**6.P.3** Understand characteristics of energy transfer and interactions of matter and energy.

“Energy Makes the World Go Round” is a support module is included in Energy Transformation that allows teacher (volunteer) and student to explore energy sources and heat transfer, historical aspects of energy sources and its implications to the future both economically and globally.

### Clarifying Objectives

**6.P.3.1** Understand ratio concepts and use ratio reasoning to solve problems.

Illustrate the transfer of heat energy from warmer objects to cooler ones using examples of conduction, radiation and convection and the effects that may result.

#### **It Just Makes Cents The Heat is On**

**6.P.3.2** Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.

**6.P.3.3** Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).

#### **Powering Up Powering Down Don't Lose Your Cool Don't Blow Your Stack It's a Wrap**

# Introduction

Energy Transformation is an engaging, hands-on science curriculum that demonstrates the effects of energy use in our world. Whether comparing the amount of energy radiating from different types of light bulbs or watching air escape a structure that appears sealed, youth will use scientific inquiry to make abstract concepts concrete for themselves. Youth will learn about the sources and history of the energy we use and observe how their energy consumption will affect the future. Connecting this understanding to their own lives, youth will see that they have the power not only to reduce their parents' electric bill but also to improve the health of their planet.

Through the lessons, youth will construct a model home that will help them develop a vivid understanding of air flow, heat transfer, and energy efficiency as the curriculum progresses. Building on the fourth-grade Essential Standards Energy Conservation and Transfer, youth will furnish the home with working lights and a ceiling fan, allowing them to analyze the outcome of the energy their circuit employs. Through a series of experiments using a wizard stick, youth will follow the air that enters and exits the model home, demonstrating for themselves the results air pressure and stack effect. Adding and removing weather-stripping to their homes further illustrates the impact of decisions made by families or businesses about the buildings they inhabit.

Based on the 4-H Experiential Learning Model, Energy Transformation allows youth to gain insight through observation, critical thinking, and discussions with their peers and facilitator. These exchanges challenge youth to expand their understanding of concepts, reflect on what they have learned, and find ways to apply their new knowledge in their home and school environments. Design of the projects fosters development of important life skills such as problem solving, communication, and collaboration.

Written for 6th- to 8th-graders, each grade-level appropriate lesson adheres to National Science Standards, which include the Order of Scientific Inquiry, Physical Science (motion and forces), Science and Technology (abilities of technological design), and Science in Personal and Social Perspectives. The curriculum is also aligned to the NC Essential Standards for Science: Energy Conservation and Transfer.

Facilitators, whether career educators or volunteers, will find exciting ideas for youth to expand and apply the lessons beyond the curriculum itself. Each lesson includes suggestions for home enrichment, field trips, guest speakers, and Internet resources. For classroom teachers, the lessons offer opportunities to pair with math or language arts instructors. Further, youth are encouraged to continue practicing scientific inquiry methods through the 4-H Engineering Design component, then blog about their Engineering Design process to incorporate technology into their learning. For more information about applying Engineering Design to this curriculum, go to the North Carolina 4-H website, <http://www.nc4h.org/>, click on Publications, then go to Resources for Educators. At the end of each lesson, facilitators will find facilitator's notes, suggestions, and resources to better prepare each lesson.

Energy Transformation would not have been possible without the generous support of Progress Energy and Duke Energy. Curriculum developers would also like to thank the Energy Conservation Program for its contribution to the content and activities to this program.

Curriculum modules have gone through pilot testing to determine the functionality and relevance to standards. Developers would also like to thank those Local Education Agencies and Cooperative Extension Offices who pilot tested the activities in the following counties: Avery, Buncombe, Cleveland, Lincoln, Madison, and Rutherford.



## ENERGY TRANSFORMATION: MODULE 1

# Energy Makes the World Go Round



**Skill Level:** Beginner

**Education Standard(s):**

NC Essential Standards Science 6th-grade  
Energy Conservation and Transfer  
National Science Standards

**Time Needed:**

2-45 minute classes, 1-90 minute bloc

**Tags:**

Renewable resources, nonrenewable resources,  
energy use, coal, nuclear, solar, wind, power

**Learner Outcomes**

Energy conservation and transfer

- Understand the historical significance of energy resources in the United States.
- Recognize types of nonrenewable energy sources that are commonly used to produce energy.
- Recognize types of renewable energy sources.

**Success Indicator**

- Understand how energy is used in everyday life.
- Describe the types (renewable and non-renewable) energy that can be produced.

**Life Skill(s)**

- Learning to Learn
- Critical Thinking

**Materials List**

- LCD projector and laptop computer or overhead projector
- PowerPoint/Talking Points (Appendices 1B)
- Guidelines for group paper (Appendix 1C)
- Guidelines for the house project (Appendices 1D, 1E)

*“Energy Makes the World Go Round” is a support module included in Energy Transformation. This module allows the facilitator and youth to explore energy sources, historical aspects of energy sources and their implications to the future both economically and globally.*

## Hook Activity

What have you done since waking up this morning that involved an energy source? Give youth 10 minutes to write down energy related activities.

Facilitator can have an example on the board of what he or she has done today since waking up.

**Example:** Took a bath, started the coffee pot, ate breakfast, brushed teeth, got dressed, drove to school, turned computer on in classroom

Energy is used to operate our computer, turn on our lights, keep our refrigerators operating, keep us warm in the winter and cool in the summer. Without energy our homes, businesses, schools, and factories would be hard to operate. We are dependent on the availability of energy.



## Learn More

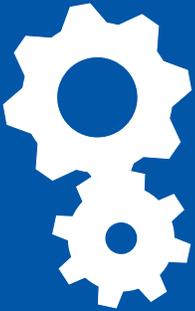
**Energy Literacy: Essential Principles & Fundamental Concepts for Energy Education:**  
<http://library.globalchange.gov/products/other/energy-literacy-essential-principles-fundamental-concepts-for-energy-education-high-resolution-booklet>

## Virtual Fun

**Energy Hog:** <http://energyhog.org/>  
**Energy Kids Games and Activities:**  
<http://www.eia.gov/kids/energy.cfm?page=5>



## Energy Makes the World Go Round



### Experience

Give students 10 minutes to write down all they have done since waking up in the morning. Facilitator can have an example on the board of what he or she has done today since waking up.

**Example:** Took a bath, started the coffee pot, ate breakfast, brushed teeth, got dressed, drove to school, turned computer on in classroom. “Looking back at your list, what have you done today that required you to use energy (or electricity, gas, solar)?”

### Additional Activity (Find it Out)

Graph the type of energy source that provided power to complete the youths' morning activities. This allows youth to question and think about what type of energy source they may be using (example: solar, gas, coal, nuclear, etc.). The facilitator should allow youth to research their local utilities to determine if the energy use graphed came from coal, nuclear, gas, hydro or some other form of renewable or non renewable source.

Utilities have a portfolio of the types of energy sources they generate to provide energy to their customers. Have your youth research their utility company to determine the type and percentage of energy sources that are being used to provide them with the energy they need to perform their daily activities.



*Make technology work for you.*

***This is a great time to begin to blog the classroom results or to use software such as Microsoft Excel to map out classroom findings.***

### Related Activities. . . .

To supplement the content of this lesson, see Energy Kids:

<http://www.eia.gov/kids/>

### Applies to 6th and 7th grade. . . .

Activities for learning:  
[http://www.eia.gov/kids/energy.cfm?page=activities\\_elementary](http://www.eia.gov/kids/energy.cfm?page=activities_elementary)

**The Environmental Protection Agency Energy Star Program estimates that the nation's schools spend on average 7.5 billion dollars on energy cost per year.**





## Energy Makes the World Go Round

### Apply. . .

- Now, knowing about different types of energy sources, how much nonrenewable energy do you think you use compared to renewable energy in a day?
- Thinking about your behaviors, where might you begin to reduce some of your energy use?
- How would you teach a family member about being a good energy steward?

### Facilitators' Notes. . .

- Facilitators will introduce the group paper and house activities. Both activities will be conducted in groups throughout this curriculum. Facilitators should determine group size for project activities and schedule time for youth to collaborate on the group paper and house project. This timing should be worked within the curriculum and is determined by the facilitator's best judgment.
- Collaborate with your Language Arts colleagues to reinforce Common Core standards within the group paper.



### Resources

- N.C. State Energy Office – <http://www.energync.net>
- N.C. Solar Center – <http://www.ncsc.ncsu.edu/>
- Database of State Incentives for Renewables & Efficiency – <http://www.dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=NC&RE=1&EE=1>
- N.C. Green Power's What's a Watt? The Basics of Electricity – [http://www.ncgreenpower.org/media/newsletters/2006/newsletter\\_summer2006\\_page6.html](http://www.ncgreenpower.org/media/newsletters/2006/newsletter_summer2006_page6.html)
- National Energy Technology Laboratory – <http://www.netl.doe.gov/about/history.html>
- U.S. Department of Energy's "A Brief History of Coal Use" (additional lesson plans included) – [http://www.fossil.energy.gov/education/energylessons/coal/coal\\_history.html](http://www.fossil.energy.gov/education/energylessons/coal/coal_history.html)
- U.S. Department of Energy's "The History of Nuclear Energy" – <http://www.ne.doe.gov/pdfFiles/History.pdf>
- [http://www.eere.energy.gov/buildings/energysmartschools/howto\\_planning.html](http://www.eere.energy.gov/buildings/energysmartschools/howto_planning.html)
- [http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess\\_financeguide\\_0708.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_financeguide_0708.pdf)
- <http://www.fypower.org/inst/>
- [http://www.ase.org/section/\\_audience/educators/](http://www.ase.org/section/_audience/educators/)
- US Environmental Protection Agency Energy Star Program [http://www.energystar.gov/index.cfm?c=business.EPA\\_BUM\\_CH10\\_Schools](http://www.energystar.gov/index.cfm?c=business.EPA_BUM_CH10_Schools)

## References

- Insulation and the Building System, Southeast Building Science, University of Florida, May 2009.
- N. C. State Energy Office [www.energync.net](http://www.energync.net)
- E-Conservation Program [www.e-conservation.net](http://www.e-conservation.net)
- <http://www.ces.ncsu.edu/depts/fcs/housing/pubs/index.php#energy>
- U.S. Department of Energy's Insulation Fact Sheet
- [http://www.ornl.gov/sci/roofs+walls/insulation/ins\\_01.html](http://www.ornl.gov/sci/roofs+walls/insulation/ins_01.html)
- Common Types of Weather-stripping [http://www.energysavers.gov/your\\_home/insulation\\_airsealing/index.cfm/mytopic=11280](http://www.energysavers.gov/your_home/insulation_airsealing/index.cfm/mytopic=11280)
- Caulking Selection and Types [http://www.energysavers.gov/your\\_home/insulation\\_airsealing/index.cfm/mytopic=11270](http://www.energysavers.gov/your_home/insulation_airsealing/index.cfm/mytopic=11270)
- Sealing Air Leaks [http://www.energysavers.gov/tips/air\\_leaks.cfm](http://www.energysavers.gov/tips/air_leaks.cfm)
- Alliance to Save Energy <http://ase.org/>