

Acting Out Energy Forms

A pantomime activity for teaching about different forms of energy



by Arianna Alexandra Grindrod

LIGHTING HOMES, heating water, warming spaces, running machines, driving cars and flying planes — everything we do requires energy. In a most basic sense, energy is a force capable of performing work or of organizing or changing matter. But how do we teach about it this invisible force? “Acting Out Energy Forms” is an engaging pantomime activity that helps provide a context for teaching scientific principles related to energy transformations, chemical transformations, electricity and light, which are central to many clean energy technologies. Using pantomime is a fun and effective way to teach if you are comfortable having your students out of their chairs and getting a bit riled up. Active learning helps students comprehend complex ideas. They may not remember the term “kinetic energy,” but once they have acted it out, they will remember that energy can be in motion.

For younger students you may decide to introduce energy as a basic concept and pick only a few energy forms to pantomime. For older students you may decide to use this activity as a template to teach the concepts and then have your students create or construct representations of various energy forms as artistic expression pieces or physical science displays.

In addition to introducing students to energy forms, this activity can be used as a stepping stone to larger, interdis-

ciplinary topics such as human impacts on energy supply and demand, climate change, current and future lifestyles, sustainability practices, distributed power generation and innovative energy technologies.

Background: Energy forms and sources

Energy occurs in many forms and is classified as either kinetic energy (in motion) or potential energy (stored) and can be converted from one form to another.

Kinetic energy

Electrical energy is the movement of electric charges.

Electricity, which is the movement of electrons through a wire or other conductor, is an example of electrical energy. Lightning is another example.

Mechanical energy is the movement of objects or matter.

Throwing a ball, lifting a weight, pulling a wagon and pedaling a bike are all examples of mechanical energy. Wind and moving water are also examples of mechanical energy. Sound, which is the movement of molecules in a wave, is another example of mechanical energy.

Radiant or light energy travels in electromagnetic waves.

It includes visible light, which our eyes can see, and also gamma rays, x-rays, ultraviolet radiation, infrared (heat)



radiation, microwaves and radio waves. Sunlight is an example of radiant energy.

Thermal (heat) energy is the vibration and movement of atoms and molecules within a substance. The hotter a material is, the faster the atoms and molecules that make up that material are moving.

Potential energy

Chemical energy is energy stored in the bonds that hold molecules together. Food, batteries, fossil fuels and biomass (plants) are examples of items that have stored chemical energy.

Stored mechanical energy or elastic energy is energy stored in objects that are either compressed or stretched. Stretched rubber bands or compressed springs are examples of stored mechanical energy.

Magnetic energy is energy produced by the magnetic field that causes magnets to attract or repel.

Nuclear energy is the energy that holds the nucleus of an atom together. This energy is released when nuclei are split apart (called fission) or combined (called fusion). Nuclear power plants split atoms to release energy. The sun releases energy when it combines hydrogen atoms to form a helium atom.

Potential energy or gravitational energy is the energy of position. An object has potential energy when it is in a position to be acted upon by gravity. Water stored behind a dam is an example of potential energy. A book teetering on a bookshelf is another example.

Energy resources

Energy resources are natural resources that can be extracted or captured for the energy they contain. Crude oil, coal, sunlight and wind are all examples of energy sources. Renewable energy sources, such as wind, sunlight, plants and moving water, are those that are naturally and continually replenished. Compared to non-renewable energy sources, such as fossil fuels, renewable energy sources are more sustainable and less damaging to the health of organisms and to the environment on which life depends. "Green energy" is energy obtained from renewable resources that produce little or no pollution and that replenish themselves faster than humans consume them.

Acting out Energy Forms

Objectives:

- Students learn that there are several forms of energy.
- Students are introduced to scientific principles related to energy transformations, electricity and light.

Grade level: K–8

Procedure:

1. Discuss the topic of energy with your students, referring to the background information provided above.
2. Choose an open area large enough to facilitate moving about. Introduce the activity by telling students, "In order to learn a little bit about how energy works in our lives, we are going to act out the various forms of energy." Explain that they will need to listen and watch, because this is a repeat-after-me, do-as-I-do game.
3. Using the "Acting Out Energy Forms" activity reference sheet (see page 40), have students mimic you as you act out energy forms. After many chuckles, inquire what knowledge your students retained. Challenge them to state or act out each energy form's definition.
4. For classes that keep science journals, have students write the definition, as they remember it, of each energy form and draw a representational image the definition.

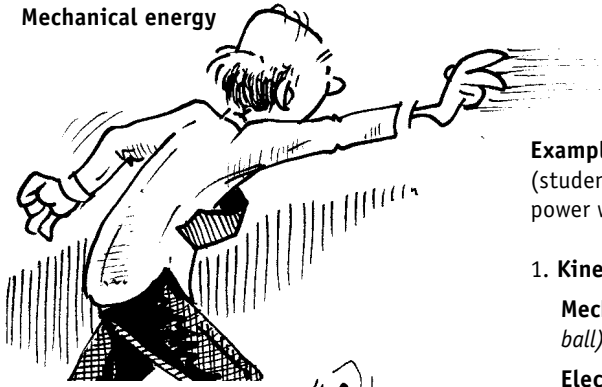
Arianna Alexandra Grindrod is the Education Director at the Northeast Sustainable Energy Association in Greenfield, Massachusetts. She created the "Acting Out Energy Forms" activity for the Northeast Sustainable Energy Association's teacher-training series Energy Thinking.

The **Northeast Sustainable Energy Association (NESEA)** focuses on promoting the understanding, development and adoption of energy conservation and non-polluting, renewable energy technologies. The NESEA K-12 Education Department offers professional development opportunities and resources for teachers, non-formal educators, and community mentors, and curriculum and programs on energy efficiency and energy conservation, and on forms and applications of renewable energy. Visit www.nesea.org or call (413) 774-6051.

Acting Out Energy Forms

Leader's Reference Sheet

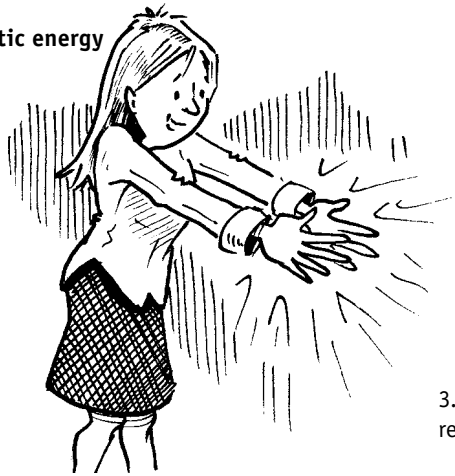
Mechanical energy



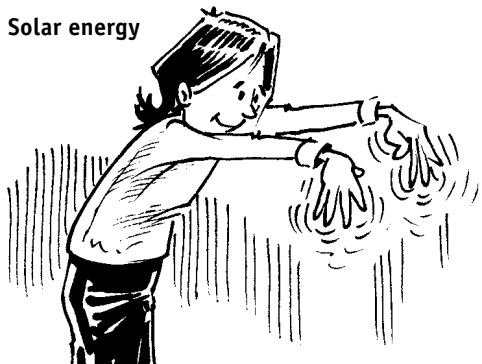
Electrical energy



Magnetic energy



Solar energy



Example: The leader says, "Kinetic energy" (students repeat) "is energy" (students repeat) "in motion" (students repeat). The leader pretends to power walk, and the students mimic the action.

1. **Kinetic energy** is energy in motion (*pretend to power walk*).

Mechanical energy is energy that is a moving object (*pretend to throw a ball*).

Electrical energy is energy that is electrons moving through wires (*put hands at sides and shuffle fast a few paces, turn and continue to shuffle, as if you are moving inside a wire*). Electrical energy is also lightning! (*Pose with your hand raised at a diagonal, finger pointed up to the sky and then point down across your body to the ground. Repeat a few times. Think disco dancing.*)

Radiant energy is the energy of electromagnetic waves, or light, traveling from the sun (*splay fingers, pointing slightly down and move your arms in a downward wave motion, mimicking sunrays traveling to Earth*).

Thermal energy is energy that is vibrating due to heat (*jiggle up and down slightly*). The hotter the matter gets, the faster it moves (*jiggle body up and down faster*).

2. **Potential energy** is energy that is waiting (*tap your foot and look at your wrist*).

Chemical energy is energy stored in food (*pretend to pick up a treat and smack your lips*), in batteries (*pretend to hold a battery up examining it*), in fossil fuels (*squat into a ball like a lump of coal*), and in plants (*feet and legs together, arms out like leaves, head arced to sunlight*).

Elastic energy is energy stored in an object that is either compressed (*tighten up your body*) or stretched (*stretch your body out like a rubber band*).

Magnetic energy is energy created by a magnetic field (*pretend your hands are magnets attracting and repelling*).

Nuclear energy is energy that holds the nucleus of an atom together (*pretend to hold something small in your hands*). Energy is released when nuclei are split apart (*pretend to pull something apart between your hands*) or forced together (*clap your hands once*).

Gravitational energy is energy in a position to be acted upon by gravity (*look down and teeter on your feet, as if you are about to fall — be dramatic with hands waving, body bobbing*).

3. **Renewable Energy** is energy from sources that are naturally and continually replenished.

Solar energy is energy that comes from the sun (*splay fingers, pointing slightly down and move your arms in a downward wave motion, mimicking sunrays traveling to Earth*). The sun's rays touch the solar panel and the energy inside gets excited (*dance in place*) and makes electricity (*diagonally hand dance up and down*).

Wind energy is energy that comes from wind turning big metal turbine blades in the sky (*wave your arms in big slow circles and make a low and constant "whoosh" sound*).

Water power is energy that comes from moving water (*move hands in wave-like motion*) falling down on turbine blades and turning them (*bend over sideways as if falling and spinning your arms*).

RESOURCES

Resource reviewers:
Debra Bridgeman, Alan Crook,
Tim Grant, Jon Hayes,
Phyllis McKenzie, Nate Meyer,
Tracy Norris, Nancy Sklavos

Architecture and Education

What happens when architects and



educators intersect? School buildings, from kindergartens to community colleges, are designed as inspired spaces for experiential learning.

Anne Taylor's groundbreaking book *Linking Architecture and Education: Sustainable Design for Learning Environments* bridges the realms of architecture and education to show stunning examples of holistic school designs from around the world. Each chapter features case studies of green buildings and an analysis of their impact on the environment. For Taylor, a successful design must respond to the needs of its users, and thus she encourages the involvement of students and the community in shaping a plan. With contributions from many architects, educators, designers and school planners, this hefty book is idealistic in its vision, but includes practical design considerations for green classrooms, composting facilities, trails, school gardens and outdoor classrooms. In its hundreds of inspiring examples, architects, administrators, school boards and teachers will find much worth exploring in this beautiful, wide-ranging book. — (JH)

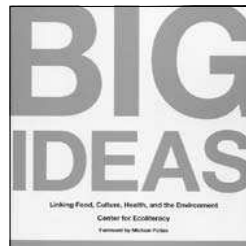
University of New Mexico Press, 2009, ISBN 978-0-8263-3407-7, 471 pp., \$100 from UNM Press, (800) 249-7737, <www.unmpress.com>.

EcoTipping Points

The EcoTipping Points website features over 100 environmental success stories collected from around the world by a team of scientists and journalists. The stories address diverse topics, but what they have in common

is a “lever,” referred to as an “EcoTipping Point” — a community process that reverses environmental decline and establishes a course towards restoration and sustainability. Building upon insights from the science of human ecology, the website offers lessons based on the stories, while explaining how EcoTipping Points work and what it takes to create them. — (TG)

<www.ecotippingpoints.org>

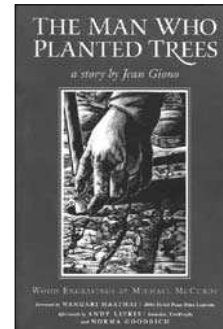


Big Ideas

The Center for Ecoliteracy's aptly named book *Big Ideas* focuses on “the enjoyment of food

as a starting point for understanding the web of ecological relationships.” The book is divided into chapters for Grades K-2, 3-5, 6-8 and 9-12, each of which is further divided into four interconnected thematic areas — Food, Culture, Health and the Environment. In each section, the authors introduce a big idea and then provide essential questions, key concepts and sample activities to guide the exploration of that idea. Students will be captivated by the questions, which help to uncover the ways in which culture influences our beliefs about food: for example, “What do farm animals need to survive and thrive? (Grades K-2); “What food traditions do different cultures have? (Grades 3-5); “In what ways do decisions about agriculture influence people's health? (Grades 6-8); and “What are examples of ways in which our society favors individual rights over the collective good as it relates to food?” (Grades 9-12). Most of the activities engage students in experiential learning, such as through creating a food garden or visiting a local food bank. This resource is an especially useful tool for anyone interested in environmental curriculum at all grade levels. — (TN)

The Center for Ecoliteracy, 2008, ISBN 978-0-9818409-0-1, 120 pp., US\$16.95 from Acorn Naturalists, (800) 422-8886, <www.acornnaturalists.com>.

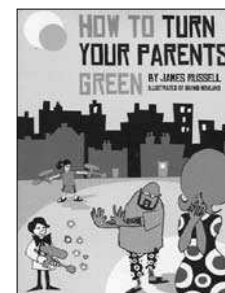


The Man Who Planted Trees

Jean Giono's famous story *The Man Who Planted Trees* is an inspiring tale of a shepherd who spends his

life planting hundreds of thousands of trees throughout his mountainous community in the foothills of the Alps. His tireless efforts repair a damaged environment and restore its life-giving systems. This story of how a barren landscape is transformed into a thriving ecosystem through the devoted efforts of a single man is beautifully illustrated by Michael McCurdy's wood engravings. In the back of the book, a brief biography of Jean Giono precedes a report by Andy Lipkis about how the tree-planting efforts of TreePeople had a positive impact on communities and individuals in the Los Angeles area. Suitable for 10- to 18-year-old readers, *The Man Who Planted Trees* is a highly motivational tale that reminds readers of the positive impact one person can have on the world. — (NS)

Chelsea Green Publishing Company, 2005, ISBN 978-1-933392-81-3, 61 pp., US\$10 from Chelsea Green, (800) 639-4099, <www.chelseagreen.com>.



How to Turn Your Parents Green

James Russell's humorous *How to Turn Your Parents Green* is a pocket-sized, non-fiction book

designed to empower 9- to 15-year-olds (the Greens) to challenge their parents (the Groans) to join them in becoming eco-warriors. The Groans grumble and gripe and are responsible for global warming, but will leave the Greens with the mess. The book provides a charter for the Groans to sign, and suggests fines to impose on