4th Grade Energy Resources

Next Generation Science Standards:

PS3.A: Definitions of Energy

The faster a given object is moving, the more energy it possesses. (4- PS3-1)

Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3)

PS3.B: Conservation of Energy and Energy Transfer

Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2),(4-PS3-3)

Light also transfers energy from place to place. (4-PS3-2)

Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2),(4- PS3-4)

PS3.C: Relationship Between Energy and Forces

When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3)

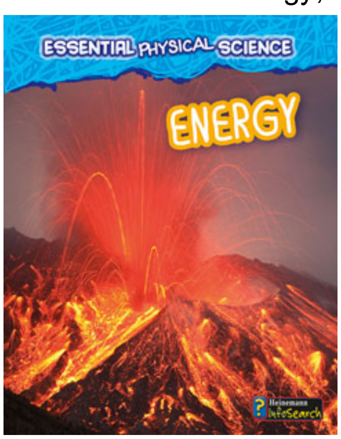
PS3.D: Energy in Chemical Processes and Everyday Life

The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)

Energy

Essential Physical Science: Energy by Louise Spillsbury (2014)

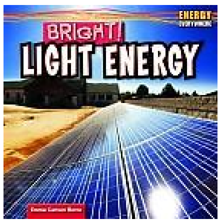
Energy comes in many forms, and we depend on it in many ways. This book explores the different forms of energy, looking at how it can be transferred and used.



Guided Reading: S

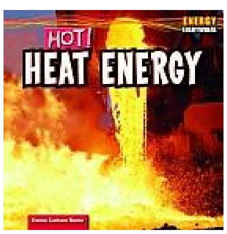
48 Pages

Bright! Light Energy by Emma Carlson Berne (2013)
The light energy we perceive is only a small portion of light and radiant energy that exists. Readers discover how light travels in waves and how different frequencies of light waves comprise the different forms of light energy that form the electromagnetic spectrum. Photographs help illustrate the measures of light energy, and how the eyes work, and sidebars highlight important technology associated with light energy.



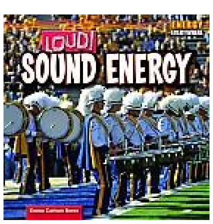
Guided Reading: Q
24 Pages

Hot! Heat Energy by Emma Carlson Berne (2013)
Heat energy is found everywhere, including the Sun's rays and the Earth's heat under the ground. This volume defines heat and thermal energy, explains the states of matter, explores measuring heat, and outlines other basic concepts of heat energy. Sidebars profile ways that heat is measured and explain concepts of thermal energy. Photographs illustrate common sources of heat energy that can be identified in everyday life.



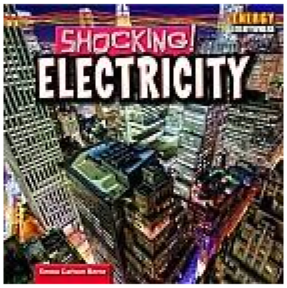
Guided Reading: R
24 Pages

Loud! Sound Energy by Emma Carlson Berne (2013)
The rumble of thunder is a sign of a storm, and by listening we can estimate how far away that storm is. Readers explore the principles of sound energy—including qualities of sound, sound waves, and the speed of sound. Readers will also learn how our ears hear sounds, and why some sounds are out of the range of human hearing. Sidebars explain sonic booms and measures of sound, while photographs depict sources of sound energy in our world.



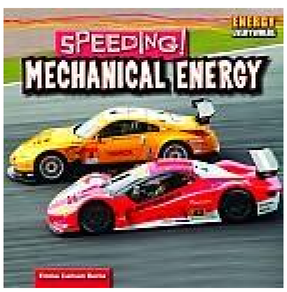
Guided Reading: Q
24 Pages

Shocking! Electricity by Emma Carlson Berne (2013)
The complex concepts of electrical energy are explained to readers, who will learn about basic science concepts such as static electricity, magnets, currents, circuits, and conductivity. Readers will learn about how electrical energy is measured and what fuels the electricity that flows into their home. Photographs show students electrical energy in action.



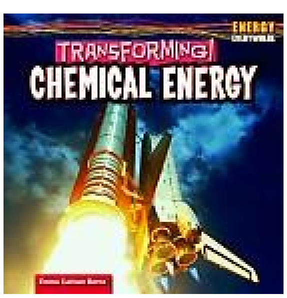
Guided Reading: Q
24 Pages

Speeding! Mechanical Energy by Emma Carlson Berne (2013)
Whether kinetic or potential, mechanical energy exists almost everywhere we look. Mechanical energy is defined through accessible text, explaining the basic concepts of matter, mass, motion, and forces such as gravity. Students will also read about the different ways that speed can be measured and learn how simple machines work. Sidebars profile scientists who formed our understanding of energy and photographs help clearly demonstrate principles of mechanical energy.



Guided Reading: Q
24 Pages

Transforming! Chemical Energy by Emma Carlson Berne (2013)
Energy can neither be created nor destroyed, but it is always in the process of transforming from one form to another. Readers will explore the concepts behind chemical energy and the transformation of energy into different forms. They will learn how batteries work, why fossil fuels are a source of stored energy, and how the forming and breaking of bonds relates to the release of energy. Sidebars profile scientists who have made important discoveries about energy and photographs illustrate chemical energy in the world around us.

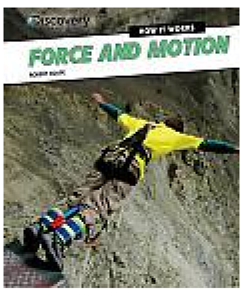


Guided Reading: Q
24 Pages

Energy by Kay Manolis (2011)
Includes bibliographical references (p. 23) and index. Explains introductory physical science concepts about energy through real-world observation and simple scientific diagrams.

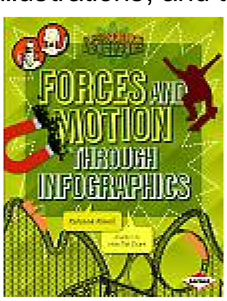
Guided Reading: M
24 Pages

Force and Motion by Robert Coupe (2014)
Includes index. What are forces? -- Simple machines -- Complex machines -- Forces and energy -- Machines at work -- Gravity -- Defying gravity -- Friction -- Magnetism and static electricity -- Structures -- Why ships do not sink -- Discovering forces. Provides an overview of force and motion, covering simple and complex machines, gravity, friction, and more.



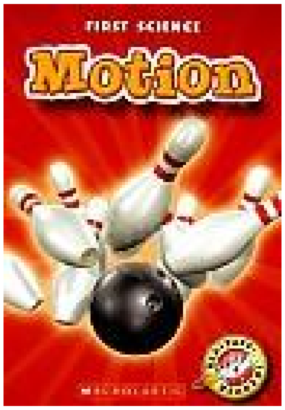
Guided Reading: S
32 Pages

Forces and Motion through Infographics by Rebecca Rowell (2014)
Includes bibliographical references (page 31) and index. Displays the facts about force and motion, discussing gravity, magnets, simple machines, and more. Includes charts, maps, illustrations, and timelines.



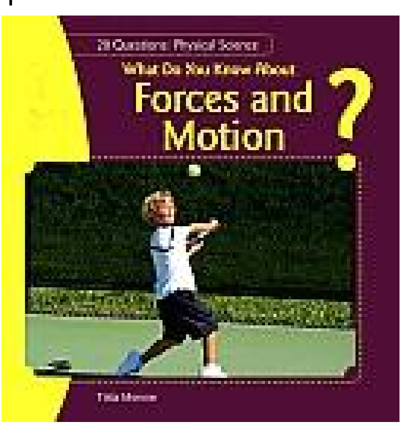
Guided Reading: R
32 Pages

Motion by Kay Manolis (2011)
Includes bibliographical references (p. 23) and index.;What is motion? -- Speed -- Laws of motion -- Friction -- Action and reaction. Simple text and full color photographs introduce beginning readers in kindergarten through third grade to the concept of motion, explaining what it is and how it impacts the world around them.



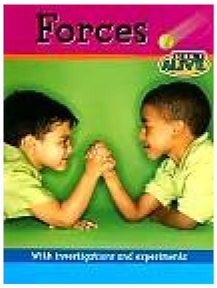
Guided Reading: P
24 Pages

What Do You Know About Forces and Motion by Tilda Monroe (2011)
Includes index. What is force? -- Can we see force? -- Does every object take the same amount of force to move? -- Can several forces act on an object at the same time? -- Does force always cause movement? -- When I push something, does it always push me back? -- Is that what happens when I let go of a balloon full of air? -- What happens if I use force on a moving object? -- Will an object move if no force acts on it? -- Does this mean that a ball will keep rolling forever? -- What kind of forces stop motion? -- Why does a ball continue moving longer than a block? -- What force makes two magnets move toward each other? -- Why do magnets sometimes push away from each other? -- Can you see magnetism in nature? -- What force causes an apple to fall to the ground? -- Why can't I kick a ball into outer space? -- How does gravity work? Provides an introduction to forces and motion and includes answers to twenty questions about them.



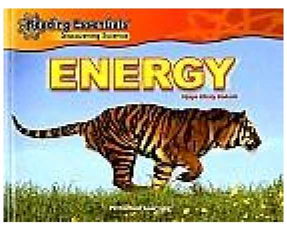
Guided Reading: Q
24 Pages

Forces by Terry Jennings (2009)
Includes bibliographical references (p. 32) and index. What are forces? -- Pushes and pulls -- Gravity -- Try this ... moon cycle -- Friction -- Types of friction -- Try this ... air resistance -- Movement -- Try this ... moving objects -- Pressure -- Floating -- Simple machines -- Try this ... pulley wheel. Introduces the science behind forces and machines, with examples such as the use of gravity, friction, levers, and pulleys to make machines work. Includes simple experiments.



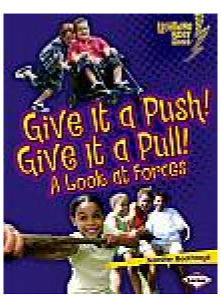
Guided Reading: R
32 Pages

Energy by Vijaya Bodach (2006)
Explains what energy is, where it comes from, how it is stored, and how it changes form, and looks at different types of energy.



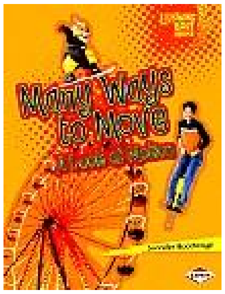
Guided Reading: J
16 Pages

Give it a Push, Give it a Pull: Look at Forces by Jennifer Boothroyd (2011)
Includes bibliographical references (p. 31) and index. An introduction to forces that discusses pushes, pulls, motion, direction, speed, and friction, and provides everyday examples and instructions for an activity.



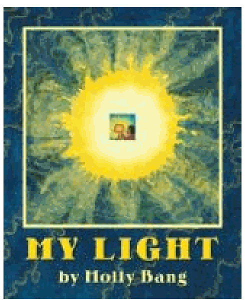
Guided Reading: J
32 Pages

Many Ways to Move: A Look at Motion by Jennifer Boothroyd (2011)
Includes bibliographical references (p. 31) and index. An introduction to motion that discusses force, gravity, speed, direction, and other related topics, and provides everyday examples and instructions for an activity.



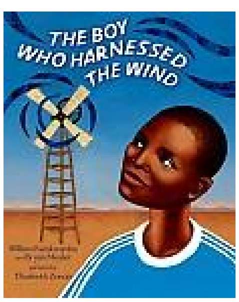
Guided Reading: I
32 Pages

My Light by Molly Bang (2004)
The sun narrates an explanation of light and energy in which the generation of electricity can be traced back to it. Tiny yellow dots represent the sun's power as it streams from light, water, wind, and electricity. Endnotes are used to illuminate everything from dark matter to atoms to pollution.



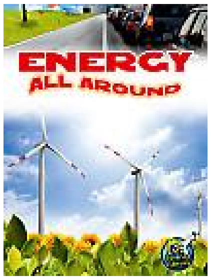
Guided Reading: N
33 Pages

The Boy Who Harnessed the Wind by William Kamkwamba (2012)
The author details how he ignored naysayers and was able to bring electricity and running water to his Malawian village when he built a makeshift windmill out of scrap metal and spare parts.



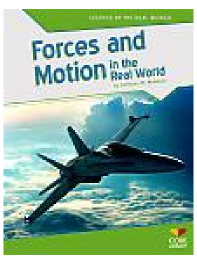
Guided Reading: S
32 Pages

Energy All Around by Buffy Silverman (2012)
Includes bibliographical references (p. 24) and index. Introduces the concept of energy from heat, motion, and fuels. This title explains how all forms of energy belong to one of two groups; potential or kinetic. It addresses how energy can be used in the form of water to create electricity, in the form of solar to heat our homes, and in the form of wind to turn the blades on a wind turbine.



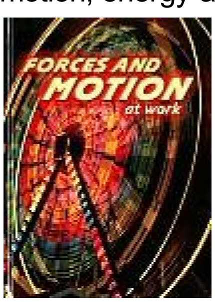
Guided Reading: Q
24 Pages

Forces and Motion in the Real World by Kathleen Muldoon (2013)
Includes bibliographical references (p. 47) and index. Explores the science of forces and motion, covering pushing and pulling, the laws of motion, kinetic and potential energy, and important dates in the history of physics.



Guided Reading: S
48 Pages

Forces and Motion at Work by Shirley Smith Duke (2012)
Includes bibliographical references (p. 48) and index. Describes the science of forces and motion, discussing unseen forces, laws of motion, energy and motion, changes in force and motion, energy at work, and using forces and motion.

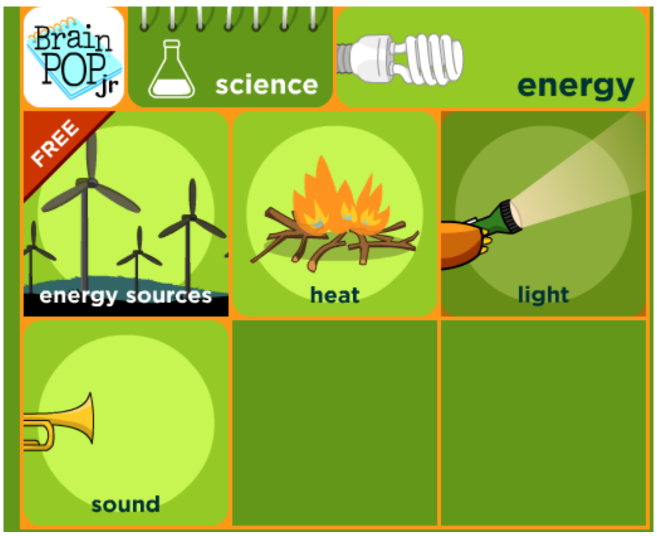


Guided Reading: Q
48 Pages

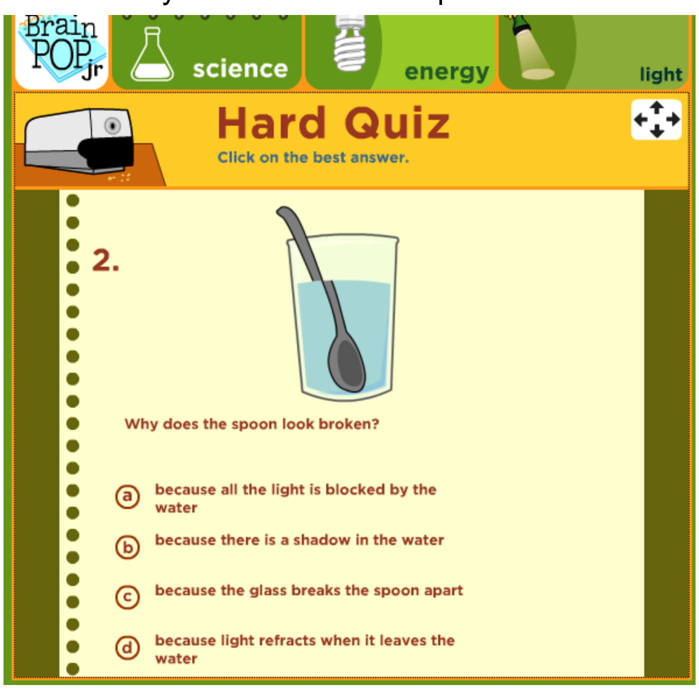
Digital Resources

Databases: (To access these databases remotely, ask your librarian for your school's username and password.)

Brainpop Jr.: *Brainpop, Jr. is a database that provides a 3-6 minute video on informational topics followed by a comprehension quiz. The database includes activities and lesson plans as well. It is geared towards grades K-3.*
These are the videos offered by Brainpop Jr. that support Next Generation Science Standards on Energy for 4th Grade.



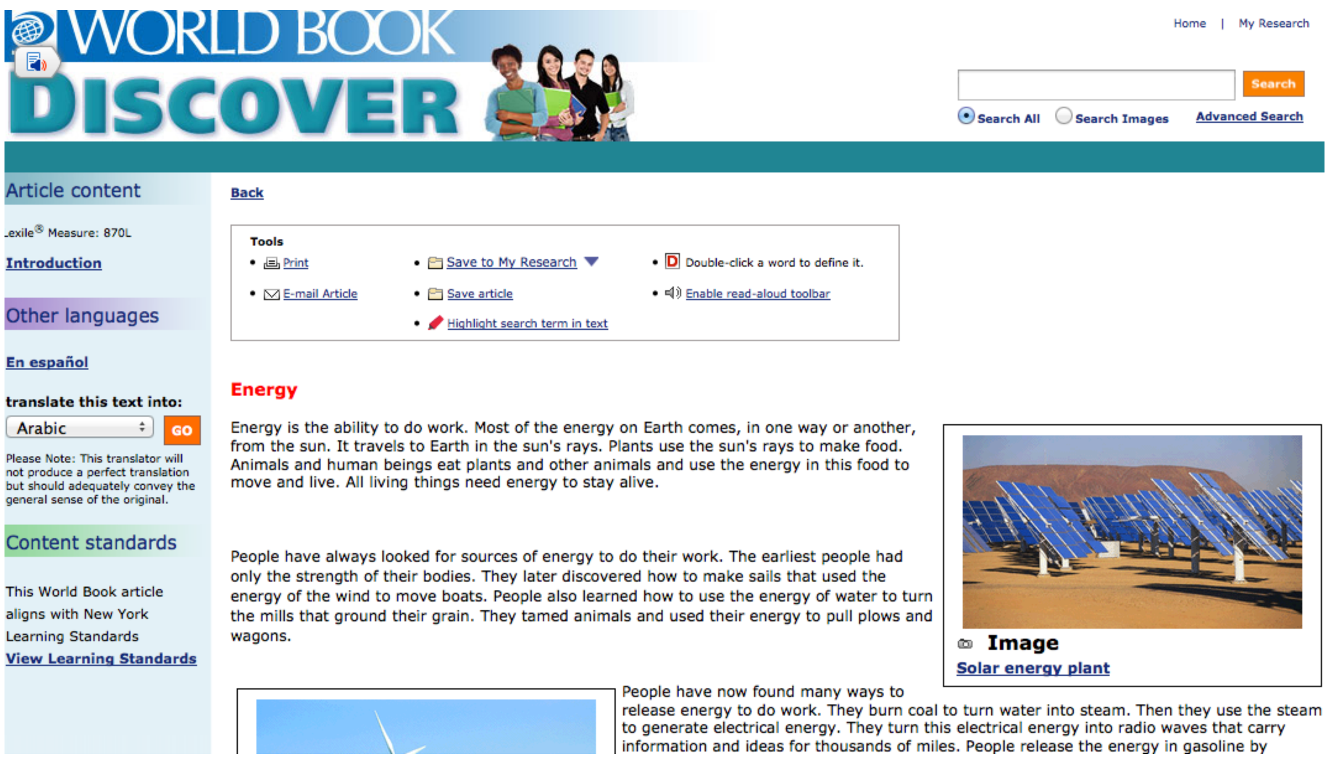
Two different online quizzes are offered after each video to check for understanding. They are entitled "Easy" and "Hard" with 5 questions each.



World Book Web:

The World Book Web is a suite of online research tools that includes encyclopedia articles, primary source collections, educator tools, student activities, pictures, audio, and video, complemented by current periodicals and related Web sites. Most all of these World Book Web research tools include options where text can be read aloud to the user. All Ithaca elementary school libraries currently subscribe to ***World Book Kids****,* ***World Book Student****,* ***World Book Discover****,* ***World Book Timelines*** *and* ***World Book Classroom: Early World of Learning****. For specific training in how to use these amazing tools consult Worldbook's training website or ask your school's librarian.* *http://www.worldbookonline.com/training/*

World Book Discover has an article called "energy" which aligns with Next Generation Science Standards for 4th Grade. You can use this link to access the article on day and night: http://www.worldbookonline.com/wbdiscover/article?id=ar830696&st=energy OR you can simply type "energy" in World Book Discover and choose the first article.



For more information, see these other articles in World Book Discover by typing in the keyword in the search bar at the top:

For more information, see these articles:

Electric generator
Electricity
Heat
Light
Nuclear energy
Solar energy

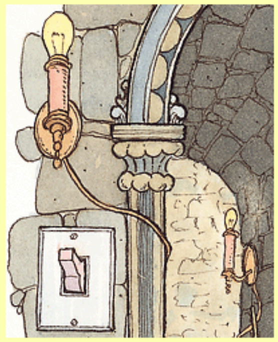
World Book Kids includes a “Think-It!” exercise on energy called “What Kind of Energy Does it Take?” http://www.worldbookonline.com/kids/activities?id=TH000008&type=thinkit

Think It!

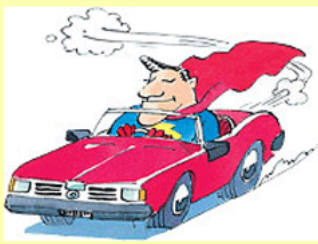
What Kind of Energy Does It Take?

Find the kind of energy that makes each thing work.

1. A light bulb gets its energy from
   a. burning wood
   b. electricity
   c. sunlight



2. An automobile is powered by
   a. burning fuel
   b. wind
   c. wheel



3. When you eat, your body gets energy

World Book Kids also includes this lesson plan that explores heat energy called “Make a Snake Dancer.” http://www.worldbookonline.com/kids/activities?id=TI000030&type=tcit

1+2=3

Teach It!

Make a Snake Dancer

Be a scientist!

INTRODUCTION

Students create a coiled snake that turns when placed over a heat source, demonstrating that heat rises.

NATIONAL CONTENT STANDARD: NS.K-4.2 PHYSICAL SCIENCE––Position and motion of objects; light, heat, electricity, and magnetism.

OBJECTIVE:

- To understand that heat energy rises and can thereby cause objects to move.

MATERIALS:

- pencils
- tracing paper
- tape
- construction paper
- scissors
- thimbles
- unsharpened pencils with eraser
- spools
- needles
- pattern provided (see below)

PROCEDURES:

Websites:

All About Energy
http://www.eschooltoday.com/energy/kinds-of-energy/all-about-energy.html
This website includes sections on kinetic, mechanical, sound, thermal, chemical, electrical, gravitational, and radiant energies. There are animated illustrations of the forms of energy in action, lesson plans and quizzes.

Energy and the Environment: Children's University of Manchester
http://www.childrensuniversity.manchester.ac.uk/interactives/science/energy/what-is-energy/
Learn what energy is, how it is stored, transferred and used. Includes activities, interactive animation, and videos.

Circuit Builder: Explore Learning lesson plan and activity
http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=638
Create circuits using batteries, light bulbs, switches, fuses, and a variety of materials. Examine series and parallel circuits, conductors and insulators, and the effects of battery voltage.

Conduction and Convection: Explore Learning lesson plan and activity
http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=658
Two flasks hold colored water, one yellow and the other blue. Set the starting temperature of each flask, choose a type of material to connect the flasks, and see how quickly the flasks heat up or cool down. The flasks can be connected with a hollow pipe, allowing the water in the flasks to mix, or a solid chunk that transfers heat but prevents mixing.

Energy Conversions: Explore Learning lesson plan and activity
http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=651
Find out how electrical current is generated and how living things get energy to move and grow. Trace the path of energy and see how energy is converted from one form to another.

Heat Absorption: Explore Learning lesson plan and activity
http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=655
Shine a powerful flashlight on a variety of materials, and measure how quickly each material heats up. See how the light angle, light color, type of material, and material color affect heating. A glass cover can be added to simulate a greenhouse.

Radiation: Explore Learning lesson plan and activity
http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=665
Use a powerful flashlight to pop a kernel of popcorn. A lens focuses light on the kernel. The temperature of the filament and the distance between the flashlight and lens can be changed. Several obstacles can be placed between the flashlight and the popcorn.

iPad apps:

Energy - by Kids Discover
cost: $3.99
Includes chapters: what is energy, water wind and other sources of energy, nuclear solar and geothermal energy, light and heat energy, energy from plants to people, machines: simple and complex, and ways to conserve energy.

Forms of Energy HD - by Sprout Labs, LLC
Cost: $1.99
Learn about potential and kinetic energy and energy transformation. The options are read, touch, see, watch, and take a quiz.

Magic Energy - by Classic Games
Cost: Free
Practice physics by harness the energy source of a windmill, use the transmitter to transfer the energy. There are 60 levels to complete in this energy game.

TeslaTown - by University of Illinois
Cost: Free
Enter Tesla Town and explore electricity generation and delivery. Go into a hydroelectric power plant and see the turbine. Visit a solar powered house or wind farm.