

# Grade 4 - Unit 2 - Energy

## Unit Focus

This unit will help students formulate answers to questions such as "What is energy?". Students will gain an understanding that energy is present whenever there are moving objects, sound, light or heat.

Students will investigate how:

- Energy can be transferred from one object to another and the faster an object is moving, the more energy it possesses.
- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways.
- The expression "produce energy" refers to the conversion of stored energy into a desired form for practical use.
- Some resources are renewable over time, and some are not.

As a culminating experience, students will use their knowledge of energy, energy transfer and renewable resources to design a windmill using the Engineering Design Process.

## Stage 1: Desired Results - Key Understandings

Established Goals	Transfer	
<p><b>Next Generation Science</b> <i>Elementary Standards: 4</i></p> <ul style="list-style-type: none"> <li>• Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. <i>4-PS3-4</i></li> <li>• Ask questions and predict outcomes about the changes in energy that occur when objects collide. <i>4-PS3-3</i></li> <li>• Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. <i>3-5-ETS1-3</i></li> <li>• Use evidence to construct an explanation relating the speed of an object to the energy of that object. <i>4-PS3-1</i></li> </ul> <p><b>Next Generation Science Standards (DCI)</b> <i>Science: 4</i></p> <ul style="list-style-type: none"> <li>• 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</li> </ul>	<p><b>T1</b> Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign. <b>T2</b> Use the scientific process to generate evidence that addresses the original questions.</p>	
	Meaning	
	Understandings	Essential Questions
<p><b>U1</b> Energy can be transferred from place to place by sound waves, light waves, heat, and electric current or from object to object through collision. <b>U2</b> Energy, in everyday life, typically refers to the conversion of stored energy into a desired form for practical use. <b>U3</b> Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. <b>U4</b> Energy can be transferred from one object to another and the faster the object is moving, the more energy it</p>	<p><b>Q1</b> How do our actions and choices impact the world around us?" <b>Q2</b> What is energy? <b>Q3</b> How can we use the energy all around us to power our lives? <b>Q4</b> How does the Engineering Design Process improve existing technologies or develop new ones?</p>	

## Stage 1: Desired Results - Key Understandings

<p>have been produced to begin with by transforming the energy of motion into electrical energy. PS3.4.B3</p> <ul style="list-style-type: none"> <li>• Energy can be moved from place to place by moving objects or through sound, light, or electric currents. PS3.4.A2</li> <li>• 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. PS3.4.B1</li> <li>• The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. PS3.4.D1</li> <li>• When objects collide, the contact forces transfer energy so as to change the objects' motions. PS3.4.C1</li> </ul> <p><b>Student Growth and Development 21st Century Capacities Matrix</b></p> <p><i>Creative Thinking</i></p> <ul style="list-style-type: none"> <li>• Design: Students will be able to engage in an appropriate process to refine their product. MM.2.3</li> </ul> <p><i>Self-Direction</i></p> <ul style="list-style-type: none"> <li>• Perseverance: Students will be able to identify problem(s) and use appropriate strategies to continue toward a desired goal. MM.4.2</li> </ul>	<p>possesses.</p> <p><b>U5</b> People work to find ways to convert energy to a usable form to make our lives better.</p> <p><b>U6</b> People try to harness clean and renewable sources of energy to protect our environment.</p>	
	Acquisition of Knowledge and Skill	
	Knowledge	Skills
<p><b>K1</b> Energy is present whenever there are moving objects, sound, light or heat.</p> <p><b>K2</b> Some resources are renewable over time, and some are not.</p> <p><b>K3</b> Engineers work to find new ways to harness energy from the energy all around us to power our lives.</p> <p><b>K4</b> Wind energy is a renewable resources that can be used to do work.</p> <p><b>K5</b> Vocabulary: Energy, work, potential energy, kinetic energy, turbine, solar, renewable, non-renewable, variable, mechanical energy, electrical energy</p>	<p><b>S1</b> Apply scientific ideas to design, test and refine a device that converts energy from one form to another.</p> <p><b>S2</b> Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution.</p> <p><b>S3</b> Apply scientific ideas to construct an explanation to solve a design problem.</p>	