Instructional Unit Title: Forms and Transformations of Energy

The teacher may provide concrete interactive examples of different forms of energy so that students can explore, observe and generate their own thoughts and definitions of energy (e.g., slinky or rope for waves, weight and pulley, generation of heat, chemical reaction).

The teacher may provide interactive examples of different forms of energy (kinetic, potential, mechanical, nuclear, electrical, chemical, thermal, radiant) so that students can identify variables that affect the amount of energy within a system (e.g., dropping objects of different masses from the same height, dropping objects of the same mass from different heights, moving an object through the use of waves).

The teacher may provide opportunities to measure potential, kinetic, and mechanical energy so that students can understand the steps to quantify an amount of energy in a system.

The teacher may provide tangible demonstrations of energy transformations so that students can comprehend that energy is conserved in all interactions. (e.g., measure potential energy before and kinetic after a free-fall interaction, pendulum, Newton's cradle).

The teacher may provide opportunities to observe and measure transformations that involve heat "loss" so that students can begin to understand that some energy is "lost" to heat in all interactions (e.g., feeling heat created by friction, calorimetry experiments, observing thermal loss in an incandescent light bulb versus fluorescent).

The teacher may provide opportunities to observe and measure energy transformations so that students can explain that total energy remains constant even as energy changes forms. (e.g., pendulum, roller coaster, emergency light bulbs, emergency radios, fires, engines).

The teacher may provide opportunities to observe and measure mechanical energy transformations so that students can calculate values for mechanical, kinetic, and potential energy in order to understand their mathematical factors during a transformation (e.g., students can find the velocity of a pendulum at its lowest point given its original potential energy and its mass).

The teacher may provide concrete interactive examples of biological processes so that students can identify the forms of energy involved in transformations in living systems (e.g., calorimetry, measuring heat from human respiration).

The teacher may provide concrete examples of processes on earth so that students can identify the forms of energy involved in transformations in earth systems. (e.g., plate tectonics, seismic activity, geothermal energy, weather systems).

The teacher may provide a concrete system of energy transfer as an interactive experience so that students can observe and collect data on input and output energies to calculate the efficiency of the system.

The teacher may provide information about the efficiency and cost of various energy sources (e.g., solar, wind, natural gas) so that students can begin drawing conclusions about the costs/benefits of the use of renewable vs. nonrenewable resources as a major energy source.

PERFORMANCE ASSESSMENT: You have been asked by your local school board to investigate four scenarios around decreasing energy consumption across the district in order to conserve energy and to create a report recommending two of the four for consideration. In your investigation you must calculate efficiency and total energy used, compare current energy usage to the proposed options, explain why there is not 100% efficiency for any option, and what happens to the unusable energy. In your report you must recommend two options that lead to decreased energy consumption, provide written rationale based on data collected, and support recommendations using graphical representation of data.