

**BY THE NUMBERS may advance the following**  
**ENERGY LITERACY PRINCIPLES AND CONCEPTS**

**1 Energy is a physical quantity that follows precise natural laws.**

**1.1** Energy is a quantity that is transferred from system to system.

**1.4** Energy available to do useful work decreases as it is transferred from system to system.

**1.5** Energy comes in different forms and can be divided into categories.

**1.6** Chemical and nuclear reactions involve transfer and transformation of energy.

**1.7** Many different units are used to quantify energy.

**1.8** Power is a measure of energy transfer rate.

**2 Physical processes on Earth are the result of energy flow through the Earth system.**

**2.2** Sunlight, gravitational potential, decay of radioactive isotopes, and rotation of the Earth are the major sources of energy driving physical processes on Earth.

**2.3** Earth's weather and climate are mostly driven by energy from the Sun.

**2.6** Greenhouse gases affect energy flow through the Earth system.

**2.7** The effects of changes in Earth's energy system are often not immediately apparent.

**3 Biological processes depend on energy flow through the Earth system.**

**3.1** The Sun is the major source of energy for organisms and the ecosystems of which they are a part.

**3.6** Humans are part of Earth's ecosystems and influence energy flow through these systems.

**4 Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination.**

**4.1 Humans transfer and transform energy from the environment into forms useful for human endeavors.**

**4.2 Human use of energy is subject to limits and constraints.**

**4.3 Fossil and biofuels are organic matter that contain energy captured from sunlight.**

**4.4 Humans transport energy from place to place.**

**4.5 Humans generate electricity in multiple ways.**

**4.6 Humans intentionally store energy for later use in a number of different ways.**

**4.7 Different sources of energy and the different ways energy can be transformed, transported, and stored each have different benefits and drawbacks.**

**5 Energy decisions are influenced by economic, political, environmental, and social factors.**

**5.3 Energy decisions can be made using a systems-based approach.**

**5.4 Energy decisions are influenced by economic factors.**

**5.5 Energy decisions are influenced by political factors.**

**5.6 Energy decisions are influenced by environmental factors.**

**5.7 Energy decisions are influenced by social factors.**

**6 The amount of energy used by human society depends on many factors.**

**6.2 One way to manage energy resources is through conservation.**

**6.3 Human demand for energy is increasing.**

**6.4 Earth has limited energy resources.**

**6.5 Social and technological innovation affects the amount of energy used by human society.**

**6.6 Behavior and design affect the amount of energy used by human society.**

**6.8** Amount of energy used can be calculated and monitored.

**7** The quality of life of individuals and societies is affected by energy choices.

**7.1** Economic security is impacted by energy choices.

**7.2** National security is impacted by energy choices.

**7.3** Environmental quality is impacted by energy choices.

**7.4** Increasing demand for and limited supplies of fossil fuels affects quality of life.

**7.5** Access to energy resources affects quality of life.