

SOLAR SITE ANALYSIS: THE SOLAR PATHFINDER

MAY ADVANCE THESE NATIONAL ENERGY LITERACY STANDARDS:

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

1.1 Energy is a quantity that is transferred from system to system. Energy is the ability of a system to do work. A system has done work if it has exerted a force on another system over some distance. When this happens, energy is transferred from one system to another. At least some of the energy is also transformed from one type into another during this process. One can keep track of how much energy transfers into or out of a system.

1.5 Energy comes in different forms and can be divided into categories. Forms of energy include light energy, elastic energy, chemical energy, and more. There are two categories that all energy falls into: kinetic and potential. Kinetic describes types of energy associated with motion. Potential describes energy possessed by an object or system due to its position relative to another object or system and forces between the two. Some forms of energy are part kinetic and part potential energy.

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. Sunlight is a source external to Earth, while radioactive isotopes and gravitational potential, with the exception of tidal energy, are internal. Radioactive isotopes and gravity work together to produce geothermal energy beneath Earth's surface. Earth's rotation influences global flow of air and water.

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. The primary sources of energy in the environment include fuels like coal, oil, natural gas, uranium, and biomass. All primary source fuels except biomass are non-renewable. Primary sources also include renewable sources such as sunlight, wind, moving water, and geothermal energy.

4.2 Human use of energy is subject to limits and constraints. Industry, transportation, urban development, agriculture, and most other human activities are closely tied to the amount and kind of energy available. The availability of energy resources is constrained by the distribution of natural resources, availability of affordable technologies, socioeconomic policies, and socioeconomic status.

4.5 Humans generate electricity in multiple ways. When a magnet moves or magnetic field changes relative to a coil of wire, electrons are induced to flow in the wire. Most human generation of electricity happens in this way. Electrons can also be induced to flow through direct interaction with light particles; this is the basis upon which a solar cell operates. Other means of generating electricity include electrochemical, piezoelectric, and thermoelectric.

4.7 Different sources of energy and the different ways energy can be transformed, transported, and stored each have different benefits and drawbacks. A given energy system, from source to sink, will have an inherent level of energy efficiency, monetary cost, and environmental risk. Each system will also have national security, access, and equity implications.

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

5.1 Decisions concerning the use of energy resources are made at many levels. Humans make individual, community, national, and international energy decisions. Each of these levels of decision making has some common and some unique aspects. Decisions made beyond the individual level often involve a formally established process of decision-making.

5.2 Energy infrastructure has inertia. The decisions that governments, corporations, and individuals made in the past have created today's energy infrastructure. The large amount of money, time, and technology invested in these systems makes changing the infrastructure difficult, but not impossible. The decisions of one generation both provide and limit the range of possibilities open to the future generations.

5.4 Energy decisions are influenced by economic factors. Monetary costs of energy affect energy decision making at all levels. Energy exhibits characteristics of both a commodity and a differentiable product. Energy costs are often subject to market fluctuations, and energy choices made by individuals and societies affect these fluctuations. Cost differences also arise as a result of differences between energy sources and as a result of tax-based incentives and rebates.

5.6 Energy decisions are influenced by environmental factors. Environmental costs of energy decisions affect energy decision making at all levels. All energy decisions have environmental consequences. These consequences can be positive or negative.