Energy Literacy

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

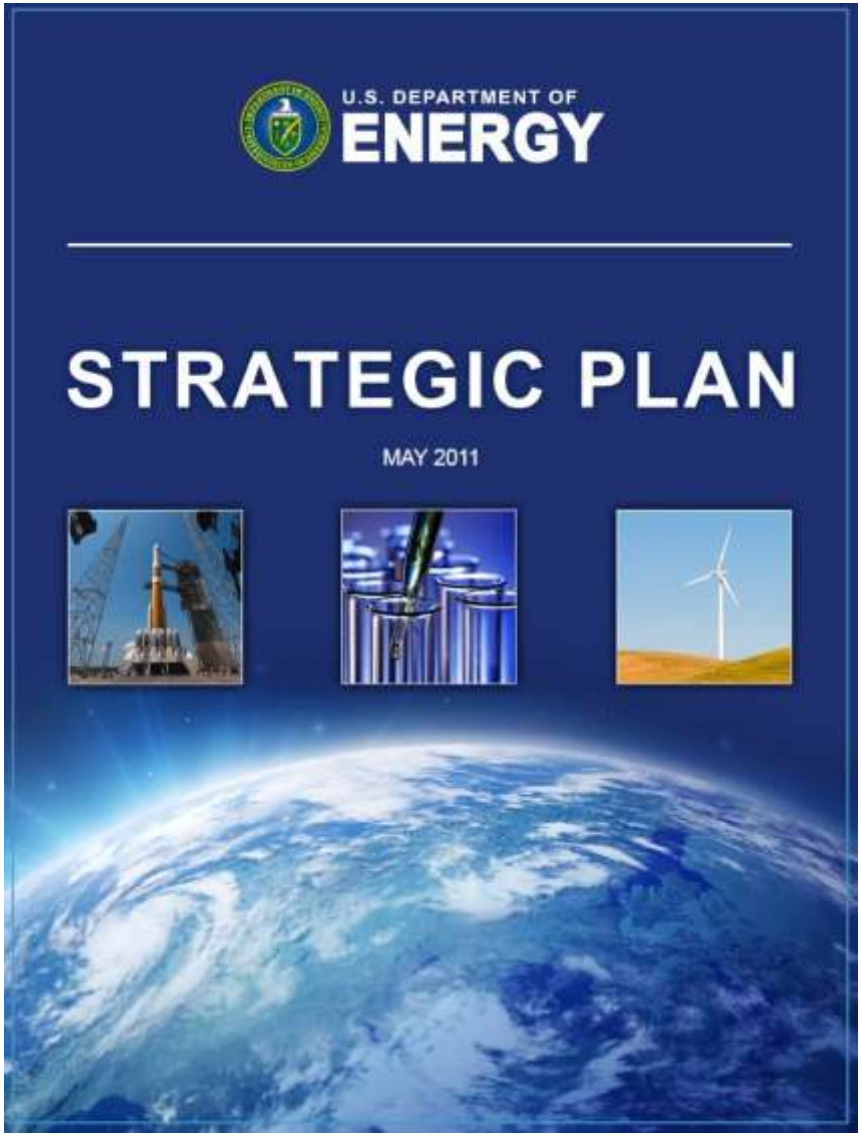
I want to talk about building a sustainable energy future…. The United States is committed to taking action to meet the energy and climate challenge.

Secretary Chu, December 6, 2010

Presenter: Matthew Inman

Albert Einstein Distinguished Educator Fellow
US Department of Energy, EERE-EEWD
matthew.inman@ee.doe.gov

Energy Literacy



Energy Literacy

Promote Energy Literacy

The Department will actively participate in the **development and implementation of a coordinated national energy education or "energy literacy" effort**. **A modest understanding of energy sources, generation, use and conservation strategies will enable informed decisions on topics from home energy use to international energy policy**. The Department will leverage relationships with academic institutions, other federal agencies, industry, organizations, and other stakeholders to improve awareness and understanding of energy issues.

[DOE, May 2011 Strategic Plan, page 21]

]

Energy Literacy

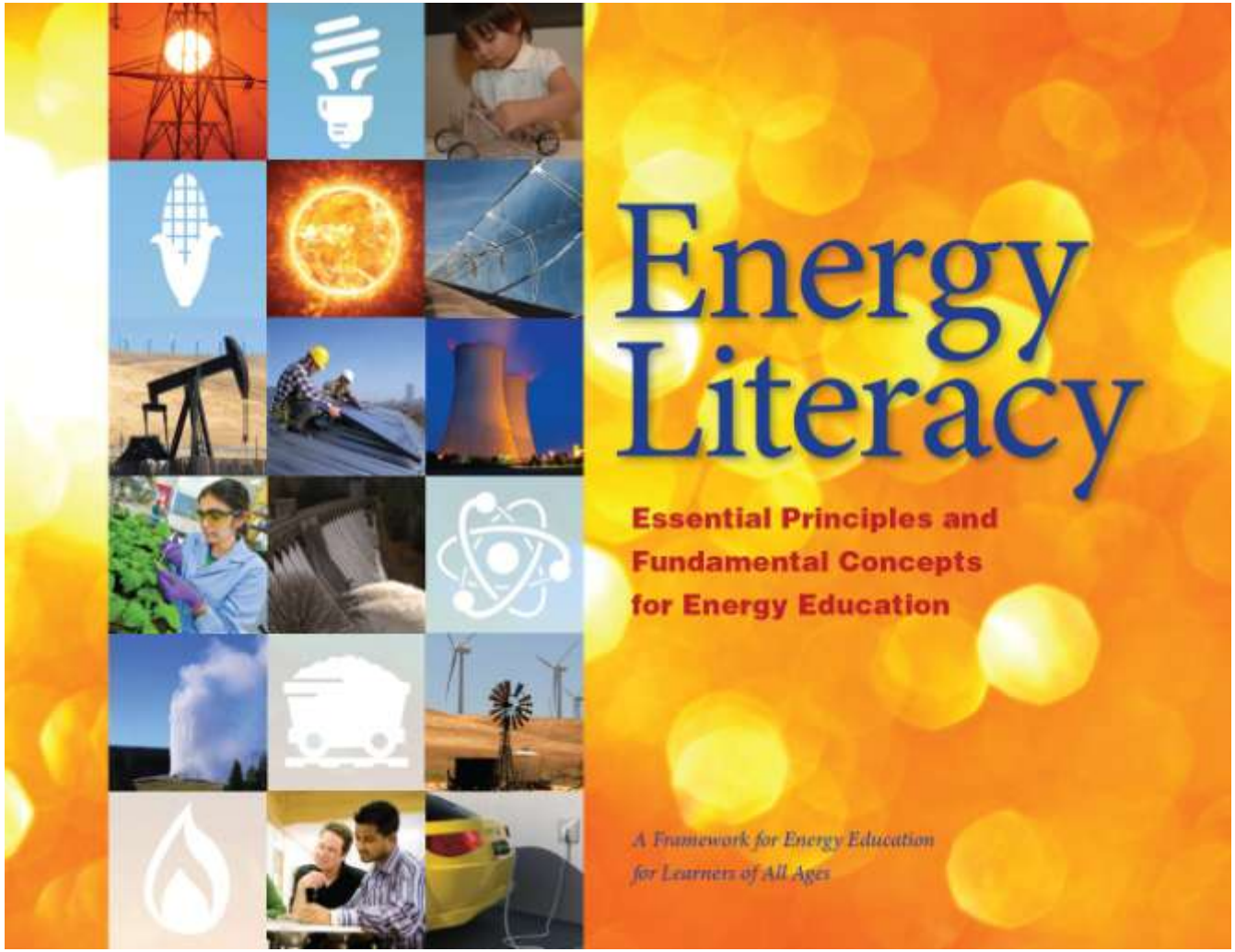
A survey of more than 1500 adult Americans from around the country, conducted by the National Environmental Education and Training Foundation in 2002, "Energy Literacy in America," yielded the following results:

- 3 of 4 Americans think they have "a lot" or "a fair amount" of knowledge about energy, but only about 1 in 10 passed a basic quiz on energy topics.
- 36% of Americans think that hydropower provides most U.S. electricity.
- More than 50% think that the U.S. generates its electricity from pollution free energy sources.
- 90% of Americans think that schools should teach energy conservation.
- 88% of Americans think that federal agencies should place more emphasis on educating adults to solve energy problems.

Energy Literacy
Essential Principles and Fundamental Concepts for Energy Education

An effort to define what it means to be energy literate and to identify the essential understandings that underlie this literacy.

Centerpiece (at right) – A guiding document that provides context, background and definitions, along with identifying the Essential Principles and Fundamental Concepts that underlie Energy Literacy.



Previous Literacy Work

- Atmospheric Science Literacy Framework
- Climate Literacy Framework
- Earth Science Literacy Framework
- Ocean Literacy Framework

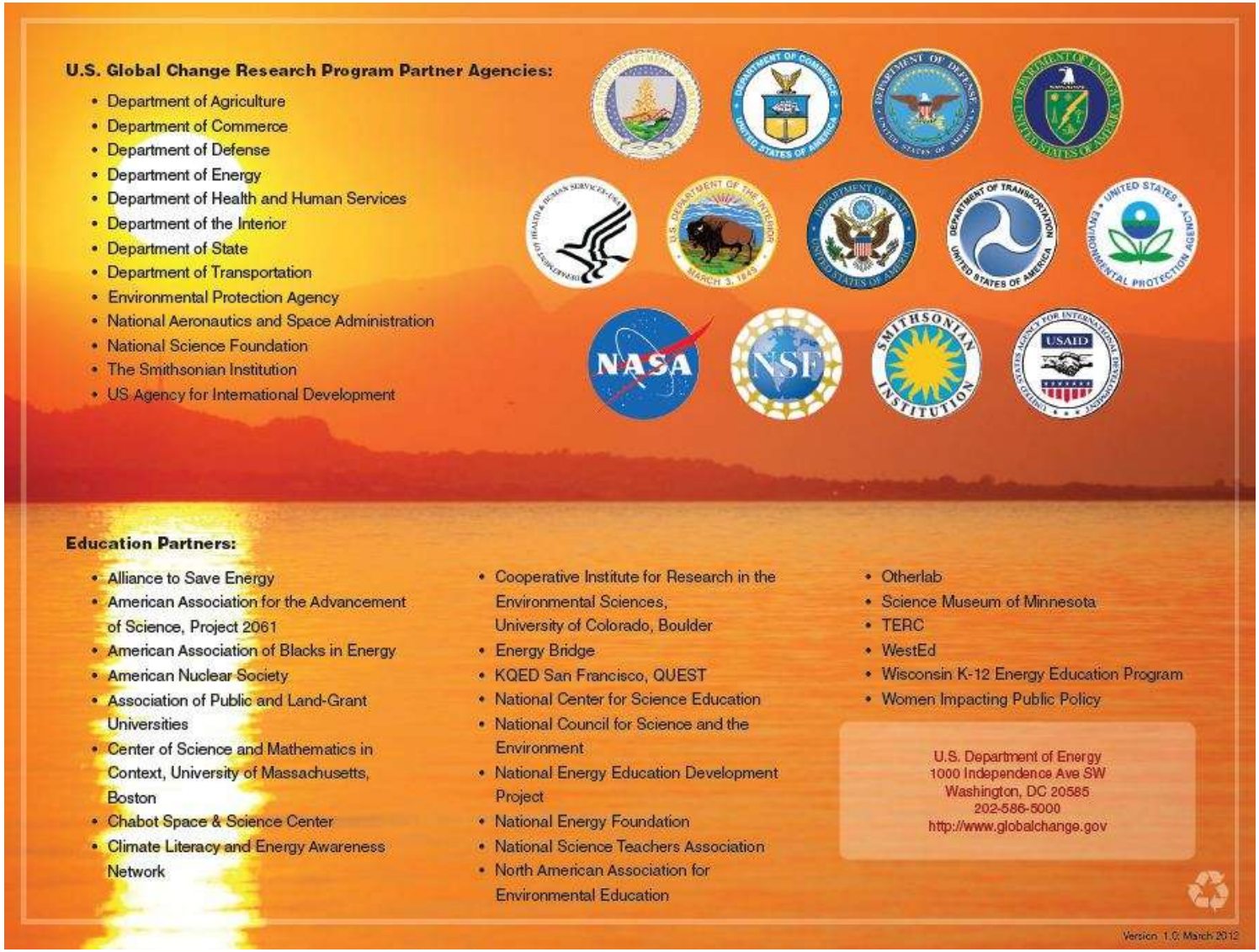
Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education, is building off of, and improving on, a model established by previous literacy projects.

The Document Development Process

- Development of this guide began at a workshop sponsored by DOE and the American Association for the Advancement of Science (AAAS) in the fall of 2010. Multiple federal agencies, non-governmental organizations, and numerous individuals contributed to development through an extensive review and comment process. Discussion and information gathered at AAAS, WestEd and DOE-sponsored Energy Literacy workshops in the spring of 2011 contributed substantially to the refinement of the guide.
- Email-based mailing list of stakeholders used to provide and receive information. Currently, there are over 1000 members representing more than 400 different offices and organizations.
- An Energy Literacy wiki page where the public was able to learn about the initiative and provide information on Energy Literacy.
- Drafting of final language by federal agency employees (Inter-Agency Education Working Group).
- Document content accuracy review. Review performed by federal agency content area experts.
- US Global Change Research Program (USGCRP) facilitation of federal agency and OSTP/NSTC approval.

Energy Literacy

Back Cover:



U.S. Global Change Research Program Partner Agencies:

- Department of Agriculture
- Department of Commerce
- Department of Defense
- Department of Energy
- Department of Health and Human Services
- Department of the Interior
- Department of State
- Department of Transportation
- Environmental Protection Agency
- National Aeronautics and Space Administration
- National Science Foundation
- The Smithsonian Institution
- US Agency for International Development

Education Partners:

- Alliance to Save Energy
- American Association for the Advancement of Science, Project 2061
- American Association of Blacks in Energy
- American Nuclear Society
- Association of Public and Land-Grant Universities
- Center of Science and Mathematics in Context, University of Massachusetts, Boston
- Chabot Space & Science Center
- Climate Literacy and Energy Awareness Network
- Cooperative Institute for Research in the Environmental Sciences, University of Colorado, Boulder
- Energy Bridge
- KQED San Francisco, QUEST
- National Center for Science Education
- National Council for Science and the Environment
- National Energy Education Development Project
- National Energy Foundation
- National Science Teachers Association
- North American Association for Environmental Education
- Otherlab
- Science Museum of Minnesota
- TERC
- WestEd
- Wisconsin K-12 Energy Education Program
- Women Impacting Public Policy

U.S. Department of Energy
1000 Independence Ave SW
Washington, DC 20585
202-586-5000
http://www.globalchange.gov

Version 1.0: March 2012

Energy Literacy

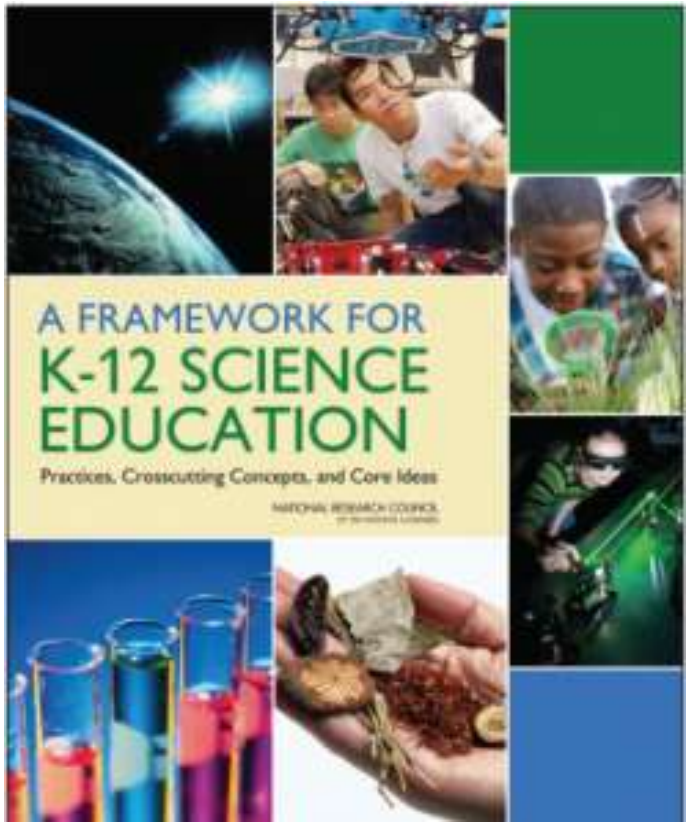
Why develop this Energy Literacy Framework?

- To foster an ever-growing community of stakeholders in energy education.
- To provide this community with at common framework from which to work.
- To bring federal agencies together with a common focus on energy education.
- To spark funding opportunities.
- To provide leverage for energy education efforts.
- To influence state and national standards.

The National Research Council's Framework for Science Education

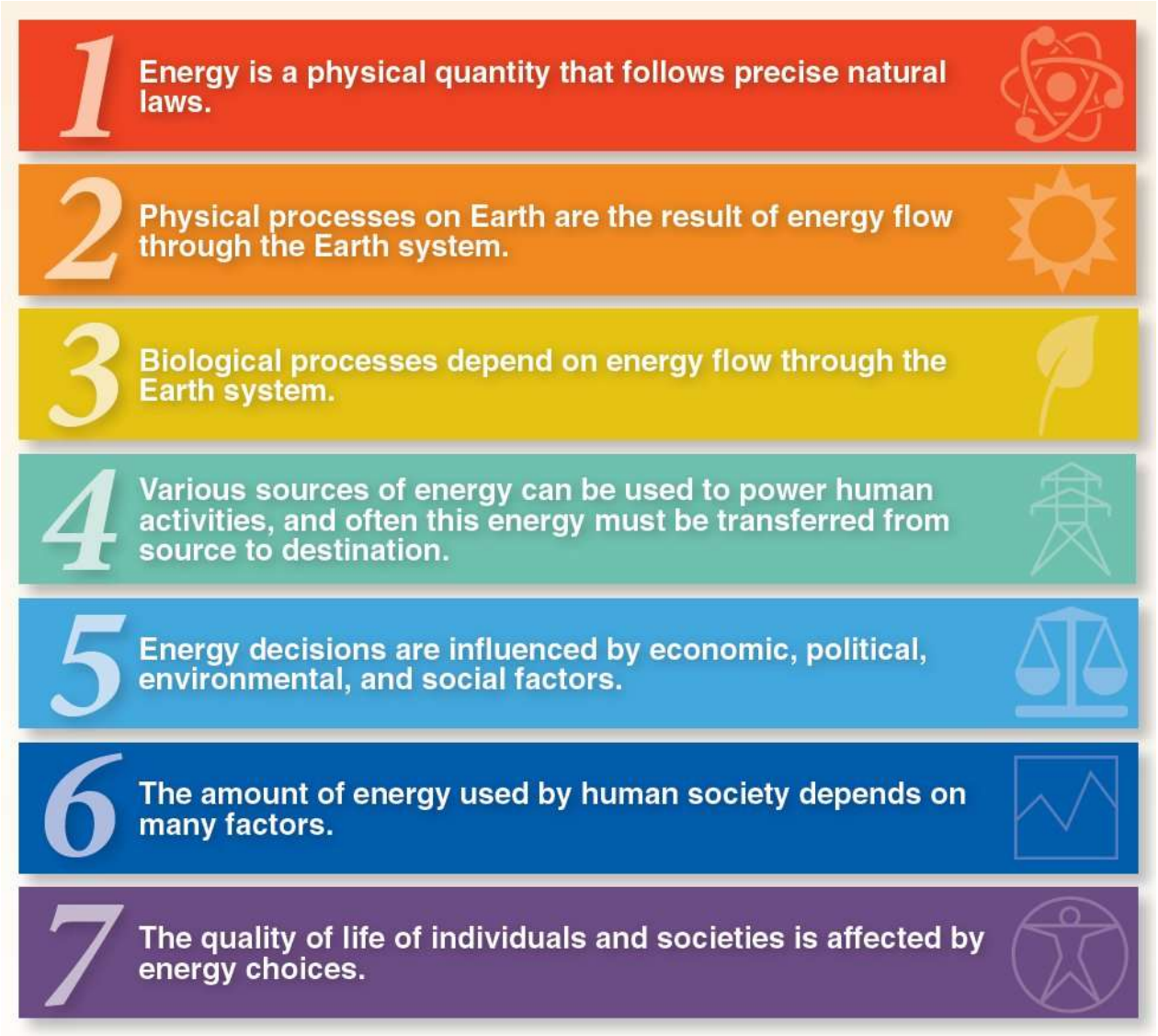
Crosscutting Concepts

1. Patterns
2. Cause and effect: Mechanism and explanation
3. Scale, proportion, and quantity
4. Systems and system models
5. **Energy** and matter: Flows, cycles, and conservation
6. Structure and function
7. Stability and change



Energy Literacy

The Essential Principles of Energy Education:



Essential Principle 6:

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

6.1 Conservation of energy has two very different meanings. There is the physical law of conservation of energy. This law says that the total amount of energy in the universe is constant. Conserving energy is also commonly used to mean the decreased use of societal energy resources. When speaking of people conserving energy, this second meaning is always intended.

6.2 One way to manage energy resources is through conservation. Conservation includes reducing wasteful energy use, using energy for a given purpose more efficiently, making strategic choices as to sources of energy, and reducing energy use altogether.

6.3 Human demand for energy is increasing. Population growth, industrialization, and socioeconomic development result in increased demand for energy. Societies have choices with regard to how they respond to this increase. Each of these choices has consequences.

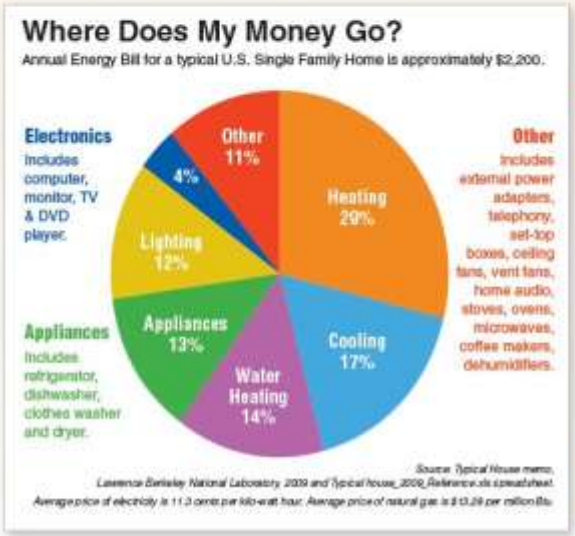
6.4 Earth has limited energy resources. Increasing human energy consumption places stress on the natural processes that renew some energy resources and it depletes those that cannot be renewed.

6.5 Social and technological innovation affects the amount of energy used by human society. The amount of energy society uses per capita or in total can be decreased. Decreases can happen as a result of tech nological or social innovation and change. Decreased use of energy does not necessarily equate to decreased quality of life. In many cases it will be associated with increased quality of life in the form of increased economic and national security, reduced environmental risks, and monetary savings.

6.6 Behavior and design affect the amount of energy used by human society. There are actions individuals and society can take to conserve energy. These actions might come in the form of changes in behavior or in changes to the design of technology and infrastructure. Some of these actions have more impact than others.

6.7 Products and services carry with them embedded energy. The energy needed for the entire lifecycle of a product or service is called the "embedded" or "embodied" energy. An accounting of the embedded energy in a product or service, along with knowledge of the source(s) of the energy, is essential when calculating the amount of energy used and in assessing impacts and consequences.

6.8 Amount of energy used can be calculated and monitored. An individual, organization, or government can monitor, measure, and control energy use in many ways. Understanding utility costs, knowing where consumer goods and food come from, and understanding energy efficiency as it relates to home, work, and transportation are essential to this process.



The Energy Star program is run jointly by the U.S. Department of Energy and the Environmental Protection Agency. The Energy Star logo designates products as highly energy efficient.

Fundamental Concept 6.7:

6.7 Products and services carry with them embedded energy. The energy needed for the entire lifecycle of a product or service is called the "embedded" or "embodied" energy. An accounting of the embedded energy in a product or service, along with knowledge of the source(s) of the energy, is essential when calculating the amount of energy used and in assessing impacts and consequences.

- The principles are meant to be broad categories representing big ideas.
- Each fundamental concept under the principles is intended to be unpacked and applied as appropriate for the learning audience and setting.
- The concepts are not intended to be addressed in isolation. A given lesson on energy will most often connect to many of the concepts.

Project Status as of 3/28/2012

- 13 USGCRP agencies have approved the document language.
- Approval by the President's Office of Science and Technology Policy has been secured.
- Document was officially released on Tuesday, March 27, 2012.

Phase 2 - Educational Materials and Outreach

The document will serve as a guide on which to base the design and creation of energy education materials, courses, and outreach. Here are just a few examples:

- Development of Energy 101, a general education science college and high school AP course on energy.
- Use of the DOE Training Portal to create immersive energy curriculum modules.
- Development of “Citizen’s Guides to Energy.” Practical guides, engaging tools and supplements to the guiding document.
- Educator resource web pages containing the guiding document, lessons & curricula, trainings, and more.

➢ **Materials and opportunities developed by professionals and organizations nationwide.**

The document is available for download at:

www.globalchange.gov/resources/educators

Energy Education Supervisor – Dr. Michelle Fox
Chief Strategist, Workforce & Education

For more Information Contact:
Matthew Inman
Albert Einstein Distinguished Educator Fellow
matthew.inman@ee.doe.gov

United States Department of Energy
Office of Energy Efficiency & Renewable Energy
1000 Independence Ave SW
Washington, DC 20585

The following slides are supplementary and not necessarily for use during the presentation.

Energy and A Solutions-Based Approach to Education

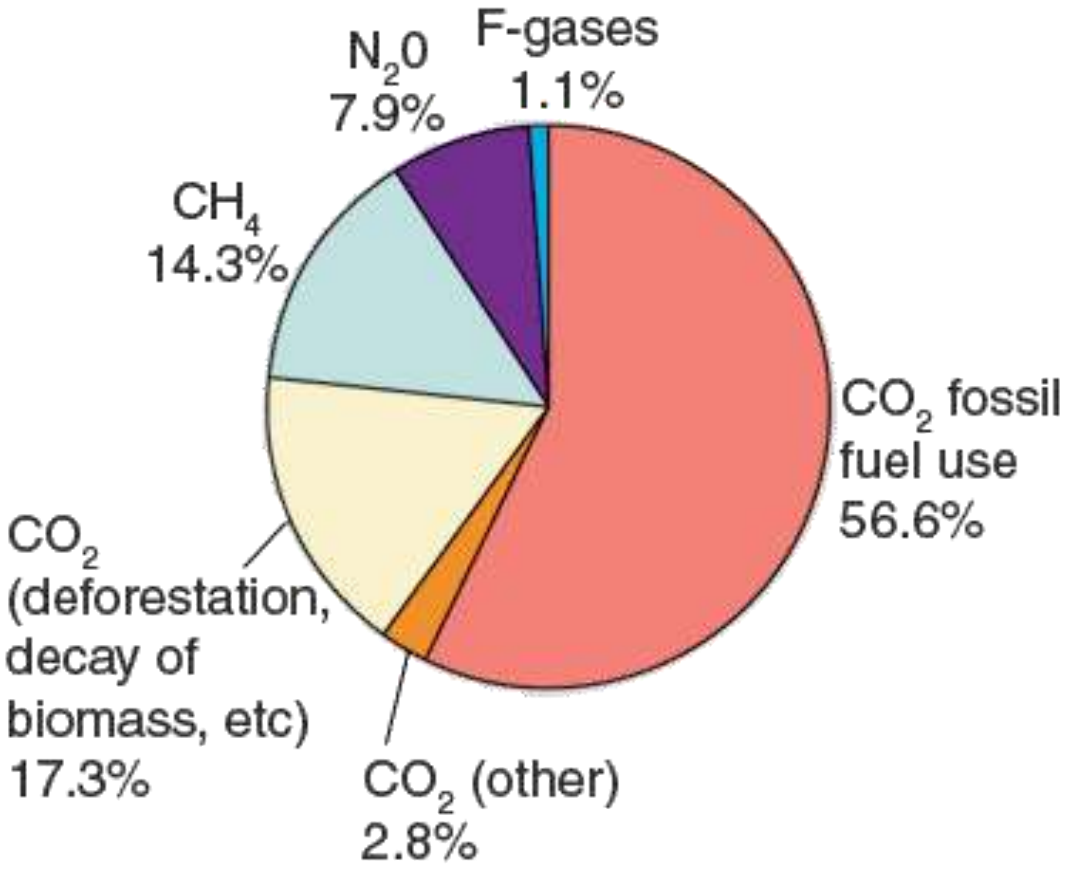
What?

A solutions-based approach is one in which a problem or challenge is acknowledged and then mitigation or solution is the focus.

Why?

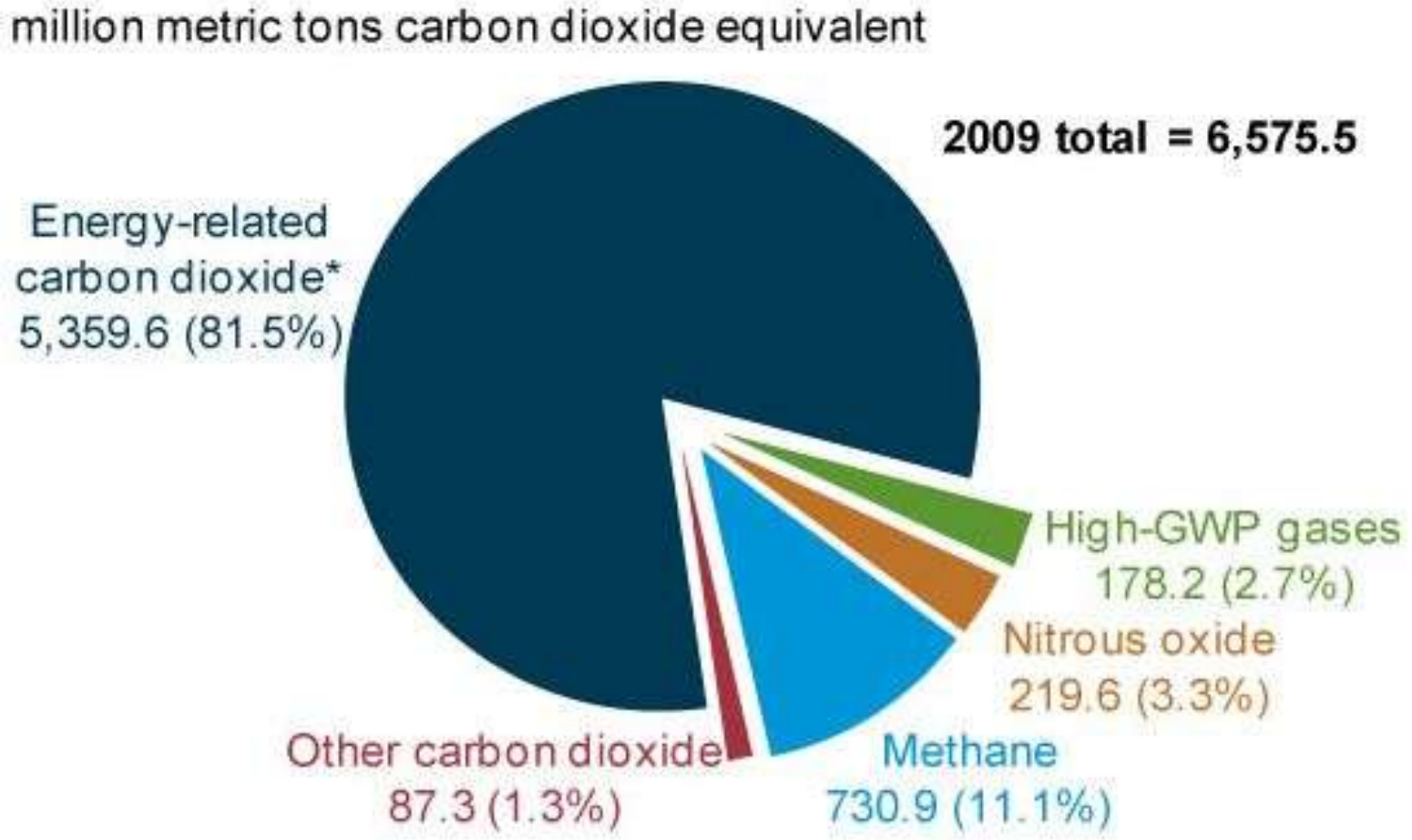
- Develops problem solving skills.
- Lends itself to real-world, challenge-oriented, project-based learning.
- A positive approach with the potential to make a difference.

World Wide Anthropogenic Greenhouse Gas Emissions Almost 60% Energy Related



Source – IPCC, Climate Change 2007: Synthesis Report

United States Anthropogenic Greenhouse Gas Emissions More than 80% Energy Related



Source – US Energy Information Administration Report Number: DOE/EIA-0573(2009)