RENEWABLE ENERGY
ON-SITE FIELD TRIP® – Wind
Applicable National Standards

The **National Science Education Standards** (**NSES**) is a set of guidelines for the science education in primary and secondary schools in the United States, as established by the National Research Council. These provide a set of goals for teachers to set for their students and for administrators to provide professional development. The NSES influence various states' own science learning standards and state-wide standardized testing.
Standards are divided into seven components:

1. **SCIENCE AS INQUIRY**
2. **PHYSICAL SCIENCE**
3. **LIFE SCIENCE**
4. **EARTH & SPACE SCIENCE**
5. **SCIENCE & TECHNOLOGY**
6. **SCIENCE IN PERSONAL & SOCIAL PERSPECTIVES**
7. **HISTORY & NATURE OF SCIENCE**

These components are sub-divided into more specific detail, based on grade level. Since our class material can span K-12, we have included all applicable standards into a single component.

1. SCIENCE AS INQUIRY

a. Understandings about Scientific Inquiry

i. Current knowledge and understanding guide scientific investigations.

b. Change, Constancy, and Measurement

i. Energy can be transferred and matter can be changed.
ii. Changes can occur in the properties of materials, position of objects, motion, and form and function of systems.
iii. Interactions within and among systems result in change. Changes in systems can be quantified and measured.

2. PHYSICAL SCIENCE

a. Transfer of Energy

i. Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, etc.
ii. Energy is transferred in many ways.
iii. Electrical circuits provide a means of transferring electrical energy.
iv. The sun is the major source of energy for changes on the earth's surface.

3. LIFE SCIENCE

a. Matter, Energy and Organization in Living Systems

i. Like all organisms on earth, humans exist and change based on environment. Unlike most organisms, humans have the ability to drastically alter their environment based on organizational decision-making as well as neglect**.**

4. EARTH & SPACE SCIENCE

a. Energy in the Earth System

i. Heating of earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.
ii. Global climate is determined by energy transfer from the sun at and near the earth's surface.

5. SCIENCE & TECHNOLOGY

a. Abilities of Technological Design

i. Proposal of designs and choice between alternative solutions.
ii. Evaluation of a solution and its possible consequences.

b. Understandings about Science and Technology

i. Scientific inquiry and technological design have similarities and differences. Scientists propose explanations about the natural world, and engineers propose solutions relating to human problems, needs, and aspirations.
ii. Technological solutions are temporary and have side effects. Technologies cost, carry risks, and have benefits.
iii. Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Risk is part of living in a highly technological world. Reducing risk often results in new technology.
iv. Technological designs have constraints. Some constraints are unavoidable, such as properties of materials, or effects of weather and friction. Other constraints limit choices in design, such as environmental protection, human safety, and aesthetics.

6. SCIENCE IN PERSONAL & SOCIAL PERSPECTIVES

a. Personal Health

i. Natural environments may contain substances that are harmful to human beings. Maintaining environmental health involves establishing or monitoring quality standards related to use of soil, water, and air.

b. Natural Hazards

i. Human activities can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal.
ii. Hazards can present personal and societal challenges because misidentifying the change or incorrectly estimating the rate and scale of change may result in either too little attention and significant human costs or too much cost for unneeded preventive measures.

c. Risks and Benefits

i. Students can use a systematic approach to thinking critically about risks and benefits.
ii. Important personal and social decisions are made based on perceptions of benefits and risks.

d. Science and Technology in Society

i. Technology influences society through its products and processes. Technological changes are often accompanied by social, political, and economic changes that can be beneficial or detrimental to individuals and to society.
ii. Social needs, attitudes, and values influence the direction of technological development.
iii. Science and technology have contributed enormously to economic growth and productivity among societies and groups within societies.
iv. Science cannot answer all questions and technology cannot solve all human problems or meet all human needs. Students should appreciate what science and technology can reasonably contribute to society and what they cannot do. For example, new technologies often will decrease some risks and increase others.

e. Natural Resources

i. Human populations use resources in the environment to maintain and improve their existence.
ii. The earth does not have infinite resources. Increasing human consumption places severe stress on the natural processes that renew some resources, and depletes those resources that cannot be renewed.

f. Natural and Human-induced Hazards

i. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and trade-offs of various hazards.

g. Science and Technology in Local, National, and Global Challenges

i. Science and technology can indicate what can happen, not what should happen. The latter involves human decisions about the use of knowledge.

ii. Understanding basic concepts and principles of science and technology should precede active debate about the economics, policies, politics, and ethics of various science and technology related challenges. However, understanding science alone will not resolve local, national, and global challenges.
iii. Individuals and society must decide on proposals involving new research and the introduction of new technologies into society.

7. HISTORY & NATURE OF SCIENCE

a. History of Science

i. Tracing the history of science can show how difficult it was for scientific innovators to break through the accepted ideas of their time to reach conclusions that we take for granted today.

For more information about the standards, please see http://www.nap.edu/openbook.php?record_id=4962