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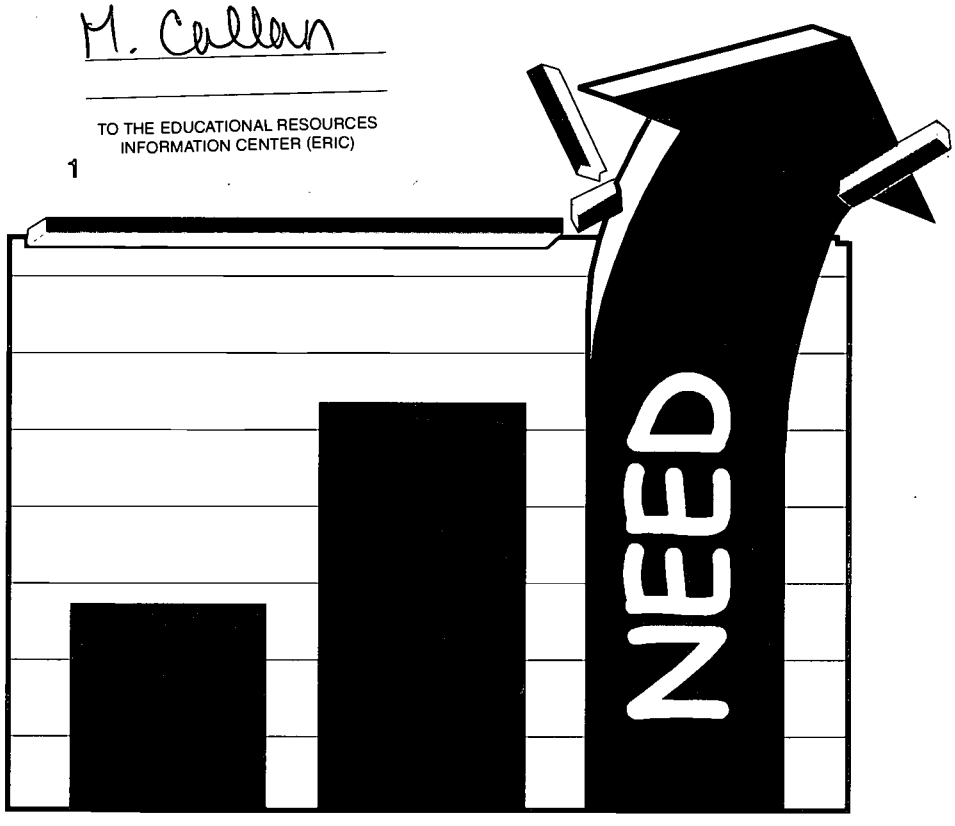
ABSTRACT

A unit on energy is a perfect opportunity to use an interdisciplinary approach with a range of grade levels. This blueprint describes the needs of one such program and covers developmental strategies step by step. Each activity is categorized according to grade level. Topics include: (1) "Getting Organized," which discusses selecting activities and organizing students into groups; (2) "The Science of Energy," which studies energy, its forms, and the transformation of energy; (3) "Sources of Energy," which studies energy sources; (4) "Electricity," which provides information on electricity and electricity generation; (5) "Energy Efficiency and Conservation," which studies how energy is used and energy conservation; (6) "Synthesis, Reinforcement, Extension," which features hands-on activities to reinforce the knowledge students have learned; and (7) "Evaluation and Recognition," in which evaluation strategies are provided. (YDS)

BLUEPRINT FOR SUCCESS

Now including the Youth Awards Guide and the Energy Polls



Grades K-12 2

uide for organizing energy units in your classroom and community and participating in the Youth Awards Program for Energy Achievement.

BLUEPRINT FOR SUCCESS

E GENERAL ENERGY

EVALUATION RECOGNITION

A QUICK LOOK

Use this guide to plan a successful energy unit and participate in the Youth Awards Program.

GRADES K-12

- Building a NEED Program
- Sample Energy Units
- Group Contract
- Enérgy Unit Exam
- Energy Polls
- Youth Awards Guide
- Evaluation Form

The NEED Project
PO Box 2518
Reston, VA 20195
1-800-875-5029

2000–2001

NEED Project
Curriculum Review Committee

George Dewey, Educator, NSTA Liaison, Fairfax, VA
Linda Hutton, Educator, Kitty Hawk, NC
Carol Timms, Consultant, Educational Dividends, Champaign, IL
Keith Etheridge, Educator, East Lansing, MI
Michele Oszust, Educator, Owosso, MI
Barbara Price, Educator, Wichita Falls, TX
Scott Sutherland, Principal, Providence, RI
Gail Marlin, Educator, Wichita Falls, TX
Lillian Silverstone, Educator, Fort Smith, AR
Margaret Grice, Educator, Cypress, TX
Jan Kessler, Educator, Fort Smith, AR
Irene B. P. Morris, Educator, Washington, DC
Dee Stout, Educator, Bellefonte, PA
Jennifer York, Educator, Presque Isle, ME
Jeri Preddy, Energy Manager, Wake County Public Schools, Raleigh, NC
Dr. JoAnn Daly, Energy Specialist, Arlington Public Schools, Arlington, VA
Pam Schmidt, Educator, Aurora, CO
Dr. Lori Marsh, Extension Specialist, Virginia Tech, Blacksburg, VA
Nancy Brock, Educator, Sugar Land, TX
Jack E. Deeter, Professional Landman, Denver, CO
Dr. Dick Rezba, Science Education, Virginia Commonwealth University, Richmond, VA
Shauni Nix, Ohio Energy Project Coordinator, Columbus, OH
Shelly Baumann, Educator, Belmont, MI
Peter Zack, MEEP Coordinator, Parsonsfield, ME
Stephanie Wyatt, Curriculum Specialist, Murray, KY
Mary Starks, Educator, Enid, OK
Jeffrey Salmon, George C. Marshall Institute, Washington, DC
Marilyn Nemzer, Geothermal Education Office, Tiburon, CA
Dan Barzel, Circuit City, Richmond, VA
John Weiner, Energy Information Administration, U.S. Department of Energy

Blueprint for Success

TABLE OF CONTENTS

AN INTRODUCTION TO THE BLUEPRINT

Energy is the perfect theme for a multi-disciplinary unit. NEED's activities are designed to develop students' science, math, language arts, music, art, and social studies skills, as well as enhance their general knowledge of energy. If you are team teaching, NEED activities are a good way to encourage students and teachers to work together on a common theme.

This blueprint will give you a brief description of NEED activities, along with grade level and the approximate time needed to complete each activity. Many of NEED's activities are appropriate for a broad range of grade levels. An order form is included in the **NEED Catalog** for you to order the activities you need to complete your unit. NEED members can order six booklets free of charge. All NEED materials are correlated to the National Science Education Content Standards.

In many areas, NEED members also have the opportunity to attend training workshops and conferences. For more information on training programs and professional development, please call NEED Headquarters at 1-800-875-5029.

Participating in NEED's Youth Awards Program for Energy Achievement is a wonderful way for students to see the fruits of their labors. Have the students keep a scrapbook of their activities as they progress through the energy unit. More information is in the **Youth Awards Guide** beginning on page 28.

Building Your NEED Program

You need to decide which activities to use, according to the following steps. The length of the unit will be determined by the number of activities you choose and the way you choose to conduct the activities.

STEP ONE: GETTING ORGANIZED

Select the activities you will use for steps two through six. Next, organize students into groups. Students usually serve in a core group for about half of the activities and in other groups for the remaining activities.

STEP TWO: THE SCIENCE OF ENERGY

Students need to learn the science of energy before they can learn about the sources of energy, electric power production, and energy efficiency. Students learn the six forms of energy and how energy is transformed from one form into other forms. Secondary students can also extend their knowledge to thermodynamics.

STEP THREE: SOURCES OF ENERGY

These activities give students an understanding of the energy sources used today—their formation, exploration, production, distribution, consumption, and economic and environmental trade-offs.

STEP FOUR: ELECTRICITY

These activities provide students with information on the scientific concepts of electricity and electricity generation, transmission, and efficient use of electricity. **NEED Infobooks** provide background information on electricity.

STEP FIVE: ENERGY EFFICIENCY AND CONSERVATION

Students learn how energy is used, new energy efficient technologies, and ways to conserve energy at home and at school. School Energy Surveys and Energy Management Programs are available.

STEP SIX: SYNTHESIS, REINFORCEMENT, EXTENSION

There are many hands-on activities to reinforce, synthesize and extend the information the students have learned. Also available are activities for students to teach others what they have learned.

STEP SEVEN: EVALUATION & RECOGNITION

Most NEED activities contain evaluation strategies. This blueprint contains a **Unit Exam** with multiple choice questions and essay questions that require students to draw upon their knowledge of energy to write an explanation or suggest a plan of action and can be done in teams and/or individually. The **Energy Polls** (page 23) and the **Youth Awards Program Guide (page 28)** are additional evaluation/recognition tools included in this booklet.

Step One: Getting Organized

- Select the activities for your energy unit. See the chart on pages 6–7 for a quick overview of NEED's resources and activities. Make sure you select at least one activity for each step. Descriptions of the activities are given in each individual step, along with grade level suggestions and class hours needed to complete the activity. Also included in this blueprint (pages 14–15) are several sample units with activities from each step.

- Assign students to seven groups. These teams work together on major activities and help each other learn.

- Consider securing energy videos and movies that may be available from energy organizations, government agencies, and regional educational media centers. Call NEED Headquarters for suggestions at 1-800-875-5029.

ORGANIZE STUDENTS INTO GROUPS

Organize students into seven groups. Each group should choose a group name, such as: The Combustible Chemicals, Ernie Electron and the Electricals, or the Mighty Morphin' Mechanicals. Once each group has chosen a name, students should brainstorm ideas for a poster or pennant that displays the group's name.

GROUP CONTRACT

Groups should develop group contracts. Distribute at least two copies of the Group Contract (page 16) to each group. Explain to the groups how they should develop their own contracts. Once the contract has been written and approved by you, each member of the group should sign it. Keep these on file in case you need to get the group, or a member of the group, back on track.

ENERGY UNIT EXAM ANSWERS *(exam begins on page 17)*

1. a	11. d	21. b	31. c	41. d	51. b	61. a
2. a	12. a	22. a	32. b	42. d	52. c	62. a
3. c	13. a	23. b	33. a	43. d	53. a	63. b
4. d	14. d	24. c	34. b	44. a	54. b	64. a
5. c	15. d	25. b	35. c	45. b	55. b	65. b
6. c	16. c	26. b	36. c	46. b	56. b	66. b
7. d	17. a	27. b	37. b	47. a	57. c	67. b
8. d	18. d	28. a	38. c	48. d	58. b	68. c
9. b	19. b	29. b	39. d	49. b	59. a	69. b
10. b	20. d	30. d	40. b	50. c	60. a	70. a

ACTIVITY	GRADE LEVEL	EMPHASIS
BACKGROUND INFORMATION		
Primary Infobook *(class sets available)*	K–4	Introduction to energy, sources of energy, electricity
Intermediate Infobook *(class sets available)*	4–8	Introduction to energy, sources of energy, electricity, consumption
Secondary Infobook *(class sets available)*	7–12	Introduction to energy, sources of energy, electricity, consumption
U.S. Energy Geography	4–12	U.S. maps with information on the energy sources
STEP TWO: SCIENCE OF ENERGY		
EnergyWorks Kit	3–6	Heat, light, motion, sound, growth, technology
ElectroWorks Kit	4–7	Static electricity, batteries, magnets, electromagnetism, circuits
Science of Energy Kit *(Elementary version)*	4–8	Forms of energy and energy conversions
Science of Energy Kit *(Secondary version)*	7–12	Forms of energy and energy conversions
Thermo Dynamics	7–12	Hands-on experiments exploring thermodynamics
STEP THREE: SOURCES OF ENERGY		
Games & Icebreakers *Energy Chants* *Energy Round-up*	K–12	Introduction to the energy sources
Primary Stories & More	K–4	Stories and hands-on activities
Energy Source Expo	3–12	Students prepare exhibits on the energy sources
Energy in the Balance	4–6	Advantages and disadvantages of the energy sources—charting and graphing activities
Transparent Energy *(transparency masters included)*	5–12	Students prepare presentations on the energy sources
Rock Performances	3–12	Students write and perform energy rock songs
Great Energy Debate Game	5–12	Advantages and disadvantages of the energy sources through evaluation and debate
Energy Enigma	7–12	Students uncover clues to the energy sources using critical thinking skills
Mission Possible	7–12	Students evaluate the energy sources used to generate electricity
STEP FOUR: ELECTRICITY		
NEED Infobooks	K–12	Information on electricity
ElectroWorks	4–7	Experiments with static electricity, batteries, magnets, electromagnetism, and circuits
Primary Stories & More	K–4	Stories and hands-on activities
Electric Puzzles	4–12	Puzzles, crosswords, and more
Current Energy Affair	7–12	Students report on electricity news
Mission Possible	7-12	Students develop a plan to increase electricity generation in a ficticious country
Games & Icebreakers *Electric Connections*	5–12	The energy sources that produce electricity

ITEM	GRADE LEVEL	EMPHASIS
STEP FIVE: EFFICIENCY & CONSERVATION		
Today in Energy	K–4	Introduction to choice, trade-offs
Energy Conservation Contract	4–12	Families pledge to save energy
Building Buddies *(kit available)*	K–3	Energy management at school and home
Monitoring/Mentoring *(kit available)*	4–6	Energy management at school
Learning/Conserving *(kit available)*	7–12	Energy management at school
Museum of Solid Waste & Energy	4–12	Students create a trash museum
Games & Icebreakers *This Week in Energy Conservation* *Most Wanted Energy Wasters*	K–12	Energy conservation activities
STEP SIX: SYNTHESIS & REINFORCEMENT		
Exploring Energy	4–6	Hands-on explorations of energy
Energy Math Challenge	5–12	Math problems with an energy twist
Yesterday in Energy	4–12	Energy in the past
Energy Around the World	5–12	Students explore how other countries use energy
Marine Energy	7–12	Energy resources under our oceans
Projects & Activities	K–12	Outreach/community service projects
Games & Icebreakers	K–12	Entertaining games about energy
Energy Jeopardy	4–12	An energy spin-off of the TV game show
NEED Energy Plays	4–12	Short plays and skits with energy themes
Energy Carnivals	K–12	Carnival games to reinforce energy knowledge in K–4 and 4–12 versions
NEED Songbook	K–12	Songs about energy
STEP SEVEN: EVALUATION & RECOGNITION		
Energy Unit Exam	4–12	Multiple choice and essay questions on the energy information taught in NEED units (page 17)
Energy Polls (Intermediate & Secondary)	5–12	Basic energy assessment tools (page 23)
Youth Awards Guide	K–12	A guide for participating in the Youth Awards Program for Energy Achievement (page 28)

Step Two: Science of Energy

ENERGY WORKS

Time: 6-8 hours **Grade Level: Elementary (3-6)**

The **Energy Works Kit** introduces elementary students to the basic scientific concepts of energy and the tasks it performs—heat, light, motion, sound, growth, and powering technology. The Teacher Guide includes instructions for each unit, plus Teacher Demonstrations and Transparency Masters. The Student Guide contains backgrounders and Key Words on each component and Worksheets for each exploration. The Student Guide also shows students how to read thermometers using both Fahrenheit and Celsius scales, how to use spring scales to measure force, and how to use protractors to measure angles of incidence and reflection. NEED schools can rent or buy the **Energy Works Kit**, which contains a class set of Student Guides and the materials needed for the Teacher Demonstrations and Student Explorations. **Energy Works** has been developed to meet the National Science Education Content Standards. The three-week rental cost is $150 and the sale price is $400.

ELECTRO WORKS

Time: 6-8 hours **Grade Level: Elementary/Intermediate (4–7)**

The **ElectroWorks Kit** introduces elementary students to the basic scientific concepts of electricity—with centers on static electricity, batteries, magnets, electromagnetism, and circuits. The Teacher Guide includes instructions for the unit, plus Transparency Masters. The Student Guide contains a backgrounder and Key Word Worksheet, as well as Worksheets for each exploration and a Unit Review. NEED schools can rent or buy the **ElectroWorks Kit**, which contains a class set of Student Guides and the materials needed for the Student Explorations. **ElectroWorks** has been developed to meet the National Science Education Content Standards. The three-week rental cost is $100 and the sale cost is $250.

SCIENCE OF ENERGY

Time: 3 to 6 hours **Grade Levels: Elementary (4–8) & Secondary (7–12)**

The **Science of Energy Kit** provides comprehensive instruction in energy transformations through a series of hands-on experiments. Students learn about the different forms of energy and how they are converted to other forms. Included are a Teacher Guide, Teacher Demonstrations, and Student Guides for seven stations. Each station explores a different aspect of energy transformations—such as light to electricity, light to heat, motion to sound, motion to heat, etc. NEED member schools can rent NEED's **Science of Energy Kit** with all of the equipment and consumables needed to conduct the experiments. Both Elementary and Secondary Guides contain several demonstrations that can be done with materials you may have at school or at home. Two-week rental of the Elementary kit is $100, three-week rental of the secondary kit is $150, and the sale cost is $400.

THERMO DYNAMICS

Time: 6 hours **Grade Level: 7–12**

A guide to hands-on experiments that explore concepts of thermodynamics, including molecular structure, conduction, convection, radiation, specific heat, heat of fusion, and heat of vaporization. The **Teacher's Guide** includes teacher demonstrations, an introductory activity for students to calibrate blank thermometers, a list of all laboratory materials needed and where to get them, and a Unit Exam.

Step Three: Energy Sources

ENERGY INFOBOOKS

NEED's **Energy Infobooks** provide resource information on energy, the sources of energy, electricity, consumption, and environmental effects. Available on three reading levels—primary, intermediate, and secondary. All NEED activities are based on the information in these booklets.

ENERGY SOURCE EXPO

Time: 6-7 class periods **Grade Level: 2-12**

This new activity in 2000 gives teacher instructions and student guides for preparing and presenting exhibits on the ten major sources of energy. Students work in groups to research and write short scripts and prepare hands-on exhibits to teach others about the sources of energy we use today.

ENERGY CHANTS

Time: 1.5 to 2.5 hours **Grade Level: K-8**

Energy Chants for primary and intermediate levels can be found in NEED's **Games and Icebreakers** booklet. Students learn a chant, hand motions, and basic facts about each energy source. Using the chants, the class can be broken into teams. Energy chants are a great way to introduce energy sources.

STORIES & MORE

Time: Varies by activity **Grade Level: K-4**

This booklet contains a series of stories and activities for primary teachers or upper elementary students to use to introduce basic energy concepts and the major energy sources to primary students.

ENERGY IN THE BALANCE

Time: 3-5 hours **Grade Level: 4-6**

This activity explores the advantages and disadvantages of the energy sources through a series of charting and graphing activities.

TRANSPARENT ENERGY

Time: 2.5 to 3.5 hours **Grade Level: 5-12**

Instructions and student handouts are found in the **Transparent Energy** booklet. Ten teams of students use NEED **Energy Infobooks** to research different energy sources. Using transparencies, each team makes a presentation.

ROCK PERFORMANCES

Time: 2 to 4 hours **Grade Level: 4-12**

You may choose to do the short or long version of **Great Energy Rock Performances**. In the long version, students write their own song, group introduction, and interview with the host of the show. In the short version of this activity, students perform a song written by NEED.

DEBATE GAME

Time: 2 hours **Grade Level: 5-12**

Appropriate for science or social studies classes organized in groups. Student groups evaluate and debate the advantages and disadvantages of the ten major energy sources used in the United States today. Game transparency masters are included.

ENERGY ENIGMA

Time: 2.5 hours **Grade Level: 7-12**

Appropriate for all classes organized in groups. Student groups use critical thinking skills to unlock the mysteries of the energy sources using clues.

Step Four: Electricity

ELECTRO WORKS KIT

Time: 6-8 hours **Grade Level: Elementary/Intermediate (4–7)**

The **ElectroWorks Kit** introduces elementary students to the basic scientific concepts of electricity—with centers on static electricity, batteries, magnets, electrmagnetism, and circuits. The Teacher Guide includes instructions for the unit, plus Transparency Masters. The Student Guide contains a backgrounder and Key Word Worksheet, as well as Worksheets for each exploration and a Unit Review. NEED schools can rent or buy the **ElectroWorks Kit**, which contains a class set of Student Guides and the materials needed for the Student Explorations. **ElectroWorks** has been developed to meet the National Science Education Content Standards. The three-week rental cost is $100 and the sale cost is $250.

ENERGY INFOBOOKS

NEED's **Energy Infobooks** provide resource information on electricity generation, distribution, and consumption. Available on three reading levels—primary, intermediate, and secondary.

ELECTRIC CONNECTIONS

Time: 30 minutes **Grade Level: 5-12**

Instructions for **Electric Connections** can be found in NEED's **Games and Icebreakers** booklet. First, students rank the yearly production of electricity for the nation's top ten energy sources. In groups, students rank the top ten sources once again. Finally, students compare their rankings with the actual production figures.

CURRENT ENERGY AFFAIR

Time: 2.5 - 3.5 hours **Grade Level: 7-12**

Appropriate for science or English classes organized in seven groups. Using ten transparencies, the teacher presents an overview of electric power production. Next, each group presents a five minute scene on one aspect of electric power production.

ELECTRIC PUZZLES

Time: 45 minutes **Grade Level: 4-12**

Appropriate for all classes organized in groups. Instructions can be found in the **Electric Puzzles** booklet. Using their knowledge of electric power generation and their NEED Electricity Infosheets, student teams solve several puzzles.

MISSION POSSIBLE

Time: 3 - 5 hours **Grade Level: 7-12**

A cooperative learning activity in which secondary students evaluate the advantages and disadvantages of the energy sources used to generate electricity as they develop a plan to increase electricity generation for a ficticious country.

Step Five: Efficiency/Conservation

TODAY IN ENERGY

Time: 1 - 2 hours **Grade Level: K-4**

Appropriate for all primary classes. Students use cards describing energy-using activities to make choices about their energy use throughout the day.

CONSERVATION CONTRACT

Time: 1.5 - 2.5 hours **Grade Level: 4-12**

Each student surveys his/her family's energy behaviors. After several weeks, students survey their families once again and tabulate their energy savings. Can be extended to neighbors and friends.

BUILDING BUDDIES

Time: 5 class periods, ongoing **Grade Level: K-4**

This program introduces students to the concepts of energy use and conservation, beginning with activities focused on home energy use and extending to school energy use and conservation. A **Building Buddies Kit** is available to monitor school energy use and behaviors, and reward energy saving practices. $175 to purchase kit.

MONITORING/MENTORING

Time: 5 class periods, ongoing **Grade Level 4-6**

This program introduces students to methods of measuring energy usage, determining costs, and quantifying environmental effects through a series of hands-on activities that include reading meters, EnergyGuide labels and electric nameplates. Students conduct surveys of school energy usage and monitor energy usage. A **Monitoring & Mentoring Kit** is available for on-going monitoring. $200 to purchase kit.

LEARNING/CONSERVING

Time: 5 class periods **Grade Level: 7-12**

Secondary students learn about energy consumption and conservation by reading school meters and utility bills, comparing EnergyGuide labels and investigating electric nameplates. Students conduct comprehensive surveys of school energy usage and develop an energy management plan. A **Learning & Conserving Kit** is available for purchase at $225.

MUSEUM OF SOLID WASTE AND ENERGY

Time: 4 - 6 hours **Grade Level: 4-12**

Each team is given an exhibit topic, a student guide, and background information. The museum *curators* complete eight exhibits and invite students, teachers, and community members to take a guided tour.

THIS WEEK IN ENERGY CONSERVATION

Time: 1.5 to 2.5 hours **Grade Level: 5-12**

Instructions for **This Week in Energy Conservation** can be found in the **Games and Icebreakers** booklet. Students are organized in groups; each group writes and performs a news brief or public service announcement on a specific area of energy efficiency.

Step Six: Synthesis

ENERGY MATH CHALLENGE

Time: 1.5 - 2.0 hours **Grade Level: 5-12**
Students work as individuals and in teams to solve energy math problems. Intermediate and Secondary level questions are included.

YESTERDAY IN ENERGY

Time: 1 - 4 hours **Grade Level: 4-12**
Students research and make presentations on energy use in the past.

ENERGY AROUND THE WORLD

Time: 1.5 - 2.5 hours **Grade Level: 5-12**
Students make presentations on energy resources and consumption in other countries.

MARINE ENERGY

Time: 1 - 4 hours **Grade Level: 7-12**
Students conduct a community hearing on the development of energy and/or minerals in coastal areas.

ENERGY ON STAGE

Time: 1 - 5 hours **Grade Level: 4-12**
The best of NEED's energy plays are included here for students to present to others.

ENERGY CARNIVALS

Time: 2 - 4 hours **Grade Levels: K-12**
Students combine carnival skills with math, spelling, history, and science knowledge in a fun activity. Each **Energy Carnival** game has questions or problems for different age levels. The **Primary Energy Carnival** contains nine games designed to reinforce information about the energy sources, renewable and nonrenewable energy, and the things energy does for us.

ENERGY JEOPARDY

Time: 1.5 hours **Grade Level: 4-12**
Students work in teams to provide questions for the answers in various categories.

EXPLORING ENERGY

Time: varies with activity **Grade Level: 4-6**
Short articles and hands-on activities and explorations on a variety of energy-related topics, such as composting, solar cooking, microwaves, and the greenhouse effect.

GAMES & ICEBREAKERS

Time: varies with activity **Grade Level: K-12**
This booklet contains activities that reinforce many energy concepts, including Energy BINGO, Energy Match Game, and more.

PROJECTS & ACTIVITIES

Time: varies with activity **Grade Level: K-12**
Ten outreach activities that extend energy knowledge into the family and community, including writing an energy newspaper, creating energy tips, and burying an energy time capsule.

Step Seven: Evaluation

Evaluation is an important component of your energy unit, and should be ongoing. As mentioned in Step One, your students can participate in one of the NEED **Energy Polls** prior to beginning the unit. The Energy Polls are found in this booklet, beginning on page 23. Many NEED activities contain suggestions for how to evaluate students' performance. Please feel free to modify these evaluation suggestions as necessary.

You may choose to use the Unit Exam found in this booklet beginning on page 17, which has 70 multiple choice questions. The questions are divided into five categories (Science of Energy, Consumption/Conservation, Fossil Fuels, Renewables, and Electric Power). The first few questions in each category are the easiest—the questions increase in difficulty as you proceed in the category. Choose questions that match what was taught during the unit.

Students can complete the multiple choice questions individually or in groups. The answers can be found on page five. Instead of, or in addition to, the multiple choice questions, you may decide to have students complete several essay questions. Five sample essay questions can be found on page 21. Students can answer the essay questions individually or in groups.

NEED also encourages all schools to participate in the Youth Awards Program for Energy Achievement by having their students keep a scrapbook of their activities to submit to NEED in April. Information about the Youth Awards Program is included in this booklet, beginning on page 28. Summaries of winning projects by schools nationwide can be found in NEED's **Annual Report and Youth Awards Booklet**. Many new activities and school programs are also highlighted in **Energy Exchange** magazine, which is sent to all member schools twice a year.

We'd like to hear your comments and suggestions about your energy education unit. Please let us know what worked well and what needs improvement. Please complete the Evaluation Form on page 35 of this booklet and send it to us.

Sample Energy Units

PRIMARY (K–4)

Step I: Get Organized
Step II : Introduction to Energy/Science of Energy
1. Primary Infobook: What is Energy?
2. Stories & More: Where Do You Kids?
3. EnergyWorks Kit

Step III: Energy Sources
1. Games & Icebreakers: Primary Energy Chants
2. Primary Infobook: History & Source Infosheets
3. Stories & More: Energy source stories & activities
4. Energy Source Expo
5. Energy in the Balance (advanced students)

Step IV: Electricity
1. Primary Infobook: Electricity & Safety Infosheets
2. Stories & More: What Would We Do?
3. ElectroWorks Kit (advanced students)

Step V: Conservation
1. Primary Infobook: Saving Energy
2. Today in Energy
3. Building Buddies
4. Games & Icebreakers: Energy Wasters

Step VI: Reinforcement & Synthesis
1. Primary Carnival
2. NEED Songbook

Step VII: Evaluation
At teacher's discretion

ELEMENTARY (4-6) BASIC

Step I: Get Organized
1. Energy Poll

Step II
1. EnergyWorks
2. Elementary Science of Energy

Step III
1. Energy Chants
2. Energy in the Balance
3. Great Energy Rock Performances or Energy on Stage

Step IV
1. ElectroWorks
2. Electric Connections

Step V
1. Monitoring & Mentoring
2. This Week in Energy Conservation

Step VI
1. Energy Math Challenge (intermediate level)
2. Yesterday in Energy (short version)
3. Energy Jeopardy or Energy Carnival

Step VII
1. Energy Poll
2. Unit Exam

ELEMENTARY COMPREHENSIVE

Step I: Get Organized
1. Energy Poll

Step II
1. EnergyWorks
2. Elementary Science of Energy

Step III
1. Energy Chants
2. Energy Source Expo
3. Energy in the Balance
4. Great Energy Rock Performances or Energy on Stage
5. Transparent Energy
6. Great Energy Debate Game

Step IV
1. ElectroWorks
2. Electric Connections
3. Current Energy Affair
4. Electric Puzzles

Step V
1. Monitoring & Mentoring
2. Energy Conservation Contract
3. This Week in Energy Conservation
4. Most Wanted Energy Wasters
5. Museum of Solid Waste & Energy

Step VI
1. Exploring Energy
2. Energy Math Challenge (intermediate level)
3. Yesterday in Energy
4. Energy Around the World
5. Energy Jeopardy
6. Energy Carnival

Step VII
1. Energy Poll
2. Unit Exam

OUTREACH (K–12)

Step I – VII
Basic or Comprehensive Unit

Outreach
1. Conduct activities for others (Energy Expo)
2. Projects & Activities
3. Youth Awards Program

INTERMEDIATE (6-8)–BASIC

Step I: Get Organized
1. Energy Poll
Step II
1. EnergyWorks
2. Science of Energy
Step III
1. Energy in the Balance
2. Transparent Energy
Step IV
1. ElectroWorks
2. Current Energy Affair
Step V
1. Monitoring & Mentoring
Step VI
1. Energy Math Challenge (intermediate level)
2. Energy Jeopardy
Step VII
1. Energy Poll
2. Unit Exam

INTERMEDIATE COMPREHENSIVE

Step I: Get Organized
1. Energy Poll
Step II
1. Secondary Science of Energy
2. Thermo Dynamics (advanced students)
Step III
1. Energy in the Balance
2. Transparent Energy
3. Great Energy Debate Game
4. Energy Enigma
Step IV
1. ElectroWorks
2. Electric Connections
3. Current Energy Affair
4. Mission Possible (advanced students)
Step V
1. Monitoring & Mentoring or Learning & Conserving
2. Museum of Solid Waste and Energy
3. This Week in Energy Conservation
4. Energy Conservation Contract
Step VI
1. Energy Math Challenge (intermediate level)
2. Yesterday in Energy
3. Energy Around the World
4. Exploring Energy
5. Marine Energy (advanced students)
4. Energy Jeopardy
5. Energy Carnival
Step VII
1. Energy Poll
2. Unit Exam

SECONDARY (7-12) BASIC

Step I: Get Organized
1. Energy Poll
Step II
1. Secondary Science of Energy
Step III
1. Transparent Energy or Energy Source Expo
2. Energy Enigma or Energy Debate
Step IV
1. ElectroWorks
2. Electric Connections
3. Current Energy Affair
4. Mission Possible
Step V
1. Learning & Conserving
2. Eneryg Conservation Contract
Step VI
1. Energy Jeopardy
Step VII
1. Energy Poll
2. Unit Exam

SECONDARY COMPREHENSIVE

Step I: Get Organized
1. Energy Poll
Step II
1. Secondary Science of Energy
2. Thermo Dynamics
Step III
1. Transparent Energy or Energy Source Expo
2. Great Energy Debate Game
3. Energy Enigma
Step IV
1. ElectroWorks
2. Current Energy Affair
3. Mission Possible
Step V
1. Learning & Conserving
2. Energy Conservation Contract
3. Museum of Solid Waste and Energy
Step VI
1. Energy Around the World
2. Energy Math Challenge (secondary level)
3. Marine Energy
4. Energy Jeopardy
Step VII
1. Energy Poll
2. Unit Exam

Group Contract

Directions: One member of your group should read the section below aloud as the other members of the group follow along.

TEAM SPIRIT

When a football team wins a championship, or a movie wins an award, or a medical team makes a great scientific discovery, the spokesperson for the group thanks all the people involved in the effort.

In the case of a winning Super Bowl team, the coach gives credit for the victory to his assistant coaches, the football players, the scouts, the owner, and the fans. At the Academy Awards, the producer of the best picture thanks the writers, the actors, the cinematographers, and the many others who made the film a success. And when you hear about a medical team that's developed a new artificial limb, or found the cure for a disease, credit goes to the doctors, the biologists, the technicians, and the support staff.

In all these cases, a group of people, each with different skills and abilities, worked together for a common goal. When they achieved their goal, the members of these groups felt proud to be a team member. Most leading actors and star athletes will tell you that the team spirit and accomplishments meant more to them than the individual praise they received for their performances.

YOUR CONTRACT

The purpose of this Group Contract is to have the members of our group discuss the importance of team work, and to make a commitment to do their best on our energy project. A weak member of the group can cancel out the outstanding efforts of the others.

Let's take five minutes to discuss unsuccessful group experiences you may have had as a member of a sports team, a Scout troop, a band, or another group. What did it feel like to be part of an unsuccessful team? What made the team unsuccessful? Develop an eight to ten item list and be ready to hand it in to the teacher at the end of this assignment.

Now let's take another five minutes to discuss successful group experiences that you may have had. What did it feel like to be part of a winning team? What made the team so successful? Develop an eight to ten item list and be ready to hand it in to the teacher at the end of this assignment.

The group should now discuss what each of us must do to make our energy education project one of the best ever created by a group of students. As we set our goals, keep in mind that, in many cases, our project can be submitted for state and national awards. Now let's write a contract that we all can agree on. A typical group contract might be written as shown below.

We, the members of the (name of project) agree to:

- get our work in on time;
- give 100 percent effort;
- rehearse parts at home;
- give the proper amount of time to each task;
- not be a disruptive force during group meetings and work time;
- give criticism in a positive way.

Once your group has written its contract, all the members must sign it. Then give the completed contract to your teacher along with your group's two lists.

Energy Unit Exam

SCIENCE OF ENERGY

_____1. Heat (thermal) energy is the motion of ...
a. molecules b. electrons c. substances d. protons

_____2. Heat (thermal) energy in solids moves by ...
a. conduction b. radiation c. convection d. all three

_____3. Heat (thermal) energy in liquids moves by ...
a. conduction b. radiation c. convection d. all three

_____4. Light (radiant) energy travels ...
a. in a straight line b. in waves c. through space d. all three

_____5. Molecules are farthest apart in ...
a. solids b. liquids c. gases

_____6. Potential energy is the energy of ...
a. inertia b. gravity c. position or place d. atoms

_____7. Kinetic energy is the energy of ...
a. solids b. liquids c. gases d. motion

_____8. Sound travels in waves through ...
a. air b. solids c. liquids d. all three

_____9. All energy for growth comes from ...
a. minerals b. light energy c. the soil d. the atmosphere

_____10. The force of attraction between all objects is ...
a. electricity b. magnetism c. gravity d. inertia

_____11. Almost all energy can be traced back to this form of energy.
a. electrical b. chemical c. radiant d. nuclear

_____12. Most of the world's energy is stored in which form of energy?
a. chemical b. electrical c. nuclear d. mechanical

_____13. During photosynthesis, a plant ...
a. absorbs energy b. gives off energy c. repels energy d. creates energy

_____14. Electrical energy can be produced from...
a. mechanical energy b. chemical energy c. radiant energy d. all three

_____15. The human body uses the chemical energy in food to produce ...
a. mechanical energy b. electrical energy c. thermal energy d. all three

CONSUMPTION/CONSERVATION

_____16. Which uses the most energy in the American home each year?
a. lighting b. water heating c. heating and cooling rooms d. refrigeration

_____17. Which type of bulb is the most energy efficient?
a. fluorescent b. incandescent c. halogen

_____18. Where should a building be insulated?
a. ceiling b. walls c. floor d. all three

_____19. If the Energy Efficiency Rating of an appliance increases, the energy it uses will ...
a. increase b. decrease c. remain the same

_____20. We measure large amounts of energy in ...
a. Btu's b. kilowatts c. joules d. quads

_____21. In the summer, when is the peak energy demand?
a. 6:00 a.m. to noon b. noon to 6:00 p.m. c. 6:00 p.m. to midnight

FOSSIL FUELS

_____22. Which energy source gives the U.S. most of its energy?
a. petroleum b. coal c. natural gas d. solar

_____23. Coal, petroleum, natural gas, and propane are fossil fuels. They are ***called*** fossil fuels because:
a. they are burned to release energy and they cause air pollution
b. they are formed from the buried remains of plants and animals that lived years ago
c. they are nonrenewable and will run out
d. they are mixed with fossils to provide energy

_____24. Gasoline is produced by refining which fossil fuel?
a. natural gas b. coal c. petroleum d. propane

_____25. Which is the cleanest-burning fossil fuel?
a. coal b. natural gas/propane c. petroleum d. all are equal

_____26. Two-thirds of which fossil fuel is imported from foreign countries?
a. natural gas b. petroleum c. coal d. propane

_____27. Propane is used instead of natural gas on many farms and in rural areas. Why is propane often used instead of natural gas?
a. it's safer b. it's portable c. it's cleaner d. it's cheaper

_____28. The major use of coal in the United States is to...
a. make electricity b. fuel trains c. heat homes d. make chemicals

_____29. Which fossil fuel is formed from the remains of ancient ferns, plants, and forests?
a. petroleum b. coal c. natural gas d. all three

_____30. What sector of the U.S. economy consumes most of the nation's petroleum?
a. residential b. commercial c. industrial d. transportation

_____31. Propane production is a result of cleaning or processing...
a. natural gas b. petroleum c. both natural gas and petroleum

_____32. Which gas can be changed into a liquid by using a moderate amount of pressure?
a. natural gas b. propane c. both at the same pressure

_____33. Natural gas is transported mainly by...
a. pipelines b. trucks c. barges d. all three equally

_____34. A rise in railroad rates would affect the cost of which energy source the most?
a. petroleum b. coal c. natural gas d. uranium

_____35. Which sector of the U.S. economy consumes the greatest amount of natural gas?
a. residential b. transportation c. industry d. commercial

_____36. Global warming focuses on an increase in the level of which gas in the atmosphere?
a. ozone b. sulfur dioxide c. carbon dioxide d. nitrous oxide

_____37. Carbon and which other chemical element are common in fossil fuels, providing energy when burned?
a. nitrogen b. hydrogen c. sulfur d. oxygen

RENEWABLES

_____38. Solar, biomass, geothermal, wind, and hydropower energy are all renewable sources of energy. They are ***called*** renewable because they...
a. are clean and free to use
b. can be converted directly into heat and electricity
c. can be replenished by nature in a short period of time
d. do not produce air pollution

_____39. Which renewable energy sources are the result of the sun's energy striking the earth?
a. hydropower b. biomass c. wind d. all three

_____40. Today, what percentage of the nation's energy supply is provided by renewables?
a. 1% b. 7% c. 15% d. 25%

_____41. Today, which renewable energy source provides the U.S. with the most energy?
a. wind b. solar c. geothermal d. hydropower

_____42. Biomass energy is a result of burning which of the following?
a. garbage b. wood c. agricultural waste d. all three

_____43. The cost of producing electricity from photovoltaic (PV) cells compared to coal is...
a. half the cost b. about the same c. twice the cost d. four times the cost

_____44. What percent of the sun's energy is converted into electricity with a PV cell?
a. 10% b. 25% c. 50% d. 75%

_____45. Over the course of a year, how much time does a windmill generate electricity?
a. 10% b. 25% c. 50% d. 75%

_____46. The thermal energy found below the earth's crust is primarily a result of...
a. continental drift
b. radioactive decay of elements
c. heat remaining from the creation of the earth
d. burning gases

_____47. Compared to other renewables, the energy produced by hydropower is...
a. much more b. much less c. about the same

_____48. The energy in which of the following is a result of photosynthesis?
a. coal b. natural gas c. petroleum d. all three

_____49. Compared to coal or nuclear power, the cost of electricity from hydropower is...
a. more b. less c. about the same

ELECTRICITY

_____50. Electricity is the movement of ...
a. atoms b. molecules c. electrons d. neutrons

_____51. Any kind of element is determined by the number of its ...
a. atoms b. protons c. electrons d. neutrons

_____52. If an atoms has 15 protons, it will also have 15 ...
a. atoms b. neutrons c. electrons d. molecules

_____53. In an atom, the particle which carries a positive charge is the ...
a. proton b. electron c. neutron d. nucleus

_____54. The North pole of a magnet ...
a. attracts electrons b. repels electrons c. is positive

_____55. Moving a magnet in a coil of wire produces ...
a. gravity b. electricity c. a battery d. a turbine

_____56. Moving electrons through a coil of wire produces a ...
a. battery b. magnetic field c. parallel circuit d. fuse

_____57. All the components are in one loop in a ...
a. battery b. parallel circuit c. series circuit d. molecule

_____58. In a parallel circuit, if one bulb burns out, the rest of the bulbs will ...
a. stop glowing b. keep glowing c. get dimmer

_____59. During the last ten years, the nation's demand for electricity has...
a. increased b. decreased c. remained the same

_____60. How much of the energy in burning coal reaches the consumer as electricity?
a. 33% b. 50% c. 75% d. 90%

_____61. Baseload power plants produce power...
a. day and night
b. primarily at night
c. only during peak hours
d. only before and after peak times

_____62. Which energy source generates more than half of U.S. electricity today?
a. coal b. uranium (nuclear) c. hydropower d. petroleum

_____63. In a nuclear power plant, uranium atoms ...
a. combine and give off heat energy
b. split and give off heat energy
c. burn and give off heat energy
d. split and give off electrons

_____64. Alternating current is used instead of direct current in our power system because it ...
a. can be transported longer distances
b. is cheaper to produce
c. has more power per watt
d. is safer to use

_____65. The biggest expense of nuclear power generation is...
a. fuel
b. building and licensing the power plant
c. disposing of the waste
d. operating the reactor

_____66. Today, the waste generated by nuclear power plants is stored...
a. at interim sites across the nation
b. at the power plants where the waste is produced
c. in the nation's repository in Yucca Mountain, Nevada

_____67. Power plant size is measured using what unit of power?
a. kilowatt b. megawatt c. gigawatt d. septawatt

_____68. In a cogeneration plant, the waste heat is used to...
a. generate electricity
b. manufacture or process a product
c. either a or b

_____69. When electricity leaves a power plant along transmission lines, its voltage is increased because it...
a. travels faster
b. experiences less power loss
c. has higher amperage
d. all three reasons

_____70. In the future, the world's use of electricity will ...
a. increase b. decrease c. remain the same

ENERGY UNIT EXAM—PART II: ESSAY QUESTIONS

Before writing the essays, your group should brainstorm all the important ideas that should be included in the essays. Please attach the list of ideas you brainstormed along with the written essays.

1. You have been asked to write an article for a local newspaper on the importance of saving energy in your home. Your article should begin with the importance of energy conservation. Make sure your article contains at least one energy saving measure from each of the following areas: water heating, lighting, home heating/cooling, and cooking.

2. You have unearthed a time capsule that has been buried for 100 years. The capsule contains six items that show how energy was used by the average American family in 1895. Describe each item, how it was used, and the source of energy that made it work.

3. You turn on a lamp in your bedroom and the radiant energy from the lamp enables you to see. Starting with that radiant energy, trace the possible energy transformations back to nuclear energy.

4. Your team has been selected by the United Nations to assist an underdeveloped country with its energy plan for the future. Affordable and environmentally acceptable energy supplies are needed to boost the standard of living of the country's inhabitants. Your job is to develop a list of at least ten questions that you need answered prior to developing an energy plan. List those questions and explain why this information is needed.

5. As new businesses, industries, and families move into your area, electricity demand continues to grow. To avoid the need for additional power plants, you have been asked to develop a plan that will reduce consumption. Make sure your plan includes suggestions for reducing electricity use during peak load periods.

Energy Poll Guide

A QUICK LOOK AT THE ENERGY POLLS

The **Energy Polls** can be used to assess students' basic energy knowledge, as well as their opinions about energy issues, before and after your classroom energy unit.

AGES: GRADES 5-8 (INTERMEDIATE) & 7-12 (SECONDARY)
PREPARATION: LOW TO MODERATE
TIME: 30 MINUTES

GET READY

Choose the suitable poll for the grade level of your class. Make one copy of the poll for each student. If you prefer, you can make one transparency of the poll and have the students answer the questions on a piece of paper. In either case, keep the results of the pre-poll so that students can compare their answers after your energy unit.

GO

Direct the students to take the poll as honestly as possible and not to make wild guesses. Explain that the poll will be an important assessment tool to show what they have learned and how their attitudes have changed.

Once you have administered the poll, go over the answers with the students. As a supplemental activity, discuss and chart the answers to the opinion questions. Collect the answers and save them to use after your energy unit is completed.

NEED is no longer able to process scanning cards to provide results for the poll. We are in the process of placing the poll on our website, so students can take the poll and class results can be analyzed via computer. We will let you know as soon as this service is available. Check our website - www.need.org for up-to-date information.

POLL ANSWERS

Some questions are simply opinion and have no correct answers.
Here are the answers to the knowledge questions:

Intermediate:

1. C	12. B
2. C	13. C
3. D	14. C
4. B	15. B
5. D	16. B
6. C	17. A
9. B	18. D
10. D	19. A
11. A	20. B

Secondary:

2. D	12. C	20. B
3. B	13. C	21. D
4. D	14. C	22. C
5. C	15. C	23. B
8. B	16. A	24. D
9. D	17. C	25. D
10. A	18. A	

Intermediate Energy Poll

Some questions are knowledge questions, others are opinion questions. Read each question and mark the response that answers the question or most closely matches your opinions. Choose *I don't know* if you can't make a good guess.

1. The energy in the food we eat comes from which sources?
   A. Water B. Soil C. Sun D. All three

2. The force of attraction between all objects is called what?
   A. Magnetism B. Electricity C. Gravity D. Inertia

3. Most of the energy in the world began in what form?
   A. Electrical B. Chemical C. Radiant D. Nuclear

4. In what form is most of the energy we use today stored?
   A. Electrical B. Chemical C. Radiant D. Nuclear

5. Most energy will eventually turn into what form?
   A. Electrical B. Chemical C. Radiant D. Thermal

6. Which uses the most energy in the American home each year?
   A. Lighting B. Heating water C. Heating/cooling rooms D. I don't know

7. Should people be required by law to save energy in their cars and homes?
   A. Definitely not
   B. Only in an energy crisis
   C. Yes, they won't do it on their own
   D. I'm not sure

8. About seven percent of the nation's energy is supplied by renewable sources of energy. What percentage of the nation's energy do you think renewables will supply in the year 2010?
   A. 5% B. 10% C. 25% D. 50%

9. Solar, biomass, geothermal, wind, and hydropower are all renewable sources of energy. They are *classified* as renewable because they...
   A. are clean and free to use.
   B. can be replenished in a short period of time.
   C. get their energy from the sun.
   D. I don't know

10. Which of the energy sources below get their energy from the sun shining onto the earth?
    A. Hydropower B. Biomass C. Wind D. All three

11. Which renewable energy source provides the U.S. with the most energy?
    A. Hydropower B. Biomass C. Wind D. Geothermal

12. The energy in fossil fuels is stored as which form of energy?
    A. Nuclear B. Chemical C. Radiant D. I don't know

13. Gasoline is produced by refining which fossil fuel?
A. Natural Gas B. Coal C. Petroleum D. I don't know

14. Which is the cleanest burning fossil fuel?
A. Coal B. Petroleum C. Natural gas/propane D. I don't know

15. Two-thirds of which fossil fuel is imported from other countries?
A. Natural Gas B. Petroleum C. Coal D. I don't know

16. Propane is used in rural areas, on farms, and to fuel appliances on campers. Why is propane used instead of natural gas?
A. It's safer. B. It's portable. C. It's cleaner. D. I don't know

17. The major use of coal in the United States today is to...
A. generate electricity. B. fuel trains.
C. heat buildings and homes. D. I don't know

18. Electricity can be produced directly from...
A. mechanical energy. B. radiant energy. C. chemical energy. D. All three

19. Which energy source generates more than half the nation's electricity today?
A. Coal B. Uranium (nuclear) C. Hydropower D. I don't know

20. Uranium is the fuel used in nuclear power plants. The uranium atoms give off energy when:
A. they combine to form larger atoms. B. they split into smaller atoms.
C. they are burned in a reactor. D. I don't know

Secondary Energy Poll

Some questions are knowledge questions, others are opinion questions. Read each question and mark the response that answers the question or most closely matches your beliefs. Choose *I don't know* if you can't make a good guess.

1. How informed are you about energy?
   - A. Very informed
   - B. Somewhat informed
   - C. Neither informed nor uninformed
   - D. Somewhat uninformed
   - E. Uninformed

2. Most of the energy we use on earth began as which form of energy?
   - A. Electrical
   - B. Chemical
   - C. Radiant
   - D. Nuclear
   - E. I don't know

3. In what form is most of the energy we use today stored?
   - A. Electrical
   - B. Chemical
   - C. Radiant
   - D. Nuclear
   - E. I don't know

4. Which form of energy will all energy eventually turn into?
   - A. Electrical
   - B. Chemical
   - C. Radiant
   - D. Thermal
   - E. I don't know

5. Which uses the most energy in the American home each year?
   - A. Lighting
   - B. Heating water
   - C. Heating and cooling rooms
   - D. Refrigeration
   - E. I don't know

6. Should people be required by law to save energy in their cars and homes?
   - A. Definitely not
   - B. Only in an energy crisis
   - C. Yes, people won't do it on their own
   - D. I'm not sure

7. About seven percent of the nation's energy is supplied by renewables. What percent do you think renewables will supply in the year 2010?
   - A. 5%
   - B. 10%
   - C. 25%
   - D. 50%
   - E. I don't know

8. Solar, biomass, geothermal, wind, and hydropower are *classified* as renewable because they...
   - A. are clean and free to use.
   - B. are replenished in a short period of time.
   - C. get their energy from the sun.
   - D. can be converted directly into electricity.
   - E. I don't know

9. Which of the energy sources below get their energy from the sun shining onto the earth?
   - A. Hydropower
   - B. Wind
   - C. Biomass
   - D. All three
   - E. I don't know

10. Which renewable energy source provides the U.S. with the most energy?
    - A. Hydropower
    - B. Wind
    - C. Geothermal
    - D. Biomass
    - E. I don't know

11. Should the government pass laws to require utilities to use renewable sources to generate part of their electricity? Advocates think this would encourage development of renewable technologies. Opponents believe there are better ways to achieve the same result. What is your opinion?
    - A. Strongly support requirement
    - B. Support requirement
    - C. No opinion
    - D. Oppose requirement
    - E. Strongly oppose requirement

12. The energy in fossil fuels is stored in which form of energy?
    - A. Nuclear
    - B. Thermal
    - C. Chemical
    - D. Electrical
    - E. I don't know

13. Which two elements are present in all fossil fuels?
    - A. Carbon and nitrogen
    - B. Nitrogen and hydrogen
    - C. Carbon and hydrogen
    - D. Oxygen and carbon
    - E. I don't know

14. Two-thirds of which fossil fuel in the U.S. is imported from other countries?

A. Natural gas
B. Coal
C. Petroleum
D. Propane
E. I don't know

15. Gasoline is refined from which fossil fuel?

A. Coal
B. Natural Gas
C. Petroleum
D. All three
E. I don't know

16. The major use of coal in the U.S. is to...

A. generate electricity.
B. heat homes and buildings.
C. fuel trains.
D. make steel.
E. I don't know

17. Propane is used in rural areas, on farms, and to fuel appliances on recreational vehicles. Why is propane used instead of natural gas?

A. It's safer
B. It's cleaner
C. It's portable
D. All three reasons
E. I don't know

18. Most natural gas in the U.S. is used to...

A. manufacture products.
B. heat homes and buildings.
C. fuel fleet vehicles.
D. generate electricity.
E. I don't know

19. The U.S. has major reserves of petroleum and natural gas off the East and West Coasts, in Alaskan waters, and in the Gulf of Mexico. Federal regulation prohibits drilling in many of these areas. Some people believe there should not be offshore drilling in any new areas. Others believe the U.S. government should allow drilling to reduce U.S.dependence on imported oil. What is your opinion?

A. Strongly support drilling
B. Support drilling in limited areas
C. Oppose drilling in most areas
D. Strongly oppose drilling
E. No opinion

20. When electricity leaves a power plant, its voltage is increased because it...

A. travels faster at high voltage.
B. loses less power at high voltage.
C. has less resistance at higher voltage.
D. All three reasons
E. I don't know

21. In a cogeneration plant, the waste heat is used to...

A. generate electricity.
B. heat buildings.
C. manufacture products.
D. Any of the first three
E. I don't know

22. Uranium atoms release energy when...

A. they combine to form larger atoms.
B. they are burned in a reactor.
C. they are split into smaller atoms.
D. they are detonated by an electrical charge.
E. I don't know

23. Which energy source generates more than half the electricity in the U.S. today?

A. Hydropower
B. Coal
C. Uranium
D. Natural Gas
E. I don't know

24. Compared to 1973, the level of air pollution in urban and suburban areas has...

A. increased significantly.
B. increased moderately.
C. remained about the same.
D. decreased.
E. I don't know

25. What is the major greenhouse gas associated with global climate change?

A. Ozone
B. Nitrous oxide
C. Sulfur dioxide
D. Carbon dioxide
E. I don't know

26. Many scientists believe that an increase in the level of greenhouse gases in the atmosphere is causing global temperatures to rise, in large part because of fossil fuel use. Others believe current research does not support this view. What is your opinion?

A. The government should act aggressively to reduce greenhouse gas emissions.
B. The government should act cautiously to reduce greenhouse gas emissions.
C. The government should do more research before it takes any action.
D. Current climate trends are part of normal variations and no action should be taken at this time.
E. No opinion

The Youth Awards Program

The 2000–2001 school year marks the 20th year of the NEED Project and the Youth Awards Program for Energy Achievement. We welcome you back to school with several new educational opportunities for you and your students to fill the year with energy and excitement!

As schools across the country look to the future, NEED provides innovative materials and training programs to help you and your school put energy into education. NEED continues to incorporate the Youth Awards Program for Energy Achievement into its school and community programs. As a central component of our evaluation and recognition, the Youth Awards Program recognizes student leadership, encourages students to evaluate their knowledge of energy, and provides ideas and programs that may be exchanged with other schools in the NEED program.

As your students participate in energy activities in the classroom and in the community, encourage them to keep a scrapbook that highlights their goals, activities, outreach opportunities, and their evaluation of the activities. The scrapbook is simple to complete, and should be compiled by the students as a team. In April, submit the scrapbook to your state's coordinator—located in your state or at NEED Headquarters in Virginia. These scrapbooks will be reviewed and awarded points at the state level and winning projects will be forwarded for national review.

The scrapbooks are reviewed by a panel of judges based on the following criteria:

Goal Setting	5
Activities to Reach Goals	25
Energy Content	20
Student Leadership	15
Community Involvement	5
Use of Resources	10
Project Evaluation	10
Project Documentation	10

Mark your calendar for the National Youth Awards Recognition Ceremonies, to be held in Washington, DC, June 22–25, 2001. Come help us celebrate! For more information about the Youth Awards Program for Energy Achievement or the National Recognition Ceremonies, please contact NEED Headquarters at 1-800-875-5029.

If you are unable to complete a scrapbook this year, please complete the program evaluation form on page 35 of this booklet and send it to us. The staff of NEED and our Board of Directors and sponsors would like to know what you're doing, and what we can do to help you put energy into your classroom.

Best wishes for a great school year,

Mary E. Spruill
Program Director

29

Planning Your Energy Project

LET'S GO!

Creating a great energy project takes work and organization, but it's also a lot of fun! Most successful energy education projects are planned in the fall. Some projects run year-round, while others run in conjunction with NEED Week (March 19–23, 2001) or with Energy Awareness Month in October. The award–winning projects are usually planned by schools' NEED clubs or energy/environmental clubs. The projects may involve one classroom, the entire school, the school district, or the entire community.

STEP ONE–ESTABLISH GOAL(S)

Your class or club should start planning your energy education project in the fall. Brainstorm goals you and your class would like to accomplish. Remember, your project must have energy as its primary focus. If you think you might need a little help, give NEED Headquarters a call at 1-800-875-5029.

Sample Goals

- Create an **Energy Expo** and invite all sixth-grade classes to tour it.
- Identify ten homes in the community that are in need of weatherization, and whose residents are on low or fixed incomes. Then secure the skills and supplies to weatherize the homes.
- Adopt a lower-grade class or classes, and prepare an energy lesson for them. If the students are in grades K-3, use **Primary Energy Stories and More**.
- Demonstrate the **Science of Energy**, **EnergyWorks**, or **ElectroWorks** experiments at a PTA meeting.
- Communicate about energy via the World Wide Web, or create a NEED web site for your school. NEED can help provide server space.
- Take your classroom energy activities school-wide or district-wide.
- Use NEED's **Energy Management Program** to develop an energy plan for your school—perform an energy survey to find out how your school uses energy and how to reduce energy use.

STEP TWO—ASSIGN TASKS

Once you know what you want to do for your energy project, you need to assign tasks. How will your school come together for this project? Which students will be involved? Make sure you have students to take photographs, design the scrapbook, and write the text for the scrapbook. The Project Adviser for the project is always the teacher, but the student director can be any student(s) with the ability to lead and energize their peers. You can make the scrapbook part of your activities, involving the English and art teachers and others.

STEP THREE—FUND RAISING *(OPTIONAL)*

You may need to raise money for your project or to attend the 2001 National Recognition Ceremonies. Registration for the conference will be $500. Fortunately, there are many ways to raise funds, so start early! You can raise money by holding car washes, bake sales, or by sponsoring a school dance or other event. You can also ask community groups or businesses to donate money or supplies to help your group. If you take the latter route, write a letter stating the purpose of your project and enlisting support. Follow up with a phone call or go in person to talk about your project.

STEP FOUR—GATHER DOCUMENTATION

Keep a record of photos to use in your scrapbook. Keep good notes on everything your group does that will become part of your scrapbook. For instance, if you write a letter to your Congressman and he/she responds, make sure you keep copies for your scrapbook. Your photographs, letters, evaluations, and samples of your group's work will become part of the documentation section of your scrapbook.

STEP FIVE—COMPLETE YOUR SCRAPBOOK

Obtain an 8 1/2" x 11" loose-leaf binder in which to compile your scrapbook. Use every blank space to tell our judges more about your project. Make sure you include the following:

YOUR SCRAPBOOK

Page 1:

The Youth Awards Application
(Found on page 34 of this booklet.)

Page 2:

The Project Summary
Have a student(s) write a 200 word summary of your project. If selected as a state or national winner, this summary will be included in the NEED Project's Annual Report. (If you would like to see other schools' project summaries, just call NEED Headquarters and request an Annual Report. It's a great way to see what other schools have done.) Take a group photo and attach it to your project summary. *Please do not cut or laminate the photo, or send a digital photo.* This photo may be used in the Annual Report.

Pages 3-?

Project Reporting Forms
Fill out a separate reporting form for each of the goals your group has agreed upon. The Review Panel looks for goals that can be accomplished and incorporate lots of energy education activities and objectives. Make as many copies of the reporting form(found on page 33 of this book) as you need. A sample goal can be found on page 32 of this book.

Documentation
Include documentation following each goal to highlight your activities. **Documentation is limited to 15 double-sided or 30 single-sided pages. Scrapbooks with more pages will not be considered in the national judging.**

CATEGORIES FOR COMPETITION

- **Primary Projects—Grades K-3**
- **Elementary Projects—Grades 4-5**
- **Junior Projects—Grades 6-8**
- **Senior Projects—Grades 9-12**
- **District Level—Across all grades and throughout the district**

NEED also recognizes Rookie Schools of the Year at the State and National Levels.

DEADLINES

The deadline for projects is April 16, 2001. Projects must be received at your state coordinator's office by that date. The projects are then reviewed for state awards and forwarded to NEED Headquarters by April 23, 2001, to be entered in national competition. Check your NEED Catalog for state coordinator information.

ELIGIBILITY

Remember, only NEED members are eligible to enter the competition. If you are unsure of your membership status, please call NEED Headquarters at 1-800-875-5029.

BENEFITS

What's good about doing an energy project? First, NEED activities help teachers and students achieve educational goals related to all disciplines: science, social studies, math, drama, art, language arts, music, etc. NEED's materials help fulfill educational standards in most disciplines and at all grade levels. Furthermore, preparing portfolios of work accomplished is an excellent learning experience for students.

PROJECT JUDGING CRITERIA

Your project will be reviewed by a panel of educators, students, business people, members of energy organizations, and others. The review panel will award your project points in eight areas as follows:

1. Project Goals **(0-5 points)**
The panel will review your project's goals. Your goals should represent the major achievements your project was striving to attain.

2. Activities to Reach Goals **(0-25 points)**
This is the most important category in the review and it receives the greatest weight in points. The panel will consider the number and quality of the activities. Activities should:

- *be useful and educational*
- *include school/community service*
- *have far-reaching/long-term results*
- *be well-organized and well-received*
- *be creative or fun*
- *include NEED materials*

3. Energy Content of Project **(0-20 points)**
The panel will review your activities to determine the energy content of your project. They will look for activities that involve energy source education, energy conservation, and energy uses.

4. Student Leadership **(0-15 points)**
The panel will review your activities to see if the students took ownership and demonstrated leadership in the activities.

5. Community Involvement **(0-5 points)**
The panel will determine how effectively the students interacted in their communities. Did the students work with other community groups or undertake community service projects?

6. Use of Resources **(0-10 points)**
The panel will determine how well your project made use of NEED materials and other resources. They will also see if you called upon knowledgeable people in your community to help make your project a success.

7. Evaluation Methods **(0-10 points)**
The panel will review your evaluation methods.

8. Documentation **(0-10 points)**
The panel will review your documentation. They will evaluate how well your project report communicates what you have accomplished.

STATE AWARDS PROGRAMS

Many state NEED programs host awards luncheons or programs to recognize the outstanding projects in the state. States present plaques and certificates to participating schools. Check your NEED catalog for state coordinator information.

NATIONAL YOUTH AWARDS PROGRAM

Your state committee will select the best projects at the Primary, Elementary, Junior, Senior, and District levels to compete in the national review in May. A national judging committee will review all the top state reports and select the School of the Year from each grade level. Finalists for School of the Year will receive special recognition as well. There is a category for Rookie of the Year at all grade levels. District-wide programs will be considered only for the District of the Year award.

NATIONAL RECOGNITION CEREMONIES

Representatives from all state projects are eligible to attend the NEED Project's National Recognition Ceremonies on June 22–25, 2001. This four day conference is organized and staffed by NEED student leaders to recognize outstanding teachers and students nationwide. Delegates receive recognition for their projects, learn about new NEED activities, and share ideas and fun with their counterparts from other states. Registration fees are $500 per person and include double–occupancy lodging, meals (except for one lunch), local transportation, a formal awards ceremony, the Spirit of Washington Dinner Cruise, tours of Washington, D.C. and Arlington Cemetery, and other special events. Some sponsorships may be available for schools. Call the NEED office for availability.

SAMPLE GOAL

GOAL: To conduct an **Energy Expo** at our school.

ACTIVITIES:

1. Obtained permission from principal to conduct activity.
2. Had all classes sign up to present exhibits on energy sources, etc.
3. Secured free/discount coupons for pizza and ice cream as incentives for students/teachers to participate.
4. Put up posters about the expo around the school.
5. Asked the Science Club to present NEED's **EnergyWorks** and **Science of Energy** experiments.
6. Sent invitations to parents and other schools to visit the expo.
7. Followed-up with thank you notes and prizes to participating teachers and the Science Club.

STUDENT LEADERSHIP: A committee of NEED students planned and organized the expo.

RESOURCES:

1. NEED's **Energy Expo, Energy Infobooks, EnergyWorks, Science of Energy.**
2. Pamphlets from our local utility company.
3. Encyclopedia Americana.
4. Energy websites linked to NEED.

EVALUATION:

1. Evaluated the project with completed evaluation forms.
2. Reviewed the evaluation forms we handed to participating teachers and students.
3. All of the teachers and 95 percent of the students indicated they would like to have another fair next year.
4. Four hundred people attended the fair.

NEED YOUTH AWARDS PROGRAM FOR ENERGY ACHIEVEMENT

PROJECT REPORTING FORM

(make one copy for each goal)

STATE ____ SCHOOL NAME _____ FORM _____ OF____

GOAL # _____

ENERGY CONTENT ACTIVITIES:

STUDENT LEADERSHIP:

RESOURCES:

EVALUATION:

NEED YOUTH AWARDS PROGRAM FOR ENERGY ACHIEVEMENT

APPLICATION FORM

STATE _____ SCHOOL NAME _____

PROJECT LEVEL

____ PRIMARY (K-3)
____ ELEMENTARY (4-5)
____ JUNIOR (6-8)
____ SENIOR (9-12)
____ DISTRICT-WIDE
____ FIRST-TIME ENTRY

CHECKLIST

____ Finished Application
____ Project Summary (200 words or less)
____ Group Photo (*Do not cut laminate. No digital.*)
____ Reporting Forms (As many as needed)
____ Documentation (15 pages front and back)
____ Standard-size Scrapbook (8 ½ x 11)

Make this application the first page of your project report. Submit your report to your state NEED coordinator by April 16, 2001. If your state does not have a NEED coordinator, please call NEED Headquarters at 1-800-875-5029 for instructions.

PROJECT TITLE			
FULL SCHOOL NAME	CLUB NAME IF APPLICABLE		
SCHOOL STREET ADDRESS			
CITY / TOWN	COUNTY	STATE	ZIP CODE
SCHOOL PHONE NUMBER (w/AREA CODE)	LAST DAY OF SCHOOL	US CONGRESSIONAL REPRESENTATIVE	
SCHOOL FAX NUMBER (w/AREA CODE)	EMAIL ADDRESS	SCHOOL WEB SITE	

PROJECT ADVISER	STUDENT DIRECTOR(S)
SCHOOL PRINCIPAL	NUMBER OF STUDENTS COORDINATING PROJECT
NUMBER OF PEOPLE YOUR PROJECT REACHED DIRECTLY	NUMBER OF PEOPLE YOUR PROJECT REACHED INDIRECTLY (MEDIA COVERAGE, ETC.)
HOME PHONE NUMBER OF ADVISER (w/AREA CODE)	

THE FINE PRINT

As the project adviser and student director(s), we declare that the attached report has been written and assembled with the participation of students and that all information and data in this report are true. We have double checked to ensure that all materials are included and that documentation has been limited to 30 single-sided or 15 double-sided pages no larger than 8½ x 11 inches.

PROJECT ADVISER SIGNATURE	STUDENT DIRECTOR(S) SIGNATURE(S)
PROJECT ADVISER PRINTED NAME	STUDENT DIRECTOR(S) PRINTED NAME (S)
DATE	DATE

NEED Program
Evaluation Form

State: _____ Grade Level: _____ Number of Students: _____

1.	Have you attended a NEED conference or workshop?	Yes	No
2.	Did you conduct a complete energy unit?	Yes	No
3.	Were the instructions clear and easy to follow?	Yes	No
4.	Did the unit meet your academic objectives?	Yes	No
5.	Was the unit age appropriate?	Yes	No
6.	Were the allotted times sufficient to conduct the unit?	Yes	No
7.	Was the preparation time acceptable for the unit?	Yes	No
8.	Were the students interested and motivated?	Yes	No
9.	Will you conduct a NEED energy unit again?	Yes	No

How would you rate the program overall?

What would make the program more useful to you?

Please mark the materials you used:

_____ Infobooks
_____ Energy Source Expo
_____ U.S. Energy Geography
_____ Science of Energy
_____ Thermo Dynamics
_____ Games and Icebreakers
_____ Primary Stories & More
_____ Energy in the Balance
_____ Transparent Energy
_____ Rock Performances
_____ Debate Game
_____ Energy Poll
_____ EnergyWorks
_____ Energy Enigma
_____ Mission Possible
_____ Electric Puzzles
_____ Current Energy Affair
_____ Today in Energy
_____ Energy Conservation Contract
_____ Building Buddies
_____ Monitoring/Mentoring
_____ Learning/Conserving
_____ Museum of Solid Waste & Energy
_____ Youth Awards Guide
_____ ElectroWorks
_____ Exploring Energy
_____ Math Challenge
_____ Yesterday in Energy
_____ Around the World
_____ Marine Energy
_____ Projects & Activities
_____ Jeopardy
_____ Energy on Stage
_____ Energy Carnival
_____ NEED Songbook

Please fax or mail to:

The NEED Project
PO Box 2518
Reston, VA 20195
FAX: (703) 471-6306

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Independent Oil and Gas Association of WV
Independent Petroleum Association of America
Independent Petroleum Association of NM
IN Division of Family and Children, Housing and Community Services
IN Department of Commerce, Energy Policy Division
IN Community Action Association
Integrated Waste Services Association
Interstate Natural Gas Association of America
Kentucky Coal Council
Kentucky Division of Energy
Kentucky Oil and Gas Association
Kentucky River Coal Corporation
Llano Land and Exploration
Lower Colorado River Authority
Maine Energy Education Project
Marathon Oil
Michigan Oil and Gas Association
MidAmerica Energy and Resource Partners
Minerals Management Service, U.S. Department of the Interior
Mississippi Division of Energy
Mitchell Energy
Narragansett Electric
National Renewable Energy Laboratory
National Ocean Industries Association
Nebraska Public Power District
NM Energy, Minerals and Natural Resources Division
NM Oil and Gas Association
NC Division of Energy
North Texas Oil and Gas Association
Offshore Energy Center/Ocean Star
Ohio Energy Project
Pacific Gas and Electric Generating Company
Panhandle Producers and Royalty Owners Association
Permian Basin Petroleum Association
Petroleum Technology Transfer Council
Premiere, Inc.
Propane Education & Research Council
Rhode Island State Energy Office
Schlumberger
Shell Oil Company Foundation
Shell Exploration and Production
SC Energy Office
SC Department of Health and Environmental Control
TN Department of Economic and Community Development
Texaco
TEED Project
TX Independent Producers and Royalty Owners Association
TX State Energy Conservation Office
Total Offshore Production Systems
Toyota/Marshall University Science on Wheels Program
TransCoastal Marine Services
Union Light, Heat and Power
Unocal Geothermal
U.S. Department of Energy
USX Foundation
Virgin Islands Energy Office
Wake County EnergySavers Program, NC
Western States Petroleum Association

THE NEED PROJECT PO BOX 2518, RESTON, VA 20195 1-800-875-5029

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Organization/Address: NEED Project P O Box 10101, Manassas VA 20108	Telephone: 703 257-1117 FAX: 703 257 0037 E-Mail Address: mcallan@need.org Date: 5/17/01

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