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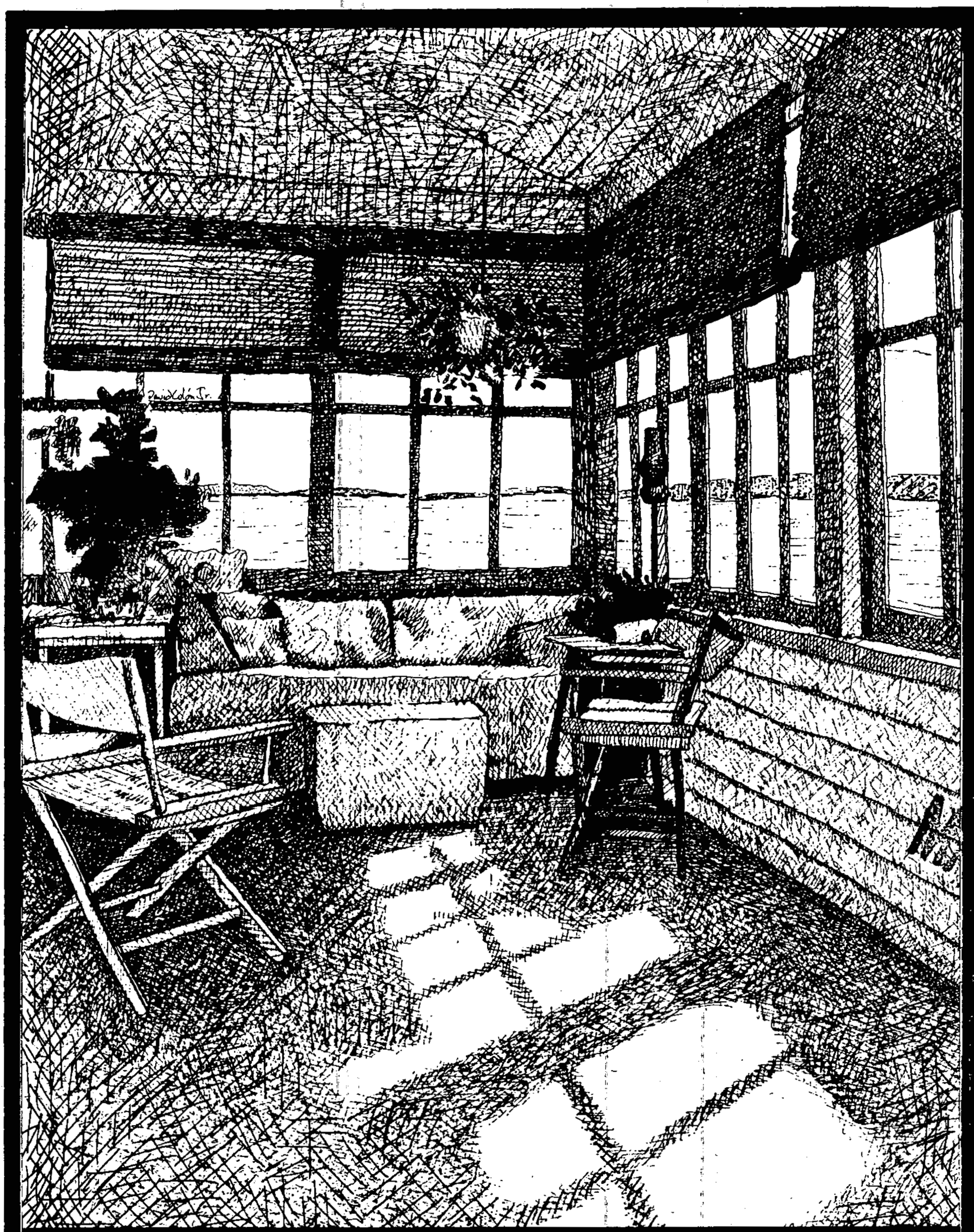
U.S. Department of Energy

Solar Energy Education

June 1981



Teacher's Guide

MASTER

HOME ECONOMICS

Field Test Edition

NOTICE

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Information on the Solar Energy Education curriculum may be obtained from:

Solar Energy Project
c/o New York State Education Department
Albany, New York 12234

Your comments on and evaluation of this field-test edition are solicited.

The Solar Energy Education Curriculum

The booklet in your hands is just one part of a series. The Solar Energy Education materials include

a **Solar Energy Text**,

a **Solar Energy Reader** in four parts:

Energy, Society, and the Sun (general),

Sun Story (history and literature),

Solar Solutions (practical applications), and

Sun Schooling (classroom-oriented readings),

Solar Energy Education Activities for

Science,

Industrial Arts,

Home Economics,

Social Studies, and

Humanities (Art, Music, and English), and

Solar Energy Education Teacher's Guides
to accompany the above activity booklets.

For more information on the Solar Energy Education curriculum, contact

Solar Energy Project
c/o Curriculum Services
New York State Education Department
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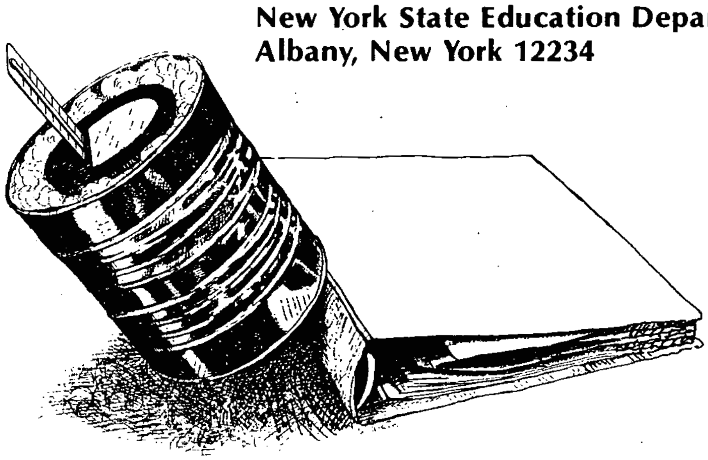

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Solar Energy Education

HOME ECONOMICS

Teacher's Guide

Field Test Edition

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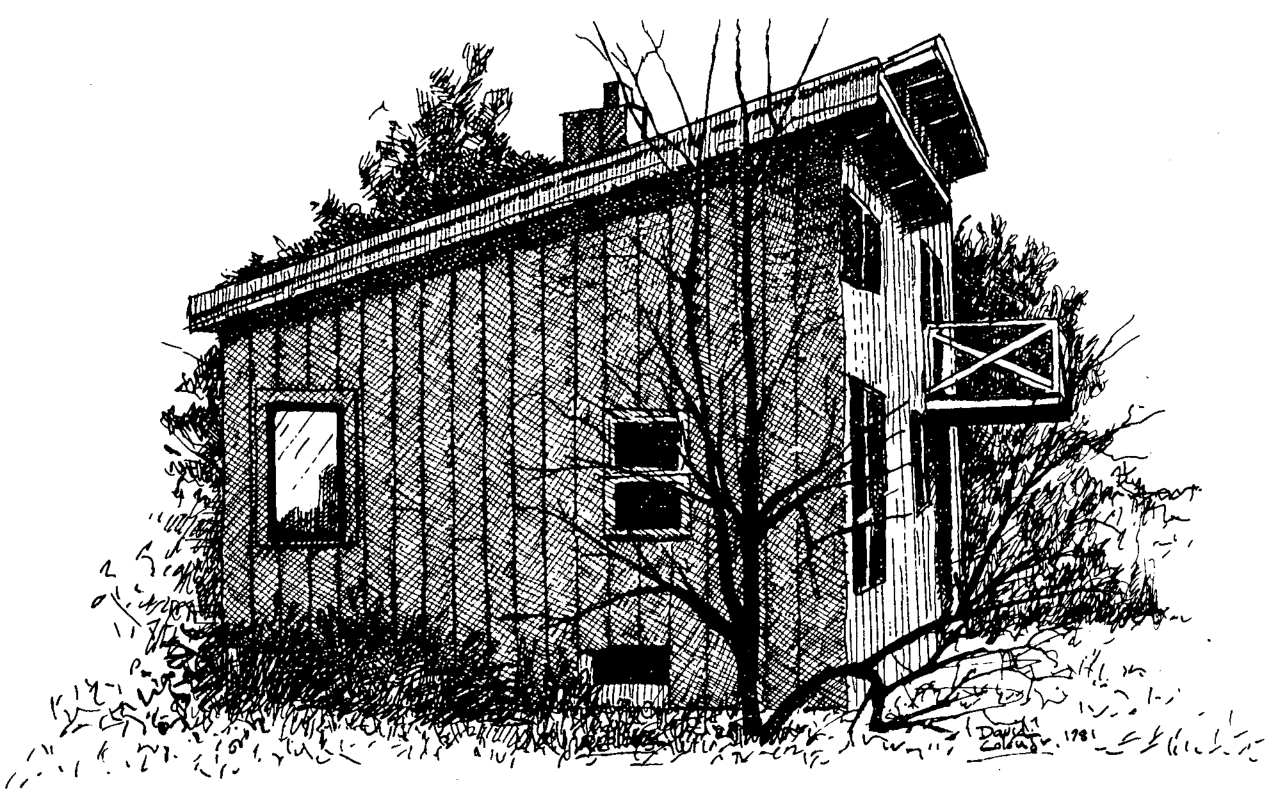
INTRODUCTION

The sun is the driving force behind all life on earth. In the last few decades, with abundant supplies of fossil fuel to support our standard of living, we have tended to forget this fact.

We've known for many years that the sun's energy could be used to great advantage but, because "conventional" fuels were cheap and easily obtained, the idea of using sunshine had to wait. It waited for us to demand more and more energy. It waited for us to develop fossil fuel supply problems. It waited until we now have so many inefficient machines that half the energy we consume leaks away as wasted heat. ...And still the sun waits.

Many Americans find our current energy problem difficult to deal with. Some deny that the problem really exists, even while they see prices rise and spendable income shrink. Many fear a reduction in their standard of living, and wonder if the end of the cheap fuel era will mean a devastating change in their lifestyles. They equate renewable energy and energy conservation with discomfort and sacrifice. These kinds of ignorance and confusion hamper our efforts to reach an energy consensus.

In this time of change, we in education know that the solution must begin with us. Home economics is particularly suited for this task. In home economics students can learn how sources of energy impact family relations, home management, and production of the necessities of life. They can develop the knowledge and skills to use renewable energy and energy conservation. Most important, they can weigh the lifestyle choices that will determine the nation's energy future.



ANNOTATED LIST OF ACTIVITIES

Activity 1

The Appliance Explosion

By comparing the kinds of appliances used in their own homes with those used in homes a generation ago, students are led to a graphic understanding of the enormous increase in residential energy use over the last generation.

Activity 2

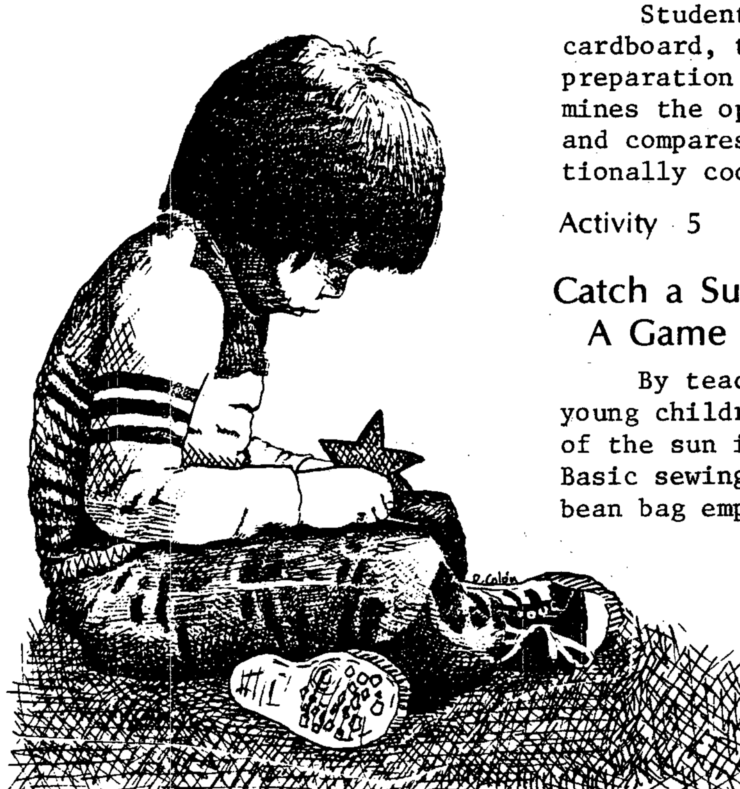
A Short Solar History

Using a data sheet on solar history, students construct a time line to express visually the advances in solar energy use throughout history. Emphasis is placed on the uses of solar energy that have provided a more comfortable home life.

Activity 3

Drying Foods with Solar Energy

A low-cost solar food dryer is constructed from a dishpan. Students use this dryer to preserve various fruits and vegetables, then evaluate the dried foods for taste and texture. Directions for solar drying are included.



Activity 4

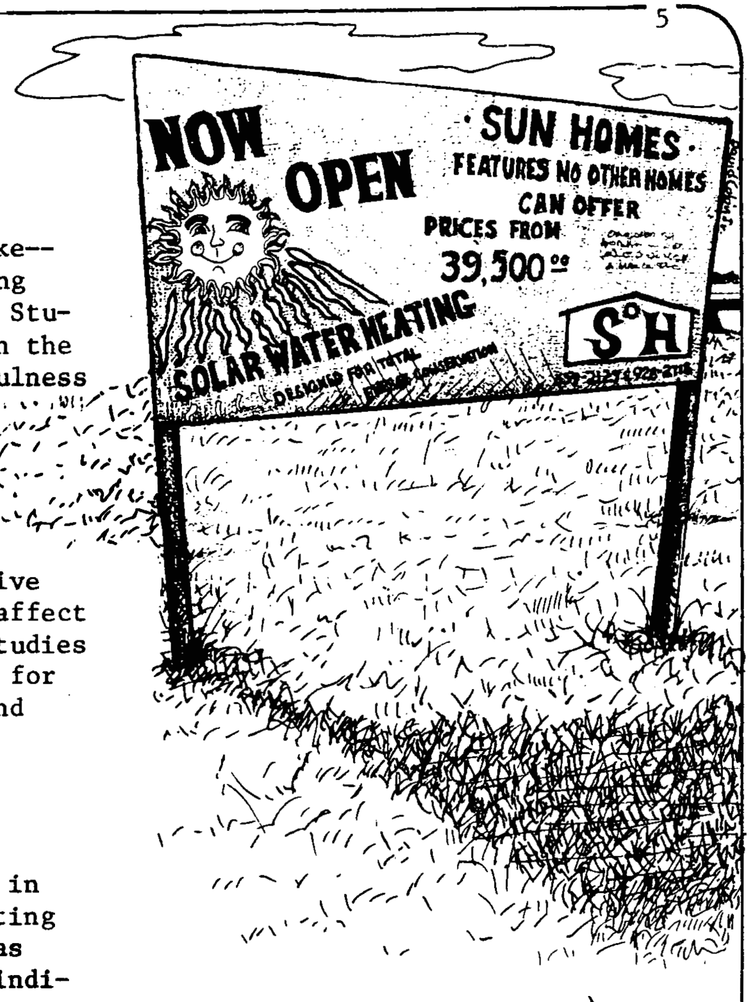
Preparing Foods Sunny-side Up

Students build a simple solar oven from cardboard, then use it to experiment with the preparation of various foods. The group determines the optimum conditions for solar cooking and compares solar cooked foods with conventionally cooked foods.

Activity 5

Catch a Sunbeam: A Game for Young Children

By teaching a simple lesson and game to young children, students learn the importance of the sun in the production of Vitamin D. Basic sewing skills are used to construct the bean bag employed in the game.



Activity 6

Sunny the Solar Snake

A draft stopper--a stuffed cloth snake--is used as a prop in a skit to excite young children's curiosity about solar energy. Students then conduct simple experiments with the children to help them understand the usefulness of the sun.

Activity 7

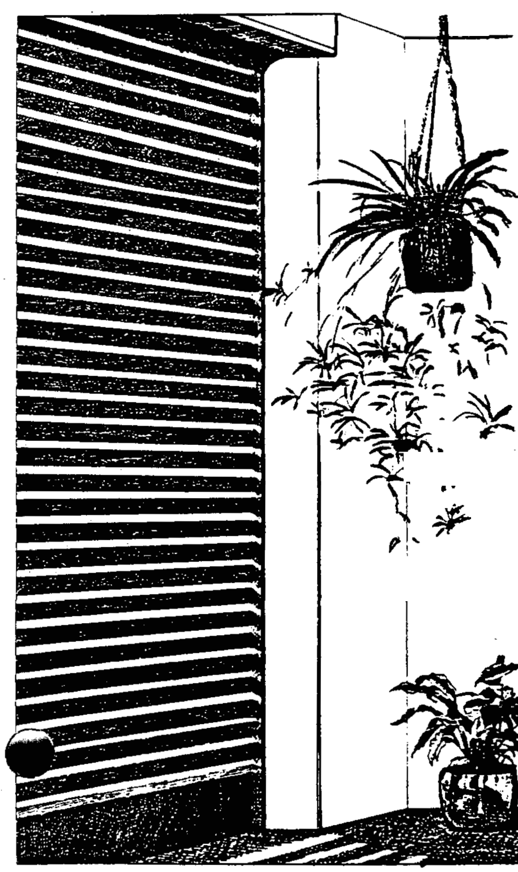
Living with Alternative Energy

Students consider how using alternative energy to heat or cool their homes might affect their families' lifestyles. Three case studies provide information on retrofitting homes for energy conservation, heating with wood, and managing passive solar homes.

Activity 8

Buying Solar Without Getting Burned

Students learn the important factors in making a wise purchase of solar water heating equipment. They research such questions as whether solar water heating will save an individual money and how to select an appropriate system.



Activity 9

Living with Solar Energy: Clothing's Role

A class fashion show illustrates how to dress for varying weather conditions: sunny or windy, hot or cold, wet or dry. Students learn the importance of layering clothes for added comfort.

Activity 10

Window Coverings for Solar Energy

Students examine the effect of windows on a room's comfort level. Using the reading activity provided and the results of research in books and magazines, students recommend window treatments for three case study situations.

The format of the solar activities has been specially planned to make the activities easy for both you and the student to use.

The Teacher Information Sheet

Choosing an Activity

Looking over the Teacher Information Sheet will help you to make a selection. Listed there are

- courses and skill areas for the activity, and
- skill and content objectives of the activity.

Getting Background

The background information is meant to save you time that might otherwise have to be spent looking for resources. For more information go to the list of references at the end of the Teacher Information Section.

Preparing for the Activity

The Teacher Information Sheet also provides

- an advance planning section
- suggested strategies for using the activity
- the activity's time frame
- points for student discussion
- possible modifications
- typical results
- methods of student evaluation

The Student Activity Sheets

Orienting the Student

Before work begins, point out the parts of the activity:

- the introduction, providing an overview
- the objectives, setting expectations
- prerequisite skills and knowledge
- procedures for performing the activity
- charts, tables, and graphs keyed to the procedure
- questions to test student understanding
- the "Looking Back" section, summarizing the activity
- the "Going Further" section, suggesting more possible activities

Reproducing the Worksheets

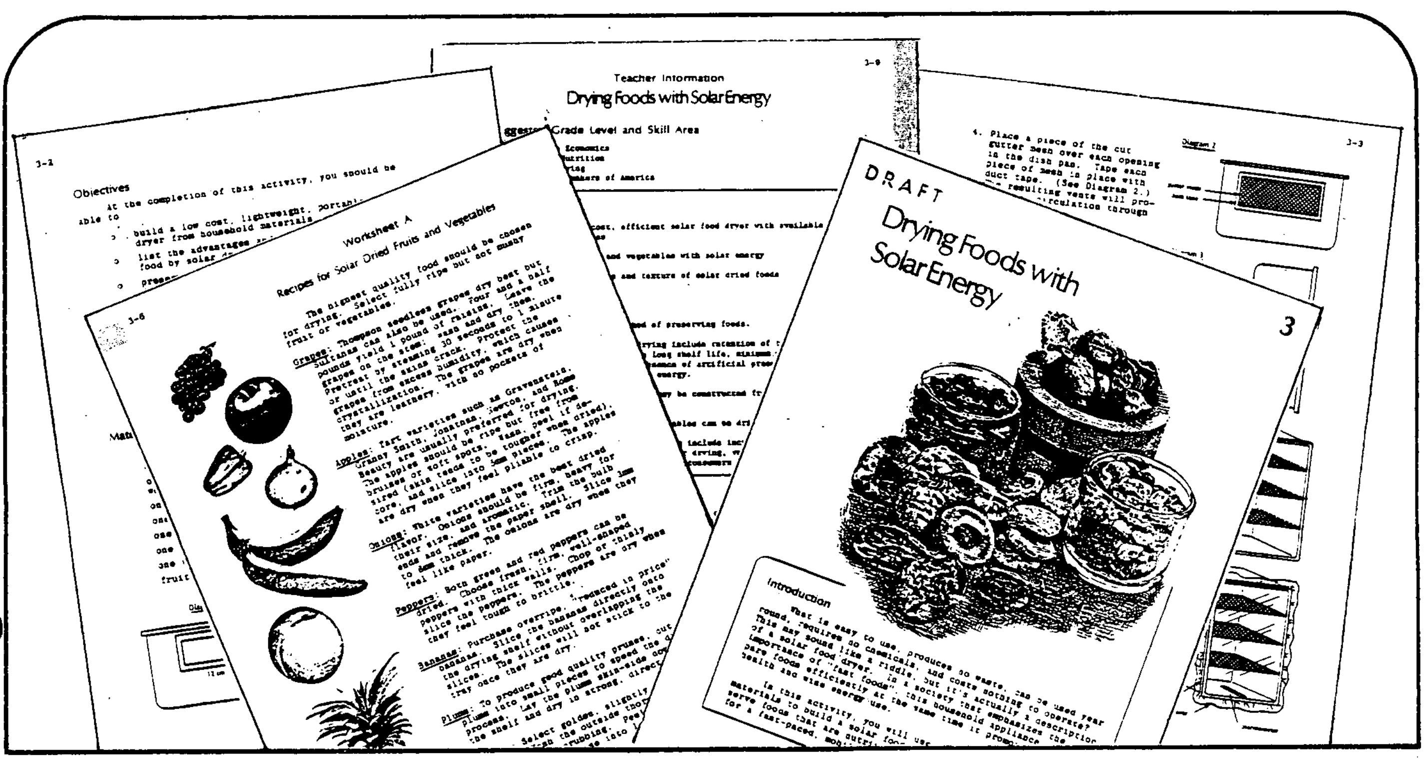
Student worksheets are marked with a gray square and are placed separately at the end of each activity.

These may be duplicated

- for use in class quantities, or
- to assemble as a separate student record book.

The following page numbers indicate student worksheets:

1-7	3-6	6-6	8-8
1-8	3-7	7-3	10-7
1-9	4-7	7-4	10-8
2-5	4-8	7-5	10-9
2-6	4-9	8-5	10-10
2-7	4-10	8-6	10-11
2-8	5-6	8-7	10-12



OTHER SOLAR ENERGY PROJECT MATERIALS

The Solar Energy Project produces other materials to go with the home economics activities. While some of these materials are still in preparation, others are already available.

The Solar Text

a comprehensive treatment of the solar field

appropriate for adults or advanced secondary students

may serve as the framework for a short course

has chapters that match individual activities

The Solar Reader

a compilation of articles from popular periodicals

covers all forms of solar energy

discusses the role of energy in society, history, and art

includes special selections for junior high students

The Science Activities

offer many ideas appropriate to home economics

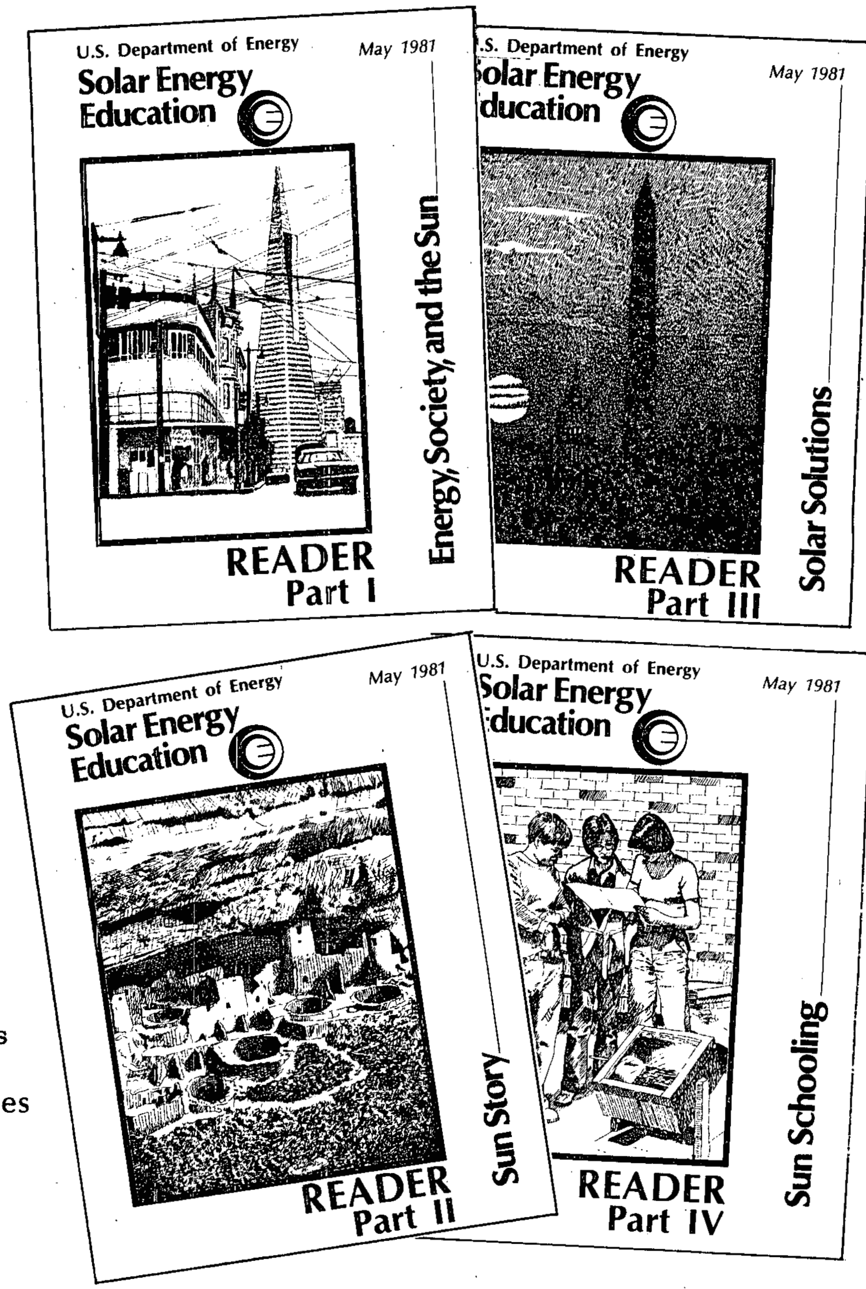
involve simple and inexpensive equipment

are divided into booklets for junior high science, earth science, biology, chemistry and physics, and general solar topics

The Solar Activities for Other Disciplines

are grouped into booklets for industrial arts, social studies, and humanities

offer excellent opportunities for teaming and interdisciplinary work



The emphasis of the Solar Energy Project materials is adaptability. Experiment with the activities and supplementary materials and fit them to your teaching style. Refer to the next section for ideas on how the project materials can be used.

TEACHING SOLAR ENERGY . . .

. . . in the Classroom

The solar activities for home economics are varied and adaptable. Try one of these approaches:

The Infusion Approach

work the activities into the existing curriculum
select activities that complement your course topics, such as food preparation or clothing selection and care
use the activities to develop or reinforce course skills and concepts

The Group Approach

use with low, high, or mixed ability groups
try out different grouping arrangements within the classroom

The Individualized Approach

select activities to match student skills
pace students according to ability
provide a variety of projects and promote sharing of ideas

The Mainstreaming Approach

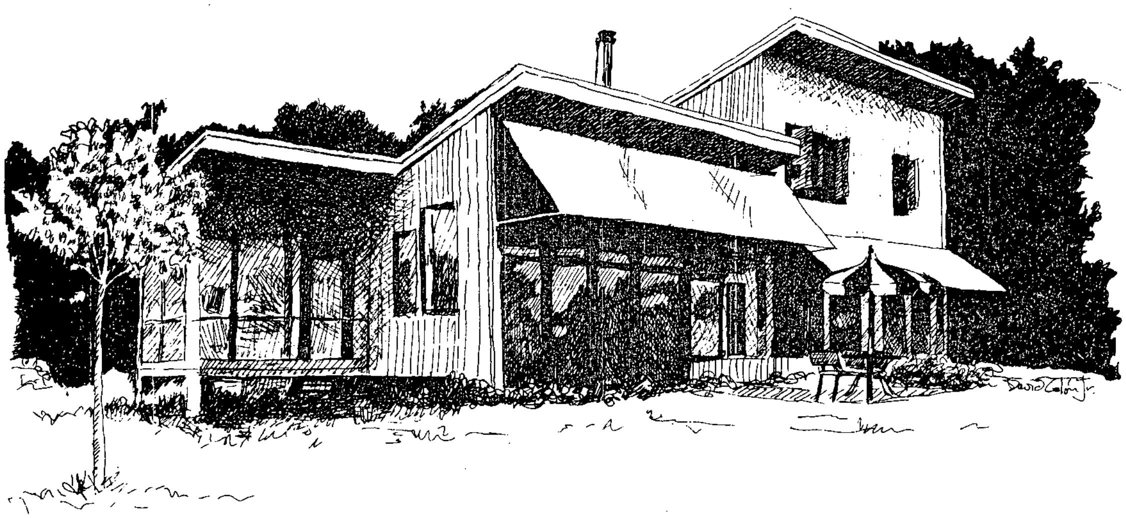
when necessary, structure student time, reinforce instructions, and break procedures into smaller steps
use to provide practice in routine home economics skills
provide demonstrations for students with poor reading and listening skills
develop evaluation measures that assess student progress, such as a checklist of attained behaviors

The Independent Study Approach

motivate the talented student
extend the topics usually covered
encourage supplementary reading
perhaps spell out responsibilities in a contract

The Energy Course

use the activities as a basis
review other energy education materials (see bibliography)
evaluate and select materials
then plan and develop the course



. . . beyond the Classroom

Field Trips

are especially interesting for vocational students
can include visits to homes and home sites, manufacturers, retail stores, laboratories, utilities, and consumer agencies
may yield speakers or materials for future courses

The Alternative Energy Club

draws a broad spectrum of students
encourages outreach to the school and community
focuses efforts of highly motivated students

The Energy Workshop

can be open to students, teachers, parents, or the public
encourages development of your own expertise
can involve guest speakers, hands-on work, media presentations
could be incorporated into the continuing education program

TEACHING SOLAR ENERGY . . .

. . . by Teaming with Other Teachers

Energy topics know no subject area bounds. In any school today, energy lessons are being taught in industrial arts, social studies, and science classrooms, as well as in home economics. But students are not necessarily learning the interrelatedness of energy concepts, issues, and problems. How can you provide the needed connections?

The Unstructured Approach

Informally invite another teacher into your classroom, just to see what's going on, or to discuss a topic or help teach a skill. A social studies teacher can discuss energy politics. An industrial arts teacher can help construct a solar oven. No matter what the lesson, students begin to see that the importance of energy goes beyond the home economics classroom.

Structured Team Teaching

When a team has scheduled planning time and classroom space, integrated semester programs can be offered. A typical team combination may include a home economics, an industrial arts, and a social studies teacher. Although a more demanding way to teach energy, the rewards are also greater.

An Energy Fair

By setting aside a special school day where all disciplines present programs and coordinate activities, you illustrate the interconnectedness of energy issues.

The Resource Center

The home economics laboratory can become an energy resource center. The energy books, pamphlets, catalogs, and other teaching aids collected by the home economics teacher can serve as valuable sources, for students presenting reports in other classes or for teachers interested in expanding energy education to their own classrooms.

. . . . . A Final Note

Just a word of caution about those cloudy, rainy, or windless days. It's not always possible to perform activities on the day you've planned for, so alternative activities for marginal days should always be at the ready.

OBTAINING INEXPENSIVE SOLAR SUPPLIES

Classified

WANTED TO BUY, SHARE, OR BORROW

Inexpensive supplies for solar energy projects. Contact Home Economics Department during school hours.

As you expand your teaching into additional solar and alternative energy activities, you will discover a need for inexpensive materials and supplies. One good source is scrap. But you may be asking yourself whether it's worth your and your students' time and effort to collect scrap. Why not consider this project as just another lesson in energy conservation?

Think of collecting scrap as a means of reusing the energy that originally went into manufacturing a product. Not only are you recycling materials, you're also recycling energy.

Suggestions for Supplies . . . . .

. . . . . General . . . . .

1. Check school sources first:
   industrial arts, science, art, and physical education departments;
   cafeteria, maintenance, health, and transportation staffs.

2. Surplus materials may be available from
   regional industries;
   local tradesmen;
   stores.
   Leave a "shopping list" and container with each one, then check back often.

3. Inexpensive supplies (and a possible school discount) may often be obtained from
   hardware stores;
   garden supply stores;
   low-budget department stores;
   farm supply stores.

4. Other sources include
   local garden clubs and beautification committees;
   community organizations;
   flea markets;
   garage and rummage sales;
   junkyards and scrap dealers;
   attics and cellars.

. . . . . and Specific . . . . .

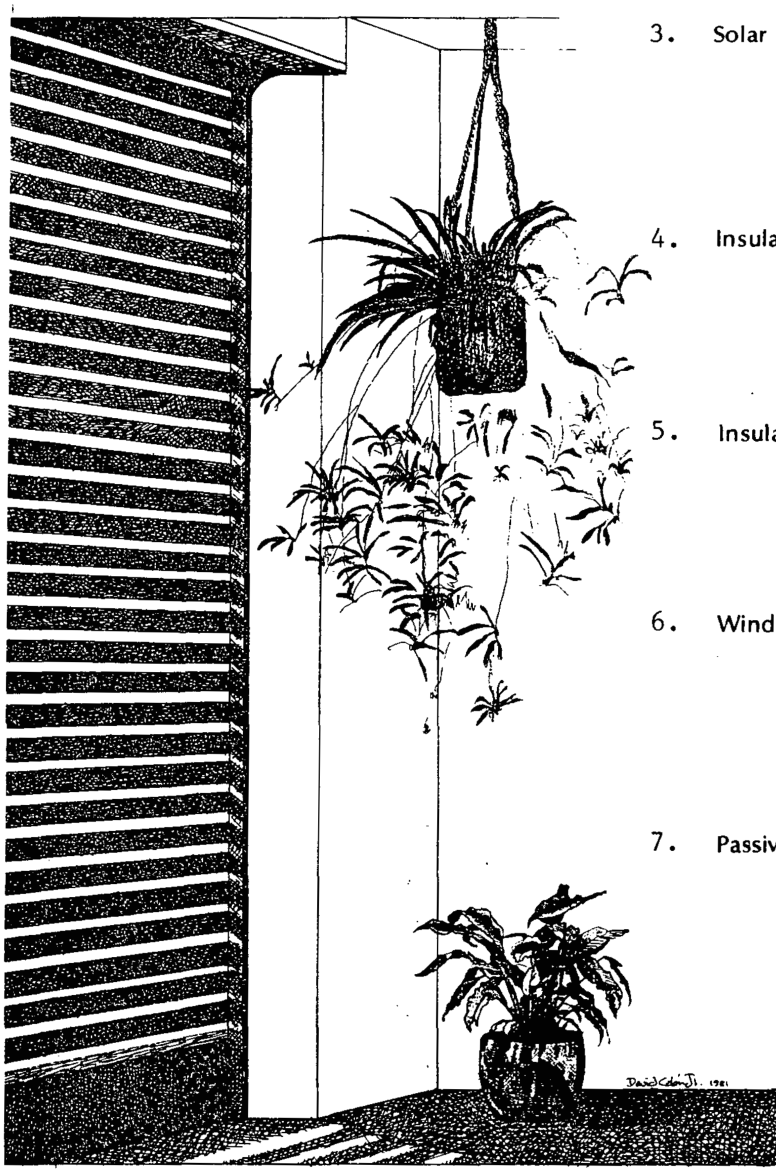
. . . for Bulletin Boards, Displays, and Posters

1. Art Supplies:

   the art department or drama club
   dismantled commercial displays
   paper and boxboard companies

2. Catalogs and Magazines:

   other teachers, friends, and students
   discount stores and mail order houses
   solar manufacturers and retailers



3. Solar Materials Samples:

   solar manufacturers and retailers
   contractors and installers

4. Insulation Samples:

   building supply stores
   contractors and distributors

5. Insulating Fabric Samples:

   fabric stores and manufacturers
   "kit" suppliers

6. Window Treatment Samples:

   furniture, curtain, and building supply stores
   Cooperative Extension

7. Passive Solar Home Plans:

   solar builders and manufacturers
   "home" magazines
   state energy office

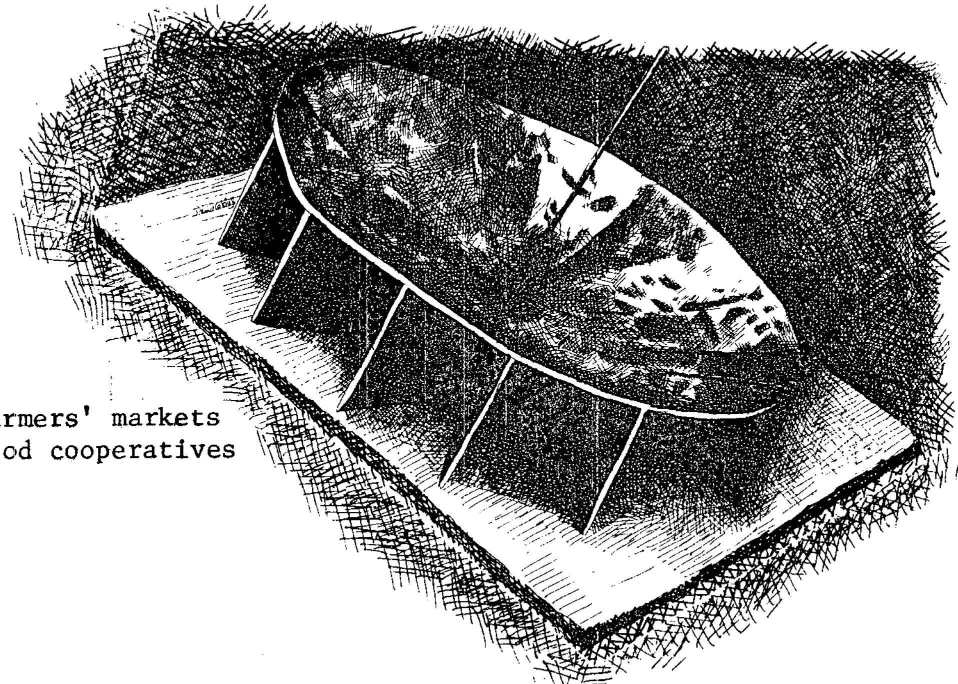
. . . for "Hands-On" Activities

1. Metric Measuring Equipment:

science and industrial arts departments
school supply houses

2. Solar Food-Drying Supplies:

hardware stores, garden supply centers, and low budget department stores
in-school sources



3. Foods:

farmers' markets
food cooperatives

4. Solar Oven and Cooker Materials:

glass and plastic companies
gift shops (aluminized mylar gift wrapping)
sheet metal contractors
solar, insulation, and carpet dealers and distributors
in-school and home sources for
- polyethylene film
- old windows
- aluminum foil
- pastry containers
- foam packing

5. Fabrics and Sewing Supplies:

seamstresses
Salvation Army and Goodwill Industries
rummage and garage sales
furniture, curtain, and department stores
physical education department (old athletic uniforms)

SOLAR SAFETY

General Considerations . . .

Solar energy activities require the same safety precautions as other home economics projects. In particular, be sure to provide

- sufficient work stations to prevent student crowding
- adequate ventilation and temperature control
- fire protection and extinguishers
- assignments that prevent unstructured student time
- instruction in lab safety, with detailed instructions for constructing and using new apparatus

. . . and Specific Considerations . . .

Students, too, should become aware of the dangers involved when solar energy is not properly used. Try a bulletin board as an interesting and effective method of stressing solar safety. The poster on the following pages will alert you and your students to the special precautions needed for working with solar energy. It can be used as is or can serve as a sample for a student display.

Procedure:

1. Draw a large symbol to represent the sun.
2. Research as many facts as you can on using solar energy safely.
3. Write a safety tip for each fact and place it on the poster.
4. Continue to add safety tips to the display as you work on your solar activities.

Suggested Titles:

Don't Get Burned by the Sun

Be Aware and Beware

Respect the Rays

Don't Let Accidents Cloud a Sunny Day

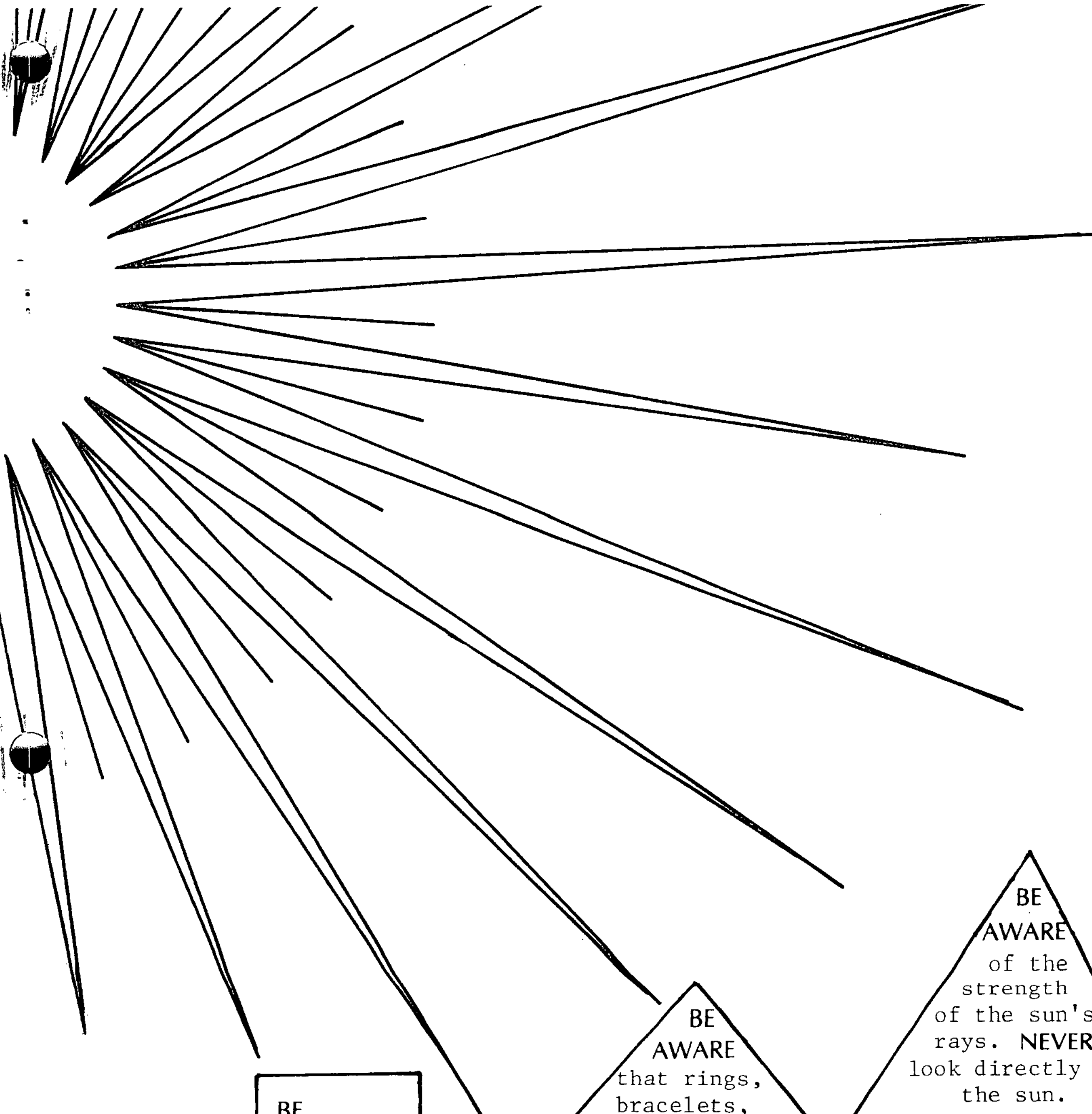
BE AWARE that meats and other protein products should be cooked under solar temperatures high enough to halt bacterial growth.
BEWARE of food poisoning.

BE AWARE that long, slow solar drying may promote bacterial growth. Dry only fruits and vegetables (no meats and other protein products). Follow recommended drying times and conditions.
BEWARE of food spoilage.

BE AWARE that incorrectly installed wood stoves present safety hazards. Follow all wood stove safety procedures.
BEWARE of fires and burns.

BE AWARE that energy conservation practices mean lower indoor temperatures during the heating season.
WEAR appropriate clothing.

BE AWARE of the high temperatures that are caused when the sun's rays are absorbed by certain materials. **BEWARE** of burns.



BE AWARE of the strength of the sun's rays. **NEVER** look directly at the sun.

BE AWARE that rings, bracelets, and long necklaces can be caught in operating appliances and equipment. **BEWARE** of accidents.

BE AWARE that sunglasses provide only minimal protection from sunlight. **BEWARE** of eye damage.

BE AWARE of the causes of hypothermia. **BEWARE** of wet clothing on cool and windy days.

BE AWARE that insects will be attracted to fruits and vegetables that are being solar dried. **BEWARE** of food contamination.

BE AWARE that certain insulations should not be handled or the loose fibers inhaled. **WEAR** respirators, gloves, safety glasses, and long-sleeved shirts.

USING METRIC UNITS

Base Units		Common Prefixes
gram (g)	= weight or mass	milli = 1/1000 or 0.001
meter (m)	= length	centi = 1/100 or 0.01
square meter (m^2)	= area	kilo = 1,000
liter (l)	= volume	
calorie (c)	= heat	
degree Celsius (°C)	= temperature	
kilometer per hour (km/hr)	= speed	

Oven Settings

Oven Setting	°C
Very Slow	110 - 135
Slow	150 - 165
Moderate	175 - 190
Hot	200 - 220
Very Hot	230 - 245
Broil	260 - 290

Temperature Conversions

°C	°F	°C	°F	°C	°F
30	86	120	248	210	410
40	104	130	266	220	428
50	122	140	284	230	446
60	140	150	302	240	464
70	158	160	320	250	482
80	176	170	336	260	500
90	194	180	356	270	518
100	212	190	374	280	536
110	230	200	392	290	554

Food Measure Conversions

English Unit	Metric Unit
1/4 tsp.	1 milliliter (ml)
1/2 tsp.	2.5 ml
1 tsp.	5 ml
1 Tb.	15 ml
1 cup	227 ml
2 cups	454 ml
Metric Unit	**English Unit**
100 ml	6 2/3 Tb.
250 ml	1 cup plus 1 Tb.
1 kilogram (kg)	4 1/3 cups

Approximate Equivalents

Liquid Measures	
English Unit	Metric Unit
1 cup	250 ml
1 pint	500 ml
1 quart	1 liter
Solid Measures	
English Unit	Metric Unit
1 ounce (oz.)	30 grams (g)
1 pound (lb.)	450 g

A SHORT SOLAR GLOSSARY

absorber: a surface, usually blackened metal, which absorbs solar radiation and converts it to heat energy in a solar collector.

active solar energy system: a system which requires external mechanical power (motors, pumps, valves, etc.) to operate the system and to transfer the collected solar energy from the collector to storage or to distribute it throughout the living units. Active systems can provide space heating and cooling, domestic hot water, and/or steam for industrial use.

backup energy system: an energy system using conventional fuels to supply all the heating and domestic hot water during any period when the solar energy system is not operating.

Btu: British thermal unit, a unit for measuring heat; a Btu is the quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit; about one-fourth of a kilocalorie (252 calories).

calorie (also: gram calorie): a metric unit of heat energy; the amount of heat needed to raise the temperature of one gram of water one degree Celsius. It equals 0.0039 Btu. One thousand calories make one kilocalorie (kcal), sometimes called a Calorie or a food Calorie.

caulking: a soft, semi-solid material that can be squeezed into nonmovable joints and cracks of a building, thereby reducing the flow of air into and out of the building.

collector: any of a wide variety of devices (flat-plate, concentrating, vacuum tube, greenhouse, etc.) which collect solar radiation and convert it to heat.

collector efficiency: the fraction of incoming radiation converted to heat and stored by the collector. If a system captures half of the incoming radiation, the system is 50% efficient.

collector tilt: the angle, measured from the horizontal, at which a solar collector is tilted to face the sun for better performance.

conduction: the transfer of heat energy through a material by the motion of adjacent atoms and molecules.

conservation: making the best use of natural resources by reducing waste, improving efficiency, and slowing the rate of consumption.

convection: the transfer of heat energy from one location to another by the motion of fluids which carry the heat.

degree day: a unit which describes the severeness of a particular climate, used in the heating industry as a measure of the amount of heating needed. The number of degree days for a particular day equals 65 degrees Fahrenheit minus the average outdoor temperature for that day.

<u>direct solar gain</u>: a type of passive solar heating system in which solar radiation passes through the south-facing living space before being stored in the thermal mass.

<u>earth berm</u>: a bank of dirt that abuts a building, used to stabilize interior temperature or to deflect the wind.

<u>energy</u>: the ability to do work or make things move; the application of a force through a distance. Energy exists in a variety of forms (electrical, kinetic or motion, gravitational, light, atomic, chemical, heat) and can be converted from one to another. Common units are calories, joules, Btu, and kilowatt-hours.

<u>evaporation</u>: the change from liquid to gas which requires extraordinary absorption of heat by the material undergoing this phase change. Liquid water, for example, absorbs 540 extra calories per gram at 100^{o} C as it vaporizes. This heat will be released again if the water vapor condenses.

<u>flat-plate collector</u>: an enclosed, glazed panel containing a dark absorbing surface that converts sunlight to heat without the aid of a reflecting surface to concentrate the rays. The collector transfers its heat to a circulating fluid.

<u>glazing</u>: the transparent or translucent cover of a solar collector (also: <u>cover plate</u>), or that material which forms a window or skylight. In solar applications, glass or reinforced polyester is usually used as a glazing.

<u>greenhouse effect</u>: a phenomenon which converts solar radiation to heat. Sunlight penetrates glazing quite easily but, when absorbed by objects behind the glazing, is reradiated as heat which does not penetrate the glazing as easily. Heat is thereby trapped and can be used. Also: the warming effect of carbon dioxide and water in the atmosphere acting as a "lid" to slow the escape of heat from the earth's surface. Molecules of water and carbon dioxide absorb and reradiate back to earth much of the heat radiated from it.

<u>heat</u>: energy that flows between a system and its surroundings because of a temperature difference between them. Heat results from the motion of molecules of matter. Also, the word <u>heat</u> is often used to refer to the energy contained in a sample of matter (for example, kilocalories per unit of food).

<u>hybrid solar energy system</u>: a system that uses both active and passive methods to operate.

<u>indirect solar gain</u>: a type of passive solar heating system in which the storage is placed between the collecting and the distributing surfaces (example: Trombe wall, water wall, or roof pond).

<u>infiltration</u>: the uncontrolled movement of outdoor air into a building through cracks around windows and doors, and in walls, roofs and floors.

infrared radiation: the invisible rays just beyond the red of the visible spectrum; their wavelengths are longer than those of the spectrum colors and they have a penetrating heating effect.

insolation: the energy received by earth from the sun, a contraction of the three words: incoming solar radiation. The total daily insolation is the equivalent of about 4.2 quadrillion kilowatt hours. Local insolation depends on the position of the earth in its orbit, the thickness and transparency of the atmosphere, the inclination of the intercepting surface to the sun's rays, and the solar constant. Weather bureaus now keep insolation data or "sunshine statistics".

insulation: material with high resistance (R-value) to heat flow. Some commonly used materials for home insulation are fiberglass, cellulose, rock wool, and styrofoam.

isolated solar gain: a type of passive solar heating system in which heat is collected in one area (sunspace, attic collector) and used in another (living spaces).

kilowatt: a measure of power, usually electrical power or heat flow; equal to 1,000 watts or 3,413 Btu per hour.

kilowatt-hour: the amount of energy equivalent to one kilowatt of power being used for one hour; equals 3,413 Btu, or about 860 kcal.

nonrenewable resources: energy resources that are not being replaced during the time span of human history. Examples are coal, oil, natural gas, and uranium.

overhang: a solid horizontal or angled projection on the exterior of a building placed (ideally) so that it shades southern windows in summer only. An overhang may be fixed or movable, part of the original construction or a retrofit. Several designs are possible. An upward-tilted overhang can also serve as a reflector in winter.

passive solar energy system: an assembly of natural and architectural components which converts solar energy into usable or storable thermal energy (heat) without mechanical power. Current passive solar energy systems often include fans, however.

payback period: the time needed to recover an investment.

photosynthesis: green plants' process of using solar energy to convert simple molecules into complex ones with high potential energy. Carbon dioxide and water are combined, in the presence of sunlight and chlorophyll, into carbohydrates such as sugars, starches, oils, and cellulose.

photovoltaic cell: a device which converts solar energy directly into electricity. Sunlight striking certain materials (silicon is most common) causes the release of electrons. The migration of these released electrons produces an electrical current. The conversion process is called the photovoltaic effect.

power: the rate at which work is performed. It is measured as units of energy per unit of time, for example: calories per second, watts (joules per second), or horsepower (foot-pounds per second).

quad: a gigantic energy unit (often used to state how much energy entire countries buy each year). It represents a quadrillion Btu or the amount of heat energy in 172 million barrels of oil. U.S. citizens used more than 78 quads of commercially-supplied energy in 1979.

radiation: the method by which heat is transferred through open space. About 60% of the heat transferred to a room from a wood stove is by radiation. Sunlight travels to us by radiation through space at "the speed of light", 299,728 kilometers per second.

renewable resources: materials that are recycled by natural processes within a relatively brief span of time (a human lifetime). Fresh water, wind, sunshine, and trees are some examples of resources that replace or recycle themselves within human time frames.

retrofit: to modify an existing building by adding a solar heating or cooling system or insulation to improve its energy efficiency.

R-value: the resistance to heat flow, reciprocal of U-value. The higher the R-value, the greater the insulating efficiency of the material. R-values are commonly stated per inch of building material. R-values are additive--thicker material or a combination of materials means increased resistance to heat flow. Some typical R-values per inch of material are 6.25 for polyurethane foam, 3.17 for fiberglass batts, 1.25 for fir and pine wood, 0.18 for plaster, and 0.08 for concrete.

solar energy: the electromagnetic radiation emitted by the sun. The earth receives about 4,200 x 10^{15} kilowatt-hours of solar radiation per day.

solar greenhouse: a sunspace containing thermal mass and used to grow plants.

storage: the device or medium that absorbs collected heat and stores it for later use.

sunspace: a living space enclosed by glazing; a sunroom or greenhouse.

sun tempering: technique for taking advantage of solar radiation for winter heating but controlling solar gain for summer cooling; does not assume distribution or storage.

temperature: a measure of the energy of motion of the atoms and molecules of a substance. Thermometers and thermistors are used to measure an object's temperature. Temperature is not the same as heat. The tip of a burning match has a high temperature, but the object as a whole might contain very little heat due to its size.

thermal mass: mass used to store heat energy, usually collected solar energy. Insulated rock bins, sand beds, and containers filled with water or eutectic salts have been used successfully as thermal masses.

thermosiphoning: heat transfer in a fluid (air, liquid) by means of currents resulting from the natural fall of heavier, cooler fluid and rise of lighter, warmer fluid.

Trombe wall: masonry, typically 8 to 16 inches thick, blackened and exposed to the sun behind glazing; a passive solar heating system in which a masonry wall collects, stores, and distributes heat.

watt: a unit of measure for electrical power equal to the transfer of one joule of energy per second. The watt is the unit of power most often associated with electricity and is determined by multiplying required volts by required amperes. One horsepower = 746 watts.

weatherstripping: material which reduces the rate of air infiltration around doors and windows. It is applied to the frames to form a seal with the moving parts when they are closed.

window treatments: applications to the interior side of windows (blinds, shades, shutters, draperies).

work: energy transferred from one object to another, that is, a force acting against resistance to produce motion in a body; measured by the product of the force acting and the distance moved through against the resistance.

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(Publications catalog and price list)

Center for Renewable Resources
1001 Connecticut Avenue, NW, Suite 510, Washington, DC 20036
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