AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301 587 8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

MIDDLE SCHOOL INTEGRATED SCIENCE,
MATHEMATICS AND TECHNOLOGY CURRICULUM

Final Report

for Period September 30, 1991 - December 31, 1993

Kenneth Brecher

Boston University
Boston, MA 02215

March 1994

Prepared for

THE U. S. DEPARTMENT OF ENERGY
AWARD NO. DE-EG02-91ER75648

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

MASTER

Final Report for DOE Planning Grant
"Middle School Integrated Science, Mathematics
and Technology Energy Curriculum"

Abstract

The Project "Middle School Integrated Science, Mathematics and Technology Curriculum" had two goals: (1) to survey the literature of energy education; and (2) to develop a theme for a possible integrated middle school energy based curriculum. We aimed to respond to the challenge of developing thematic integrated curricula as advocated by the NSTA, AAAS and other organizations analyzing the future of American science and mathematics education. The survey of middle school energy curriculum materials has been completed. A list of the resources surveyed are included in this report. Though many energy based curriculum materials have been produced, none of them appears to be broadly disseminated throughout the country. Some energy based curriculum materials are far less well developed than others. We found that an integrated set of modular materials concerning the energy based theme of light and optics does not now exist. If they were developed, they could be broadly disseminated throughout middle school courses in the physical and biological sciences, as well as in new integrated science courses proposed as part of the current science education reform movement. These types of modular materials could also provide a powerful means of student exploration of new technologies such as microcomputers.

Middle School Curriculum Project Motivation

This planning grant project was motivated by the growing population of students who have not succeeded in traditional middle and secondary school science and mathematics courses and who, by virtue of their poor performance, discontinue the study of mathematics and science related subjects early in their educational careers, often as early as grade 8. According to numerous educational studies, the failure of these students is related to problems ranging from lack of interest in the subject matter, to poor reading and learning skills, to incomplete understanding of major concepts. By the end of grade 8, most of these students are having difficulties with a variety of mathematical concepts including: 1) the interpretation of graphs and data in a variety of displays; 2) an understanding of variables and the use of activities that require proportional reasoning; 3) functions and formulae; and 4) the application of mathematical concepts to the solution of problems in the physical world. Many have lost their innate curiosity about natural phenomena; others no longer seek to discover how the biological and physical world works; and most have little hands-on or technological experience. Further, in studies of entering college freshmen, of whom more than two million per year are enrolled in remedial college-level mathematics courses, the same difficulties have been identified. For reasons similar to those cited for eighth graders, many of these college students shy away from mathematics and science related majors. Thus our middle school curricula are not providing students with the concepts and skills requisite for the study of higher level mathematics, science and technology subjects.

Middle School Curriculum Materials

One way to address some of these problems is to develop curriculum materials appropriate for middle school. In the first part of this project, we conducted a survey of existing energy based curriculum materials. We also examined how new technologies might play a role in both the type of materials to be used in the future and how they could be disseminated. Our goal was to uncover a set of topics which integrate science, mathematics and technology and which could be disseminated broadly throughout the middle school curriculum. We were particularly interested

in materials employing hands-on and microcomputer based activities.

We looked for content areas drawn from all of the fields of science, with the central theme of energy. These might then lead to the development of a resulting integrated curriculum which could serve as a model for the type of unified science education program currently being proposed by the American Association for the Advancement of Science (AAAS) in Project 2061 and by the National Science Teachers Association (NSTA) in the Science, Scope, Sequence and Coordination Project. This would allow for a vertical integration cutting through traditional barriers of biology, chemistry, physics, earth science, and astronomy. It would allow for the melding of scientific, mathematical and technological issues in a unified manner. At the outset of the project, we felt that such a curriculum would have as its subject focus one major theme: energy. The specific scientific topics might include: (1) kinds of energy; (2) conversion of energy between from one form to another; (3) sources of energy; (4) energy conservation. The mathematical concepts and topics to be addressed could include: (1) graphs and their interpretation; (2) proportional reasoning; (3) variables, functions and formulae; (4) methods of data organization including lists, tables, graphs, and (5) statistical techniques.

Planning Grant Survey

During the late 70's and early 80's a variety of energy education materials were produced for use at all grades in the schools (see Appendix I). These materials met with a range of success in the classrooms, with a few continuing to have limited use up to the present time. Others have been phased-out for a variety of reasons. We decided that a careful analysis should be conducted to (a) determine which materials have met with the greatest success before new materials are prepared and (b) determine the most effective models for implementing curriculum materials which focus on energy. In particular, the curriculum materials produced by the Oak Ridge Associated Universities, Energy 80, The Thomas Edison Foundation and the National Science Teachers Association need to be reviewed against current usage and needs. In addition, science materials which focus on energy as a theme but were not published as a part of the early 80's effort in energy education also needed to be

examined. The Physical Science II materials and The Man Made World developed under NSF grants and individual lab experiments from the Earth Science Curriculum Project, the Intermediate Science Curriculum Study and various commercial textbooks published in the last decade also provide useful materials for developing a new 90's energy curriculum effort. In appendix I we outline some of the major curriculum development projects which we proposed to examine during the planning grant period.

During the course of our own survey, we found that a number of other surveys of energy education curricula have been conducted. Therefore we also "surveyed the surveys" and got copies of many of the individual energy curriculum materials. Sources for most of these are listed in Appendix III.

We have also looked into the success or failure of some of these curricula. A copy of our phone questionnaire to their developers is attached as appendix II. We do not attempt to summarize the results here since they were by their nature informal. Nonetheless, our general conclusions are: (1) none of the materials are widely disseminated; (2) their use has varied, usually decreasing over time; (3) their use is often regional, supported by local utilities or other interested parties. Overall, there seems to be no long term sustained use of any of the existing energy based curriculum materials, at least by comparison with, for example, the middle school course Introductory Physical Science (IPS) developed with NSF support in the 1960's and still in use today with over 3 million copies of the text printed to date.

Overall, we have found many materials, but none in widespread or universal use. Reasons may be varied. However, several ideas emerge: (1) energy is perhaps too broad a subject; (2) energy is a rather abstract concept; (3) it is unlikely that a course based on one concept, especially one as broad as energy, can be integrated together and then taught widely throughout the country.

We now feel that a set of new modules (which are independently usable in preexisting courses) with a general integrating theme of more limited scope are more likely to receive widespread use. In addition, the advance of new technology and the use of these technologies in the teaching of science currently makes it possible to explore a range of energy related activities not possible with previous

curriculum materials. Microcomputers with expanded memories, high speed and color make it possible to generate energy system simulations, as well as collect and analyze data with the use of MBL interfaces. The laser video disc, CD ROM drives and telecommunication capabilities which are now available in the schools open a much broader range of problems for study. Current educational research indicates a strong need to include these technologies in the development of new curriculum materials for adolescent learners.

Future Light and Optics Modules Development

After surveying the literature, we have found that many energy curriculum topics have been developed. However, for reasons summarized above, they have not received wide distribution. Most do not employ the latest microcomputer technologies, including CD ROM, laser discs, or use of the Internet. Often the breadth of energy topics in them makes a single integrated set of materials unwieldy, either because it is too much to teach in a single course, or because it cannot be meshed with preexisting curricula.

Therefore, we have concluded that what we should aim to develop, at least at Boston University, is a set of integrated modules which cut across the sciences but which include a focused set of energy based topics. Because Boston University has now established a Center for Photonics Research and because of the interests of faculty in Astronomy, Physics, Chemistry and other sciences which relate to light and optics, it is our intention to focus attention on curriculum materials development which relate to the energy theme of light. This approach will have a number of advantages: (1) first and foremost almost everyone has direct experience with light and direct fascination with it; (2) the subject is broad, yet finite enough to develop in depth; (3) light plays a role in every day life, but also offers room for many abstractions and quantitative study; (4) light allows for relative ease of experiments and low cost - that is, it is possible to produce, control, direct, manipulate light as a bench-top hands-on science; (5) and finally, light offers many connection to new technologies, including fiber optics, computer and television displays, etc.

A set of Middle School optics modules (tentatively entitled called "Seeing the Light") could include some of the following topics:

- i. Physics: light emission, absorption, propagation, lenses, polarizers. gratings;
- ii. Astronomy: radiation from sun, stars, spectra of stars, etc.
- iii. Meteorology: atmospheric optics - rainbows, sunsets, blue sky, etc.
- iv. Geology: fluorescence of rocks, birefringent materials, etc.
- v. Chemistry: fluorescence, chemiluminescence, etc.
- vi. Biology: vision, eye, bioluminescence, photosynthesis, phototropism;
- vii. Psychology: perception, light vs. color, illusions, stereopsis, etc.
- viii. Art: color mixing, perspective, etc.
- ix. Technology: fluorescent vs. incandescent lighting, solar power, etc.

In conclusion, we are now considering the development a set of connected but independent curriculum modules about light and optics for use in existing middle school science courses. Their development could be undertaken with contributions from many faculty at BU in a variety of Departments within the Colleges of Arts and Sciences, Engineering and Education. The materials would incorporate use of new technologies such as fiber optics, lasers, LEDs, computers and Internet delivery. They would ultimately be developed at Boston University, in conjunction with middle school teachers with whom we are in contact. Pilot test sites for the resulting modules could include Chelsea Junior High School, as well as other Boston area middle schools, representing both suburban and urban populations.

Appendix I - Curricula Containing Middle School Energy Materials

Preliminary List of Energy Materials Reviewed:

Energy, Franklin Institute Museum-To-Go, Philadelphia, PA, 1988.

Energy Sources, ibid.

Energy Sources, SCIS, Hudson, N.H., Delta Education, 1978.

Energy Transfer, Franklin Institute Museum-To-Go, Philadelphia, 1987.

Heat, ibid., 1988.

Heating and Cooling, ESS, Hudson, N.H., Delta Education, 1985.

Magnetism and Electricity, SAVI/SELPH, LAWRENCE HALL OF SCI., 1979.

Magnetism/Electric Models, Franklin Institute Museum-To-Go, Philadelphia, 1986.

Models: Electric and Magnetic Interactions, SCIS, Hudson, N.H., Delta Ed., 1971.

Probing the Natural World/1, ISCS, Morristown, N.J., Silver Burdett, 1970.

Science, Models and Toys: Stage III, Science 5/13, London: MacDonald, 1974.

Copes Tchr. Gds. for Grades 5 - 8, (2 volumes), COPES, New York, NYU, 1972.

Electromagnet Device Design, USMES, Newton, MA, Ed. Development Center, 1973.

Hot Water and Warm Homes from Sunlight, GEMS, Lawrence Hall of Science, 1986.

On the Move, London, MacDonald, 1983.

Physical Science II, Education Development Center, Prentice-Hall, Boston, 1972.

Energy - A Sequel to IPS, Haber-Schaim, Prentice-Hall, Boston, 1983.

Man Made World, Engineering Concepts Curriculum Project, New York, 1972.

Appendix II - Telephone Survey Questionnaire

Several months ago we asked you to send copies of (OPTION 1: copies of energy education materials you produce and distribute) (OPTION II: Name of Program). We've received it and reviewed it. Now, if you have a few minutes, we'd like to ask you a few questions about it.

1. DATES

- a. What year was it first available? _____
- b. Is it still available? ☐ Y ☐ N
- c. Is it still being used? ☐ Y ☐ N

2. DISSEMINATION

- a. How did you inform teachers and school systems about the program?

- ☐ presented at teacher conference
- ☐ mass mailing of brochures/literature
- ☐ mass mailings of the program itself
- ☐ ads in publications What publications? _____
- ☐ press releases to newspapers What papers? _____

Comments _____

- b. Did (Do) you sell the materials to teachers and school systems? If not, how do you get it out to teachers?

☐ sell ☐ loan for free ☐ rent ☐ give away

IF SOLD... Is it sold at market value? ☐ Y ☐ N

Cost of production only ☐ Y ☐ N

Is the product subsidized? ☐ Y ☐ N If so, by whom? _____

Comments _____

- c. Did (Do) you make any special arrangements to help teachers use the materials, such as workshops or classroom visits?

- ☐ workshop
- ☐ trainer or representative visits classroom and leaves materials behind
- ☐ materials sent to schools/teachers without additional support
- ☐ other _____

Comments _____

- d. How widespread is your usage area?

☐ local ☐ statewide ☐ national

If your usage area is limited, why is it?

- ☐ the materials themselves are region specific
- ☐ restrictions have been placed on you
- ☐ practical reasons (such as cost) _____
- ☐ other _____

3. TEACHER RESPONSES

- a. Do you have any information from teachers about how they use this unit and how they feel about it? ☐ Y ☐ N
- b. Is that information based on anecdotal information or surveys you have conducted?
 ☐ anecdotal information (such as conversations) ☐ surveys

IF IT IS FROM SURVEYS....

Do you have any survey results you could send to us?

- c. How do most teachers use the materials?
 ☐ As a stand-alone unit of instruction? ☐ # days.
 ☐ As a supplement to an existing unit? Which unit? ☐ # days
 ☐ Other (specify) _____
- d. What grade levels most commonly use the material?
 ☐ K - 3 ☐ %
 ☐ 4 - 6 ☐ %
 ☐ 7 - 9 ☐ %
 ☐ 10 - 12 ☐ %

For what grade level were the materials originally intended?

- e. How do you think teachers like this material?
excellent	very good	good	adequate	poor
1	2	3	4	5
- f. What do teachers describe as the greatest strengths of the materials?

- g. What is the shelf life the material or program?
 ☐ less than one year ☐ about 1 year ☐ 1 - 3 years ☐ More than 3 years
- h. Do you know of any comparable material that we might want to be aware of?

- i. What suggestions have your teachers made for improving the material?

4. TEACHERS USING THE MATERIALS

Could you please give us the names and schools (or phone numbers) of 3 to 10 teachers who use or have used the materials.

- 1.
- 2.
- 3.
- 4.
- 5.

Appendix III - Sources of Energy Curriculum Materials

Name	Address	Organization	City	Sta Zip
	2040 Alameda Padre Serra, Box 439	American Bibliographic Center	Santa Barbara, CA	93103
PG&E Educational Services	77 Beal Street	Community Relations Dept.	San Francisco, CA	94106
	5505 East Carson, Suite 250	Education Development Specialists	Lakewood, CA	90713-3093
	1742 Connecticut Ave. NW	NSTA	Washington, DC	20009
	562 Boston Avenue	Queue, Inc.	Bridgeport, CT	06610
	Grimes State Office Building	Department of Education	Des Moines, IA	50319-0146
	6767 Green Valley Road	El Dorado County Office of Education	Placerville, CA	95667
	400 Main Street	The Culver Company, Inc.	Stamford, CT	06901
	1320 "A" Santa Monica Mall, #202	Enterprise for Education	Santa Monica, CA	90401
	5160 Wiley Post Way, Suite 200	National Energy Foundation	Salt Lake City, Utah	84116
	1424 16th St., Suite 601	Nuclear Information and Resource Service	Washington, DC	20036
	1412 Sixteenth St. N.W.	National Wildlife Federation	Washington, DC	20036
California Energy Extension Service	1400 Tenth St.	Governor's Office of Planning & Research	Sacramento, CA	95814
	55 Chapel Street	EDC School and Society Programs	Newton, MA	02160
	111-19th Street, N.W.	Edison Electric Institute	Washington, DC	20036
	5555 Florin-Perkins Road	PG&E, Sacramento Division	Sacramento, CA	95826
The Energy Education Project	1400 Washington Ave.	S.U.N.Y. at Albany	Albany, NY	12222
World Games Projects, Inc.	3508 Market Street	University Science Center	Philadelphia, PA	19104
ERIC Clearing House for Science	1200 Chambers Rd.	The Ohio State University	Columbus, OH	43212
	313 W. Winton Ave.	Alameda Co. Office of Education	Hayward, CA	94544-1198
Conservation & Renewable	P.O. Box 8900	Energy Referral Service	Silver Spring, MD	20907
	33 Main Street	San Mateo Co. Office of Education	Redwood City, CA	94063
Know Nukes Institute	Roxbury Street	Antioch/New England	Keene, NH	03431
	1630 Blackhawk Hills	The Acid Rain Foundation, Inc.	St. Paul, MN	55122
LHS GEMS	University of California	Lawrence Hall of Science	Berkeley, CA	94720
Hawaii State Energy Office	335 Merchant St., Room 110	Dept. of Planning & Economic Dev.	Honolulu, HI	96813
	Two Rockefeller Plaza	New York State Energy Office	Albany, NY	12223
The Center for Renewable Resources	1001 Connecticut Ave., N.W.	Suite 638	Washington, DC	20036
U.S. Department of Energy	P.O. Box 62	Technical Information Center	Oak Ridge, TN	37830
Vince Jannetta	1800 Asylum Avenue	CONNECT	West Hartford, CT	06117
Carole Bell	83 Park Street	OSCAR	Providence, RI	02903-1037
Chris Owen	120 State Street	Department of Public Service	Montpelier, VT	05620
	1320-A Third Street, Suite 202	ENTERPRISE FOR EDUCATION, INC.	Santa Monica, CA	90401
Dana Lee Delucca	2 1/2 Beacon Street	Governor's Energy Office	Concord, NH	03301-4498
Julie Capobianco	275 Westminster Street	Governor's Office of Energy	Providence, RI	02903-3415

Name	Address	Organization	City	State	Zip
Mickey McKinley	525 South Pleasant Street	Hitchcock Center for the Environment	Amherst,	MA	01002
Diane McCann Thomas	P.O. Box 252	MEEP	Gorham,	ME	04038
Hatheway Environmental Resource Ctr	South Great Road	Massachusetts Audubon Society	Lincoln,	MA	01773
Marietta Devine	510 George St.	Miss. Dept. of Econ. & Community Dev.	Jackson,	MI	39202
Gerald Katz	P. O. Box 2518	NEED Project	Reston,	VA	22090
Ray Cornia	5160 Wiley Post Way	National Energy Foundation	Salt Lake City,	UT	84116-2871
	23 Ames Street	Northeast Sustainable Energy Assn.	Greenfield,	MA	01301
Beverly Bonnar	P.O. Box 543, 750 West Center St.	EUA Service Corporation	Brigewater,	MA	02379
Karen Sawyer	25 Research Drive	New England Electric	Westborough,	MA	01582
Tony Spinelli	P.O. Box 270	Northeast Utilities	Hartford,	CT	06141-0270
Sara Aitken	362 Injun Hollow Road	Conn. Yankee Information & Science Ctr	Haddam Neck,	CT	06424-3099
Greg Wilson	278 Main Street	Millstone Information & Science Center	Niantic,	CT	06357-0278
Thomas J. Dudeck	80 Temple Street	United Illuminating Company	New Haven,	CT	06506
Meg Brunette	Edison Drive	Central Maine Power	Augusta,	ME	04336
Nancy Jackson	P.O. Box 1209	Maine Public Service Company	Presque Isle,	ME	04769-1209
Dena Lehman	800 Boylston Street	Boston Edison Company	Boston,	MA	02199
Michael O'Malley	2421 Cranberry Highway	Commonwealth Electric Company	Wareham,	MA	02571-1091
Karen Warner	285 John Fitch Highway	Fitchburg Gas & Electric Company	Fitchburg,	MA	01420
David Johnson	1000 Elm Street	Public Service of New Hampshire	Manchester,	NH	03105-9989
Anne Quigley	12 Turner Road	Newport Electric Corp.	Middletown,	RI	02840-0011
Hilde Sparrow	P. O. Box 39	Central Vermont Public Service Corp.	Montpelier,	VT	05601-0039
Cynthia Russell	Green Mountain Drive	Green Mountain Power Corporation	Montpelier,	VT	05602-9801
	P. O. Box 157, Governor Hunt Road	Vermont Yankee Energy Information Ctr	Vernon,	VT	05354
	200 State Road	Channing L. Bete Co., Inc.	South Deerfield,	MA	01373
	1410 Varsity Drive	Acid Rain Foundation	Raleigh,	NC	27606
Elizabeth Burbank	1130 Seventeenth St., NW, Suite 220	American Coal Foundation	Washington,	DC	20036-4604
Educational Programs	1515 Wilson Boulevard	American Gas Association	Arlington,	VA	22209
Public Relations Department	1220 L Street, NW	American Petroleum Institute	Washington,	DC	20005
Kim Trella	165 Capitol Avenue	Department of Environmental Protection	Hartford,	CT	06106
	9 West Broad Street	Keep America Beautiful, Inc.	Stamford,	CT	06902
Ann Sumner	One McGuire Street, P.O. Box 1338	Concord Electric Company	Concord,	NH	03302-1338
Beth McLaughlin	216 Epping Road	Exeter & Hampton Electric Co.	Exeter,	NH	03833-1115
Dr. Edmund R. McGrath	U.S. Route 1, P.O. Box 300	The Science & Nature Ctr. at Seabrook	Seabrook,	NH	03874-0300
Culver Company	130 Centre Street	Danvers House	Danvers,	MA	01923
Div. of Litter Prevention & Recycling	Fountain Square, Building F-2	Ohio Dept. of Natural Resources	Columbus,	OH	43224

Name	Address	Organization	City	Sta	Zip
	75 Moulton Street	Educator's Publishing Service	Cambridge,	MA	02138-1104
U.S. Department of Energy	1000 Independence Avenue, SW	Nat'l Energy Information Center, EI-231	Washington,	DC	20585
National Science Teachers Association	1742 Connecticut Avenue, NW	Publications Sales	Washington,	DC	20009
Bill Duesing	153 Bowers Hill Road	Solar Farm Education	Oxford,	CT	06478-1756
Francis A. Swierz	54 Middlesex Turnpike	Electric Council of New England	Bedford,	MA	01730
Bill Shepardson	1 Sullivan Road, P.O. Box 1310	New England Power Tool	Holyoke,	MA	01040-1310
	1720 K Street, NW, Suite 914	Alliance to Save Energy	Washington,	DC	20006
	410 First Street, SE, 3rd Floor	American Nuclear Energy Council	Washington,	DC	20002
Education Division	1130 17th Street, NW	National Coal Association	Washington,	DC	20036
Darlean Schmidt	555 North Kensington Avenue	American Nuclear Society	LaGrange Park,	IL	60525
	777 N. Capitol Street, Suite 805	American Wind Energy Association	Washington,	DC	20002
	1776 I Street N.W., Suite 400	U.S. Council for Energy Awareness	Washington,	DC	20006-3708
	777 N. Capitol Street, NE, Suite 805	Solar Energy Industries Assoc.	Washington,	DC	20002
	P. O. Box 7732	Nat'l Council for Environmental Balance	Louisville,	KY	40257-0732
	237 Hatchville Road	New Alchemy Institute	East Falmouth,	MA	02536
Eloise Farmer	c/o Choate Rosemary Hall	CT Science Teachers Association	Wallingford,	CT	06492
Cathryn Eidson	376 Hartford Turnpike	EAST CONN	North Windham,	CT	06256
Carl Niger	80 Washington St.	Office of Policy, Develop., & Planning	Hartford,	CT	06106
Tom Keller	Station 23	ME Department of Education	Augusta,	ME	04333
Dean C. Marriott	State House, Station 17	Dept. of Environmental Protection	Augusta,	ME	04333
Tom Skinner	State House, Station 53	Office of Energy Resources	Augusta,	ME	04333
C. Rogers Close	1385 Hancock Street	MA Department of Education	Quincy,	MA	02164
Laura Merrill	100 Cambridge Street, Rm. 1500	Division of Energy Resources	Boston,	MA	02202
Evelyn Sullivan	JFK Bldg., Region I	Environmental Protection Agency	Boston,	MA	02203
Ed Hendry	101 Pleasant Street	NH Dept. of Education	Concord,	NH	03301
Charles E. Knox	P.O. Box 95, Hazen Drive	Dept. of Environmental Services	Concord,	NH	03301
Catherine Dittietro	721 Chalkstone Avenue	RI Science Teachers Association	Providence,	RI	02908
Ed Costa	22 Hayes Street	RI Dept. of Education	Providence,	RI	02908
Allen Kousen	120 State Street	VT Dept. of Education	Montpelier,	VT	05620
Reginald Larosa	103 South Main Street	Dept. of Env. Conservation	Waterbury,	VT	05671-0401
	The Pennsylvania State University	Energy Technology Projects	University Park	PA	16802
Nat'l Technical Inf. Service	5285 Port Royal Road	U.S. Dept. of Commerce	Springfield,	VA	222161
Golden Gate Energy Ctr.	Bldg. 1055, Fort Cronkhite	GGNRA	Sausalito,	CA	94965
Energy & Man's Environment	Suite 301	1224 S. W. Hamilton	Portland,	OR	97201
Appropriate Energy Technology	333 Market Street	U. S. Dept. of Energy	San Francisco,	CA	94105

Name	Address	Organization	City	Sta	Zip
Cupertino Union School District	5050 Moorpark Ave.	De Vargas Elementary School	San Jose,	CA	96129
Cupertino Union School District	6560 Hanover Drive	John Muir Elementary School	San Jose,	CA	95129
The San Francisco	289 City Hall	Recycling Program	San Francisco,	CA	94102
	Sonoma State University	The Energy Center	Rohnert Park,	CA	94928
	44 North Last Chance Gulch	Alternative Energy Resources Org.	Helena,	MT	59601
Eashington St. Office of Env. Ed.	NE 158th and 20th Ave. NE	c/o Shoreline District Offices	Seattle,	WA	98155
	P.O. Box 4000	NCAT Publications	Butte,	MT	59702
American Association for	745 Gaines School Road	Vocational Instructional Materials	Athens,	GA	30605
American Public Power Assn.	Suite 300	2301 M Street, NW	Washington,	DC	20037
American Solar Energy Society	Suite G-1	2400 Central Avenue	Boulder,	CO	80301
Center for Environmental	46 Prince Street	Information, Inc.	Rochester,	NY	14607-1016
The Council for Solid Waste Solutions	Suite 500	1275 K Street, NW	Washington,	DC	20005
Dow Chemical-U.S.A.	2040 Dow Center	Dow Plastics Communications	Midland,	MI	48674
Florida Energy Office	2740 Centerview Drive	Dept. of Community Affairs	Tallahassee,	FL	32399-2100
	664 Hilary Drive	Geothermal Education Office	Tiburon,	CA	94920
Houston Lighting & Power Co.	611 Walker/ P.O. Box 1700	Corp. Community Relations-Ed. Services	Houston,	TX	77251
Independent Petroleum Assoc.	1101 Sixteenth St., NW	of America	Washington,	DC	20036
The Learning Works	Dept. NEIC	P.O. Box 6187	Santa Barbara,	CA	93160
Nat'l Propane Gas Assoc.	Suite 100	1600 Eisenhower Lane	Lisle,	IL	60532
No. Indiana Public Services Co.	5265 Hohman Avenue	Corp. Comm. Dept./Ed Services	Hammond,	IN	46320
Potomac Electric Power Co.	1900 Pennsylvania Ave., NW	Comm. Relations & Ed. Services	Washington,	DC	20068-0001
Procter & Gamble	P.O. Box 14009	Educational Services	Cincinnati,	OH	45250-0009
Renew America	Suite 710	1400 Sixteenth ST., NW	Washington,	DC	20036
Shell Oil Company	P. O. Box 2463	Public Affairs	Houston,	TX	77252-2463
Southface Energy Institute	P.O. Box 5506	158 Moreland Ave., SE	Atlanta,	GA	30307
	680 Andersen Drive	Steel Can Recycling Institute	Pittsburgh,	PA	15220
	Box USA	Take Pride in America	Washington,	DC	20240
	1115 San Jacinto- Suite 272	Texas Mid-Continent Oil & Gas Assn.	Austin,	TX	78701-1906
	26 Church Street	Union of Concerned Scientists	Cambridge,	MA	02238
U.S. Dept. of Energy - CDIAC	P.O. Box 2008	MS-6335, Building 1000	Oak Ridge,	TN	37831-6335
University of Florida	186 Norman Hall	Center for Economic Education	Gainesville,	FL	32611-2053
Office of Nuclear Energy	NE-50	Office of Space & Defense Power Systems	Washington,	DC	20545
U.S. Dept. of Energy/Public Affairs	1000 Independence Ave., SW	Office of Nuclear Energy, NE-12	Washington,	DC	20585
U.S. Dept. of Energy	1000 Independence Ave., SW	Off. of Fossil Energy Comm., FE-5	Washington,	DC	20585
U.S. Dept. of Energy	1000 Independence Ave., SW	Off. of Civilian Radioactive Waste Mgt.	Washington,	DC	20585

Name	Address	Organization	City	Sta	Zip
Project Ocean	Fort Mason, Bldg. E	Oceanic Society, S.F. Bay Chapter	San Francisco,	CA	94123
Pennzoil Company	P.O. Box 2967	ESHA Dept.	Houston,	TX	77252
Exxon Corporation	225 E. John W. Carpenter Frwy.	Public Affairs Dept.	Irving,	TX	75062-2298
Shell Oil Company	Two Shell Plaza	P.O. Box 2099	Houston,	TX	77252
Mobil Oil Corporation	3225 Gallows Road	Public Affairs Dept.	Fairfax,	VA	22037-0001
Mr. Dick Obermann	200 Public Square, 36-A	c/o British Petroleum America	Cleveland,	OH	44114-2375
Lyondell Petrochemical Company	1221 McKinney Avenue, Suite 1600	Director, Public Affairs	Houston,	TX	77010
Chevron Companies	575 Market Street	Public Affairs Dept.	San Francisco,	CA	94120
Texaco Inc.	2000 Westchester Ave.	Public Affairs Dept.	White Plains,	NY	10650
Ms. Cheryl Finkenbinder	Philips Bldg., 16th Floor	c/o Philips Petroleum Co.	Bartlesville,	OK	74004
Amoco Corporation	200 East Randolph Drive	Public Affairs Dept.	Chicago,	IL	60601
Energy Food and You Program	2000 N.E. Perkins Way	Washington State Office of Env. Education	Seattle,	WA	98155
Energy Education Project	1400 Washington Avenue, Box 2210C	SUNY - Albany	Albany,	NY	12222
Tenneco, Inc.	P.O. Box 2511	Public Affairs Department	Houston,	TX	77001

DATE

FILMED

7 / 1 / 94

END

7
1
1
1