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ALASKA ENERGY EXTENSION SERVICE
DIVISION OF ENERGY & POWER DEVELOPMENT

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF ALASKA

APPROPRIATE ENERGECTIONS

Energy Extension Begins

The Alaska Energy Extension Plan is in the first planning stages. Objectives, programs, and support activities will be dependent upon final funding. Three preliminary plans will be prepared based on various funding levels. Preliminary thinking envisions: The University of Alaska Cooperative Extension Service as the main network for EES; a Solar Technical Information Unit in Fairbanks; a Wind Technical Information Unit in Anchorage; Contract Services to perform energy audits with main emphasis on commercial buildings; Contract Services with public and private utilities to perform home audits; appropriate Technology Workshops involving solar, wind, hydro, biomass, etc.; Training workshops for community groups interested in local energy conservation programs; Energy Conscious Community Programs; Identification of various barriers to use of solar applications including capitalization costs, availability of technology, taxes, assessments, etc., with specific workshops on selected topics. Public suggestions for the Alaska Energy Extension Service are required by law. If you wish to see any special programs included in the AKEES Plan, you should write the editors or call John Hale at 276-0512.



Appropriate Technology

SMALL GRANTS PROGRAM

14 ALASKAN PROJECTS FUNDED UNDER APPROPRIATE TECHNOLOGY PROGRAM

Fourteen Alaskan proposals have been funded under the Region X U.S. Department of Energy Appropriate Technology Program. The grants program, which began last September, drew more than 260 proposals from Alaskan individuals, Native groups, non-profit groups, and small businesses. This grass roots program is included to foster small scale, innovative and locally appropriate ideas on the use of alternative forms of energy. The Alaskan projects that were funded under the program are:

WATER-POWERED WATER DELIVERY PUMP: Donald L. Chaney of Petersburg received \$1,534 to demonstrate the use of a water-powered ram to lift water 15 feet from a creek into a storage tank for domestic use. The system relies totally on water power from a creek, rather than using a gasoline generator or pump to lift the water.

WINDMILLS FOR SALMON AQUACULTURE: Nerka, Inc., a private, non-profit salmon hatchery at Perry Island in Prince William Sound, will construct and test a windmill to pump water for aquaculture through the salmon culture system during the winter months.

CRAB WASTE AS FUEL: R. Charles Vowell of Unalaska received \$12,000 to install and operate a 10,000 gallon capacity bio-gas generator which will use crab wastes from the community's canneries as fuel. The methane gas produced will be distributed to the Haystack Hill neighborhood in Unalaska, reducing the use of propane and heating oil. The sludge will be used as fertilizer.

About 50 percent of the crab catch is considered waste and currently it is ground up and dumped on the ocean floor. If the project proves successful, Vowell plans to install several more methane generators and a pipeline through town.

GROUND HEAT STORAGE SOLAR GREENHOUSE: John Collette received \$9,500 to demonstrate a method of using the soil under the greenhouse to store solar heat. A series of heat exchangers will collect excess heat in the top of the greenhouse and transmit the heat to the soil through an anti-freeze solution in pipes.

SOLAR-HEATED GREENHOUSE: The Kuskokwim Native Association at Aniak was awarded \$16,800 to build and test a greenhouse heated totally by solar heat. The project's goal is to extend the growing season to nine months without using supplemental fossil fuel heat. The greenhouse will use an adjustable reflector/insulator which will make it possible to store more heat on warm days.

Discarded 55-gallon oil drums will support the growing benches and act as the heat storage. In the winter, the greenhouse will be used to store vegetables. The solar project will supplement the native association's agriculture program which supplies vegetable produce to eleven native villages in the middle Kuskokwim River Valley.

POULTRY-HEATED SOLAR GREENHOUSE: Elizabeth Hart of Galena received \$13,800 to design and build a demonstration solar greenhouse that will rely heavily on body heat from chickens raised in the greenhouse as a heat source. Ms. Hart will grow garden vegetables and raise chickens for eggs year round and will market her products locally. Backup heat will be provided by a wood stove using local sawmill waste and forest residue as fuel.

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APPROPRIATE TECH CONTINUED

HIGH SCHOOL GREENHOUSE PROJECT: The S.A.V.E 1 High School in Anchorage was awarded \$464 to insulate their greenhouse in order to make it more energy efficient. In addition they will build and install two solar panels to provide heating. The S.A.V.E. is an alternative school for students who have dropped out of the regular school program. All work will be completed by the students and teachers, and the students will receive academic credit for their work.

SOLAR-HEATED HOUSE FOR NORTHERN LATITUDES: Kyle Green of Wasilla received \$49,300 to build and demonstrate a solar heated home designed to be 100% self-sufficient from renewable energy resources. This unique type underground home provides a complete insulation envelope of consistent R-factor, double entry, water heat storage and ventilation independent of the special design windows. The house is designed to be simple and maintenance free and low cost.

SOLAR COLLECTOR FOR HOME HEAT: Craig Anderson of Kenny Lake was awarded \$400 to construct and build a passive solar system using solar collectors and reflector shutters in the southern exposed walls to route hot air into the living area and heat sink walls for storage. The collectors will be constructed with recycled beer and soft-drink bottles.

INSULATING SHUTTER: Ed McGrath of College was awarded \$2,400 to design and construct vertical sliding insulating shutters that will fit into the side of a house. The shutters will be opened and cleaned by using a pull cord.

They will be installed on a private home in Fairbanks where the occupants will use the shutters and keep records of their fuel bills to compare with the previous year's bills to judge the energy savings. Mr. McGrath will manufacture and market the shutters locally.

SMALL-SCALE HYDROELECTRIC SYSTEMS: Chester B. Johnson of Valdez received \$5,900 to increase the generating capacity and efficiency of his existing hydroelectric system (turbine type pelton wheel) by lengthening the pen-stock, building a small rock dam to create a reservoir and installing a new 7.5 kilowatt alternator. The updated system will supply electricity for three families now without electric power.

WIND POWERED FREEZER: Dan Denslow of Ambler was awarded \$3,000 to develop and build a small walk-in freezer to be powered by an existing wind generator and storage battery system. The freezer box will be outdoors, half underground and shaded from direct sunlight. The condensing unit will be placed in a cool cellar several feet from the box.

The freezer will service five families and will be used to preserve food gathered in the spring and summer, thereby reducing the amount of food that must be flown in. Mr. Denslow will publish the design and performance record of the freezer.

CONTINUED

ALASKA LEADS NATION IN RESPONSE TO DOE APPROPRIATE TECHNOLOGY GRANTS PROGRAM

The Office of Small Scale Technology of the U.S. Department of Energy (DOE) has announced that the State of Alaska had the highest per capita response to the Small Grants Program. Alaskans submitted 258 proposals representing 63.4 proposals per 100,000 population. Below is the ranking of the states according to the response to the program.

State	Responses per 100,000 People
1. Alaska	63.4
2. Vermont	28.5
3. Idaho	26.6
4. New Mexico	25.0
5. Maine	18.4
6. New Hampshire	18.2
7. Delaware	15.5
8. Washington	13.1
9. Oregon	12.1
10. Colorado	10.7
11. Maryland	10.6
12. Massachusetts	10.5
13. Hawaii	10.3
14. Rhode Island	9.9
14. Virginia	9.9
14. Wyoming	9.9
17. Oklahoma	9.4

18. Nevada	8.8
19. Connecticut	8.3
20. West Virginia	8.2
21. Kansas	8.0
22. Montana	7.5
22. North Dakota	7.5
22. Iowa	7.5
22. Arkansas	7.5
26. Pennsylvania	7.1
27. South Dakota	7.0
28. Florida	6.8
29. Georgia	6.5
30. Texas	6.0
31. Missouri	5.4
32. Minnesota	5.1
33. Arizona	5.0
34. Wisconsin	4.9
35. Nebraska	4.6
35. New York	4.6
37. Tennessee	4.1
37. Mississippi	4.1
39. New Jersey	4.0
39. Louisiana	4.0
41. Utah	3.8
42. Alabama	3.5
43. Kentucky	3.4
43. California	3.4
45. North Carolina	3.2
46. Indiana	2.9
47. South Carolina	2.5
48. Illinois	2.3
49. Michigan	1.9
50. Ohio	1.7

WIND POWERED GREENHOUSE: A. Hart Alex, Kivalina, was awarded \$9,600 for installing a wind generator to provide electricity for heating and lighting the McQueen School's greenhouse. Connection will be made with the existing electric grid for backup power during periods of insufficient wind speeds. Electric heaters in the greenhouse will allow year-round crop productions. Students will photograph the project and describe the construction techniques and potential energy savings to other Alaskan villages.

SOLAR-ASSISTED HOT WATER HEAT: The Kenny Lake Community League was awarded \$2,200 for a solar-assisted hot water heating system in the community library building. An anti-freeze solution will be circulated through black plastic pipes against a black background under corrugated plastic and two layers of glass.

The next round for the grants is scheduled to take place at the beginning of October, 1979. For more information, write the editors.

Alaska Leads Continued

While the greatest response to the A.T. Program came from the smaller more rural states, the \$8 million funding available for grants did not. The money that was available for the 1979 program was allocated solely upon population. This resulted in Region X, which Alaska belongs to, receiving 1,251 proposals for the \$350,000 allocated (\$280 per proposal) while Region V (Chicago) received 1,210 for the \$1.6 million allocated (\$1,353 per proposal).

The Division of Energy has been working with the DOE on amending the funding formula and it appears that the next program funding will take into consideration the responses to the program. This should result in more money being available for Alaskan proposals.

In addition, the Division of Energy has been working with the Alaskan Congressional Delegation in raising the amount of funding available to the program. The House Science and Technology Subcommittee has authorized \$23.5 million for the next round compared to the last program's \$8 million and the Senate Energy and Natural Resources Subcommittee, thanks to the efforts of Senator Stevens, is expected to authorize \$23 million.

PROGRAM AVAILABLE TO LOWER ENERGY COSTS FOR FARMERS

The Division of Energy has learned of two Federal Programs designed to help farmers reduce their dependence on the increasingly expensive fossil fuels that are making the cost of farming and large scale gardening more costly every year.

The first program is the Economic Development Administration's (EDA) Alcohol Fuel (Gasohol) Plant Program. The program offers \$10,000,000 in grants during the federal fiscal years 1979-1981 for the construction and field evaluation of gasohol and aquaculture waste. To apply or learn more about the program contact Clyde Cartledge of the state EDA Office, 701 C Street, Anchorage, AK 99501 (271-5009). The other program is the U.S. Department of Agriculture's farm facility loans for solar grain drying systems. The solar grain drying loans are available to farmers under the same terms and conditions as other farm facility loans that are administered by the Department of Agriculture's Agricultural Stabilization and Conservation Service (ASCS). To apply contact Charles F. Marsh, Alaska ASCS Office, 2221 E. Northern Lights, Suite 125, Anchorage AK 99504 (277-7659).

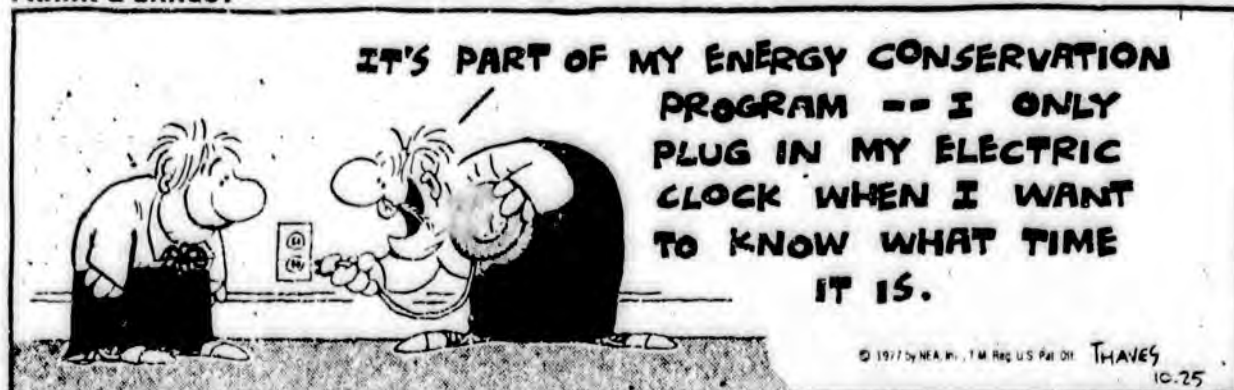
HEAT PUMP DEMONSTRATION SET

Three Juneau organizations will be sponsoring a heat pump demonstration to test its adaptability as an energy saving device.

The Alaska Electric Light & Power Company, Glacier Highway Electric Association, and the Alaska Power Administration of the U.S. Department of Energy are initiating a program where five residences in Juneau will be fitted with heat pumps. The homes will be monitored to determine the energy saving data. The three agencies will be sharing the costs of purchasing and installing the heat pumps.

A decision on which home will be selected will be made on the first of August. For more information, contact Betty McVey, Alaska Power Administration, Federal Building, Juneau.

FRANK & ERNEST



Greenhouse

TWO ALASKAN FIRMS RECEIVE SOLAR GRANTS

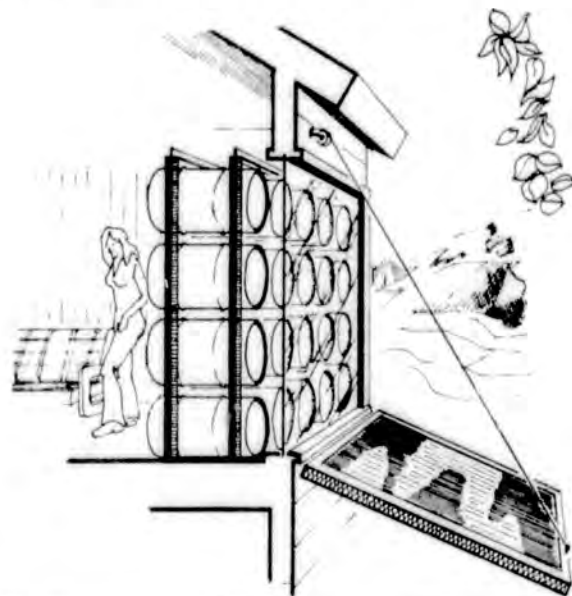


The U.S. Department of Housing and Urban Development has announced solar design grants of \$2,000 each to two Anchorage home building companies.

The grants to single family home builders to design energy conserving solar homes that will be built for sale went to Solarctic Construction and Devcon Enterprises of Anchorage.

Solarctic's grant managed by Don Markle and designed by Ron Bissett involves an energy conserving design with passive solar heating and a solar hot water heating system in a house to be built in the Matanuska Valley.

Devcon's grant, designed by Jimmy Anderson and managed by Jim Pitts, will cover the construction of an Anchorage super insulation and a passive solar heating system.



TRADE FAIR

The Energy Production and Management Trade Expo '79 will be held at the Anchorage Sheraton Hotel October 14 to 17, according to Chuck Ferrel of Honeywell, Inc., who is chairman of the event. Fifty-five Alaskan and Canadian companies will be exhibiting at the event.

Persons or firms desiring to take part in the Expo as an exhibitor or who would like to attend various seminars can do so by writing Grace Pleasants, Expo Director at EPMTE '79, c/o Division of Energy and Power Development, 1st floor MacKay Bldg., 338 Denali St., Anchorage, AK, 99501. Exhibit spaces 10x10 cost \$350.00 and seminar fees for exhibitors are free for up to two persons and cost \$115.00 for non-exhibitors.

ALASKA ENERGY SURVEY PROGRAM

ENERGY CONSERVATION IN BUILDINGS

The Division of Energy's Conservation Office is making available a series of energy audit workbooks. The workbooks aid the user in identifying a building's energy use, methods of reducing that use, cost estimates for implementing those methods, and payback calculations for those costs based on energy savings. Homeowners can choose from a computer assisted energy survey or a do-it-yourself workbook. Commercial property owners can opt for the do-it-yourself workbook or a two-part audit manual allowing for professional assistance. The workbooks are provided free of charge. Just write: SPACE, P.O. Box 3535, Anchorage, Alaska 99510 and ask for any of the following:

DO IT YOURSELF

- | | |
|---|---------------------------------------|
| ☐ Apartment Bldg. | ☐ Retail Store |
| ☐ Warehouse | ☐ Office Bldg. |
| ☐ Restaurant | ☐ Home Survey |
| ☐ Hotel and Motel | |
| ☐ Home Computer Survey | |

PROGRAM AIDS ENERGY INVENTORS

Individual inventors and small companies may apply to the office of Energy-Related Inventions of the National Bureau Standards for funding of their energy saving inventions.

Assistance is available in the form of grants, loans, contracts and financial awards. The average grant amount has been \$50,000 but requests for as little as \$3,000 are also considered. Any invention or idea for a new device, material, process or procedure that would result in energy savings or more efficient use of energy may be submitted.

To obtain a brochure on the program, write to:

Richard Pastore
Office of Energy Related Inventions
National Bureau of Standards
Washington, D.C. 20234

To specifically assist inventors in the Pacific Northwest in the development of energy-related inventions and new products, the NBS has established the "Energy Northwest Office." To learn more about Energy Northwest services, write to:

The Invention Center
College of Business Administration
131 Gilbert Hall
University of Oregon
Eugene, Oregon 97403



**ENERGY
SELF
SUFFICIENT
TODAY!**

Have you ever dreamed of declaring your independence from OPEC cartels and increasingly expensive utility bills? Donald Dunning of Healy has achieved precisely this.

Mr. Dunning upon his retirement realized that his pension would not be able to maintain a conventional home and utility bills. So he resolved to do something where he could keep his monthly bills to a minimum to be able to stay in Healy.

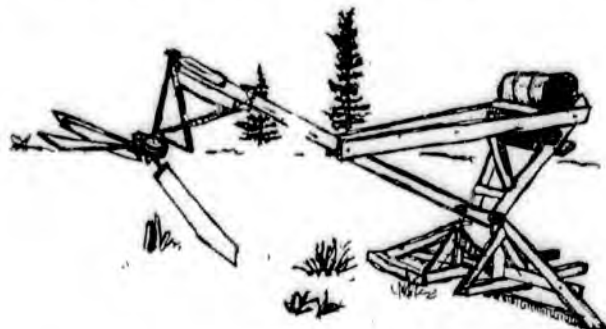
He designed an ingenious heating system for an old 10x50 mobile home that uses a pot-type oil stove with a secondary air entrance. A double floor was installed which allows the heated air to circulate to the room perimeter thereby heating the house and keeping the floor warm.

His windmill shows good imagination and here is the description of it in his own words:

"I built a windmill to charge my 12v batteries and I use an inverter when I want 120vAC for my color TV. It is adequate for tape deck, CB, small cord organ, etc. The mill that I am using is a fully feathering, three bladed unit, 14 ft. in diameter which is built around a 1941 Jeep front axle.

"Healy's wind is legend! There is enough energy in some gusts to blow a reasonably conventional windmill through the whole settlement. I couldn't imagine a mill and structure that would stand up to the force so I built a tower that would simply bow down out of the wind. The tower is counter balanced with a drum of water/ice so that after the gusting is over the mill raises back into the wind and resumes generating. (Illustrations 4 and 5).

"The blades are a single sheet of 1/4" plywood secured to 3/4" water pipe. There doesn't seem to be any reason for a stream-lined "high lift" profile like an airplane wing because there is enough wind. Strength is the main thing."



**ENERGY.
We can't afford
to waste it.**

ENERGY INVENTORY

Nancy Lee and Elaine Blythe of the Alaska Center for the Environment are collecting information for a directory about energy conservation and alternative energy applications in Alaska. If you use any technology in your home, farm, business, or industrial plant that reduces or eliminates the need for fossil fuels, they would like to hear from you.

Wind, solar collectors, small hydro, bio-mass, solar greenhouses, passive solar homes, heat pumps, water rams, and other appropriate technologies are all items of interest. Education, training, and legislative programs that you may have participated in are also desired.

Required for the Alaska Center for the Environment Energy Conservation Directory Survey are:

Name, address and phone number plus:

1. What are your major interests, experience or skills as related to energy conservation and/or alternative energy?
2. Of what applications of energy-saving technologies are you aware?
3. Have you started or built any energy-saving projects? How much has it cost? How did you finance it? Did you have any problems implementing your ideas?
4. Where did you obtain materials for the project?
5. What information source(s) did you find most valuable?
6. What other information would you find useful? Please be specific as possible.
7. Are you involved in an energy group or program? What is its purpose?
8. Do you think that a formal statewide alternative energy group would be useful in Alaska?

Send directory information to the Editors.

RURAL FUEL MANAGEMENT SEMINARS CONDUCTED

The Division of Energy with the cooperation of Chevron, USA conducted a fuel management seminar in Fairbanks on May 3.

The purpose of the seminar was to assist persons who are involved with ordering, receiving, storing, or dispensing fuels for villages in Rural Alaska. The seminar sessions covered such critical issues as how to anticipate the village's fuel requirements, fuel delivery and storage, safety, how to build environmentally safe fuel storage facilities, how to organize village fuel companies, possible sources of assistance, energy conservation, and anticipating shortages. Representatives of Village Councils, Village Corporations, State agencies, and barge companies attended the sessions.

Dale Rusnell of the Division of Energy explained the State's programs assisting villages in fuel management and Jim Howard, Jim Scheid, and Bill Kramer explained Chevron USA's field fuel training program.

Besides DEP and Chevron, the U.S. Coast Guard, Rural Alaska Community Action Program, the Division of Economic Enterprises, the Department of Environmental Conservation and the Department of Community and Regional Affairs also participated.

INCENTIVES FOR ENERGY CONSERVATION IN ALASKA

Business Energy Tax Credit

An additional ten percent investment tax credit is available for qualifying business taxpayers who invest in one of the following six categories:

1. Alternate energy property;
2. Wind or solar energy property;
3. Specially defined energy property;
4. Recycling equipment;
5. Shale oil equipment;
6. Equipment for producing natural gas from geopressured brine.

If the property is financed with tax-exempt industrial bonds, the credit is reduced to five percent. If the property is tangible personal property that qualifies for regular investment credit, then both credits can be utilized. In order for the equipment to qualify, it must be new and placed into service after September 30, 1978 and before January 1, 1983. This credit is available only to those taxpayers engaged in a trade or a business in which the trade or business structure is located in the United States. The property must have a useful life of at least three years and the credit will be recaptured if the property is disposed of before its useful life ends. The property must meet quality and performance standards that are in effect at the time the equipment is placed in service.

STATE OF ALASKA

Residential Fuel Conservation Tax Credit

If you have a personal residence in the State of Alaska, you can receive a tax credit of 10 percent of your expenses, up to a maximum of \$200, for residential fuel conservation capital improvements.

What are "expenses for fuel conservation capital improvements"?

1. The cost of additional insulation or insulating materials installed in the residence of the taxpayer if the residence was in existence on January 1, 1977;
2. The cost of insulating windows;
3. The cost of labor for the installation of the materials set out in No. 1 and No. 2; and
4. The cost of installation of alternate sources of power generation not dependent on fossil fuels for energy supply, such as wind, solar, tidal, and geothermal sources. The credit will apply only if the alternate source becomes the primary source of energy.

ENERGY TAX CREDITS

Tax credits are provided by both the federal government and the State of Alaska to encourage energy conservation and the development of alternative energy sources. Credits are subtracted from the income taxes you owe. They are not merely deductions used in computing your taxable income.

FEDERAL

The following are the new tax credits that may be claimed by individuals who installed energy-saving materials or solar, geothermal, or wind-powered equipment in their homes after April 19, 1977.

Residential Energy Conservation Tax Credit

You can receive tax credits amounting to 15 percent of the first \$2,000 spent on qualifying equipment, up to a maximum of \$300, if you installed energy-saving materials in your principal residence after April 19, 1977. Taxpayers who are owners, renters, and owners of cooperatives or condominiums are eligible for credits.

Residential Alternate Energy Tax Credit

If you installed renewable energy resource property in connection with your principal residence, you could receive up to 30 percent of the first \$2,000 spent and 20 percent of the next \$8,000 spent on qualifying equipment. The maximum credit would be \$2,200. Eligible equipment includes solar space and hot water heating, wind energy equipment, geothermal equipment, and other "renewable energy" equipment.

How Does the Energy Credit Work?

The credit is subtracted from the federal income taxes you owe. If you qualify for a tax credit in excess of the tax you owe, you can carry the credit forward on future tax returns through taxable years ending January 1, 1988.

Example:

\$4,000	Cost of insulation
x 15%	
\$ 600	Federal tax credit
\$ 600	Federal tax credit
- 300	Income tax owed
\$ 300	Credit for next year!

How Do You Apply for Energy Tax Credits?

Form 5695 is available for individuals filing 1978 tax returns. The completed form should be attached to your standard federal income tax return Form 1040.

For more detailed information regarding the credits, contact your local tax office for Publication 903, "Energy Credits for Individuals."

Internal Revenue Service
310 K Street, 2nd Floor
Anchorage, AK 99501
Tel. (907) 277-8715
Toll-Free Taxpayer—Zenith 3700

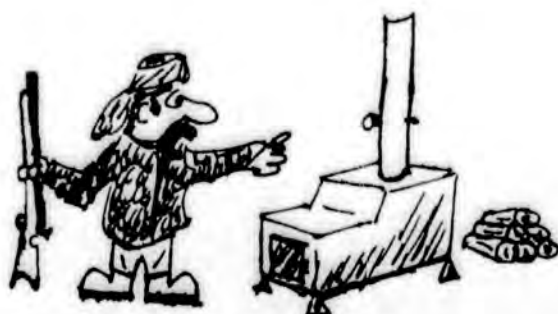
AND FOR YOU WOODBURNERS...

(Taken from Vermont Energy News)

Economic Justification of Woodburning Over Fuel Oil—First Year Costs

ITEM	CREDIT	COST
(2) Stoves, equipped and set up	\$—	\$1,385
Remove hot water baseboard system w/ boiler	—	238
Sell hot water baseboard system w/boiler	125	—
Pursue reputable wood dealer (not available)	—	76
Buy:		
Chain Saw	—	210
Axe, hatchet, wedges, maul, cant hook	—	119
Old truck (scrapped after first load)	—	595
New 4-wheel drive truck	—	8,645
Wheel chains	—	88
Replace truck rear window (twice)	—	310
Work gloves (swiped from shop)	—	—
Fine for cutting wrong trees	—	500
Buy:		
5 acre woodlot	—	4,995
Splitting machine	—	950
14 cases Miller beer	—	126
6 Fifts Ginger Brandy	—	38
Fine for littering	—	250
Towing charge (creekbed to hardtop road)	—	50
Gas, oil, chain sharpening, and Band-Aids	—	97
Doctor's fee for splinter removal from eye	—	45
Safety glasses (swiped from shop)	—	—
Medical costs for broken toe (dropped log)	—	128
Safety shoes	—	35
Repair burned hole in Living Room carpet (unsuccessful)	—	76
New Living Room Carpet	—	699
Paint Living Room Walls and Ceiling	—	110
Taxes on woodlot	—	44
Woodlot boundary dispute settlement	—	465
Roof repair after chimney fire	—	840
Fine for assaulting fireman	—	50
Extension ladder	—	55
Chimney Brush	—	22
Medical cost for broken leg (fell off roof)	—	478
Chimney Cleaner Service	—	90
Coffee table replacement (chopped up and burned while too drunk to bring up firewood from cellar)	—	79
Divorce settlement	—	14,500
Annual Fuel Oil Saving	376	—
	\$501	\$36,388

NET COST OF FIRST YEAR WOOD BURNING OPERATION:
\$35,887



ALTERNATIVE POWER REVOLVING LOAN FUND

Low-interest loans of up to \$10,000 are available for the purchase, construction, and installation of alternative energy systems. The loans are for up to 50 percent of the cost of installation, and provide 20 years' financing at an interest rate not to exceed 8 percent.

For detailed information and applications for the Loan Fund, contact the Division of Business Loans, Department of Commerce and Economic Development:

Juneau— Pouch D
Juneau, AK 99811
Tel. (907) 465-2510

Anchorage— 201 E. 9th Ave., Suite 103
Anchorage, AK 99501
Tel. (907) 274-6693

Fairbanks— 675 - 7th Ave.
Station A
Fairbanks, AK 99701
Tel. (907) 452-8182

SMALL BUSINESS ENERGY LOANS

The Small Business Administration has established a Small Business Energy Loan Program. The program offers loans up to \$350,000 (\$500,000 for loan guaranties) where other financial assistance is not available on reasonable terms through non-Federal sources.

The loans are intended to provide a means for small businesses to start up, continue, or expand in developing, manufacturing, selling, installing or servicing specific energy measures.

Energy measures eligible under the program include:

1. Solar heating equipment;
2. Photovoltaic cells and related equipment;
3. Products or services that increase the energy efficiency of existing equipment, methods of operation, or systems which use fossil fuels;
4. Energy production from biomass;
5. Industrial cogeneration of energy, district heating, or production of power from industrial waste;
6. Hydroelectric power equipment, wind energy conversion equipment; and
7. Engineering architectural, consulting or other professional services which are necessary to aid citizens in using any of the above measures.

For more information or application forms, contact the Small Business Administration, 1016 W. 6th Ave., Anchorage, AK 99501, tel. 271-4022 OR Federal Building and Courthouse, 101 12th Ave., Fairbanks, AK, tel. 452-1951 x211.

ENERGY BROCHURES AT DEPD

A stock of the following brochures on energy topics are available at the Division of Energy and may be obtained by writing the editors:

- How to Improve the Efficiency of your Oil-Fired Furnace
- How to Understand Your Utility Bill
- 1979 Gas Mileage Guide
- Winter Survival
- How to Save Money by Insulating Your Home
- Tips for Energy Savers
- Solar Energy and Passive Energy Designs
- Solar Greenhouse Bibliography
- Passive Solar Heating
- Guide for Submission of Unsolicited Proposals DOE

AKEES SACK LUNCH

AKEES has been running a Sack Lunch Program for the past six months. Meetings are normally held on the first Thursday of each month at the AKEES office located on the first floor of the MacKay Building at 338 Denali St. Meetings are sometimes changed to avoid holiday conflicts. Wide publicity is given this program through public service announcements in newspaper, radio, and direct mail. Dress is informal. The public is invited.

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We welcome news items and comments. Please send contributions to: Appropriate Energections, Division of Energy, 338 Denali Street, MacKay Building, 1st Floor, Anchorage, AK 99501.



ALASKA ENERGY EXTENSION SERVICE

Division of Energy & Power Development
Department of Commerce & Economic Dev.
7th Floor, MacKay Building
338 Denali Street
Anchorage, Alaska 99501
Tel. (907) 276-0512

Representative Brian Rogers
P.O. Box K, College Branch
Fairbanks, Alaska 99708



The Cooperative Extension Service as a part of the University of Alaska conducts educational programs in agriculture, natural resources, human resources (including home economics and youth), and community resource development. Extension information and programs are available to all citizens throughout the state, regardless of race, color, or national origin.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Dr. James W. Matthews, Director, Cooperative Extension Service, University of Alaska.

APPROPRIATE ENERGECATIONS

KOTZEBUE RECEIVES WIND GENERATOR



The U.S. Department of Energy (DOE) has installed a 2.2-KW Ener-tech wind generator at the residence of the Mayor of the City of Kotzebue as part of a national wind field evaluation program. The wind generator will be interconnected to a utility grid to provide backup power to the user. Kotzebue Electric Association is cooperating with the program by interconnecting the wind generator to their grid.

The Kotzebue project is part of a field evaluation program that is being conducted by DOE. A major objective of the program is to address issues involving permits and the interconnecting of the wind machines with a public utility. Alaska was one of the first states in the nation to be selected to participate in the program. The Division of Energy participated in selecting the site and will assist in the monitoring of the project.



AKEES READY FOR KICKOFF

As the new year rapidly approaches, the Alaska Energy Extension Service nears its baptismal date. AKEES has finished its preliminary plan and mailed it to our good friend in Department of Energy, Region X, Andy Ekman.

In the meantime, we have been extremely fortunate in securing the services of nine outstanding Alaskans who will serve on the State's Energy Conservation Advisory Board. They will be giving guidance to AKEES as part of their duties. Members of this important board are: Paul Crippen of the Matanuska Valley Federal Credit Union; James Fisher of the U.S. Dept. of Agriculture; Dave Hutchins of the Alaska Rural Electric Cooperative Association; Gordon Jackson of Alaska Legal Services Corp.; Ed Janzen of the Sheet Metal Workers Int. Assoc. Local 23; Kay Linton of the Alaska Federation of Women Clubs; Dave Schneider of Yukon Office Supply, winner of the 1978 Energy Conservation in Management Award; Alaska State Senator Arliss Sturgulewski and Emma Walton, Science Curriculum Specialist who has been a mainstay in Energy Conservation in our school systems. With the talent available to us and strong support from Andy Ekman it appears that AKEES can look forward to a bright future.

FIRST ALASKA ALTERNATIVE ENERGY CONFERENCE

Over 800 alternative energy enthusiasts from all over Alaska gathered at the Anchorage Community College on November 9-11 to learn and share information on the development of alternative energy in Alaska.

The conference, sponsored by the Alaska Center for the Environment, featured such energy luminaries as Preben Maegaard from Denmark, David Morris of the Institute for Local Self-Reliance of Washington, D.C., Jerry Plunkett of the Montana Energy Research and Development Institute, Sim Van der Ryne, Farrallones Institute, Berkeley, California; Chris Conway of Energy Probe, Ottawa, Canada; and Rich Seifert of the University of Alaska at Fairbanks.

Many other experts from all over Alaska directed workshops on such topics as solar design, greenhouses, wind generation, small hydro development, community energy systems, funding and financing for alternative energy projects and state and local programs. The workshops focused on the sharing of information specifically designed to help Alaskans develop and use renewable energy resources.

In addition a panel of state officials, moderated by Representative Brian Rogers, reviewed state energy programs and issues involved in developing an Alaska energy policy. The panel was composed of Clarissa Quinlan, Alaska Division of Energy; Phil Smith of the Rural Alaska Community Action Program; Deming Cowles and Dave Sturdevant of the Department of Environmental Conservation and John Bates of the Department of Transportation and Public Facilities.

Besides facilitating the exchange of information on alternative energy sources available, policy caucuses were held to develop resolutions on issues involved in the development of alternative energy in Alaska.

A lobbying group, Citizens for Alternative Energy emerged from the conference. The group's purpose is to develop grass-roots for the development of programs aimed at furthering energy self-sufficiency in Alaska. A nine-person board was selected to organize the group. Members of the board are Morris Morgan of the Tanana Chiefs Conference; Rich Seifert, University of Alaska, Fairbanks; Jane Galblum of Fairbanks; Jim Farmer, Koyukon Development Corp., Galena; Axel Carlson, Cooperative Extension Service, Fairbanks; Virginia dal Piaz, Alaska Renewable Resource Corp.; Rae Ann Hickling, Palmer; Dan Denslow from Ambler and Nancy Lee of the Alaska Center for the Environment. For more information on the group contact the Alaska Center for the Environment.



WESTERN SUN

Western SUN, the western region solar energy center composed of thirteen western states (including Alaska) has established a plan funded by the U.S. Department of Energy for encouraging the use of solar energy in the West. Each member state has established a State Solar Office to implement the program at the level.

Alaska's State Solar Office, which is in the Division of Energy and Power Development, should have its solar plan contract with Western SUN by the end of November.

The current Western SUN operating plan included programs for solar water heating, passive solar space heating, industrial process heat, small wind systems and wood combustion.

The Alaska State Solar Office will implement the solar energy program with particular emphasis on training, information and education which will include elements of data collection, information dissemination, and planning and program development throughout the state.

Call Bob Shipley, Solar Energy Specialist, at 276-0508 for solar energy information.

There are two libraries in Anchorage being set up specifically for public information on alternative energy. One is within the Division of Energy and Power Development and is still in the process of organization. The second has been established at the Alaska Center for the Environment, 1069 W. 6th Ave., under a grant from the U.S. Department of Energy. Reference materials can be checked out.

HOME WEATHERIZATION PROGRAM

Alaska's Weatherization Program has recently become a part of the Division of Energy and Power Development.

The program is statewide and serves low-income persons. A priority is placed on serving the low-income elderly and handicapped. The program's goal is to weatherize homes to conserve energy and decrease the high fuel bills paid by those least able to afford them.

The areas where there are presently programs are listed with the contact agencies and telephone numbers:

Municipality of Anchorage 264-4700
(Anchorage area)

Fairbanks Town and Village Association 456-5178
(Fairbanks and Delta areas)

RurAL CAP 279-2511
(Rural Alaska - various regions)

Ketchikan Indian Corporation 225-5158
(Ketchikan)

A public hearing is scheduled for December 17, 1979 in Anchorage on the FY '80 State Plan for Weatherization. Persons interested in obtaining copies of the plan or attending the public hearing should call 276-1169 or write:

Janice S. Brewer
Weatherization Program
Division of Energy and Power Development
7th Floor MacKay Building
338 Denali Street
Anchorage, Alaska 99501

DEPD INFORMATION

REFERRAL LIST

Bruce Atkinson	Schools & Hospitals Program	276-1169
Steve Baden	Public Information, Appropriate Technology	276-0512 Ext-37
Neil Basescu	Geothermal	276-0508
Jan Brewer	Weatherization	276-1169
Terry Dale	Lighting & Thermal Standards Energy Audits, Intergovernmental Coordination	276-0512 Ext-34
Greg Edblom	Regional Energy Assessments, Energy Supply and Demand	276-0508
John Hale	Energy Extension Service	276-0512 Ext-36
Barry Herron	Weatherization	276-1169
Patty Kirkwood	State Energy Conservation Program	276-0512 Ext-35
Don Markle	Alternative Energy Demonstration Projects	276-0508
Grant Peterson	General Administration	276-0508
Charlesa Quinlan	Division Director	276-0508
Dale Russnell	Fuel Allocation, Hydroelectric Rural Electrification	276-0508
Bob Shipley	Solar Office, Western SUN	276-0508
Kyle Weaver	Grants Administrator	276-0512

NEW DEP STAFF MEMBERS

The Division of Energy has augmented its staff with the addition of Patty Kirkwood and Neil Basescu.

Patty Kirkwood has replaced Jim Fredrickson, who left the Division to accept a teaching position on the Aleutian Chain. Patty has a B.A. and M.S. from Northwestern University and has completed all of her Ph.D research requirements. Her professional experience includes chemical research in pharmaceutical industry and geochemical and alternate energy research in Alaska. She has lived in rural Alaska and is especially concerned with Alaska's urgent need for energy self-sufficiency and for making the best use of Alaska's varied energy resources.

Neil Basescu is the new Alaskan Research Associate for the Geo-Heat Utilization Center of the Oregon Institute of Technology. A research associate from the Geo-Heat Utilization Center works in the State energy office of Alaska, Oregon and Washington. Neil will monitor geothermal development in the State and produce relevant maps, data, reports and will coordinate research and development of potential geothermal sites.

Neil has a M.A. in Geology from Cornell University and has a solid research background.

Appropriate Energyctions is published quarterly by the State of Alaska Division of Energy and Power Development.

Staff:

Editors: Steve Baden and John Hale

Contributing Writers: Mark Baumgartner, Jon M. Nielson, and staff of DEP.

We welcome news items and comments. Please send contributions to: Appropriate Energyctions, Division of Energy, 338 Denali Street, MacKay Building, 1st Floor, Anchorage, AK 99501.

NORTHERN TECHNOLOGY GRANTS AWARDED

Twenty projects were funded in the first round of the Northern Technology Grants Program. The program, managed by the Alaska Council on Science and Technology offered grants up to \$5,000 to develop low-cost and small-scale technologies appropriate to Alaska. Of the twenty proposals funded, seventeen were energy-related projects. Energy projects funded were:

Regeneration Freezer — Kevin McDougall of Delta received \$3,100 for a buried, brine-immersed multi-family freezer that would need no energy and will store the cold of winter for summer use.

Hydraulic-Powered Auto — Bert Bingham, Ken Kunkel and Don Luterbach of Fairbanks were awarded \$4,045 to build a car with an hydraulic propulsion system that should enable the auto to get 75 miles per gallon at speed between 55 and 75 mph.

Waste Heat Greenhouse — The Galena Regional Learning Center, \$2,570 to build a greenhouse heated with waste heat from the local power plant.

Solar Hot Water Heater — Julie Scott of Camp Bingle received \$1,200 to build a solar collector for hot water at the Harding Lake Camp.

Insulated Shutters — Rob Walton of Fairbanks, \$1,000 to design and construct insulating shutters for large windows.

Tidal Current Hydraulic Suction Dredge — O. Alexander Hoke of Juneau was awarded \$5,000 to build a working model of a tidal current powered suction dredge.

Solar Greenhouses — Steve and Cyndie Tack of Fairbanks and Jeremy and Linda Weld of Gakona each received \$5,000 to construct a solar greenhouse for their homes.

Oil-Fired Clothes Dryer — Mike Potter of Fairbanks, \$500 to convert a standard electric clothes dryer to an oil-fired one.

Methyl Fuel Plant — Douglas R. Grimm of Auke Bay received \$5,000 to build a scale model of a methyl fuel plant using waste wood chips and garbage.

Low-Head Hydroelectric Generators — Richard Ford of Copper Center was awarded \$2,500 to build a small-scale hydroelectric system to supply two-thirds of his power. The system will be mounted on a raft in the Copper River. Ted Neville of Fairbanks received \$350 to build a paddle wheel hydro generator.

Wood-Coal Furnace — Donald Ruef of Palmer received \$2,109 to build and test a wood-coal furnace.

Electric Car — David Grove of Fairbanks received \$5,000 to build and test an electric car for operation in cold climates.

Solar Heater — Chris Johansen of Fairbanks was awarded \$500 to build a window placed solar air heater.

Waste Oil Heater — Donald Pendergast of Fairbanks received \$250 to construct a waste crankcase oil burning stove.

Experimental Greenhouses — Jim Donally of Anchorage received \$1,000 to build three greenhouses to test the efficiency of a plastic product, called ACPS, as a greenhouse wall material.

For further information on any of the funded projects or grant program contact Chris Noah, Alaska Council on Science & Technology, Pouch AV, Juneau, Alaska 99811.



APPROPRIATE TECHNOLOGY SMALL GRANTS PROGRAM SECOND ROUND SCHEDULED

The second round of the Department of Energy's Appropriate Technology Small Grants Program is scheduled to begin this December.

The program offers grants up to \$50,000 to individuals, small businesses, Native groups, local agencies and non-profit groups to develop small scale energy efficient and locally appropriate energy conserving and alternative energy projects.

The first round of the program took place last September and fourteen Alaskan projects were funded. Funded projects included: wind generators; a crab waste bio-gas project; a small hydro-electric project; an energy efficient solar greenhouse and the State's first all solar home. The average grant awarded was \$10,000 and the amount awarded for grants ranged from \$400 to \$45,000.

The funding formula for the second round of the program has been changed to include response to the program. This, added to an increase in appropriations by Congress, means more grant funds will be available to Alaskans.

For more information or to apply for the program contact Steve Baden, Alaska Division of Energy.





SOURCES OF FUNDS FOR ALTERNATIVE ENERGY PROJECTS

The key to securing financing for an alternative energy project begins with a little research and a good understanding of what the potential funding sources are. Nearly every federal agency offers programs that can be utilized in developing an energy project. In addition agencies generally have "discretionary funds" that can be designated for various projects. Many private foundations are supporting innovative energy programs. In any case the secret for raising funds, is knowing how to tap the funding sources.

The Center for Renewable Resources has published an invaluable directory called "Sources of Funds For Solar Activities" that identifies possible funding sources. The purpose of the directory is to provide individuals and organizations with information on where to go for funding for their energy-related projects. The directory gives help in preparing proposals and lists foundations and agencies that support alternative energy projects.

This directory will help make the job of fundraising much easier. The directory is available from Center for Renewable Resources, 1001 Connecticut Ave., NW, Washington, D.C., 20036.

KENAI HOSTS ENERGY FAIR

More than 1,000 persons visited the Kenai Energy Fair held at the Kenai Mall on September 29 and 30. Eight exhibitors attracted fairgoers to displays concerning wind generation, wood burning stoves, insulation, energy efficient building, lighting and oil production.

One of the leading attractions at the fair was the energy environment simulator which was featured in the Division of Energy's display.

The fair was sponsored by the Kenai Mall Merchants and organized by Chuck Miller, proprietor of Zales Jewelers.

RAILBELT POWER ALTERNATIVE STUDY UNDERWAY

The House Power Alternatives Study Committee under the leadership of Representatives Hugh Malone and Brian Rogers is sponsoring a study that will research the contributions which energy conservation and renewable energy sources can provide in supplying the energy needs of the Railbelt area.

The information gathered for the report is expected to add a new dimension to energy planning in Alaska and will be useful to citizens and officials in formulating energy policy for the state.

The scope of work will include determining total energy demand in the railbelt by end use and the potential of alternative technologies, conservation, wood, small hydro, solar and wind to meet the demand.

Alaskan organizations involved in the study include Mark Fryer & Associates; the University of Alaska's Institute of Social & Economic Research, the Institute of Water Resources, the Alaska Federation for Community Self-Reliance, and the Alaska Public Interest Research Group.

The report is scheduled to be presented to the House around the first of April 1980.

SOLAR FIRE STATIONS FUNDED IN FAIRBANKS

The Chena-Goldstream Volunteer Fire Department has received \$125,000 from the State Legislature to build two fire stations incorporating passive solar heating designs.

When completed the stations will each measure approximately 40 x 60 feet and will feature roof solar collectors and heavily insulated walls, floor and roof. The structures will utilize solar heat as their primary heat source for at least four months of the year.

The fire stations will illustrate the practical application of solar energy in northern climate as well as providing fire protection and medical services to the Chena-Goldstream areas.

For additional information on the solar fire stations contact Jon M. Nielson, 80443, College, Alaska 99708.

WIND ANEMOMETER LOAN PROGRAM OFFERED

The Alaska Division of Energy will soon be initiating a wind anemometer loan program. The program, funded through a Department of Energy grant, will offer ten anemometers to individuals, small businesses and villages who have demonstrable interest in wind generation.

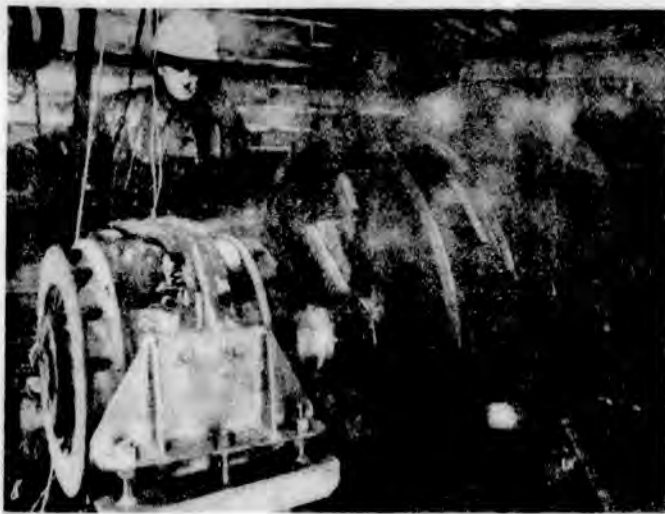
The anemometer will include recorders with digital readouts and telescoping tower. The period of loan will be for one year. The person receiving an anemometer will be responsible for installing the device and keeping daily readings. The readings will be recorded on a data sheet and be sent monthly to the Arctic Environmental Information and Data Center to be included in its wind index file at the end of the year. An analysis will be made that will provide the average watts per sq. meter at the site.

The primary objective of the program is to stimulate Alaskans' enthusiasm in wind energy, speed the process of commercialization of wind generators as an alternative energy source and collect site specific wind data.

The program will be managed by the Alaska Energy Extension Service and the Alaska Solar Office. It is expected that the anemometer will be available for loan in later winter or early spring. For further information on the program contact Steve Baden, Division of Energy, 338 Denali, Anchorage, Alaska 99501, 276-0512.



If you have any questions about solar energy
call the toll-free solar hotline
800-523-4700



Ed Estes and his 35-kilowatt hydroelectric system is pictured here. The pelton wheel, right rear, is powered by water that is carried in a 12' pipe from a reservoir 254 feet up the mountain. The hydroelectric system is powering Estes' home, store and service station at Moose Pass.

Carole Jaffe, Seward Phoenix Log photo

OLD CONCEPT REVIVED AT MOOSE PASS

At one time small-scale hydro-electric generating plants abounded in Alaska. The plants provided power to Alaskan miners to run winches and other equipment. With the advent of cheap fossil fuels many of the plants were abandoned. Now with the increasing cost of fossil fuels interest has been renewed in hydro power.

Ed Estes of Moose Pass has taken this old concept and put it into action by having his home, store and service station powered by a pelton wheel which runs a 35-KW generator. Estes' hydro plant completes a full circle which began in the 1930's. In 1931 Mr. Estes and his stepfather, Frank Rogcraft used a 19-KW pelton wheel to power the family's sawmill plus the lights and small appliances in 21 Moose Pass homes. Estes was licensed by the Federal Power Commission to sell the electricity within the community.

Later Estes abandoned his hydro system for diesel generators. Eventually, Chugach Electric extended its grid to the community. Ed Estes, however, had the foresight to retain his water rights to hook up the hydro generator in the future for personal use.

With recent increase in the price of diesel fuel, Ed Estes grew interested in reviving his hydro plant. With the assistance of Hayden Electric Motors of Anchorage Estes reinstalled the pelton system.

He dug a lake above the generator housing and ran a 12-inch pipe down the mountain the pelton wheel creating a 254-foot head. Standby Chugach power is still available for times when the generator is in need of maintenance or repair and costs \$11 a month. The total system cost was approximately \$35,000. Not at all a bad investment considering he will be self-sufficient for the power needs of his home and business.

Another example of the revival of small-hydro is Chester Johnson of Mile 49 Richardson Highway, outside of Valdez. Mr. Johnson, for the past eight years, has relied on a refurbished pelton wheel for his power. This summer Mr. Johnson received an Appropriate Technology Grant to lengthen his penstock, build a dam and update his system to provide power to three of his neighbors who have never had the luxury of electric power.

PILGRIM'S PROGRESS

The Alaska Division of Energy is undertaking a geothermal exploration and demonstration project at Pilgrim Hot Springs, forty miles northeast of Nome.

Two exploratory wells have been drilled to date. Both wells struck hotter water under higher pressures than expected. The wells, 6 inches in diameter and 150 feet deep, struck hot water at 90 feet. Upon completion of drilling, flow through the well head was at 150 gallons a minute for the first well and 300 gallons a minute at the second. The water temperature at the well head of the first well is 90 degrees C (194 degrees F) and 92 degrees C (198 degrees F) for the second well. Particularly encouraging is the fact that the flow from the wells is artesian (natural water pressure is bringing the water above ground level).

State and federal officials are excited with the preliminary results and are optimistic about future commercial prospects.

The project is in suspension for the rest of the winter. A third well will be drilled in Spring, 1980. At this time the feasibility of various demonstration projects at the site will be assessed.



ALASKAN ENERGY EFFICIENT BUILDING STANDARDS PROPOSED

The Division of Energy has been working to develop an energy efficient building standards since February, 1978. A group of over 30 persons from Rural Alaska, professional organizations, businesses and government recommended the adoption of ASHRAE 90-75R, Energy Conservation in New Building Design, as the statewide minimum standard.

Congress has provided funding for all states to develop a minimum thermal and lighting standard for new construction. Terry Dale of the Division's Conservation staff has been coordinating the program.

Alaska House Bill 364 contains the provision that could enact a statewide energy efficient building standard. If you have a question or comments on such legislation please write to David Rogers, c/o Representative Bill Miles, Pouch V, Juneau, AK 99801 or Terry Dale, Division of Energy, Suite 110, 338 Denali, Anchorage, AK 99501.



FEDERATION FOR COMMUNITY SELF-RELIANCE OPENS FAIRBANKS OFFICE

The Alaska Federation for Community Self-Reliance has recently opened offices in Fairbanks. The Federation is a grass-roots non-profit group whose goal is to promote energy conservation and to develop appropriate technology to increase local economic self-efficiency.

The office is manned by a five-person staff and located at Room 103 of the Arctic Bowl Building (946 Cowles Street).

The Federation offers: on-site energy audits to Fairbanks homeowners; assistance to residents in locating skilled services and financing for home improvements that conserve energy; workshops and seminars on alternative energy; an appropriate technology library. Since August the Federation has been providing personalized follow-up to the Division of Energy's computerized Home Energy Survey Program.

For more information on the Federation or its activities drop by their office or call 456-7674.

ALTERNATIVE ENERGY RESOURCE CATALOG AVAILABLE

The Alaska Center for the Environment has just completed the Alaskan portion of a national catalog of model solar conservation projects for the Center for Renewable Resources.

Twenty Alaskan projects in solar, wind, hydro, biomass, as well as other renewable technologies are listed. In addition 175 Alaskan solar resource people and agencies are listed.

For more information on the catalog contact Nancy Lee, Alaska Center for the Environment, 1069 W. 6th, Anchorage, AK 99501 (274-3621).



Solar Directory Available

The Department of Energy's Solar Energy Research Institute has released a directory of solar technical training programs nationwide.

The *Solar Energy Technical Training Directory* is available free of charge and lists 91 post-secondary institutions offering training programs in technical fields such as solar system fabrication, installation and maintenance.

The directory can be ordered by calling toll-free request lines of the National Solar Heating and Cooling Information Center: Telephone (800) 523-4700.

ENERGY SACK LUNCH SCHEDULE

The highly successful Sack Lunch Program, sponsored by AKEES, is back in business. *Tentative schedule* follows: Dec. 17, 1979, Roger Billings, one of the nation's leading authorities on hydrogen; Jan. 3, 1980, *Jim Covertson* who will speak on multi-fuel residential furnaces; Feb. 7, 1980, Kyle Green, winner of a \$49,300 Appropriate Technology Grant for a solar home will describe his progress.

For information as to time and place contact J. Hale at 276-0512. Publicity will be given this program through public service announcements in newspapers, radio and direct mail.

ENERGY PUBLICATIONS

"Micro-Hydro Power: Reviewing An Old Concept," a do-it-yourself handbook on small-scale hydro power, covers issues involved in developing hydro-power from calculating the feasibility of the project down to the actual construction. Written by the National Center for Appropriate Technology for the U.S. Department of Energy, \$5.25 from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161 (order number DOE1ET/01752-1).

"Wind Power for Farms, Homes and Small Industry." This publication is intended to provide you with a basis for determining the practicality of wind energy for your particular situation. It provides the reader with basic information needed to evaluate legal and environmental impacts, evaluate one's energy requirements, the wind resources, system components, Nelson Engineering & Research Inc. for the U.S. Department of Energy, \$9.50 from National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

"How to Build an Oil Barrel Stove" by Ole Wik. The book provides simple directions for making a wood stove out of an oil barrel entirely without welding equipment or power tools. \$1.95 from Alaska Northwest Publishing Company, Box 4-EE, Anchorage, Alaska 99509.

"Thermostat Control Timer." A build-it-yourself device to help you cut heating costs and increase comfort. Available free from the National Center for Appropriate Technology, P.O. Box 3838, Butte, Montana 59701. (Publication N. 034.)

"Small Farm Energy Project Newsletter," is published by the Small Farm Energy Project, a research and demonstration project of 24 farms sponsored by the Center for Rural Affairs. The newsletter, available free, is designed to disseminate information on alternative energy sources for farms, such as organic farming, waste recycling, energy conservation, wind and solar energy, minimum tillage, alcohol, methane and hydrogen. To receive the excellent newsletter write Small Farm Energy Project, P.O. Box 736, Hartington, Nebraska 68739.

FAIRBANKS AGRICULTURAL EXPERIMENT STATION RECEIVES ENERGY EDUCATION GRANT

The Agricultural Experiment Station in Fairbanks has received a \$49,948 grant from the Department of Health, Education and Welfare to develop an energy education and alternative energy workshop program.

The program will feature monthly workshops on energy alternatives for northern climates and a pilot project to incorporate energy issues into math, language and science classes.

The workshops will focus on such issues as solar and wind energy, insulation, oil and gas development, transportation and energy conservation.

For more information on the energy education program contact Belle Mickelsen at the Agricultural Experiment Station, University of Alaska, Fairbanks 99701, (456-7674).



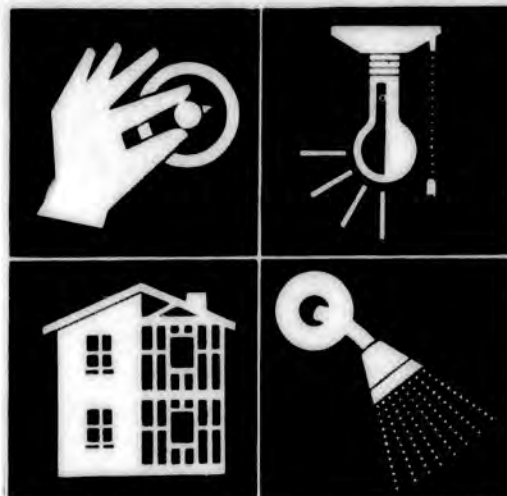
SAVE ENERGY WITH A WATER FLOW RESTRICTOR

Most of us take hot water for granted, thinking very little of heating water. Actually, the cost is about 15 percent of the average home's total energy bill! Excess water from one shower used once daily can be costing Alaskan homeowners as much as \$30 a year. (A five-minute shower may use as much as 20 to 40 gallons of water, half of which is hot.) So you can see, the potential for saving both dollars and energy are enormous.

The easiest way to reduce your consumption is to install water flow restrictors in shower heads and faucets. A flow restrictor cuts the amount of water by about half without significantly reducing pressure. Restrictors save energy two ways:

- The energy used to pump it.
- The energy used to heat it.

The Division of Energy is distributing water flow restrictors free of charge. Already over 4,000 Alaskans have taken advantage of the program. According to a 1976 FEA report, the estimated potential savings in this country through the installing of flow restrictors is equivalent to 100,000 barrels of oil each day. To receive a free flow restrictor write the editor.

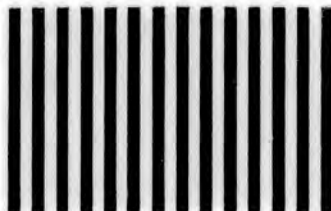


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STATE OF ALASKA
DEPARTMENT OF COMMERCE & ECONOMIC DEVELOPMENT
DIVISION OF ENERGY & POWER DEVELOPMENT
1st Floor, McKay Building
338 Denali Street
Anchorage, Alaska 99501

STATE PENALTY FOR
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Box K
College
Fairbanks, AK 99708

SUMMARY OF PROJECTS

DEPARTMENT OF ENERGY

REGION X

Appropriate Technology

SMALL GRANTS PROGRAM

for the Pacific Northwest and Alaska

OCTOBER 1979

DEPARTMENT OF ENERGY

Appropriate Technology Small Grants Program
for the Pacific Northwest and Alaska

Summary of Projects, 1978-1979 Program
October 1979

WHAT

Congress has authorized the U.S. Department of Energy (DOE) to undertake a small grants program in support of small-scale energy-related technologies referred to as appropriate technologies because they are "appropriate" to local needs, skills, and available energy resources. Grants funds are available for:

- ° Concept Development Studies; the research into and development of an idea, concept or investigative finding (\$10,000 maximum award per applicant);
- ° Development Projects; studies, investigations, models, hardware development, etc., involving experiments and/or tests (\$50,000 maximum award per applicant);
- ° Demonstration Projects; the testing and/or use of technologies or systems under actual operational conditions (\$50,000 maximum award per applicant);

In terms of energy resources, Appropriate Technologies

- ° make use of available renewable energy resources; and/or
- ° conserve non-renewable energy resources; and
- ° are energy conserving.

In scale and character, Appropriate Technologies

- ° are small-scale; and
- ° are simple to install, operate and maintain; and
- ° are low cost; and
- ° are environmentally sound; and
- ° are durable; and
- ° make use of locally available resources, material and local labor skills; and
- ° employ novel applications of existing technologies or develop new concepts or technologies.

In relation to the user, Appropriate Technologies

- ° satisfy local community energy needs; and
- ° increase community energy self-reliance through the use of available energy resources.

WHERE

The Region X program supports projects to be performed in the States of Alaska, Idaho, Oregon and Washington (Federal Region X). Applicants do not have to reside in Region X.

WHO

Proposals can be submitted by:

- ° Individuals
- ° Local nonprofit organizations, foundations, associations and institutions
- ° Interstate, State, regional, and local governmental agencies, including school and special districts
- ° Indian Tribes and Nations, and Alaskan Native Corporations and villages
- ° Small businesses

WHY

The Appropriate Technology Small Grants Program is designed to:

- ° Make more energy-related technology options available in the United States;
- ° Make technology available which is not otherwise accessible to the DOE;
- ° Further national efforts to promote the use of renewable energy resources and the conservation of non-renewable energy resources.
- ° Seek out the talents of individuals and small businessmen, in addition to major organizations, corporations, and academic institutions.

WHEN

The 1978-1979 program closed for receipt of applications in December of 1978. The 1980 Program will be announced in January 1980. Application Forms will be made available at that time. The deadline for submitting proposals will be 60 days after the Program Announcement (probably about mid-March). The results of the evaluation, review, and selection process will be announced in mid-summer with money reaching selected applicants in late summer and early fall.

RESULTS

To date (October 1, 1979), 41 applicants have been selected to receive funds to start or continue their projects. Grant awards have ranged from \$ 400 to \$ 47,900. The average amount of financial assistance for a grantee has equalled \$ 11,000. In addition to the proposals selected to date, approximately 80 highly-rated proposals have been sent to other Federal agencies, State and local agencies, or other DOE Headquarters Offices for review, where some (5 that we know of) have received financial support. Many others (200+) have been sent to other groups funding Appropriate Technology projects (e.g., the Bio-Energy Council), and some of these (10-15 that we know of) have received support from such groups. Region X received 1255 proposals in 1979 and \$ 400,000 for grants, supporting about 3.5% of the proposals received. In 1980, Region X should receive about \$ 1.5 million with 1250 proposals, allowing 12% - 15% to be funded. If 2000 proposals were received, Region X could receive in excess of \$ 2 million allowing 200+ projects to be funded.

MORE

For additional information on the Region X Department of Energy Appropriate Technology Small Grants Program, please contact:

U.S. Department of Energy, Region X
Appropriate Technology, M/S 500
1992 Federal Building
915 Second Avenue
Seattle, WA 98174

- or phone -

(206) 442-1746

ALASKA

<u>Application Number</u>	<u>Project</u>	<u>Applicant and Project Location</u>	<u>Amount of Grant Award</u>
A-009	<u>INSULATING SHUTTER</u>	Ed McGrath College, Alaska	\$2,375

Mr. McGrath will design and construct vertical, sliding, insulating shutters that will fit into the side of a house, over an existing window, and require no modifications to the house. The shutters will be opened and closed by using a pull cord instead of electricity. They will be installed on a private residence in Fairbanks, Alaska, where the occupants will use the shutters and keep records of their fuel bills. These will be compared with previous fuel bills to determine the energy savings achieved. Mr. McGrath will manufacture the shutters and market them locally.

A-034	<u>WIND-POWERED GREENHOUSE</u>	Northwest Arctic School District Kivalina, Alaska	\$10,927
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The Northwest Arctic School District and students of the McQueen School will install a wind generator to provide electricity for heating and lighting in the school's greenhouse. A 4,000 to 6,000 watt electric generator will be used with an inverter to produce AC power. A connection will be made with the existing electrical distribution system for backup power during periods of insufficient wind speeds. Electric heaters in the greenhouse will permit year-round crop production, thereby reducing the need to have produce shipped in by air. Students of the McQueen School will document and photograph the results of this project and make presentations to other Alaskan villages regarding the techniques of greenhouse and wind system construction and the potential associated energy savings.

A-043	<u>BIO-GAS PLANT</u>	R.Charles Vowell Unalaska, Alaska	\$11,800
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Mr. Vowell will install and operate a 10,000 gallon capacity bio-gas generator which will use crab scraps from the Unalaska canneries as fuel. About 50% of the crab catch is currently wasted, and, at present, is ground-up and dumped on the ocean floor. The methane gas produced will be distributed to residents of the Haystack Hill neighborhood (in Unalaska) to help serve their energy needs, thereby conserving propane and #2 heating oil (imported by air). The sludge which remains after waste digestion will be used as fertilizer to increase summer vegetable production. The output of the generator will be measured using a standard natural gas meter and, if the expected amount of methane is produced, Mr. Vowell will consider installing several more methane generators and a pipeline throughout the town.

A-046	<u>SOLAR COLLECTOR/ HOME HEAT SINK</u>	Craig H.F. Anderson Muldoon, Alaska	\$400
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Mr. Anderson will construct and test a passive residential solar heating system by using a solar collector and reflective shutters in the southern exposed walls of a home to route hot air into the living area and into heat sink walls for storage. The collectors will be constructed from recycled beer and soft drink bottles. The system will be constructed entirely by Mr. Anderson, will have no moving parts, and will require very minimal maintenance.

A-063	<u>POULTRY-HEATED SOLAR GREENHOUSE</u>	Elizabeth Hart Ruby, Alaska	\$14,260
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Ms. Hart will design and build a solar greenhouse that will rely heavily on body heat from chickens raised inside the greenhouse as a heat source. The greenhouse will be facing south (buried in a northerly sloping hill), heavily insulated, and provided with back-up heat in the form of a thermostatically controlled wood stove which will use local sawmill waste and forest residues as fuel. Ms. Hart will grow garden vegetables and raise chickens for eggs throughout the year and will market her products locally. Waste from the vegetables and chickens will be composted to produce fertilizer. The project and its energy savings and nutritional benefits will be described to other villages in the interior region of Alaska through slide shows, talks, and video-tape presentations.

A-064	<u>SMALL-SCALE HYDROELECTRIC SYSTEM</u>	Chester B. Johnson Valdez, Alaska	\$5,780
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Mr. Johnson will increase the generating capacity and efficiency of his existing hydroelectric system (turbine-type Pelton wheel powered by a small waterfall) by lengthening the penstock, building a small rock dam to create a reservoir, and installing a new 7.5 KW alternator. The updated system will serve the electrical needs of three families who are presently without electricity. All required labor will be donated.

A-103	<u>GROUND HEAT-STORAGE SOLAR GREENHOUSE</u>	John Collette Fairbanks, Alaska	\$9,484
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Mr. Collette will demonstrate a method of using the soil under a greenhouse as a heat storage medium. A series of heat exchangers will collect excess heat in the apex of the greenhouse and transmit the heat to the soil via an anti-freeze solution in pipes. The system is designed to reduce the need for venting excess heat during warm periods, thereby storing the saved heat for use during cold periods. The warmed soil is also expected to promote higher plant yields. Provisions will also be made for heating the ground in an outdoor garden plot with the heat exchangers.

A-119	<u>WIND-POWERED FREEZER</u>	Dan Denslow Ambler, Alaska	\$3,500
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Mr. Denslow will develop and build a small walk-in freezer that will be powered by an existing wind generator and storage battery system. The freezer box will be located outdoors, half underground and shaded from direct sunlight; the condensing unit will be located in a cool cellar several feet from the box. This freezer will serve five families and will be used to preserve the food that is gathered in the spring and summer. This will reduce the amount of food that will have to be imported by air at great energy and monetary expense. Mr. Denslow plans to publish the design and performance data of the freezer and distribute the data to other potential community freezer users in Arctic Alaska.

A-164	<u>SOLAR-ASSISTED SPACE HEAT</u>	Kenny Lake Community League Copper Center, Alaska	\$2,242
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The Kenny Lake Community league will demonstrate a solar-assisted space heating system in the community library building. Solar energy will be collected by a water-antifreeze solution circulating in a fixed position collector. The warmed solution will circulate to a 2000 gallon storage tank. A thermostatically controlled circulating pump will pull the warmed solution from the tank and route it through a system of fin-pipe convectors, which will heat the library. The system is designed with thermostats and one way valves to prevent heat losses. Design details of the system will be on display in the library and made available to the public. This will probably be the first active solar-assisted space heating system in Alaska.

A-167	<u>WATER-POWERED WATER DELIVERY PUMP</u>	Donald C. Chaney Petersburg, Alaska	\$1,535
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Mr. Chaney will install a water-powered ram to replace a gasoline-powered electrical generator and electric pump which presently supply his home with water. The ram is designed to lift water fifteen feet above a creek to a storage tank. Mr. Chaney will install the system himself and is volunteering his labor.

A-172	<u>SOLAR-HEATED GREENHOUSE</u>	Kuskokwim Native Association Aniak, Alaska	\$18,156
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The Kuskokwim Native Association (KNA) will build and test a greenhouse heated totally by the sun. The goal is to extend the short Alaskan growing season to nine months without the use of supplemental electric or fossil fuel heating. The greenhouse will utilize an adjustable reflector/insulator which will make it possible to store heat on warm days. Discarded 55 gallon oil drums will be used to support the growing benches and to provide the heat storage. The greenhouse will be used as a winter storage site for vegetables immediately following the growing season. The greenhouse project will supplement the KNA's present agriculture program which supplies vegetables to eleven native villages in the middle Kuskokwim River Valley.

A-185	<u>WINDMILLS FOR SALMON</u> <u>AQUACULTURE</u>	NERKA Inc. Perry Island (Prince William Sound), Alaska	\$21,850
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NERKA, a private non-profit group operating a salmon hatchery, will construct and test a windmill to pump water for circulation through their salmon culture system during the winter months. The project's goal is to increase the salmon run through greater survival of eggs and fry in the critical winter period when run-off water sources freeze. In addition, brackish or sea water will be pumped over the eggs to control fungus and attempt to adapt the salmon fry to ocean life. The results of the project will be published in professional and trade journals.

A-189	<u>HIGH SCHOOL GREENHOUSE</u> <u>PROJECT</u>	S.A.V.E. 1 High School Anchorage, Alaska	\$650
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The S.A.V.E. 1 High School will install insulation around the base of their greenhouse, install Visqueen plastic on the inner wall to create a dead air space, insulate the plant beds, install a false ceiling, and insulate the north wall of their existing greenhouse to reduce heat loss and their heating expense. In addition, the high school students will build and install two solar panels to heat the intake air for the greenhouse's heating furnace. The S.A.V.E. School is an alternative school for students who have withdrawn from regular school programs. All work will be completed by the students and teachers, and the students will receive academic credit for their work.

A-246	<u>SOLAR-HEATED HOUSE FOR</u> <u>NORTHERN LATITUDES</u>	R. Kyle Green Wasilla, Alaska	\$47,900
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Mr. Green will build and demonstrate a passive solar-heated home that is designed to be totally independent from non-renewable energy resources. This unique dome-type partially underground home will include a complete insulation envelope of ferro-cement, a double entry, heat storage, a composting toilet, grey water drainfield, and an independent ventilation system. The house is designed to be simple and maintenance free, aesthetically pleasing, and low cost. Mr. Green's home could be considered as an updated and modernized version of the traditional Alaskan Aleut native residence. Mr. Green plans to publish the basic building design and the results of his demonstration in a pamphlet which will be available to the public.

IDAHO

<u>Application Number</u>	<u>Project</u>	<u>Applicant and Project Location</u>	<u>Amount of Grant Award</u>
I-085	<u>SOLAR PROCESS ALCOHOL PLANT</u>	Thomas E. Gaynor Palisades, Idaho	\$24,265

Mr. Gaynor will construct a small farm/ranch size ethyl alcohol plant which could be used for the production of gasohol as a fuel for vehicle use. Feedstocks for the fermentation will be alfalfa, corn, wheat, barley, potatoes, and beets. A solar collector system will be used to power the distillation system.

I-103	<u>LOW HEAD HYDRO TURBINE DEVELOPMENT</u>	Erik Norquest Boise, Idaho	\$34,600
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Mr. Norquest will perform computer analyses and experimental testing of a model turbine he has developed which is designed to obtain maximum power from heads of 4 to 15 feet. This turbine concept is designed for use in small slow-moving creeks and rivers and irrigation canals and may reduce or eliminate the environmental problems of conventional dams and turbines which can become fish migration barriers or cause nitrogen supersaturation and drastic pressure changes, decreasing water quality.

I-113	<u>SOLAR-HEATED PIGGERY AND CROP DRYER</u>	William T. Dishman Pingree, Idaho	\$7,500
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Mr. Dishman will add solar collectors to a 32 crate farrowing house (pig nursery) he is building. The solar energy collected will be used to heat the farrowing house, its water, and its rock bed heat storage system. Excess hot air will be removed through a duct system and used for crop drying at harvest time.

I-114	<u>SOLAR-ASSISTED HEAT PUMP</u>	Brian Cluer Fairfield, Idaho	\$6,060
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Mr. Cluer will construct and test a system for using solar panels and a eutectic salt-heat storage system integrated with a heat pump to furnish space heating to a building. The system will have controls to force air directly to the collectors at minimum temperatures, thus increasing the economical operation of the heat pump. Mr. Cluer will keep records on the efficiency of this system; he estimates an energy cost savings of approximately 40%. The system is designed to require less maintenance than other similar systems.

I-123	<u>ARTESIAN WELL PRESSURE</u> <u>REFRIGERATION</u>	Fish Breeders of Idaho Inc. Buhl, Idaho	\$9,050
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The Fish Breeders of Idaho Inc. will eliminate its use of electricity to power their refrigeration equipment. They will use an artesian geothermal well to directly drive a turbine pump which, acting as a hydraulic motor, will directly turn a refrigerator compressor. The system is expected to operate at 80% efficiency and not require any unusual maintenance.

I-130	<u>INSULATING SHUTTERS</u>	Mark A. Williams Moscow, Idaho	\$2,000
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Mr. Williams will construct and test a system of insulating windows to reduce heat loss and control light. The system uses a constant shutter to break up the convective air current loops that increase heat loss. The shutters are adjustable to control direct and indirect solar radiation. Following tests in a simulated environment to determine efficiency, final testing will be done in an actual home under normal operating conditions.

I-132	<u>PHASE CHANGE SALT</u> ENERGY STORAGE SYSTEM	William J. Quapp Idaho Falls, Idaho	\$9,200
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Mr. Quapp will incorporate a phase change salt energy-storage system into a residential home which uses solar collectors and a wood burning fireplace to reduce its need for electricity. The phase change salt storage system requires much less volume per amount of heat stored than conventional rock or water energy-storage systems. Mr. Quapp and his friends will volunteer all labor required for installation.

I-150	<u>STORAGE BATTERIES</u>	Snake River Pottery	\$1,000
	<u>FROM RECYCLED</u>	Bliss, Idaho	
	<u>AUTO BATTERIES</u>		

Aldrich Bowler of the Snake River Pottery will demonstrate a method of recycling used automotive batteries to make them suitable for use with small wind and water-powered electrical systems. Lead melting required in the process will be done using waste heat from pottery firing. Following testing of the recycled batteries, a do-it-yourself book will be published to advise others of the recycling and battery testing procedures.

I-177	<u>RESIDENTIAL</u> <u>WIND-POWERED</u> <u>GENERATOR</u>	Victor Mark Murray Samuels, Idaho	\$880
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Mr. Murray will install two wind-powered electrical generators to provide electricity for lighting and other domestic needs in his home. The system will use storage batteries and a convertor to power the 110 volt appliances in the home. Testing will take place to determine the cost effectiveness of the system.

OREGON

<u>Application Number</u>	<u>Project</u>	<u>Applicant and Location</u>	<u>Amount of Award</u>
0-088	<u>URBAN LUMBERING</u>	The Other Lumber Company, Inc. Rickreal, Oregon	\$11,100

This project involves the further development and testing of the expansion capabilities of "Urban Lumbering" through use of improved technology, including manufacture of prototypes of innovative pieces of equipment which will (1) facilitate the dismantling of buildings, (2) reduce the amount of solid waste for disposal following dismantling, thereby saving energy, (3) increase the availability of recycled building material in a reusable form, and (4) enhance the economic feasibility of lumber salvage/dismantle vs demolition/dumping.

0-140	<u>SOLAR-HEATING</u> <u>TROMBE WALL</u>	Treasure Valley Community College Ontario, Oregon	\$3,976
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The Treasure Valley Community College will develop and demonstrate the use of a solar-heated Trombe wall on the south side of the College Art Shed. The project is designed to show the feasibility of Trombe walls in Eastern Oregon and Southern Idaho. If successful, the project will lead to installation of a Trombe wall on the south side of the Gymnasium and the Student Center Building. The College will make all results of the project available to the public.

0-142	<u>ELECTRIC VEHICLE</u>	Richard's House of Television McMinnville, Oregon	\$9,662
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Mr. Richard Propp of Richard's House of Television will continue work on an electric vehicle which he has been developing for the past five years. The Appropriate Technology grant will allow Mr. Propp to further demonstrate the feasibility of producing a high performance, reliable, serviceable, battery-powered electric vehicle at a low cost, using existing technology and hardware. A display model of the electric vehicle will be completed and demonstrated through a traveling exhibit in Western Oregon.

0-196	<u>FIRE STATION</u> <u>PASSIVE SOLAR</u> <u>RETROFIT</u>	City of Gearhart Gearhart, Oregon	\$12,775
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The Gearhart Volunteer Fire Department will retrofit their uninsulated concrete block fire station. The building presently has a concrete slab floor and is heated by a forced-air oil furnace. The ceiling of the building will be insulated to R-30; rigid insulation will be placed around the foundation perimeter and earth berming will be used to insulate exterior walls. The exterior walls will be painted dark brown to absorb solar heat which will convert the building into a passive solar collector with the concrete floor, walls and fire equipment acting as the thermal storage media. A 50% savings in energy costs is expected. Upon completion of the project, the City will conduct weekend open-house programs and provide information on each phase of the project to show material costs, heat gain, and projected cost savings for each project element.

0-241	<u>WIND-POWERED</u> <u>ELECTRICAL</u> <u>GENERATOR</u>	Linn-Benton Community College Albany, Oregon	\$8,050
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The Linn-Benton Community College will construct a wind-powered electrical generator rated at approximately 3 KW (in a 20 mph wind). The three-bladed rotor, 18 feet in diameter, rotating at a maximum 200 rpm, will transmit energy through a gear box to an alternator. The windmill will supply the electrical needs for an existing passive solar-heated building on campus. The completed system will become a component of the instructional and demonstration program in alternative energy resources at the College. Two separate applications of the system will be demonstrated. First, the windmill will be connected to a battery storage bank to simulate operation at a remote site. Second, it will be coupled with a synchronous converter to simulate connection to a utility grid.

0-259	<u>PASSIVE SOLAR</u> <u>GREENHOUSE/</u> <u>AQUACULTURE SYSTEM</u>	Amity Foundation Eugene, Oregon	\$22,330
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The Amity Foundation will monitor and evaluate the performance of a recently constructed solar greenhouse/aquaculture system. This will include monitoring light, temperature, and humidity in the greenhouse; measuring water temperature and quality; monitoring fish growth and health; and conducting species evaluation in the aquaculture system. In addition, they will combine a Savonius windmill with a compressor to pump air into the aquaculture tanks, and attempt to develop inexpensive, locally-grown fish food which can be pelleted. The project participants will include volunteers, college students, and senior citizens. All materials used will be obtained locally.

WASHINGTON

<u>Application Number</u>	<u>Project</u>	<u>Applicant and Location</u>	<u>Amount of Award</u>
W-015	<u>URBAN HOMESTEAD</u>	Jody Aliesan Seattle, Washington	\$4,500

Ms. Aliesan will demonstrate an integrated system of renewable-resource and energy conservation measures which are available for use by any urban household. The project will involve keeping records on household consumption of energy and energy related goods and services; providing publicity, personal tours, written articles, and project plans; and providing a bibliography of useful publications, resource listings, and recipes for those visiting the site. Some energy conservation measures to be demonstrated at the home include a passive solar greenhouse; raised bed, intensive/companion/succession planting garden with rain barrel-drip irrigation; aerobic and anaerobic composting; wood stove heat; recycling and reuse of paper, metal and glass; and use of second-hand recycled clothing.

W-041	<u>INTERNAL COMBUSTION- INTERNAL EXPANSION DIESEL ENGINE</u>	Raymond C. Lehde Alderwood Manor, Washington	\$3,125
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Mr. Lehde will conduct tests to determine which of two methods of injecting water into the cylinders of a diesel engine will provide increased fuel efficiency. If the expected increases in fuel efficiency (as high as 20%) are realized, modification kits will be marketed and design of an engine using the new technology will begin.

W-056	<u>SMALL SCALE AQUACULTURE PROJECT</u>	W.H. Hastings Mt. Vernon, Washington	\$5,140
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Mr. Hastings will study and demonstrate the biologic and economic feasibility of food fish production in small water impoundments (roadside ditches, small ponds, etc.). The study will be done at sites which are already prepared and capable of supporting coho salmon. The study will involve the introduction of cultured forage (isopods, copepods, amphipods, etc.) and home waste foods and food factory by-products into the pond, with data taken on fish growth and condition, forage production, water chemistry, and acceptability of artificial feeds. Mr. Hastings will donate his services, and employ student technicians supervised by local college professors and professional scientists, along with local labor. Mr. Hastings estimates the food produced/energy input ratio will be 5:1.

I-108*	<u>BIO-MASS CONVERTER</u>	Leon Breckenridge Breckenridge & Calhoon Partnership Everett & Spokane, Washington	\$9,620
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Mr. Leon Breckenridge will design, construct and demonstrate a home-sized anaerobic methane digester which will use household garbage and garden wastes. Sludge from the digester will be deposited in a garden area and used to make potting soil. The project is designed to demonstrate that a methane digester can be built and maintained by individuals, on a single-family home scale, providing useful energy at a cost comparable to that incurred through use of non-renewable energy sources.

W-103	<u>SOLAR GREENHOUSE</u>	Juanita High School Kirkland, Washington	\$20,000
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The students and staff of Juanita High School will build an energy efficient greenhouse using both passive and active solar technologies; it will include a combination natural gas/wood burning furnace which will use waste wood fuel (including milk cartons and cardboard lunch trays) which is now thrown away. Construction will include use of recycled materials from an existing greenhouse at the school. The greenhouse will serve as a demonstration for other school districts and institutions, and its use and energy savings will be widely publicized throughout the Seattle area. Over one-third of the 1500 Juanita High School students will be involved in the building, monitoring, evaluation, or use of the greenhouse.

W-160	<u>SOLAR GRAIN DRYING</u>	Tilth Producer's Co-operative Rockport, Washington	\$13,840
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The Tilth Producer's Co-operative will demonstrate the feasibility of using solar grain drying technology in the high humidity areas of the Pacific Northwest. They will also demonstrate the potential of replacing propane-fired crop dryers with wood-fired crop dryers. The project will include construction of a trailer-mounted wood-fired burner from scrap materials, and comparison of a horizontal flat-plate solar collector grain dryer with a grain dryer powered by a vertical collector.

* Originally proposed to be performed in Idaho.

W-202	<u>SOLAR-HEATED DOMESTIC</u> <u>WATER</u>	Small Tribes Organization of Western Washington Sumner, Washington	\$8,500
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The Small Tribes Organization of Western Washington will construct two different demonstration solar water heaters for both testing and demonstration. The systems will be tested and demonstrated for one week at a time by ten Indian tribes located in the Puget Sound area. A hands-on workshop will also be conducted in which tribal members at each of the demonstration sites will build a system identical to one of the demonstration units and install it in a tribal home. Following the demonstration and testing, the Small Tribes Organization will publicize the results of the tests and demonstrations to encourage more tribal and non-Indian involvement in appropriate technology.

W-289	<u>WASTEWATER TREATMENT</u> <u>BY AQUACULTURE</u>	City of Everett Everett, Washington	\$9,000
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The City of Everett, Washington will assess the practicability of obtaining and adapting aquatic organisms for use in the City's existing waste treatment lagoons. Specifically, the use of clams and African warm water fish (Tilapia) will be evaluated on the basis of potential energy savings, capital cost savings, and effectiveness in controlling algae which presently grow in the treatment ponds during the warmer months. Algae control by aquaculture could prove to be a highly cost effective alternative to traditional costly and energy-consuming wastewater treatment technologies.

W-299	<u>SOLAR GASOHOL</u> <u>PRODUCTION</u>	Leavenworth High School Leavenworth, Washington	\$740
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The Leavenworth High School Physics Class will demonstrate the production of gasohol by fermenting organic solid wastes in 55 gallon drums. The alcohol will be distilled with solar energy, through tracking mirrors. The resulting alcohol will be mixed with gasoline and used to operate one of the school's official vehicles.

W-323	<u>HANDMADE CHEESE PLANT</u>	Roger & Sally Jackson Oroville, Washington	\$2,210
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The applicant is proposing construction and demonstration of a handmade cheese plant that is designed to operate without using electricity or fossil fuels. The milk processing room will be insulated, cement floored with a wood frame, will have southern-exposure skylights, and will have a pre-aging, fresh cheese drying room attached. The aging room (already constructed and tested) is a conical straw pile (30 ft. base, 20 ft. height) with a pole and board frame hexagonal room inside. A Coleman lantern is used for light, as needed. By covering the aging room with a straw pile, temperature and humidity are kept at a low enough level that undesirable mold growth is almost completely inhibited. The room is warmed with air currents that pass through 3" pvc pipes embedded in a hot manure pile. These pipes are connected to a heat duct that leads into the aging room. In the event that ambient temperature drops below 20° F for more than two days, a continually burning kerosine lamp is activated and provides needed heat.

W-369	<u>WIND-POWERED GENERATOR DEMONSTRATION</u>	White Mountain Cooperative Ferry County, Washington	\$14,950
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The White Mountain Cooperative Community will develop and demonstrate an electrical system to meet the needs of the 10 families in their community. The system will consist of 10, 12 volt 200-watt wind-powered electrical generators and will use lead acid battery storage. The system will produce 20 kwh per month. All labor will be donated by the community.

W-403	<u>SOLAR-HEATED GREENHOUSE</u>	Colville Confederated Tribes Nespelem, Washington	\$41,825
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The Colville Confederated Tribes will construct and monitor two integrated "stair-stepped" 1800 square foot solar-heated greenhouses, positioned on a south-facing slope. The lower greenhouse will be used for cool crop production and as a heat source for the upper greenhouse, which will be used for more tender crops. Year-round commercial scale crop production at a northern latitude will be demonstrated. The project will be monitored and compared with the performance of three existing traditional greenhouses.

PLEASE NOTE: THE FOLLOWING PAGES WERE TREATED
AS A UNIT IN THE ORIGINAL DOCUMENT.

SOLAR TECHNOLOGIES: AN OVERVIEW

PUBLISHED BY THE SOLAR ENERGY RESEARCH INSTITUTE

THE FOLLOWING EXCERPTS PRESENT BRIEF INTRODUCTIONS TO SOLAR
ELECTRIC TECHNOLOGIES BEING COVERED IN THE NORTHWEST
REGIONAL ASSESSMENT STUDY.

Solar radiation is a virtually inexhaustible energy source. This life-blood of our planet manifests itself, either directly or indirectly, in many forms: from tiny one-celled plants called phytoplankton, to giant sequoias, to fossil fuels (oil, coal, natural gas), to winds, and even to the great reservoirs of heat in the oceans themselves.

The sun's solar energy output is on an almost unimaginable scale. The sun's core is a raging thermonuclear furnace where 5 million tons of matter are converted to energy every second at 15 million degrees. Earth's share of this bounty of solar radiation is 3,000 quintillion ($3,000 \times 10^{18}$) Btu's of energy per year. This extraordinary number means that a single day's sunshine falling on the Earth's surface would satisfy the whole world's energy needs for 15 years. (This is theoretical since all of the sunshine cannot be converted to a usable form of energy.) Similarly, the quantity of solar energy striking the Earth's surface in just 25 days is equivalent to this planet's total known reserves of fossil fuels.

The idea of harnessing this shower of solar radiation in some direct manner is not new. The Greek writer Xenophon, in about 400 B.C., described solar-oriented architecture. Legend has it that Archimedes won a naval battle with a solar weapon in 213 B.C.

In the United States, the private entrepreneur traditionally has been responsible for most solar research and development. But in October 1973 we became suddenly and uncomfortably aware that the pace of the entrepreneur can be too slow for a nation faced with the waning of fossil fuels and the delay of nuclear power's timetable. Ironically, the mid-wives for the birth of solar energy were the OPEC nations, who chose to choke off the flow of oil to the United States late in 1973. The following months were a nightmare of gasoline shortages and feverish Congressional activity toward solar energy legislation and funding. The oil embargo was the spur for greatly increased solar energy research and use in both the governmental and private sector. As a result, solar has now begun to compete in price with conventional fossil fuels in some areas of the country.

Here, then, is what seems to be the ideal energy source, one that is enormously abundant and relatively non-polluting. With all these advantages, why then haven't we been using solar technologies all along?

The answer is that solar energy suffers from two constraints. Although the solar resources are abundant, they are also diffuse and, as a result, require considerable collector surface area to gather enough energy to be useful. These collectors cost money—to build, to install, and to maintain. The second constraint is that sunshine is intermittent. The number of sunlight hours and availability of solar resources fluctuate, depending on location, season, and weather. We have difficulty in phasing our energy needs to match this on-and-off variability of the sun's energy.

One Quad of Energy Is Equivalent to...

Enough energy to heat 500,000 homes for 20 years based on an 1,800 sq. ft. single family house in the Washington, D.C. metro area).

Enough crude oil to fill a fleet of 75 supertankers (based on 325,000 ton supertankers, each with a capacity of 2.3 million barrels).

A mountain of coal 1,000 feet high and 2,000 feet in diameter, or 500,000 railroad cars full of coal (based on 83 tons per car).

A Standard Home's Heating and Cooling Requirement...

Is approximately 177,000,000 Btu (based on a 2,500 sq. ft. home built before 1970).

1 Btu = The quantity of energy required to raise 1 pound of water 1 degree Fahrenheit.

3,412 Btu = 1 kilowatt hour (1 kWh)

Useful Conversions

1,000 watts = 1 kilowatt
1,000 kilowatts = 1 megawatt (one million watts)

kilowatts x hours = kilowatt-hours (kWh)
megawatts x hours = megawatt-hours (MWh)

746 watts = 1 horsepower (hp)
1 kilowatt = $1\frac{1}{3}$ hp
1 Btu = 252 calories
1 Btu per hour = 0.2931 watts
1 watt = 3.412 Btu per hour

Natural Versus Technological Collection

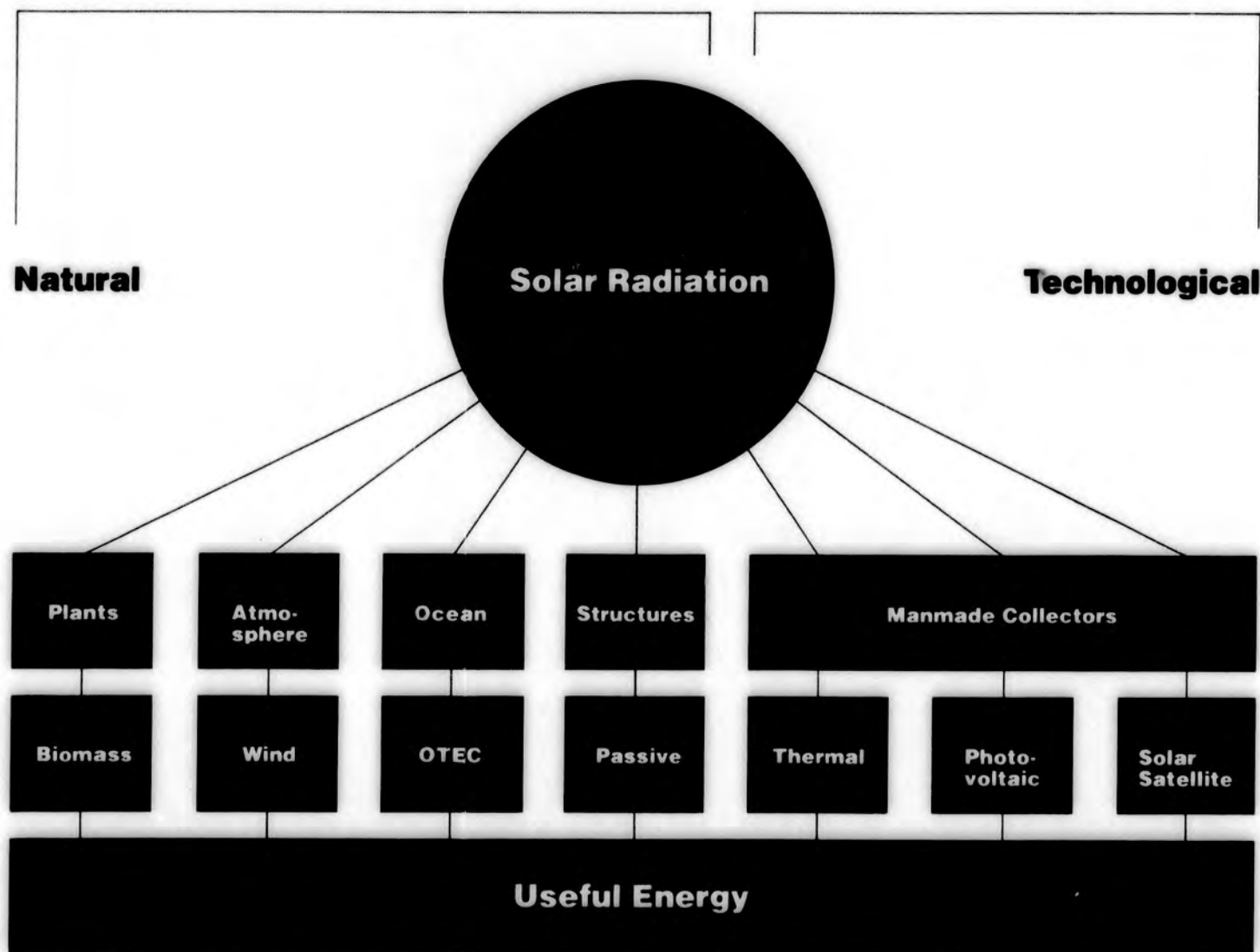
2

Solar energy technologies can be divided into two broad classifications: **Natural Collection Systems** and **Technological Collection Systems**.

The economics of solar energy utilization depend on the type of collection and conversion processes used. For technological conversion systems, the amount of collectable energy is determined by the amount of solar energy per unit area of collector at a given geographical location.

The total biosphere participates in the natural collection technologies—the earth, the wind, and the water—and provides free collector surfaces. Since no collectors need to be built, the energy costs for natural systems are determined by the converter; example—the wind turbine.

On the other hand, technological options are essentially subject to a further economic constraint before conversion can even be considered. Collectors must be fabricated, and these construction costs present an additional expense to the energy conversion process.



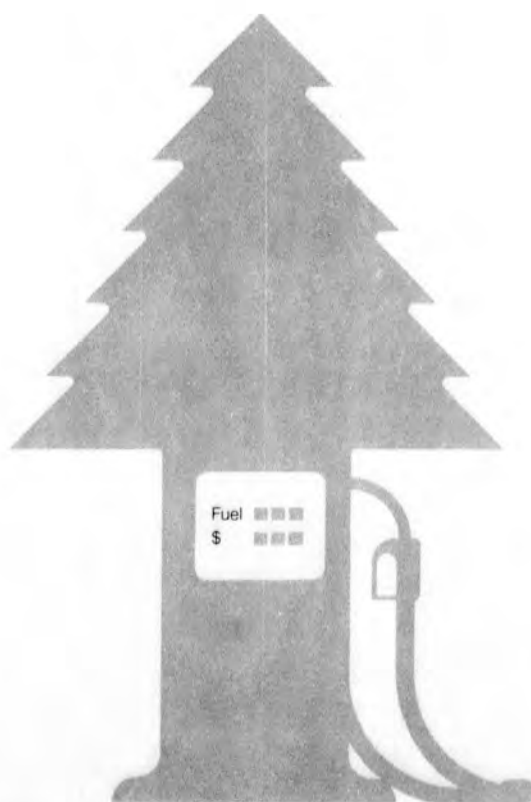
Man's Oldest Form of Solar Energy

Biomass is any material derived from growing organisms—wood, corncobs, or seaweed. Biomass is a direct and natural form of solar energy and can be produced as long as the sun shines on our land and oceans. It has been humanity's principal form of fuel for most of its existence. In the United States, wood provided 75% of our energy a hundred years ago, a quantity equivalent to approximately 3% of our present enormous energy appetite. Sweden currently obtains 8% of its total national energy demand from wood, and Finland relies on wood for a full 17% of total energy. Cheap oil and gas will soon be things of the past in this country. The United States, too, may well turn to using the biomass which supported us only a century ago.

Many forms of solar energy—solar power towers, solar collectors, photovoltaics, wind energy—require more research and development. But biomass fuels are already here. In many cases, residues from forest, field, and municipal wastes form a near-term source of solar energy which can be collected and used now. Such residues might provide up to 5% of U.S. energy by 1985, while solving large disposal problems at the same time.

Yet, if we are to use biomass effectively as a significant and reliable contributor to U.S. energy supplies, we must learn to manage our land more effectively and efficiently. It has been estimated that in 20 years, by applying our present technology, we might obtain as much as 15% to 20% of our energy from biomass farms in which plants are raised and harvested for their energy content.

The first problem that we face with biomass energy use is its **conversion** to solid, liquid, or gaseous fuels. Fortunately, since people have used biomass for thousands of years, many conversion methods have already been sufficiently developed and must now only be modified and adapted to present uses. The burning of wood and other forms of biomass is, of course, the oldest form of biomass energy use. In rural America, many people are buying wood burning stoves as a low-cost alternative. In Vermont, for example, it is estimated that 7% of the residents now rely on wood stoves as their primary heating source. Charcoal is man's oldest synthetic fuel. It has provided heat for cooking and making iron for many centuries.



Some power plants are even making the conversion from gas or oil to biomass fuels. In Burlington, Vermont, a new 50 MW wood combustion power plant will be under construction and is scheduled to provide electricity to 30,000 customers.

Gasifiers are being developed now to generate a low-energy gas from organic residues which can substitute for gas and oil in existing equipment. **Digesters** which convert cattle manure from large feedlots into pipeline quality gas are already operating on a commercial scale, and the by-products from these digesters can be used for fertilizer and even as cattle feed.

Although gas is a useful form of energy, we also require liquid fuels. **Pyrolysis** (high temperature heating in the absence of oxygen) of biomass produces a dark oil which can replace petroleum in industrial applications. Biomass is also an attractive source for making alcohol.

Possible fuels from this process are: (1)

Methanol—wood alcohol derived from wood or municipal wastes and (2)

Ethanol—grain alcohol reduced by fermentation from agricultural products.

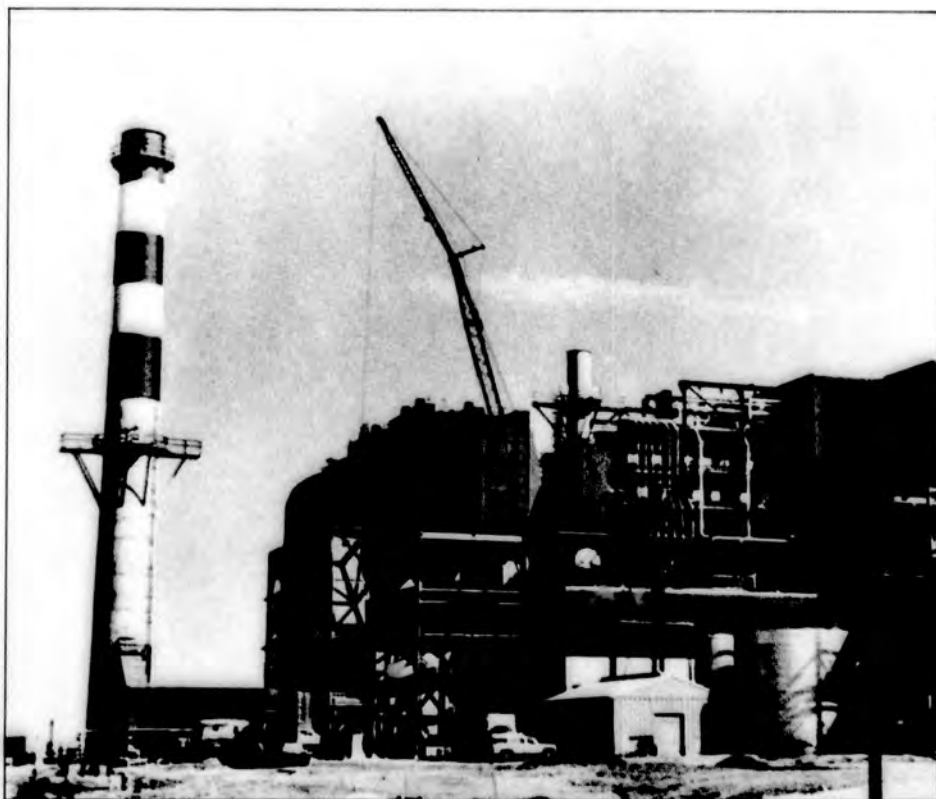
Alcohols are, in many ways, superior to gasoline as a fuel, as they have higher octane and they can burn cleaner than gasoline. One promising use of alcohol is as a mixture with gasoline. This composite fuel, "**Gasohol**," has been satisfactorily tested in fleets of cars in Nebraska, Germany, and Sweden. It has also been placed on public sale in Nebraska and Illinois.

Production of biomass as a fuel will become the limiting factor in using biomass for energy. A number of projects are underway to study the biomass production potential of our forests and land not presently in use. Projections suggest that, with modified harvesting and growing techniques and use of improved species, we could achieve much larger yields of biomass in the United States. Other studies are examining the possibility of cultivating algae and seaweed.

In the past, man has created many deserts from forests and prairies by over-harvesting of wood and food. We must be certain that, in the future, we are not mining land or water in a way that could ultimately destroy the productivity of the Earth. Thus, biomass is potentially one of the most ecologically attractive forms of energy if we take care to preserve the balance of nature.



Over 200 million tons of trash is collected in the United States annually. This "problem" can also be an energy source. The plant pictured here will charge a fee to burn the garbage of at least 10 surrounding towns. The heat from the burning trash will produce steam to provide energy to generate electricity for a manufacturing plant.



The Wind Energy Resource

A fraction of the solar radiation **incident** on the Earth is converted by the atmosphere into the **kinetic** energy of our winds. A windmill or wind turbine converts the kinetic energy of moving air into mechanical motion. This mechanical energy has long served humanity, providing power for transportation at sea from the beginning of civilization and for agricultural purposes in Western Europe as early as the Eleventh Century. Present estimates of wind energy available for modern use vary significantly, but even the lowest represents a substantial energy potential.



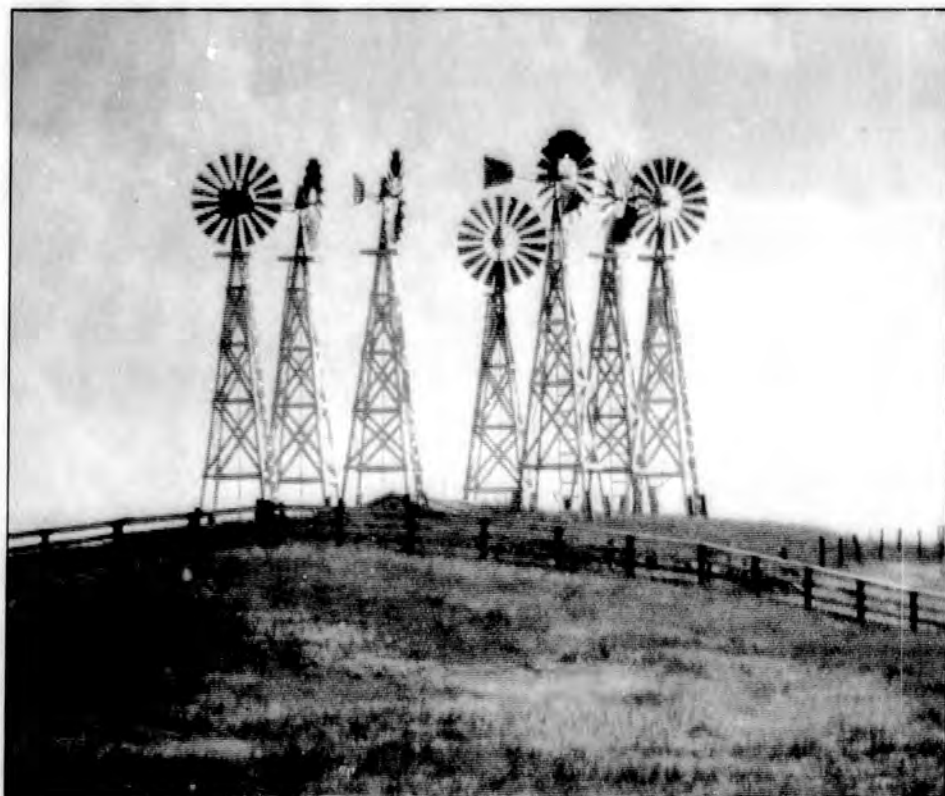
This large wind turbine generates 200 kilowatts, providing electricity for about 60 homes in Clayton, New Mexico. The Department of Energy is planning larger wind turbines and is considering clustering them on windmill "farms."

Thousands of these are still turning away. This collection of "Air Motors" on "Windmill Hill" in western Nebraska has been pumping water steadily since 1936.

Wind power was used extensively in the United States until recent times. More than 6 million small windmills (each less than 1 kW) were used in this country before the 1950s to pump water and to generate electricity. Roughly 150,000 are still in operation. The largest wind machine ever built in this country to generate electricity was the Smith-Putnam 1.25 MW unit installed in Vermont. This machine had a rotor diameter of 174 ft. It operated intermittently from 1941 to 1943 when a damaged blade broke, and the project was abandoned.

Modern designs to use wind power cover a wide range of sizes and technologies. The largest machines to be built in the federal program have larger blade spans than the wing span of a jumbo jet and weigh many tons. Components of fiberglass, steel, aluminum, concrete, wood, plastics, and other materials are in use. Deployment plans range from units for a single home to plants with the capacity of some fossil fuel generating facilities. The federal wind program has grown significantly in funding since 1973. This vigorous program is demonstrating both small and large wind generators.

The construction of windpower installations does not require any new technologies, and cost estimates in favorable regions of the world are fairly close to those of other energy sources. However, to produce appreciable amounts of power, installations have to be fairly large and are costly. Such giant windmills placed at regular distances might not be aesthetically pleasing. Moreover, wind velocities decrease considerably at night and also vary with the weather. Consequently, for reliable power from wind, the problem of storing energy must be solved. These are some of the reasons why wind power has not yet found large-scale applications even in potentially favorable regions. Yet, even the smallest estimate of wind energy available represents a substantial amount. It is anticipated that in some parts of the world, wind power will be able to make an appreciable contribution to meeting overall energy demand. The first commercial systems are expected to be operational in this country by the early 1980s.



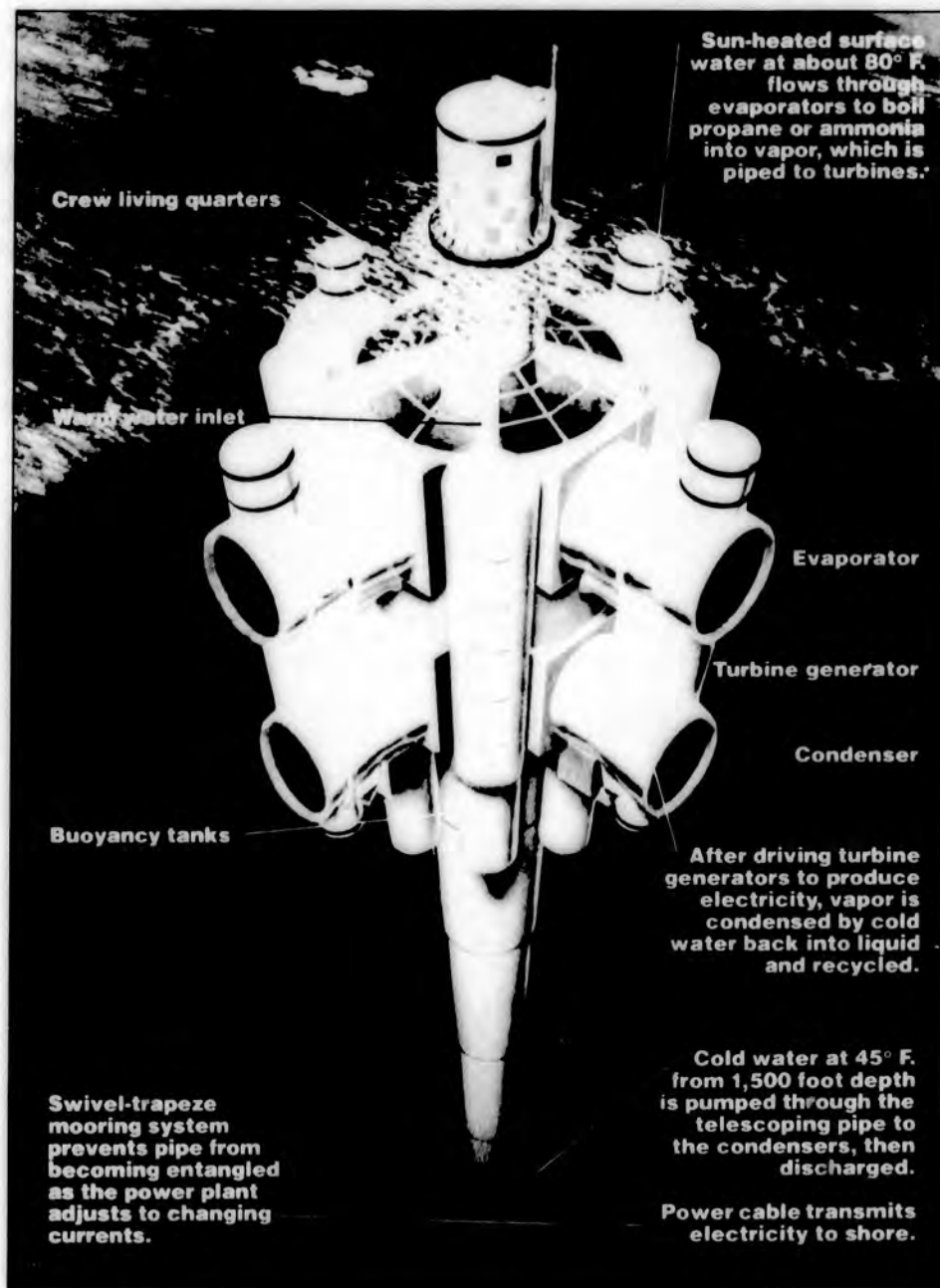
Almost 71% of the Earth's surface is covered by oceans. Oceans are tremendous natural storehouses of solar energy in the form of kinetic energy stored in waves. Oceans also have tremendous solar energy potential stored in temperature differentials.

Ocean Thermal Energy Conversion (OTEC) is an indirect form of solar energy utilization. OTEC systems tap the thermal gradients between various ocean depths: surface water, heated by the sun, vaporizes a fluid such as ammonia. The pressurized vapor drives a turbine to produce electricity, which is then transmitted to land via cable. The vapor, in the meantime, is pumped back to the deep regions of colder water, where it cools and is again converted to a fluid. It is then ready to be sent back to the warm surface for the cycle to begin again.

The available amount of thermal energy within the ocean is large, but converting this energy requires development of efficient, durable, and cheap heat exchange equipment which can withstand rough and corrosive conditions. The first demonstration plant is expected to begin operation in 1985 and the first commercial plant by 1992.

The second method of utilizing the storage capacity of the oceans for energy generation is through harnessing ocean waves and tidal currents. Systems to accomplish this are being developed in Japan and the United Kingdom, where prototype installations are being built. Cost estimates and projections in areas of the world favorable for this type of solar energy utilization look promising. This may be one of the more important ways of providing power to some energy-poor nations of northern Europe.

In this country initial work is being conducted on "lift translators," devices similar in design to large venetian blinds. These slats, propelled by air or flowing water (tides), travel up and down on an endless belt. This device linked to a generator could provide significant amounts of energy.



This is an artist's concept of a structure proposed by Lockheed's Ocean Systems Division for an Ocean Thermal Energy Conversion (OTEC) System. The structure

is a platform with crew quarters and maintenance facilities. Attached around the outside are turbine generators and pumps. It is 250 ft. in diameter and 1,600 ft. long and weighs about 300,000 tons. The structure is designed to send 160,000,000 watts of power ashore to distribution networks. This is enough power to fulfill the needs of a city with 100,000 people.

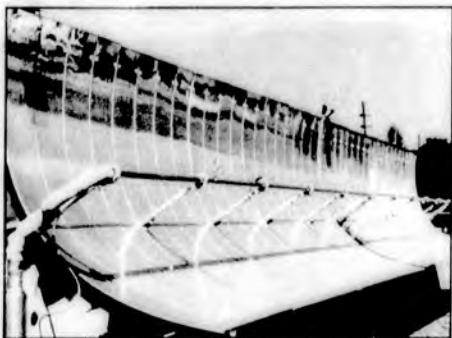
Solar Thermal Energy Conversion to Electricity

The conversion of solar energy into electricity is a problem with a variety of possible solutions. One solution is solar thermal conversion. Solar thermal conversion utilizes various types of solar collectors to generate steam which drives a turbine and generator to produce electricity. Only the solar heating of the boiler distinguishes this cycle from that of a coal- or gas-fired power plant. This use of existing power-generating technology is a major reason that solar thermal power systems are being studied for future commercial applications.

Two major types of solar collecting systems are employed in solar thermal power systems. The first is the **power tower, or central receiver concept**. This collector system consists of a large tower surrounded by a field of tracking mirrors (**heliostats**) which concentrate the sun's rays onto a boiler located in the top of the tower.

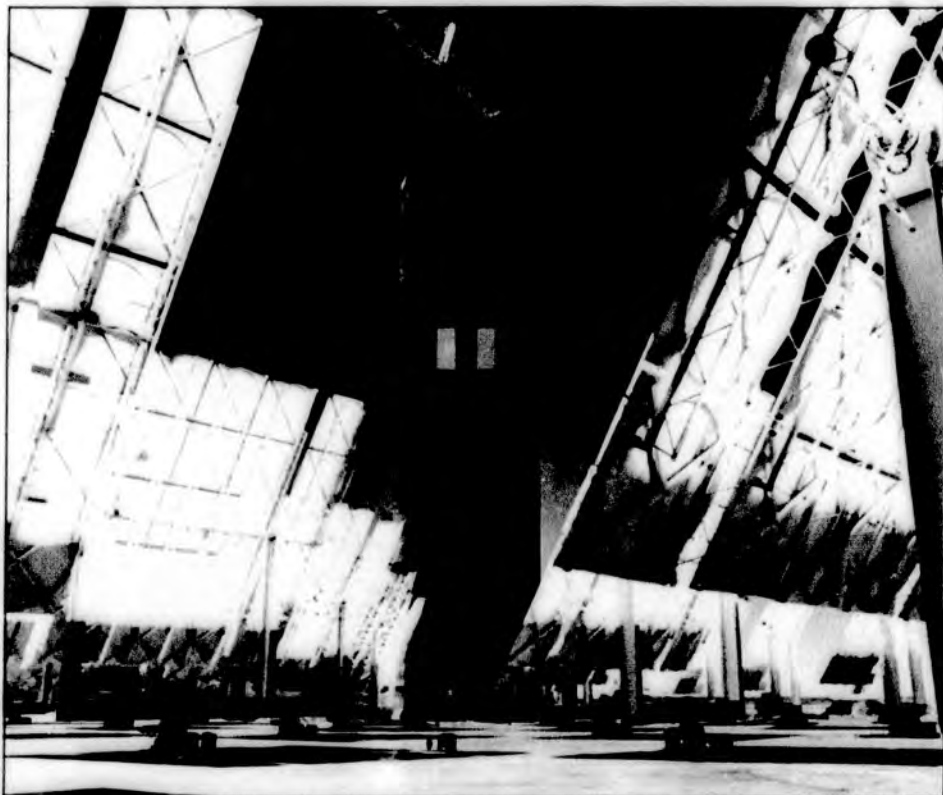
The other type of collecting systems consists of **distributed collector systems** which feed thermal energy into central power generating equipment. An example of this type of system is a field of mirrored parabolic troughs which concentrate the sun's rays onto a line receiver at the focus of the parabola. Steam generated in the receiver is used to drive a turbine, as in the other methods. Another possible collector system of this type consists of a field of parabolic dishes where the sun's rays are brought to a point focus. For high temperatures to be maintained at the receiver, these systems must track the sun across the sky by moving either the concentrating mirror or the receiver. Collectors employing both tracking techniques are being investigated by industry and government.

Several similar solar options are under study so that the most economical solar power systems can be developed.



This parabolic trough collector has important applications in the areas of agricultural and industrial process heat. Current estimates suggest that, with today's technology, solar could deliver up to half of the energy requirements for industrial and agricultural processes. We must remember that industry accounts for about 40% of America's total energy budget.

Rear view of some of the 72 heliostat arrays in the "ready" position for the first major focusing test at DOE's Solar Thermal Test Facility at Sandia Laboratories. A 2x3 ft. hole was burned in the 1/4-inch thick steel target (a black rectangle mounted in front of white insulating material) in less than two minutes.



The conversion of solar radiation into electrical energy by solar cells is a direct spin-off of the satellite and space program. Photovoltaic solar cells, as opposed to conventional collectors which convert solar radiation into heat, produce direct electricity. This simple, solid state device holds the promise of long operating life with little need for servicing. Since it is expected that by 1985 a full one-third of all our energy requirements will be electrical, solar cells could contribute greatly to the wide range of applications which consume electricity.

Solar Cells are connected and are often placed into a sealed glass or plastic unit called a **module**. Any number of these modules, each of which might deliver 12 watts, are then positioned into a rigid frame to provide a specific power rating. These framed unit **arrays** are arranged at a specific site to form a **field** which meets the electrical requirements.

Since solar cells only deliver power during daylight hours, a photovoltaic system requires storage (usually a battery system) if power is to be supplied at night or during cloudy weather conditions. Also, the cells require **power conditioning** by an inverter to change the DC to AC current and to regulate and keep the voltage output constant.

Perhaps one of the most immediate applications for this particular technology is providing power to remote areas where there is no existing power grid or where other electric sources can only be operated at high prices. Photovoltaics are finding wide applications for roadside telephones, ocean navigation buoys, and forest fire stations. The technology of photovoltaic conversion is well developed, but large-scale application is hampered by the high price of solar cells. In recent years, however, the price has been significantly reduced, and extensive R&D is underway to develop automated, efficient production processes which will reduce prices further still. It is a goal of the National Photovoltaic Program to achieve costs low enough to make solar cells competitive with conventional electrical sources by the mid-1980s for some applications.

Right: Closeup of a solar cell array used to run a 10 horsepower irrigation pump. Far right: A fresnel lens (top) is used to concentrate the sun's rays on a solar cell, thereby greatly increasing the efficiency and electrical output.



NORTHWEST REGIONAL ASSESSMENT STUDY
SOLAR ELECTRIC WORKSHOP

Tuesday, November 13, 1979

Captain Cook Hotel - Adventure Room
Fifth and K Streets
Anchorage, Alaska
(907) 276-6000

AGENDA

8:45 - 9:00 a.m.	Registration
9:00 - 9:20 a.m.	Introduction
9:20 - 9:40 a.m.	Robert Shipley, State Division of Energy and Power Development Solar electric - a regional perspective
9:40 - 10:00 a.m.	Thomas R. Stahr, Municipal Light and Power Solar electric - the utility perspective
10:00 - 10:15 a.m.	Coffee break
10:15 - 11:15 a.m.	Review of wind and photovoltaic systems. Performance and economic potential
11:15 - 12:00 noon	Discussion Formation of afternoon discussion groups
12:00 - 1:30 p.m.	Catered lunch (provided)
1:30 - 3:00 p.m.	Discussion group meetings ● Siting and user-related issues ● Economic and financial concerns ● Interaction of utilities and users
3:00 - 4:00 p.m.	Discussion group reports Formulation of workshop recommendations
4:00 p.m.	Adjournment

NORTHWEST REGIONAL ASSESSMENT STUDY PURPOSE AND OBJECTIVES

The Solar Energy Research Institute (SERI) is conducting a series of studies to assess the potential for solar electric technologies in the United States. For these nationwide studies, the country has been divided into six regions. The Northwest Regional Assessment Study (NWRAS), for the region comprising Alaska, Washington, Oregon, Hawaii, Idaho, Montana, Nebraska, North and South Dakota, and Wyoming, is being performed under contract to SERI by JBF Scientific Corporation, with the assistance of CH2M HILL.

The general purpose of the study is to accelerate the practical use of solar electric generating systems. Six broad generating options are being evaluated:

- Solar thermal (STEC)
- Ocean thermal energy conversion (OTEC)
- Photovoltaic energy conversion
- Wind energy conversion systems (WECS)
- Total energy systems (thermal and electric)
- Electrical generation from direct combustion of biomass

As well as technical considerations, the legal, social, institutional, environmental, and economic issues surrounding solar electric development are being examined. The participation of potential owners, users, and other concerned persons is an integral aspect of the project.

The specific objectives of the study are to identify:

- The potential solar electric options that are expected to be employed in the region in the period 1980-2000. These include both central (utility) and dispersed systems.
- How and when each option might be employed by particular user groups.
- The barriers and incentives to development of solar electric systems.
- Key demonstrations that are necessary to facilitate solar electrification in the region.
- A strategy for implementation, including identification of who should take specific actions and the roles of the Federal and state governments.

NORTHWEST REGIONAL ASSESSMENT STUDY WORKSHOP PURPOSE AND OBJECTIVES

The workshop to be held in your area is an integral part of the Northwest Regional Assessment Study (NWRAS). The general purpose of the NWRAS is to assess and accelerate the practical use of solar electric generating systems in the 10-state northwest region. The specific objective is to identify barriers and possible incentives and to identify opportunities for demonstration and subsequent large-scale use of both central and dispersed systems during the period 1980-2000. Evaluating technological feasibility is one aspect of the study. Equally important are the social, economic, legal, institutional, and environmental factors that affect solar electric development. It is this second, "nontechnical" aspect that the workshop will address.

Participants in the workshop will represent current and potential user groups of solar electric systems. Because you are familiar with the unique aspects of your state, your personal experience and discussion of the obstacles and support you have encountered will be very valuable.

We would like to examine the following issues in this workshop:

- What barriers exist in your state and what possible incentives can be developed to overcome them? Issues that might be considered include community objections or interests that affect user acceptance; market penetration strategies; economic or political trends that can influence solar electric development.
- What is the existing institutional framework of your state that will affect solar electric development (zoning, pending legislation, etc.)? How can this framework be used to accelerate the market potential for solar electric systems?
- What additional studies should be undertaken in your state to further solar electric application?
- What "model" or demonstration projects could be undertaken in your state to illustrate the applicability of solar electric technology?

The information obtained from the workshops will be synthesized with the other study data, and strategies will be developed to stimulate solar electric applications in each state. At a seminar to be held in spring of 1980, study results will be presented. At that time, your additional comments and suggestions for steps that can be taken to realize solar electric as a viable energy alternative will be requested for incorporation into the final study document.

NORTHWEST REGIONAL ASSESSMENT STUDY
SOLAR ELECTRIC WORKSHOP
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SOLAR ELECTRIC REPORT

Published by JBF Scientific Corporation under subcontract to the Solar Energy Research Institute for the Northwest Regional Assessment Study.

NW Energy Study Underway

The Northwest Regional Assessment Study (NWRAS) will assess the possibilities for use of solar electric technologies for the region comprising Washington, Oregon, Idaho, Montana, Wyoming, North and South Dakota, Nebraska, Alaska and Hawaii. The project is being performed by JBF Scientific Corporation, of Wilmington, Massachusetts, with the assistance of CH2M Hill, of Seattle, Washington, as part of a nationwide effort by the Solar Energy Research Institute (SERI) for which the United States has been divided into six regions.

The general purpose of the study is to accelerate the practical use of solar electric generating systems. Five broad generating options will be evaluated:

- Solar thermal
- Ocean thermal energy conversion (OTEC)
- Photovoltaic energy conversion
- Wind energy conversion systems (WECS)
- Electrical generation from direct combustion of biomass

Technical considerations will be examined as well as legal, social, institutional, environmental, and economic issues surrounding solar electric development. The participation of potential owners, users, and other concerned persons will be an integral aspect of the project.

The specific objectives of the study are to identify the potential solar electric options that are expected to be employed in the region in the period 1980-2000 including both central (utility) and dispersed (smaller applications located at the point of use) systems; how and when each option might be employed by particular user groups; key demon-

WORKSHOP SCHEDULE SEE BACK PAGE

strations that would facilitate solar electrification in the region; and a strategy for completing the actions, including identification of who should take specific actions and the roles of the Federal and state governments.

Public participation will play a major role in the NWRAS. In addition to this newsletter, there will be workshops and seminars aimed at involving residents of the study area in the project.



States in Northwest Study Region

NORTHEAST STUDY RESULTS

Wind and photovoltaic energy systems can make a significant contribution to the electricity needs of the Northeast United States in the 1980-2000 period if Department of Energy cost goals for these systems are met and fuel and electricity costs rise at a pace exceeding inflation by a few percent. Under these assumptions, a market for dis-

persed wind systems would begin in the mid 1980's and dispersed photovoltaics would follow in the mid 1990's. These are the major findings of the Northeast Regional Assessment Study for Solar Electric Options, conducted for the Department of Energy by a team headed by JBF Scientific Corporation.

Other findings of the study include the following. A market for central or distributed wind systems for utilities is estimated to begin about 1990 and could provide 10 to 20 percent of the electrical energy

needs of the region by the year 2000, if critical siting and utility compatibility problems are solved. Dispersed solar electric systems (wind and photovoltaic) could provide another two to four percent of the region's electricity needs by that time. Another technology, combustion of wood biomass, has a limited potential for use in utility central power plants, mainly in the northern tier of the region. By the year 2000, up to three percent of utility generating capacity could be wood-fired, based on resource availability.

(CONT ON PAGE 2)

Wind Energy Available Now

Imagine a Wyoming prairie town with a large wind turbine and a water tower, or a Nebraska farm with a wind-powered irrigation and grain drying system, or pulp and paper mills in the Pacific Northwest and sugar processing plants in Hawaii with wind generators supplying a large fraction of their electrical requirements. All these scenes could become realities if federal and state energy programs reach their goals and energy costs continue to skyrocket. Wind energy systems can be expected to appear early in the 1980's. Certain specialized situations easily justify wind system purchases today.

These scenes represent the result of a vigorous effort to supplement existing oil-fired and other electrical generating equipment with renewable, and environmentally benign, systems. The elements of this effort include a government-funded R&D program, a strong and growing wind machine industry, a widespread wind machine testing and demonstration program, and an administrative program at all levels of government to modify existing practices and regulations to encourage alternative energy system development and use.

The federal government, through the Department of Energy, (DOE) has carried on a wind energy program since 1973 to "accelerate the development of reliable and economically viable wind energy systems and enable the earliest possible commercialization of wind power." This program is a balanced effort focused on developing new wind machine designs (particularly the larger sizes), testing and demonstrating existing machines, uncovering market opportunities in the near, mid, and far term, and defining and solving problems with existing institutions and laws. An additional effort in the federal wind program is directed towards characterizing winds in the detail necessary to select promising sites for wind machines.

The DOE machine development effort is divided into five segments dealing with wind turbines in the one to 50 kilowatt, 100 kilowatt, 500 kilowatt, megawatt, and multimewatt scale and advanced concepts of all sizes. A 125 foot blade diameter machine (200 kilowatts) is sited for installation on Kaena Point, Oahu, Hawaii in 1980. Five sites in the Northwest are being studied to determine the wind energy availability and potential value to utilities. The sites are: Augspurger Mountain, Washington; Cold Bay, Alaska; Huron, South Dakota; Boardman, Oregon; and Kingsley Dam, Nebraska.

There are several reasons why wind systems are not widely used but the primary one is probably economic. The costs are not justified by the buyers' perception of their value. Also, the safety of machines in populated areas will have to be demonstrated, the aesthetic impacts will have to be evaluated and the potential radio/television interference problems will have to be solved along with a host of other more minor concerns. Society, in the form of the existing utility systems, impinges in turn on the WECS user. The questions of utility rates and treatment of a WECS user can greatly affect the value of a wind system.

The federal wind energy program is addressing these issues with numerous studies identifying, quantifying, and proposing solutions to various problems. In addition, the Federal Energy Regulatory Commission of DOE, the agency charged with utility regulation, is presently preparing rules and policies specifically designed to encourage production of significant amounts of electricity by harnessing untapped natural resources.

Numerous congressional activities including the National Energy Act of 1978 and the proposed Solar Bank and Wind Energy Commercialization Bill provide financial incentives which enhance the value of wind and other solar systems to a buyer.



*Drawing of Boeing
WECS (2500 kilowatts)*

There is substantial momentum developing in the national effort to promote solar energy systems. Behind the scenes, the OPEC nations are providing what might be the biggest incentive of all. The Northwest Study region has abundant wind resources to tap and many appropriate applications waiting to be explored. You may be driving through that wind-powered Wyoming town before you know it.

NE STUDY (FROM PAGE 1)

The Northeast Regional Assessment Study (RAS) was performed to assess the potential of solar electric systems in the region during the period 1980-2000. The Northeast was defined as the six New England states (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut) as well as New York and New Jersey. Six solar energy technologies were considered: wind energy conversion systems (WECS), photovoltaic energy conversion, electric generation from biomass, solar thermal electric, solar total (combined thermal and electric), and ocean thermal energy conversion (OTEC). Applications of these technologies included utility-owned central and dispersed electrical generating systems and privately-owned dispersed generating systems.

(CONT ON PAGE 3)

NE STUDY (FROM PAGE 2)

In completing its studies, the JBF team addressed four factors which affect the potential value of solar electric generation in a region: available resources; population, land use, and economic development patterns; electric energy demands and prices of fuel; and the region's social, legal, and institutional characteristics. Extensive background data in each of these areas was obtained and combined in JBF's computer analysis of solar-electric systems to produce an assessment of the potential of solar electric systems in the Northeast.

The JBF team was able to specify not only expected patterns of solar electric market development in the Northeast, but was also able to detail a series of actions which would serve to increase the potential market for solar electric technology. The results of a series of user workshops held in Burlington, Vermont and Cambridge, Massachusetts played a key role in the development of these recommendations.

Financial incentives recommended by JBF included the extension of 1978 National Energy Act tax credits until the year 2000. Low-interest loans through a solar bank were also proposed. Despite the favorable impact on market penetration which these incentives would have, JBF researchers are careful to note that they are not adequate to make widespread dispersed user-owned (e.g., homeowner) solar electric systems financially attractive by the year 2000. New incentives, such as an 'oil use reduction credit' were recommended.

The study found that demonstration programs will play a key role in accelerating solar electric penetration in the Northeast, as they are expected to provide an early market and test arena for new equipment and also to stimulate the formation of new manufacturers of the systems. These programs would also serve as a focal point for gaining an understanding of public reactions to the systems.

Similar studies of the Southeast and Southwest regions have also been recently completed for DOE.

State-By-State

In each newsletter, we plan to cover alternative energy programs currently underway in the various states of the study region.

ALASKA

The grants are out in Alaska for 14 energy-saving projects funded by the Department of Energy's, "Appropriate Technology Small Grants Program", a government effort to promote and publicize ways of saving energy that are small-scale, low-cost, and environmentally safe. Most of the projects will be built in small communities and use power from the sun, wind, or biomass to cut down imports of fuel oil and food supplies. Grants run from \$400 to almost \$50,000. Wind-powered solar electric generating systems are among the projects receiving grants.

Alaska leads the nation in per capita responses to the DOE program. Alaskans submitted over 260 proposals, which is about 63.4 proposals per 100,000 population.

Dan Denslow's wind-powered freezer in Ambler will save energy directly by using a wind generator and storage batteries to power a condensing unit and freezer, both located half underground. The freezer will also replace energy-expensive airlifted food by preserving food gathered by the families in spring and summer. Denslow plans to publish data on the design and performance of his freezer.

Several people are experimenting with ways of heating a greenhouse in a northerly climate. Students at McQueen School in Kivalina will install a 4,000-watt wind generator to heat and light their greenhouse. The windmill will generate AC power through an inverter, with a tie-in to the existing electrical network for backup during calm periods.

For more information on the "Appropriate Technology Small Grants Program", contact the DOE Region X Office at 1992 Federal Building, 915 Second Avenue, Seattle, Washington 98174.

HAWAII

Sun-rich Hawaii is using its tropical waters, cane and pineapple wastes, and windy cliffs to replace petroleum as a source of energy. While the state currently imports about \$60 million of oil each year, the islands of Molokai and Hawaii plan to be energy self-sufficient by 1990 with alternative energy sources.

Currently, the largest undertaking is an experiment to extract energy from the sea, using temperature differences between the ocean's surface and bottom. In May, Mini-OTEC, the first part of this ocean-power program, was dedicated. It is anchored off Ke-Ahole Point on the big island of Hawaii, where the test operation will run for six months. The 50 kilowatts of electricity generated will be used to run pumps and test instrumentation.

Mini-OTEC tests will lead to the launching next year of OTEC-1, a one megawatt project to be anchored farther off Ke-Ahole Point. In the future, a Seacoast Test Facility, or STF, will be located onshore. The facility will simulate conditions future OTEC plants are likely to encounter.

Other solar electric projects will use by-products from Hawaii's sugar cane and pineapple industries (biomass) to produce power and reduce reliance on petroleum-based fertilizers. Before electric utilities were formed, the sugar companies burned cane fibre, or bagasse, to power their mills and sold surplus electricity to surrounding towns. Now energy planners are studying ways of drying bagasse and centralizing burning. Each ton of dried bagasse is equivalent to two barrels of petroleum.

Although Molokai has no sugar industry, the island may be able to burn pineapple trash to run steam-electric plants. Another fuel alternative under consideration on Molokai is the fast growing but slow burning koa-haole tree. The koa would be cultivated on tree farms, and then harvested and chipped before burning in boilers.

WORKSHOPS

JBF Scientific Corporation is sponsoring a series of workshops and seminars designed to provide an opportunity for individuals to discuss the potential of solar electric power generation in the Northwest study region and to define a series of actions which will encourage the use of solar electric systems in future years. The meetings will center on non-utility power generation and will feature discussions of wind and photovoltaic systems for a variety of applications, ranging from residences to large industrial establishments. Workshops are tentatively scheduled for Honolulu, Hawaii, and Anchorage, Alaska, during the week of November 12, and for Portland, Oregon, and Omaha, Nebraska, in late November or early December. Seminars will be held in the same cities in the early spring of 1980. The specific locations and times will be presented in future newsletters.

The workshops are designed to address the following topics:

- What barriers to solar electric development exist in each state and what possible incentives can be developed to overcome them? Issues that might be considered include community objections or interests that affect user acceptance; market penetration strategies; and economic or political trends.
- What is the existing institutional framework of each state that will affect solar electric development (zoning, pending legislation, etc.)? How can this framework be used to accelerate the market potential for solar electric systems?
- What additional studies should be undertaken in each state to further solar electric application or to answer concerns voiced at the meetings?
- What "model" or demonstration projects could be undertaken in each state to illustrate the applicability of solar electric technology?

The information obtained from the workshops will be included with other study findings, and strategies will be developed by JBF to encourage the development of a market for solar electric applications in each state in the study region. The study results will then be presented at the seminars. Participants will have the opportunity to evaluate study findings and to offer additional comments and suggestions regarding solar electric systems that can be incorporated into the final study document.

INPUT/OUTPUT

If you have any information on solar electric activities in the 10-state Northwest area that we might use in future issues of "Northwest Solar Electric Report" or know of other people who would like to be added to our mailing list, please write to the Editor, JBF Scientific Corporation, 2 Jewel Drive, Wilmington, MA 01887. We look forward to hearing from you.

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NORTHWEST REGIONAL ASSESSMENT STUDY
SOLAR ELECTRIC WORKSHOP

DISCUSSION GROUP TOPICS

The following sheets provide a summary of key concerns that may affect the development of markets for solar-electric technology. Issues have been listed in three categories:

- I. Siting and User-Related Issues, including identification of potential SE users, resource and siting concerns, and other issues that may affect market development.
- II. Economic and Financial Concerns, including identification of purchase criteria, potential financial arrangements, and impact of ownership options on system economics.
- III. Issues related to the Interaction of Utilities and Users, as the distributed use of solar electric systems by individual users on the utility grid increases.

At the workshop, three working groups will be formed, each discussing one of these categories. Each working group will attempt to respond to the concerns included in its category. The groups should feel free to add any topic to the discussions if it is felt that a relevant issue has been omitted.

Each task group will attempt to cover:

- A discussion of the issues or potential barriers outlined in the following summary (other issues are most welcome--however, undue overlap with the other task groups should be avoided if possible).
- Discussion and recommendations on incentives, institutional change, education and promotion, legislation, or other recommendations for action to remove impediments to the development of solar electric or to accelerate its growth in the region.
- Recommendations for demonstration opportunities (the more specific and the more uniquely characteristic of the region, the better).

I. SITING AND USER-RELATED ISSUES

- A. Who are high-potential users of solar-electric systems in the following categories?
- Residential
 - Commercial (one-shift)
 - Industrial (two-shift and three-shift operation)
 - Agricultural
- B. What choices for electrical energy exist within the sub-region and what are their characteristics in terms of cost and availability?
- C. Siting Concerns
1. Land Use
 - What is the availability of land for wind and/or photovoltaic systems?
 - What zoning restrictions exist within the sub-region that might affect these systems?
 - Are private land-use restrictions (restrictive covenants, subdivision controls, condominium by-laws) prevalent that might affect the siting of solar-electric systems?
 2. Resource Availability
 - Are there well-known areas of high wind and/or solar resources that would provide good sites for solar-electric systems?
 - How might access to solar and/or wind resources be guaranteed?
- D. How seriously will consumer protection devices, such as the following, affect the development of markets for wind and photovoltaic systems?
- Product liability/warranties
 - Product standards

- Testing and certification
- Licensing of installers
- Bonding/underwriting of contractors

E. Will the following insurance/safety concerns pose a constraint to the development of wind and photovoltaic markets?

- Liability arising from system operation, mechanical and electrical hazards, vibration, aesthetics, electro-magnetic interference and similar concerns.
- Vandalism and natural hazards and their potential impact on insurance rates.
- Potential of the systems for damage to the environment.

II. ECONOMIC AND FINANCIAL CONCERNS

- A. What alternative purchase criteria might be used by consumers, and which provide the most realistic basis for a purchase condition?
- First cost
 - Payback
 - Life-cycle costing
 - Cost per unit of energy
 - Rate of return on investment
 - Other
- B. How might the above factors change in the event of more uncertainty in supply of traditional energy sources?
- C. What is the existing financial climate within the sub-region, and how will this affect solar electric market penetration?
- Availability of capital
 - Traditional means of financing investments of similar size in the region
 - Potential alternative financing arrangements available
 - Impact on financing arrangements of the uncertainty of future system costs and resale value
- D. Would the financial picture modify with a change in ownership pattern? Which might be preferable?
- User-owned
 - Utility-owned
 - Third party
 - Cooperative ownership

III. INTERACTION OF UTILITIES AND USERS

A. Ownership Issues

1. Should utilities become involved in owning and operating solar electric systems that are installed on the premises of individual users?
2. Should distributed systems be owned only by the users?
3. Is there a place for third-party ownership (i.e., a third party owns and operates the solar electric system and sells the electricity to either a utility or an individual user)?

B. Physical Interactions

1. The addition of solar electric systems by many individual users on the utility grid may introduce a variety of physical effects. These include:
 - Introduction of harmonics
 - Reduction in power factor
 - Variation in distribution system voltage levels
 - Effects on system stability
 - Equipment modifications to allow backfeed of excess electricity.
2. As the market potential for solar electric grows, how can utilities fulfill their obligation to provide high-quality power without seeming to restrict the acceptance of solar electric?
3. Safeguards to prevent hazardous backfeed from solar electric systems will be a necessity. Clearly, the utilities have an obligation and responsibility in this area. However, do others have a role as well (industry groups, regulatory agencies, other governmental bodies)?

C. Rates

1. When a customer installs a solar electric system, his electric consumption will decrease. However,

when the sun does not shine, he may still place the same peak-hour demand on the utility that he did before owning solar electric equipment. Should his rates be revised? If so, how?

2. Occasionally, the solar electric equipment may generate excess electricity that cannot be usefully employed by the owner. If the system is designed to backfeed into the grid, at what rate should the utility purchase the excess electricity?
3. Should there be a "demand charge" levied against user-owned solar electric equipment to reflect the uncertainty of its performance during peak-load hours?

D. Utility Installed Capacity

3. Should there be a "demand charge" levied against user-owned solar electric equipment to reflect the uncertainty of its performance during peak-load hours?

D. Utility Installed Capacity

1. In the face of increased usage of solar electric generation by the utilities' customers, should utilities be required to maintain installed capacity to meet their peak loads when the sun does not shine?
2. As an alternative to the above, might the utilities employ some scheme of "load shedding" during those periods when the demand is high and the sun is not shining?

E. Effects on Utilities' Long-Range Planning

Both the growth in electricity consumption and the necessary increases in installed capacity become more difficult to project if the potential for significant growth in solar electric applications develops.

1. What measures might utilities adopt to alleviate problems in this area?
2. What roles might federal, state, and local agencies play in the planning process?

PLEASE NOTE: THE PRECEDING PAGES WERE TREATED
AS A UNIT IN THE ORIGINAL DOCUMENT.