

---

UMR-MEC Conference on Energy / UMR-DNR Conference on Energy

---

13 Oct 1977

## The National Program for Solar Energy

Keith Davidson

Richard J. Gariboldi

John J. Purcell

Follow this and additional works at: <https://scholarsmine.mst.edu/umr-mec>



Part of the [Energy Policy Commons](#), and the [Power and Energy Commons](#)

---

### Recommended Citation

Davidson, Keith; Gariboldi, Richard J.; and Purcell, John J., "The National Program for Solar Energy" (1977). *UMR-MEC Conference on Energy / UMR-DNR Conference on Energy*. 281.  
<https://scholarsmine.mst.edu/umr-mec/281>

This Article - Conference proceedings is brought to you for free and open access by Scholars' Mine. It has been accepted for inclusion in UMR-MEC Conference on Energy / UMR-DNR Conference on Energy by an authorized administrator of Scholars' Mine. This work is protected by U. S. Copyright Law. Unauthorized use including reproduction for redistribution requires the permission of the copyright holder. For more information, please contact [scholarsmine@mst.edu](mailto:scholarsmine@mst.edu).

THE NATIONAL PROGRAM FOR SOLAR ENERGY  
Keith Davidson, Richard J. Gariboldi and John J. Purcell  
Department of Energy  
Chicago, Illinois

Abstract

On October 26, 1974, the Solar Energy Research Development and Demonstration Act was signed into law authorizing a vigorous federal program of research development and demonstration to establish solar energy as a viable energy resource. Solar heating and cooling of buildings represents a midterm help in an attempt to be less dependent on oil and natural gas. Many other solar programs are underway in the development of solar energy.

On October 26, 1974, the Solar Energy Research Development and Demonstration Act was signed into law authorizing a vigorous federal program of research development and demonstration to establish solar energy resource for the nation.

Program planning of solar energy research development and demonstration is being carried out under guidelines established by this Act and by three other Legislative Acts passed by the 93rd Congress: The Solar Heating and Cooling Demonstration Act of 1974; the Energy Reorganization Act of 1974 and The Federal Non-Nuclear Energy Research and Development Act of 1974. Together the four laws give general authority to the Department of Energy (DOE) and other federal agencies to conduct a wide range of activities as part of a research development and demonstration program aimed at effective energy utilization.

To help put DOE's Solar Energy Program into proper focus, let me digress for a moment and talk about our present energy situation.

Today, over 75% of our energy demand is met by petroleum and natural gas. But the supply of these energy resources here at home is dwindling and ultimately will be in short supply world-wide.

Oil imports are currently at a record 44% of the nation's supply. Without any new energy initiatives, imports will continue to rise at an alarming rate.

The essence of today's challenge is to wean this nation away from its dependence on oil and gas and onto alternative energy sources -- in short, to create new energy choices for the future.

In the very short term -- and by that we mean between now and 1985 -- today's energy producers must be expanded to buy

time for the development of new energy alternatives. This includes an expanded use of coal, nuclear, enhanced recovery of oil and gas, and conservation.

During the midterm between 1985 and 2000, additional energy contributors could include synthetic fuels manufactured from coal and oil shale, geothermal energy, solar heating and cooling homes and buildings, and the windmill.

But even a combination of all these resources will not satisfy all the energy demands of future generations. While sources such as the wind and solar heating and cooling will continue to provide some of our energy needs as long as the wind blows and the sun shines, our finite resources such as oil, coal and uranium will gradually disappear.

For the longer term from the year 2000 onward, we are looking forward to the general use of at least one of two "inexhaustible" energy sources. They are: Nuclear Fusion and Solar Electricity.

So that, solar energy for heating and cooling will play a growing part in our energy future. And solar energy for electricity might play a role in their longer term.

Solar energy represents an alternate and inexhaustible energy resource for widespread use in residential and commercial buildings. The National Program for Solar Heating and Cooling of Buildings aims to stimulate the development of an industrial, commercial and professional capability for the production and distribution of solar water heating, space heating and cooling systems. This is in keeping with the national policy of reducing our reliance on oil and natural gas. The primary goal of the program is to work with industry in the development

and early introduction of economically competitive and environmentally acceptable solar energy systems to help meet national energy requirements. The thrust of the program is to demonstrate the economic viability of solar energy for the heating and cooling of buildings within the five-year federally sponsored programs.

Currently, over 300 companies offer solar energy systems, subsystems and components. It is estimated that they are capable of producing 8 to 10 million square feet of collector per year. In 1976 approximately 4 million square feet of collectors were sold for about 1,000 separate installations.

The federal programs are aimed at stimulating the industry to an annual manufacturing and installation capability of 20 million or more square feet by the year 1980. This is roughly translated into a goal of 1% of new construction in that year. The goal for market penetration in the United States in 1985 is 10% of new buildings. This would mean a multi-billion dollar industry employing hundreds of thousands of people.

As part of Solar Energy Research Development and Demonstration, DOE is conducting a National Program for Solar Heating and Cooling of Buildings with the assistance of the Department of Housing and Urban Development (HUD), the National Aeronautics and Space Administration (NASA), the Department of Defense (DOD), the National Bureau of Standards (NBS), and other federal agencies. The National Program for Solar Heating and Cooling of Buildings is structured to stimulate solar energy applications so that solar energy could provide at least 10% of these heating and cooling energy requirements by the year 2000. That represents an ambitious program of 12,500 buildings per month using

solar heating and cooling.

The National Program for Solar Heating and Cooling of Buildings is made up of several component parts:

Residential Demonstration	DOE and HUD
Commercial Demonstration	DOE
Development in Support of Demonstration	NASA
Research and Development	DOE
Data Collection, Evaluation & Dissemination	DOE/NASA/HUD
Standard and Criteria	NBS supporting DOE & HUD
Environmental & Resource Assessment	DOE

Under the Commercial Demonstration Program is a program to demonstrate solar heating and cooling in federal buildings. The federal government, with its large inventory of buildings, has an opportunity to expand the base of residential and commercial buildings using solar energy on a cost effective basis. DOE supported DOD solar heating and cooling projects include 2 shopping centers and 50 residential units. Solar heating and cooling demonstration projects are being carried out in cooperation with the General Services Administration (GSA). These include new and existing buildings of various types throughout the United States. GSA provides a potential market of some 10,000 existing or new buildings. NASA has completed a solar energy system installation in the Systems Engineering Building at its Langley Research Center. DOE itself manages a large number of buildings, and several hot water and space heating applications are planned. The Heating Plant of Argonne National Laboratory will use solar energy to heat the water for its power plant.

Other federal solar projects currently underway:

Tennessee Valley Authority	Visitors' Center
Veterans Administration	Hospital
U. S. Postal Service	Post Office
U. S. Treasury	Border Station
Dept. of Interior	Park Building
	Indian School
Dept. of Health, Education & Welfare	Health Care Center

Data Collection Evaluation and Dissemination. The collection and evaluation of the data to a wide range of users is a key part of the national program. Specific emphasis is placed on user needs and standardization of data to allow system comparison. Instrumented data from the sensors at the demonstration site is sent to the central processing station for evaluation. The non-instrumented technical data such as design information is coded, stored in a computer and analyzed. The non-technical data (building codes, zoning regulations, financing problems) is also collected and stored at the "National Solar Data Bank."

Commercial Building Demonstrations. The commercial building application is a major element in the Program for Solar Heating and Cooling of Buildings. The commercial demonstrations like the residential are being carried out in "annual" cycles taking advantage of advances in the technology from cycle to cycle.

Phase I or Cycle I was begun by NBS and carried on by the Energy Research and Development Administration (ERDA) when ERDA was formed. The solicitation for the first cycle was made in September, 1975. The solicitation for the demonstration program is being done through the Program Opportunity Notice (PON) procedure. The response to the first PON resulted in 308 proposals from which 32 contract awards

were made. One of these is in Ingham County, Michigan, Ingham County Board of Commissioners Health Center - a solar hot water system.

Solicitations for the second cycle of commercial demonstration projects was released in October, 1976. The selection of successful proposers was announced on May 10, 1977. There were 307 proposers from which 80 were selected. These projects include such buildings as offices, schools, hotels, motels, fire stations, police stations, hospitals and libraries in 33 states. Two Missouri proposals were accepted. Stephens College of Columbia will install 3,240 square feet of honeywell flat plate collectors for the Visitors' Center for Space Heating Application (\$93,457), and William Too and Associates will install 244 square feet of KTA flat plate collectors for space heating and hot water needs for their St. Louis office building (\$7,912). Twelve million, six hundred thousands (\$12.6 million) has been allocated to fund the second cycle projects or an average of \$156,000 per project. Government funding will be provided on a cost sharing basis, only for the solar portion of the project. NASA Marshall Space Flight Center in Alabama, and DOE San Francisco Operations Offices will monitor the technical design and construction of the projects. In addition, NASA Marshall is performing the development in support of demonstrations for solar by testing collectors.

Other DOE sponsored solar installations include:

- Wichita, Kansas Medical Center
- Burger King in New Jersey
- Barwood Development - Boca Raton, Fla.
- Towns School - Atlanta, Georgia
- Schennandoah Georgia Community Center
- Federal Building - Saginaw, Michigan

In addition to solar heating and cooling, solar has many other potential applications:

In Industry. In 1975 the U. S. industry consumed over 40% of the energy used in this nation. Over 40% of the heat energy required was below 350 degrees fahrenheit. The solar energy technology to produce this energy is already available.

On the Farms. Energy consumed on American farms accounts for about 2% of the nation's energy requirement. This is almost 100% oil and gas. Perhaps as much as 50% of this energy could be derived from solar systems by the turn of the century with technology already known today.

Solar Thermal Energy Conversion. Power generation is in the beginning stages. The primary focus is on the central receiver system concept. A 10 MW pilot plant is scheduled to begin generating electricity by the end of 1981. We plan to initiate preliminary studies in 1979 on a 100 MW Demonstration Plant to become operational in 1985. Associated with the 10 MW pilot plant is the construction of a 5 MW Solar Thermal Test Facility. This facility is located in Albuquerque, New Mexico, and should be operational by December of this year.

Photovoltaic Energy Systems. The principles involved in photovoltaic are solar cells which converts sunlight directly into electricity are well known through experience gained in the space program. With the development of less expensive means of producing components, the solar cells have the potential to provide a significant source of clean and reasonable energy.

The major problems that must be overcome are high cost and low production. The solar cells cost about \$15,000 per peak

KWE by FY 1986.

Wind Energy. Wind energy systems have been in use for many centuries and are known to be technically feasible. The general objective of the DOE wind energy program is to advance the technology. We have a 100 KW system which is being tested at Sandusky, Ohio, and plan to test four large experimental wind turbines during 1978 and 1979. The first two machines are based on the Sandusky prototype. They will have blades about 125 feet in diameter and generate 200 kilowatts in winds of about 19 mph. The second two will have blade diameter of 200 feet and generate 1500 kilowatts in a 22 mph wind.

Ocean Thermal Energy Conversion. Ocean thermal energy conversion (OTEC) systems are based upon the conversion of the large amount of heat naturally collected and stored in the ocean into a usable form of energy - electricity. Principal applications are the production of base-load electricity and the manufacture of energy-intensive products, such as ammonia. Additional possibilities include the promotion of aquaculture through a supply of nutrients contained in cold ocean water, and the production of fresh water.

Passive Solar Heating. In conclusion, I would like to say a few words about passive solar heating. As you know, in a passive system the house itself collects and stores the sun's radiant energy in the form of heat. The heat is distributed throughout the building by natural processes. DOD spent about \$300,000 in FY 1977 on passive solar research and development mostly for work at Los Alamos. In FY 1978 plans are to spend 1.4 million. Some of the projects will involve design, construction and instrumentation of

buildings with innovative passive heating and cooling systems. Data from these buildings will provide a "quantitative basis" for designing passive systems for other buildings.

As you can see, DOE has a broad program for the development of solar energy to help make it an economically viable and significant contributor to our effort to be less dependent on oil and natural gas.