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The Implementation of State Solar Incentives: Research, Development, and Demonstration Programs

Bruce Green

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A Division of Midwest Research Institute

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THE IMPLEMENTATION OF STATE SOLAR INCENTIVES: RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAMS

BRUCE GREEN

FEBRUARY 1979

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FOREWORD

This report documents work performed in compliance with Contract No. EG-77-C-01-4042, Task No. 5125. The report was prepared by B. D. Green of the Policy Analysis Branch of the Solar Energy Research Institute. This report is a part of a larger report entitled "The Implementation of State Solar Incentives: A Preliminary Assessment."

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Policy Analysis Branch

Approved for:

SOLAR ENERGY RESEARCH INSTITUTE

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SUMMARY

Many states have initiated energy research, development, and demonstration (RD&D) programs, particularly solar energy RD&D programs, in response to a perceived neglect of certain energy resources, technologies, and applications by the federal government. States tend to develop low-cost, low-risk, near-term, and high-visibility solar energy RD&D projects because of limited resources and a desire not to duplicate federal program direction and emphasis. Differences between state and federal programs are often complementary. Technologies emphasized in the state programs include passive solar heating, low-cost active solar space and hot water heating, wind energy conversion, biomass energy conversion, and micro-hydro power generation.

In many instances, drawing a clear line between state solar energy RD&D activities and solar energy commercialization activities is difficult. A duplication of effort or possible conflict may result if states refuse to relinquish or compromise these commercialization-type program activities and the regional solar energy centers (RSEC's) continue in their planning to emphasize such commercialization activities.

Communication between the state solar energy RD&D program administrators and staff and their federal counterparts is poor. Thus, opportunities which could result from cooperative efforts between state and federal levels are being missed.

The limited evidence from legislative review sessions and rule-making hearings indicates that public attitudes toward the state RD&D programs examined have been generally very favorable. Legislative disposition toward these programs has also been quite favorable.

Additional solar energy RD&D program design and implementation recommendations can be made on the basis of this research project. (For supplemental information regarding these recommendations, please refer to Section 6.0.)

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SECTION 1.0

INTRODUCTION

One of the significant elements of state-level solar energy activity is a research, development, and demonstration (RD&D) program. This program, usually within the state's overall energy RD&D program, may not fit the traditional definition of RD&D. Most of the state solar energy RD&D programs are not oriented toward basic research, do not develop highly complex research concepts, and do not demonstrate high-cost and high-risk solar energy technologies. The states view high-risk, capital-intensive RD&D projects as being most appropriately performed by the federal government and private industry.

For the states, solar energy RD&D programs function primarily in support of commercialization* efforts. This close programmatic relationship between solar energy RD&D and commercialization efforts at the state level is a function of a more immediate or near-term emphasis within state-level RD&D programs. In fact, some states perceive their solar energy RD&D programs as predominantly a commercialization activity. One interviewee suggested that a third D representing "delivery" should be added to RD&D.

The objective of this section is to describe the results of a pilot study of state solar energy RD&D programs. The a priori assumption which motivated the study is: the process of program design and implementation can be as important as the content and spirit of a law that establishes a program. A state administration's political goals may drastically affect how a solar energy program is designed and implemented, and who can participate in the program. A new program such as solar energy RD&D may not complement or appropriately fit into the overall mission of the responsible administering agency. These factors may translate into lower levels of effectiveness and results for such a program.

General program design and implementation issues encountered by the states are described in this section. This material should be useful to the states and the federal government in program design, implementation, evaluation, and redesign. The following is included: a catalogue of state solar energy RD&D programs; the choice of case study states; program implementation experience in the case study states; and observations, recommendations, and conclusions.

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*"Commercialization" is defined as the establishment of both a viable private demand for solar energy systems and an industry capable of meeting this demand. This definition implies that the demand for solar energy systems and the responding industry can exist without government subsidy, although some subsidies may be justified to account for environmental and social benefits which are not included in market prices. (This definition is taken from Solar Incentives Planning and Development: A State-of-the-Art Review and Research Agenda, Solar Energy Research Institute, August 1978.)

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SECTION 2.0

REVIEW OF AVAILABLE RESEARCH, DEVELOPMENT, AND DEMONSTRATION INCENTIVES AT THE STATE LEVEL

There are a large number of institutional arrangements and fiscal mechanisms available to a state for the creation and implementation of an internally-funded solar energy RD&D program. The choice of mechanisms and instruments is partly governed by the program emphasis preferred by the particular state. The term "Solar Energy RD&D" has been used to describe a large spectrum of activities at the state level, ranging from research on materials and experimental technologies to near-term commercialization assistance. Included in solar energy state RD&D activities have been the following:

- research on materials and experimental technologies;
- modification of existing technologies for local conditions and for local energy use patterns;
- inventories of existing renewable energy resources and of the potential applications of solar energy systems;
- cooperation with private industry for the testing of solar energy systems;
- demonstrations and monitoring of solar energy systems; and
- dissemination of results of research, product development, and demonstration monitoring.

To support one or more of these activities, each state has a number of fiscal options. The choice of funding mechanisms will have important implications for program design and continuity, stability of funding, program autonomy, and administrative flexibility. (This will be discussed for the four state study states in Subsection 5.1.) Some of the common funding mechanisms for state solar energy RD&D programs include:

- annual legislative appropriations from general revenues;
- "ear-marking" of funds from existing special revenues (primarily state mineral severance taxes);
- levying of a surcharge on energy sold by regulated utilities;
- sale of state bonds;
- solicitation of outside funds (generally from federal government sources or from private foundations); and
- cost-sharing with private industry.

In general, there are several distinct approaches that a state can take to promote solar energy RD&D. These include:

- institutional support for the creation of new research institutes at state universities and the awarding of grants to existing private organizations;
- funding of specific projects through existing state agencies including annual competition for available funds and solicited, noncompetitive proposals; and
- cost-sharing with private industry, i.e., resource assessment and governmental participation in ongoing private demonstration facilities.

Priority given to possible state solar energy RD&D activities and availability of local institutional resources will largely determine what institutional arrangements and mechanisms a state will select for the performance of solar energy RD&D.

There are also a number of project-specific choices which must be made, either by the legislature or by the implementing agencies. These include:

- size of funded projects;
- duration of projects;
- type of project emphasis (near-term, basic research, etc.);
- applicant eligibility criteria; and
- use of outside advisory groups.

These issues will be addressed further in Section 5.0 below.

SECTION 3.0

STATE RESEARCH, DEVELOPMENT, AND DEMONSTRATION INITIATIVES, 1974-1978

Since 1974, a large number of states have enacted legislation creating energy RD&D programs, including solar energy RD&D. The variety of programs and their implementation and administrative experience is the focus of this research project. Table 1 contains a listing of all state energy RD&D programs, including solar energy RD&D programs.

As Table 1 illustrates, over the last four years states have shown an increasing interest in establishing their own energy RD&D programs. In 1974, four state programs were initiated; in 1975, seven; in 1976, none; and in 1977, six state programs were initiated for a total of 17 programs. Many other states have considered establishing their own energy RD&D programs and more states will probably establish programs in the near future.

Table 1

	Legislation/ Statute	Date	Funding*	Administering Agency
Arizona	Chap. 58 HB 2062	1977	Gen. Rev.	Arizona Solar Energy Research Commission
California	AB 1575 Chap. 276	1974	EUS	California Energy Resources, Conservation, and Development Commission
Colorado	SB 50	1974	Gen. Rev.	Colorado Energy Research Institute
Florida	SB 721	1974	Gen. Rev.	Florida Solar Energy Center
Hawaii	SB 1585	1974	Gen. Rev. & Bonds	Hawaii Department of Planning and Economic Development
Illinois	PA 80-432	1977	Bonds	Illinois Institute of Natural Resources
Iowa	SB 289	1975	Fed.	Iowa Energy Policy Council
Maine	PL 1558	1975	Gen. Rev.	Maine Office of Energy Resources
Montana	SB 86	1975	MST	Montana Department of Natural Resources and Conservation
New Mexico	PL 288	1975	MST	New Mexico Energy and Minerals Department
New York	A 8620	1975	EUS	New York State Energy Research and Development Authority
North Carolina	RL 911	1975	Gen. Rev.	North Carolina Department of Commerce
Ohio	HB 584	1975	Gen. Rev.	Ohio Energy & Resource Development Agency
Oklahoma	HJR 1013	1977	Gen. Rev.	Oklahoma Department of Energy
Oregon	SB 572	1977	Bonds	Oregon Department of Energy
Texas	HB 1799	1977	Gen. Rev.	Texas Energy Advisory Council
Minnesota	Chap. 455	1977	Gen. Rev.	Minnesota Energy Agency

*Funding Types:
Bonds
General Revenues (Gen. Rev.)
Energy Use Surcharge (EUS)
Mineral Severance Tax (MST)
Federal Support Funds (Fed.)

SECTION 4.0

THE EXPERIENCE OF IMPLEMENTING RD&D PROGRAMS IN SELECTED STATES

4.1 CHOICE OF CASE STUDY STATES

One objective of this research is to provide useful information about program design and implementation issues to states both with and without solar RD&D programs. For this pilot study, a small number of solar energy RD&D programs were selected for intensive study. Criteria for the choice of case study states include: (1) length of time programs have been in existence; (2) relative degree of program activity and/or innovation; (3) type of program design; and (4) geographical distribution among regions where plausible.

Based on the above criteria, the New Mexico, Montana, California, and Florida solar energy RD&D programs were identified for detailed investigation and for on-site interviewing of program administrators and staff. These programs exhibit a variety of institutional settings, funding methods, and legislative directives and are located within states of various levels of indigenous energy resources. It should also be recognized that each state program is characterized by a variety of unique circumstances (e.g., politics, personalities, the presence of federal laboratories and research facilities) which may affect the program design and implementation experience of that state.

4.2 NEW MEXICO

In 1974, an energy research and development fund was established as a state-financed program administered by the Board of Educational Finance. This fund is drawn from the Severance Tax Income Fund--an energy-related minerals severance tax. The New Mexico Legislature appropriated $2 million to the fund which by law could only support energy research and development proposals submitted by the six higher education institutions in New Mexico. Of 46 projects funded in this initial year, $225,000 was granted for seven solar projects.

In 1975 a new energy research and development program (Chapter 255, Sections 92-99, Laws of 1977) was created to supersede the above one-year-old program. This newer program, also appropriated $2 million, was administered by the newly created Energy Resources Board (Chapter 289, Laws of 1975). Chapter 288 of the 1975 legislative session also enabled the Energy Resources Board to develop its own proposals as well as to accept proposals from the higher education institutions and nonprofit research and development institutes. An energy research and development review committee was also established (Chapter 288, Laws of 1975) to assist and advise the Energy Resources Board in granting funds for specific projects.

This energy research and development program has continued to date with the following changes. In 1977 the Department of Energy and Minerals (DEM) was created and replaced the Energy Resources Board. In the same year, an additional $500,000 was allocated to New Mexico State University (Chapter 347, Laws of 1977) to establish the New Mexico Solar Energy Institute. The purpose

of the institute is to:

- develop solar equipment performance standards for solar energy development;
- test solar energy heating and cooling systems;
- coordinate major research, development, and demonstration efforts within the state;
- collect and disseminate information to citizens and industry concerning solar energy research, development, and demonstration and solar energy applications and technologies; and
- coordinate the development of federal solar energy programs within the state.

Two of the above elements will be discussed in detail in Subsection 5.6.

The Energy Resources Board and the subsequent Department of Energy and Minerals were established as executive branch energy agencies. These agencies, respectively, were and are the lead state government agencies in the solar energy area. The Department of Energy and Minerals administers all solar-related, state-funded RD&D. The energy research and development fund, administered by the Department of Energy and Minerals, has used $6 million in state funds as "seed money" to attract over $10 million in federal and private research funds during the past three years.[1] Forty-one solar energy RD&D projects have been funded through the state program from 1975-1977 (see Appendix A).

4.3 MONTANA

The Montana Renewable Alternative Energy Research, Development, and Demonstration Grant Program was first authorized in 1975 to "stimulate research, development, and demonstration of energy sources harmonious with . . . long-range ecological stability."[2] The program is administered by the Department of Natural Resources and Conservation and is supported annually through 1979 by 2.5% of the revenue received from the state's coal severance tax.

The program awards grants to any person, educational institution, or other organization with the provision that projects funded are not utilized to "commercially market electricity, heat, energy, or energy by-products."[3] Preference may be given to projects which are partially supported by federal

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[1]Department of Energy and Minerals, A Status Report on the New Mexico Energy Research and Development Program, June 1, 1978.

[2]Montana Statues, Section 84-7407, R.C.M. 1947.

[3]Ibid.

funds, research centers unattached to existing educational institutions where several investigators can share services, and research centers which make information available to individuals, small businesses, and small communities. A somewhat unique feature of the statute is that a one-time appropriation of $15,000 was committed for the purpose of publicizing information about enacted tax incentives for alternate energy applications and the Renewable Alternate Energy Research, Development, and Demonstration Program during fiscal year 1975-1976.

Total program expenditures, including personnel, accounted for approximately $562,000 in 1976 and $957,000 in 1977. Over the last three years since program inception, 110 projects have been funded at sums ranging from $600 to $100,000 (see Appendix B for additional information). Up to 90% of the total grant may be advanced to the recipient. The idea underlying this approach is that projects should not be held up due to initial or "up-front" monetary needs.

Procedures and policies for the administration of the Renewable Alternate Energy Grants Program have been defined in rules adopted by the Department of Natural Resources and Conservation. During the rule-making process, the public was very supportive of the program and draft rules. Only one change was induced by this public hearing--two grant submittal periods occur in each year instead of one. The following procedures have been established for evaluating and processing applications.[4]

- The program staff reviews each application for content and compliance with the rules and regulations. If an application conforms to the rules and regulations, it is accepted. If it does not, more information is requested or it is returned to the applicant with an explanation. The applicant then has the option of correcting the deficiency and resubmitting the application within the program's established deadline.

- An ad hoc committee may review the applications for technical feasibility. The committee consists of at least two persons qualified to evaluate applications in each of the six renewable energy categories: solar, wind, wood, water, geothermal, and biomass. In general, there are two independent technical reviews. In addition, the program staff reviews all applications.

- The Alternative Energy Advisory Council (AEAC), a five-member council appointed by the Governor, then reviews and evaluates the applications considering factors other than technical feasibility. AEAC is primarily concerned with the potential for practical application and development in Montana. After conducting their evaluations independently, members meet to discuss the applications and make recommendations for funding to the Department.

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[4]Montana Department of Natural Resources Conservation, Energy Planning Division, Renewable Alternative Energy Research, Development, and Demonstration Program: Report to the Legislature, February 1977.

- The Department Director makes the final decision on which projects are funded. This decision is based on results of the evaluations and recommendations of the AEAC.

4.4 CALIFORNIA

Assembly Bill #1575 (Chapter 276, 1974) created the California Energy Resources Conservation and Development Commission. The Commission is directed to perform such functions as demand forecasting, utility rate review and analysis, and energy facility siting. In addition, the Commission is authorized to develop and coordinate a research and development program for energy conservation and improvement of energy supplies. This statute explicitly states that assessment and accelerated development of solar energy resources is to be a part of the Commission's activities.

The California Energy Commission and its activities are supported by revenues from a one-tenth of a mill ($.0001) per kilowatt-hour surcharge on all electricity sold to consumers within the state. This surcharge will increase annually by one-hundredth of a mill increments over a ten-year period, thus resulting in a two-tenths of a mill charge in the tenth year of Commission operation. These revenues are in turn deposited in the State Energy Resources Conservation and Development Special Account which is established in the General Fund. These funds must then be annually appropriated by the legislature in the Budget Act.

During its initial years of operation, the California Energy Commission recognized the need to define more clearly and concisely what areas of RD&D should be carried out. To this end, commission staff drafted clarifying legislation which eventually became law (Chapter 1081, 1977).

The California Energy Commission has assessed possible RD&D areas to determine which should be pursued by the state and which should be done by other sectors. As a result of this assessment, the Commission's RD&D program focuses on:

- providing supply alternatives to nuclear and fossil fuel (primarily solar, geothermal, and biomass);
- developing and analyzing conservation techniques;
- reviewing nuclear and fossil fuel options to ensure environmental and public protection (e.g., power plant siting); and
- assessing future supply and demand for energy in California.[5]

The priorities within this broad range of activities were developed from the

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[5] California Energy Commission, Energy Research and Development Program California Energy Trends and Choices: 1977 Biannual Report of the State Energy Commission, Vol. 6, January 1977.

following questions:

- Can the development of the option contribute to meeting California's projected energy needs in the next 20 years?
- Does the option have controllable or negligible environmental effects?
- Is the option sufficiently pursued by other organizations?
- Can the Commission's support result in significant benefits to California?[6]

All of the above items are the basis for energy RD&D program planning by the Commission. Within the solar energy RD&D area, the following five areas are receiving Commission attention:

- domestic hot water heating and space conditioning (using active systems);
- space conditioning via passive solar energy design;
- industrial process heat;
- wind energy; and
- solar-thermal electric generation.[7]

4.5 FLORIDA

Senate Bill #721 (Chapter 74-185), effective July 1, 1974, directed the Board of Regents of the state to develop a plan for a state solar energy center. The stipulated purpose of the center is to promote research and development of solar energy, to disseminate information on the results of such research, and to demonstrate the capability of solar energy systems to provide energy resources to the state. In 1975 the Board of Regents' plan was approved, and the legislature appropriated $1 million to support the Florida Solar Energy Center. The enabling legislation directed that the center be integrated with the existing technical and personnel resources of the state university system and coordinate their diverse activities regarding solar energy development.

The Florida Solar Energy Center is divided into three divisions: Research, Development, and Demonstration; Education and Information Services; and Energy Systems Analysis. In addition, a Technical Advisory Committee, appointed by the Center director, makes recommendations to the director concerning ongoing operations and plans. This committee includes representatives from public and

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[6] Ibid.

[7] Ibid.

private universities, energy utility companies, professional associations of architects and engineers, the solar energy industry, and others involved in the state's energy future.

For the first two years of operation, the center had a budget of $1 million annually. During the third operating year the center received $1.3 million in state funds and an additional $1,236,467 in federal and private research funds.

The Research, Development, and Demonstration Division is the center's largest section and accounts for over half of the overall budget. One of the division's major programs is the testing, certification, and labeling program.

SECTION 5.0

ANALYSIS OF CASE STUDY STATE RD&D PROGRAMS

To compare and assess the four state solar energy RD&D programs, analysis will focus on six aspects of the implementation experience and administrative setting:

- source of program funding;
- institutional and political setting;
- legislative bounds to administrative policy-setting;
- policy-setting role of the administering agency;
- level of program planning, evaluation, and information dissemination; and
- level of project monitoring, evaluation, and information compilation.

Variations in these factors help determine the viability and effect of the implementation of a state solar energy RD&D program, as well as the nature of the output of the program itself.

5.1 SOURCE OF PROGRAM FUNDING

As noted at the bottom of Table 1 (Section 3.0), there are five methods which states are using to fund solar energy RD&D programs: the sale of state bonds, appropriation of state general revenues, levying of a surcharge on energy sales, "earmarked" funds from a mineral severance tax, and use of federal funds. In the four case study states, Florida uses general revenues, California levies a surcharge on each kilowatt of electricity sales, and Montana and New Mexico fund solar energy RD&D programs from a state mineral severance tax.

The predictability of funding support for RD&D programs is important for program stability and success. Unlike many other state expenditures, RD&D programs require a multi-year time horizon and commitment. For this reason, energy use surcharges and mineral severance taxes would appear to be preferable methods of RD&D program funding since they are predictable, dependable, and stable. Annual appropriation of state general revenues, and, to a lesser extent, proceeds from state bond sales, are subject to political fluctuations in the legislature. With the growing taxpayer revolt, funding mechanisms which rely upon state income taxes or general revenues may be politically unacceptable and therefore undependable.

General revenue funding may mean that the administering agency is subjected at least annually to program review by a legislative oversight committee. This review may center around issues such as why a certain project was not funded

in a certain legislators' district or may become embroiled in a partisan dispute. In short, general revenue funding may require greater accountability to the legislature and a more subjective program review.

State bond sales may also prove erratic as a program funding method. State bond sales will probably precede the initiation of an RD&D project where this funding method is used. RD&D program funding levels may become dependent on the relative success of bond sales. Economic factors at a variety of levels (e.g., national, regional, and state) may affect the sales of state bonds at various times. Incurring additional state debt may not be politically acceptable at certain times and RD&D program funds may therefore be jeopardized if they rely on bond sales as a funding method. As with state revenues, bond sales may be an unpredictable and irregular method of program funding.

Federal funds are normally used to supplement state solar energy RD&D funding or to support specific projects. As in the above examples, federal funds may be irregular and subject to federal budget priority changes. Additionally, the federal government has not generally funded RD&D efforts at the state level, but rather has managed RD&D efforts on its own, or designated this responsibility to federally contracted laboratories.

The above general observations, like any generalizations, have their exceptions. The Montana Renewable Alternate Energy Grants Program, funded with revenues derived from the state coal severance tax, would apparently have a stable program funding source. This has been exactly the case until the present. The Renewable Alternate Energy Grants Program legislative oversight committee froze funds for the upcoming year. This occurred just prior to election time and may have been meant to demonstrate fiscal restraint to the voters. This decision was recently reversed by the oversight committee. In contrast, the Florida Solar Energy Center, which depends upon annual appropriations from general revenues for the funding of its RD&D program, has consistently received budget increases and rapid legislative approval for its program. There are several explanations for this reversal of the expected relationship between funding sources and program viability. In the case of Florida, it appears that the location of the solar energy RD&D program within a respected and politically powerful university system seems to have insured dependable and regular funding. This factor will be discussed later in this report.

Validity of these initial generalizations is still questionable. Further analysis, based on a larger number of case study states, should help clarify this important issue area.

5.2 INSTITUTIONAL AND POLITICAL SETTING

The type of agency responsible for translating RD&D enabling legislation into program plans and managing a solar energy RD&D program may be critical to successful program implementation, administration, and effectiveness. Other influencing factors are the agency's overall mission, familiarity with RD&D programs, and institutional relationship to other agencies and organizations.

In Florida, the multi-layered institutional arrangement of the Florida Solar Energy Center (FSEC) gives the FSEC a relatively high degree of institutional and political autonomy. FSEC is organizationally located within the large and influential state university system. Administratively, the FSEC reports to the Florida Technological University (F.T.U.) which, in turn, reports to the Florida Board of Regents (B.O.R.). The B.O.R. reports to the Florida Legislature. FSEC staff feel that this institutional setting provides them with substantial flexibility in administering the RD&D program, as well as in maintaining program continuity, job security, and staff stability. The state university system also provides much needed equipment and technical expertise.

The FSEC's state university system affiliation and the B.O.R.'s strong influence in the state legislature has helped counteract the negative effects (e.g., irregularity, politically-motivated program review and evaluation) of using general revenues for RD&D program funding. FSEC funds have been readily approved and increased by the legislature.

The Montana Renewable Alternate Energy Grants Program is located within the Montana Department of Natural Resources and Conservation (DNRC). The DNRC has sole responsibility for all energy-related state programs and projects. This clear delegation of administrative responsibility for energy programs has mitigated against state agencies duplicating efforts and resource allocations, centralized RD&D experience and talent, and minimized inter-agency "turf-fighting." Since only one agency is responsible for energy programs, time which would have been spent coordinating inter-agency activities within the executive branch is available for program management and related tasks.

The Florida and Montana experiences indicate that a strong relationship may exist between institutional and political setting, program design, implementation, management, and effectiveness. Future research will test the validity of this hypothesis.

5.3 LEGISLATIVE BOUNDS TO ADMINISTRATIVE POLICY-SETTING

The focus and direction of state RD&D activities, projects and grants, participant eligibility, and project duration may be explicitly stated in the enabling legislation, implicitly identified through general legislative criteria (e.g., "environmentally benign" or "renewable and cost-effective"), or determined by the administering agency. In the latter case, the administering agency is de facto setting state policy. The focus of decisions on the scope of the RD&D program may affect program implementation and management. A legislature may be inclined toward more liberal criteria while an administering agency may be more conservative in its approach. A legislature may desire a small number of RD&D projects (for ease of review) while an administering agency may opt for a large number of projects in order to maximize research output.

In Montana, the legislature established specific criteria related to project duration:

> A grant may cover a period not exceeding one (1) year, and the Department may not commit itself to spending funds anticipated to be available more than one (1) year after the grant period begins . . . [but the DNRC] may give an applicant a statement of intent to renew its support of his work, subject to the availability of funds and such other conditions as the Department may express (Chapter 501, Section 84-7412).

This one-year grant duration has caused problems for grant recipients since RD&D projects characteristically require more than one year. The Montana program manager noted that the lack of assurance of continued project funding created a feeling of insecurity among grant recipients. In addition, the one-year duration criteria often makes a project's final report dependent upon a grant renewal.

In New Mexico, the state legislature limited the total expenditure for any one project in a given year. Chapter 255, Section 92, Laws of 1977, states that: ". . . not more than ten percent of the total funds appropriated for any one fiscal year shall be allocated for any single project."

California RD&D legislation (Chapter 1081, Section 25601) also stipulates an upper limit for large-scale alternate energy system demonstrations, allowing "not more than one-half of the total state funds appropriated for the solar energy research and development program as proposed in the budget . . . ."

5.4 POLICY-SETTING ROLE OF THE ADMINISTERING AGENCY

The staff and administrators of the implementing agencies play a major role in the selection of the projects which will be funded by a RD&D program. By doing so, they also influence the overall direction of the program, favoring certain technologies or certain approaches. To assist in this selection process, the administering agencies in the case study states have relied upon three major guides:

- restrictions within the enabling legislation;
- internal selection criteria; and
- external advisory groups.

Several legislative restrictions on the duration and size of projects are discussed in the preceding section. In the following analysis, several examples of methods used to screen proposed projects that fit within the bounds imposed by the enabling law will be discussed.

The best example of the development of criteria for both the identification of broad areas of RD&D interest and the selection of individual projects is found in California. Responding to the mandates of a 1977 law which its own staff helped draft, the California Energy Commission in its 1977 Biannual Report to the Governor and Legislature outlined a two-year energy plan which included a major component for solar energy research. The basic components of this overall energy plan, as well as the specific solar research priorities, is

contained in Subsection 4.4. All but one of the priority areas identified (the exception being solar thermal electricity generation) are near-term research areas which are closely linked to commercialization efforts for existing, established technologies.

Outside advisory groups have also played important roles in the selection of projects in several of the states. In Montana, the Alternative Energy Advisory Council (AEAC) and in New Mexico, the Energy Research and Development Review Committee both assist in the screening of proposed projects for state RD&D funding. Each group makes recommendations on which particular projects should be funded to the director of the state energy office. The director then makes the final selection, drawing upon the advisory group recommendations and those made by staff. By participating in the project selection process, the advisory groups play an important role in the direction of overall state RD&D policy. In general, the advisory groups have preferred small-scale commercialization and demonstration projects which would assist in the rapid movement of solar technologies into the energy marketplace.

5.5 LEVEL OF PROGRAM PLANNING, EVALUATION, AND INFORMATION DISSEMINATION

There has been little systematic program planning or evaluation that has yet taken place in the four case study states. In part, this is due to the newness of these programs. This factor has been exacerbated by a general lack of staff, funds, and evaluation expertise in each of the four states. The staff of each program recognized the importance of RD&D planning, including the identification of objectives and goals. Such program guides were seen as being crucial to improving program efficiency, direction, and effectiveness. A program plan which is available to the public would also help focus public participation in the RD&D program and would facilitate in the process of grant and contract solicitation.

Program evaluation can help discover areas within the program plan requiring a shift in emphasis. Additionally, program evaluation periods may be the best time to integrate new areas of RD&D into the program plan since this will be a time of scheduled program plan modification. Sudden, unscheduled program shifts or modifications may be disruptive to program administrators, participants, and projects.

Program evaluation periods may also be an excellent time to invite the input of special interest groups and/or an advisory panel. The use of these special interest groups for program evaluation and the incorporation of their members into a program advisory panel may help foster a constituency which supports the program. This may contribute a perspective leading to greater local relevance of the program. These groups may be a significant resource to a solar energy RD&D program. Special interest groups have contributed input to program design in both Montana (Alternate Energy Resources Organization) and Florida (Florida Solar Energy Industries Association).

5.6 PROJECT MONITORING AND INFORMATION DISSEMINATION

Several of the case study states have begun programs to follow the progress of individual projects and to accelerate the dissemination of research results of these projects. Montana committed $40,000 in 1978 for the first-year funding of a major monitoring effort. At the completion of each project, information on the research data and approach are compiled and made available to a broad range of potential users. The California Energy Commission routinely publishes the results of its funded research, including solar energy studies and demonstrations through a computerized central mailing list. Such information dissemination is important, since it produces a multiplier effect* by making results available to a variety of interested parties. The New Mexico state legislature, when creating the New Mexico Solar Energy Institute, recognized the importance of an integrated RD&D program and the availability of research results by directing the Institute to:

- coordinate major research, development, and demonstration efforts within the state; and
- collect and disseminate information to the citizens and industry in the state concerning solar energy RD&D efforts within the state (Chapter 347, Laws of 1977, Paragraph B).

This arrangement delegates solar energy RD&D coordination, and information collection and dissemination to an institute located within the state university system which also reports to the State Department of Energy and Minerals.

*RD&D multiplier effect--the increased application of RD&D findings by groups or individuals outside the funding agency due to the availability of information on project results and problems encountered.

SECTION 6.0

OBSERVATIONS, RECOMMENDATIONS, AND CONCLUSIONS

Certain general observations can be made on the basis of this assessment of the four states. Some of these observations are transferable to other state solar energy RD&D programs.

6.1 PROGRAM DESIGN AND IMPLEMENTATION OBSERVATIONS

1. Coordination and cooperation with state universities has proven beneficial and important for program autonomy, stability, and continuity. The state universities represent a resource with relevant talent and equipment. Because of the technical talent located at many state universities, RD&D program association with these individuals can yield a more credible program. New Mexico's Solar Energy Institute and Florida's Solar Energy Center are good examples of institutional arrangements for facilitating university contributions, cooperation, and coordination (see Subsection 5.2).

2. Program planning, including the identification of objectives and goals, has been largely neglected in state RD&D activities. This oversight or neglect has been due to a lack of time, staff, legislative mandate, and/or administrative directive. All four case study states have neglected this area of their RD&D programs to some degree (see Subsection 5.5).

3. Program evaluation has been underemphasized and/or overlooked in the solar energy RD&D programs in the four states examined (see Subsection 5.5).

4. The monitoring and evaluation of specific projects was recognized by several state officials as a neglected area. Without this review, it is difficult to assess what benefits are being realized by a given program. The failure to disseminate project information and results is also a critical shortcoming in state RD&D program follow-through. Without this process, the RD&D multiplier effect is minimized. States have begun to recognize this need. Montana recently committed nearly $40,000 for project evaluation of those projects funded during the initial phase of their Renewable Alternative Energy Grant Program (see Subsection 5.6).

5. In most cases, there is no functional or definitional difference between RD&D activities and commercialization activities. Since many of the RD&D projects are near-term, they become associated with commercialization activities. The California and Florida programs exhibit this characteristic (see Subsections 4.4 and 4.5).

6. Special interest groups have played important roles in facilitating the implementation of RD&D programs and in furthering public awareness of solar energy in general. In certain cases, they have been important in program design (Montana and Florida). The New Mexico Solar Energy Association has been a key actor in New Mexico due to its broad constituency and advocacy of solar energy. Many of these groups are excellent resources which should not be ignored in RD&D planning and evaluation (see Subsection 5.5).

7. Advisory groups have been a positive and constructive force behind program design, implementation, direction, and emphasis. They have proven to be an excellent mechanism for special interest group and public participation. Advisory groups of this nature are contributing to RD&D programs in Montana, Florida, and New Mexico. The balance of interests and professions represented on the advisory group will help determine the course and direction of the program. These groups, removed from program administrative responsibility, and not accountable to program administrators, can offer valuable, timely, and critical input to the program (see Subsection 5.4).

8. Many RD&D projects and program emphases have been initiated in order to address areas of near-term potential neglected by federal government programs. Low-cost, decentralized, and "low-tech" solar applications have been a major emphasis in the Montana program. Passive design options and potential have been the focus of research in California. By filling these RD&D gaps in federal programs, these state programs complement federal efforts. This program emphasis may also help establish immediate program credibility, demonstrate accountability, and provide valuable experience quickly (see Subsections 4.3 and 4.4).

9. Unclear legislative intent and direction has contributed to problems associated with ambiguous program emphasis and direction, administrative responsibility and accountability, and inattention to many of the previous eight points. Clarity of specific program directions or desired accomplishments will aid program administrators during budget review sessions. For example, the California Energy Commission sought to clarify RD&D program elements and directions by drafting AB 1512 (Chapter 1081) in 1977 (see Subsection 4.4).

6.2 GENERAL OBSERVATIONS

1. Public attitudes, as evidenced in rule-making hearings or legislative review sessions, have been favorable and supportive of these programs. The Montana program seems to stand out as the best example of a program administered with considerable public support. The California program received a vote of confidence and approval for its strong solar energy advocacy role and progressive manner during public hearings on utility involvement in the commercialization of solar energy in California.

2. As already mentioned, program emphasis has been on the near-term, lower-cost, lower-risk projects (e.g., water heating, greenhouses, passive designs). This emphasis as opposed to the federal RD&D program emphasis on relatively longer-term, higher-cost, higher-risk projects (e.g., photovoltaics, large wind machines, and "power towers") may be the most effective working niche for the states. It is a common argument within state legislatures which are considering energy RD&D program enabling legislation that the federal government is already engaged in this area. A nonduplicative, appropriate, and hopefully complementary state energy RD&D program is most desirable.

3. There is potential conflict and duplication of effort inherent in the nature of state RD&D programs since they are similar to commercialization activities. The regional solar energy centers (RSEC) have been directed by

DOE to perform commercialization activities. However, it was expressed by several interviewees that it is unlikely that their states would cease their activities in this area.

4. The program funding mechanism, its predictability and stability may have an impact on the program over time. This issue is discussed at length in Subsection 5.1.

The following recommendations can be made regarding state-level solar energy RD&D program design and implementation.

1. Efficient and effective program implementation will be greatly facilitated by a clear delegation of administrative responsibilities. These factors can be addressed within the enabling legislation itself or in subsequent rule-making hearings. Clarity regarding program responsibilities will mitigate inter-agency and intra-agency conflict.

2. Solar energy RD&D program planning and identification of goals and objectives have been neglected to some extent in every case study state. This is also true of the case study states' energy RD&D programs in general. Program planning, including identification of goals and objectives, would assist in determining the best use for limited resources and in the coordination of projects around program goals or desired outputs.

3. It is desirable to coordinate state RD&D activities with state universities. Overall program success may be a partial function of the degree of cooperation and coordination that exists between the program administrators and staff and the state universities. A more effective use of limited program funds may be realized through the use of state university equipment, facilities, and personnel.

4. Influential special interest groups that are recognized as competent within the solar energy community can be a valuable resource to state RD&D programs. These groups can assist administrators and staff in program planning, project monitoring and evaluation, program evaluation, and program information dissemination. They can also be valuable allies during legislative review or budget sessions.

5. Program advisory groups can greatly facilitate the flow of valuable information to program administrators and staff. As neutral and objective entities, program advisory groups may be the most appropriate bodies to bring about the realization of many of the above recommendations during program evaluation. Program advisory groups should be composed of representatives from the variety of interests within the state solar energy community.

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6. Transition Metal ION Complexes as Catalysts in the Solar Decomposition of Water to Produce Hydrogen
7. The New Mexico State University Solar Heated and Cooled Demonstration Home
8. Thermal Trap Solar Energy Collector
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10. Initiation of Wind Power Technical Center
11. Solar Collector Test Facility
12. Solar Ponds for Residential Heating
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19. New Mexico Solar Business Potential
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21. The New Mexico Wind Potential
22. Solar Energy and Energy Conservation
23. Application of Solar Energy to Night Heating of Greenhouse
24. Instrumentation of the New Mexico Department of Agriculture Building
25. Pyranometer Station for the Assessment of Solar Energy Influx in Eastern New Mexico
26. Performance Evaluation of the New Mexico State University Solar Home
27. Addition of an Air-Cooled Collector Test Capability to the Solar Collector Test Facility
28. Information Dissemination of Wind Energy
29. Solar Irrigation Pumping Demonstration Project
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34. Solar Thermal Test Facilities Users Association

35. The Air-Cooled Thermal Trap Solar Energy Collector

36. Performance Evaluation of the New Mexico State University Solar House

37. Ejector-driven Open Air Brayton Cycle with Non-tracking Solar Collectors for Water Pumping

38. New Mexico Solar Radiation Networks

39. Development of Low-Cost Heat Pipe Concentrating Collector

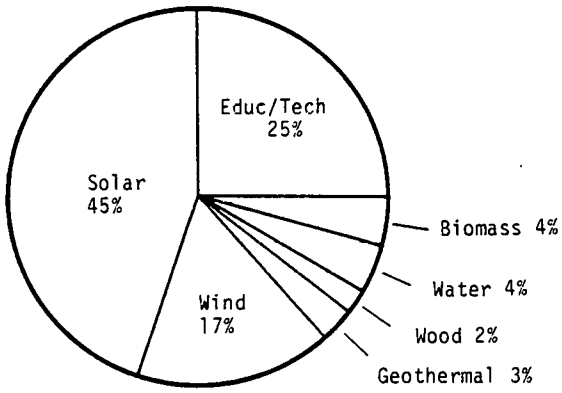
40. Preparation of High Efficiency Solar Cells and Corrosion Studies on the Solar Cell Materials

41. Utilization of Solar Produced Nitrogen Fertilizer

SOURCE: New Mexico Energy and Minerals Department, A Status Report on the New Mexico Energy Research and Development Program, June 1, 1978.

APPENDIX B

MONTANA RENEWABLE ALTERNATE ENERGY GRANTS PROGRAM



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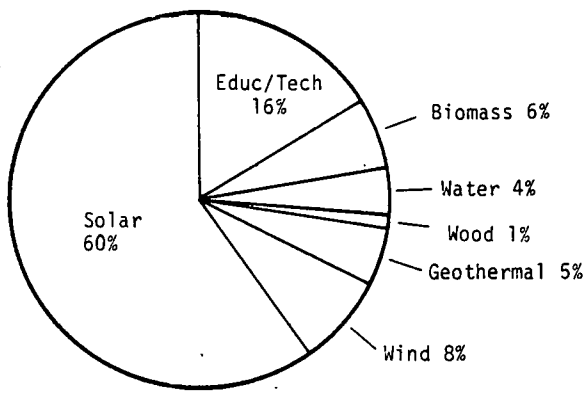

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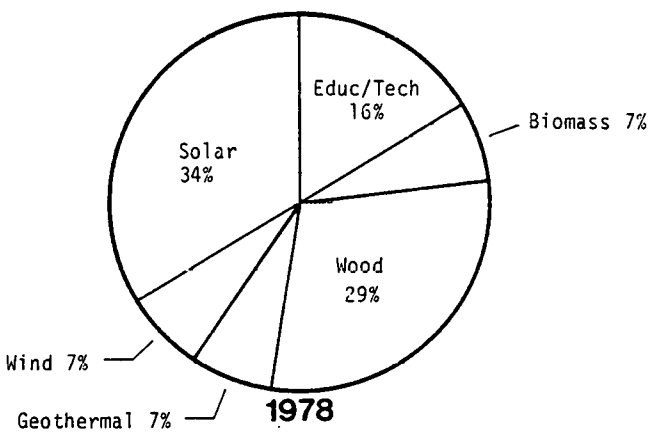

1978

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APPENDIX C

INDIVIDUALS INTERVIEWED

California Energy Commission
July 10-12, 1978

Don Carner, Energy Conservation Specialist

Mike DeAngelis, Manager, Solar Technology Development

Bob Farley, Manager, Policy Analysis Program

Bruce Gilland, Builders Outreach Program

Matt Ginisar, Wind Energy Specialist

Bob Hodam, Manager, Biomass Program

Marshall Hunt, Manager, California Passive Program

Alec Jenkins, Solar Program Specialist

Stan Kaplan, Policy Analysis Program

Dr. Lawrence Murphy, Office Manager, Solar Office

Florida Solar Energy Center
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Dr. David Block, Director, Florida Solar Energy Center

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Omar Hancock, Research Engineer

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Montana Department of Natural Resources and Conservation
August 14, 1978

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Gerry Knudsen, Manager, Alternative Renewable Energy Grants Program

Randy Moy, Chief, Energy Planning Bureau

Jan Konigsberg, Solar Energy Coordinator

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